



# 1974

## WORLD POPULATION YEAR

COMMITTEE FOR INTERNATIONAL COORDINATION OF NATIONAL RESEARCH IN DEMOGRAPHY

### **SEMINAR ON DEMOGRAPHIC RESEARCH IN RELATION TO POPULATION GROWTH TARGETS**

**3 - 9 April 1973**

**University of the West Indies  
ST. AUGUSTINE (Trinidad and Tobago)**

**CICRED 1973**

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# FOREWORD

by Jean BOURGEOIS-PICHAT,  
Chairman of Cicred

1. *The seminar on "Demographic Research in Relation to Population Growth Targets" is the first of a series organized by Cicred. It has been held at the University of the West Indies in St-Augustine (Trinidad and Tobago) which has to be thanked for its generous hospitality. Among the people who deserve special thanks, the Chancellor of the University, Dr. L.E.S. Braithwaite has to be mentioned. He was the one who took the decision to invite Cicred to come to his University and he welcomed the participants at the opening of the seminar.*

2. *He gave to Professor Jack Harewood, co-Director of the Institute of Social and Economic Research at the University of the West Indies the task of organizing physically the seminar. Dr. J. Harewood, with the help of his staff at the Institute, succeeded in running the seminar very smoothly, so contributing greatly to the success of the meeting.*

3. *The technical preparation of the seminar was the responsibility of Professor Helmut V. Muhsam from the Hebrew University in Jerusalem. The idea to have a seminar on the subject was first proposed by him during the meeting of representatives of demographic research institutes organized by the United Nations Population Division in Lyon (France) from 3 to 11 June, 1971. He has to be congratulated first for the idea but also for the excellent job he performed in preparing the seminar.*

4. *The United Nations Fund for Population Activities was kind enough to finance the project and financial support of the Fund was, of course, essential for the holding of the seminar. The Executive Director of the Fund, Mr. Rafael Salas, has to be thanked for his decision.*

5. *Finally, the substantive programme of the seminar was established in cooperation with the United Nations Population Division. Mr. Octavio Cabello, Acting Director of the Division when the work started, was replaced later on by M. Léon Tabah the present Director of the Division. M. Tabah was represented at the Seminar by Mr. Riad Tabbarah.*

6. *The decision to ask Cicred to organize seminars was taken in Belgrade (Yugoslavia) during the first Assembly of Cicred. But in taking its decision, the Assembly made clear that the seminars of Cicred had to fulfill certain conditions.*

*"They should be different from the seminars organized by other bodies. If not, "there would be no reason for Cicred to be embarked on this project. The Assembly thought that the role of Cicred ought to be that of organizing seminars of centers of research and not seminars of experts as is usually the case. Thus centers would be invited to participate and not individual experts. Each center will designate its representative who will speak in the name of the center.*

*"The recommendations of the seminar would commit the centers provided that the recommendations are ratified by the Director of the center or by other authorities. The scheme would be similar to the signing of treaties between Nations. To be applied, they have to be ratified by the parliament of each nation. This means that something definite will result from each seminar, though it may not necessarily follow the lines of the recommendations exactly" (\*).*

7. *The seminar on Population Research in Relation to Population Growth Targets was organized along the lines set forth by the first Assembly of Cicred which have just been recalled. The report on the seminar prepared by Mr. Geoffrey McNicoll from Australia, presently at the East-West Population Institute (Honolulu, U.S.A.) ended with a list of research to be undertaken if one wants to find a solution to the unanswered questions which appeared during the debates of the seminar. Work is under way to transform this list of research into a list of concrete research projects which will be farmed out among the centers members of Cicred to be included in their work programme.*

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(\*) Report on the first Assembly of Cicred (§ 28).

8. *May be it is worthwhile at this point to explain what are the centers members of Cicred and more generally what are the purpose and the structure of Cicred. It has been created as a consequence of the meeting of representatives of demographic research institutions gathered in Lyon by the United Nations Population Division from 3 to 11 June 1971 and referred to above.*

9. *The purpose of the Lyon meeting was to discuss the various problems encountered by the centers in planning and promoting research and also to stimulate new research in view of the forthcoming World Population Year 1974. As a consequence of the rapid increase of institutionalized demographic research during the last few years, the need to introduce a certain amount of coordination among the activities of the various demographic research centers became obvious. First a plan suggesting research priorities was established by the Lyon meeting with the hope that various centers would include some of them in their work programme, particularly as a contribution to the World Population Year 1974. But the participants of the Lyon meeting realized that such a voluntary effort alone would not be sufficient. In order to provide a real boost for new research, financial help would be required. An individualistic approach of the various institutions able to provide such an help on an individual basis did not seem very promising. Hence the creation, in October 1971, of the Committee for International Coordination of National Research in Demography (C.I.C.R.E.D.).*

10. *First a list of centers dealing more or less with demographic research was established. 636 centers were discovered. Out of this extended list, a core of 175 centers was extracted representing centers having demographic research as their essential activity. These 175 centers were offered to become members of Cicred (\*). Most of them have accepted. These centers were those which were asked to nominate a representative to the seminar on Population Research in relation to Population Growth Targets. Thanks to the financial contribution of U.N.F.P.A., it was possible to pay for the attendance of representatives of centers from developing countries (38 centers nominated a representative but due to financial constraints only the expenses of 23 could be paid). Altogether 53 centers belonging to 32 countries were participating in the seminar i.e. 33 % of the membership of Cicred.*

11. *From the point of view of organization and attendance, the seminar has been a success. But an important step remains to be taken and one will know if Cicred reaches its aims only when this step is achieved i.e. the translation of the recommendations of the seminar into concrete research projects and the farming out of these projects among the centers members of Cicred. As said above, work is in progress.*

12. *In inviting centers to designate representatives to the seminar, it was suggested to give preference to young demographers. A great number of centers followed this suggestion and it was quite rewarding to see new faces. For most of them, it was their first international meeting and they came to Trinidad and Tobago with great expectations. I am sure that reality has been far below what they were expected. But as some of them told me at the end of the seminar, this first contact with international cooperation aroused a need they were not conscious of before coming and they are anxious to repeat the experience. As they were new in the field of international meetings, they did not take always a very active part in the discussions, but I am sure that next time, they will be well prepared and they will have a more active participation. In bringing the coming generation of young demographers in the arena, the seminar has been a success.*

13. *The seminar did not develop exactly along the lines that the co-Director had in mind. This is not surprising. The scheme prepared by a co-director is always an intellectual game which will collapse when confronted with reality. The reasons are numerous. First, the authors of background papers always deviate from the outline prepared by the co-director. Each individual has his own views and he succeeds to present them even if they are not too well linked to the subject. On the other hand, important aspects of the subject are sometimes left out by the background papers and many participants came with the idea of asking explanation to the authors of background papers. It happened that some authors of background papers were unable to attend the seminar and the participants could not ask their questions. This is a lesson for the forthcoming seminars. The presence of the authors of background papers is essential.*

14. *For each sitting, a discussant had been designated. His task was to present the background papers related to the sitting and to open the discussion. The practice showed that a more lively discussion would have been obtained if the discussant had been asked to review the available literature in order to locate opposite views of those expressed in the background papers.*

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(\*) Cicred is directed by a Council of 21 people elected for three years by the first Assembly of Cicred held in Belgrade (Yugoslavia) on 29, 30 and 31 of May 1972. The composition of the Council is given in annex 3 to this report. The core of 175 centers is not a close body. New centers are added as they become known by the Council.

15. Finally, the subject was a difficult one. It touches population policies which are always full of emotional content.

*In this report, one will find after this foreword :*

- a) the opening statement made by the co-Director of the seminar,*
- b) 10 background papers (\*)*
- c) the report of the seminar prepared by the General Rapporteur,*
- d) the list of participating centers and other representatives (annex 1),*
- e) the programme of the seminar (annex 2),*
- f) the list of Council members of Cicred (annex 3).*

Port of Spain  
Trinidad and Tobago  
April 1973

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(\*) 11 background papers were planned. Unfortunately the paper prepared by M. Demeny entitled *Economic criteria for population growth targets* was submitted in a provisional and unfinished form. M. Demeny could not find time to rewrite and complete his paper and it is not published here.

# PRELIMINARY COMMENTS FOR DELIBERATIONS ON POPULATION GROWTH TARGETS

Introductory Statement of the Co-director in charge  
of the preparation of the discussion

by H. V. MUHSAM

Jerusalem, (Israël)

1. Before we can start fruitful deliberations on demographic research in relation to population growth targets, we should make it clear to ourselves what we understand to be "targets". A full discussion of this subject is in Dr. Iskandar's background paper. We might first of all accept Dr. Weller's suggestion to consider as "targets" only changes in demographic characteristics, which are assumedly brought upon by intentional action of the members of society acting in some concerted way. A society which, for one reason or another, prefers laissez-faire to any other policy, can be regarded as not to have set any specific "target" to its population. But if change is expected to occur "naturally" and societal action is aimed at maintaining present circumstances in spite of forecasted changes, we would include this case in our category of targets.

2. Now, according to Dr. Frejka's classification scheme we should differentiate between

- concrete, quantified, well defined targets, and
- fairly loose statements of aims and desires.

He suggests to include both under the definition of targets, because, so he claims, either may lead to well designed, energetic, purposive actions or to vague meditations and unrealistic, wishful thinking. Whether we are concerned with "targets" or not, should depend on the type of action which is actually taken to reach the objectives rather than on the terms in which these objectives are stated.

3. Frejka then suggests to consider the "subject" with respect to which the target is stated : the population as a whole, the average family or the individual person. Such a differentiation may be of theoretical interest. But it should, in principle, be possible, to translate any target termed in one of these "subjects" into any other terminology : a target birth rate, which is considered to apply to the total population, can be translated into an average family size, and this subsequently into the required behaviour of individuals in terms of age at marriage, fertility planning practice of the married etc. But this is a subject to be discussed at the Seminar.

4. Frejka's third criterion of classification of targets is called by him "statistical measures applied" in defining the target. I think that this is a slight over-formalization. I would consider the *aspect of population* concerned as more significant than the statistical measure used to quantify the behaviour. Indeed Frejka's principal classes are fertility, mortality, migration, population change (i.e. growth rates), absolute numbers of population, age composition, nuptiality, and contraceptive practice.

5. This last issue deserves certainly also further discussion at the seminar. However, there is no doubt that "targets" may relate to either the number of a population itself or to changes in this number. Regarding changes in this number, it is certainly agreed that targets may concern the absolute size of such changes or rates of change, as well as any one or several of the components of change : birth rate, number of immigrants admitted etc. Aims termed in any of these categories qualify certainly for being called population growth targets.

But whether we should include in our definition of "population growth targets" aims which a society may set to itself in terms of ages at marriage, practice of contraception or other means of achieving a given birth rate or population growth, this I would submit to your deliberation. But it is certainly important to differentiate between population growth targets on the one hand, and means and measures to reach the target

on the other hand. A change in nuptiality behaviour is, to my view, *a means* of achieving a given birth rate or average family size, while the desired birth rate, or the family size, is a population growth target.

6. However, such a differentiation is largely a matter of semantics. But in our future discussions, an agreed terminology can only facilitate procedure, and many misunderstandings can be avoided, if we come, in advance, to an agreement as to the meaning of such terms as targets, means of realising targets, criteria for setting targets etc.

7. This applies also to one of the population characteristics which Frejka proposes as a possible target, namely : the age structure. If we should consider the age structure as an acceptable "target", why would the urban-rural distribution, the set of labour – force participation rates, the structure by industry etc. not be considered as eligible targets ? Is the fact that the age structure is, directly and completely determined by "demographic" factors, while the urban-rural distribution, the labour force structure, etc. are determined only partly by purely demographic factors, a sufficient reason for such a discrimination ? I think it is not. And I would propose that we differentiate, in our future discussions, clearly between primary population factors, which are liable to target setting, and accompanying circumstances, which may be necessary, desired, dreaded, possible etc. In setting targets, such circumstances shall obviously be taken into account : eg. in setting a target in terms of an optimal rate of growth, the ensuing age structure should not be disregarded, or, in setting a target for total population size, the probable rate of urbanisation must be reckoned with. But this should not detract our mind from the differentiation between the primary problem of selecting a target and the secondary problem, of considering the desirability of all the accompanying circumstances of a demographic, economic, social, political, or any other, nature.

8. I repeat : these are matters to be discussed at our first meeting. As a preliminary step to this discussion, we should, perhaps, consider how and why a society may desire to set, to itself, population growth targets. The reason is certainly not "demographic": population numbers or structures are definitely neither desirable nor undesirable, *per se*. Why should it be more desirable that the total population of a country be 20 rather than 10 million – or why would a birth rate of 18.6 be preferable to one of 16.8 ? In fact, a population growth target is most often an element in a general social and economic development plan. Thus we must differentiate between the objectives of an overall socio-economic plan, and population targets, the latter being often nothing but means and ways of achieving the former. When we are considering population growth targets here, independently of this frame of reference, we must be careful not to include other aspects of the overall socio-economic development programme among the population growth targets.

9. In our deliberation. I would propose that population growth targets be not considered to emerge, so-to-say, as a by product of such general development policies, but we should discuss specific criteria which permit to establish definite population growth targets.

But before we come to this subject, we should first complete our attempts of defining, what we consider as population growth targets. Frejka proposes to differentiate between short term, medium term and long term targets, and we shall discuss this subject in some detail, when we shall be concerned with the "timing" problem. Finally, Frejka suggests a differentiation between types of subjects formulating targets, namely individuals vs. institutions. This is certainly an important aspect for many practical purposes, such as selecting means of implementation and assessing chances of achievement. But for our present preoccupation with the problems of definition, this differentiation seems not to be of major importance.

10. The most important aspect of Frejka's attempt of defining population growth targets is certainly his differentiation by the demographic characteristics affected ; I would like to put his 8 categories into two large classes : targets concerning total population size, and targets concerning population growth rates, the latter covering fertility, mortality and migration targets, or at least, constraints regarding their relative levels, as well as implications regarding the age structure and possibly levels of nuptiality and contraceptive practice.

11. It is one of the conclusions which I think that I am permitted to draw from the consensus of our background papers, that population growth targets which would imply an optimal *rate* of growth are not considered as interesting or realistic by the demographic profession, now-a-days. A population growth target should, apparently, always be a total population figure. This stands in extreme opposition to practice in all countries which have set targets to themselves as can be seen from the list of targets of Frejka's paper.

12. In theory, the problem of an optimal rate of population growth seems to arise only in the case (see Sauvy's background paper) where a population wishes to change its number from one figure to another : the question of a desirable rate of growth for its own sake is not even put.

While Sauvy seems to reject (except under slightly extraordinary circumstances) the existence of a non-zero optimal rate of population growth on *a priori* assumptions, Weichselberger arrives at a very similar



conclusion, following an empirical line of thought. He attempts to find the most efficient age structure in respect of relative numbers of producers and consumers which it would imply, and he is lead to the age structure which would obtain in a practically stationary population.

13. Thus even without taking into account the finiteness of each country and the earth as a whole, optimization considerations lead apparently to the conclusion that zero population growth has certain advantages, in terms of the internal equilibrium between numbers of consumers and producers. But this conclusion is certainly very sensitive to the set of assumptions made, and in particular, to three of Weichselberger's working hypotheses, namely :

1) that children have no amenity value to their parents, or, in other words, that the value of children is only in their future contribution to the gross national product.

2) that the productivity of successive cohorts is constant, i.e. that younger generations are neither better prepared nor better adjusted to producing and living in a developing and assumedly progressing society, and that skills and knowledge of older generations do not become obsolete.

3) that a growing population presents no psychological and technological advantages over a stationary population. I do not want to discuss here and now, the purely psychological aspects. But the technological advantage is obvious. In a stationary population, new technologies can be put into use only in response to new demands of a constant population, or to replace equipment which will then stand idle, while in a growing population, new technologies can be introduced to satisfy demands of the additional population.

14. I do not think that it is my function, now, to list arguments in favour of population growth or, for that matter, its disadvantages. But I do not think, either, that this Seminar should pass in silence over the problem of the optimal rate of population growth, even though it might be agreed that in the long run population must come to a stationary state. Before we come to a conclusion with regard to the optimum population size, we may well discuss the optimal rate of growth, which would obtain in a, say, infinite universe, or, as long as we are relatively far off the optimal population size.

15. Weichselberger gives an example of such an attempt ; but as he presented his approach as an introduction to his discussion of the timing problem rather than as a contribution to the problem of the optimal growth rate, his results should not be considered as conclusive. Further discussion at the appropriate session of the Seminar is therefore recommended.

16. The problem of the optimal size is covered in Singer's background paper. However, to my surprise, Singer seems to look for an optimal *series* of sizes which the population would reach, successively, if certain assumptions with respect to fertility, mortality and migration are fulfilled, rather than a single optimal number. Thus it looks as if Singer tried to optimize the trend of future population size. But the optimal trend in population figures is just another way of presenting optimal rates of change or rates of growth. This proves nothing but that the question of the optimal rate of growth or the optimal series of successive rates of growth and that of the optimal size — or a series of successive optimal sizes i.e. rather an optimal series of realistic future sizes — are, in fact only two aspects of the same problem.

17. That both questions are only different aspects of the same basic problem is probably due to circumstances which will be discussed immediately afterwards : namely the questions of timing, paths and feasibility of population growth targets.

Let me put this complex of questions, or one of its aspects, into the following very simple formulation : If we know that the optimal population of a country is, say 10 millions and its population is today of a different size, namely, for instance, 5 or 20 millions, the aspect of the timing problem which comes to play here, would be concerned with the question of whether or not it makes a difference *when* the optimum is reached : tomorrow, in 25 years or in the infinite future. Feasibility considerations would permit us to estimate at which price, if at all, the optimum can be reached tomorrow, in 25 years or in the infinite future. Path consideration would be concerned with the question whether the population size should approach the optimum, for instance, first fast and later slowly, or first slowly and later fast : each path may involve different prices in terms of the effort needed and the inconvenience involved in following it, as well as in terms of the penalty imposed on society by the fact that the number of the population differs from its optimum size. Thus the three problems of feasibility, timing and paths are interwoven. Unfortunately, none of our background papers discusses the three together, and even more unfortunately, none of the three problems is fully discussed in any of the papers. It is true that Frejka presents very interesting arguments on feasibility of targets, that Weichselberger discusses on aspect of the timing problem, at least, to some extent, and that Sauvy's paper contains many pertinent remarks on the problems of selecting paths to reach a target.

18. Let us, therefore, look at these matters now, in some detail. However, before we can do this a few words are needed regarding the process of optimization which leads to setting population growth targets. It is true

that this is not a matter of a few sentences : it will form the main subject of our Seminar and it is, in fact, fully discussed in many of the background papers (Singer, Sauvy, Day, Frejka etc.)

If I should try to explain this process in a few words, I would say that a population growth target is determined by presenting a suitable indicator of human wellbeing (such as GNP) as a function of a suitable population variable (such as the total population). The value of the population variable for which the human welfare variable is maximum is then a "population growth target". If following this approach we want to determine the optimum size of a population, or say, its optimum birth rate, the reply depends largely on the point of time or the period at which "optimization" should obtain. It is, for instance, obvious that from the purely economic point of view and in the short run, i.e. the next 15 years, a zero birth rate would be optimal : all the expenses involved in pregnancy and childbirth, raising children and educating them would be saved and could be used to raise the level of present consumption or could be invested to raise future levels of living. But this is true only in the short run : 15 to 20 years later the empty cohorts would be missing to compensate for withdrawals from the labour force, the labour force would decrease and so would the national product. Thus, if we "optimize" for a date which is farther ahead than, say, 15 years, a zero birth rate may not be optimal, and the same applies to an optimization for a length of time which extends into a time which is more than 15 years ahead.

19. Together with this aspect of the optimization procedure goes the problem of the rate of discounting in computing present values of future assets and liabilities. Should advantages or disadvantages accruing to ourselves in a relatively remote future, or to our children and grandchildren, be accounted for with the same weight as similar assets and liabilities experienced already today or tomorrow ? M. Sauvy claims that the rate of discounting is merely a matter of taste and in Singer's background paper an author is claimed to recommend ironically that the interests of future generations, may well be disregarded completely because why should we take their interests into account while we know only too well, "... what posterity has ever done for us ! " Here, the rate of discounting would, then, be infinitely high. On the other hand a zero-rate of discounting should perhaps be applied to production and consumption in situations which are at the margin of starvation : under such circumstances, any delay in consumption is liable to cause death, i.e. to completely deprive the subject of the chance of enjoying future consumption even though it may be increased. Similarly, advanced consumption of products needed for tomorrow has no advantage over its consumption at the time at which it is due, because its absence at that time would also cause a catastrophe : future consumption has under such circumstances exactly the same value as present consumption and the rate of discounting should be zero. Thus the rate of discounting for the present value of future events seems to be a legitimate subject of discussion and should be considered together with the timing problem.

20. This latter problem, together with the problem of the rate of discounting, has a second aspect which is not very well covered in the background papers, namely that of setting the term at which population growth targets should be achieved. I mentioned already that this is largely a matter of feasibility together with one of assessing the cost of trying to reach the targets at an earlier date and of determining the dysamenity involved in reaching it only later.

21. Finally, we are concerned with the problem of selecting the best path toward our target. This problem is very clearly discussed in Sauvy's paper, though mostly in qualitative terms. If we tried to quantify Sauvy's ideas, we would certainly find it difficult to attach prices to the different paths and to compute "present values" of the advantages and disadvantages attached to each path at various future moments. But this is the only way to the solution of the problem of the "best" path toward population growth targets. Singer's approach implies, obviously, most of these considerations.

22. We can now come back to a major aspect of the optimization process, which we have hitherto neglected : that of selecting the "dependent" variable, i.e. the variable which should be maximized in determining population growth targets. When I presented the maximization process in short, a few minutes ago, I used per capita G.N.P. as an example for the dependent variable to be maximised. This example would fall in the category of economic criteria for selecting population growth targets, to which our Wednesday morning session will be devoted. A full discussion of the economic arguments is given in Demeny's background paper(\*), which I do not intend to summarise now.

23. But I would like to draw your attention to Sauvy's and Weichselberger's papers, because each of them presents very clearly a *partial* economic argument : Weichselberger taking only current production and consumption into account and Sauvy, only investments needed for the renewal of the stock of existing equipment and for additional equipment required to keep the per capita equipment constant in the presence of an increasing population. In spite of the difference in approach, both authors arrive at most similar

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(\*) As explained in the foreword, Mr Demeny has been unable to write his paper on a suitable form for printing.

conclusions, namely that very slow population growth, perhaps zero population growth, and, under slightly peculiar circumstances, possibly, a low negative rate of growth, ensure both the most favourable ratio between producers and consumers in the population, and a relatively light burden of new investment to be secured through abstaining from current consumption.

24. The full economic argument is set out in Demeny's paper, and an attempt to extend the economic argument into, at least, some non-economic categories, is made by Singer.

25. Singer argues, in fact, that the part of the national income which is spent to deal with "regrettable necessities" of life such as military defense, police, commuting to work etc. should not be counted as "income", while certain amenities of life such as leisure, fresh air, good health, the pleasures of family life and raising children, should be added to national income at the price which people are actually paying, or would be ready to pay if they were available for purchase.

This is not exactly Singer's list, and I advise you to check his list and to make up your mind as to whether you agree with it or not. Why should medical services, for instance, be counted as a consumption item and not like police services a "regrettable necessity". And might not the same apply to the minimum food requirements? Are they not as much a "regrettable necessity" as defense and commuting? And would not most youngsters consider the school as a "regrettable necessity" rather than an investment in their future?

26. It is indeed an important issue to determine, what we actually want to maximise when selecting population growth targets. It is certainly not economic well-being, but rather something of the type of human happiness, worth while living, decent human conditions, etc.

The full argument of the non-economic criteria is taken up in Day's paper and I do not think it necessary to summarize his arguments, here. What I had to say on this subject I said a few minutes ago and I repeat: it is a matter to be discussed at this Seminar, that we should try to optimize in selecting population growth targets, and I shall not be surprised if we do not come to an agreement. It is certainly a matter of individual tastes, personal experiences, social norms, economic conditions, and many other considerations whether we attach more importance to increasing food supply or to increasing personal freedom to leisure or to social security . . . to fresh air or to happy family life, to happiness in this world or happiness in a world to come.

27. Many of the non-economic criteria for selecting population growth targets are not immediate functions of populations size or rate of growth – the same being incidentally also true with regard to the economic criteria. Thus, for instance the social situation of a country depends certainly on the degree of urbanisation which, in turn, is a function of the size of the population. Thus, in selecting a target for the size of a population we must take into account the degree of urbanization which is involved in this size and assess the advantages and disadvantages of this degree of urbanization. Similarly most population characteristics, such as the internal composition of the urban population, the percentages, occupied in agriculture, manufacturing and services and many other depend on the size of the population; and on the other hand the style of life, the level of living and the per capita national income – all are functions of these population characteristics. Some of the problems involved in these relationships are presented in Hauser's background paper; these and others should also be discussed here.

But for the purpose of the present Seminar it seems to me to be the main question, whether these aspects of population should be considered as independent criteria for selecting population targets or rather taken into account as "intermediate variables" in the basic relationship between the one preferred criterion variable and the population size (or rate of growth), which should be optimized. I think that I should refer in this context again to the system analysis approach followed in Singer's paper, where very many interrelated variables are *accounted* for, and we are free to vary any of them, to assess the effect of any change in this "independent" variable on the criterion variable.

Further aspects of this last problem will be discussed in the last meeting, when problems of compatibility are being considered. I shall say a few words on this subject, a bit later on.

28. When we shall have come to some agreement on the criteria to be used in selecting population targets or at least clarified the problems involved, we can try to identify the ways and means of achieving targets, once they are set. I hope that the discussion on this subject can be held without specifying what the targets actually are. Because, in practice, there are at most two aspects of demographic behaviour which can be adapted so as to achieve targets: fertility and migration.

29. If we disregard the, most unusual, situation, in which a population growth target involves the need for maximal physiological fertility, any manipulation of fertility requires a certain amount of family planning.

This amount of family planning can, in theory, be achieved by either supplying the necessary amount and quality of family planning services or by inducing the population by other means to adapting its behaviour to the desired level of fertility. The former aspect is fully covered by Ross's paper which proves, among other things, that a large amount of further research is needed to determine the amount of family planning services needed to achieve a given number of births neither more nor less.

30. Non-family planning measures to achieve fertility targets are an even more subtle subject. Social engineering to affect the age at marriage, sexual behaviour of the married, contraceptive practices etc. would come under this heading and some of these subjects are very well presented by Weller.

31. Finally migration can be used to achieve population growth targets. But if emigration is desired, it is not always easy to find places to settle the emigrants; and when immigration is desired, the required type and kind of candidates is not always easily available and ready to migrate at the right moments. Both these problems, together with other difficulties in achieving population growth targets through migration policies are discussed in Price's background paper.

32. In addition to considering family planning and migration policies separately we should try to evaluate the alternative of achieving population growth targets either through fertility control or through migration control. Few countries have this choice; but if it exists the relative advantages and drawbacks must be assessed.

33. Throughout the work of the seminar, I imagine that the approach to all subjects will be atomistic: each topic will be discussed on its own merits, largely independently of all other considerations: Thus, at the end of our deliberations we should test whether this method has not lead us astray: whether the assumptions made for one purpose do not contradict those made at another occasion; whether the conclusions drawn at one stage are not inconsistent with assumptions made at another stage and whether conclusions reached by different approaches are compatible with one another.

34. It is hard to foresee the course of our deliberations and our conclusions. But there seem to be several areas in which the risk of inconsistencies and incompatibilities is particularly high, and I think I should list them right now:

1) Different targets may be incompatible: an optimal rate of population growth which is not zero would certainly not be compatible with any optimum population size.

2) In selecting a criterion, considerations based on the interest of the individual may lead to different results than those based on the interests of society: Hardin's "Tragedy of the Commons" is a good illustration.

3) Individual value systems differ also one from another and would certainly lead to inconsistent population growth targets.

These two last risks of our approach are mentioned in Day's background paper.

4) Frejka discusses to some extent what he calls "structural and time consistency". When we come to our last session, we should study these matters again, in view of what we shall have learned during the seminar.

5) Finally, I wish to draw your attention to a point made very incidentally by Hauser in his paper: the possibility of a lack of compatibility between national and international targets. Let us assume that all nations of the world have established population growth targets which optimize what each of them considers as the most important objective in their national life, and this may be per capita national income, happiness, national security or many other things; we could then, obviously, add up the ensuing national populations and find the trend in world population which would emerge. But taking the world as a whole, can we be sure that this trend "optimizes" what we consider as the most important issues for the society of nations: peace, understanding, cooperation? I have raised this question in an article which should have appeared last month in the *Journal of Peace Research*, and I think that we should discuss this matter, to some extent, at the last session of our Seminar. Indeed we are here, among many reasons to prepare the *World Population Year*, and *world population targets* are certainly a most appropriate topic for the *World Population Year*.

35. With this last remark, I have come to the end of my introductory comments. I think that we should retain this principle in our minds: we are here to make our contribution to the *World Population Year*, not only to solve our own, individual and national population problems. We should try to contribute to promote the welfare of the world as a whole, at least as far it is liable to be affected by the population issue.

# SOME THOUGHTS ON NUMERICAL POPULATION GROWTH TARGETS

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## Introduction

1. Current accelerating population growth is of primary concern for most of the nations of the world. The rate of global annual population increase has never been so high in the history of mankind. It took the first human couple and their descendants thousands or perhaps millions of years to reach a population number of 1.7 billions by the start of this century. In the 70 years since then the world population has doubled. Under unchanging conditions by the end of this century, i.e. in another 30 years the number of population on the space-ship earth will double again.

When population growth outstrips the ability to produce the basic necessities of life for the people, then disaster will arise.

Even if with advanced technology men have the ability to increase the production of economic goods needed for an enjoyable life, at present rates of economic and population growth the interdependent resources of the earth may not be sufficient and environmental degradation will occur. There is a distinct possibility of cataclysm in the not too long-run.

2. The club of Rome's projection on the predicament of mankind spans a period of one century from now. This threat of disaster makes the acceptance of population control as a necessity by responsible world leaders, as witnessed by the historic U.N. Declaration on Population in 1967.

The problem of population and natural resources is most clearly manifested at present in the developing countries where about 75 percent of the world population are living and where the amount of available nutritive food is sometimes only half the quantity required by the population for a normal diet.

The prospect for the year 2000 is even more alarming, when according to U.N. Medium projection about 80 percent of the world population will be living in the now developing countries.

3. This upsurge in population in developing countries is caused by constant high birth rate while simultaneously the death rate has been declining swiftly, particularly for the population in the first years of life. Therefore expectancy of life at birth in most of the developing countries has increased in the last half of this century. Before the second world war the average number of years lived after birth for a baby in a developing country was about 25 years, while today it is around 50 years.

4. Population problems are no longer topics for academic discussions but they have also caught the attention of policymakers.

I think that it is proper to state that now-adays in most of the countries where development programs are jeopardized by population growth, actions programs are developed to cope with the high rate of population increase.

The highly frequent meetings, conferences and seminars on population problems at the international and national level have to be interpreted as the anxiety to ensure positive results from ongoing action programs.

5. Understandably the focus of action is on the fertility aspect of population growth. Many national and international organizations, private, governmental or intergovernmental in structure, have been established to take measures to decelerate the present rate of population increase by reducing fertility. If fertility levels can be brought down to lower levels, then population growth will also be decreased. This leads to the interpretation of family planning programs as synonyms with programs aimed at the slowing down of population growth. There are however various other factors which have to be taken into consideration to achieve successfully lower levels of population growth.

Certain aims or targets have to be set out and periods stipulated for the attainment of certain rates of population increase.



## Population growth targets.

6. First of all we have to clarify what is meant by population growth targets. Generally we can define a target as something after which we are striving within a certain period of time. Population growth targets are therefore rates of population growth or size of population which are to be achieved within a predetermined number of years.

Targets can be expressed in different ways, namely numerically or verbally. If one sets as population growth target a certain percentage rate of annual increase then he is making a numerical expression.

A proper example of a numerical population growth target is the aim to reach Zero Population Growth, although it is debatable whether zero is a number or not.

On the other hand if one's efforts are concentrated on achieving certain unquantifiable qualities of population growth such as people's attitude and way of life compatible with certain types of population growth then the expression of population growth targets could only be verbal. Of course a clear, watertight demarcation between the two kinds of expression is quite often very difficult to make.

Moreover, targets of population growth can be stated in a demographic or in non-demographic expression. Suppose we are aiming at certain levels and patterns of demographic determinants of population growth, then the population growth target is presented in a demographic way.

Sometimes it is also possible to achieve population growth targets which are consistent with corresponding levels of socio-economic development. Here the target of population growth is more or less determined by rates of socio-economic growth.

There is also a possibility of deriving population growth targets from targets of acceptors to be achieved by a family planning program based on certain assumptions on age structure and couple years of protection by the use of certain family planning methods.

Another possible expression of a population growth target is to use as a model the population of another country with rather similar social and cultural background.

7. The option for a certain kind of target will be determined by many different factors and has to be done by the policy making institution in the country concerned. No uniformity can be expected in this matter in the heterogeneous world community where we are now living.

Moreover the setting of target will be influenced by the available resources in the country. A target has to be realistic and feasible within the given physical, cultural, social and economic framework and the appropriate period.

The kind of target which has been selected usually can be considered as a reflection of the type of commitment of the policy-makers to the solution of population problems. On the other hand the attention to population problems is inseparable from socio-economic and political concern. A perfect prescription for a balanced formula between these intertwined problems has still to be invented.

The most reasonable decision by those who are committed to population planning is to opt for a demographic kind of population growth target. The presentation of demographic targets lends itself to the purpose of numerical target setting.

8. If the countries in the world are sincere in their concern with the current explosive nature of population growth, the leaders can decide in what way and how soon they seek to solve the problem. This can be given focus by the setting of a numerical population growth target to be reached at a certain future calendar year.

This long run or medium run population growth target has to be broken down into periodical partial goals of shorter duration. It is through these periodical objectives that attempts will be made to keep the actual population growth trend in line with the long run or medium run plan path.

However flexibility is to be preferred to rigid adherence to the long run goal. It should keep open possibilities to take advantage of in the periodical plan when new and favourable development opportunities arise. Any move that will assist progress towards the long run target should be encouraged and welcomed.

9. The achievement of the target will be influenced by various factors in the course of time. Therefore the likelihood of events in the future has to be studied carefully. These events consist of elements which can be forecast with varying degrees of certainty. Therefore they are not always easily presented in a numerical way. However it is imperative to choose the correct annual policy orientation and to express it by annual or quinquennial targets. These short-run targets should have their own focus. This specific focus can be worked out on the basis of the long-run strategy, periodical review, periodical estimates of the resources situation and preliminary estimation of the effects of policies. These exercises give room for the identification of major problems and will provide information for the formulation of the population policy orientation. The

population policy orientation so derived will then need to be expressed in both numerical and non-numerical terms in greater detail.

The periodical partial targets constitute the numerical goals to be achieved within a given shorter time-span. The longer run targets have to be taken into account in the process of formulating interim targets of shorter duration. This can be done by the expression of interim targets as a percentage or proportion of the related longer run targets. Another method is based on the assumption that the partial targets will be interpolations between the base year and the terminal year annual rate of population growth.

10. Decelerative population growth targets should make action programmes possible. To make targets operationally less cumbersome and manageable, disaggregation could be limited to the most important essential influencing factors. It is perhaps preferable to have separate targets for these basic factors of population growth, such as levels and patterns of fertility, mortality, migrations, family planning programmes, communicative efforts, educational or literary attainment, etc. The number and composition of these fundamental factors will vary with local and temporal conditions. The targets for these factors may be called sub-targets. Such a set of sub-targets could serve as a reflection of priorities and show the direction in which population control effort is to be channeled.

This will also make it possible to keep track of progress. This method of work however requires the necessary organizational arrangement for a continuous check on all the selected basic determinants.

Moreover the consistency of partial targets with the main objective has to be checked continuously by existing methods. The major problems for developing countries in the use of these methods at present is the reliability and timely availability of data. This latter may prevent more than very rough internal consistency of the targets, limited to some determining factors only. Rapid improvement in this field cannot be expected since improvement in data collection will still be rather slow in the foreseeable future.

The time aspect of population growth targets can be expressed with fewer constraints. A medium time span is to be preferred to a longer run. A population growth target for the duration of 25 years has frequently been made with breakdown into quinquennial and annual targets.

Success of population control, however, is not guaranteed by the kind of target setting but will depend on the quality and intensity of the implementation of well defined political decisions. It is for this latter that numerical population growth targets are worth taking into consideration.

### Benefits of numerical targets

11. The obvious advantage of numerical targets is their clarity and simplicity to the common people. Numerical population growth targets can be presented very briefly. That is why this way of presentation is more appealing to people than complicated verbal statements.

The psychological impact of numbers is greater than sophisticated phrases.

This is the more so in countries where populations have not attained high levels of education. The successful accomplishment of any form of growth target will depend mainly on the understanding, acceptance and cooperation of the population at large.

One of the advantages of the numerical presentation of population growth targets is that the matching of partial short-run target with the ultimate aim can be done in a more rewarding way. Any possible deviation from the long-run target can be more easily detected due to the more simple presentation for the relevant population.

For personnel in charge of planning activities numerical determination of population growth is a very useful means. The preference for this kind of presentation has been clearly demonstrated by past and present existing development programs. The United Nations Program for the Second Development decade has been constructed on the basis of certain numerical population growth targets in the relevant period.

The numerical population growth targets are not only a tool for policy makers but also for executives. Any divergence from the protracted trend toward the long-run target can be perceived readily. If necessary rapid adjustments can be made to keep in line with the desired goal.

12. Moreover from the population growth targets can be derived targets for other related fields in development. Suppose that the present rate of population growth is  $\alpha$  percent and  $x$  percent annual rate of population growth is set as a target for year  $t$ .

From this target can be derived not only targets for demographic parameters, but also targets for education, health, housing, food supply, economic activities, population, etc. Estimation of financial resources implied by the numerically defined population growth target can also be made. This part of the work is rather complicated and not easy to conduct. However it is vitally important in framing planning activities. From an

estimation of the aggregate cost involved in reaching the planned target an evaluation can be made whether the desired goal is realistic to strive after, compared to the available material and non-material resources.

13. Population growth target is supposed not to be a result of pure academic exercise which floats in the air as an utopian scheme, but it should be within reach of the population at large in cooperation with a development-committed administration and policy making institutions. In developing countries population growth targets are usually set without accurate reference to the available limited economic resources, management and personnel. A program which is developed based on the assumption of a decline from the present annual rate of 3 percent population growth to zero population growth in 1980 is obviously utopian. Such a program is doomed to fail. The contrary is also true, namely a program to raise an annual rate of close to zero percent population growth to three percent at the end of this decade cannot be achieved successfully even for today's most advanced country in the world.

14. Although the method of numerical presentation of population growth targets has its advantages, one should not over-evaluate it as a perfect way of presentation of population change.

Any method has its limitations. If reporting and registration of population change is conducted correctly with insignificant omissions and in-accuracies, the estimation of factual population growth can be achieved properly. However, it is still questionable whether the correct underlying factors which lead to the change can be understood, registered and reported in a numerical way. But on the other hand population change is also influenced by elements which are difficult or impossible to express perfectly by the use of numbers. For instance, the preference for a large family size is determined by interdependent factors of tradition, culture, religion, way of life, personal preference, etc. Usually these factors do not lend themselves easily to numerical presentation, despite advancement made by the sociometry. Besides these factors, changes in the family size will also affect the basic demographic characteristics of the population.

The relationship between demographic and non demographic factors, which are usually interdependently influencing population growth, are not expressible in an exact numerical way.

#### Limitation of numerical targets

15. The exact nature of numerical targets could create unresolvable adjustment problems if deviations are observed between partial short-run targets and the long-run goal, particularly if such divergences are related to non quantifiable social factors. In countries where statistical population data are incomplete and less accurate, qualitative subjective judgements could easily disturb the progressive trend towards the long-run population growth target.

Another point is that without special intensive and correct communication and information, rigid numerical targets could be misleading, due to incorrect interpretation. This is more evident for developing countries where illiteracy still prevails and the level of educational attainment is still not at a high level.

Any given rate of population growth is the outcome of a complex set of interacting factors. A thorough knowledge of these factors is a prerequisite for an accurate setting of targets. An inaccurate numerical growth target will frustrate planners and people for whom the programs are made.

Finally, rigid adherence to numerical population growth target is less desirable than a more flexible attitude. Trends in population growth rates will fluctuate within a certain range rather than stay put at a static rate. Fluctuations will occur within any unit of time, since the life cycle will not abide to an exact linear progression. However, well trained students in demography are able to observe the trends in growth blurred by many partial fluctuating movements. It is worth noting that any evidence of abusing numerical growth target ought to be prevented and to be always reminded that target should not deviate too widely from permissible range of growth.

#### Summary and conclusion.

16. It is not the purpose of this paper to present a final answer to the question of the necessity of numerical population growth targets. The main objective is to provide some points of discussion on why preference is given to numerical growth target, its benefits and limitations. Bearing in mind the ease with which sheer numbers can be misunderstood, it is imperative to note that knowledgeability, accuracy and caution should always be the guidance in the use of numerical targets.

A careless and superficial knowledge may give way to misinterpretation and frustration.

One of the weaknesses of numerical presentation of population growth targets is the existence of factors which do not lend to exact numerical presentation but whose influence on population growth is certainly not to be neglected.

Finally, periodical revisions of numerical population growth targets need to be made as new data become available.

# THE PROBLEM OF POPULATION OPTIMA

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## Abstract

1. The problem of "optimum population" involves maximizing a certain function of population level, distribution, and rate of growth. We have tried to develop a methodology to tackle this problem, as well as a demographic-economic model suitable for simulation purposes. It calculates a "per-capita welfare index" as a function of various demographic and economic parameters. The model has been developed so far specifically for the United States and for a time frame of several decades ; it can be extended to other countries.

The welfare index makes allowances for quantities that are not normally counted in the Gross National Product, such as household production and the value of leisure time ; but it disallows the costs which arise from the need for increased pollution control, from resource scarcities, and from urban disamenities.

We briefly describe the model, its exogenous inputs and its various outputs. We also show the results of sensitivity analyses as well as runs done with different assumptions concerning the parameters. In its simplest application, the model can be used to answer the question "Have we become better off or worse off as our economy and population have grown ? " Aside from this historical investigation, it is of course possible to do simulation analyses and to investigate the effects of specific policies on the future welfare of the population.

## Introduction

2. It may seem intuitively obvious that a country should have an optimum population level : i.e. the citizens of the country would be better off at this level of population than if the population were less or if it were greater. But intuition can be misleading ; therefore, a more careful analysis is needed.

How does a geophysicist get involved with population ? Well, through a progression of positions with the Department of the Interior, the Environmental Protection Agency, and the Brookings Institution. Having been concerned with natural resources and with environmental problems, I asked myself the following question : Which of many factors provides a limit to population growth ? Is it fuel resources and energy, mineral resources, food, water, or even simply land ? What will we run out of first ? What determines the carrying capacity of the world – or of the United States ? After organizing a stimulating conference in 1969 under the auspices of the American Association for the Advancement of Science (1) my search turned out to be inconclusive. *All* of these factors determine the carrying capacity – to a greater or lesser extent. It is rare that a single factor can be pinpointed. But in the process of searching I made some important discoveries. 1) First of all that my question was misleading. I had confused optimum level of population with maximum level. Many people still continue to do this. I have now learned that the optimum is always less than the maximum. 2) I also came to realize that the question is too simpleminded. Optimum population depends not only on level, but on the spacial distribution and rate of growth of population, on technological progress, and on a wide variety of parameters which enter into demography and economics. 3) Finally, the optimum population level is not fixed as time changes ; very likely it decreases with time.

I gradually learned that to address the problem of optimum population, I would have to develop a method which is much broader and which can answer many other questions. I therefore rephrased my goal as follows :

What methods can we develop to assess the general societal consequences of governmental policies, or of major technological advances, or of private decisions such as a reduction in fertility. In particular, how can we determine an optimum level of population for a country ?

This essay gives a progress report on our efforts to develop such methods.

## Scope of the study

3. The study deals with the United States over a time span of the next 30-50 years. The justification for neglecting the rest of the world at this stage is as follows. We are interested in methodology, and for this

purpose the United States presents a sufficiently complicated example. Secondly, this is an empirical study requiring real data ; U.S. data are often better developed and certainly more accessible. Thirdly, the United States is reasonably homogeneous and has a large enough economy so that the influence of the rest of the world is actually quite small.

Our justification for not going much beyond 50 years has to do with our belief that radically new technologies can and will arise which will invalidate longer-range projections. For example, the development of nuclear fusion power would lead to a situation in which energy would be practically inexhaustible, which in turn would alter many other considerations.

### Axiom

4. In the study we assume that people behave rationally ; that they attempt to maximize their utility ; that they want more and not less of any good ; that therefore a growth of welfare is desirable. People express their behavior by and large in the market place and in the political arena. Their purchases determine what manufacturers will produce and their voting behavior determines political decisions. Our study is not a normative study. We do not try to suggest that one kind of behavior is better than another. We accept society as it is : a society which is interested in material welfare and a high standard of living.

We can therefore rephrase our original question in the following terms : What are the welfare consequences of various modes of population growth and economic growth, and what are the welfare consequences of the various methods that are employed to influence economic growth ?

It should be recognized that economic growth can be influenced by a variety of methods. If for example we wish to stop economic growth, the method employed is important because the welfare consequences are determined by it. Consider for example the following ways in which growth of GNP can be affected.

- 1) By influencing population growth.
- 2) By changing the savings rate, and thereby the rate of investment.
- 3) By stimulating or depressing technical innovation and technological progress.
- 4) By introducing a rationing or a progressive taxation of energy.
- 5) By introducing more leisure. For example, by early retirement, or by late entry into the work force.
- 6) One might even postulate a situation in which work is outlawed for men, thus making up for centuries of discrimination against females.
- 7) Finally, government can influence growth through fiscal and monetary policies. This is often done unintentionally by causing unemployment and depressions.

### Objectives of the study.

5. The objectives are twofold : 1) To construct an objective function, which measures the aggregated amount of welfare per individual in the nation. The definition must be appropriate to our society and cultural patterns. It must also be an operational definition so that welfare can be calculated from the kind of data that are available in the national statistics. 2) The second task is to develop a mathematical model which relates this index of welfare to demographic and economic parameters, thus allowing us to project a time "stream" of welfare indices as a function of various assumptions concerning population and concerning the economy.

### Construction of a Welfare Index.

6. One might object that the material index of welfare which we are defining does not really measure happiness. In my view it measures an important component of happiness : the "global" component. The other component is intensely local and determined by interpersonal interactions with a very few people, with family, co-workers, friends, etc. This latter component of quality of life should be reasonably independent of overall demographic and economic parameters in the United States. If this is so, then we can neglect it in a partial analysis.

7. The construction of a welfare index follows in concept the ideas of Juster (NBER), Nordhaus and Tobin (Yale) (2), and others who would "amputate and imputate the GNP". But we depart considerably from previous work. Like most others, we define welfare as consumption in households. We include non-market production (but not yet illegal services and goods which are not counted by the national income statistician). We add the value of leisure — not at the opportunity cost of wages foregone, but using an empirical utility function, based on what people indicate their leisure time is worth. While we count much of educational expense as investment and therefore not as consumption, we depart by ascribing health costs to consumption, rather than to investment or to "regrettable necessities". Of course, such items as defense expenditures, police expenditures, commuting to work, are all regrettable necessities and do not contribute directly to welfare. In



this way we treat every item that enters into the gross national product, i.e. every item of governmental and private expenditures. In addition, however, we also subtract certain disamenities which are produced by population and economic growth.

1) The three principal items are pollution control costs, which rise faster than GNP (in spite of the fact that there is a trend away from goods production and towards services, and in spite of the fact that processes are being introduced that creates less pollution – the limited assimilative capacity of the air and water environment introduces an important non-linearity which cannot be avoided.

2) Resource costs also increase as such items as fossil fuels become exhausted. In a perfect market there would of course be immediate substitutions or the immediate introduction of new technology. In an imperfect market such as ours there is a kind of “stickiness” (akin to static friction) which slowly “ratches” up the cost. We are seeing this phenomenon now applied to oil and gas prices.

3) Finally, we have the costs of agglomeration of population, related to the very uneven distribution of people. Large cities become increasingly less efficient as traffic jams increase internal distribution costs ; as land prices and rents rise, thereby adding to the costs of all products ; and as interpersonal disamenities such as crime and all kinds of urban problems increase. Of course much can be done by technology ; for example, by a better transportation system. But we have to take account of the increasing inefficiencies which raise the cost of living – and therefore diminish per-capita welfare as population and GNP grow.

8. Of course, there is much arbitrariness in the definition of an index of welfare. I have called it a Q-index rather than “quality of life”, simply because many people have already formed their definitions or opinions. While definitions are always a matter of taste, I hope that reasonable people may agree that it is a better measure of welfare than GNP, and that in spite of arbitrariness it can be useful. I hope, however, that I have not been guilty of what St. Augustine confessed :

“For so it is, oh Lord my God, I measure it ; but what it is that I measure I do not know”.

As an aside I should mention that it would be quite difficult to carry out the analysis I have just described in a socialist country, i.e. one having a controlled market economy, or in an underdeveloped country where a market is not well developed and where barter and household production are relatively important.

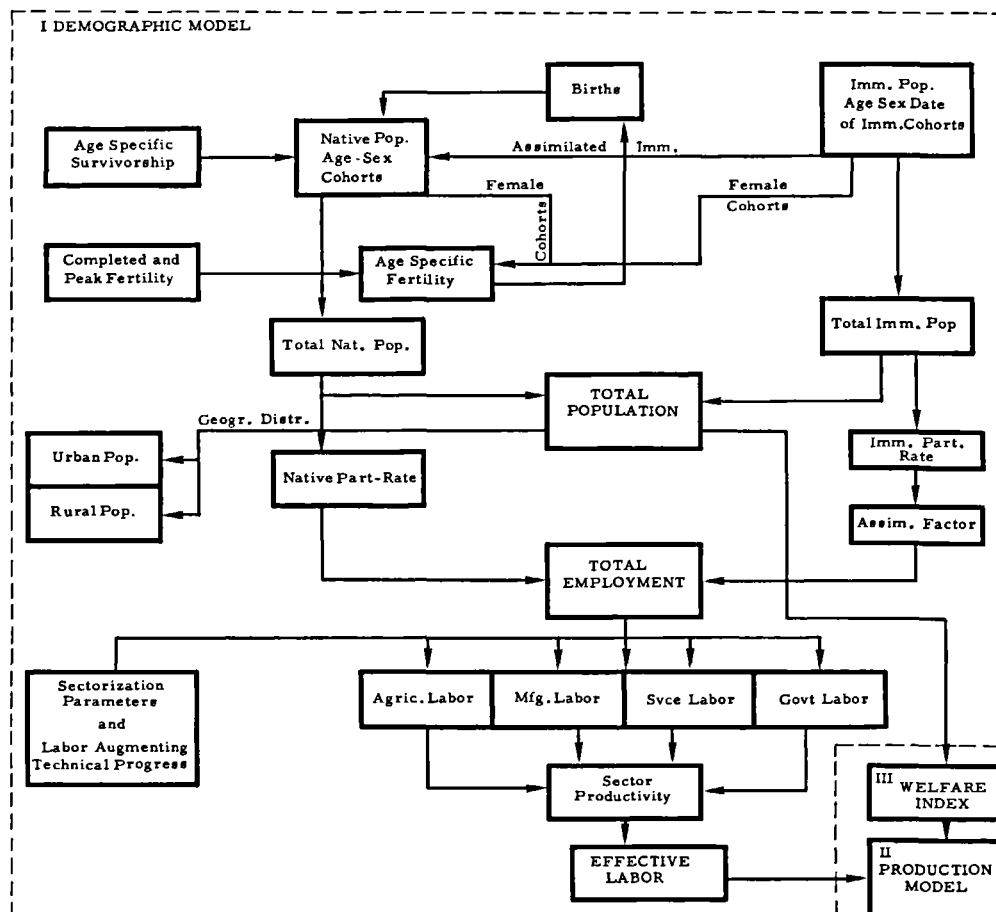
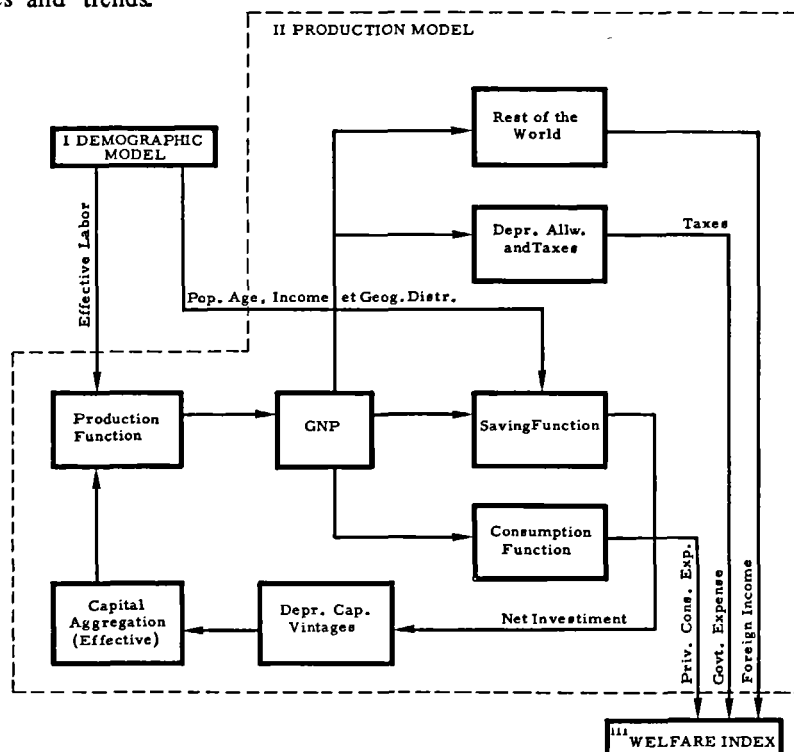


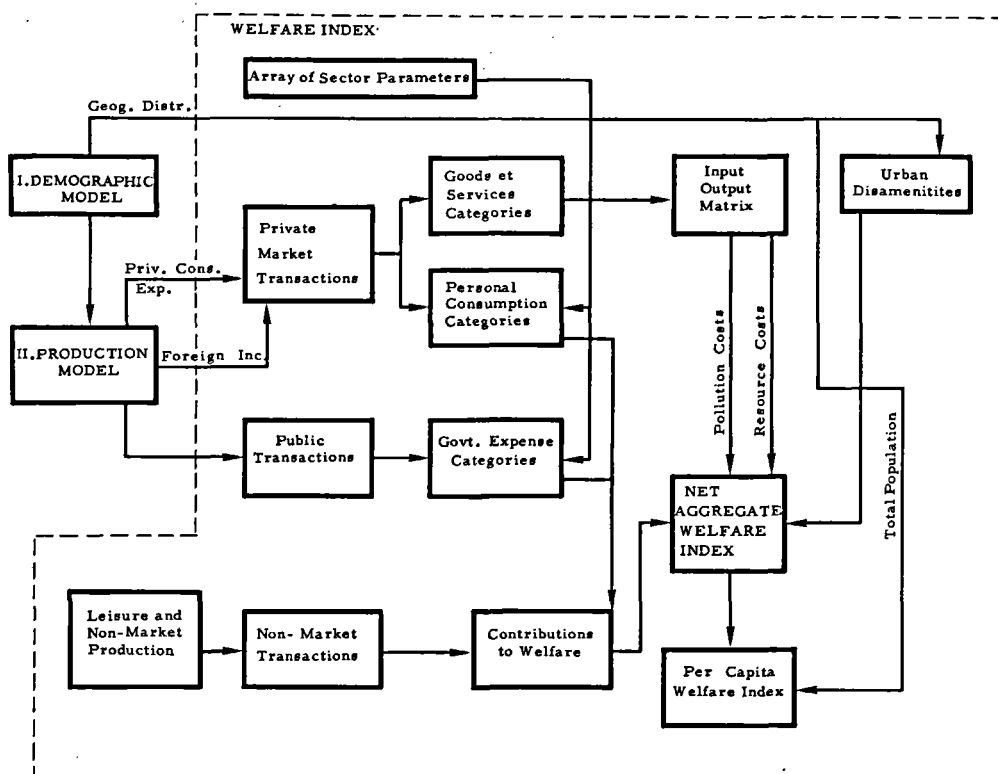
Fig. 1. – Demographic model.

### Construction of the Mathematical Model

9. Our mathematical model consists of three parts. The demographic part (Fig. 1) is rather complicated, yet conceptually quite straightforward. It considers native and immigrant population ; their age distributions ; it allows for different fertility assumptions ; projects characteristics of households, geographic distribution of population and income distribution ; projects labor productivities in different sectors, such as agriculture, manufacturing, services and government ; and ends up with effective labor after having considered labor participation rates and trends.



**Fig. 2. — Production model.**



The economic model (Fig. 2) is simple, essentially a neo-classical model with a one-sector output – GNP. Part of the GNP is reinvested in capital cohorts which have a rising productivity because of technological progress. The model allows for different modes of investment, including one which preserves a constant capital-labor ratio.

The third part of the model (Fig. 3) is a diagnostic that calculates the welfare index. It sectors the output of the economy according to demand. It subjects each sector to an analysis which follows the definition of our welfare index. It also sectors the output according to production so as to be able to calculate the resource and environmental implications, and therefore the resource and environmental costs.

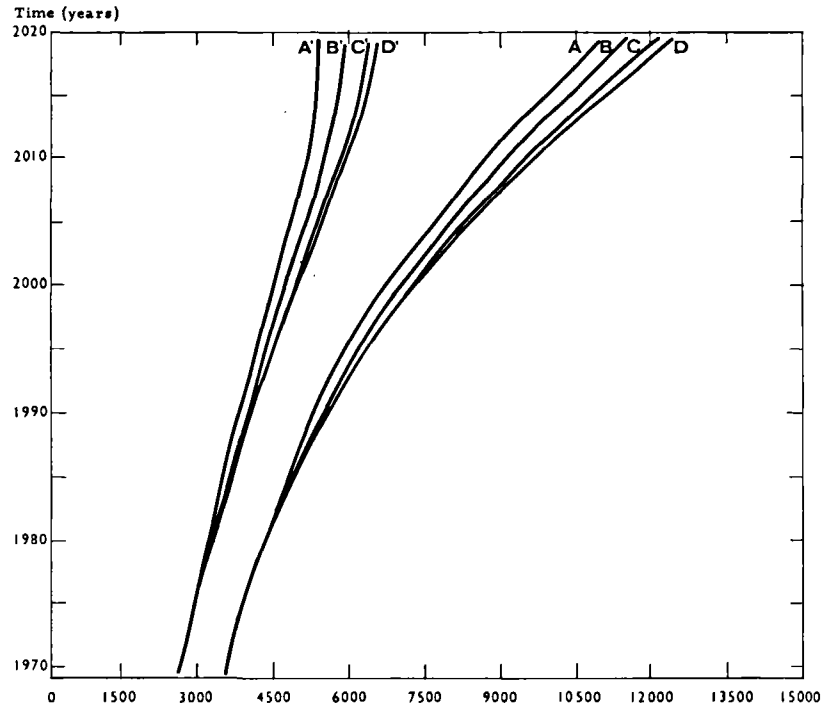


Figure 4. Per-capita GNP (A, B, C, D) and per-capita welfare (A', B', C', D') with four different fertility projections :

- A. 1968 values of fertility  $f_0$  held constant.
- B. Reduced to an asymptotic value of  $f_\infty = .85 f_0$  ; with a halftime of 5 years.
- C.  $f_\infty = .66 f_0$  ; with a halftime of 10 years.
- D.  $f_\infty = .50 f_0$  ; with a halftime of 20 years.

The decrease in fertility is exponential, reaching halfway to the asymptotic value  $f_0$  in one halftime  $T$ , i.e.

$$f(t) = f_0 - (f_0 - f_\infty) [1 - \exp - (t/T)]$$

For all four runs we assumed an initial age distribution as of 1969 ; we held constant the following items :

- a) Age-specific survivorship rates (mortality)
- b) Immigration as a proportion of total population
- c) Savings (gross investment) as a fraction of GNP.
- d) Rate of capital depreciation.

We trended leisure time, labor participation rates, labor productivity, and applied appropriate forecasts for all consumption sectors, for pollution control costs, resource cost increases, and urban disamenities.

**Results :** It can be seen that per-capita GNP increases with time ; but that decreasing the rate of population growth leads to greater per-capita GNP values. Per-capita welfare increases more slowly ; it appears to reach a maximum around the year 2020 with Conditions A'. However, lower rates of population growth again lead to much greater values of welfare, and to continuing increases. There seems to be little improvement, however, in going from C' to D'.

Some key results of the runs are as follows :

Run	Pop (1970)*	Pop (2019)*	GNP (1970)**	GNP (2019)**
A and A'	204.8	360.4	728	3966
B and B'	204.8	313.1	728	3624
C and C'	204.8	279.3	728	3402
D and D'	204.8	274.2	728	3405

\* in millions  
\*\* in constant (1958) dollars (billions).

I will not draw any comparisons here between our model and that of the Club of Rome group at MIT. I have explained my objections elsewhere (\*).

Suffice it to say that our model does not attempt a world-wide aggregation, nor do we aggregate all resources, all pollution, etc. Instead we have done our aggregation at the economic level using dollars as the common unit. This essentially is the philosophy of the GNP which aggregates goods and services of various kinds. Our model attempts to simulate the operation of our market economy as closely as possible.

## Results

10. There are many kinds of results and these can best be visualized by glancing at a typical printout from a computer run (3).

The assumptions are shown in the figure legend (Fig. 4), but we will comment here on some of the prominent results. The main one certainly is that per-capita welfare is increasing today and will continue to increase for some time to come before it reaches a maximum, presumably diminishing beyond this point. In the meantime, however, much can happen in the way of technological change which makes projections beyond 30-50 years quite uncertain. Of particular interest, of course, are differential results, obtained by running the model with one of the main assumptions slightly changed. Since we are primarily interested in the effects of population growth we present the results from four runs having different fertility assumptions. Run A assumes the 1968 fertility remaining unchanged. Run C assumes that this fertility diminishes to 66 % of this value asymptotically, with a half-time of 10 years ; i.e. reaching halfway, to 83 %, in 10 years.

I have plotted, the results in Fig. 4, with comments reserved to the figure legends. The main result, comparing the Q-index, shows that the slower rate of population growth leads to higher benefits at all times in the future.

## General Comments on Results

11. What the model does for us is to provide a diagnostic which allows us to total up the effects of any particular assumption, or of a governmental policy, a private decision, etc. It sums the plusses and the minusses and compares them eventually in the Q-index which is the important objective function. The result is a time run of Q-indices (Fig. 5). The larger values are clearly more desirable, the smaller ones are less desirable. The interesting situations are those in which the Q-index as a result of one policy is both larger and smaller at different times, with respect to the Q-index which one obtains without this policy (Fig. 5-b). There are many practical examples for such situations. A large capital investment over the next few years would reduce consumption and therefore lower the Q-index, but would presumably raise it some years hence and therefore benefit a future generation.

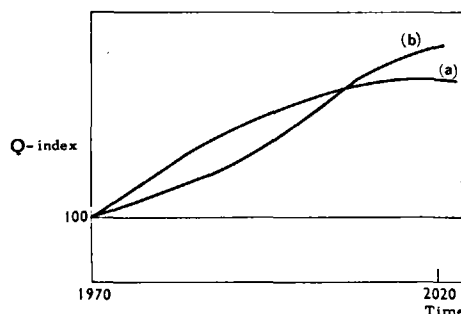


Fig. 5. — Two possible time-streams of the Q-index. Which is to be preferred ?

One value of our model is that it allows an explicit method of looking at the future and evaluating the consequences of a policy decision. In our example, one would then compare two streams of Q-indices which have been calculated by the computer model. To make such a comparison we need of course to assume a certain discount rate. Our model cannot determine the discount rate. It is set by other considerations which are largely political and determined by how much we feel we owe to a future generation. (Some have argued that since future generations will be wealthier and better off than we are and certainly have a higher welfare index, then taxing ourselves now to benefit a future generation amounts to regressive taxation. As some have put it "What has posterity ever done for us ?")

There are of course many examples where such matters need to be considered. In the pollution control field, for example, the separation of sanitary and storm sewers in U.S. cities may cost between 30 and 50 billion dollars. The restoration of the Great Lakes may be a project of equal magnitude. Should we undertake such a project and over what time scale ?

(\*) In EOS, Transactions of the American Geophysical Union, Vol. 53, pp. 697-700, 1972. The results of the Club of Rome Study have been published in *Limits to Growth*. (See references).

12. There are still many weaknesses in our model. We are aware of some of these. Missing at this stage is distribution of income and distribution of welfare ; the model deals only with averages. We have no theory how growth affects distribution of income, nor do we have a theory of how distribution of income affects growth (perhaps by way of productivity or through the absence of strikes and social upheavals). Knowledge of the distribution of income is important because it affects consumption patterns. Higher income means more luxury goods and more services, relative to basic necessities.

We have not quite discovered how to compare one distribution of welfare with another. Research needs to be done on the marginal utility of welfare ; we have no way as yet of taking into account the "Duesenberry effect" (\*). Until then we can use the concept of cardinal welfare value. We plan to do some experimentation on discretionary welfare, defined as welfare beyond the basic necessities of life.

At this stage the model has no regional or local detail. It is aggregated over the United States, with some disaggregation according to urban versus rural population.

At this stage the input/output table has not yet been introduced. We are therefore not yet in a position to have consistent inter-industry forecasts of the kind carried out by Clopper Almon (4). It is our hope that we may be able to introduce this feature very soon.

## Summary

13. We have taken some steps to construct a diagnostic tool to measure the consequences of decision making, technology assessment, population policies – in short, every kind of human decision and in all of its ramifications. By focusing on a single index which measures welfare as well as possible we hope to be able to answer the question whether we as a society will be better off or worse off under one set of assumptions as against another set of assumptions, under one set of policies as against another set of policies, with one technology as against another technology, and with one set of private decisions, for example as regarding fertility, as with another set. In particular, we should be able to investigate which combinations of demographic parameters lead to a maximum value of the welfare index.

## Acknowledgements.

14. I appreciate the assistance of Messrs. Harry Burt, Giorgio Canarella and James Morris. The research was supported by the Center of Population Research – National Institutes of Health under contract NIH-NICHD-72-2052.

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15.

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(\*) Which argues that individual consumption (and welfare) is affected by that of others, through a "demonstration effect".



## APPENDIX

### Application of the U.S. Model to Other Countries.

16. It should be clear that the U.S. model just described cannot be applied to other countries directly, and that for several reasons. First, the concept of an optimum population may not be reasonable in all cases. Consider, for example, the extreme case of a country which has great mineral wealth but nothing else, little arable land, little water, no capital, no factories, etc. It is intuitively obvious that the optimum population is synonymous with minimum population, since then the per-capita return from the sale of the minerals would be a maximum. While admittedly this is an extreme case, it does show that the matter of imports and exports has to be considered very carefully, especially for small underdeveloped countries.

17. Next, we should examine the concept of the "target". Is the objective in all cases a high level of material welfare? While this may be appropriate to many societies, one can imagine a cultural pattern, say a monastic one, which does not lay great stress on material welfare. In that case, the definition of the Q-index would be different from the one that I have adopted for the United States. But the general methodology could still be applied, i.e. after an appropriate Q-index has been defined, one could still construct a mathematical model which calculates it and projects it into the future, under a given set of initial assumptions.

18. The matter of assumptions has to be examined very carefully also. What are important assumptions for the United States, may not be important for other countries, and vice versa. Also, the type of information required to run the mathematical model may be different for other countries. In general, however, one would want good statistical data which are appropriate to the type of mathematical model that is constructed (\*).

As mentioned earlier, the Q-index may be difficult to calculate for a country that does not have a well-developed market economy. If barter constitutes a large part of the economy, then prices may have to be "imputed" in order to be able to measure welfare. Even in the U.S. model imputation is done for non-market production, for example for goods and services produced in households.

For similar reasons it may be difficult to apply our model to a socialist country. In our model the welfare value of goods and services is determined by the price which people pay in a free market. In a controlled market the welfare value of goods and services would have to be obtained by other methods.

19. Aside from the above exceptions, it seems to me that our methods should be applicable to other countries whether they are sparsely or densely populated, whether they are large or small, whether they are heavily industrialized or agricultural, urbanized or rural, whether they have a high fertility or a low fertility, or whether they have a high mortality or a low mortality. Consider for example an agricultural country having a high fertility and high mortality. The Q-index might be defined in a very similar fashion to that of the United States. A mathematical model would be constructed in a similar fashion. But the parameters entering into it would be quite different. There probably would be no migration to the country. The amount of schooling received would be less, the age of entry into the work force would be lower. Educational expenses therefore would be less on a per-capita basis. However, the number of children would be relatively higher because of an age structure with a high dependency ratio. On the other hand, medical costs might be less per capita since people do not survive to the age where degenerative diseases are important. For such a country, pollution control costs and urban disamenities would be less important, but not the increased cost of natural resources. In particular, one would want to know the productivity of marginal agricultural land, and the cost of working it in order to produce acceptable crops.

20. It is clear that a great deal of research would have to be done in order to develop satisfactory methods of building demographic models for different countries. Yet, I believe that the task is essential and important. In order to influence policy decisions and policy makers it is important to present them with quantitative arguments. It is important to indicate to them the effects of different policies and the consequences of different assumptions. Hopefully, this will not only lead to an optimum population, but also to an optimum path for reaching an optimum population.

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(\*) In fact, an important application of our mathematical model would be to establish what accuracies are required for demographic surveys and data, by empirically testing the effects of small errors.

# THE OPTIMAL VARIATION RATE OF A POPULATION

by Alfred SAUVY

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1. To tackle such a delicate notion as the *optimal variation rate of a population*, we are going to define the bases of the problem by various means of approach and examples.

It is not necessarily a question of a national population, nor even a human population. The problem may arise for a town, a region, human sub-populations (for instance, a working, scholastic or professional population etc.) animal populations (cattle) or the populations of objects (forest, collection, financial capital etc.).

The most general problem.

2. Here is a group made up of A elements which we propose to increase, till it reaches level B. How are we going to proceed ? What approach must we follow ?

So as to be able to define an optimum we must know what variable has to be maximized. One may, for example, intend to obtain the most advantageous economic result possible. But several factors may conflict and we shall see some examples of this.

If the date by which the effective B has to be reached is also determined, the rate of variation in the time would itself be determined, if it were supposed, furthermore, that it has to be regular. But it may be otherwise ; various considerations may suggest an irregularity : for instance, the starting-off may be difficult and this could dictate regular acceleration and not a constant speed.

There is also the question of the stop or subsequent movement, once the objective B is achieved. It is all the more difficult to ignore totally what will happen next as the movement may itself have a certain inertia and as an abrupt halt may present various disadvantages.

An example.

3. For example, let us take a person who intends to stock his empty library over a period of five years, but who does not wish to go beyond this. This library can contain 300 volumes. It is therefore a question of purchasing on average 60 volumes per year. If the owner's income goes on increasing, he may decide to buy more books (for instance, in proportion to his income, but not necessarily so). If, on the other hand, he feels a keen desire to enjoy them, this owner could agree to larger financial sacrifices over the initial years, so as to derive maximum satisfaction. We see here two conflicting factors, in the definition of optimisation.

In the case envisaged there is no problem about the continuation of the movement, since it is agreed that the total of 300 volumes is final and that the owner will easily find new uses for his income becoming available ; but in other cases, this indifference and lack of inertia will give way to other considerations.

If the owner wishes, for example, to build a library of demographic works and he sees new ones appear from time to time, the objective may be modified, during the five years or else be extended beyond this. The reading of these works may make him need to purchase others. The owner may also benefit from higher income enabling him to exceed the initial objective etc.

In other cases, the suddenness of a change may increase the cost or provoke inconvenience ; regularity is, thus, a factor to be taken into consideration.

A national population.

4. Let us consider a country where the public authorities have determined, by means which do not interest us at the moment, a desirable population over the national territory. The population A ought one day to reach the number B, for economic, political or military reasons, it matters little here.

By what way should we pass from level A to level B ?

If the difference between the current population and the desired one is substantial, it is not desirable and it is even sometimes impossible to make up the deficit, in a very short time.

Let us take, for instance, a country with 10 million inhabitants which intends to have 15 million. To achieve such an increase, by natural growth, would take several years. From the purely arithmetical point of view, it could consider a rapid immigration of 5 million inhabitants. But even admitting that it could find the immigrants easily and that their entry did not pose any socio-political problem, considerable investment would have suddenly to be made, and this could even exceed the total production possible. Limitations would be imposed not only for financial considerations, but also in terms of the available working population.

Similarly, if this country of 10 million inhabitants intends to return to 7 million, a period of time is necessary. It is even less conceivable to expel suddenly 3 millions inhabitants. A decrease in the population, by reducing the birth-rate, may require a great deal of time.

In the two cases, a suitable approach must be contemplated, either by the mechanism of births and deaths, or by migration or by both means. To be able to speak of the optimum, we should define what we wish to maximize, for instance, the economic development.

We shall see, moreover, that this optimal approach does not necessarily entail a constant rate of change.

The question of the optimal rate of variation does not only arise at the national level, but we have seen it for any sub-population corresponding to a given character or even for a population of objects. The problem also exists in biology. A young child measuring one meter ought to reach the height of 1 meter 70 centimeters or 1 meter 80, but if his growth were too fast, he would be weakened by it. Nature has planned a suitable rate.

The means of action : the birth rate and death rate.

5. If immigration and emigration are left aside, or if they can only assure part of the desired change, the latter can only be obtained by an increase or decrease in the birth rate. We suppose, in fact, that every possible effort is made to fight, in favour of a reduction in the death rate. In practice, it is not so ; in national budgets economic investment is always in equilibrium with social or sanitary investments.

But in no country is the calculation made in human lives either because it is too hazardous, or because it is too offensive to give rise to a debate or even a simple declaration.

We shall suppose therefore that it is a question of acting on the birth rate, with migration possibly playing a secondary rôle.

From the very moment that the birth rate is questioned, the break-down into ages is also challenged and this greatly complicates the problem since, for 15 or 20 years and even beyond, we are faced with a provisional economic change, hence a parasitic interference entailing an additional charge if the birth rate is to increase or a reduction, if it is to decrease.

Before tackling this problem in all its complexity, we are going to disregard the break-down into ages, and this leads us to the study of a stable population. We shall examine later on under what conditions such stability could be contemplated in practice.

The economic evolution of a stable population.

6. It may be a question of a totally stable population with fertility and mortality constant at every age, but this is not necessary. The essential point in the developments which follow is that the break-down into ages be constant. This supposition enables us to isolate the very influence of the increase in number.

The growth of a population always leads to charges and always presents advantages. The charges are easier to gauge and even to identify than the advantages.

The economic charges of the growth in population.

7. Two stable populations which grow at different rates, but are moreover placed under the same conditions, notably in terms of productivity, have unequal charges for two reasons :

- they do not have the same charges for the non-working population, both young and old,
- they do not have the same investments imposed by growth.

The stable population which grows the most rapidly has higher youth-charges and lower old-age ones. Between the two therefore there is a certain compensation, but this cannot be complete ; the balance depends on :

- the average charge of a young person
- the average charge of an old person
- the age of passing from the non-working to the working stage
- the age of passing from the working to the non-working stage.

In practice, *the compensation proves itself to be more or less integral so that we may neglect this factor.* We must, however, define what we mean by the investments imposed by growth.

8. In order to ensure the additional inhabitants the same levels of equipment and the same facilities as for the initial population, investments are required in housing, hospitals, schools, transportation and working tools etc. In other words, it is necessary, so as to maintain simply the standard of living, to increase the national capital in the same proportion as the population. These are the *demographic investments*.

In the same way, an adolescent ought to receive, in addition to the maintenance-ration proportional to his weight, as for an adult, a growth-ration proportional not to his weight, but the speed of his growth.

If the national capital  $F$  is equal to  $\alpha$  times the national income  $R$  and if the population increases by  $r/100$  per year, the demographic investments  $I$  ought to be, seemingly equal to  $F_r/100$  per year, that is  $\alpha R_r/100$ . The ratio of the demographic investments to the national income is then :

$$\frac{I}{R} = \frac{\alpha_r}{100} \quad (I)$$

However, this formula, currently used, is not exact ; it neglects the fact that a growing population has less investments to amortize than a static one ; these amortizations deal in fact with items of equipment made in a previous period when the population was smaller.

Total cost of the investments.

9. In the calculation which is going to follow, we leave aside the fact that certain items of equipment refer to specific age-groups (school equipment, working tools etc.). As soon as the population is stable, the taking into account of these differences in age would complicate needlessly the problem. We are supposing in practice that all the investments are necessary from birth ; the general result is in no way altered by this hypothesis.

Among the new-comers into the world (births), one part corresponds to the maintenance of the population and the other (the surplus of births over deaths) to the increase. For the former, there is no need to provide additional items of equipment since those of the deceased are made available. For the latter, on the other hand, new equipment has to be built. And as one must also renew the worn-out equipment, which have reached the end of their life, the total charge is made up of :

- the equipment corresponding to the growth in the population
- the old equipment to be replaced.

Both are proportional to the size of the population. But between them there is a lag. The equipment to be replaced corresponds to a previous period.

Calculation of the demographic investments.

10. Let us consider a demographic investment intended to ensure within a stable population the upkeep of an item of equipment determined per person, let  $D$  be the duration in years of this item of equipment, supposed rather long,

$p = r/100$  the rate of the geometrical progression of the population, supposed rather low.

The calculation (\*) shows that the charge per inhabitant regarding this item of equipment, whose cost is supposed to be equal to one, is :

$$C_p = p \frac{e^{Dp}}{e^{D_1}} \quad (II)$$

Because of the reduction in the charge of the past (renewal), the total charge increases less than proportionately to the rate of growth. Or more precisely, if two stable populations have different growth rates, the one which increases the fastest has higher charges, but in a proportion somewhat inferior to the ratio of the growth rates.

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(\*) The reader may refer to the January-February, 1972 issue of the review *Population* : the economic charges and the advantages of the growth in population pages 15 and 16. (Les charges économiques et les avantages de la croissance de la population).

If  $D$  is infinite, that is to say, if the equipment has never to be replaced, the formula (II) is no longer strictly appropriate, but, as the charge is limited to the equipment of additional people, we see directly that the charge per inhabitant is equal to  $p$ , hence formula (II).

If  $p$  is very small, we can neglect the terms in  $p^2$  hence :

$$C_p = p \frac{1 + D_p}{D_p + \frac{D^2 p^2}{2}} = \frac{2}{D} \frac{1 + D_p}{2 + D_p}$$

If the growth is zero ( $p = 0$ ) the charge is :

$$C_o = \frac{1}{D} \quad (III)$$

These are the replacement charges.

The charge imputable to the growth is the difference between the value given by formula (II) and that given by formula (III) hence :

$$C_p - C_o = \frac{p}{2 + D_p}$$

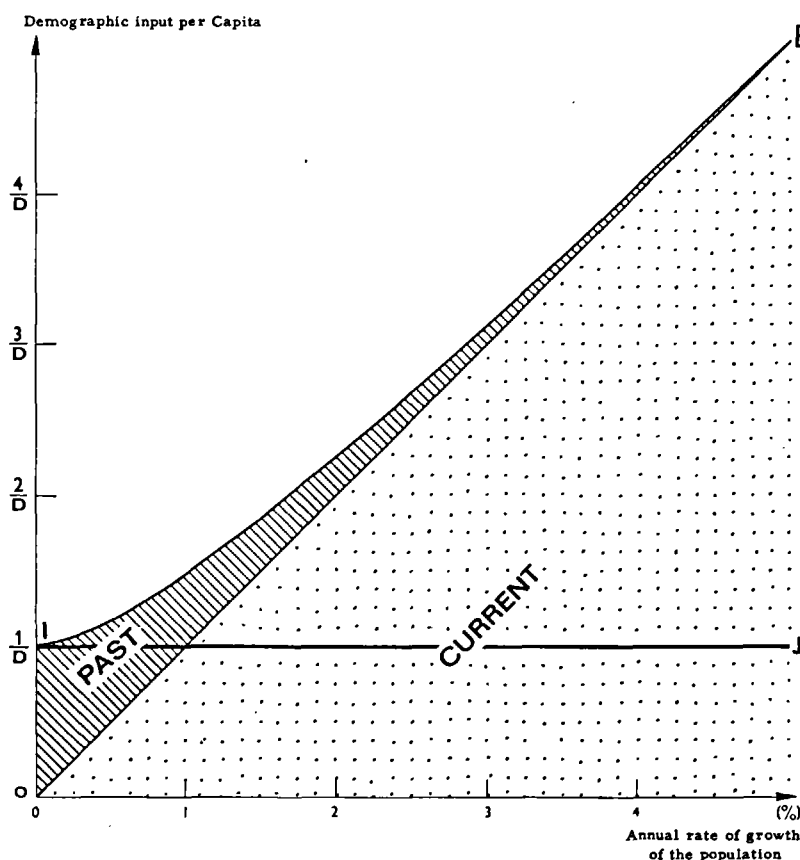


Fig. 1. —

Figure 1 shows how the input is related to the growth rate. Let us remind that we are here comparing stable populations with different growth rates and not a given population in a time series. The total input is located for the past (renewing of old material) in the area above the bissector  $OB$  and for the current period in the area below. The input corresponding to the growth of population is above  $IJ$ .

Ratio of the growth charges to the national income.

11. From the formulae (II) and (III) we can deduct the total charge and the growth charge proper in relationship to the national income, if we know :

- the cost of each item of equipment per inhabitant
- the duration of each item of equipment

One has only to add up the various charges relative to each item of equipment and to compare the total to the national income.

Whilst being somewhat inferior to that which would be given by the classical formula (I), the result is nonetheless significant.

An example, housing.

12. Let  $R$  be the national income

$P$  be the total population

$P_A$  be the working population

$p = r/100$  be the rate of growth

We suppose that the average duration of a dwelling is equal to 100 years, which is a case often observed, and that a unit dwelling (\*) costs  $T$  years' work (the quotient of the national income by the working population). The total charge for the population  $P$  is drawn from (II) :

$$L = \frac{r}{100} \frac{e^r}{e^r - 1} PT$$

Compared to the national income  $R$ , equal to  $TP_A$ , this charge becomes :

$$\frac{L}{R} = \frac{r}{100} \frac{e^r}{e^r - 1} \frac{P}{P_A}$$

If  $p$  is equal to  $\frac{1}{100}$  (a rate of growth of 1 % per year), often exceeded, we have :

$$\text{For : } P_A = \frac{P}{2} \quad \frac{L}{R} = 3.16 \%$$

$$\text{For : } P_A = 0.4 P \quad \frac{L}{R} = 3.95 \%$$

In the latter case, which is more frequent, this charge of 3.95 % may be compared to that which a static population would have to bear, 2.5 % of the national income. Thus, for a single dwelling, the additional charge resulting from the growth is equal to 1.45 % of the national income and this obliges us either to lower the standard of living by as much, or to take this sum out of the economic investments which would reduce the rate of growth. Now  $r$  is often very superior to 1 in developing countries.

In the preceding hypotheses, one must always devote to housing one part of the national income equal to

$r$	Total charge	Charge due to growth
0	2.5 %	0
1	3.95 %	1.45 %
2	5.78 %	3.28 %
3	7.9 %	5.4 %

In this example, as in the previous arguments, we have neglected the influence of internal migration and of the special needs in equipment that can result. Now this migration is itself in part connected with growth. Their case will be taken up later on.

(\*) It is a question of cost per person hence of the cost of a family dwelling, divided by the average number of people living there.

### The case of a declining population.

13. This case has been very little studied until now and presents itself differently. We always suppose that the population has been stable for a long duration. The past-charge (items of equipment to be replaced) may, indeed, be fictitious, for it is not in the interest of the population to renew items of equipment which would not be used. Let us consider the question another way :

When deaths  $d$  exceed births  $n$ , the number of items of equipment which have become available surpasses the requirements resulting from births. There would therefore be nothing to build if this equipment were all in good condition ; a certain number of them have reached the end of their life and are out of use. If their proportion  $m$  is superior to  $d-n/d$  there is a certain number of items of equipment to be built, their number is :  $n - (1 - m)d$ . It could be that, the difference being negative, a population would have no equipment to build for a long time. But, at the end of a certain time (the duration  $D$  of an item of equipment) the available stock would be out of use and it would be necessary to begin a new period during which building would be required. Moreover, one may wonder whether the non-used equipment continues to age or remains in good condition. Simple conditions of obsolescence lead us to adopt rather the first answer, but it may be nuanced.

Furthermore, the compulsory internal migration (see later on) may make the equipment still in good condition dilapidated. Anyway the case is very different from that of the growing populations.

### The effect of acceleration and slowing down.

14. If a population, static until now, begins to grow, or else, if, stable for a long time, it increases its growth, it cumulates past-charges relatively with high present charges. The total may be very large.

Inversely, a population which until now is on the increase, and then becomes static, has no present-charges and only rather small past-charges.

This shows us that acceleration is expansive and that slowing down is advantageous.

### General considerations on demographic investments.

15. We have assumed, in all the previous arguments, that a new item of equipment entirely replaced an old one. Now, during periods of technical progress, it is not so. The cost stays indeed as is indicated by the formula, but there is a qualitative improvement which results from it.

This is the reason why the strict calculation of the demographic investments gives results which are somewhat less favourable than in reality.

### Natural capital and deterioration.

16. We have referred, until now, to the national patrimony made up of renewable investments built up by man. Now the question of natural capital may be posed in two ways :

1) Each inhabitant should always have the same share of natural capital. But this can hardly increase, at least under certain of its forms. In terms of space, for instance, the national area of each country is limited. The case of the polders in the Netherlands is practically the only one in the world. But land-clearing and development can have a similar result. Besides, certain natural capitals can be built up again or renewed. Forests can be planted on ground unsuitable for cultivation ; investments in recreation facilities may give to the city-dwellers the oxygen they lack, etc.

Generally, the investments granted to maintain the natural capital per person ought to be counted with the growth-charges ; indeed, their result is not to increase the standard of living, but to prevent it from falling. Reservations will, however, be set forth later on.

2) The natural capital can be damaged by men or the elements ; this is the general problem of pollution or soil-erosion. At first sight, deterioration seems proportional to the population. In practice, it is far from being so, especially for soil.

### The economic advantages of population-growth.

17. The economic advantages of demographic growth are varied, but less visible than the charges and more difficult to appraise. We shall confine ourselves to indicating the main mechanisms :

– **The overheads of the collectivity.** Be it a question of a nation, a region or a town, there is a certain number of charges which are independent of the size of the population or increase less quickly. They are shown most often by the public expenditure (military expenses, public authorities, broadcasting, television etc.). This



phenomenon is partly the counterpart of the equipment which has to be increased to give each additional inhabitant the same position as the others.

All the collective charges ought not to be counted. Old-age pensions for example, are compensated in a stable population by the youth-charges, as we have seen. As concerns the domestic national debt, it is a State financial charge which carries transfers from one to the other ; it does not constitute a national charge as does the external debt. One may doubtlessly put forth that its covering by income-tax weighs down the progress of the economy, but if the population is stable, we can suppose that the national debt also increases in the same proportion as the population.

Let C represent the overheads of the nation, independent of the population.

The charge per inhabitant  $C/P$  decreases when  $P$  increases ; the production available per inhabitant increases by as much. If the general productivity is constant, the function derived from the production available per inhabitant increases as  $1/P^2$ .

— **General profitability.** Invariable in technique, agriculture comes up against the law of diminishing returns, and this can lead to expensive investments (hydraulic dams for irrigation etc.). On the other hand, industry benefits greatly from a growth in efficiency in accordance with the quantities produced. Not only does the profitability of various activities increase (printing, newspapers, mechanical engineering etc.), but new industries can be created (automobile, aviation, electronics, or even simply agricultural-machinery).

Where there is equality in the sizes of the companies, growth in population stresses competition and reduces the possibilities of monopoly.

— **Increase in density.** The increase in the population in a limited territory, brings in an equivalent growth in the density, and consequently a decrease in the average distance separating two inhabitants. The density works in different ways on the economic level ; (we are leaving aside now the question of diminishing returns as it is already included in the demographic investments, particularly for agriculture).

Transport is less costly for its users because the average distance separating two inhabitants is shorter, and because the network is denser ; the effects of the two factors do not cumulate. Furthermore, the tendency of the inhabitants to go to the towns just as soon as the soil is totally cultivated, results from this advantage. The latter is particularly felt in two sectors, education and public-health. Children have less distance to cover to go to school. Later on, they have more chance of finding near their home a technical college or a university etc. For public-health, the question has been disputed ; for a long time, the death-rate has been higher in the towns than in the country.

18. Today this law is far from being general. The conditions of hygiene are sometimes very inadequate in the towns, but, in case of accident, the speed in dispensing first-aid is as important as its quality.

We may examine generally the influence of density on the death-rate. Observations of time trends cannot give conclusive results. Indeed, in all the developed or semi-developed countries the increase in the population has been accompanied by the economic development or at least by the progress in medical techniques. Although close, the correlation has no meaning.

We ought therefore to limit the comparisons to the space. Now, in practice, it is impossible to find two countries which differ in density and which are placed under identical conditions.

For the 68 countries having the necessary statistics available, we have compared the female life-expectancy at birth  $E_{oF}$  (less influenced than the male one by the mode of living and notably by toxicants, tobacco and alcohol) and the number  $M$  of doctors per 100,000 inhabitants. Below 150 doctors per 100,000 inhabitants, the correlation is strong and the points are located about the line :

$$E_{oF} = 31 + 19.5 \log M$$

The dispersion is, however, rather wide about this straight line ; the chief anomaly occurs for the countries of average longevity. Some of them seem to be located about another straight line situated above the first one. Here follows, for these countries, the actual life-expectancy and that given by calculation :

	$E_{oF}$ actual	$E_{oF}$ true to calculation	Density per sq. km.
Grenada	67	57	299
Trinidad	68	58.5	184
Thailand	61	51.5	70
Ceylon	63	65	191
Hong Kong	71	63	3829
Jamaica	69.5	63.5	171
Barbados	68	62	595
Mauritius	65	58	409

The continental countries of similar medical density, Jordan, Guatemala, Pakistan, India, Gabon and Egypt have, on the contrary, lower longevity than forecast by calculation. The density is certainly not the only factor in question, but its influence seems important.

19. In conclusion, the growth in the population and consequently, in the density, can, to a certain extent, have a favourable influence on the death-rate ; but this influence cannot easily be expressed in economic terms.

– **Pollution and deterioration :** Once again, the influence of the density may be felt in varied and even contrary ways. In physical terms, the pollution and deterioration of the natural resources are at first sight proportional to the population, but we shall see, with regard to sociological and moral factors that other link-ups can occur.

– **Division of work :** Technical progress requires a more and more elaborate division of work which handicaps small populations. This factor may be connected to the previous ones, although it is not identified with them.

– **Structural adjustments :** This is a little known factor although it may be the most important. Many disarrangements and distortions take place within an economy in motion (professional, geographical etc.), either because of errors, or because of unforeseen technical innovations. These distortions may be corrected almost automatically by the growth without additional cost. If, for example, the number of sugar-refineries proves to be too high in relation to the needs, the growth in the population will remove the excess without there being any need to do away with the surplus works. It is always easier to correct a faulty structure by additions than by reductions.

Amongst the numerous distortions possible, we may quote the case of internal migration.

#### Internal migration.

20. Let us take, to be more concrete, the case of housing and migration from the country-side to the town.

Every person must have a dwelling (under the previous conditions) so that the number of dwellings must be equal to the population.

If a village depopulates very quickly, the migration will leave vacant dwellings still in good condition ; this migration creates the need for additional dwellings.

Let us suppose that the migration takes place from area A to area B. If the population of A decreases at a rate superior to  $1/D$  ( $D$  is the duration of an item of equipment), certain dwellings still in good condition may no longer be used, and an equivalent requirement for additional dwellings asserts itself.

This situation is more likely to occur within a decreasing or very slowly increasing population. Two variables are in effect present : the total population and the law governing the distribution of the inhabitants between area A and area B. Whatever this law be, the decrease ought to be greater in area A to maintain the balance.

#### Moral and sociological factors.

21. These are obviously the most difficult to measure and even to identify. Consequently, they are often totally neglected.

Various authors like E. Dupréel, E. Boserup etc. have, however, pointed them out. Difficulty has often a creative value and History provides us with many examples of this. Moreover, the ageing which accompanies the decrease or the low increase may have adverse economic effects, with an aged population risking being turned towards the past more than a young one.

Experience provides us with interesting precepts of which we shall mention the most significant.

In the 19th century, France was more or less under the same conditions as the other countries of western Europe (science, technics and politics etc.). The only exception to this was the demographic factor : because of the decline in the birth-rate which had begun in 1780, the increase in population was noticeably inferior to that of the other countries (England, Germany, Belgium and Switzerland etc.). The retrospective application of the current quantitative patterns, based on the demographic investments would make one believe that the standard of living of the French must have been at about the beginning of the 20th century twice that of the other countries. Now it was more or less equivalent. Psychological factors balanced this : fear of progress, growing old, attachment to the past and less competition etc., which cancelled out the advantages of slower growth.

We know also that in a region in the process of depopulation, there is a lack of initiative or it is very difficult to put new ideas into practice.

History does not, on the other hand, provide us with an example where a decline in the population has been accompanied by economic progress.

The loss of vitality on account of growing old may be compensated for, to a certain extent, if this growing old is recognized and if provisions are made in advance to avert its disadvantages.

The general movement.

22. The total growth-charges and advantages give a complicated function whose direction cannot be easily determined.

Let us not forget that we are not following the charges and advantages of a population which is developing in time, but rather that we are comparing the lot of stable populations placed under the same geographical and technical conditions, yet having different rates of growth.

As we have already seen, we must make a difference between the case of populations which have an economic interest in growing and that of those having an economic interest in declining ; or more exactly, we are distinguishing the cases (territory, technics, and initial peopling) where growth is advantageous and those where it is the decrease which raises the standard of living. First of all, let us examine the first case.

The optimal rate of growth.

23. For a determined rate of growth there are charges and advantages.

The curve C of the charges (Fig. 2) is always convexly turned downwards. Past a certain limit, in effect, the advantages should hardly increase any more when the system is higher ; this is especially the case of the overheads of the State and the nation, that of the structure-compensations, and also that of the moral or sociological advantages. Beyond a certain rate the effect of emulation can even give way to a state of discouragement. The theory of creative difficulty always comes up against limits.

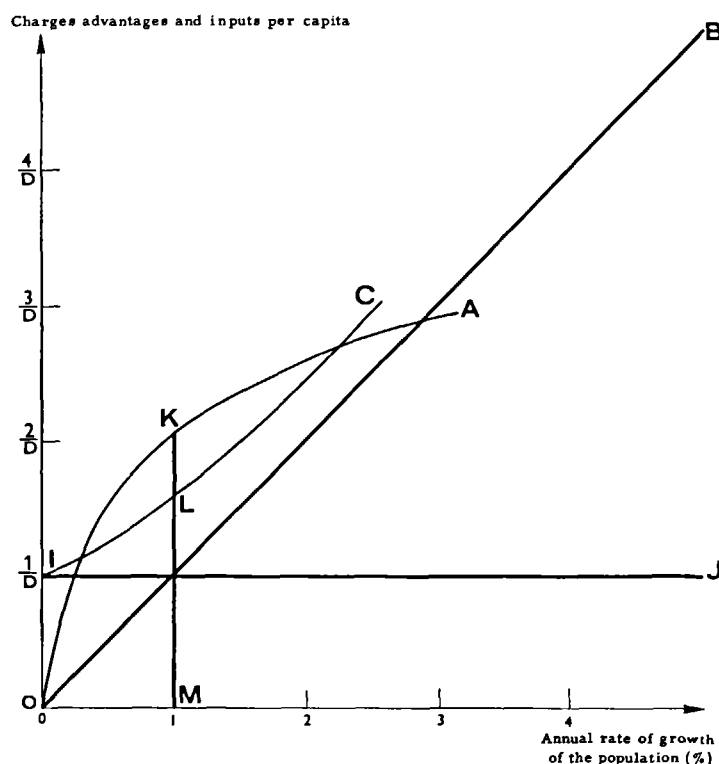


Fig. 2 - Optimal rate of growth.

Let us suppose therefore that the convexity of the curve representing the advantages is turned upwards. The curve A representing the advantages and the curve C, the charges, must necessarily meet each other. If, in effect, the curve A (which itself starts from the origin), always remained below curve C, there would never be any interest in growth, which is contrary to the hypothesis. Just as soon as the curves meet and their convexities are in opposite directions, a rate of growth OM exists such that the tangents in K and L are parallel and that the difference is the greatest possible.

It is impossible to pass on to experimental checks because of the abstraction of the reasoning. Although the populations of western Europe are not stable, one may consider, however, that the annual growth-rate of 0.5 to 1 % that they have experienced since the war is very close to the optimum. Above, the charges of demographic investment would have been too heavy and below, the advantages of growth too low.

Let us consider now the case of a declining population. The question of the charges is, as we have seen, much more uncertain and even more arbitrary than in the case of a growing population. As concerns the growth-advantages which become negative here, they are also very difficult to appreciate. We may suppose that a very fast rhythm of decline would present serious disadvantages and ought never to be desirable. As by hypothesis, we are considering the case of a net advantage due to the decrease, zero growth is not the most favourable position either. Between the two an optimal position must therefore exist.

## Two obstacles.

24. The preceding developments were raised, let us point out, with the aim of eliminating the variations of the break-down into ages which, in this particular case, play a parasitical part. The optimal rate that we are finding is the rate of growth of a stable population. In other words, being given at the outset a given territory, given technics, given items of equipment and a given initial peopling, we are searching for what is the most advantageous degree of growth economically.

Even in these little realistic hypotheses the optimum would only be a provisional position. Even allowing that it is possible to provide a population with full stability for example, by appropriate migration, its increase could change little by little the initial conditions as soon as the territory is limited. For instance under-populated at the beginning, the territory could be less under-populated or even over-populated later on. From another point of view, the technical changes could, contrary moreover to a very widespread notion, have an opposite effect. The calculation would only be worth while where a territory is unlimited and homogenous.

If, in a given territory, a population is stable and it notices for example that its rate of growth is too fast, it cannot change this rate without changing its break-down into ages.

We are going to simplify the problem partially by arguing about sub-populations, for instance a professional population. The disturbance is partly removed because the new arrivals start working immediately. But there remain perturbations at the beginning and at the end.

## The medical population.

25. Let us consider the number of doctors practising in a country. To simplify the explanation we are supposing that the death-rate is nil during their working-lives, stretching from 25 to 65 years of age. At the outset the effectives are the same at each age ; the population is stationary.

One day it is noticed that the number  $M_1$  of doctors is inadequate and that it has to be increased to  $M_2$ . The problem is to find the best possible way to go from  $M_1$  to  $M_2$ .

Two variables are independent and may with difficulty be reduced to only one ; the economic level and the number of human lives saved. Let us even assume that it is possible to reduce everything to economic units. Two objectives are competing :

1) It would be useful to be able to increase immediately the number from  $M_1$  to  $M_2$  so that the population may profit from this improvement. Human lives will be saved.

2) But the passing from  $M_1$  to  $M_2$  in a very short time, for instance one year, raises various disadvantages as well as being costly :

– the first year one should increase the number of new entries from  $\frac{M_1}{40}$  to  $\left(\frac{M_1}{40} + M_2 - M_1\right)$  which will correspond to a very large increase. This would bring about :

– a poor selection of the best, thus a deterioration in the quality of the medical corps which is contrary to the goal of human lives.

– a heavy charge for the universities and hospital-centres, not to mention technical impossibilities. Thus acceleration proves costly.

– 40 years later, the retirement of this abnormally high effective would bring up again the problem of the deficit and would compel us, once again to resort to excessive recruitment.

As we have to take into account the factor of regularity we shall strive to attain the number  $M_2$  only progressively, over a certain number of years. A solution giving rise to very low upheaval, that is nil at the

start, leads us to increase the annual recruitment from  $\frac{M_1}{40}$  to  $\frac{M_2}{40}$ ; it could then last indefinitely. But this solution, administratively convenient, sacrifices human lives.

A faster acceleration would force us to foresee a reduction in the intakes once the number  $M_2$  is reached. But it may be also that the objective  $M_2$  is only an intermediate one, a provisional stage which changes the premises.

Without any further hypotheses, it is not possible to compare the respective costs of the various solutions and consequently to define the conditions of optimum, that is to say of the greatest advantage.

### The agricultural population.

26. Let us take now the opposite case, just as frequent as the first: In a country there are  $A_1$  farmers and calculations have shown that a number  $A_2$  lower than the first would be enough. The problem is to pass from  $A_1$  to  $A_2$ .

The considerations put forth in the previous case may easily be transposed: It would be unreasonable (allowing that it were possible) to do away with, for one or several generations all the recruitment of young people and every access to the agricultural profession. Even if such a project were possible, it would bring about later new upheavals when these generations find themselves unemployed.

The optimal way leads us to reduce the upheavals, as much as possible and reconcile speed and acceleration, to arrive at the desired number. Here once again the initial facts must be clearly defined.

### The use of stability over a long period.

27. If an objective very superior or very inferior to the actual number is desired for a national population, use of the optimal rate of variation may be made in 3 stages:

- the arriving at a stable state, supposing a slowing-down or acceleration
- the period of stable state, for a certain time, at a constant rate of variation, considered optimal
- the arriving at a stationary state, before reaching the desired number.

These operations may be compared with the movement of a space-missile which first of all accelerates, then travels at a constant speed, only then to be slowed down before arriving at its goal.

### The passing to a stationary or stable population.

28. Mr. Bourgeois-Pichat has shown for Mexico that an abrupt halt in growth would lead to unacceptable upheavals in the break-down into ages, but that these disturbances would be much less serious if the net reproduction rate of the moment were progressively reduced to 1.

Another solution consists in passing directly to the stationary state. Let us suppose that the stable population grows at the rate of 2.5 % annually and that the mortality and fertility rates in each age are constant; if the fertility rates per age drop 2.5 % annually, which is possible, births will be constant and the population will progressively become stationary. At the end of approximately one century, but in actual fact a little sooner, deaths will in their turn stop increasing and the population will be stationary. Moreover, after 15 to 20 years, the reduction in the fertility rates may be less than 2.5 % annually, because of the coming to the age of procreation of the "stabilized" generations.

However, if the death-rates in each age decrease, the stability, especially in the young ages, of the number of births would not be sufficient to ensure the stationary state of the population. An increase or reduction in the fertility rates at a rhythm inferior or superior to the growth rate could lead, under the same conditions, to a stable population growing or declining, which at least offers the advantage of regularity. We are now going to study two more concrete cases applying to two types of developing countries.

### The underpopulation.

29. Certain countries, especially in Africa, south of the Sahara, are very populated and would gain economically by having a much greater population, sometimes 10 times larger. A solution for them is to maintain annual growth and even to increase it by working on the death-rate. This solution may be accepted on condition that it is possible to bear a high rhythm of demographic investment; if not, the country would risk having a large, yet badly equipped and little educated population which would slow down development.

The question of the optimal rate of growth to be adopted then depends on the sanitary (possible progress over the death rate in the various ages) and economic conditions. The adopted rate ought to be maintained, yet reducing as much as possible the upheavals at the beginning and end of the movement.

## The overpopulation.

30. We are considering here the case of an absolute over-population, that is to say, one which might remain, even using more productive techniques. In other words, even with a more advanced technology, this population would benefit in its standard of living by being less numerous.

In the countries which seem currently to fall into this case, the objectives pursued have only till now applied to the rate of growth, required, for example, to drop from 3 % per year to 2 % or 1 %. This objective, whilst meeting the practical possibilities, implies simply a slowing-down in growth and corresponds very rarely to accurate economic calculations.

Making every reservation as to the moral and sociological disadvantages of a decrease, it then is advisable to seek not the stationary state which would entail a large increase in the population, but a gradual drop in the number of births, thereby arriving at the state of declining stability. Once the country is well into the movement which, at the outset, means another population increase, it could decide whether to pursue it, slow it down or increase it.

One difficulty ought to be pointed out : the effect of the reduction in births is to lower temporarily the youth-charges without increasing, in relative value, that of old-age. We admit that the gain makes up for the loss later. Only the reduction in the youth-charge will have permitted expenses or fiscal relief and, once into the habit, it will be difficult to decree an increase in the social charges. This is an additional reason for realizing a long time in advance the disadvantages of growing old.

The taking into account of this fact ought not of course to affect the material charges alone.

## Conclusion.

31. The notion of optimal rate of variation, which seems simple and only implies a function with one variable, is more complicated than it appears and even has no meaning, if it is viewed too simply. Even if the objective is clearly defined, for example, the average income per inhabitant, several variables are involved which have to be reconciliated, particularly the general rate and the regularity. It is only after examination of concrete cases that practical solutions can be put forward.

# NOTES ON THE DEMOGRAPHIC EVALUATION OF POPULATION GROWTH TARGETS (\*)

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1. This paper, in its present form, is intended as a background for discussion. It summarizes my somewhat disorganized and preliminary thoughts on the demographic evaluation of population growth targets.

Part I includes, among other things, an attempt to outline what population growth targets are, to discuss their components, and to make a few observations on the subjects that formulate population growth targets. Part II discusses the demographic evaluation of population growth targets and at the same time, demographic (as opposed to political, economic, etc.) target-setting. However, it is not limited to a description of possible target-setting and target-evaluating procedures, but presents in its first section two general principles that seem to underlie the specifics of demographic target evaluation.

## I – INTRODUCTORY REFLECTIONS (\*\*)

### 1) An Attempt to Classify Population Growth Targets

2. Individuals and/or institutions of a particular population are often not content with, and fear possible undesirable (adverse) consequences of past, current, or anticipated population growth trends. Consequently, a desire to intentionally alter growth trends and to influence their future paths is often formulated. Such an expressed desire can be considered a population growth target. In order to be able to discuss methods of defining and evaluating population growth targets, it might be useful to sort out targets according to several different aspects (see Table I).

One possible aspect for classification of population growth targets is by whether or not a precise quantification is contained in the target formulation (“the annual rate of natural increase should be 2.4 % in 1980” as opposed to “it is desirable to have a small family”). Demographers with the help of formal demographic procedures can evaluate both the feasibility of achieving and the actual achievement of a quantified population growth target with relative facility compared to an unquantified target.

This demographers’ facility should not be confused with the potential “real life” impact of any population growth target. The fact that a target is quantified does not mean that more action (programs, laws, public discussions, etc.) will be generated and that the target will thus be achieved earlier than otherwise. An unquantified population growth target can be just as, if not more, effective as a quantified one, but it is more difficult to evaluate possible paths toward its achievement.

A further aspect of classification is the subject to which the target pertains. The target can deal with the aggregate national population, or with its components, i.e., the average family and/or individual.

The type of statistical measure that is employed to formulate the population growth target is a relevant aspect of classification. The statistical measure used in formulating a population growth target will probably reflect the authors’ mode of thinking and might therefore also imply the type of efforts to be developed toward target achievement. A target defined with the help of the crude growth rate, for instance, can be achieved by various combinations of both migratory and natural increase, which in turn leaves open the choice

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(\*) I am deeply indebted to several of my colleagues at the Population Council. For having provided invaluable assistance in assembling the information contained in Tables II and III, I am grateful especially to Valerie Parker, but also to B. Maxwell Stamper ; for having read and commented on an even more preliminary draft than the present one, to Steve Baldwin, David Sills, William Seltzer, and Roy Treadway. A special expression of gratitude is due to Bernard Berelson who generously allowed us to extract information for Table 3 from a forthcoming book which he is editing, *Population Policy in the Developed World*.

(\*\*) This section of the paper might overlap with the paper of Professor Iskandar. If so, I humbly apologize, however, I did not see any other way to discuss Part II without first, at least superficially, going through the topics discussed in Part I.

of different value combinations regarding crude birth and crude death rates. A desired direction of population growth trends can be expressed through a set of statistical measures, in which case mutual consistency is called for (more about this in Part II). A detailed structure for this aspect of the classification is given in Table I.

TABLE I – A CLASSIFICATION OF POPULATION GROWTH TARGETS

Aspects	Classes, Categories
A. Quantification	<ul style="list-style-type: none"> <li>– precisely defined values of demographic measures, with specific time limitations</li> <li>– fairly loose statements, not well specified demographic measures, with vague time limits</li> </ul>
B. Subject of Definition	<ul style="list-style-type: none"> <li>– total population</li> <li>– family</li> <li>– individuals</li> </ul>
C. Statistical Measures Employed	<ul style="list-style-type: none"> <li>– fertility measures (crude birth rates, total fertility rates, gross reproduction rates, age-specific fertility rates)</li> <li>– mortality measures (crude death rates, expectation of life at birth, age specific mortality rates)</li> <li>– migration measures (rates of immigration, emigration and net migration)</li> <li>– measures of population change [combined effect] (crude rates of population growth/includes natural increase and migration/, crude rates of natural increase, net reproduction rates)</li> <li>– absolute number of population</li> <li>– measures of age structure (dependency ratio/child, old age, combined/proportion of age group)</li> <li>– marital status (average age at marriage, structure of population by age and marital status)</li> <li>– contraceptive practice (numbers of acceptors/total and by method/, number of users/total and by method)</li> </ul>
D. Time Dimensions	<ul style="list-style-type: none"> <li>– short-term</li> <li>– medium-term</li> <li>– long-term</li> </ul>
E. Subject Formulating Target	<ul style="list-style-type: none"> <li>– individuals</li> <li>– private institutions (national, international)</li> <li>– public institutions (national, international)</li> </ul>

3. A rather arbitrary aspect of classification is one based on the point in time at which the target is directed. An element of objectivity could be introduced by stipulating as a criterion of the classification the childbearing behavior of certain cohorts. One would ask whether the achievement of the target is dependent primarily on that childbearing population which at the time of target definition is already “active” (short-term targets – up to, say, 5 years)(\*), or whether the achievement of the target depends primarily on the childbearing-behavior of those cohorts presently “inactive, but alive”, i.e., the cohorts whose size is already known and whose future size can be relatively well projected (medium-term target, say, from 6-20 years). Targets other than these depend heavily on the fertility behavior of cohorts yet “unborn” (long-term targets, say, over 20 years).

One could also attempt to classify the subject responsible for formulating and publicizing population growth targets. Targets can be voiced by individuals or by private and public institutions both national and/or international (the most powerful of which are national governments). The importance of this stems from the fact that public influence of the proclaimed population growth target (for instance, the programs that can be organized to achieve it, attendant changes in the legal system that might be generated, influences which could be exerted on the press and other mass media, pressure to introduce population education into the school system) will differ significantly depending on who formulated the target. The obvious extreme example would

(\*) Occasionally, annual population growth targets are formulated ; usually within the context of monitoring a family planning program.



be targets defined by individuals as opposed to those formulated by a government. But in countries where the press is controlled, a personal statement can be assumed to have been cleared by the authorities, and the impact of such a statement will differ considerably from a comparable personal statement in a "free" press country. However, seemingly much smaller differences in the authorship of a population growth target could signify a substantial difference in the target's public impact. Two different ministries of one and the same government may have distinctly different effects on public affairs, for instance.

4. So far, we have been using a rather broad definition of "population growth target": namely "a formulated desire to intentionally alter and influence the future paths of population growth trends". Using this definition, the "formulated desire" to change population trends expressed by any subject is considered a population growth target. One way of narrowing the concept of population growth target is to specify that only such population growth targets formulated by governments or by institutions directly linked to governments will be considered "eligible". It appears justified to make the above restriction since only population growth defined by governments, planning offices, ministries, etc., or possibly by influential international organizations (U.N., World Bank) have a chance of generating and influencing programs (family planning or family supporting), laws, and educational campaigns.

## 2) Population Growth Targets as an Expression of Concern

5. Some people tend to think that concern with population growth has increased since World War II, and that it is currently at its highest point in history. It is difficult to evaluate such a belief since there have been times of major concern with high or low rates of population growth before. Whatever the case may be, in the beginning of the 1970s population does seem to be a matter of non-trivial concern in many countries. Some of the symptoms of this concern include:

- the number of organizations (and their size) dealing with population has grown rapidly during recent years, for instance, United Nations Fund for Population Activities (UNFPA), International Development and Research Center (IDRC), Committee for International Coordination of National Research in Demography (CICRED);
- expenditures on population related projects around the world seem to have grown; this is especially true for anti-natalist programs (for instance, external assistance in population has grown from approximately 4 million dollars in 1962 to over 200 million dollars in 1972), however, no aggregate evidence seems to be available pertaining to pro-natalist programs;
- governmental population commissions have operated in many countries during recent years;
- membership in national and international professional population organizations has grown rapidly;
- the fact that one can find a considerable number of countries with a variety of population growth targets (see Tables II and III).

Views on population growth differ from country to country, can differ in time in one and the same country, and are often different between various groups of the particular country's citizens. Data in the tables give partial evidence of the fact that countries, or rather certain subjects in particular countries (governments, governmental commissions, scientists, the general public), are often in favor of a different type of population growth than is currently occurring. For many developing countries, a slower rate of population growth is considered desirable, while governments in several developed countries would be happier if their populations would grow faster. There are also countries in which the rate of population growth is high and yet the governments are not only unconcerned, but are in fact content with this state. On the other hand, the opinion has frequently been voiced that even a low rate of national population growth is "harmful" and that a "zero" or even "negative" rate of growth would be most desirable for the current and future welfare of a particular country. Last but not least, there are countries in which the rate of population growth is of no particular concern, and thus "population" appears in no list of issues on any governmental agenda and/or in public and scientific debates.

6. To summarize, in the early 1970s most developed countries were experiencing a low rate of population growth, i.e., around 1 % p.a. or less, while developing countries had a high rate of population growth, in the area of 2 % p.a. or more. Value systems judging "good" and/or "bad" aspects and consequences of population growth in countries around the world differ considerably, and thus one finds in both groups of countries individuals and governments that are either:

- a) unconcerned with the rate of population growth; or
- b) concerned and
  - (i) consider the rate of population growth too high
  - (ii) consider the rate of population growth too low
  - (iii) consider the rate of population growth appropriate.

TABLE III - POPULATION GROWTH TARGETS AND RELATED DEMOGRAPHIC MEASURES IN DEVELOPED COUNTRIES (AROUND 1970)

Country	Estimate of Demographic Characteristics (1971)				Total Fertility Rate	Population Growth Target	Specific Policy Measures Related to Population	Desired effect of population Related Policies
	Population (Millions)	Crude Birth Rate	Crude Death Rate	Rate of Natural Increase				
Argentina	25	22	10	1.2	3.1 <sup>(g)</sup>	No explicit target	Abortion restricted ; contraceptives legal ; financial benefits to large families ; efforts beginning towards "Argentinizing" the Patagonia and frontier areas which have experienced substantial foreign immigration	Pro-natalist ; Increased internal migration to frontier areas
Australia	13	22	9	1.2	2.9 <sup>(d)</sup>	General tendency appears to be in direction of slowing population growth	Abortion laws conservative (except in South Australia) ; contraceptives legal ; no policy directed towards natality at present; efforts to reduce immigration anticipated; concern over urban growth	Anti-growth
Belgium	10	14	12	0.2	2.3 <sup>(e)</sup>	"Stimulus-response" approach to population problems ; no systematic attempt to alter native population trends	Abortion restricted ; contraceptives legal, but no advertising and information materials on them permitted ; considerable family allowances ; immigration encouraged (annual growth exceeds natural increase) ; policy of economic and administrative decentralization	Maintain immigration levels, possibly adjust according to economic needs ; Increased internal migration to industrializing "less favored regions" ; Increased decentralization
Bulgaria	9	16	9	0.7	2.3 <sup>(e)</sup>	3-child family	Abortion available, but not granted to young childless married women (assuming normal circumstances), contraceptives legal, state housing and job priorities to 3 or more child family ; financial and social incentives (maximum for 3 children) ;	Pro-natalist
France	51	17	11	0.6	2.6 <sup>(f)</sup>	Achieve population level commensurate with desired economic, social, political goals	Abortion restricted ; contraceptives legal ; substantial aid to and for encouragement of large families ; detailed policy encouraging immigration (sensitive to economic conditions) ; incentives for creating new jobs and industrial activities in certain parts of France	Pro-natalist ; Maintain immigration levels, possibly adjust according to economic needs ; Increased internal migration to new industrial areas
Great Britain	56	16	12	0.4	2.4 <sup>(d)</sup> (England, Wales) 2.8 <sup>(e)</sup> (Scotland)	Disperse population concentration from urban areas	Abortion fairly liberal ; contraceptives legal ; policy directed toward distribution of population ; tightening of immigration regulations ; creation of "green belts," "new towns", "conurbations" to relieve urban congestion	Anti-growth ; Reduced immigration levels ; Increased redistribution of population away from urban areas
Greece	9	16	8	0.8	2.4 <sup>(e)</sup>	Higher CBR ; higher level of net in-migration ; decentralization and redistribution of population	Abortion illegal ; no legislation on importation or distribution of contraceptives ; substantial incentives to have children ; large benefits for families with 5 or more children ; proposed measures to create socioeconomic motives encouraging immigration ; country divided into 7 highly autonomous areas to facilitate redistribution and decentralization of population	Pro-natalist ; Increased immigration levels ; Increased internal migration through decentralization
Hungary	10	15	12	0.3	2.1 <sup>(e)</sup>	Gradual increase in CBR to ensure replacement ; equalize age structure	Abortion legal ; contraceptives legal ; family allowances ; proposals to increase influence of pro-natalist policy particularly in 20-29 age group to prevent long range birth decline ; housing preferences to large families	Pro-natalist
Ireland	3 <sup>(a)</sup>	22 <sup>(c)</sup>	12 <sup>(c)</sup>	1.0 <sup>(c)</sup>	3.9 <sup>(e)</sup>	Population corresponding to economic needs ; redistribution of highly concentrated population in large cities (particularly in Dublin)	Abortion, contraceptives, divorce illegal ; family allowances ; income tax benefits as well as housing preferences to large families ; financial incentives to industries in depressed areas and to the rural population to remain rural	Increased internal migration from concentrated areas
Israel	3	27	7	2.0	3.8 <sup>(e)</sup>	Larger families, increase of population for political, economic and "Jewish demographic" reasons	Abortions illegal ; contraceptives available through physician ; family planning services scarce ; creation of committee intended to carry out pronatalist measures ; open immigration policy for Jews	Pro-natalist ; Increased Jewish immigration
Netherlands	13	19	8	1.1	2.7 <sup>(e)</sup>	Population proportionate to economic demands ; equal distribution of population	Abortion illegal ; contraceptives available ; foreign labor recruited for unskilled and semi-skilled jobs (preferably "temporary" immigrants) ; attempts to encourage excess population into foreign countries (particularly Canada, Australia, New Zealand) through bilateral agreements, assistance provided to emigrants ; encourages migration from Western provinces and industrialization of underdeveloped regions	Maintain immigration levels of temporary unskilled and semi-skilled labor according to economic needs ; Maintain services for emigration of excess population ; Increased internal migration
Poland	33	17	9	0.8	2.2 <sup>(e)</sup>	Check excessive birth decline (keep NRR slightly above replacement)	Abortion legal ; contraceptives legal ; detailed and increased maternity and child rearing benefits ; program aimed at increasing housing space, particularly for young couples ; anti-migration policy to large cities ; location of new industrial activities in less developed regions (policy of "deglomeration") ; incentives to prevent rural exodus	Moderately pro-natalist ; Increased internal migration away from large cities
Rumania	21	21	9	1.2	3.2 <sup>(d)</sup>	Large family	Abortion restricted ; detailed socioeconomic policies designed to effect natality increase ; State assumes much of financial burden of child raising	Pro-natalist
USSR	243 <sup>(c)</sup>	17 <sup>(c)</sup>	8 <sup>(c)</sup>	0.9 <sup>(c)</sup>	2.4 <sup>(f)</sup>	Maintain population growth	Liberalized abortion ; family allowances after 4th child ; various proposals to increase national birth rate, the majority of which favor raising fertility in low fertility areas	Increased fertility of low fertility groups
U.S.	207	17	9	0.8	2.1 <sup>(a)</sup>	Commission on Population Growth and the American Future concludes the U.S. target should be stationary growth	Legality of abortion varies from state to state ; contraceptives legal ; investigation of population growth in relation to available economic resources ; no specific policy measures as yet although proposals include encouragement of economic growth in rural and small towns	
West Germany (Federal Republic of Germany)	61	13	12	0.1	2.4 <sup>(e)</sup>	No explicit target	Government avoids concepts of "population policy" as such ; official recognition of "inner family life" as beyond state realm ; agreements between Federal Republic and other nations on recruitment of foreign labor ; considerable services provided immigrants ; optimum spatial redistribution of population based on voluntary migration into developing areas	Maintain immigration levels of foreign labor according to economic needs ; Increased internal migration to developing areas.

**Footnotes :**

(a) 1972            (d) 1969            (g) 1965

(b) 1971            (e) 1968

(c) 1970            (f) 1967

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TABLE II - POPULATION GROWTH TARGETS AND RELATED DEMOGRAPHIC MEASURES IN DEVELOPING COUNTRIES (AROUND 1970)

Country	Estimate of Population in 1970 (Millions)	U.N. Estimate, 1966-70			Population Growth Target	Source	Rationale for Population Related Policies	Desired Effect of Population Related Policies
		Crude Birth Rate	Crude Death Rate	Rate of Natural Increase (%)				
ASIA								
China, People's Republic	760-950	33	15	1.8	Late marriage ; Small families	Nortman, <i>Population Studies</i> , 1972	"Health and prosperity of nation" achieved through increased spread of education and health measures.	Anti-natalist
India	550	43	17	2.6	Reach CBR of 25 as quickly as possible by creating facilities for 90 % of India's married population to adopt family planning	<i>Fourth Five Year Plan, 1966-71</i>	Raise living and health standards.	Anti-natalist
Indonesia	121	48	19	2.9	3 million contraceptive acceptors by 1973	<i>First Five Year Development Plan (1969/70-73/74)</i>	Reduced population growth will better allow capital formation for investment, lessen unemployment, improve health, welfare, general living conditions.	Anti-natalist
Iran	29	45	17	2.9	Establish relative equilibrium of lower age groups in population during plan period ; create optimum conditions for child health and growth	<i>Fourth Development Plan, 1968-72</i>	Raise per capita income and lower unemployment, improve living and health conditions	Anti-natalist
Korea, Republic of	32	28 <sup>(e)</sup>	8 <sup>(e)</sup>	2.0 <sup>(e)</sup>	NI decrease to 1.5 by 1976 ; NI decrease to 0.5 by 2000s	<i>Third Five Year Plan, 1968-72</i>	Raise income level ; higher education ; alleviate housing shortage	Anti-natalist
Malaysia	10	33 <sup>(b)</sup>	7 <sup>(b)</sup>	2.6 <sup>(b)</sup>	Reduce NI to 2.0 by 1985	<i>Development Plan, 1971-75</i>	Promote economic growth ; increased maternal and child health conditions	Anti-natalist
Nepal	11	45	23	2.2	Decrease NI to 2.0 (tentative goal)	Nortman, <i>Population Studies</i> , 1972		
Pakistan	114	51	18	3.3	Reduce CBR to 45	<i>Third Five Year Plan, 1965-70</i>	Keep national income and growth commensurate with population growth ; smaller families provide healthier conditions than unlimited family size	Anti-natalist
Philippines	39	45	12	3.3	50,000 acceptors per month by 1973 ; Reduce NI to 2.0 %	<i>Development Plan, 1972-75</i>	Increase per capita income ; decrease dependency ratio ; free resources now being directed to dependent population ; reduce unemployment	Anti-natalist
Singapore	2	23 <sup>(a)</sup>	5 <sup>(a)</sup>	1.8 <sup>(a)</sup>	Obtain the participation of 180,000 eligible women in family planning program within 1966-70 ; Reduce CBR to below 20	Singapore Planning and Population Board, <i>Fifth Annual Report, 1970</i>	Reduce dependency ratio ; relieve economic stress caused by high rates of population growth	Anti-natalist
Sri Lanka	13	29 <sup>(a)</sup>	8 <sup>(a)</sup>	2.2 <sup>(a)</sup>	Reduce CBR by at least 1/3 during ten year period (CBR = 32 in 1966)	<i>Provisional Scheme for a Nationwide Family Planning Program in Ceylon, 1966-76</i>	Relieve strain on social services (educational, medical, etc.) and natural resources ; improve material and child welfare ; reduce dependency ratios	Anti-natalist
Taiwan, Republic of China	14	28 <sup>(a)</sup>	5 <sup>(a)</sup>	2.3 <sup>(a)</sup>	2-child family	Committee on Family Planning, Taiwan Provincial Health Dept., <i>Semi-Annual Report, July-December 1971</i> .	Improve individual standard of living ; relieve population pressure on economic development	Anti-natalist
Thailand	36	43	10	3.2	Reduce population growth rate to 2.4 by 1980 ; 400,000 new acceptors in 1974 and thereafter	Unhanand, "Target for the Family Health Project, Thailand", Ministry of Public Health, Bangkok, May 1970	Reduce cost of social services, increase economic growth	Anti-natalist
Turkey	36	40 <sup>(d)</sup>	15 <sup>(d)</sup>	2.5 <sup>(d)</sup>	Voluntary planning for desired number of children	<i>First Five Year Development Plan, 1963-67</i>	Raise per capita income, reduce dependency ratios, avoid future excessive manpower	
AFRICA								
Cameroon	6	43	23	2.0	Population to reach 15 million	Gwatkin, <i>Studies in Family Planning</i> September 1972	Increased population would aid in reaching goals more quickly	Pro-natalist
Ethiopia	25	46	25	2.1	Expansionist ; population increase seen as "encouraging"	<i>Second Five Year Development Plan, 1963-67</i>	Greater availability of labor ; expansion of domestic market	Pro-natalist
Gabon	0.5	33	25	0.8	Maintain CBR at 35	U.N. Economic Commission for Africa Survey	Avoid shortage of manpower	
Ghana	9	47	18	2.9	Widespread family planning methods, reduce scale and rate of immigration ; reduce birth rates parallel to reduced death rates	<i>Population Planning for National Progress and Prosperity : Ghana Population Policy (March 1969)</i>	Avoid unemployment, poverty, poor health conditions ; concern over housing	Anti-natalist
Kenya	11	48	18	3.0	Double existing number of family planning clinics (130), exclusive of those in Nairobi	<i>Development Plan, 1970-74</i>	Higher per capita growth, reduce unemployment, decrease dependency ratio, improve maternal health, reduce infant mortality	Anti-natalist
Mauritius	0.84	27 <sup>(a)</sup>	8 <sup>(a)</sup>	1.9 <sup>(a)</sup>	Reduce CBR to 20 by 1975	<i>Five Year Plan, 1970-75 (As quoted by D. Nortman, Reports on Population/ Family Planning, September 1972)</i>	Reduce social service cost, keep population growth in accordance with economic growth	Anti-natalist
Morocco	16	50	17	3.3	Short term CBR to 45 ; Long term CBR to 35 (1980-85)	<i>Moroccan Plan, 1968-72</i>	Reduce rate of population growth ; reduce high dependency rate ; provide solution to problems of nutrition, schooling, housing and employment	Anti-natalist
Nigeria	55	50	25	2.5	Distribution and movement of population according to economic opportunities ; Mobility of skilled labor	<i>Second Development Plan (1970-74)</i>	Reduce population growth, dependency ratios, relieve unemployment, reduce concentration of the gainfully employed in low productive sectors of the economy	Anti-natalist
Sierra Leone	3 <sup>(b)</sup>	45	23	2.2	Moved from pro-natalist position on population to one of neutrality	Gwatkin, <i>op. cit.</i>		Neutral
Somalia	3	46	24	2.2	Government did not view population as a problem because of its low population density and Somalia's large availability of natural resources	<i>Development Plan, 1963-67</i>		Neutral
Sudan	16	49	18	3.0	Keep population and economic growth harmonious	<i>Ten Year Development Plan, 1961/62 - 71/72</i>	Target achievement would continuously increase average per capita income	Moderately anti-natalist
Swaziland	0.41	52	24	2.8	As of 1969, government expressed no concern that population growth rate was too high	<i>Post-Independent Development Plan, 1969</i>		Neutral
Tanzania	13	47 <sup>(d)</sup>	22 <sup>(d)</sup>	2.5 <sup>(d)</sup>	Keep population growth related favorably to economic growth ; Concentrate on benefits of child spacing	<i>Second Five Year Plan, 1969-74 ; Daily News (Tanzania) 1/10/73</i>	Concerned with having only those children for whom adequate education and other services could be provided	Moderately anti-natalist
Tunisia	5	37	16	2.1	Reduce CBR to 34 by 1975	<i>National Plan for 1969-72</i>	Reduce population growth rate, establish equal rights for women, improve maternal health	Anti-natalist
Uganda	10	50 <sup>(b)</sup>	18 <sup>(b)</sup>	3.2 <sup>(b)</sup>	Reduce CBR to 45 ; Reduce CDR to 15 ; Reduce NI to 3.0	<i>Third Five Year Plan, 1972-77</i>	Reduce the burden on educational services ; increase economic output ; reduce future unemployment ; raise per capita standard of living ; increase the investment per worker ; reduce the demand on social services	Anti-natalist
United Arab Republic	33	44	17	2.8	Reduce CBR by one point per year for ten years, beginning 1969	Nortman, <i>Population Studies</i> , 1972		Anti-natalist
Upper Volta	5	49	29	2.0	Government does not express any concern over native population increase ; interested more in migratory movement out of Volta	<i>Volta Plan Outline, 1967-70</i>		Neutral
LATIN AMERICA								
Barbados	0.3	21 <sup>(b)</sup>	8 <sup>(b)</sup>	1.3 <sup>(b)</sup>	Reduce CBR to 20 ; Reduce NI to 1 %	<i>Barbados Development Plan, 1969-72</i>	"Stated goals with respect to national income growth, employment levels, education and health will hardly be attainable (unless population growth is reduced)"	Anti-natalist
Colombia	21	45	11	3.4	Reduce urbanization and fertility	<i>Plan of Economic and Social Development, 1970-73</i>	Reduce population stress on educational system ; reduce future unemployment ; promote economic growth	Anti-natalist
Dominican Republic	4	49	15	3.4	Reduce CBR to 28 by 1977	Nortman, <i>Population Studies</i> , 1972		Anti-natalist
Jamaica	2	34 <sup>(a)</sup>	8 <sup>(a)</sup>	2.7 <sup>(a)</sup>	Increase family planning ; Seek new migration outlets	1963-68 <i>Development Plan</i>	Reduce high dependency ratio ; relieve urbanization	Anti-natalist
Puerto Rico	3	25 <sup>(a)</sup>	6 <sup>(a)</sup>	2.0 <sup>(a)</sup>	Reduce maternal and infant mortality rate ; Retain the greatest number of families possible in the rural areas ; make provisions for helping parents with programs of family planning	<i>Four Year Economic and Social Development Plan of Puerto Rico, 1969-1972</i>	Improve housing, maternal and child health, maintain a balance between rural and urban areas in terms of available resources	
Trinidad & Tobago	0.95	23 <sup>(a)</sup>	7 <sup>(a)</sup>	1.7 <sup>(a)</sup>	Reduce CBR to 20 by 1977	<i>National Family Planning Program (1968-1972) (quoted in Nortman, op. cit.)</i>	Reduce unemployment, housing shortage	Anti-natalist

Footnotes : (a) 1970 ; (b) 1969 ; (c) 1968 ; (d) 1967 ; (e) 1971.

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## II – THE DEMOGRAPHIC EVALUATION OF POPULATION GROWTH TARGETS

### a) The Structural and Time Consistency Principles

7. When a population growth target is defined on the basis either of broad (technical, economic, educational, etc.) calculations and considerations, or on a purely intuitive basis, or on a mixture of rational considerations and emotional convictions, it can and should be evaluated in order to establish the feasibility and the likelihood of its being achieved. One way to do this is to illustrate what would have to happen in the period between the present time and the time when specified targets should be achieved. It is then a matter of judgement (i.e., a combination of speculation, informed opinion, scientific analysis, etc.) by governments, scientists, and others whether the trends which would have to take place in order to fulfill a certain goal can be achieved, or whether the chances for such trends being realized are outside the limits of reality.

8. Any population growth target defines certain desired features of the demographic situation of a population at a specified future point in time. These features imply other features of the population at that time (in short, let us refer to these relationships as “the structural consistency principle”) which are not necessarily defined, discussed, or possibly not even recognized. Moreover, to reach a defined target, Y years hence, trends of the various demographic processes have to develop from “now” to “then”. Under “normal” conditions, i.e., assuming no major catastrophes, there are certain (admittedly fuzzy) limits within which such trends can realistically occur, because the current demographic, behavioral, social and other features of the population concerned co-determine possible future trends, and because trends of most aspects of societal life have a certain (possibly irregular) continuity. The fact that a future demographic feature goal has to be reasonably consistent with the current situation, can be referred to as “the time consistency principle”.

It is the role of the demographer to evaluate whether the defined population target is consistent with the current features of the demographic situation of the population and with trends that can conceivably occur between “now” and “then”. Also to be evaluated is whether the target is consistent with the values that other demographic features of the population are likely to attain at the time when the target will presumably be achieved.

To summarize, the purpose of the exercise is to evaluate the demographic feasibility of the population growth target by analyzing the structural and time consistency principles from a demographic viewpoint. Others, i.e., non-demographers, can and should evaluate the political, economic, religious, and sociological feasibility of population growth targets and the trends and interrelationships implied by them.

9. Once targets have been defined, one of their important purposes is to generate social action that would presumably expedite their achievement. One could consider as a basic prerequisite in setting out to achieve a target, keeping that target within the “reasonable limits”. It is occasionally argued that it is desirable to overstate the goal in order to stimulate more action and enthusiasm. Such an exaggeration on knowledgeable grounds seems justified. However, “unrealistic” population growth targets were probably often defined as a result of employing inadequate procedures. Since a grossly unrealistic goal is not likely to be achieved, it is a potential source of disappointment and public embarrassment and serves to discredit any programs connected with the achievement of the population growth target.

10. Let us now briefly discuss the proposed classification of Table 1 from the point of view of demographic feasibility, i.e., bearing in mind the need to adhere to the structural and time consistency principles.

A. *Quantification.* A somewhat different approach and method will be applied to adequately quantified as opposed to qualitatively defined population growth targets. The structural and time consistency principles can be tested and analyzed with the help of methods of formal demography when a clearly quantified population growth target is used. On the other hand, it might be possible to employ formal demographic methods (to test the structural and time consistency principles) even when evaluating vaguely quantified targets, by translating these vague targets into more concrete terms (for instance, small family = 2 or 3 children born per woman) at least for illustrative purposes. Possible “non-demographic” procedures of evaluating population growth targets might be appropriate and might be used more frequently when an unquantified population growth target is concerned.

B. *Subject of Definition.* The structural consistency and time consistency principles should be investigated carefully. For example, a desired trend of the rate of population growth of a particular population might imply behavioral changes at the individual level that might not necessarily be evident at first sight.

C. *Statistical Measures.* Adherence to the structural and time consistency principles is essential. Every population is a complex regenerating organism of interacting individuals constrained by societal and biological “laws”. Demographic phenomena and processes as expressed by statistical measures can be complex matters to

handle. For instance, conceivably a crude birth rate can change over time, although the total fertility rate will remain constant over the same period of time (*ceteris paribus*, the crude birth rate can increase/decrease/solely as a result of an increase/decrease/of the proportion of the childbearing population).

D. *Time Dimension*. Since "the future" is implied by definition in the concept of a population growth target, the most suitable techniques to employ are population projections. From the vantage point of adequate testing and analyzing of the structural and time consistency principles, it seems appropriate to use reasonably detailed component projections as opposed to "simple" projections (such as the extrapolation of the total population by a mathematical equation using an assumed rate of natural increase). The technical construct of the component projection should be designed in such a way as to adequately reflect the basic relation of the demographic measures in the initial stage, as well as to illustrate trends of these measures over time and their mutual dependency.

The nature and number of the components of the projections is flexible. It goes without saying that there is a positive relation between the number of components and the complexity of the construct of model.

By help of such projections, one can illustrate the type of short-term trends that would have to be realized in order to achieve specific long-term targets.

E. *Subject Formulating Target*. The thoroughness, soundness of, and care devoted to the evaluation of a population growth target will, among many other things, depend upon the institutional auspices of the target. Such auspices also affect the importance attached to the target, and thus to population policy and to measures of its implementation.

## 2) Demographic Procedures of Target Evaluating and Target Setting Using Iranian Data as an Illustration

11. This section of the paper describes procedures that can be employed in the demographic evaluation of a defined population growth target. These procedures can and should also be an integral part of target-setting activities. The structural and time consistency principles intrinsically underlie the procedures discussed. In order to avoid the pitfalls of a too abstract discussion, it seemed useful to provide a concrete example (Iran) that would illustrate at least the more important points.

A serious circumstance in the process of defining a population growth target in Iran was the realization of certain existing resource limitations in that country. His Imperial Majesty, the Shahanshah has said, "In our country special attention should be paid to the fact that we are facing a serious limitation, namely a water shortage. Our limited water resources can support only a given number of people ; this fact obliges us to carefully plan our future population (1). Many other circumstances (ill health, illiteracy, poverty, etc.) evidently played a role in defining the population growth target set in 1970 which sought a reduction in the rate of population growth to 1.0 % p.a. within 20 years. The population growth rate at that time was believed to be in the order of 3.0 % p.a. Even at first sight, it is obvious that the defined goal implies profound societal and behavioral changes.

Given these parameters, one possible way (2) for demographers to proceed is to attempt the following :

A. Assemble the best available data on past demographic trends and on the current demographic profile of the population concerned ;

B. Compute component projections on the basis of presumably feasible trends in fertility and mortality and compare the results of these projections with the defined goal ;

C. Compute projections that would lead to the desired goal and evaluate the trends of demographic measures which would have to be realized in order to attain that goal.

### A. *The Collection of Available Data on Past Demographic Trends and the Current Demographic Profile*

12. Data on past trends and especially on the current demographic profile will be internally consistent if drawn from a reliable, comprehensive and experienced statistical network. Almost all less developed countries, as is the case of Iran, do not yet possess such a statistical infra-structure. Therefore it is a cumbersome and difficult task to assemble the needed demographic data. Often one has to resort to a variety of estimation techniques to obtain even approximate values for key variables. In working with data of such quality, special attention must be devoted to checking the consistency between variables. A good way to do this is by computing a retrospective projection. Many inconsistencies may thus be revealed. One must remember, however, that consistency does not necessarily establish validity, since two errors may cancel each other out.

13. The assembled data will serve as the basis for further analysis with the help of component projections. The particular data requirements will depend on the specific type of projections employed. It is often sufficient to use single sex (female) projections ; an important body of information can be generated and

derived from these, including a rough estimate of the total population. In countries with pronounced sex selective migration or mortality, single sex projections might prove to be insufficient.

There probably is a "minimum" set of data that must be assembled in order to utilize component projections effectively :

- i. The age structure of the (female) population (preferably by five-year age groups) ;
- ii. Information on mortality-age-specific survival rates for comparable age groups of item (i) (i.e., a life table) or sufficient information to enable selection of the relevant model life table ;
- iii. Age-specific fertility rates which also enable the computation of the gross reproduction rate, the total fertility rate, and (together with information ii) the net reproduction rate.

Tables IV-V present the above data for 1965 (i) and average data for the 1965-70 period (ii and iii) and provide an example of a five-year (1965-70) projection. The projection is actually a mini-retrospective projection, since one can (subject to constraints of inadequate statistical information) compare its results with real developments.

TABLE IV - PROJECTION OF FEMALE POPULATION, IRAN, 1965-70

Age Group	$F_{x-1}(a-1)$ (1) Female Population 1965 (in 1000s)	$P_x(a-1)$ (2) Female survival rate 1965 - 70	$F_x(a)$ (3) = (1) . (2) Female population 1970 (in 1000s)
0 - 4	2 129	.95 210	2 491 <sup>(1)</sup>
5 - 9	1 979	.98 314	2 027
10 - 14	1 424	.98 237	1 945
15 - 19	1 069	.97 639	1 398
20 - 24	889	.97 156	1 043
25 - 29	848	.96 780	863
30 - 34	805	.96 377	820
35 - 39	654	.95 930	775
40 - 44	583	.95 324	627
45 - 49	364	.94 111	555
50 - 54	370	.92 122	342
55 - 59	204	.88 883	340
60 - 64	326	.83 968	181
65 - 69	157		273
70 +	296	.62 065	281
Total	12097	X	13 969
Female ( $e_0^0$ )	X	52.0	X

(1) Computed in Table V.

TABLE V. - COMPUTATION OF THE AGE GROUP 0-4 IN 1970, IRAN

Age Group	(1) $F_x(a)$ 1965-70 Average Number of Females (in 1000s)	(2) $m_{65-70}(a)$ Rate of Daughters per Female	(3) = (1) • (2) $F_x(a) • m_{65-70}(a)$ 1965-70 Average Number of Female Births (in 1000s)
15-19	1 233	.0594	73
20-24	966	.1386	133
25-29	855	.1848	158
30-34	812	.1452	118
35-39	714	.0924	66
40-44	605	.0330	19
45-49	459	.0066	3
Total :	5 649	X	572

$F_x(0-4) = [5 \Sigma F_x(a) • m_{65-70}(a)] • P_x(a_0) = 5.572 - 0.87027 = 2491$  (transfer to Table IV)

*B. The Computation of Component Projections with Presumably Feasible Trends of the Components (Fertility, Mortality) and a Comparison of the Results of these Projections with the Defined Goal*

14. The assumed trends of the basic components can be assessed in different ways, ranging from simple, intuitive considerations about their future paths to complex discussions and analyses of sub-components influencing the future paths of the components. For instance, the trend of fertility decline for the total population could be a result of fertility declining at different rates within different strata of the population – the decline could be much faster among the urban than the rural population. A fertility decline could also be the result of changing marital patterns, i.e., later first marriages than is currently commonplace, and thus larger proportions of single persons at comparable ages. Marital fertility could decline both as a result of desired smaller family sizes as well as different timing patterns – larger intervals between marriage and first birth, and between subsequent births (3). Such behavioral changes would probably not be realized without profound changes of life style, including profound changes in the use of contraceptive techniques. These, and other sub-components, can be scrutinized, and their possible impact can be evaluated and taken into account.

Also, it is often useful to apply trends of the components that seem, for some reason, unrealistic. The result of projections made under unrealistic assumptions illustrates developments that are not likely to occur, but which can be compared with the outcome of more realistic projections, thus providing a better idea of the limits of realistic alternatives.

15. In our example (i.e., Iran), the following assumptions were applied :

a) Mortality, as expressed by the female expectation of life at birth ( $e_0^f$ ), was estimated at 52 years in the 1965-70 period. In view of the known economic and social progress Iran has made in recent years and in view of signs of mortality decline, one could realistically assume a further decline of mortality. Several different types of hypothetical trends of mortality decline could be constructed, but we have used only one such trend which seems reasonable (likely deviations from this trend would not make a great difference to our conclusions). According to our assumptions, the female  $e_0^f$  will continue to rise, and will reach the value of 63.5 years in the early 1990s.

b) Fertility as expressed by the total fertility rate would presumably decline rapidly (by historical comparison). We have selected two alternative paths for this decline : one seems more realistic (replacement level fertility reached by 2000) and the other with an even faster fertility decline (replacement level fertility attained by 1980).

Assuming that the age pattern of fertility would not change over time (which could be a further useful refinement in the calculations) and applying the trends as described in (a) and (b), selected results of the projections are given in Table VI. Since the formulation of the population growth target was to achieve a 1.0,% growth rate in 20 years, we naturally turn attention mainly to the resulting trends of the crude rate of natural increase. In the "realistic" projection, where presumably replacement level fertility would be reached by 2000, the rate of natural increase in the 1990-95 period would be more than double the proclaimed goal – 2.1 % p.a. In the "very optimistic" projection in which replacement level fertility would be reached by the 1980s, the rate of natural increase in the early 1990s would be closer to the goal, but still 30-40 % above the desired level.

TABLE VI – PROJECTIONS OF SELECTED DEMOGRAPHIC MEASURES, IRAN 1965-2005  
(ASSUMING REPLACEMENT LEVEL FERTILITY IS ACHIEVED IN 2000-05 AND 1980-85)

Period	Replacement level fertility reached in 2000-05				Replacement level fertility reached in 1980-85			
	Total Fertility Rate	Female Crude Birth Rate	Female Crude Death Rate	Female Crude Rate of Natural Increase	Total Fertility Rate	Female Crude Birth Rate	Female Crude Death Rate	Female Crude Rate of Natural Increase
1965-70	6.8	44	15	2.9	6.8	44	15	2.9
1970-75	6.1	40	13	2.7	5.3	35	12	2.3
1975-80	5.5	38	11	2.7	3.9	28	10	1.8
1980-85	4.8	35	9	2.6	2.5	20	9	1.1
1985-90	4.2	32	8	2.4	2.4	21	8	1.3
1990-95	3.5	28	7	2.1	2.3	22	8	1.4
1995-2000	2.9	24	7	1.7	2.3	21	8	1.3
2000-2005	2.3	19	7	1.2	2.3	19	8	1.1

Neither the realistic nor the unrealistic projection led to a population growth rate of 1.0 % p.a. in the early 1990s. Therefore, the target itself is probably unrealistic.

*C. The Computation of Projections Leading to the Desired Goal (in our Case, a 1.0 % Population Growth Rate in the Early 1990s) and an Evaluation of the Trends of Demographic Measures Necessary to Attain the Desired Goal*

16. For this particular exercise, the usual projecting procedure, i.e., defining the assumptions as well as the computation machinery, require modification. In the previous section, with a given initial age structure of the (female) population and defined age patterns of fertility and mortality, future trends of mortality and fertility (as expressed, for instance, by the total fertility rate) are the independent variables. The rate of natural increase is among the dependent variables. In the present section, the rate of natural increase becomes an independent variable, whereas the fertility trend is an outcome of the projection. In other words, the present procedure defines a certain desired trend of the rate of natural increase, and the projection computed on the basis of this desired trend (with the given initial age structure, defined age pattern of fertility and mortality, and defined mortality trend) will show the fertility trend required to achieve the target.

In our example, we have assumed that the rate of natural increase will decline from its late 1960s level of 2.9 % p.a. to the desired 1.0 % p.a. level in the early 1990s linearly. The relevant results are shown in Table VII. In order to reach such a rate of natural increase in Iran in the early 1990s, fertility would have to be even below replacement level fertility at that time. The total fertility rate would have to fall by about 5 children (from 6.8 in the late 1960s, to less than 2 in the early 1990s), thereby implying major behavioral and societal changes. Between the early 1970s and the early 1990s, fertility would have to decline at a rate faster than the rate of fertility decline experienced in Finland, Japan or Taiwan in recent decades (See table VIII).

TABLE VII – PROJECTION OF SELECTED DEMOGRAPHIC MEASURES, IRAN, 1965-1995  
(ASSUMING A 1 % RATE OF NATURAL INCREASE BY 1990)

Period	Total Fertility Rate	Female Crude Birth Rate	Female Crude Death Rate	Female Crude Rate of Natural Increase
1965-70	6.8	44	15	2.9
1970-75	5.8	38	13	2.5
1975-80	4.6	32	10	2.2
1980-85	3.5	27	9	1.8
1985-90	2.6	22	8	1.4
1990-95	1.9	17	7	1.0

TABLE VIII – TOTAL FERTILITY RATES' ACTUAL 1945-1969 : TAIWAN, JAPAN, FINLAND.  
PROJECTION (ASSUMING 1 % NATURAL INCREASE IN 1990-95) : IRAN 1965-1995

Year	Taiwan	Japan	Finland	Year	Iran
1945			3.0		
1946			3.4		
1947		4.5	3.5	1965-70	6.8
1948		4.4	3.5		
1949	5.9	4.3	3.3		
1950	6.0	3.6	3.1		
1951	7.0	3.3	3.0		
1952	6.6	3.0	3.1	1970-75	5.8
1953	6.5	2.7	3.0		
1954	6.4	2.5	2.9		
1955	6.5	2.4	2.9		
1956	6.5	2.2	2.9		
1957	6.0	2.0	2.9	1975-80	4.6
1958	6.1	2.1	2.7		
1959	6.0	2.0	2.8		
1960	5.8	2.0	2.7		
1961	5.6	2.0	2.7		
1962	5.5	2.0	2.6	1980-85	3.5
1963	5.4	2.0	2.6		
1964	5.1	1.9	2.5		
1965	4.8	2.1	2.4		
1966	4.8	1.6	2.3		
1967	4.2	2.2	2.2	1985-90	2.6
1968	4.3		2.1		
1969	4.1		1.9	1990-95	1.9



## CONCLUSION

17. The above steps (A), (B), (C), represent a possible approach to the demographic evaluation of population growth targets. Such an analysis can be combined with an evaluation of the economic, political, sociological, educational, religious, etc., aspects of achieving any proclaimed goal. The demographic (and other) evaluation of population growth targets is merely a possible preparatory stage in developing social action meant to be instrumental in achieving population growth targets.

It is advisable to follow a procedure similar to the one outlined above in order to reveal the nature of the demographic trends that have to be generated to realize a specified population growth target. Although demographers view the predictive power of population projections with justified skepticism, projections can be very useful in the context of evaluating the paths that would have to be taken in order to reach a specified target. Properly designed projections reflect not only the population growth consequences of the assumed possible future mortality and fertility trends, but they will also reflect the impact of demographic trends of past decades which is present in the current age structure of a population (4).

## FOOTNOTES

(1) United Nations, *Population and Family Planning in Iran*, p. 5.

(2) The subject has also been treated directly or indirectly in Bourgeois-Pichat, J., Si-Ahmed Taleb, "Un taux d'accroissement nul pour les pays en voie de développement en l'an 2000. Rêve ou réalité ?" *Population*, Sept.-Oct. 1970, pp. 957-974 ; United Nations, *Population and Family Planning in Iran*, pp. 26-37 ; and Frejka, Tomas, *The Future of Population Growth : Alternative Paths to Equilibrium*, Wiley & Sons, New York, 1973.

(3) R. Lesthaeghe, "Nuptiality and Population Growth", *Population Studies*, November 1971, pp. 415-432.

(4) Cf. Ansley J. Coale, *The Growth and Structure of Human Populations : A Mathematical Investigation*. Princeton University Press, 1972.

# TARGETS OF POPULATION GROWTH AND THE TIMING PROBLEM

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## 1) Introduction

1. Some years ago, I did some research on the question of optimal population growth (1). I constructed a very simple model which allowed the calculation of a what one may call optimal growth rate of population with regard to the resulting age distribution and its economic strength. Although it was a very simple model, the results seemed rather reasonable. They showed that a population with a low death rate, and therefore with a high life expectation at birth should have a growth rate near zero to achieve the economically best age structure. It could also be shown that populations with very high death rate would be economically better off with a declining number of population, say with a negative growth rate. The optimal birth rate for populations with high life expectation turned out to be between 14 ‰ and 15 ‰ and those for populations with low life expectation were only slightly higher, but did not reach 17 ‰.

2. Comparing these results with actual birth rates and growth rates, I found a simple interpretation: The situation in developing countries with low life expectation differs enormously from that described by the results of my calculation. This is partly due to the fact that the demographic situation in developing countries is far from being optimal according to my interpretation, and partly due to the fact that the assumptions I used in the simple form of the model are very poor if applied to developing countries. For instance, this simple model does not take into account the possibility that the younger generations may have higher productivity than the older ones.

On the other hand, when high-developed countries with high life expectation were considered, it was found (in 1966) that the actual situation was not very different from my calculations. In fact, with respect to these countries, the assumptions of the model are not so far from reality.

Meanwhile, the situation in many high developed countries has changed, more or less rapidly. If I take the country of my residence, Western Germany: A rapid decline of the birth rate during the last years has caused a considerable difference between the optimal birth rate as described by the model and the real birth rate, which is merely about 11 ‰.

3. If one considers these discrepancies, the timing problem arises immediately. It proves that the growth rate, which is optimal "in the long range", must not be optimal in the moment, and that the growth rate which is optimal in the moment, is by no means optimal "in the long range". Only the target "optimal age distribution in the long range" is covered by the model I used, but people, if they have the means to do so, obviously try to optimize their personal situation in the present and in the near future, and this may lead to a growth rate which is not only very far from the long-range-optimum, but also from the optimum for a period thirty or forty years ahead from now.

## 2) The Description of a Simple Model

4. The idea of the optimization was to compare man as a producing unit with man as a consuming unit, and to consider the role of the different ages in both respect. If there is any possibility to estimate the productive force of men and women of different age groups, one may calculate the total productive potential of a given population. If there is a procedure to compare the needs of men and women in different age groups, it is possible to calculate what may be called the total "demanding potential" of the given population. The ratio between these two totals is a measure for the impact of age structure on the ability of a certain population to achieve a high level of living. We may call it "Ratio of productive and demanding potential" (ROPAD). Obviously ROPAD is a measure which depends not merely on the age structure, but also on social circumstances as determined by the historic situation. The patterns of weights used in the nominator and in the denominator depend on the social structure and may be different in different societies even at the same time. Generally, it may be easier to find the weights to be used in calculating the productive force than that necessary for the calculation of the demand potential.

5. There are numerous questions concerning the latter : Observing old people in a certain population spending much less money than younger people, may we conclude that the needs of old people are smaller than that of younger people – or is the social situation of old people the only reason of their frugality ? It further may be that in a prospering society these weights must be very different from those in a poor society. To overcome the difficulties in obtaining information about these weights I made a very simple assumption in accordance with the Population Division of the United Nations : To let this weight be 1.0 for all persons between 15 and 75 years of age, and let it be 0.7 for all younger than 15 and older than 75 years (2).

6. The weights for calculating the productive force were based on the rates of employment by age and sex as reported by statistical offices. For the actual calculation I used the rates for Western Germany in 1963, but reduced the actual rate for persons of more than 65 years assuming that most of these persons reported as employed, do not have a full-time-job (3). In Figure 1 the weights used in the calculation are shown.

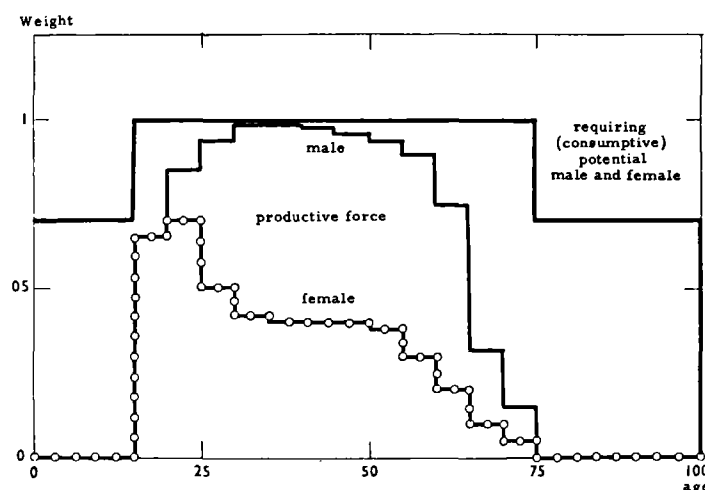


Fig. 1 – The weights used in the computation of ROPAD.

7. If in calculating the “productive force”, the rate of employment as given by the statistical offices is used, housewives are generally not included in the labour force. There would be many reasons to adjust the figures in order to count housewives among the labour force, but I did not do so. Therefore the “productive force” of an actual population is almost equal to the labour force, and the ratio ROPAD proves almost identical with the gross rate of employment, only slightly adjusted by assuming that the per capita consumption of children and old aged people is smaller than of the other parts of population. Besides, hardly any difficulties exist in finding ROPAD for actual populations and in comparing these populations with regard to this measure.

8. In addition it may be possible to compare fictitious populations and projections of age distributions with regard to ROPAD. The practical relevance of these calculations depends, of course, on whether it may be assumed that the weights used remain constant. Nevertheless, I used a model with constant weights in order to estimate the variation of ROPAD due to changing age structure alone. A certain pattern of reproductive behaviour, i.e. a certain set of age specific reproduction rates, together with a life-table provides data concerning the age structure of the population at a future period. By calculating ROPAD one may estimate whether a certain reproductive behaviour, given the life table, leads to a better ratio between productive forces and demanding potential – indicated by a higher value of ROPAD – or not. As this calculation can be prepared for different future periods, one may provide data for time series of values of ROPAD. In some cases, this time-series will be very smooth, in other cases it may oscillate. Yet it is well known, that under the assumption of constant natality and constant mortality the actual age composition at the beginning of the first period is gradually replaced by the age structure of a stable population which develops after some time. Therefore, if one is interested in the long range influence of a certain reproductive behaviour, one uses stable populations and concentrates on studying the influence of a certain annual growth rate on ROPAD, and so I did in my study of 1966.

9. For this purpose I used the model life tables published by the United Nations Population Division (4), and selected 12 of the 40 life tables to find which growth rate would generate the best value of ROPAD for each of these tables. Some results are shown in figure 2, where the optimal growth rate is plotted against life expectation at birth. One can see that the optimal growth rate is slightly above zero for stable populations with high life expectation, while in cases of low life expectation the optimum growth rate is negative. Therefore, a shrinking of the population seems to be desirable to get the best value of ROPAD in the resulting

age structure of the stable population. Figure 3 shows what this observation means with respect to the optimum birth rate fitting to each life table : In cases of high life expectation values between 14 ‰ and 15 ‰ would be optimal, while in the cases of low life expectation the birth rate may become higher, but not higher than 16 ‰ as long as life expectation is not below 20 years.

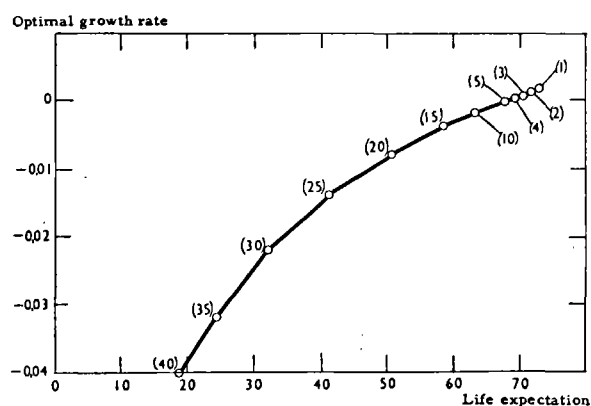


Fig. 2. — The optimal growth rate (with respect to ROPAD) plotted against life expectation at birth for stable populations derived from 12 model life tables.

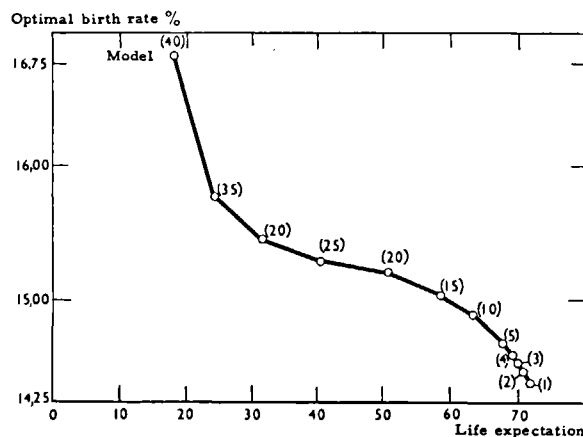


Fig. 3. — The optimal birth rate (with respect to ROPAD) plotted against life expectation at birth for the stable populations derived from life tables.

10. It is an issue of great interest whether the optimal value of ROPAD is higher in case of a “good” life table with high expectation than in the case of a “bad” life table with low life expectation. It may be assumed that countries with a bad life table must be better off concerning the value of ROPAD, as the “burden of the old aged” is much lower in their case. Figure 4 provides evidence that this guess is right. The optimal values of ROPAD, which are below 0.49 in cases of high life expectation, are between 0.50 and 0.55 for those life tables which have low life expectation.

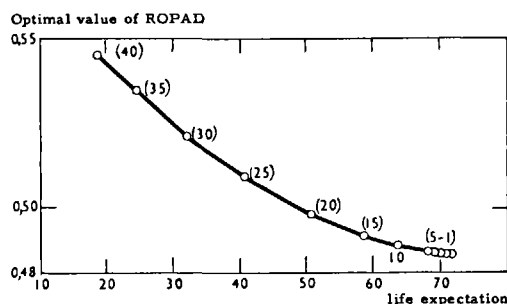


Fig. 4. — The optimal value of ROPAD plotted against life expectation at birth for stable populations derived from 12 model life tables.

11. Finally, I considered the sensitivity of the optima. Some of the results are shown in figure 5. It is easily to be seen that a deviation from the optimal growth rate in both directions does not change the value of ROPAD remarkably if the deviation does not exceed 3 ‰. Larger deviations lead to much lower values of ROPAD ; for some actual combinations of life table and growth rate at least the stable population must show values of ROPAD below 0.45.

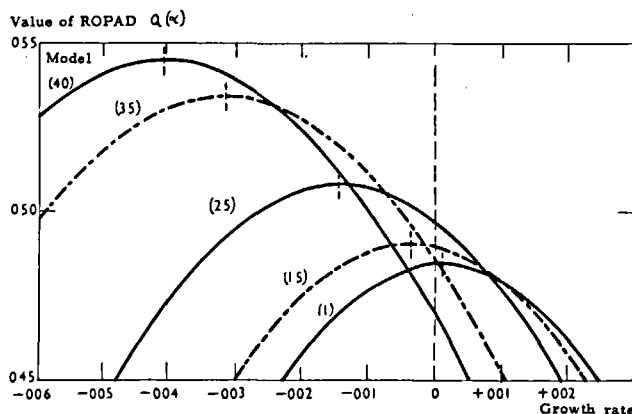


Fig. 5. — The values of ROPAD against annual growth rate for stable populations derived from 5 model life tables.

The most remarkable finding from these calculations seemed to be : In those high-developed countries with life expectation at birth near 70 years, a growth rate near zero should be the best, a case where the stable population comes quite near to a stationary population. Growing or shrinking of the population tends to worsen the economic situation as measured by ROPAD remarkably at least in the long run, if it exceeds 0,3 % per year.

### 3) Shortcomings of the Model

12. Of course, there can't exist a model which describes all aspects of reality. Especially in demography it is impossible to take into account all variables that may be of importance in describing a certain situation. But if one tries to qualify the models by the number of the possibly important variables they pay regard to, the model described in section 2 must certainly be classified as poor.

Among the variables which are omitted, the most popular is surely that of population number. Obviously it contains two aspects. The first one is that of population size as compared with what one calls the carrying capacity of the region to which it belongs. In Nazi-Germany it was very popular to talk about the overpopulation of the country. At present this is popular all over the world in connection with projections according to which the world population will increase far beyond the earth's capacity to feed people. Though I don't want to deny the possible importance of that criterion in any future I do not think that it deserves as much attention for the time being as is given to it. Certainly, there are many regions which are overcrowded considering their technical and economical resources. But if in these regions something like a stationary population could be achieved, it would without doubt be possible to promote an economic development which generates a balance of population size and carrying capacity within some 20 or 30 years.

13. The main problems concerning population number seem to be connected with its growing or shrinking. We observe now the world-wide problem of rapidly growing population in developing countries, and it seems to me that it is not the size, but the growth of the population which makes things so difficult there. The model of section 2 takes into account only the age distribution connected with a certain birth rate, but not the problems connected with the phenomena of growing or shrinking populations. The former are well known : The steady need of investment for new capacities in education, occupation and supply. It seems quite obvious, that by taking into account these needs one would find an optimal growth rate of zero instead of those positive growth rates resulting from certain life tables in section 2.

14. The problems of shrinking populations are less well known and much more difficult to understand : Considering the economic consequences the main problem is the devaluation of investment. But as long as the trend of population growth is positive for the rest of the world, it seems rather unrealistic to expect a remarkable decline of population number in a certain country. In such a case an immigration flow is practically inevitable, and the problems of the "too low" birth rate are replaced by the problems of immigration. Taking this into account, it is obvious that the enormous decrease of population as resulting from the model in section 2 for developing countries with low life expectation has to be corrected considerably.

15. Two other aspects which are not taken into account in the model are of considerable importance. The one is the effect of technical, educational and scientific progress on the productivity of different cohorts. If this progress occurs in any living generation, the younger population has got better education than the older and is better adjusted to the requirements of today's economy. Therefore, one should take into consideration a certain difference in productivity between people of higher age and of lower age. This would not change the mathematics of the model in section 2, but lead to results which are very different from that in the foregoing section. Especially for developing countries it may be well justified to assume a gain in productivity up to 3 % from one birth year to the next. If this is true, the generation of sons, taken as 25 years younger in average than their fathers would have about twice the productivity of the fathers. In case of a growing productivity it is obvious that it is the difference between the growth rate of population and the growth rate of productivity that counts in the model of section 2. The results of the preceding chapter should be interpreted, in case of changes in productivity, as follows : Figures 2 and 5 show that in the case of a life table model No. 35 the relation of productive capacity and demanding potential is optimal if the difference between the growth rate of population and the growth rate of productivity in a stable population is near - 3,2 %. Under the assumption of 3 % increase in productivity from birth year to birth year, a growth rate near zero or an almost stationary population may be regarded as optimal. In higher developed countries the annual rate of productivity growth is without doubt much lower, but as long as there are changes in technology one may expect a small growth of productivity from one birth year to the next. Thus the resulting optimal growth rates of populations are somewhat higher than those shown in section 2, and it might quite well be, therefore, that for all contemporary life tables combined with the respective growth rate of productivity a population growth near zero tends to be optimal.

16. This finding makes it easier to deal with another objection against the model as used in the preceding chapter. Since a model which is based on optimization "in the long run" uses a historic life table (or a model which approximates this life table), the problem of declining mortality has to be taken into account. At present it does not seem as if this objection would be of great importance for many developed countries, where declining mortality – measured by the increase of life expectation at birth – was very small during the last ten years. But for developing countries one can expect a considerably declining mortality during the next decades. Somebody who wanted to base population policy on calculations like the models above would have to decide whether to use the life tables of today or any projection of future life tables. If this policy wants to take into regard, in addition, a productivity gain, it will be quite impossible to make a forecast in this field for some decades. Accordingly, one might choose the policy which uses the data of the moment, which means that one would have to expect the necessity of adjusting the policy in the case of changing mortality or changing productivity gains. It is very probable that the two effects have different directions, that the optimal growth rate resulting remains rather near zero, and the resulting optimal birth rate shows a slow decline.

#### 4) The Problem of Timing

17. The target of the model of section 2 is an optimization "in the long run". Mathematically spoken : The value that ROPAD approximates is made a maximum. This criterion is similar to any policy whose targets are in infinite far future. It is true that, if conditions remain unchanged and the age distribution is not too irregular, a very good approximation to stable population is achieved within some decades. But for practically all people living now this target is not of personal benefit, in the same way as any economic policy which sets a target far ahead, forces the contemporaries to sacrifice personal aims. People living now would be much better off by achieving a fertility pattern which secures a high value of ROPAD in the near future. The example of West-Germany described in section 1 shows a population whose fertility was 10 or 12 years ago too high if compared with the results of section 2, but is declining now to values of the birth rate near 10 ‰(\*), which surely is considerably lower than the birth rate that would achieve optimal ROPAD according to the model of section 2.

18. If one takes into account that the gain in productivity from birth year to birth year must be estimated at at least 5 ‰, and the fitting life table model is that with number 3, resulting in an optimal difference between growth rate of population and growth rate of productivity almost exactly zero, the deviation is striking. While the population number should have a very slight increase or remain constant, this is not a tendency which can be observed now ; the distance between the optimal birth rate and the actual birth rate is great enough to ensure a remarkable difference in ROPAD.

Natality is a result of individual behaviour, and any population policy can have only limited influence on it. Individual behaviour in an economically minded population is focussed on the near future. In a modern industrial society there are no economic reasons to favour a greater number of children per family, and psychological reasons for a greater number of children are very weak in the vast majority of families. In the traditional rural society a greater number of children was an important individual target for ensuring family tradition, for ensuring ones living after retirement, for getting good and cheap labour at the farm and for establishing new relationships. None of these reasons is valid in the modern industrial society. Therefore, people who understand to control their fertility, as in the example of West-Germany do so to such a high extent, that a sharp decline in population number and enormous irregularities in age distribution must result. It seems likely, that sooner or later other countries where the situation is similar to West-Germany, will reach the same low level of the birth rate Germany has now. This would be in accordance with individual economic targets at present, and with propaganda, so that people have good conscience achieving this state concerning family planning.

19. One might ask whether it would be possible to formulate a target of population policy which is nearer to the contemporaries. The targets of most politicians, especially if due to reelection, relate to a comparatively near future, even if they pretend to seek for optimal solutions which can last for ever. The same does the individual if he cares for his personal spending as long as he is in employment, and relies on an old-age-insurance after retirement. To be able to behave in concordance with his true personal interest, the individual must be told, that some 30 or 40 years later there must be enough younger people to work and pay for him, if he was to get a satisfactory pension.

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(\*) The actual birth rate in West-Germany, amounting to values above or near 18 ‰ from 1961 to 1964 has declined to 11,3 ‰ or 11,4 ‰ in 1972. There is a marked falling tendency from 1968 on which allows a projection for 1973, according to which the birth rate in that year would not exceed 10,4 ‰. The net reproduction rate for 1972 may be estimated as 0,81 which corresponds to an annual shrinking rate near 8 ‰ of the stable population. The resulting irregularities of the age distribution are striking : The number of children 9 years old in 1973 is 1 1/2 times the number of children one year old.

20. Now let us compare the individual fertility targets with those of a nation, and purely economic or political targets with demographic ones. A rather high value of ROPAD at a given moment can be achieved by a sharp reduction of fertility during the preceding 20 years, but inevitably this leads to a small value about 30 years after this moment. Consequently, it is not possible to choose any period and to be satisfied with a high value of ROPAD then, trusting that this "now established good situation" will last in future. Therefore, a population policy relating to age structure must take care for the future as a whole, not only for a certain moment.

If this policy considers the conditions of stable population as a central target, the resulting strategy will prove its value by the time, but it will not be popular with the contemporaries. In my view there are two ways to overcome this difficulty.

21. The first way is to take into consideration all values of ROPAD in future years, but to use an annual rate of devaluation which gives the near future a higher weight than the farther one. The case of considering only the stable population would be included for  $\rho = 1.0$ ,  $\rho$  being the factor of devaluation from one year to the next. The rate of devaluation in this case is zero. Now choosing a positive rate of devaluation, so that the factor is smaller than 1.0, a model evolves where the total of weights remains finite, so that the weight of the farther future, for instance 50 years onwards and later, is comparable with the weight of the near future. If one chooses  $\rho = 0.9$ , the annual devaluation rate being 10%, the total weight, one gives to the future 50 years onward and later, is not more than 0.5%, while the first year gets 18 times this weight, i.e. 9%. Of course, such a calculation would yield a very sharp decline of population as "optimal growth rate". The first twenty years ahead, when such a low fertility causes an increase of ROPAD, would get a weight of 87 1/2%, while the times when the disadvantages of this low fertility come into effect, could exert only a small influence on the weighted average. Even 5% as annual rate of devaluation is much too high. Times 50 years ahead and later would get about 7.7% of the weights, only one third of the weights for the first 5 years (22.6%). It seems that annual rates of devaluation between 1% and 2% are reasonable. The weight of the farther future is then between 36% and 61% and comes near to one half in the case of a devaluation rate of 1 1/2%.

22. As choosing this rate of devaluation is obviously pure policy making, one must acknowledge that there can't be something like an "optimal growth rate". Which growth rate one regards as "optimal" depends on the attention one gives the nearer and the farther future. It is obvious, too, that the disadvantages of "too high" fertility are seen immediately, the disadvantages of "too low" fertility are the problem of the farther future. Therefore, there must be a strong dependence of the resulting optimal growth rate and the chosen rate of devaluation: The higher the rate of devaluation the lower the optimal growth rate.

In searching for the optimal fertility due to the foregoing model one is not constrained to fertility patterns which remain constant over time. It might be, that according to the present age distribution a certain up and down in fertility proves optimal with respect to a chosen annual rate of devaluation. This is one of the reasons why such calculations are so tedious.

23. I want to describe another method of solving the timing problem, which restricts the choice of strategies in a certain way. One chooses a moment at least 50 years ahead and selects that type of constant fertility behaviour which renders the best value of ROPAD at this time. For a comparatively small period, for instance 5 years, a so selected fertility is regarded as optimal. At the end of this period the calculation is repeated using the new age distribution and a new fixed period in the same distance from the new point of observation as the first one from the old. This is a very heuristic strategy based on the following principle: Every generation chooses that pattern of fertility which renders the best economic situation 50 years later if fertility remains unchanged during this time. As the calculation is revised sometimes before the 50 years are over, it is very unlikely that exactly this optimum is reached in reality, but it is rather likely, that for "normal" age distributions at the beginning this strategy remains constant from period to period, except for variations in productivity gain. The idea is, that it is not necessary to consider now all possible patterns of fertility behaviour in future, because now it must be decided merely which behaviour within the next years is to be regarded as optimal, while this decision for later periods can be made later and with new data. This strategy, somehow similar to that of dynamic programming, has the advantage of much less computational work than the strategy described first and to show something like a programmed flexibility. Its disadvantages: There is no theory according to which it might be regarded optimal.

24. One may ask, why the time at which ROPAD should be optimal must be 50 years ahead. The answer is very remarkably: If it was earlier, the optimum fertility might be zero, at least if productivity gains are rather low. In fact, if one calculates ROPAD only for part of the population which is older than 45 years, omitting children, students and young working people, one might find better values than for the total population. Of course, the result "fertility zero through the next 50 years" would be quite senseless, and one may conclude, that the possibility of this result is an obvious shortcoming of the model. On the other hand, one should not

forget that better educational systems lead to lower rates of employment among persons of age under 25 years. If this is not compensated by a higher growth rate of productivity, the "burden of the youth" gains weight compared with the "burden of the old aged". Under these circumstances a feeling may rise that it takes too long, until the investments in young people pay. And at last all computations may lead to one conclusion: "The less children the better" – a stand-point which seems to have already been reached by some demographers.

## 5) Concluding Remarks

25. The timing problem was discussed in the foregoing chapter in connection with a type of a population growth target which is sensitive to a very high extent with respect to timing. There are other targets in population policy for which the timing problem is comparatively simple. If a certain growth rate is the target of population policy and it is lower than that one prevailing now, the answer to the timing problem is obvious "The earlier, the better". Things could be slightly different, if an increase in birth rate should be wanted, which would lead to a remarkably higher number of children. In this case it would be wise to take care for the necessary facilities before having the children born. Rather similar is the situation, if the target is a certain population number, especially a higher one. Neither increase in birth rate nor immigration in a considerable extent – mortality pattern taken as unchangeable – could or should be achieved immediately for obvious practical purposes. If one aims for a lower population number, of course one would not try to stop fertility completely until the wanted reduction of population number is reached. Yet in none of these cases difficulties of such a kind arise, which would call for theoretical interest.

26. But as targets concerning population structure will become of more and more interest, the special problem of age distribution must be seen as a central one. In the course of time the area where human fertility is under human control will become larger and larger. It is among the main tasks of population policy to enlarge this area and to secure that in this area birth control is used in a wise way. To be able to exert such influence the scientific study of population has to pay much more attention to all aspects of growing or shrinking populations, among which the influence on the age structure is one of the most important. Therefore I think that a lot of research is necessary on that and related topics in the next future.

## FOOTNOTES

(1) Kurt Weichselberger, *Optimale Bevölkerungsentwicklung vom Gesichtspunkt der wirtschaftlichen Leistungsfähigkeit (Versuch eines Modellansatzes)*, in Lucie Osadnik, *Bevölkerungsstatistik u. Arbeitskräfterechnung*, Ergebnisse des Ersten Internationalen Demographischen Symposiums, Leipzig, without date.

(2) United Nations, *The Aging of Populations and Its Economic and Social Implications*, *Population Studies*, No. 26, New York 1956, p. 61.

(3) Statistisches Jahrbuch für die BRD 1964, p. 147 and p. 152. Statistisches Bundesamt, *Bevölkerung und Kultur (Fachserie A), Erwerbstätigkeit (Reihe 6) I. Entwicklung der Erwerbstätigkeit (Ergebnisse des Mikrozensus April 1963)* p. 22.

(4) United Nations. "Age and Sex Pattern of Mortality", *Population Studies*, No. 22, New York, 1955.



# TARGETS FOR DEALING WITH THE POPULATION EXPLOSION, IMPLOSION AND DISPLOSION

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1. The adoption by less developed countries (LDCs) of national policies to dampen birth rates and thus reduce rates of population growth has been primarily motivated by efforts to raise levels of living. Some LDCs have adopted family planning policies ostensibly in the interest of maternal and child health but in such countries the demographic consequence of such programs will also inevitably be considered. The first group of LDCs include 24 of the 47 countries which have or support family planning programs. Of these some 15 have set targets for birth rates or natural increase to be achieved (1). The extent to which nations with targets have achieved them is shown by Dorothy L. Nortman to vary from 0 to 100 percent. Little significance can be attached to these figures, however, as Nortman is aware, because "the realism of the target is as important a factor for the fulfillment as the adequacy of the implementing mechanism" (2).

2. Since economic development is the primary motivation underlying the LDCs' efforts to control population growth it may well be asked whether control of fertility and growth are the only population factors which should be considered to facilitate and achieve a higher GNP and levels of living? This question necessitates the consideration of not only the "population explosion" but, also, "the population implosion" and the "population displosion" (3). The population implosion refers to the increasing concentration of population, that is, urbanization and metropolitanization. The population displosion refers to the increasing heterogeneity of population sharing not only the same geographic locale but, also increasingly, the same life space – social, economic and political activities. It is the contention of this essay that in the interest of economic and social development, often hard to distinguish, demographic targets should be set taking into consideration not only the consequences of the population explosion but, also, of the implosion and displosion. Discussion of the problems involved in setting such targets follows.

## Targets for the Population Explosion

3. Targets in respect of the population explosion relate to the birth rate to the population growth rate and to total population size.

The setting of targets for birth rates, and population growth rates has up to this point in time been more an exercise in wishful thinking and diplomacy than in realistic planning. Targets have ranged from so modest as to call for almost imperceptible change (e.g. Pakistan) (2) to so ambitious as to be virtually unattainable (Philippines – with a target of reducing the growth rate from 3.1 percent to 2.0 percent per annum in six years ! ). No nation has as yet set a total population target.

Family planning agencies have set both birth rate and natural increase rate targets. The former are presumably subject to modification by means of effective family planning programs ; the latter involve, of course, consideration of the course of the death rate as well as the birth rate and are, therefore, more hazardous since mortality, in general, is not subject to the impact of family planning. Elementary as this consideration is, the fact is that population growth targets have been set that could not possibly be met without a considerable increase in mortality (e.g. the Philippines).

4. Because it is more subject to the control of family planning agencies let us first consider the items that should be considered in the setting of birth rate targets if a realistic goal is to be adopted. Assuming that a multi-method family planning program is involved, the usual case, then the elements that affect the number of births that can be averted to bring the birth rate down include: the characteristics of the eligible population, especially by age; the contraceptive mix of the acceptor population ; and the contraceptive effectiveness of the contraceptive mix. The estimated number of births that can be averted as determined by the manipulation of

these elements can then be subtracted from the expected births as determined from age-specific birth rates prevailing before the family planning program is launched. A model for achieving such measurements has recently been developed by a colleague of mine at the Population Research Center at the University of Chicago, Dr. John E. Laing, serving as the head of the Family Planning Evaluation Office of the Population Institute at the University of the Philippines (4). The validity of the method depends, of course, on the validity of the data that are available. In most LDCs a combination of official statistics, sample surveys and competent analysis is necessary before the model can be employed. Among the figures which must be studied are the official statistics on "acceptors" which for various reasons, are subject to overstatement.

5. Using the Philippine data to illustrate the working of his model, Dr. Laing permits the following types of conclusions :

1. If the present and anticipated reported levels of acceptors, the mix of contraceptive practices, and contraceptive effectiveness continue and if the death rate remains constant, then the growth rate of the Philippine population between 1970 and 1976 would decline from 3.01 percent per annum to 2.29 percent per annum, a decline of 23.9 percent. This decline would result from a decrease of 7.2 points on the estimated crude birth rate, from 43.0 per thousand to about 35.8 per thousand.

2. If the death rate declines by 0.5 per thousand per year, a more realistic assumption, and the other assumptions stated above hold, the growth rate could decline from 3.01 percent to 2.59 percent by 1976 or by 14.0 percent.

3. If allowance is made for the inflation of acceptor statistics as indicated in the National Acceptor Survey, an inflation of at least 20 percent, then the estimated birth rate would decline to only 37.4 per thousand or by 13.0 percent. If the death rate remained constant, the growth rate would decline from 3.01 percent to 2.43 percent or by 19.3 percent. If the death rate decreased by 3 points during the six year period the growth rate would decline to only 2.73 percent, a decrease of only 9.3 percent, even though acceptors reached 40 percent of all eligible women.

Dr. Laing's model and the available data make it possible to indicate the number of acceptors that must be obtained if the target of a 2.0 percent growth rate in 1976 is to be attained.

4. *To achieve a 2.0 percent growth level the crude birth rate must drop to 30.2 per thousand (assuming a 3 point decline in the crude death rate).* This would mean a level of 1,298,600 births in 1976 with a total national population of 43,000,000, an achievement which would involve the aversion of 603,500 births in 1976. This would require about 1 million new acceptors each year for the next four years. If the death rate remains constant, about 785,000 acceptors would be required each year.

5. Under present levels of use-effectiveness, the number of acceptors required to reduce the growth rate by one-third by 1976 would be 4,250,000 (assuming a declining death rate). *This number is not too far from the total estimated number of eligible women in the 1976 population, about 5.7 million.* Hence, given present levels of contraceptive-use effectiveness and contraceptive mix, even if every married woman aged 15 to 49 years were to be an acceptor, the birth rate would be reduced to 23.1 per thousand. With a death rate of 13.1 per thousand, the growth rate would then be 1.0 percent per annum. Since it is highly unlikely that all women will join the family planning program and given the fact that the death rate will in all probability continue to decline, the growth rate with the present contraceptive mix and use-effectiveness would not be decreased by more than about one-half. To do more than this would require an increase in contraceptive use effectiveness. This would be accomplished in a number of ways including :

- a. an "enriched" mix of contraceptives — with greater proportions of the more effective methods such as sterilization.

- b. broadening the present clinic-oriented approach to include other elements, e.g. incentive programs, or a much more comprehensive approach to family planning (5).

The type of conclusions possible from the application of Dr. Laing's model as applied to the Philippines point to the way in which targets can be set on a realistic basis. The utilization of such a model can provide an antidote to both wishful thinking and diplomatic considerations and, make sound planning possible. Needless to say the utilization of the model in specific national situations will undoubtedly require research activity to obtain the necessary inputs on the part of competent personnel with both demographic and statistical skill.

6. Once a realistic birth rate target is accepted a realistic death rate trend must be estimated in order to set a growth rate target. Since mortality in the LDCs, although declining rapidly, is still relatively high, birth rates may be decreased even while growth rates increase by reason of the more rapid decline of death rates. It would be most unwise for a government in its zeal to encourage fertility reduction not to forewarn its people that even with a lowered birth rate the population growth rate could still rise. Without such a forewarning public zeal in behalf of reducing fertility could turn into public apathy when disillusionment follows upon continued increase in population growth.

The setting of a realistic target for population growth involves, then, the close articulation of family planning activities and public health and other functions which affect mortality. If it is not possible to obtain

reasonably reliable estimates of mortality trends the family planning agency is well advised to restrict itself to the setting of only fertility targets.

7. Fortunately, no LDC has yet attempted to set a total population target. "Fortunately" is an appropriate word in this context because there is no adequate way to determine such a target. In this connection the question of "optimum" population size inevitably arises. The quest for "optimum population" is like the quest in King Arthur's Court for the "Holy Grail". Although the problem of the optimum will be discussed elsewhere in this symposium it is in order to point out here that the optimum is always a function of the value criteria applied in its determination. Moreover, the question of what is optimum for a given country would not necessarily be consistent with what is optimum for the world and the time is already here to consider global as well as national population goals (6). Finally, it must be noted that it would be certainly unrealistic, even if a consensus were achieved, to set a total population goal, even if adduced to be optimum, below the size that a population has already attained.

A more realistic approach to the problem of total population size stems from recognition of the fact that in a finite world as well as a finite nation zero growth is inevitable (as an average over time). Once this proposition is understood and accepted then the more realistic question than optimum size is: "What alternative paths to zero growth are possible and which (or combination of paths) is feasible and desirable? A framework for answering this relevant question is given in the report on *Population and the American Future* (7). The criteria to be considered include the following:

"a minimum of fluctuations" from period to period in the number of births;

zero growth should be achieved at "a lower rather than a higher level";

"moderate changes" should be affected in patterns of marriage and childbearing;

"an average number of children of about two per couple should be the goal in the United States (in countries with higher death rates a higher average would produce zero growth).

The adoption of specific targets for achieving zero growth is, of course, relatively far down the road for the LDCs but it would be wise for population planners to bear such a goal in mind. That this is a longer run consideration is, of course, reinforced by the fact that a lag of some 65 to 70 years would be involved between the attainment of a replacement level of children and actual zero growth.

### Targets for the Population Implosion

8. The setting of targets relating to the population implosion involve a number of both economic and social considerations. Major among such considerations are:

- 1) regional balance in population distribution;
- 2) urban-rural balance in population distribution;
- 3) investment in human resources;
- 4) absorption of in-migrants to urban areas;
- 5) infrastructure development in urban areas;
- 6) problems of areas of out-migration.

Each of these items necessarily involves many sub-items all of which are very much relevant to social as well as economic development. Full consideration of these matters is, of course, beyond the scope of this paper but certain crucial problems can at least be touched upon. In brief, the setting of targets relating to the population implosion involves the development of a framework for avoiding or, at least mitigating, the more severe problems that constitute everywhere, in economically developed as well as the developing nations, the "urban crisis".

9. *Regional and Urban-Rural Balance.* The population explosion among other things generates imbalances between people and resources causing migratory flows to effect better balances. Migrations necessarily create disruptions both in areas of out- and in-migration which call for adjustments both economic and social. In the interest of orderly economic and social development planning requires attention to regional and urban-rural balance which can be effected by policy and program, national and regional. It is desirable, therefore, to set targets for such balance within the framework of broad plans for development. This is an area calling for accelerated research both to determine general principles and specific measures. The growing literature on regional, metropolitan and urban planning is creating at least a point of departure for additional research (8), for policy formulation and for the eventual setting of targets.

10. *Investment in Human Resources.* Urbanization with its concomitant "urbanism as a way of life" (9) requires new dimensions in the development of the human potential. More specifically, urbanism as a way of

life creates unprecedented needs for education and specialized skills to cope with the new world the urban agglomeration represents. What is involved, in essence, is improvement in the quality of a population – through increased investment in the development of the human being. It is necessary, therefore, to target the allocation of resources for this purpose, with sub-allocations for the various levels of formal schooling including vocational training and for other programs. A number of avenues are available for increased investment in human resources as outlined by Professor Theodore Schultz (10) each of which may be interpreted to be an area for the setting of targets.

**11. Absorption of In-Migrants.** Although the mass populations in the LDCs are subject to all the social and physical ills which accompany poverty, the most intense manifestations of social pathology are generally to be found among recent in-migrants to urban areas (11). The shantytown is usually the locus of the new in-migrant and the most festering and visible manifestation of human misery which often generates social unrest and may lead to political instability. As one element in economic and social planning it is desirable, therefore, to design policies and create targeted programs to minimize the frictions of readjustments of the in-migrant and to maximize his contribution to his area of destination. Proposals have been made for the establishment of in-migrant reception centers equipped to perform such a function, which, of course, must be synchronized with migratory flows and programs to effect regional and urban-rural balance.

**12. Urban Infrastructure Development.** The rapid urbanization underway in most LDCs is, unlike urbanization in the economically developed countries, proceeding without equivalent rapid economic and social development. A major problem is posed by the necessity to allocate scarce resources to predominantly “economic” or predominantly “social” investment. Most aspects of urban infrastructure undoubtedly have both economic and social implications often hard to separate. For example is investment in housing, transport, water supply, sewerage and schools economic or social? While some differentiations can be made for these various items there can be little quarrel with the proposition that both economic and social gains are involved in each. As one element in comprehensive planning, then, targets should be set for the development of urban-infrastructure, in general, and by category of item, articulated, of course, with other elements of the economic and social plans.

**13. Areas of Out-migration.** Areas subject to large out-migration often become unbalanced communities with economic and social problems that require attention in national and sub-national planning. Since migration is selective by age, sex, education and other characteristics, the non-migrants in areas of out-migration constitute abnormally structured populations often in deteriorating economic and social communities. Such areas should be studied to determine how their problems can best be resolved – a task that will also require the setting of goals or targets (13).

The population implosion may in many instances generate at least as many barriers, in the long run, and more stubborn obstacles, in the short run, to economic and social development as the population explosion. In consequence, it would be short-sighted, indeed, to set targets for dealing with aspects of explosive growth and ignore the problems arising from increased population concentration and its concomitants.

### Targets for the Population Displosion

**14.** Although many societies, at least as far back as antiquity, have had heterogeneous populations, rarely until relatively recently have diverse groupings shared a common life-space as well as a common locale. Population heterogeneity by culture, language, religion, value systems, ethnicity, race and life style has in the past been generally accompanied by rigid forms of social stratification, slavery, caste or some form of super-ordination and subordination paralleling the categories of diversity.

Since World War II the world has been swept by the “revolution of rising expectations”, a happy phrase struck by Harlan Cleveland when he was an Assistant Secretary of State in the U.S. (now President of the University of Hawaii) and widely popularized by the elder Adlai Stevenson. As a result this is the first generation of mankind in which there is virtually no minority group that does not insist on full equality of opportunity albeit in a pluralistic society.

**15.** The insistence on equality of opportunity by diverse population groupings in societies in which they have hitherto been subject to disadvantaged status has led to widespread communal conflict. Examples are to be found in both the economically advanced areas and the LDCs. Among the former are the bitter conflict between Roman Catholics and Protestants in Northern Ireland; between French Canadian separatists and English descendants in Canada; between blacks and whites in the Union of South Africa, Rhodesia, Great Britain and the United States of America. Among the latter are the tribal conflicts in Africa; the conflict between the Punjabi and Bengali in West and East Pakistan (now Bangladesh); and the conflict between Malays and Chinese in Malaysia. Communal conflicts, frictions of the population displosion, at least in the short run, may be as much a barrier to economic and social development as high fertility and growth rates.

Accordingly, in national and sub-national planning, policies should be formed and programs instituted, with definite targets to alleviate and possibly eliminate the conflicts which arise from differential status of diverse population groupings.

### Concluding observations

16. Man as the only complex culture building animal on the globe has generated four developments which are profoundly affecting his attitudes, values, behaviorisms and institutions. Three of these are population developments, the population explosion, implosion and dislosion. The fourth is the acceleration of technological change – the technoplosion. These developments may be considered as the elements of what the writer has termed “the social morphological revolution” (14).

Each of the population developments has consequences which constitute barriers to economic and social development. In efforts to induce development, nations, resorting to central planning, must formulate policies and programs to eliminate the impact of such barriers. In tackling this problem good administration is faced with the necessity of setting goals or targets to be attained against which progress may be measured. It has become generally recognized by LDC governments that targets must be set for fertility levels and population growth rates. It has yet to be grasped that targets must also be set for dealing with other aspects of population, namely the implosion and dislosion.

### FOOTNOTES

(1) Dorothy L. Nortman, “Status of National Family Planning Programmes of Developing Countries in Relation to Demographic Targets”, *Population Studies*, vol. 26, no. 1, March 1972, p. 8. To the writer’s knowledge this number should be at least 16 because the Philippines, listed as “unknown” in the above source, also has a specific growth target.

(2) *Ibid.*, p. 7.

(3) Philip M. Hauser, “The Chaotic Society – Product of the Social Morphological Revolution”, *Sociological Review*, vol. 34, no. 1, February 1969, pp. 1-19.

(4) John E. Laing, “Births Averted by a Multi-method Family Planning Program”, Population Institute (Manila: University of the Philippines, September 1972) (mimeographed – awaiting publication).

(5) E.g. Philip M. Hauser, “Population Policies Affecting Fertility – A Sociological Perspective on Family Planning Programs”, Paper prepared for 1973 General Conference, International Union for the Scientific Study of Population.

(6) E.g. See “Declaration of Population Strategy for Development”, Economic Commission for Asia and the Far East, Twenty-ninth Session, 11-23 April 1973, Tokyo, Japan, p. 3 paragraph 6 (mimeographed).

(7) Commission on Population Growth and the American Future, *Population and the American Future* (Washington : U.S. Government Printing Office, 1972), pp. 10-11.

(8) Especially relevant are the studies of the United Nations Research Institute for Social Development : Cumberland, John H., *Regional Development : Experiences and Prospects in the United States of America*, the Netherlands: Mouton & Co., 1971.

Kuklinski, A., R. Petrella (eds.), *Growth Poles and Regional Policies: A Seminar*, the Netherlands: Mouton & Co., 1972.

Kuklinski, Antoni (ed.), *Growth Poles and Growth Centres in Regional Planning*, the Netherlands: Mouton & Co., 1972.

Lefebvre, Louis and Mrinal Datta-Chaudhuri, *Regional Development: Experiences and Prospects in South and Southeast Asia*, the Netherlands: Mouton & Co., 1971.

Mihailovic, Kosta, *Regional Development: Experiences and Prospects in Eastern Europe*, the Netherlands: Mouton & Co., 1972.

(9) Louis Wirth, “Urbanism as a Way of Life”, in *Community Life and Social Policy* (Chicago: University of Chicago Press, 1956), pp. 110-132.

(10) Theodore Schultz, *Investment in Human Capital* (New York : The Free Press, 1971), pp. 14-47.

(11) E.g. Philip M. Hauser (ed.), *Urbanization in Asia and the Far East* (Calcutta : UNESCO, 1957), pp. 209 to 257, *Urbanization in Latin America* (Paris: UNESCO, 1961), pp. 170-248.

(12) Hauser, Philip M. (ed.), *Urbanization in Latin America*, Paris: United Nations Educational, Scientific and Cultural Organization, 1961, pp. 308 ff.

(13) *Ibid.*, pp. 304 ff.

(14) Philip M. Hauser, “The Chaotic Society: Product of the Social Morphological Revolution”, *loc. cit.*, p. 1-19.

# NON-ECONOMIC CRITERIA FOR ESTABLISHING POPULATION GROWTH TARGETS

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1. Any discussion of population growth targets implies the existence of individual and social goals, the attainment of which is thought to be affected by the number and characteristics of the population. A particular demographic condition is not a goal isolated from other social priorities, nor is it an end in itself. It is, rather, a means to the achievement of the conditions of life thought desirable. When we ask, "What is the best size or composition for a population?" what we are really asking is: "What are the demographic conditions most conducive to some desired state of affairs?". Population is but one of the many variables to be considered in achieving an optimum environment for living.

2. There are three problems to contend with in any consideration of population goals: problems of measurement, of adjustment to cultural difference and change, and, finally, of diversity of values. A further problem – that relating to the specific means of effecting these goals and to the likelihood of any success with these means – is excluded from the present discussion. The focus here is on what goals should be sought, not on how to go about seeking them (1).

3. Problems of measurement are of two types. One derives from the fact of the causal interdependence of social phenomena. Because population is only one of several variables that can affect conditions of life, whether demographic characteristics are causally related to any particular set of circumstances is ordinarily impossible to determine in any but rather general terms. The measurement of specific relationships has been attempted, but even the most sophisticated of these attempts have accomplished little in the way of a precise delineation of possible causal relationships between demographic attributes and such conditions as, for example, poverty, crime, disease, the provision of social services, entrepreneurial activity, levels of aspiration, economic conditions, or varieties of political behavior. Any assessment of the role of population must invariably be hedged round by all manner of assumptions about "others things being equal".

4. A further problem with measurement is the virtual impossibility of making any precise assessment of the *degree* of causal relationship with respect to demographic conditions. We may have a reasonably clear idea that country X would be better off with a smaller population, but we cannot know that it would be *8 per cent* better off with three million fewer inhabitants and but *4 per cent* better off with two million fewer, instead. Nor can we know which of country X's inhabitants would gain the most, and which the least – or which would, possibly, even experience a loss – in consequence of such a change in demographic conditions.

5. Determination of population goals is further impeded by the related facts of cultural change and cultural difference. At the time of Columbus what is now the territory of the United States supported hardly more than a million people and, because of the harsh conditions of life in many areas, may have seemed to some tribes to be overpopulated, even then. Yet, today, under remarkably different cultural conditions, it supports (with some assistance, to be sure, from other areas in the form of international trade) 200 times as many – and does so at a *material* level of living incomparably higher than that of the early aboriginal inhabitants.

6. Finally, there is the problem of values. Any definition of what is desirable or undesirable depends ultimately on one's values. To the problem of measuring the relationship between population and particular social conditions, and the difficulty of establishing absolutes in the face of cultural change and differences, must be added the diversity in human values about what ends are to be served by manipulating demographic factors.

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(\*) The views and opinions expressed in this paper are those of the author and do not necessarily reflect those of the United Nations.

7. Human values are, of course, the basis for any establishment of social goals. They are also the basis for the determination of acceptable means to the attainment of these goals — as the present controversies over abortion, and the failure even to consider infanticide, amply demonstrate. In considering the relation of human values to demographic goals, it is worth noting two things: first, the hierarchical arrangement of values; and second, the possibility of conflict between an individual and his society.

8. In any system of values — both those of society as a whole and those of its individual members — there will be a hierarchy of competing value preferences. This hierarchical arrangement is subject to change, of course, but it is an aspect of the situation that must be taken into consideration in any social planning, such as that having to do with population, the success of which depends on individual human behavior.

9. It must be further recognized that there is no *necessary* congruence between the values of individuals and what may be said to be the values of society. As Hardin has shown so effectively in his classic, “Tragedy of the Commons” (2), the satisfaction of certain individual goals may well jeopardize the wellbeing of the society itself and, in so doing, eventually the wellbeing, also, of the individuals who constitute the society, including even those whose pursuit — and temporary satisfaction — of individual goals put this whole process of jeopardization into notion. In part, this is a question of time perspective: a long-term social concerns versus short-term individual ones. But given the fact that the individual’s identity is essentially that defined by his society, and the further fact of the importance of general social wellbeing to the wellbeing of the individual, the inevitable policy question remains: to what extent must the attainment of various individual goals — or the use of various means to the attainment of these goals — be restricted on behalf of the public good? While by no means confined to demographic conditions, this question pertains with particular force to demographic behavior — especially fertility and, to a lesser extent, migration — because of the causal significance of the behavior of *individuals* and the long-run consequences entailed in but slight changes in such behavior: as, for example, in the individual decision to bear but one additional child.

10. As another paper at this seminar goes into this question of individual goals, my own discussion will center on more general, essentially *social* goals. But any planning on behalf of the achievement of certain demographic conditions must be based on recognition, first, of the fact it is individual human behavior that is the vehicle through which any demographic planning must work and, second, that this individual human behavior is going to be in large measure the result of the operation of individually-held values — values arranged in hierarchical fashion, often in competition with one another in any particular instance, subject to change, and frequently, perhaps, at some variance with the long-range needs of society.

11. Past efforts to establish suitable demographic goals can, I feel, be faulted on three grounds: first, the failure to think in terms of a wide variety of human needs; second, the failure to appreciate the ecological and social limits imposed by our finite planet; and third, the emphasis on consideration of *size* to the exclusion of consideration of *characteristics*.

12. Let us take as our goal for any given society something general enough to be agreed to by nearly everyone — something, for example, like a good standard of health and wellbeing for all members of the society, obtained at the least psychological and social cost and with the least deleterious consequences for the natural environment. This is not “the good life”, it is a more modest goal than that. But it is something of a minimum toward the attainment of “the good life”. Among some of the world’s peoples, attainment of this goal will mean a higher material level of living; among others, it will mean a lower one. And the same holds within societies: attainment of this goal will mean more for some, less for others. One cannot help but agree with the executive chairman and director-general of the Swedish International Development Agency who forcefully points out that, because of what can be known by virtue of being able to calculate the capacity of the biosphere,

“A level of consumption such as that already reached in the west, and soon to be reached in Japan, is totally unrealistic as a basis for a far-reaching demand for equality embracing all humanity... Anyone who advocates narrowing the gap between rich and poor nations, while at the same time envisioning, let us say, a continued 3-5 % increase per year in real income for the bulk of the Swedish people, is supporting two irreconcilable policies. If he advocates both theses and predicts that both can be carried out simultaneously, he is either ignorant or mendacious... All talk of an international levelling of income to the standard enjoyed by a nation like the Swedish is pure nonsense” (3).

13. In determining the bearing of demographic characteristics on the attainment of the goal of a good standard of health and wellbeing it is necessary to take both the *broad* view and the *long* view. The *broad* view of population and this goal involves recognition that human needs are complex and varied, and that they are different at different ages and at different steps of the life cycle. The environmental requirements — both natural and social — of a 5-year-old are different from those of a 65-year-old; of an unmarried young adult

different from those of his married counterpart, whatever the society. Nonetheless, at all ages and all stages of life man needs more than food to be fully human. The cultivation of the whole person would seem also to require serenity, dignity, order, predictability, leisure, peace, beauty, elbow-room, even though, with his extraordinary powers of adaptability, man can, on occasion, become inured to severe deprivation with respect to one or the other of these needs – become inured, that is, in much the way one can grow used to chronic pain.

14. Most discussion of demographic goals has been based on narrowly economic criteria of value ; which is hardly surprising, given that economic conditions are more readily quantified and the data depicting them are more frequently collected. But for our purposes here, the economic criterion is a particularly misleading one, not only because of its implied assumption that economic growth invariably adds to the sum of human happiness, but also for its implied assumption that such growth can be endless, that the limits to economic development are essentially ones of technology and finance, rather than ecology and resources. Yet, applying the broader criteria of human needs leads to the observation that there is no necessary connection between “the good life” and economic development. In a high-consumption society this relationship may, in fact, be negative in many respects : the greater the economic growth in *general* terms – as illustrated, for instance, by urban sprawl, highway construction, increased automobile usage, billboards, television advertising, and suburban power mowers – the greater the deterioration in the quality of life available to the individual, as he is progressively deprived of community life, of peace and of beauty, and as he suffers restriction of his access to outdoor recreation and to clean air and water.

15. The broad view thus involves recognition that population size is not the only factor determining the quality of life or the relationship between man and environment. How a people experiences population size is mediated through its cultural practices and standards. The chances for present and future generations to enjoy a high quality of life thus depend on the interplay of three factors : *population size*, the *rate of consumption* of land, air, water, and minerals, and the *use that is made* of the resources consumed. The interplay of these three factors sets the limits, but it does so, ordinarily, within a wide range of possible variation. A people could halt its population increase and still consume resources at ruinous rates ; and whether its allocation of resources was wise or unwise in terms of immediate social utility, the rate of consumption of these resources could, itself, eventually result in hardship and chaos.

16. Turning now to the need for the *long* view in determining demographic goals, it can be noted that taking this approach involves, first, the recognition that posterity is of significance if for no other reason than that so many now alive are going to survive long enough to experience the conditions formed by decisions taken in the present. An understanding of population dynamics forces the present generation to think, even in terms of its own self-interest, well beyond the requirements of the present and the immediate future. A lot of posterity is already here. In the United States, for example, some 85 per cent of the present population can expect to survive to the year 2000, and more than two-thirds to the year 2015 (4). With increasing longevity, their younger age structures are likely to make these percentages even higher in many of the developing countries. Certainly there is no need to appeal on the basis of as-yet-unborn children and grandchildren to impress upon us the necessity of having, in C.P. Snow’s words, “an appetite for the future” when we consider the nature of desirable population goals.

17. Moreover, population is not like water issuing from a tap – to be turned off at will when the desired level has been reached. To a unique degree, demographic conditions at any point in time are determined by what has gone before. Even if, starting tomorrow, women were to have no more than two children apiece, total world population would continue to rise substantially for another two decades, simply because all the world’s mothers for the next twenty years have already been born, and the *numbers* entering the childbearing ages have been rising year by year. The achievement of ultimate demographic goals is inevitably and necessarily a time-consuming process.

18. Finally, the long view requires that we acknowledge that this is a finite world. To be sure, much time can be bought, even considerable improvement in the quality of life achieved, through changes in the rates and patterns of use of air, minerals, land, and water : through application of the most ecologically sound practices in agriculture and in waste disposal, for example ; or, for another example, through the present abandonment of that increasingly widespread manifestation of private affluence and cause of public squalor – the automobile. But in the last analysis, population must ultimately stop increasing – everywhere. This is a statement not of a goal, but of an axiom.

19. The limits we must work within are, of course, by no means all geographic or ecological. There are social and psychological limits, as well. Though I am reluctant to infer much about human behavior from the studies of behavioral anomalies resulting from crowding among Norway rats and other species, it seems fairly obvious that there can arise such densities of human settlement, or frequencies of human contact and degrees of



impingement of human beings upon one another, as would result in a breakdown of those social relationships and patterns of individual behavior that are essential to the continuation of human society, and even to the maintenance of individual life. Some suggestion of how social viability can be affected in this manner can already be gleaned from many countries' experience of transportation and communication tie-ups, delays attending travel to work, the difficulties encountered in gaining access to recreation, in disposing of wastes, and so on.

20. So far as optimum *size* is concerned, then, the dependence of human wellbeing on the interplay of many diverse elements permits us to set only very broad limits. Ecological, resource, and social psychological limits will set the maximum number of people who can be supported, and thereby narrow the range ; but there remains, nonetheless, a considerable latitude within which any particular country's demographic goals might be located ; a latitude affected by its people's style of life, their technology, the distribution of wealth and power within the social system, and the trade relations they may have with other countries.

21. But if there is this uncertainty about suitable demographic goals so far as *size* is concerned, there would seem to be much less uncertainty about suitable demographic goals so far as *characteristics* are concerned. If our ultimate goal is something approaching the good life for all members of society, the minimum demographic means to this goal would seem to consist of three conditions. First is a low level of mortality. It is hard to imagine that death could be such a commonplace that it occasioned no sense of loss, no suffering – particularly when, as is the pattern in high mortality populations it was so prominently visited upon infants and young children.

22. Second is a stable age and sex distribution. This would entail stability in annual numbers of births and in relationships among age-specific patterns of mortality. Because of general economic conditions, or the sheer numbers involved, it might still be difficult with such an age distribution to make adequate provision of school and other social services, and also of employment for new entrants into the labor market. But with a stable age distribution there would be no aggravation of these difficulties as a consequence of year-to-year fluctuations in the numbers succeeding to different age levels ; no problems of the sort occasioned in the United States, for example, by the fact that for every three children born in 1945 there were more than four children born only two years later.

23. The third, and final, demographic characteristic would be a secular growth rate equal to zero. The most suitable goal so far as demographic characteristics are concerned is thus a stationary population enjoying low mortality. No population can increase indefinitely. As already noted, there are limits : limits to resources, to physical space, and to what can be termed "social and psychic space". However much these limits may be extended by changing the pattern of use of the environment and the pattern of behavior of individual members of society, there will be a point, even with the most judicious use of the environment and the most prudent pattern of human behavior, beyond which increases in population will result in declines in the quality of life. In fact, in consequence of the existence of limits, one could even argue that a truly optimum population would have a *negative* and not merely a zero, growth rate : a negative growth rate in order that human numbers – however efficient the use made of the environment – would be regularly brought into line with a steadily decreasing quantity of resources. But whether we accept quite this extreme a position, it must surely be recognized that the period of growth – both economic and demographic growth – that the world is currently experiencing can hardly be more than a tiny interlude in the history of mankind.

24. Now, acceptance of a stationary population enjoying low mortality as the ultimate demographic goal would seem, at first, to involve no conclusion about either the eventual size of this population or the time period to be allowed for attaining it. We continue to be faced with the old question of what is the optimum population size ; and we have already seen that the answer to this question must, in any particular instance, necessarily take account of the interplay of a considerable diversity of elements.

25. Yet, the question may not be altogether unanswerable. Recognizing the ultimate necessity of halting population growth, and simultaneously accepting the desirability of an essentially stationary population, does seem to have some implications for the establishment of population goals, so far as size is concerned. As Herman Daly has suggested,

"The optimum population is more likely to be discovered by experience than by *a priori* thought. We should attain a stationary population at some feasible nearby level. After experiencing it we could then decide whether the optimum level is above or below the current level . . . It is more important to be able to attain a stationary state (at any level) than to know in advance which level is optimal" (5).

26. The key, it would seem, is acceptance of the desirability of a stationary population : being "able and willing", that is, "to stay at the optimum once you find it. Otherwise, Daly common-sensically points out,

"knowing the optimum merely enables us to wave goodbye as we pass through it" (6).

27. The significance of attaining a stationary population, and the time ordinarily required to do so, would thus seem to argue for early – and virtually universal – movement in the direction of halting population increase. Just how this is to be done is, of course, by no means obvious. Certainly it could be expected that different approaches would be appropriate within different societies ; and it could also be expected that movement toward a given demographic goal could proceed in a variety of ways with respect to such intervening demographic variables as migration rates, marriage patterns, the timing of childbearing, and the distribution of family sizes. Maintenance of replacement-level fertility, for example, is possible both with a considerable variety of family sizes, as has been the case in France, and also with a high degree of concentration at the average, as has been the case in Sweden (7).

28. Research on this matter could be usefully addressed not only to the causes of different patterns of demographic behavior, but also to the range of possibilities for the attainment of the demographic conditions that are necessary. Must a world of stationary populations be also essentially one of cultural and demographic homogeneity ? The world may already be moving in this direction, but is it necessary for it to do so, as far as achieving the demographic conditions necessary to human wellbeing is concerned ? I am inclined to think not – though I confess that I may be expressing here a personal value more than a considered judgement based on an analysis of the pertinent facts.

29. Certainly there seems little reason to anticipate essentially identical consequences to flow from achievement of a stationary population (or, for that matter, from the achievement of any other demographic condition). We must beware of succumbing to the enticement of demographic determinism. What life is like in any particular society would seem to depend far more on nondemographic than on demographic variables. Even under ideal demographic conditions, life could conceivably be either meager or bountiful, violent or peaceful, miserable or happy. For any particular pool of resources and any particular set of cultural and social conditions, achievement of a stationary population would only make the good life more attainable ; it would not, in itself, create it. Once the parameters of such a demographic condition are established, the good life is more a function of social attitudes and policy than of any particular demographic characteristics.

30. To sum up : Population has to stop increasing sometime. This is both a physical and a social necessity. In terms of what it means for our opportunities, both now and in the future, an earlier cessation is preferable to a later one. Beyond this, whatever its ultimate size, I would claim it is better if a population's mortality levels are low and if year-to-year fluctuations in the numbers of births and deaths it experiences are kept to a minimum. But whether this population will be living well or poorly will depend on much more than its size and composition. Size and composition will set the limits, but they will not, except at the very extremes, be the final arbiters of the quality of a people's life.

## FOOTNOTES

(1) In this connection, see: Lincoln H. Day and Alice Taylor Day, *Too Many Americans*, Boston: Houghton Mifflin, 1964, chap. 10 ; Kingsley Davis, "Population Policy: Will Current Programs Succeed ?" *Science*, Nov. 10, 1967 ; Alice Taylor Day, "Population Control and Personal Freedom: Are They Compatible ?" *The Humanist*, Nov/Dec. 1968 ; and Bernard Berelson, "Beyond Family Planning", *Science*, Feb. 7, 1969.

(2) Garrett Hardin, "Tragedy of the Commons", *Science*, Dec. 13, 1968.

(3) Ernst Michanek, *The World Development Plan: A Swedish Perspective*, Stockholm: Almqvist and Wiksell, 1971, p. 62.

(4) For the calculation of these figures, see Lincoln H. Day, "Concerning the Optimum Level of Population", in S. Fred Singer (ed.), *Is there an Optimum Population Level ?*, New York: McGraw-Hill, 1971, p. 280.

(5) Herman E. Daly, "The Stationary-State Economy", *The Ecologist*, July, 1972, p. 7.

(6) *Ibid.*

(7) Lincoln H. Day and Alice Taylor Day, "Family Size in Industrialized Societies: An Inquiry into the Social-Cultural Determinants of Levels of Childbearing", *Journal of Marriage and The Family*, May, 1969, pp. 243-244.

# TARGET CALCULATIONS IN SIX FAMILY PLANNING PROGRAMS

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1. Many developing countries have decided to reduce their population growth rates, and several have calculated how many family planning acceptors the desired reduction would require. This paper reviews a few of these plans and comments upon their adequacy.

As to the decisions to reduce growth, by 1965 a number of these were on record, and in early 1966 an Asian conference of family planning programs cited examples as follows, for reduction of the crude birth rate from :

Ceylon	36 to 26 in 15 years
Taiwan	36 to 24 in 10 years
India	40 to 25 in 10 years
Pakistan	50 to 40 in 5 years
Singapore	30 to below 20 in 5 years
Korea	reduce growth rate from 2.9 % to 2.0 % in 10 years

By early 1973, as Dr. Frejka's background paper for this meeting documents, highly specific statements of the extent to which growth (or fertility) should be reduced had been made by 13 governments in Asia, 5-6 in Africa, and 3 in Latin America, with additional governments making declarations of intent without specifying numerical goals. The actual performance of family planning programs has been compiled by Nortman (1) and discussed intensively by Lapham and Mauldin (2).

2. The chief instrument chosen to obtain these objectives is in virtually all cases a large-scale family planning program – the provision of services and information for contraception and sterilization (and in isolated cases abortion) directed chiefly to married couples and often backed by leadership emphases that smaller families would be beneficial to the individual and to the society. Singapore has gone further, to institute anti-natalist measures, or remove pro-natalist ones, in income tax relief, delivery charges, maternity leave, and housing availability. The Philippines recently withdrew income tax exemptions for fifth births and above. Tunisia quite early took measures to raise the status of women, such as the prohibition of polygamy and postponement of the age at marriage, and in 1960 limited the family allowance to commercial and industrial workers to four children (3).

Abortion laws or regulations have in some instances been liberalized within a context of concern about high population growth, most recently in Korea, the United States, and India. A few places have instituted "incentive" schemes of one type or another, and there appears to be a growing interest in their potential for strengthening established programs. Overall, however, it is the programs themselves that have dominated the planning of targets, and it is these which we shall discuss.

3. A second level of objectives interacts with the first – the choice of what concrete work goals for the family planning program properly match the desired decline in growth or fertility. This is interactive because the overall objective has sometimes been modified when experience and more refined calculations showed that it implied unrealistically high work targets. The derivative aims are generally stated in terms of achievements for each family planning method offered by the program. For the loop it is usually acceptances, sometimes continuing wearers. For sterilization it is the number of operations. For the pill and condom it varies : first acceptors, continuing users, supplies distributed.

4. A third level of focus is the allocation of the work targets to local administrative units within the country. Various rules have been used, most revolving around the concept that each area and worker should do a "fair share" of the total. This puts the allocation chiefly onto an estimate of the number of married women below age 49 or 44 in the area, with modifications (formal or informal) for past performance, travel difficulties, and

so on. For local areas and individual workers, targets are often used for their stimulus effect upon program personnel.

5. Finally, a last level of target setting has concerned requirements for staff, supplies, and budget to match the above. Again there is interaction: if the funding realistically available is severely limited, that will scale down the personnel to be hired or even the objectives to be achieved. On the other hand, the larger objectives, once established, become a powerful argument for approval of substantial staff and budget levels.

Before entering into the complexities of the plans themselves, a simpler overview may be useful.

6. A first gross fix on the population to be served is relatively easy. In a developing country population of 1,000 there will be (Tables I-II).

(1) 200-250 females aged 15-49 ; 130-200 married

(2) 180-230 females aged 15-44 ; 115-185 married

(3) 140-190 females aged 20-44 ; 110-160 married.

The choice between lines (2) and (3) is important where marriage or cohabitation begins early. Where it does not, the age group 15-19 should be eliminated, as few of them will be eligible and fewer interested.

This says that from 11 % to 16 % or so of the population will be married women under age 45. Of these, some will be naturally sterile, the exact percentage highly dependent on age from a low of around 3 % at ages 20-24 to over 30 % for ages 40-44 ; Henry's work can be used to obtain a suitable approximation (4). If surveys have gathered the appropriate data, a further subtraction can be made for those who have had sterilizing operations, and an addition can be made for those in cohabitation as distinct from formal marriage. The end result of this will be the determination that 10 %-15 % of the population is eligible, with their husbands, for program contact.

Supposing that the crude birth rate is 40, it is these 100 to 150 females who are responsible for the 40 births each year. The program might start by saying that the crude birth rate can be reduced by one-fourth, i.e., from 40 to 30, by recruiting about one-fourth of the childbearing population just identified. Besides being a very large undertaking, this would by no means guarantee the desired result.

TABLE I - PERCENTAGE OF FEMALES IN REPRODUCTIVE AGES TO TOTAL POPULATION : SELECTED DEVELOPING COUNTRIES

		Females (15-49)	Females (15-44)	Females (20-44)
Algeria	(1966)	20.6	19.0	14.5
Egypt	(1960)	21.7	19.5	16.4
Kenya	(1962)	23.4	21.9	17.2
Morocco	(1960)	22.4	21.0	18.0
Zaire	(1955-1958)	u	25.1	21.4
India	(1961)	19.8	17.9	14.0
Indonesia	(1964-1965)	24.1	22.1	18.3
Iran	(1968)	20.0	18.6	14.5
Iraq	(1965)	19.9	18.2	14.3
Nepal	(1961)	24.9	22.9	18.7
Pakistan	(1961)	20.9	19.3	15.3
Philippines	(1960)	23.2	21.3	16.0
Thailand	(1960)	23.2	21.3	16.6
Turkey	(1965)	21.8	20.4	16.1
Colombia	(1964)	22.7	20.9	15.6
Mexico	(1960)	24.0	22.2	15.9
Peru	(1961)	22.7	21.1	15.9
Venezuela	(1961)	22.2	20.3	15.5
Ceylon	(1963)	22.2	20.3	15.6
South Korea	(1966)	22.6	20.7	16.2
Malaysia (W)	(1968)*	21.9	20.0	14.7
Chile	(1960)	24.2	21.9	16.9
Taiwan	(1966)	21.3	19.6	14.6

u = unavailable  
 \*Estimated  
 Source : United Nations, Demographic Yearbook, 1968, Twentieth Issue, (New York : United Nations Department of Economic and Social Affairs, Statistical Office, 1969).  
 United Nations, Demographic Yearbook, 1970, *op. cit.*

TABLE II – PERCENTAGE FEMALES MARRIED IN REPRODUCTIVE AGE GROUPS

		Married women per 100 population of age :			Married women (15-44) per 100 women
		15-44	15-49	20-44	15-44
Algeria	(1966)	14.3	u	12.4	75
Egypt	(1960)	14.7	16.4	13.8	72
Kenya	(1962)	15.3	16.5	13.0	70
Morocco	(1960)	17.1	18.0	15.6	81
Zaire	(1955-1958)	20.6	u	18.9	82
India	(1961)	18.0	19.3	15.2	86
Indonesia	(1964-1965)	16.7	u	u	75
Iran	(1966)	15.6	16.8	13.7	81
Iraq	(1965)	12.8	u	u	70
Nepal	(1961)	19.7	21.1	16.7	86
Pakistan	(1961)	16.0	17.1	13.2	86
Philippines	(1960)	12.6	14.1	11.9	59
Thailand	(1960)	13.2	14.6	12.6	62
Turkey	(1965)	15.8	u	u	78
Colombia	(1964)	11.5	12.7	10.7	55
Mexico	(1960)	12.8	14.1	11.7	61
Peru	(1961)	12.3	13.7	11.6	59
Venezuela	(1961)	11.7	12.9	10.7	58
Ceylon	(1963)	12.9	14.4	12.2	64
South Korea	(1966)	13.0	u	u	63
Malaysia (West)	(1957)	14.7	16.1	13.0	72
Chile	(1960)	11.7	13.4	11.3	53

u = unavailable

Source : United Nations, *Demographic Yearbook*, 1968, Twentieth Issue (New York : United Nations Department of Economic and Social Affairs, Statistical Office, 1969).

United Nations, *Demographic Yearbook*, 1970, *op. cit.*

7. First, it ignores projections into the future. In young programs these are often omitted as it will take up to five years just to reach those initially identified. But the time flow has to be faced : large numbers of new entries each year come up through the pyramid of marriage and early births, large numbers leave through aging and broken marriage, many acceptors terminate use, and, in some countries, a very large young cohort arrives to worsen the age structure of the eligible group. Another complicating factor is that many acceptors move from one method to another, confusing the count of how many couples have been covered by the program. All of this introduces new and difficult calculations for the "maintenance" aspect of the program.

8. Equally serious, it is not clear how many births are prevented by a given number of acceptors, or users, in the program. And the better the method of estimation, the less likely it is that the data needed for it will be available. The correlates of greater effect by the program are tied to its *uniqueness* (did the acceptors use birth control before, are they living in an area where alternative services are available), the *potential fertility* of acceptors (are they young, of low parity, with a recent birth), and the *methods offered* (how many, how good is continuation). There are innumerable complexities : sterilization offers the best continuation but is not attractive to younger couples ; a program may start more readily where it is *not* unique – where the public is already accustomed to private birth control and commercial methods.

9. Moreover, the program must work under constraints related to the family cycle. About 20 % of all births will be first births and actively sought by the couple. A somewhat lower percentage will be second births (5). In general, acceptance flows from the broad middle group – not the lowest parities nor the youngest couples, nor the oldest and the sterile, but those in between. There is usually a substantial spread as well – appreciable numbers do accept after the first two births, and surprising numbers come from the upper age and parity categories. Therefore, the focus must be a broad one, both because of this spread and because different sub-groups move at different rates toward new attitudes and practices.

Fortunately, the acceptors select themselves to an extent in such a way as to bring into the program those with a greater proclivity to future births. Clearly those who know themselves to be sterile will not accept, nor will those who are already using highly effective methods. This puts a differential immediately

into those who accept and those who do not, and those taking up program contraception tend to be those for whom other sources were unknown or unattractive, and therefore likely to have gone unused.

None of these considerations makes it easier to know program effect on fertility, yet rational planning requires that estimates be made. A few case studies of these estimates are now presented.

## Turkey

10. Turkey's population growth goals have changed frequently over the last decade, but a plan published recently by the Ministry of Health (6) is interesting for its manner of handling the target question.

The plan starts by reviewing Turkey's past and projected population growth, together with information on various fertility measures. A carefully done projection to the year 2000 is invoked, which assumes that age-specific fertility rates will continue to fall mildly, at the same pace as in the recent past. This reflects chiefly the secular trend in both marriage age and birth control, as the program itself has so far been a mild one with no significant effect upon the birth rate. By the year 1995 the population size would reach 68 million, a level seriously above the State Planning Organization's published aim of no more than about 60 million by then.

From this discrepancy the plan develops its objectives. To meet the 60 million target, it estimates that the total fertility rate (TFR) (i.e., the number of births a woman living to age 50 would have under the prevailing age-specific rates), will have to fall from the present 5.7 to 3.0 in 1995. For the first five years, mid-1972 to mid-1977, the plan set a target of an 0.5 drop in the TFR.

11. With attention narrowed to those five years, specifics follow. First, the female population (in five-year age groups) is moved forward year by year, and an unchanging set of age specific fertility rates is applied to obtain a baseline number of births anticipated each year. The process is then repeated under three alternative levels of program strength through acceptances set at low, medium, and high rates. Each five-year age group starts in 1972 as a cohort and moves forward through the acceptance experience of each assumption. A smooth decay curve for continuation is applied (with very favorable assumptions about duration of use); the same curve is used for each of the three levels of program acceptance. All this creates a number of *continuing users* as of the mid-point of each year, who are removed from the risk of live birth. The number of births expected at each age, i.e., the baseline mentioned above, is reduced by an exactly proportionate amount. This changes the age specific fertility rates, with a modified TFR and other fertility measures directly following. The result is that the TFR would fall as targeted from 5.7 to 5.2 under the third assumption, of low acceptance rates. However, the continuation rates assumed are extremely high ones and the age distribution of acceptors is optimistic on the participation of younger women, whose fertility is very high. On the other hand, the calculations ignore any assistance from a rising age at marriage, or from increased abortion and contraception in the private sector.

One feature of the plan deserves special mention, that each acceptance cohort is carried through time separately, and is subjected to a rate of increasing acceptance figured on the base of *current non-users*. This avoids the pitfall of across-the-board acceptance rates which if attained year after year would sometimes accumulate more users in certain age groups than there are members. A difficulty remains, however, that with time a large proportion of a cohort may become discontinuers of the contraceptive methods offered, making the assumed acceptance rate among non-users perhaps unrealistic.

12. This plan has the strength of component projection both for the population and for acceptor experience. It is structured within the context of careful baseline information from previous demographic work, with estimates of age specific fertility rates, an age distribution, and a reasonable population projection. The work incorporates several fertility measures, not just one, and shows how progress in reducing the TFR is diluted by an untoward age distribution so that the crude birth rate and population growth rate are not able to fall as impressively as the TFR. However, no attention is given to what Potter has called the "fine structure" of family building, i.e., to states of pregnancy, wastage, anovulation, secondary sterility, etc. Nor is there recognition that acceptors may have higher fertility expectations than others, and therefore more births prevented than the prevailing age-specific fertility rates would indicate.

Unfortunately, as an incidental note, the highest fertility rate prevails for ages 20-34, and it happens that population growth will be especially sharp within this age range. Thus, the high initial rate aggravated by an enlarging base creates a powerful pressure toward growth even in the presence of some program gains.

## Pakistan

13. The 1965-69 Pakistan program operated under an overall objective of a crude birth rate reduction from 50 to 40, by reaching the 20 million fertile couples contained in the population. Assuming a concurrent decline

in the crude death rate from 20 to 15, the growth rate would fall from 3 % annually to 2.5 %. The longer-range goal was 1.5 % by 1985 (7).

The dominant concern in target analysis was to translate program performance into couple years of protection (CYP) against pregnancy, and from there to births prevented. The latter was accomplished by the simple rule that one birth was avoided for every three couple years of protection. For the former the rules changed from time to time, and the following describes one of the chief variants (8).

During each month of program operation, IUDs, sterilizations, and conventional methods were accepted, and each of these was converted to the single measure of CYP. A sterilization was given a full CYP in the first year and 15 % less for each year thereafter. An IUD was assumed to give .75 CYP during the first year, .50 the second, .35 the third, and none thereafter. Conventionals were kept on a current basis: 100 units distributed in a particular month contributed 1 CYP then, on the rough assumption of coitus twice per week.

All these assumptions were scientifically controversial, though their value for administrative simplicity was conceded. Objections included:

14. *For conventionals*: besides the uncertainty of the rule of coitus twice per week, no discount was made for supplies which were recorded as having moved through the distribution chain but failed actually to reach potential users, or for those which did so but were not indeed used, or for intermittent and defective use resulting in pregnancy failure.

*For the IUD*: the stair-step approach of .75, .50, and .35 CYP for the first three years called for improvement through use of a smooth decay function as widely employed in the life table method. Further, whether by stair-steps or smooth decay, the projection of wearing time was a mathematical construct. Actually, some "protection time" became useless by the death of one partner, by marital dissolutions of other types, by secondary sterility present at insertion or developing thereafter, by amenorrhea during the early months of wearing due to a recent birth, and by pregnancies *in situ*. This list of factors, in Potter's analysis (9), caused a discount of 31 % (medium assumption) of the useful protection time projected under the life table curve.

15. *For sterilization (almost entirely vasectomies)*: in the first year, a vasectomy was said to give 1 CYP, which assumed that all couples remained alive and cohabiting, were fecund at the operation and would have remained that way; that no wives were pregnant when the operation was done; that no post-operative failures occurred due to residual sperm; and that no women were amenorrheic due to a recent birth. For subsequent years, the 15 % discount per year was an effort to recognize such factors; whether 15 % was too much or too little was not determined.

Couple years of protection for all three methods were summed, to produce a single index of achievement. This procedure made all months of protection equivalent, without differentiation as to whether the wife was amenorrheic, fecund, or in a state of pregnancy during the particular month, and without regard to the decided advantage of staying with individual couples over an extended period of time in order to move them systematically into the fecund part of the birth interval and reduce the proportion of "protected" couples which were actually amenorrheic. But the overall procedure did have the appeal of giving a single measure of program achievement over time and between local areas. The hazard was that of invisible distortions of progress toward the desired fertility reduction, either by overstatement or indeed understatement of administrative accomplishment.

16. Administrative considerations caused other difficulties of interest. A performance statement was needed for each fiscal year, but there was no easy way to attribute the protection achieved by IUD insertions and sterilizations to a particular twelve-month period. Finally it was decided that an IUD inserted during a particular fiscal year would be considered to provide 3/4 of one CYP within that same fiscal year, a sterilization a full year, and 100 units of conventionals a full year. However, to the extent that IUD and sterilization acceptances occurred evenly throughout the year, the protection afforded against conception was on average six months. Further, any fertility effects were lagged by an additional nine months (IUDs were generally inserted only into non-pregnant women). The question of carry-over protection into future years also presented difficulties. Nevertheless, the need remained to measure somehow the benefits accruing from the fiscal years' work, and such perplexities are never entirely avoidable in the balancing of scientific sophistication against administrative convenience.

## Thailand

17. Thailand's goal is to reduce her natural increase rate from the 1970 level of over 3 % to 2.5 % by 1976 (10). Calculations have been made indicating that the program can reduce the crude birth rate by 7.8 points (e.g. from 41 to 33.2) from 1970 as a base to the end of 1976. The reasoning runs as follows:

The three contraceptive methods of pill, IUD, and female sterilization are well established in the program and are expected to grow in popularity. The pill particularly may enjoy wider usage, as it is dispensed by medical auxiliaries who are widely dispersed in the rural health facilities. The Thai plan gives a year-by-year schedule of the numbers of acceptors sought for each of these three methods, with the total running from 300,000 for 1971 up to 410,000 for 1975 and for 1976. This is an annual acceptance figure of 5 % to 8 % of the married women ages 15-44. It is recognized in principle that some women will try more than one method and will be duplicated in the counts, and that some acceptors will pass out of the eligible group (by death, broken marriage, or aging) so that as of 1976 an appreciable proportion of the past acceptances must be discounted. (However, none of these considerations enter the calculations).

18. How many births will these acceptances prevent? As in Pakistan, acceptances are converted to couple-years of protection (CYP). A smooth decay curve of continuation is used for acceptors of the IUD and the pill, although at high continuation levels especially for the pill. For sterilization acceptors, no decay is assumed. No allowance is made for any of the corrections called for in the Pakistan discussion or for the factors which in Potter's estimate cause about 30 % of the CYP for the loop to be discounted (this figure is somewhat dependent on the age of acceptors). The figure would perhaps be more for sterilization acceptors inasmuch as they are older and are quicker to encounter secondary sterility and marital dissolution from mortality, though it is the age distribution, not the mean, which really counts. In any case, since the calculated fertility effect in the Thai plan is directly proportional to couple years of protection, these corrections alone might mean about one-third less effect on the birth rate than computed, apart from any questions about the level of continuation rates.

A factor pointing to a yet larger adjustment is the inclusion of 1965-1970 acceptors in the calculations. They contribute 35 % of the couple years of protection present during the 1971-1976 period, and would by their greater aging require larger discounts in useful wearing time.

19. The conversion to births prevented is straightforward : 3.25 couple years of protection are considered to represent one birth prevented, equivalent to the assumption that 3.25 years is the normal birth interval for acceptors. Two adjustments underlie the 3.25. The normal Thai birth interval well exceeds three years, but acceptors are usually of higher fertility, so 3.0 is considered reasonable. On the other hand, acceptors often start use soon after a birth when they are still amenorrheic and so "waste" using time, therefore 3.25 is better. This necessary guesswork results in an assumed fertility-prevented rate of  $1/3.25$ , or 308 births per 1000 acceptors per year.

20. To estimate the effect on the crude birth rate, the official population projections for Thailand (low-growth assumption) were taken as a baseline. The count of births prevented for each calendar year was put against the estimated population for that year to yield the change in crude birth rate, and the calculated result is, as mentioned, a very large reduction in fertility. Re-computations would be useful to check the change in results from modified assumptions in the chain of reasoning. So far as the course of the crude birth rate is concerned, it will probably be driven down by the program less than calculated, but will be strongly affected by the marriage age and by private birth control.

## Philippines

21. The Philippines four-year economic development plan 1972-1975 (11) contains a calculation relating number of clinics, number of acceptors, and saturation of the eligible group, with the consequent effect on the population growth rate. The published work table is shown here (Table III).

The eligible group is estimated at 12.5 % of the population, and is considered to grow at 3.1 % per annum. To service this group, the program must develop a substantial level of activity, and this is made directly dependent upon the establishment of clinics. From the start in 1970, the number of clinics grows to 1,870 in 1974, and on average each one recruits 44 new acceptors per month during 1971, declining to 25.8 per month in 1974. Simple multiplication of this number by the number of clinic months of operation within the year yields the acceptors registered for that year (Column 6). These acceptors are accumulated through time, with a 4 % loss from each year to the next to recognize death and sterility. Cumulative acceptors grow much faster than does the target population, until in 1975 a large proportion of the then eligible group will have at some time accepted family planning in the clinics.

The plan emphasizes that the effect of this upon the population growth is unclear, as the calculations leave unspecified the continuation of use after acceptance. On the other hand, no effect is included for private birth control or for later marriage. These may of course be offset by a large new cohort of young people entering the eligible group, in effect denying the assumption that it will grow at only 3.1 % per year.

The plan refers to the possibility of converting the target of approximately 50,000 acceptors per month to a number of "continuing users" and calculates under high and low assumptions that the program might



bring the population growth rate from an estimated 3.1 % per year to a new level of from 2.3 % to 2.7 %. All this work has been carried into greater detail by Laing (12).

TABLEAU III – TARGETS FOR NEW ACCEPTORS AT FAMILY PLANNING CLINICS, FY 1972-1975  
ASSUMING 1,870 CLINICS BY FY 1974  
(BASED ON NUMBER OF CLINICS AND REMAINING ELIGIBLE WOMEN)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Fiscal year	Number of eligible women at beginning of Year(1) (in thousand)	Number of remaining eligible women at beginning of Year(2) (in thousand)	Proportion of eligible women still remaining at beginning of Year(3)	Number of acceptors per month per clinic(4)	Number of clinic month(5)	Number of registered acceptors during the year(6) (in thousand)	Cumulative no. of acceptors at end of year(7) (in thousand)	Number of clinics to be added annually	Cumulative number of clinics
1970	—	—	—	—	—	100	100	—	—
1971	4,647	4,547	.978	44.0	7,847	345	441	—	870
1972	4,791	4,350	.908	40.9	14,076	576	999	400	1,270
1973	4,940	3,943	.798	35.9	18,876	678	1,637	400	1,670
1974	5,093	3,456	.679	30.6	21,876	669	2,240	200	1,870
1975	5,251	3,011	.573	25.8	22,476	580	2,730	0	1,870

(1) 12.5 % of the population, assuming an annual growth rate of 3.1 %.

(2) Number of eligible women for current year minus cumulative number of acceptors.

(3) Ratio of remaining eligible women beginning of the year to eligible women at the beginning of the program.

(4) Proportion of women remaining multiplied by 45 (optimum average of acceptor rate/clinic).

(5) Allowance is given for new clinics. Number of old clinics multiplied by 12 mos. and number of new clinics by 9 mos.

(6) Estimated from clinic months and acceptors per month per clinic.

(7) Cumulative acceptors is adjusted for addition due to the death and sterility by subtracting 4 % of previous year's cumulative figure before adding the current year's figure.

Source : *Four-year Development Plan Fy 72-75*. (Adopted by the National Economic Council, 23 July 1971). Republic of the Philippines. Table 16.1, page 215.

Column 1 grows at 3.1 % per year.

2 = col. 1 minus col. 7 entry for previous year

3 = col. 2 divided by col. 1

4 = col. 3 times 45

5 = see note 5

6 = col. 4 times col. 5

7 = col. 6 plus .96 times col. 7 entry for previous year.

#### Republic of Korea 1962-1971

22. The government decided in 1961, on the basis of the 1955-60 intercensal growth rate of 2.9, that in the interest of its economic development objectives it would intervene to reduce population growth. It initially considered the goal of reducing growth to 2.0 % by the end of 1966, but further study suggested that this was unrealistic, and it finally chose 2.5 % by the end of 1966 and 2.0 % by the end of 1971.

The national program began in early 1962, offering vasectomy, condoms, and other traditional methods including rhythm. In 1964, the loop became available for mass use, and a ten-year plan was written covering the period from January 1962 through December 1971. This plan charted the course of fertility, mortality, and growth year-by-year across the ten-year period, first without a program and again with it.

The plan said (13):

23. "... that 100 married women would ordinarily have 25 births per year and that loops in place would suppress all 25. Originally, 20 percent of loops were predicted to drop out in the first year and 10 percent per year thereafter (including regular terminations plus deaths and menopause). Vasectomies were assumed to

remain effective to December 1971, with deaths, menopause, and so on, disregarded. Conventional methods were discounted by 70 percent, down to a 30 percent level. All acceptances in each calendar year repressed no fertility until the next calendar year. Therefore if 100 loops were inserted one year and 20 percent dropped out, the fertility repressed in the next year was  $100 \times 80\% \times 25 = 20$  births. For 100 vasectomies it was  $100 \times 25 = 25$ . For 100 couple-years of conventionals it was  $100 \times 30\% \times 25 = 7.5$ . By projecting the targeted acceptances by year and by method, births prevented and couples protected were calculated easily. By December 1971, 31.6 percent of couples would be protected through these government services, and it was assumed that another 13.4 percent of married women aged 20-44 would find protection on their own, making 45 percent in all.

24. "Using 1960 census data... population projections... and Japanese and Taiwanese experience, 1962 fertility was taken at 40 and estimated to decline naturally by 4 points per year (4 in 10 years to 36 in 1971), taking into account an estimated 13.4 percent of couples practicing on their own. To this was added each year's program effect, translating the births-prevented figures into an additional decline in the crude birth rate, all with the end result of a 27.0 birth rate by December 1971. Mortality was taken at 10.5 in 1962 and was expected to decline by .3 points per year (3 in 10 years, to 7.5 by 1971). The difference was a 1.95 percent growth rate at the end of the plan period, a shade below 2.0 percent.

25. "With only two or three revisions, this plan stood as the operating blueprint into 1970... The principal revision was to elevate the IUD target from 1 million to 1.8 million to recognize that IUD terminations would be higher than originally thought. Balancing this was the fact that no account was taken of induced abortions which by 1968 were ending at least 20 percent of all pregnancies, or of pills, which were selling about 125,000 cycles per month commercially and going to about 240,000 couples in the program by December 1970. Also ignored was the rapidly rising age at marriage, which has removed many highly fertile young women from early childbearing and lengthened the generational span".

#### Korea — 1972-1976 and Taiwan — 1970-1979

26. These plans go into great detail(14) and will be presented only briefly here. Both project total population and the female population in five year age groups and both project the percent married by age through time to develop more precisely the eligible group for each calendar year. Both work at the level of marital age-specific fertility rates, extending them to estimate expected fertility without the program. Fundamentally the births to be prevented emerge from the gaps between these extensions and the marital rates targeted to achieve the overall fertility fall desired. However an iterative process was needed to attain a realistic fit between these gaps, the acceptance rates thought possible, the pattern by age, and conversion formulas for births prevented.

Because every thing is handled by age, it is necessary to choose an age *pattern* of acceptance and consequent fertility decline. To an extent this choice must be arbitrary; yet there are guides from recent historical experience and from Japan, and these are used to obtain the future secular expectations and the likely pattern of program response.

Each year's prevented births depend directly upon the number of users, their estimated potential fertility, and the estimated effectiveness with which each contraceptive method is thought to be used. Neither plan treats acceptors in cohorts as the Turkey plan does, rather they focus on the number of acceptors needed during each calendar year within age groups and do so without direct reference to saturation from previous acceptances.

Overall these plans are the most sophisticated of those reviewed, partly due to richer data on which to draw and extensive program experience.

27 The foregoing examples of family planning target calculations are reasonably illustrative of the approaches now used and their difficulties. Rather straightforward work can be done in the short term for new programs, where the overriding task is to estimate the size of the eligible population and its subgroups, and to establish initial acceptance and continuation rates. Calculations at this stage may be made without reference to the complexities which arise when large numbers have entered and left the childbearing population in general and the accepting group in particular, and when many acceptors have switched methods. The further the departure from this early situation, the more tenuous the plan becomes. The imponderables include:

- at what age will women in their late teens and early twenties marry or cohabit
- at what rate will private birth control increase, separately for contraception, sterilization and abortion
- how much fertility effect should be attributed to an acceptance in the program and how does this change with age, timing of acceptance within the birth interval, and continuation
- what will acceptors do who terminate the program methods; what effect will the program have had upon their future behavior

— in the longer run, how will the saturation of acceptance within age groups build up, and how far will the program penetrate to the younger ages and lower parities, from which a growing proportion of births will derive.

28. Although no program has yet handled these complexities satisfactorily, there is a growing literature of analytical work and of empirical estimates for some of the key determinants, and with the general growth of methodology in target computations, it will become possible for each country to draw upon alternative methods to assess its own goals. One factor is not explicitly present in calculations from any of the plans reviewed. Acceptors of all methods except sterilization, upon terminating use, are often in the fecund portion of the birth interval and at a higher-than-average risk of pregnancy. Consequently, their post-termination birth rates may be exceptionally high and so partially cancel the births avoided during their using time. On the other hand, acceptors may, after leaving the program, be exceptionally determined to avoid further childbearing and have lower-than-average birth rates. (Results in both directions have been observed in different family planning programs). Potter's corrections encompass postpartum amenorrhea, and where these are used the pitfall is covered. Of course, a sufficiently conservative figure for conversion from using time to births prevented will offset the pitfall also, but a more refined analysis is needed to know how conservative it must be.

29. Over a very long period of time, a program which attained a steady state of protecting say one-third of the married women of childbearing age at any one time would still not be able to ignore the questions of whether using time typically overlapped postpartum amenorrhea, ran into mortality and marital dissolution, prevented an exceptionally high number of births due to a sharp selectivity of who accepted, and so on. A simpler way of putting it is that under a steady state, the program's effect would revolve around who accepted, at what stage of birth interval, at what age, for how long, and as an alternative to what actions in the program's absence. To these questions others are added during the unique timing circumstances of a program's start-up phase, or during changes in the prevailing continuation rates or other determinants mentioned.

However, it is easy to list difficulties, and hard to suggest improvements. The plans reviewed have if anything over-estimated program effect, probably seriously. On the other hand, they have probably under-estimated the effect of such helping factors as a rising age at marriage and increased private birth control. Above all, they have established the fact of planning — that the work is to be guided by a chain of objectives which moves from the overall goal to concrete targets for field administration. This in turn is stimulating better planning and better research, and a steady improvement in the accuracy of the action plans may be anticipated.

## FOOTNOTES

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(2) Robert J. Lapham and W. Parker Mauldin, "National Family Planning Programs: Review and Evaluation", *Studies in Family Planning*, Volume 3, Number 3, March 1972.

(3) Amor Daly, Ch. 13, "Tunisia" in *Family Planning and Population Programs*, ed. Bernard Berelson, et. al. Chicago: University of Chicago Press, 1966.

(4 a) Donald J. Bogue, et al. *An Empirical Model for Demographic Evaluation of the Impact of Contraception and Marital Status on Birth Rates*. Chicago: Community and Family Study Center, University of Chicago, 1973, p. 15.

(4 b) Louis Henry, "La Fécondité naturelle : observation-théorie-résultats", *Population*, 16 (1961), pp. 625-32.

(4 c) Louis Henry, *Fécondité des Mariages*, Institut national d'études démographiques, Travaux et documents, Cahier No. 16 (Presses Universitaires de France 1953), p. 103. See also his, "Some Data on Natural Fertility", *Eugenics Quarterly*, 8 (June, 1961), p. 85.

(5) First births as a percentage of all births run illustratively as follows: 16 (West Pakistan in 1962); 17 (East Pakistan, 1962); 21-22 (Thailand, 1960-1964, 1966). The percentages for the second birth are respectively 17, 15, and 18. See John A. Ross, "Postpartum Program: Action Implications", Chapter 1 in G.I. Zatuchni, ed. *Postpartum Family Planning*. McGraw-Hill, 1970, p. 15, Table IV. See also *Statistical Year Book of Thailand* and *Public Health Statistics* for Thailand.

(6) *Population Planning Strategy, Targets, Outline of Programs, and Inputs Needed for the 1972-1977 Five Year Period*, A Policy Statement by the Ministry of Health and Social Welfare, Ankara, March 20, 1972.

(7) Enver Adil, "Progress and Problems of Fertility Control Around the World", *Demography* Volume 5, Number 2, 1968. See p. 660.

(8 a) Lee L. Bean and William Seltzer, "Couple Years of Protection and Births Prevented: A Methodological Examination", in *Ibid.*

(8 b) Lee L. Bean and A.D. Bhatti, "Three Years of Pakistan's New National Family Planning Programme", *The Pakistan Development Review*, Vol. 9, No. 1, Sp 1969.

(9) Robert G. Potter, Jr., "Estimating Births Averted in a Family Planning Program", in *Fertility and Family Planning*, ed. S.J. Behrman, et. al. Ann. Arbor: University of Michigan Press, 1969, pp. 413-434. See p. 425, Table 3.

(10) "Thailand", *Country Profiles*, New York: The Population Council, March, 1972. See p. 7.

(11) Republic of the Philippines, *Four-Year Development Plan, FY 1972-75*, See pp. 214-5.

(12) John E. Laing, *Births Averted by a Multi-Method Family Planning Program*. Family Planning Evaluation Office, U.P. Population Institute, September 1972 (Submitted for Publication).

(13) Taek Il Kim, et al., *The Korean National Family Planning Program*. New York: The Population Council, 1972. See p. 63.

(14) For Korea, various unpublished memos available upon request. For Taiwan, *Projection of Population and Corresponding Family Planning Recruitment and Costs by 5-Year Age Groups, 1970-1979 for Taiwan Area*. Committee on Family Planning, Taiwan Provincial Department of Health, Republic of China, December 1970.

# MIGRATION AS A MEANS OF ACHIEVING POPULATION TARGETS

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1. There are two situations here. First, where a population is above a given optimum, migration policy may be directed at cancelling out natural increase and gradually reducing population to the optimum. Second, where a population is below a given optimum, migration policy may be directed at adding to natural increase to bring population up to the optimum. In either case, the more urgency there is about reaching the optimum the greater is the annual net emigration or immigration aimed at.

2. There are several interesting demographic points inherent in such situations, notably the effects of target migration on natural increase, the results of re-migration, and the consequences of achieving net migration by a cyclical process averaging about the target rather than by a steady annual flow. There are also a number of important political and social matters involved, notably the fact that migration normally involves other societies, either as destinations or sources, and the fact that both net emigration and net immigration are likely to have domestic consequences not always foreseen by the population planners, some of which may work towards continuing migration long after target has been achieved while others may work towards reducing migration long before target is achieved. These demographic and socio-political factors tend to become strongly interlinked and it is more realistic, and much more illuminating to tackle the more theoretical demographic points in the context of political and social forces. For this reason this essay does not deal with abstract population models but with two actual populations, those of Malta and Australia, the former aiming at large-scale net emigration and the latter pressing for a sustained large-scale net immigration.

3. The little archipelago of Malta (consisting of the islands of Malta, Gozo and Comino) has for many decades been afflicted with an overpopulation problem. (1). During the eighteenth century, when the islands were controlled by the Knights of St. John, the income from intensive cotton farming and processing, together with the local expenditure of moneys derived by the Knights from European properties, had lifted the population to 100,000; on the islands' 121,844 square miles this represented some 800 persons per square mile, then one of the highest densities in the world. In the early nineteenth century, now under British control, islanders saw the virtual destruction of their cotton industry by competition from the new cotton growing areas of Egypt, and the replacement of the relatively generous Knights of St. John by an imperial mistress dominated by notions of free-trade and economy. A prolonged period of distress ensued, 1820-40, to be succeeded by a procession of violent up-swings and down-swings in the economy, partly reflecting periodic crop failures in Europe but mainly reflecting the ups and downs of British spending on fortifications, harbour works and fleet servicing, these in turn varying with international crises and wars. This situation continued into the twentieth century, right up to World War II, provoking numerous outcries and occasional commissions enquiring into the causes and consequences of poverty and unemployment, notably those of 1824, 1836-8, 1867-8, 1878, 1911-12, 1926, 1936-7, 1955.

Despite the down-swings, however, population growth continued. The birthrate fluctuated between 29 and 43 per thousand 1826-1945, never falling below an average of 33 per thousand per decade. The death-rate, excluding abnormal peaks caused by invasions of cholera and small-pox, fluctuated between 18 and 32 per thousand, never falling below an average of 20 per thousand per decade. As a result, natural increase remained between an average of 6 and 20 per thousand per decade, exerting a constant pressure on resources.

4. Emigration as a solution for Malta's population problems had long been suggested, and periodic attempts had been made officially to found Maltese colonies overseas or to encourage Maltese to emigrate as individuals and families: to Cephalonia and other Greek islands in the 1820s; the West Indies 1837-41; Tripoli 1849-50 and again 1865-6; Jamaica 1872-4; Cyprus 1878-80; Australia 1881-4; Brazil 1911-12; Australia in the 1920's. In practice, not one official colony was successfully established while relatively few Maltese responded to official encouragement. The numerous persons who did emigrate usually did so privately, a few to Europe, America and Australia but most to North Africa and the Levant. By the end of the nineteenth

century sizeable Maltese communities existed in Algeria, Tunis, Tripoli, Egypt and Turkey (perhaps 50,000 in all) but these were smaller than one might have expected from the total volume of emigration, especially when one remembers that Maltese natural increase abroad was substantial and that many of the 50,000 were second and third generation persons born overseas. The plain fact was that, because of ease of return, a very strong love of home, and periodic political and economic upheavals in Moslem countries of settlement, the rate of re-migration from Africa and the Levant remained very high, about 85 % for much of the nineteenth century.

5. Maltese settlements building up in Europe and overseas from the late nineteenth century onwards were much more stable, but they had not grown very large before statutory quotas in the U.S.A. and administrative restrictions and quotas in Australia in the 1920's — largely based on the number already settled — kept further immigration at a relatively low level. These communities, therefore, had no time to develop that strong attractive power that flourishing settlements abroad sometimes exercise on the home population, as when relatives and friends continue to join their friends and kinsfolk abroad long after the original causes of emigration — shortage of land, unemployment and so on — have vanished. The populations of some of the nearby Lipari, Ionian and Dalmatian islands, to say nothing of parts of Basilicata and the Peloponnesos, declined noticeably in this way by migration to North America and Australasia, 1840-1928. But the Maltese population, with its slowness to establish stable communities in the major countries of immigration, and its experience of occasional bursts of prosperity when British strategic expenditure soared, missed this pull from abroad and simply continued to grow. By 1948 it had grown from the 100,000 of 1815 to well over 300,000 a density of nearly 2,500 per square mile; (admittedly some 10,000 or more of the total were British servicemen and their families, likely to be withdrawn should Britain evacuate the naval and air bases).

6. When Malta emerged from World War II, battered and war-torn, with her imperial mistress showing marked signs of disillusionment with imperial grandeur and with the costs of maintaining expensive strategic bases, attention again focussed on the population problem. In 1946 this looked more serious than ever. Not only was the death rate falling rapidly, from the 20 per thousand of 1937-9 to 13 per thousand (soon to fall below 10 per thousand), but the birth-rate was over 38 per thousand and showed no signs of falling; i.e. natural increase was at the unprecedentedly high level of 25 per thousand, or 2.5 %. The government of Malta thereupon decided that it was essential both to make a realistic estimate of optimum population and to achieve that optimum by large-scale emigration; little attention was at this time officially paid to reducing the birth-rate, as Malta's ardent loyalty to the Papacy led her officially to reject all artificial means of birth-control while her situation in the warm-blooded Mediterranean world led her to reject the Irish solution of late marriage (2).

7. Hence the official adoption of an optimum population of 250,000 or a little less, to be achieved in 10 years by an annual net emigration of 5 % half of which would counteract the natural increase of 2.5 % and half of which would reduce total population by 2.5 % per annum. Once total population had declined to the optimum, emigration could be reduced to 2.5 % per annum, to counterbalance natural increase and keep the population steady at 250,000 or less. In statistical terms and starting with the year 1950 — the year in which emigration got under way on a large scale — this policy meant achieving the targets set out in Table I below. The accumulated statistics appear in Diagram 1.

8. These target figures are based on the assumption that emigrants are, in terms of age, sex, fertility and mortality, a representative cross-section of total population, and that as total population is reduced by the excess of net emigration over natural increase, so natural increase will fall at the same rate as total population. In practice, non-refugee migrants are rarely a representative cross-section, normally being concentrated in the age-groups 15-34, i.e. the ages of relatively high fertility and low mortality. In a people such as Malta's, with a substantial natural increase, this means that natural increase falls faster than the rate of total population falls because, although mortality relatively rises a little with the departure of healthy young adults, fertility falls even faster because of the departure of persons of child-bearing ages. In practice, in Malta, women aged 15-34 (responsible for 80 % of births) made up 20 % or more of all emigrants and were losing by emigration nearly three times as much as other age-groups, 11.5 % compared with 4.5 % for the years 1962-5 (Males aged 15-34 lost even more, 27.7 % compared with 3.9 %). Assuming that emigrating women would have had the same fertility as those not emigrating, and allowing something for deaths, the result of this age selective emigration was that accumulated natural increase would have been 2,700 below target after 10 years and 3,900 after 20 years — see line marked 'natural increase, adjusted', on Diagram 1.

9. In the event, and somewhat to the surprise of Maltese clerical and political leaders, actual natural increase was well below even this adjusted line — see Table I and Diagram 1. Though the crude death rate continued to fall, from 12.8 per thousand in 1947 to 8.5 in 1955, thence to average about 9.0, the crude birth rate fell considerably more — from 38.8 in 1947 to 27.6 in 1957, to 16.7 in 1967, thence to average about 16.0. This fall, far greater than that arising from the age selectivity of emigration, was in fact the result of a substantial

TABLE I. - MALTA'S POPULATION TARGETS AND ACHIEVEMENTS.

Year	Total population(1)		Natural increase		Net migration(2)	
	Target (- 2.5 % p.a.)	Actual	Target (+ 2.5 % p.a.)	Actual	Target (- 5.0 % p.a.)	Actual
1950	312,000	312,000	7,800	7,057	- 15,600	- 8,221
1951	304,200	310,836	7,605	6,035	- 15,210	- 7,461
1952	296,595	309,410	7,415	5,861	- 14,830	- 4,583
1953	289,180	310,688	7,230	6,129	- 14,460	- 3,984
1954	281,950	312,833	7,049	5,920	- 14,098	-10,875
1955	274,901	307,878	6,873	5,877	- 13,746	- 8,146
1956	268,028	305,609	6,701	5,500	- 13,402	- 4,104
1957	261,327	307,005	6,533	5,839	- 13,066	- 1,614
1958	254,794	311,230	6,370	5,871	- 12,740	- 2,253
1959	248,424	314,848	6,211	5,663	- 12,421	- 2,800
Sub-Total			69,787	59,752	- 139,574	- 54,041
1960	248,424	317,711	6,211	5,746	- 6,211	- 3,459
1961	248,424	319,998	6,211	4,737	- 6,211	- 3,129
1962	248,424	321,606	6,211	4,673	- 6,211	- 3,116
1963	248,424	323,163	6,211	3,691	- 6,211	- 6,043
1964	248,424	320,811	6,211	3,638	- 6,211	- 8,492
1965	248,424	315,957	6,211	2,694	- 6,211	- 7,560
1966	248,424	311,091	6,211	2,475	- 6,211	- 4,147
1967	248,424	309,419	6,211	2,324	- 6,211	- 3,935
1968	248,424	307,808	6,211	2,262	- 6,211	- 2,649
1969	248,424	307,421	6,211	2,072	- 6,211	- 2,366
Total	248,424(3)	307,127(3)	131,897	94,064	- 201,684	- 98,937

Notes : (1) Actual Total population, starting with the estimate of 312,000 for 1950, is adjusted annually by recorded natural increase and net migration (of the local population) and is not adjusted to match the census totals (319,620 on 30/11/57 and 315,765 on 26/11/67) ; these are much affected by movements of British service families and, perhaps, some unrecorded re-migrants.

(2) Actual Net Migration is based not on total movement - again much affected by movement of British servicemen and their families - but on the long-term movement of local inhabitants.

(3) Totals for 1970.

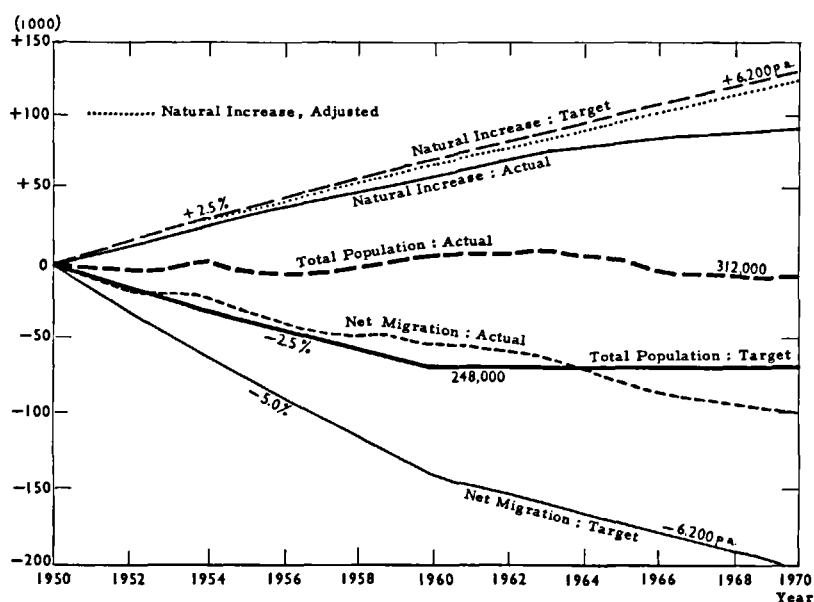


Diagram 1. - Malta 1950-1970. Accumulated Increases.

swing to birth control. In this way, by 1969, instead of having to reckon with an accumulated natural increase of 131,898 (at 2.5 %) Malta had only to reckon with 94,064, ie. in terms of population reduction she was 37,834 better off than expected.

10. On the other hand migration was much less successful than planned — see Table I and Diagram 1 — the accumulated total being only 54,041 by 1959, compared with a target of 139,574, and only 98,937 by 1969 compared with a target of 201,683 ; ie. 102,746 behind. There were several reasons for this. First, the success of large-scale emigration depends very much on the readiness of other countries to receive immigrants for permanent settlement. The government of Malta entered into negotiations with various countries and in 1948 concluded a formal migration agreement with Australia (then seeking immigrants for its large-scale immigration programme) whereby both countries contributed to passage costs and Australia agreed, directly or indirectly, to find the migrants jobs and accommodation. By 1950 migration from Malta to Australia was over 5,000 a year, slumped to less than 2,000 a year during the Australian recession 1952-3, picked up to 7,500 a year in 1954-5, dropped again to less than 2,000 a year when Australia imposed temporary restrictions on all southern Europeans in 1956, rose again to 5,500 a year when restrictions were removed in the mid sixties, but slumped again to less than 2,000 a year in the later sixties, this time mainly because of events in Malta. In all, Australia accepted nearly 70,000 Maltese settlers, 1947-71, about two-thirds of total Maltese emigration. The next most important countries were the United Kingdom, Canada and the United States ; variations occurred here also but on a much smaller scale. In short, Malta's policy of large-scale emigration has been very dependent on events in major countries of settlement and fell short of target partly because of occasional economic and political difficulties in those countries.

11. The second reason for migration falling short of target is that an official programme of large-scale emigration is not always easy to organize or finance. Having decided on its policy the government of Malta realized it would have to make considerable sums available for subsidizing passage and other migration costs, and for helping emigrants maintain families left behind ; in 1953 the British government agreed to cover two-thirds of these expenses. By mid 1955 Malta had spent £ 954,000 on emigration, the British government £ 651,000 and Australia £ 330,000. Then came several forceful criticisms, coming to a head under the new Labour government of Dom Mintoff, to the effect that the population reduction policy had arisen mainly from Britain's imperial views that Malta was analogous to a battleship — the population of which should be no more than necessary to make an effective fighting unit — rather than from a view that the Maltese were an independent people with a viable future based on industry, trade and tourism. A special economic Commission severely criticized the emigration policy on the grounds that it was not only exceedingly expensive but also sent abroad the island's most skilled, educated and productive citizens ; (3) they felt that the money would be better spent in developing local industry and trade and that skilled Maltese should stay at home to help in such developments. Partly as a result, pressure for emigration decreased and migration to all main countries of settlement declined for several years (see Table I).

12. After the resignation of the Mintoff government in 1958, and after various constitutional crises, Malta eventually reverted to the Nationalist government, achieving complete independence in 1964. The earlier population policy revived, negotiations were re-opened with major countries of settlement, and the government decided to enter I.C.E.M. (Intergovernmental Committee for European Migration), though this involved Malta in paying I.C.E.M. over \$ 1.2 million a year, 1964-5, towards that organization's operational expenses in moving some 16,000 migrants : payments to I.C.E.M. fell later when movement declined somewhat. In the late sixties, especially when the Labour government returned to office, migration was again pressed less strongly and again fell to less than 3,000 a year.

13. The third reason for emigration falling behind target lay in the character of the Maltese people themselves : no matter how well governments and multi-lateral institutions organize things the success of voluntary emigration programmes depends on the people themselves, on their willingness both to emigrate and stay permanently abroad once emigrating. In practice, even when the migration machinery was working at its best, net emigration never reached target (except in 1964-5 and then only because target, on the assumption that previous targets would have been achieved, came down from 12,400 to 6,200 a year — see Table I). Partly this was due to the reluctance of many families to leave their beloved "fior del mondo", as they called their rocky islands. Partly it was due to the return home of persons who had intended permanent settlement abroad and then changed their minds ; these averaged about 700 a year during the fifties but well over 1,000 a year during the sixties, making an accumulated return movement of more than 16,000 for the two decades ; ie. a return proportion of 15 % or so. Though this was very much less than the 85 % of nineteenth century emigration to Africa and the Levant, it was still substantial enough to make things appreciably more difficult for the population reduction policy (4).

14. At this point we may leave Malta, temporarily, to consider the other area under examination, the continent of *Australia*. This became part of the British Empire at much the same time as Malta but has had a



population history almost exactly the reverse. Founded as a series of convict prisons and strategic bases it was not until the 1820's that Australia was seriously considered by the imperial government as a place when transplanted Britons and Europeans might exploit unused natural resources and build a great new nation. From then onwards, however, population growth and economic development have been major themes in Australian history.

In sounding these themes, advocates of a great Australia have always stressed the importance of large-scale immigration as a major element in rapid population growth. With reason. Over the period 1788 to 1971, and excluding the Aborigines, the Australian population grew from nil to 12,640,000, 35 % by net migration and 65 % by natural increase, much of this last being due to new immigrants having children after arrival. A major difficulty, however, has been the 10,000 miles separating Australia from Britain and the great time and expense involved in transporting migrants across them, especially when compared with the much shorter distances and cheaper costs involved in migration across the Atlantic. Very early in their history, Australian governments adopted methods of overcoming this handicap, notably the use of public revenue (especially revenue from the sale of public land) to cover immigrant passage costs. Persons coming at public expense were known as "free" or "assisted" migrants, as distinct from "full fare" or "unassisted" migrants travelling at their own expense or at that of their friends and relatives. Over the whole period 1830-1971, Australian governments have accepted 5.3 million settlers, about 2.9 arriving with public assistance and 2.4 million coming on their own resources.

15. This immigration has not been uniformly steady or popular. During times of recession, as in the 1870's, 1890's, 1930's and early 1950's, there was much antagonism to further immigration, on the grounds that new arrivals would compete with established settlers for scarce jobs ; at such times official encouragement of immigration was either severely reduced or stopped altogether. In this sense immigration to Australia has been on the 'boa-constrictor' principle, periods of massive intake being followed by periods of digestion. Before 1947 migration upswings were twenty years or more apart : since 1947 they have been nearer 10 years apart, and it is on this 10 year cycle that the cyclical calculations to come have been based.

16. As the Australian population increased other motives for expansion appeared alongside simple desire for growth and development, notably a concern that the population should be large enough to defend the whole continent against invaders. This was very evident in the two large-scale immigration programmes of 1908-14 and 1919-28. It was even more evident in World War II. During this war, indeed, the relatively small Australian population of seven million was just about to be invaded by the Japanese army when the American fleet sank or diverted the Japanese transports at the battle of the Coral Sea. The fear arising in Australia was so profound that as early as 1944-45 the Labor government began to plan a programme of rapid post-war population growth. Other reasons were the historic wish for growth and development, the government's realization that during the 1930's the birth-rate had fallen so low (16.5 per thousand) that the number of young persons ready to enter the work-force in the late forties would be less than 10 years earlier, and the Labor Party's confidence, arising from its successful war-time administration of economic and man-power matters, that it could organize a programme of population growth without endangering employment. On its side the Liberal opposition had for long wanted rapid population expansion, to keep down the cost of labour and to ensure industrial development by constant enlargement of home markets. These factors all combined to produce a bi-partisan agreement, which lasted until 1971, to maintain a programme of population growth of the maximum possible size.

17. In assessing maximum possible size Arthur Calwell, the energetic Labor Minister for Immigration 1944-9 and a great admirer of the United States, invited a body of experts to examine, amongst other things the growth of the American population 1820-1920. This group concluded that the American experience showed that the optimum growth for a new country was 2 % a year and that Australia could and should aim at this figure. As natural increase was then about 1 % (birth-rate 21.0 per thousand and death rate 10.3 in 1944) this, they argued, accounted for 1 %, or half the desired increase, leaving the other half, another 1 %, to be found by migration. Here they did not draw any distinction between "1 %" as a half of the total population increase compounding at 2 % a year, "1 %" as compound interest rate based on the initial population, and "1 %" as 1 % of the previous years total population, whatever that happened to be. Their long-term policy statements implied the first ; in practice, year by year, they worked more on the last. Whatever they had in mind, however, the "1 % per annum" remained the official long-term migration target until 1972 : quietly forgotten when net intake exceeded 1 % and things seemed to be going well (as in 1949-51, 1955-6 and 1968-9), it always revived when large-scale immigration was under attack and pro-migrationists feared that there would be lasting cuts in the programme, as distinct from temporary lulls because of short-term difficulties in recruiting abroad or providing jobs in Australia.

18. As formulated in 1944-5 the population growth policy had several important demographic consequences, though these were not all realized at the time. First were the simple numerical increases involved, see Table II

TABLE II - AUSTRALIA'S POPULATION TARGETS AND ACHIEVEMENTS (000'S)

Year	Total		Natural Increase		Net migration	
	Target(1) (+ 2.0 % p.a.)	Actual(2)	Target (+ 2.0 % / 2)	Actual(3)	Target (+ 2.0 % / 2)	Actual
1945-6	7426.4	7426.4	74.3	83.9	74.3	- 9.8
1946-7	7575.0	7500.5	75.7	118.7	75.7	- 6.4
1947-8	7726.5	7612.8	77.3	101.6	77.3	29.4
1948-9	7881.0	7743.8	78.8	100.5	78.8	101.1
1949-0	8038.6	7945.4	80.4	112.4	80.4	161.5
1950-1	8199.4	8219.3	82.0	113.1	82.0	133.0
1951-2	8363.4	8465.4	83.6	114.5	83.6	102.9
1952-3	8530.7	8682.8	85.3	123.1	85.3	58.1
1953-4	8701.3	8864.0	87.0	120.3	87.0	53.1
1954-5	8875.3	9037.4	88.8	123.0	88.8	91.4
Sub-total			813.2	1111.1	813.2	714.3
1955-6	9052.8	9251.8	90.5	128.3	90.5	98.8
1956-7	9233.9	9479.0	92.3	129.6	92.3	86.4
1957-8	9418.5	9695.0	94.2	137.0	94.2	66.6
1958-9	9606.9	9898.5	96.1	138.0	96.1	77.2
1959-0	9799.0	10113.6	98.0	141.1	98.0	79.1
1960-1	9995.0	10333.9	100.0	149.8	100.0	85.2
1961-2	10194.9	10568.9	102.0	149.5	102.0	48.4
1962-3	10398.8	10766.8	104.0	142.7	104.0	69.7
1963-4	10606.8	10979.2	106.1	136.6	106.1	84.4
1964-5	10818.9	11200.2	108.2	125.4	108.2	100.6
Sub-total			991.4	1378.0	991.4	796.4
1965-6	11035.3	11426.2	110.4	124.9	110.4	92.4
1966-7	11256.0	11643.5	112.6	123.0	112.6	87.4
1967-8	11481.1	11853.8	114.8	127.3	114.8	93.4
1968-9	11710.8	12074.5	117.1	139.0	117.1	126.4
1969-0	11945.0	12339.9	119.4	142.9	119.4	112.6
1970-1	12183.9	12595.4	121.8	158.0	121.8	101.4
1971-2	12427.6	12854.7	124.3	161.8	124.3	41.7
Sub-total	12676.1(4)	13058.0(4)	820.4	976.9	820.4	655.3
Total			2625.0	3466.0	2625.0	2166.0

Notes : (1) Target and Actual Total are estimates back from 1947 census plus allowance for full-blood aborigines.  
 (2) Actual totals are not adjusted to fit with later censuses.  
 (3) Includes allowance for Aborigines before 1966-67.  
 (4) Totals for 1972-73.

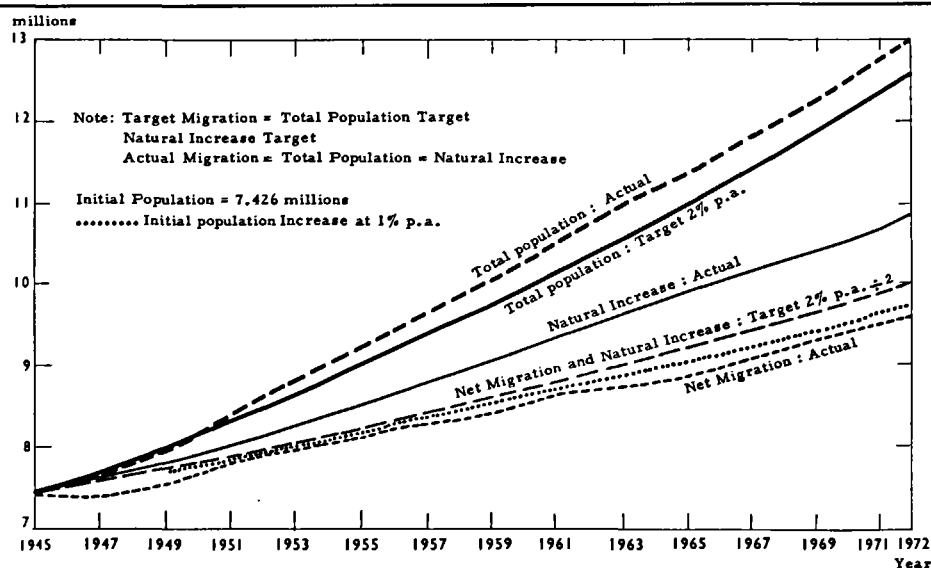


Diagram 2. - Australia 1945-1972, Accumulated Increases.

and Diagram 2. These show that target natural increase and net migration, both at half of a 2 % increase of total population per annum, rose from 74,265 in 1945-6 to 124,274 in 1971-2 ; a rise which might be quite reasonable for natural increase but involved a migration programme of steadily growing size and complexity when considering the efforts involved in bringing even 74,000 immigrants all the way from Europe to Australia and then finding jobs and accommodation for them. The strains imposed by this constantly increasing target were one reason why some planners later suggested a flat migration target of 100,000 a year : the government at once rejected this as it preferred the simple percentage target (5). In fact these planners were not so wide of the mark. The fact that Australia exceeded its immigration target five times in the first decade when target was averaging 81,000 or so a year, and only once in each of the second and third decades when targets were averaging 99,000 and 120,000 a year, suggests that the percentage target is not very realistic in the long run and that a flat target might well be more so.

19. The second demographic point lay in the assumption about natural increase. Though planners did not realize it, they were actually making the double assumption, not only that total population would continue a natural increase of half of 2 % per annum but also that the population of 1945 (the 'initial' population) would continue its 1944 natural increase of 1 % a year. There is, of course, a considerable difference between the two natural increase lines (see Diagram 2) as the latter does not contain any natural increase to the immigrant population. Moreover, the double assumption contains a further assumption – that the natural increase of the immigrant population must be the difference between the two lines, whether this difference is reasonable or not. Actually this hypothetical immigrant natural increase is not impossible in the short-run, though it grows steadily from 1 % in year 2 to 1.2 % in year 30 and, if the whole set of assumptions were presumed to continue indefinitely, would eventually become absurd.

20. In practice, total natural increase has been well over target (see Table II) averaging 1.38 % for the years 1945-62 and 1.16 % 1963-71. Until the early sixties this was due to both initial and immigrant populations maintaining a natural increase well over 1 %, primarily because the post-war 'baby boom' affected both populations and kept the birth-rate up at an average of 23.2 per thousand 1945-54 and 22.6 during 1955-61. After that the birth rate of the initial population came down somewhat and, were it not that the immigrant population maintained its earlier birth-rate, the rate for the total population would have fallen lower than the 20.3 it averaged 1961-68. Even so, this was well above the depression birth-rate of 16.5 and, with the death rate averaging less than 9.0 per thousand, ensured a continued natural increase of well over 1 %.

21. The third demographic matter of importance is re-migration. Although there had been considerable re-migration in the 1930's – at one point it had exceeded immigration – the planners of the mid forties for some reason left it quite out of account ; in their early statements they spoke as if gross immigration was identical with net migration and implied that, provided gross immigration reached 1 % of total population each year, Australia would be achieving its population target. In the early post-war years this confusion mattered little as re-migration was in fact very low ; largely because so many of the 1948-51 arrivals were refugees, with no homelands safely available for return, it averaged about 3 % of settler arrivals (I am here using the Australian terminology distinguishing those arriving for permanent settlement from long-term visitors ; the latter are persons intending to stay for a year or more, but not permanently, and who eventually nearly all re-migrate). From the recession of 1952-3 onwards, however, settler re-migration became steadily more important, in cumulative terms reaching 12 % by 1961, 14 % by 1966 and 18 % by 1972 ; which means that of the 2.95 million settlers arriving in Australia since 1947 over 530,000 had left permanently by mid 1972 ; and this is after deducting from loss those who changed their minds and came back to Australia to settle for a second time. Those cumulative proportions conceal the fact that, while earlier settlers had a departure rate of well below 18 %, more recent arrivals have had a rate considerably higher ; estimates for the settler arrivals of 1966-7 show that 23 % or so had already left, apparently permanently, by mid 1972.

22. This steady increase of settler loss reflects the changing character of world migration ; leaving aside refugee movements there seems to be, with cheaper air-travel and growing opportunity for skilled employment on a temporary basis, a greater tendency for migrants not to settle permanently but to stay a few years in one country and then go on somewhere else. All this makes a target of permanent settlers somewhat more difficult to achieve and was, quite naturally, not thought of by those formulating Australia's post-war population policy, especially as their eyes were more turned to the past.

Nor did the planners take account of the permanent loss of native Australians. Though not as massive as settler loss this has nevertheless been significant, totalling nearly 250,000 for the period 1947-72 and lately averaging 20,000 a year ; (these figures are based on the annual excess of departures over arrivals amongst native Australians, the steady accumulation of which each year, after allowing for time-lag, represents clear demographic loss).

The annual loss of at least 35,000 former settlers and 15,000 native Australians, a total of at least 50,000 in all, means that an immigration programme has to bring in 50,000 new settlers to counteract loss

before there can be any population growth from net migration. A target of 1 % of 13 million, as at mid 1972, means a net migration of 130,000 which when allowing for cover against 50,000 loss means a new settler intake of at least 180,000 a year ; this is quite a high figure and again helps explain why Australia's migration achievement has lately been below target.

23. The final point of interest is the fact that Australia's gain from post-war immigration has not been spread evenly over the years but, as previously indicated, has come in roughly ten year cycles ; see Table II for troughs of 1952-4, 1961-3 and 1971-3 (present indications are that the 1972-3 net migration will be as low as that of 1971-2). From the demographic viewpoint, the question is whether the effects of a cyclical intake on population growth will be the same as the effects of a steady annual intake, assuming that both have the same average. The answer is "It depends". Models show that a net migration, built up of rates which average 1 % but swing between 0.5 % and 1.5 % on a ten year cycle, will exceed a net migration of 1 % each year if the cycle begins half way up an upswing but will be less than a steady 1 % if the cycle begins half way down a downswing ; in between the cyclical gains are more or less often in excess of the steady 1 %.

24. This, however, oversimplifies the problem as it does not allow for the fact that migration upswings frequently have a different age-sex composition from migration down-swings. Australia's policy, for instance, has been to recruit a relatively high proportion of single male and female workers when conditions are booming and the economy is crying out for labour, but to cut single worker intake drastically in recession in favour of relatively more married couples and families. This has the economic advantage of increasing consumers more rapidly than workers, at times when the economy needs greater consumer demand and less worker output, but also has the political and administrative advantage of maintaining a sufficient flow of migrants to honour international agreements and keep the immigration machinery at work. But the effect on immigrant natural increase is to dampen down the cyclical forces as the number of immigrant wives of child-bearing age changes relatively little. One can only say, then, that if migration is being conducted on the Australian pattern population growth is little affected by the migration being steady or cyclical.

25. In terms of policy it is important to see the causes and results of these cycles. In part they arise from economic fluctuations in the Australian economy, leading governments to cut back intake in recession and expand it in prosperity ; the troughs of 1952-4, 1961-3 and 1971-3 are all associated with economic recession. Not that the government is the only party involved. It can and does exercise complete control over the two-thirds of total intake it has been bringing in since 1947 under one or other of the assisted passage schemes ; also, it can and does instruct its migration officers and consuls abroad to cut down the number of visas and entry permits granted to unassisted migrants. But in times of recession the number of persons wishing to migrate on their own resources falls rapidly, as does the number of persons, established in Australia, who are anxious to bring relatives to join them ; especially as these have to guarantee accomodation and jobs before the government will issue an entry permit. As in the 'freer' migration of the nineteenth century the system is still very largely self-regulating in economic terms ; government action in this sense is only doing what would be done anyway.

26. But the cycles also reflect happenings abroad. The relatively slow recovery of migration after the 1961 trough was in part due to the marked improvement of economic conditions in western Europe and the sharp drop in the number of Dutch and German families, and later Italian families, wishing to settle in Australia. Also involved was the refusal of the Italian government to re-new the migration agreement until Australia had agreed to put Italian immigrants on the same very favourable conditions as British immigrants. This very largely explains why in the mid sixties Australia greatly expanded her recruiting activities abroad, made migration agreements with countries formerly untouched, notably Yugoslavia and Turkey, and introduced new assisted passage schemes to cater for suitable migrants from North America and elsewhere. By the late sixties Australia was spending nearly \$ 40 million a year on assisted passage schemes and was the major user of ICEM services and major contributor to ICEM's operational budget. Though this very large effort has been periodically criticized, and may well slacken off under the new Labor government, it nevertheless reveals the determination with which most Australians have hitherto pursued the objective of a 1 % population growth by migration. That they have in fact achieved a 0.9 % migration is further evidence of their determination.

27. Having briefly outlined the migration policies and achievements of both Malta and Australia, we can now review the general situation. It is at once clear that, in matters of this kind, there is little scope for sophisticated demographic theories and model-building ; population and migration policies based on simple percentage increases or decreases can usually be demographically assessed quite adequately in terms of simple arithmetic. True, this simple tool sometimes reveals things that are buried deep in the policy assumptions and which the policy makers did not see, as instance the assumption in the Australian formulation that migrant natural increase would grow steadily away from the natural increase of the initial population. These, however, are relatively minor matters.

28. The main factors involved are not theoretical but political, social and administrative : the willingness of people to themselves emigrate or to accept immigrants, and the balance of economic and political forces at home or abroad. In fact, though policy-makers put their targets in precise percentage terms they are not really very concerned about achieving them exactly, or whether they achieve their ends as a steady flow or in ups and downs which average out somewhere near the mark in the long run. The targets are basically political targets, valuable to give some basis for rough planning and some solid foundation for political publicity and argument. Which is why the 1 % immigration target in Australia becomes most prominent when migration is under attack and the pro-migrationists feel their policies threatened ; when things go well the target sinks into the background. Pro-migrationists in Australia, in fact, appreciate being able to put the 1 % target into the background at times ; they well know that with uncertain conditions in countries of origin, and economic recession always round the corner, it is as well to grab the migrants while they are available, even if it means going well over target for a few years. Calwell, the Labor Minister for Immigration who adopted the 1 % target in 1944-5, and made it a constant part of his talk when selling migration to a somewhat suspicious working-class, suddenly dropped it in 1948 when he found the Displaced Persons available in large numbers, with free shipping provided ; migration in the 'refugee' years 1949-50 went over 2.0 % of total population, (see Table II). In short, it is the long-run average that interests the policy-makers, much more than the short-term target.

29. In Malta, there was less talk about the 5.0 % emigration target, partly because policy-makers realized that achievement was lagging so far behind (see Table I). Emigration targets are often more difficult to achieve than immigration targets, mainly because it is easier for a country of settlement to attract voluntary migrants than for a country of origin to force them out. Even more important, however, was the relative size of the two targets. Australia's 1 % immigration target was much more modest than Malta's 5 % emigration target, and even then was not often attained. Australia's achievement, in fact, was a net migration averaging + 0.9 % ; Malta's was - 1.6 % a year for the 20 years, a not inconsiderable achievement.

30. Here, then, we may leave this discussion of migration targets, simply noting the fact that these arise from, and are subsidiary to, political decisions about optimum population or optimum growth rates. Whether the Maltese authorities of the late forties really understood the wider demographic implications of selecting 250,000 as Malta's optimum, or whether the Australian authorities of the mid-forties clearly comprehended the full demographic implications of its decision that a 2 % growth rate was the optimum rate for Australia, involve other and deeper matters than those touched on this essay.

## REFERENCES

1. Much of what follows on Malta is derived from Charles Price, *Malta and the Maltese*, Melbourne, 1954.
2. Conversation between author and Malta's Department of Labour, 1951.
3. T. Balogh and Dudley Seers, *The Economic Problems of Malta*, Malta, 1955 (Interim Report) p.vi.
4. The return statistics here are considerably higher than Malta's official return statistics. My estimates are based on estimated returns to Malta from Australia, extrapolated to other countries of settlement, and make allowances for returns not recorded either abroad or in Malta, as when someone returns to Malta saying he is only coming back for a short visit (and is not therefore recorded as a returner) and then decides to stay.
5. See Report of Committee of Economic Enquiry, (the Vernon Committee) appointed 13/2/63, reported May, 1965, chaps. 4 and 17 and Appendix C.

# NON-FAMILY PLANNING APPROACHES TO ACHIEVING POPULATION CHANGE TARGETS

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## Introduction

1. This paper represents an examination of four issues ;

1. What is a population change target ?

2. What is a non-family planning approach to attaining a population change target ?

3. Is a non-family planning approach necessary ?

4. What are some of measures frequently recommended as non-family planning methods of attaining population change targets, and how feasible and effective are these ?

### What is a population change target ?

2. For the purposes of this paper, a population change target has been defined as an explicit and specified numerical rate of change in population size that a nation wishes to achieve as a whole. It is assumed that the society will seek to attain this target through deliberate actions by its polity. This does not preclude the possibility that the polity, acting in terms of its definition of the situation and its goals, will enunciate a target for the population with only minimal consultation with the public ; nor does it preclude the possibility that the target will be the existing rate of population change and that deliberate actions will be taken to maintain that rate.

3. Hence, we have either a numerical rate of change or some conceptual analogue, such as a stationary population or slow growth. Such targets may have a positive sign, a negative sign, or be equal to zero. Population change targets that involve zero population growth have yet to be formally adopted by a government, although there are vocal proponents of such a policy for the United States, as well as for the world's population, and it is clear that eventually the global population must have a zero rate of change. It is also apparent that the population change target may be a higher rate of population growth than currently exists. Historically, most population policies have been pronatalist, designed primarily to increase marital fertility and also to encourage more and earlier marriage (Glass, 1965:4-5). More recently, acting out of a concern over the decline in the birth rate, in 1966 the Romanian government repealed the 1957 law that had liberalized the conditions under which abortions could be obtained (David & Wright, 1971 ; and Tietze, 1969).

4. In the remainder of this paper, however, we will be concerned only with those population change targets that involve rates of population change that are lower than those that currently exist. I have used the term population change target instead of population growth target because such a target could be negative, although no society has yet adopted a target of negative population change for itself.

### What is a non-family planning approach to attaining a population change target ?

5. Change in population size occurs if, and only if, reproductive change (births minus deaths) combined with net migration (immigration minus emigration) do not sum to zero. When the sum is positive, growth occurs. When the sum is negative, the population decreases in size. Thus change in population size is the result of the interplay of four factors: fertility, mortality, immigration, and emigration.

6. The family planning approach to attaining a population change target is one that emphasizes the provision of contraceptive supplies, services, and education in the belief that the number of couples desiring to limit family size is sufficiently large, and the intensity of their belief sufficiently strong, to bring the birth rate

down to acceptable levels within a reasonable period of time (Ridker, 1969). As Bogue (1966 : 727) states : "The family planning programs now underway. . . place great emphasis upon the, "knowledge and service" theory : If you inform people about the methods and give them good service, a significant number will accept". Elsewhere, Davis (1967 : 731) notes that : "The family-planning approach to population limitation . . . concentrates on providing new and efficient contraceptives on a national basis under public health auspices".

7. Thus, the family planning approach to achieving population change targets is restrictive in the sense that it seeks to influence only one of the demographic components of change. Given the type of population change target considered in this paper, however, this restriction is not particularly dysfunctional because the choice lies between lowering the amount of reproductive change and/or increasing the amount of net emigration. On the national level, given the existing political barriers to international migration and the large numerical bases of many countries, altering the rate of net migration is not a long-term mechanism for reducing population growth. Although there are special populations, such as those of small islands, for which this has been an effective means of demographic response in the past, it simply is not an option available to most societies. Therefore, the amount of reproductive change must be reduced. This can be accomplished by lowering fertility and/or raising mortality. In most societies the latter is not morally acceptable, so the amount of reduction in reproductive change that must occur must be effected by reducing fertility by an amount that is sufficiently greater than any reductions in mortality that may occur.

8. However, there is a second, and more serious sense in which a family planning approach is restrictive ; and this is its concentration on only one of the mechanisms that can affect family size—the use of contraception (including rhythm and sterilization in most programs). Although some of these are not directly manipulable, overlooked or ignored are the eight other intermediate factors through which fertility may be affected : age at marriage, extent of nonmarriage, amount of time spent after or between marital unions, extent of involuntary abstinence, frequency of coition during periods of nonabstinence, extent of involuntary infecundity, extent of induced abortion, and extent of foetal mortality from involuntary causes (Davis & Blake, 1956).

9. Moreover, most family planning programs currently existing are unnecessarily narrow in practice because they do not utilize all available means of contraception (Davis, 1967 : 732), which greatly reduces their demographic effectiveness (Potter, 1971). Stycos (1962) has illustrated the extent to which privately-sponsored family planning programs have been restrictive in the variety of contraceptive methods offered to the program users. Specifically, these programs appear to have been directed "at" lower class females by middle and upper class women who have emphasized the maternal health aspects of spacing and number control. Actually, economic factors have been found to be much more important, than health of the mother in birth control motivation (Chandrasekaran, 1955 ; Green *et al.*, 1972 : 4 ; and Stycos 1962).

10. Almost all of the non-family planning methods of attaining a population change target that have been proposed imply changed contraceptive behavior as one of the principle intermediate variables through which changes in fertility are to be effected. The difference between family planning and non-family planning approaches is more subtle, being one of degree of dependence and emphasis. For instance, in his listing of measures "beyond family planning" that have been suggested as resulting in lower birth rates, Berelson (1969 : 3) includes lowering death rates, particularly those of infants and children, even further than current levels. In addition to its humanitarian value, this measure would weaken one of the institutional inducements for large families—the need for old age security combined with the absence of adequate provisions for this by the government and the presence of high infant and child mortality—that are present in many less developed countries (Heer and Smith 1967 ; May and Heer 1968 ; and Enke and Brown 1972). The principal intermediate variables through which this measure could result in lower fertility would be increased use of contraceptives, increased incidence of voluntary infecundity, and increased incidence of foetal mortality from voluntary causes—and two of these variables would be an integral part of any broadly perceived and administered family planning program. Thus, couples would eventually perceive that they need to have fewer live births than before to insure having X number of children survive to maturity, one sociocultural feature exerting a pronatalist influence upon the family would be weakened, and large numbers of live births would be less functional than before. In the presence of any sociocultural factors that exert an antinatalist influence upon couples, a smaller proportion of the population would desire a large family and this should result in relatively more persons attempting to have small or medium-sized families. Although there might also be an increase in the age at marriage because of less perceived pressures by parents and other relatives to marry early (if at all), the greatest proportion of any overall fertility reductions that might occur as a result of this measure would be attributable to a reduction in marital fertility, chiefly due to an increased use of contraceptives, sterilization, and induced abortion. However, decreasing infant mortality is considered a non-family planning method of reducing fertility because of its emphasis on the importance of changing family size desires and because it would not be necessary to establish a formal planning program (theoretically at least) in order to effect a reduction in family size through this measure.

11. Perhaps the biggest difference between family planning and non-family planning approaches to reducing fertility is the treatment accorded to desired family size. The family planning approach to reducing fertility levels is heavily biomedical in orientation, emphasizing delivery systems and the development of newer, more effective methods of contraception. It does not assume that it also may be necessary to change desired family size. Thus Gillespie (1965 : 8) describes the aim of the family planning campaign in Taiwan as : "to integrate, through education and information, the idea of family limitation within the existing attitudes, values, and goals of the people". Fertility is viewed as analogous to a disease that can be controlled by massive treatments with the proper vaccine (contraceptive). Indeed, a leading proponent of the family planning approach to reducing fertility levels has written :

"... the plague of high fertility is no more insuperable than was malaria or other infectious diseases that are now all but forgotten. The timetable for the eradication of runaway population growth is about the same as for the conquest of these other diseases". (Bogue, 1969 : 827).

In addition to ignoring the possibility that desired family size may have to be altered, a family planning approach to reducing fertility largely entails minimal changes in the institutional structure of the society—perhaps one of its more attractive features to members of the government and the ruling class.

12. On the other hand, a non-family planning approach to lowering fertility recognizes that family size often represents an adaptive response to persons' perceived sociocultural and environmental milieus (Carlsson, 1966 ; Chaplin, 1971 ; and Salaff, 1972). It is in this vein that Blake (1969 : 528) writes that "... population replacement would not occur at all were it not for the complex social organization and system of incentives that encourage mating, pregnancy, and the care, support, and rearing of children". Thus, a non-family planning approach to reducing family size emphasizes the importance of altering desired family size and attempts to accomplish this through changes in the institutional alignment and sociocultural milieu of the population.

Is a non-family planning approach necessary ?

13. A non-family planning approach to attaining many population change targets may be necessary because the family planning approach tends to produce a family size that is higher than that required for realization of that target. A family planning approach to reducing family size assumes that a significant proportion of the population has a desired family size that is smaller than their completed family size and that dramatic reductions in family size can be achieved by making contraceptive knowledge and methods freely accessible to all adult segments of the population. Thus, discussion of family planning programs focuses upon the right of parents to decide the number and spacing of the children they wish to produce (Hartley, 1972 : 317). In their treatment of the 'perfect contraceptive' population, Bumpass and Westoff (1970) describe a population in which couples can have the number of children they want, when they want them. Jaffe (1971) describes a program based on voluntarism because "it calls for public policies and programs to help give couples the opportunity to carry out their own fertility aspirations, not to tell them how many children they may or can have". The much heralded Universal Declaration of Human Rights (n. a. 1969), signed by U Thant and the heads of 30 nations, was essentially an expression of the right of couples not to have unwanted fertility, as was the first recommendation in a recent study by the National Academy of Sciences (1971 : 93). Thus, at most, family planning programs can reduce fertility only to desired family size.

14. Table I depicts the relationship between completed family size and population growth, given various constant other conditions. Under these assumed parameters, which are not atypical of those present in many less developed countries, attainment of an average completed family size of 3.5 children would result in an annual growth of 1.2 %. Attainment of a completed family size of 5.0 live births would result in an annual growth rate of 2.4 %. Thus the necessity of a non-family planning approach to the realization of population change targets cannot be assessed adequately without taking into account the level of change inherent in the target and the desired family size levels present in that society. Some levels of desired family size, if realized, are simply incompatible with the attainment of some population change targets.

15. An international listing of desired family size in the mid-1960's revealed that people in developing countries want more children than people in the industrialized countries, with averages varying from 2.0 to 3.5 in the latter and from 3.5 to 5.0 in the developing countries (Mauldin, 1965 :4-6). It is concluded that "... although it is not yet true that people in the developing countries share the small family ideal, it is true that most of them no longer want very large families. They want moderate families".

16. The validity of such responses, particularly in less economically developed contexts, is by no means certain. Hauser (1966) contends that KAP (knowledge, attitude toward, and practice of family size limitation techniques) have generally failed to include adequate efforts to study the reliability and validity of the data. Marino (1971) has conducted a critical examination of KAP survey methodology and, on the issue of



TABLE 1 – INTRINSIC RATES OF GROWTH AND YEARS IT WOULD TAKE THE POPULATION TO DOUBLE IN SIZE RESULTING FROM VARYING COMPLETED FAMILY SIZE UNDER CONDITIONS OF CONSTANT MORTALITY (a) AND MEAN LENGTH OF GENERATION (b)

Completed Family Size	Intrinsic Rate of Growth(d)	Doubling time(c)
0.5	– .056	–
1.0	– .032	–
1.5	– .017	–
2.0	– .007	–
2.5	.000	∞
3.0	.007	99.0
3.5	.012	57.8
4.0	.017	40.8
4.5	.021	33.0
5.0	.024	28.9
5.5	.028	24.8
6.0	.031	22.4
6.5	.034	20.4
7.0	.036	19.3

(a) Female life expectancy at birth is 58.7 and the probability of a female's surviving from birth to the mean age of childbearing is .821.

(b) Mean age of childbearing is 28.2.

(c)  $rt = 69.31$ , where  $r$  is the growth rate in percent per year and  $t$  is the time in years.

(d) It should be pointed out that the intrinsic rates of growth listed above are likely to be lower than those actually observed for three reasons. First, observed rates are partially the product of past demographic behavior which is reflected in the current age structure. Thus, almost every parent in the years between now and 1988 has already been born. In situations of decreasing fertility, the observed age structures tend to be younger than those associated with the proper stable population. Hence the observed rate of population growth would be higher than the intrinsic rate of growth. Second, these figures assume constant mortality. It is expected that less developed countries will continue, in the short run, to experience declines in mortality, particularly infant mortality. This will increase the probability of surviving the mean age of childbearing and therefore produce an intrinsic rate of growth higher than that computed in Table I. Finally, these computations assume a constant mean age of childbearing. As completed family size is reduced one may reasonably expect some reductions in the mean age of childbearing. Other things being equal, this would produce a somewhat larger intrinsic rate of growth.

reliability, writes : "If family size preferences in developing countries are indeed unstable . . . then one of the main arguments for family planning advocates, that women want fewer children than they have, is of dubious value because the women *themselves* are unsure of the number they want". Finally, Ridker (1969 : 281) has questioned the validity of responses to questions on desired family size elicited from persons living in less modernized countries.

"If properly interpreted, evidence from attitude surveys suggests that desired family size is not much below actual family size . . . 'effective desire'—that is, a level of desire sufficiently intense so that the average couple's behavior is capable of being influenced by the provision of supplies and information— is for a larger number than these numbers indicate".

17. Ridker uses three types of evidence to support his contention that measures of desired family size of the type reported by Mauldin (1965) for less developed countries are too low. First, persons tend to think in terms of an ideal sex composition when responding to questions of this type and, if this sex composition is not obtained, persons are likely to prefer a larger family size. Second, when parents indicate a desire for a number of children they normally mean a certain number surviving to adulthood and, in conditions of relatively high infant and child mortality, it may be necessary to have a larger number of live births. Finally, questions such as these are not capable of determining whether the intensity of expressed desires for a given family size is strong enough to influence their behavior. Hauser (1967) raises the question of intensity of attitudes and motivations, charging that KAP researchers have arrived at the conclusion that there is a market for family planning without producing evidence of purchasing power, i.e., a level of motivation sufficient to suffer the costs involved in attempting to control fertility. Marino (1971 : 43-44) also emphasizes the importance of motivation, charging that "... it is incorrect to assert, as the technologists do, that motivation and contraceptive technology are equally important. Motivation is clearly the dominant variable in the

question". Later, after a lengthy discussion of the results from numerous KAP surveys, he concludes (p. 62) that :

"...there may be as much evidence in KAP surveys to support the contention that motivation is minimal as there is to support the conclusion that it is widespread . . . the only other clear conclusion that can be drawn from this review of family planning research is that something is amiss with KAP methodology".

Even if accepted on face value, however, the measures of desired family size—if realized— that have been obtained in many countries are not compatible with the attainment of any but the most modest population change targets. Programs based upon the right of parents to decide the number and spacing of their children may be of greater humanitarian than demographic significance. There are two types of couples who do not have the number of children they desire to have. One type has more children than desired. This is called "excess fertility" and has been given extensive treatment in demographic and policy related literature. The conclusion drawn by many family planning researches is that excess fertility is prevalent in less modernized countries. The other type of couples not having the number of children they desire are those with a family size smaller than desired. This has been termed "deficit fertility" (Weller and Chi, 1972) and its existence has been largely ignored. Thus, there has been much publicity given to the demographic implications of eliminating excess fertility in the United States (Bumpass and Westoff, 1970), but there has been little recognition of the fact that two probability samples conducted in the United States (Whelpton, *et al.*, 1966 : 52-53 and Ryder and Westoff, 1971 : 74) reveal a larger proportion of wives reporting deficit fertility than reporting excess fertility. Nor is this unique to the United States, as Davis (1967 : 732) reports that people have fewer children than they would like to have in industrial countries.

18. There are two types of deficit fertility couples — those who cannot have as many children as they desire because they are involuntarily sterile or subfecund and those who, for various reasons, are voluntarily limiting their family size to a level lower than they would desire it to be. The extent to which deficit fertility is voluntary as opposed to involuntary is not known, but it is clear that the occurrence of deficit fertility causes some problems for those who are justifying family planning programs on the basis of their potential demographic effects *and* because they will enable couples to have the number of children they desire. (cf. Tabbarah 1964). The demographic effectiveness of a family planning approach to lowering fertility would be maximized if excess fertility were reduced or eliminated and deficit fertility allowed to persist. Otherwise one would be substituting births that are currently prevented — either voluntarily or involuntarily — for births that would be prevented by the family planning programs. Yet this departs from the principle that each couple should be able to have the number of children they want when they want them. One could justify research to help couples conceive (and thus reduce the incidence of involuntary deficit fertility) on the grounds that this is proper basic research with much knowledge and skills involved that are transferable to contraceptive applications. However, deficit fertility may be a largely voluntary matter (cf. Weller and Chi, 1972), and a family planning program cannot help these couples achieve their fertility desires. Perhaps, more important, however, is the issue of whether the same officials recommending family planning programs on the basis of some universal "right" to have the number of children desired, and only that number, would be supportive of eliminating deficit as well as excess fertility.

19. This raises another issue in dealing with population change targets, and that is the extent to which approaches to achieving them should be voluntaristic. Family planning programs are justified on the basis of their voluntaristic orientation and certainly represent one end of the continuum ranking measures in terms of voluntarism, the other being represented by what Djerassi (1970) has termed "Orwellian" methods of fertility control. As Hartley (1972 : 317) notes, the increased acceptance of family planning by national leaders and by individual families may still be accompanied by continuous population growth. Davis (1967 : 732) has reached the same conclusion :

"There is no reason to expect that millions of decisions about family size made by couples in their own interest will automatically control population for the benefit of society".

20. As noted later, however, this issue is not unique to the demographic effectiveness of family planning programs as means to attaining population change targets but applies to all measures that emphasize voluntarism as a basic principle. Hardin (1968) has observed that in the case of population it is not true that each individual intent on his own gain will promote the public interest. The administrator as well as the program designer may have to realize that measures to reduce fertility significantly below current levels in many countries may also have to incorporate the principles of persuasion and explore means of motivating people to behave in a manner consistent with attaining the population change target.

21. A final type of reasoning that leads to the conclusion that it is improbable that the family planning approach — by itself — is sufficient for the realization of most population change targets is twofold. First is

the historical observation that fertility has been reduced in the absence of formal family planning programs. Indeed, such declines often occurred despite pronatalist pressures exerted by the polity (Davis, 1967 ; and Goldscheider, 1971). Thus, Kirk (1967 : 49) writes :

“The European population learned to limit family size, but the process was gradual and stemmed from private decisions made *in spite of* restrictive legislation, religious opposition (Protestant as well as Catholic), and public denunciation of birth control practices in what was generally a ‘conspiracy of silence’ on sexual matters and human reproduction. The prevailing middle-class morality prevented free public discussion, and public authorities harassed militant fringe groups that advocated birth control”.

Moreover, secular declines in fertility have occurred only in the presence of societal modernization (Weller and Sly, 1969). Even today, those countries in which fertility is known, or surmised, to be falling are also modernizing (Nortman, 1972a : 3). Second, there is considerable evidence to suggest that many persons practice family planning regularly only after they have already had a relatively large number of children (Germaine, 1972 ; and Nortman, 1972b).

22. In summary, non-family planning approaches to achieving population change targets are needed because there is no assurance that a family planning approach will have sufficient demographic impact. At most the family planning program can reduce family size only to the same level as desired family size. In most countries this level is too high to be compatible with the full realization of the targets that may be adopted. This can be estimated mathematically, however, and in situations in which it is clear that desired family size is too high to result in attaining the population change target there should be measures taken that attempt to reduce desired family size and that recognize the importance of motivation in limiting family size as well as the more purely technological and biomedical aspects contained in family planning programs. Some of these measures most frequently suggested in the literature are discussed – often critically – in the following section.

What are some measures frequently proposed as non-family planning methods of attaining population change targets ?

23. The number of non-family planning methods of attaining population change targets is so large that a systematic discussion of each would be impossible within the context of the present paper. The point was made earlier that the appropriate type of measures will depend partially upon the target and the level of growth implicit in the target as well as the level of growth that already exists. This paper has been concerned with population change targets that are a specified numerical rate of growth lower than the one currently existing in a national population, and it has been argued that in general such targets should be attained by reductions in family size. Berelson (1969) has already compiled an inventory of non-family planning methods of possibly reducing family size, along with a brief discussion of them in terms of scientific, medical and technological readiness, political viability, administrative feasibility, economic capability, moral, ethical and philosophical acceptability, and presumed effectiveness. Rather than attempt to duplicate such an effort, I have chosen to single out several methods frequently proposed as resulting in reduced family size and to discuss these in terms of probable demographic effectiveness and their feasibility. I have further confined myself to voluntaristic approaches to reducing family size and have – with one exception – concentrated on measures that would involve changes in desired family size.

### *Abortion.*

24. Liberalizing any restrictive abortion laws that may exist and placing abortion within a medically supervised context would probably result in reduced family size in most countries. This would also be of humanitarian and social value, for induced abortion tends to be widespread – whether legalized or not – and persons obtaining illegal abortions tend to experience much higher mortality and morbidity risks than those undergoing legal abortions. As for demographic effectiveness, in most countries where a change in abortion laws has occurred there has been a corresponding change in the birth rate, and most writers have drawn the conclusion that a change in abortion laws is a causal factor in changes in fertility levels (United Nations, 1972 : 42-43 ; and Ross, *et al.*, 1972 : 33). (Cf. David and Wright, 1971 for an illustrative discussion of the Romanian experience). An even stronger statement of the role of abortion as a means of regulating family size is the hypothesis that few, if any, populations have achieved the transition from high to low fertility without significant recourse to induced abortion (Potter, 1972 ; Davis, 1963 ; and Speidel, *et al.*, 1971).

At the present time, liberal grounds for legal abortion exist in only a few countries of the world, mainly in the Scandinavian countries, Japan, the United Kingdom, the USSR, most Eastern European countries, and, very recently, in Singapore and a few states of the United States. Few less developed countries include induced abortion among the approved methods of fertility control, and even then only for extremely restrictive therapeutic reasons (United Nations, 1972 : 41-42, 101).

25. The magnitude of any reduction in fertility that would result from the legalization and liberalization of abortion would be dependent upon several factors. Abortion could prevent births among those women who experience contraceptive failures or who find the available contraceptive methods unsuitable (for whatever reason) for regular use. Thus, to the extent that a population has access to *and* regularly uses very efficient contraceptive methods, the impact upon family size of changed abortion laws would be reduced. This is further the case in that, in the absence of induced abortion, not all conceptions result in a live birth and the number of live births averted per operation is a positive function of "the frequency and calibre of accompanying contraception" (cf. Potter, 1972). Moreover, to some extent legal abortions are often substitutes for abortions that would have been obtained (illegally) anyway. To the extent that such a substitution effect occurs the impact of liberalized abortion laws upon family size will be minimal.

26. Like its counterpart — establishing widespread family planning programs — this writer does not see any way in which liberalizing abortion laws would directly result in a lowering of desired family size or would increase a person's motivational level toward limiting family size. It would remove an obstacle to the limitation of family size, but by itself this measure is at best capable of reducing family size to a level coincident with desired family size, and there is no assurance — as pointed out earlier — that this will be compatible with the level of completed family size required for realization of the population change target. Desired family size perhaps could be reduced indirectly because of a contextual effect. Thus, any reduction in family size that occurs because of the prevention of unwanted births may be conducive to the development of an atmosphere in which individual members come to think a smaller family is ideal, or at least normal. Moreover, increased access to abortion may affect population change rates by reducing the incidence of early marriages. Liberalizing abortion legislation is mentioned in this paper because it does have some demonstrable demographic impact and because it is outside the scope of almost all national family planning programs. Indeed, many family planning programs are justified on the somewhat moralistic grounds that they *reduce* the incidence of induced abortion (Davis, 1967 : 732 ; and United Nations, 1964 : 30). It is in this sense that legalizing abortion and liberalizing the conditions under which an abortion may be obtained are proposed as a non-family planning method of attaining a population change target.

27. It is not seen as a substitute for family planning programs but rather as an extension, another means of broadening the base of these programs away from the current emphasis on a limited number of contraceptive techniques, e.g., those endorsed by the dominant religious group or socioeconomic clique. It is obvious that liberalized abortion — by itself — would have almost identical limitations to those inherent in current family planning programs with respect to attaining population change targets. When desired family size is low enough to be compatible with the completed family size implied by the population change target, there is no demographic reason that a broadly administered family planning approach — combined with freely available access to induced abortion in a medically supervised and safe context — would be insufficient for the realization of that target. At the same time, when desired family size is higher than necessary for realization of the target, liberalizing abortion laws — like family planning — will be a first step only.

Therefore, in the remainder of this section the emphasis will be upon measures that imply changes in desired family size.

### *Modernization*

28. Perhaps the surest non-family planning method of reducing family size in order to facilitate attainment of a population change target is societal modernization. Some scholars have taken the stance that modernization is a necessary condition for long-term declines in family size (Ovsienko, 1966). Goldscheider (1971 : 153) lists three prerequisites for reductions in family size : 1) structural separation of family from economic roles ; 2) increase in the living standard to some point where family size conflicts with rising aspirations, perhaps where a feeling of relative deprivation is engendered (see Davis 1963 for a detailed treatment of the importance of this factor) ; and 3) minimal roles of alternative responses (particularly out-migration) to demographic pressures in lieu of family size reduction.

29. This view of societal modernization as a necessary condition for long-term reductions in family size is supported by Nortman (1972 a : 3), who points out that those countries in which fertility is known, or surmised, to be falling are also modernizing, and by Weller and Sly (1969), who conduct a temporal analysis of data from 14 countries covering the interval from 1929 through 1967.

At the same time, societal modernization may not be a sufficient condition for reductions in family size. A case in point is Mexico. By 1964 per capita energy consumption (an indicator of modernization) had increased to a level that was 3.5 times as great as the 1929 level, yet the crude birth rate only declined from 49.4 to 44.8 (or by 9.3 %) during this interval (Weller and Sly, 1969 : 322-324).

Other things being equal, the short-term effect of modernization certainly is to increase actual family size (Heer, 1966). As modernization occurs, better health conditions increase the probability that a woman

will conceive and retain the fetus to term, lowered mortality raises the proportion of persons who survive to the age of reproduction and reduces the probability of widowhood during the reproductive years, and the incidence of infecundity-producing diseases, e.g., venereal disease, may be reduced as well as the intensity of taboos on coition during lactation (Davis, 1967 : 734 ; Bourgeois-Pichat, 1967 ; and Bondestam, 1972 : 43-48).

30. Thus, although societal modernization appears to be a necessary condition for the occurrence of reductions in family size, it apparently is not a sufficient condition – at least in the short run. This means that we should not depend solely upon modernization to lower family size. Moreover, one could scarcely recommend “modernization” to a nation as a preferred non-family planning method of achieving its population change target, for most countries that are attempting to reduce rates of population growth are doing so in the belief that this will facilitate the occurrence of economic growth (Nortman, 1972a : 5-6).

### *Payments For Not Having Children*

31. One frequently recommended measure involves payments for periods of non-pregnancy or non-birth (Berelson, 1969 : 2). One of the largest drawbacks to this approach is the substantial amount of capital involved. For instance, Balfour (1962) proposed providing national savings certificates to married women in the reproductive ages who remain non-pregnant for three, four, five, or more years at the rate of \$3 – \$5 per year. Quite apart from the fact that this particular sum is many times too low to influence the reproductive behavior of inhabitants of relatively modernized countries, this plan would cost about \$200 per year per 1000 population. This amounts to \$20,000,000 per 100 million population. This cost would be offset by the savings that would result from each prevented birth (cf. Enke, 1966) and the need for initial capital outlay could be reduced by deferring payments at 4-5 years. Moreover, most of this money would subsequently be recirculated in the economy. Morally, this approach seems preferable to one featuring “disincentives” – that is, various financial penalties for giving birth or for having a family size that is larger than the government has defined as appropriate given the existing population change target. This is because the financial rewards for not having children can be used to improve the social and economic situation of the parents as well as any children that may already exist, whereas disincentives would unjustly punish the offspring as well as the parents. However, the demographic effectiveness of the payments approach has not been demonstrated, and a country would be unwise to base its program of population control upon this one method. But it might be useful to consider this measure as one of many which a government would undertake – at least provisionally – in an effort to reduce rates of population growth.

### *Increased Female Labor Force Participation.*

32. Persons conducting research in industrialized settings have consistently observed that women in the labor force have less children than women not in the labor force. Although this is partially attributable to the self-selection of subfecund and sterile women into the labor force, it is primarily due to more regular and effective contraceptive practice on the part of working women (Freedman, 1962 : 223 ; Ridley, 1959 ; and Weller, 1969). Combined with numerous cross-sectional aggregative analyses depicting a negative correlation between an area's rate of female labor force participation and its fertility rate (cf. Weller, 1971), these findings have led numerous persons to suggest that one method of lowering fertility, particularly in the less developed countries, would be to increase rates of female labor force participation (Collver, 1968 : 60 ; Collver and Langlois, 1962 : 367 ; A. Jaffe, 1959 : 13 ; Kasarda, 1971 : 314-315 ; Kupinsky, 1971 : 365 ; and National Academy of Sciences, 1971 : 85).

33. There are several reasons one would expect labor force participation and family size to be negatively associated. To the extent that it is remunerative, foregoing employment to bear and raise children represents certain definite opportunity costs which the family may not be willing to pay. Moreover, there is the physical and emotional strain of performing adequately in the wife, mother and worker roles, and this may motivate the woman to curtail her family size in order to work. Female labor force participation is associated with a later age at marriage, and this may foster the development by the woman of role perceptions that are incompatible with large families. Moreover, marital employment outside the home is associated with more egalitarian patterns of family interaction and decision-making, which may also result in a lower family size. Finally, by removing the woman from her home and the immediate circle of friends and relatives, employment outside the home increases her number of interpersonal contacts and thereby increases the likelihood of her obtaining information on various methods of preventing births (Weller, 1969 and 1971) and also of her thinking of herself as an individual apart from her familial roles.

34. Nevertheless, there are several reasons why this is probably not an effective means of reducing family size, at least in the less modernized countries. Quite aside from the political problems involved in increasing rates of female employment in economies that are already characterized by high rates of male unemployment and

underemployment, and in which there is difficulty in maintaining present capital-worker ratios because of a rapidly expanding labor force produced by rapid population growth, the demographic effectiveness of this measure is questionable.

First, research conducted in less developed countries has generally revealed the negative association between labor force participation and family size to be either absent or perceptibly weaker than in industrialized settings (Weller, 1971). The context in which female labor force participation occurs in less developed settings, and the demographic effects of this participation, tend to be quite different than in a more modernized setting. The locale of the employment, the occupational and industrial structure of the female labor force, the ease of child-care arrangements, and the whole milieu surrounding the woman's employment are such that it is easier to combine gainful employment with motherhood, and the opportunity costs involved in interrupting employment to bear children tend to be minimal because of the low levels of remuneration and the ease with which a similar position may be found with no loss of mobility potential (which tends to be practically nonexistent).

35. Second, most of the evidence cited to support this recommendation is cross-sectional. Longitudinal studies have been rare, and the few that have been performed generally have failed to support the notion that increases in female labor force participation will result in (or are even associated with) decreases in fertility. It is clear that the longitudinal studies are the more appropriate tests of the hypothesis, and these have generally been nonsupportive (Weller, 1973 contains a more detailed treatment of this issue). Thus, it appears that increasing rates of female labor force participation is not a feasible method of reducing family size.

### *Population Education*

36. Another measure frequently discussed in the context of non-family planning methods of attaining a specific population change target is population education (Davis, 1967 ; Simmons, 1970 ; and Wayland, 1966). There is no clear and generally accepted definition of population education (Viederman, 1972a : 342). Viederman (p. 337) offers perhaps the broadest definition :

"Population education is defined as the process by which the student investigates the nature and meaning of population processes, population characteristics, the causes of population change, and the consequences of these processes, characteristics, and changes for himself, his family, his society, and the world".

Similar definitions may be found in Population Reference Bureau (1970 : 18) and L. Davis (1972), and it is in this sense that the term population education is used in this paper.

37. Although there can be little doubt that demographic factors are intertwined with many aspects of our lives and that school curricula are generally incomplete by virtue of completely disregarding these inter-relationships (a point made 11 years ago by Hauser, 1962), the real question is whether population education is a feasible and effective means of attaining a population change target of the type being discussed in this paper — some rate of growth lower than that which currently exists.

38. There are several features that would seem conducive to the achievement of such an objective. First, and perhaps foremost, is its potential to change desired family size by reaching the young and by influencing motivational levels. A great deal of demographic behavior is the result of socialization. Attitudes toward a desirable family size are formed at a fairly young age — before adolescence (Gustavus and Nam, 1970). Thus, a program of population education could reach persons before their attitudes toward family size are completely formed and influence them in the direction appropriate for the attainment of the population change target. At the present time, this age group is not reached by a formal program of population education.

"The population community has spent most of its energy talking to people who have already formed or begun to form their families — not to children whose ideas about family size, crowding and population growth are still very much in flux".

(Population Reference Bureau, 1970 : 12).

This approach has the additional advantage that a delivery vehicle — the educational system — already exists. Moreover, knowledge is viewed as being inherently valuable in most societies. Finally, if effective, this approach could be used to increase — when deemed appropriate — rates of population growth as well as to decrease them. Thus, it is more flexible than many of the other measures discussed in the literature.

39. However, there are numerous reasons why we should not place our faith in population education to the same extent to which some have blindly placed their faith in family planning as *the* method of reducing family size. First, we need empirical evidence that population education can result in an alteration in rates of

population growth, and at the present time no such evidence exists (Seltzer and Horsley, 1972 : 23). Obtaining such proof requires a considerable amount of experimentation, financial expenditure, manpower, and — above all — time.

40. As Simmons (1970) points out, there are four basic educational approaches — sex education, education for family living, population awareness, and basic value orientation. Given the definition of population education used in this paper, the third would seem most appropriate. The first two are too narrow in potential scope. For instance, it would be difficult to include a treatment of the causes and consequences of internal migration in a program of sex or family living education. The fourth approach has shortcomings of a different nature. One is the probable necessity of an extremely indirect approach, given the present dominant orientation of school administrators and parents.

“A direct approach to changing basic value orientations is not likely to be effective, and may even mobilize resistance to whatever else the agent of change may be attempting to do. Consequently, educational programs should not be developed which would directly confront, much less attack, a society’s basic value orientations”. (Simmons, 1970 : 3).

Moreover, teachers have also been socialized in the society and many will hold values and attitudes that reinforce the pronatalist structure (Russo, 1972 : 358). A final objection that may be raised to the changes in basic orientation approach is its potentially indoctrinary nature. On the other hand, some argue that students are already being indoctrinated in respect to other items of importance to the society.

41. Actually, the issue of whether population education should be one-sided or multisided in its approach to demographic behavior has yet to be resolved satisfactorily. Will the most effective program (from a demographic point of view) be one that is propagandistic (Stop at Two ! ) or will it be one that is value-fair, i.e., one in which the opportunities for evaluating theories and for exploring values and their consequences are provided and encouraged (Viederman, 1972b : 35) ? Massialas (1972a : 353) articulates this latter position when he states that the idea of population control is antithetical to what we consider to be the proper role of the classroom teacher because it implies that the teacher seeks to indoctrinate children and youth into accepting the idea of limiting the size of the population without presenting them with the opportunity to inquire into other meaningful alternatives and the grounds upon which they are based. (Also see Viederman, 1972 a : 337).

To the government administrator, however, the value-fair approach may seem contradictory, and such deliberations may seem unnecessarily time-consuming and fraught with the danger that the “proper” decisions may not be reached.

42. A third type of decision that must be made about population education is the most effective manner in which to introduce it into the formal school curriculum. Massialas (1972b) has identified three distinct modes of introduction. One is the program infusion approach, which seeks to supplement and strengthen the existing curriculum with regard to its treatment of population matters. A second mode of introduction involves the unit of study approach. This is not directly connected with other, traditional topics but is presented within the general context of a curricular content area, e.g., social studies. Finally, there is the separate course mode of introducing population into the school curriculum. If this approach is adopted, there is the additional decision that must be made concerning the disciplinary location of the course. Should it be multidisciplinary ? Should it be located within the biological sciences or within social studies ?

43. These are issues that cannot be definitely resolved at the present time on the basis of past experience. This means that we must proceed with population education without the secure knowledge that we are proceeding properly. This will necessarily entail false starts, misdirection, and inefficiency ; and this makes it imperative that population education programs be constantly evaluated to determine their effectiveness (Nam, 1972).

44. In addition to these essentially programmatic questions about population education, there are several factors that should temper our enthusiasm for population education as a measure for attaining population change targets. One is the time lag involved and the extent to which this reduces the capacity of the society to adjust its responses to changing conditions promptly and with minimal slippage. Also, quite apart from the manpower and financial problems that are involved in introducing population education into the formal school system, there is the problem of reaching persons who are not regularly exposed to the school system. In less developed countries this poses a real problem that can be solved only by setting up a parallel delivery system. Perhaps more basic, however, is that personal and societal goals do not necessarily overlap. Indeed, if they did then the entire issue of non-family planning methods of attaining population change targets would be quite academic. As Pohlman and Rao (1969) state :

“A mass of research shows that people will not plan individual family size for national good. . . Population education, as we have defined it, includes also the meaning of larger or smaller families, and later or

earlier marriages, to the *individual*. 'If you marry too soon, these are the things that will happen to you ! ' 'If you have too many children, here are the effects on you ! ' "

Yet knowledge in this area is largely incomplete. Arguments in favor of a given population change target are necessarily aggregative in character, for population change rates are aggregative rather than individual phenomena. Hence a great deal more basic research is needed that examines the relationship between population growth and the social, mental, economic well-being of individuals and families.

45. Perhaps the final potential drawback to population education as a device for attaining population change targets is its indirect nature. For instance, if the population awareness orientation is adopted, then awareness of the consequences of current demographic behavior must lead to changes in attitudes which must lead to changes in actual behavior in a manner appropriate to the attainment of the target.

46. The preceding is not written to suggest that population education is not an effective method of altering demographic behavior and thereby attaining population change targets. On the contrary, it seems to have some merit — particularly its potential to reach the young and to alter existing levels of motivation. However, optimism should be liberally tempered with the realization that this method *may* not work. It would be unwise to place a great deal of reliance upon this method until there is empirical evidence that one should. Acquiring such evidence will require repeated trials and experimentation.

### Concluding comments.

47. This paper has been concerned with only one type of population change targets — those that involve a rate of population growth at some specific level that is lower than the rate of population growth that currently exists. In general, attaining these involves some reduction in desired family size and motivation to have children. Not to recognize this is to fail to recognize the magnitude of the behavioral changes that must take place before we can properly speak of population control.

For most population change targets, family planning programs are not enough and desired family size must be changed. That is readily apparent. I have not optimistically described any magical methods through which this can be done, for in my search of the literature I encountered none. However, to interpret this as a pessimistic report would be misleading.

If one poses the question : "What are the principal non-family planning methods by which family size can be reduced ? " the honest demographer must reply "I don't really know, but here are some ideas. . .".

This means that non-family planning measures of affecting family size should be tried on a provisional basis, with as much experimentation and research built into the programs as possible. It also means that there must be a constant assessment of their effectiveness (real or otherwise) as well as a realization that these particular methods may not be as effective as hoped. Given this, perhaps governments would be wise to introduce several measures instead of relying exclusively upon one approach. Non-family planning measures that are adopted should be viewed as complementary to each other as well as to family planning, and there should be a willingness to consider new approaches if it becomes apparent that those already adopted are not successful.

Finally, it should be realized that demographic behavior does not occur in a vacuum. Rather, it both affects and is affected by numerous factors. As Davis (1963 : 345) notes :

"The process of demographic change and response is not only continuous but also reflexive and behavioral — reflexive in the sense that a change in one component is eventually altered by the change it has induced in other components ; behavioral in the sense that the process involves human decisions in the pursuit of goals with varying means and conditions".

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# FINAL REPORT BY THE GENERAL RAPPORTEUR

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1. This report on the Seminar on Demographic Research in Relation to Population Growth Targets is a summary of the main issues addressed by the conference, set in a more or less coherent context (1). While not a point-by-point account of the deliberations, it follows roughly the outline of the sessions.

Two themes recurred frequently in the discussions in various guises and can be considered to lie at the heart of the subject of the Seminar, although not referring explicitly to population targets. First was the broad area of externalities or spillover effects, whether between individuals within a family, between families within a community, between communities within a nation, or between nations. The conceptualization derives from economic theory, but can plausibly be given a much wider interpretation as well as being readily rephrased in the languages of other disciplines. It presents the basis for a valuable framework for the analysis of public policy. The second underlying theme of the conference was the distinction between the technical and the political. At many points the discussion concerned the contrast between policy construction based on demographic, social, economic or environmental arguments, leading to statements of what is desirable – or even optimal – on the one hand; and what in fact goes on in the real world of planning and policy making, on the other hand. In the second of these realms, what may be optimal is often irrelevant.

2. An important objective of the Seminar was to elicit research suggestions in the area of population growth targets. The list of topics appended to this report represents high priority research needs in the judgment of participants. The individual items noted there should be seen in relation to the issues reviewed more fully in the body of the report.

## Concept of "Population Growth Targets".

3. To maintain consistency with usage in other areas of planning, it is useful to distinguish "objectives" and "targets". The former are broad expressions of aim, such as to maximize average levels of welfare or to reduce mortality as rapidly as possible. They may or may not consist of a formal criterion function. The latter refer to more or less precise quantitative statements of goals that it is hoped to attain – although data problems may hinder or prevent later ascertainment of whether they have been attained. Examples of targets in this sense would be a 6 percent annual growth in GNP, a reduction of 25 percent in total fertility over ten years, zero population growth by the year 2000, etc. It was argued that nonnumerical statements of goals could also constitute targets. Often targets would be established through a process of optimization applied to some formal objective criterion. Both targets and objectives have important roles in planning and policy making.

4. To set up targets in any responsible manner presupposes some minimum level of knowledge of the situation. In the area of population, this knowledge should include both data on current demographic behaviour and on the available means of modifying this behaviour in the direction of the target. It is unreasonable and unnecessary to expect very complete data (2), such as an annual index of fertility in selecting a birth rate target, since one important purpose of setting a target is symbolic – to strengthen motivation or initiate thinking in new directions. In addition, the action of setting a target may help to generate the data needed to evaluate actual performance. Nevertheless, sufficient information should be available to enable a judgement as to the *feasibility* of the target, if only because credibility is rapidly lost if performance habitually falls short of targets.

5. An important practical difficulty with the concept of population growth targets is the remoteness of goals expressed in terms of most demographic measures from the day-to-day concerns of policy-makers. A particular

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(1) The document was prepared by the General Rapporteur, Dr. Geoffrey McNicoll, with the assistance of the individual reports by session rapporteurs.

(2) See Appendix : Recommendation for Research N° 1.

population ceiling or a specified reduction in the growth rate may have important implications for living conditions or other aspects of social welfare, but unless stated and justified in terms of such factors there would be little inclination to adopt these demographic targets. In general, the lack of information on the benefits and costs of intervening in demographic behaviour provides a convincing rationale for budget-minded governments not to concern themselves with population targets.

#### Types of Population Targets : Levels versus Rates.

6. An initial categorization of possible targets put to the Seminar distinguished between targets of total population size and targets related to growth rates or their components (fertility, mortality, migration). To the extent that population policy is an outcome of maximizing some welfare criterion over a specified time period, however, the distinction is unnecessary. The desired population "target" would then be a time-trajectory, coalescing the problems of levels, rates and timing. Economic-demographic simulation models in the Coale-Hoover tradition illustrate this procedure, albeit often without making use of formal optimization techniques.

Recent attempts — and others dating back many decades — to determine optimum levels or trends in population size, were open to criticism. It is difficult to define valid criteria or to construct realistic models because of the large number of relevant variables and their complex interactions. In particular, no policy indications can properly be drawn from these models unless account is taken of the costs associated with changing demographic behaviour. Such costs are hard to incorporate in aggregative approaches, and are perhaps best left to the political process. A modest "diagnostic" role for aggregative models remains.

A further objection to theorizing at this level is the problem of reconciling conflicts of interest, both between individuals or groups within a nation and between nations. The case of a minority ethnic group that feels its position vis a vis the majority threatened by a national fertility control program, provides a clear example. Obvious parallels exist in the international sphere.

7. Various demographic indices in addition to population size and vital rates were suggested as potentially important target variables. These included measures of population density (1) and distribution — in particular the rural-urban mix — and age structure. But most interest centers on fertility. Since a very significant aspect of any putative target is its appeal to politicians, administrators and eventually the public, there is a strong case for choosing target indices that are readily comprehensible. The total fertility rate, for example, with its simple interpretation as expected children ever born at current age-specific rates, appears preferable to other fertility measures from this viewpoint. It was noted that a target mean level of total fertility may have widely different implications for social structure depending upon the variance of family size within the population (2).

#### Problems of Feasibility : Paths and Timing.

8. An "atomistic" approach to population policy separates the problem of setting a target from that of choosing appropriate time paths to attain it. In the context of an overall socioeconomic framework for policy analysis, such a split would not be valid. Each feasible time path has associated with it a different set of cost and benefits, but to choose the best from among them begs the question of why the particular level of the target was selected in the first place. In terms of the political process, however, there is much more to be said for the utility of this two-stage procedure.

It is important that population growth targets be well-integrated with other aspects of social and economic planning. But this does not suffice to ensure the feasibility of the targets. The latter depends on the current demographic patterns, the means available for modifying them, and the constraints that are recognized in doing so. Setting targets on the basis of their presumed desirability without concern for means and constraints was compared in vacuity to the proposition "if camels had wings they could fly". The methods of formal demography provide an appropriate set of tools for evaluating many feasibility questions (2).

9. Broad population targets, such as a desired average rate of growth, leave grossly underdetermined the immediate demographic components that would attain them. Many combinations of fertility, mortality and migration are possible, each with different implications both for individual welfare and for other areas of social and economic policy. The relation between fertility and infant mortality is of especial importance in this context.

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(1) Recommendation for Research N° 11.

(2) Recommendation for Research N° 3.

(3) Recommendation for Research N° 2.

10. There was discussion of whether or not a smooth path of fertility was beneficial per se. Fluctuations in period fertility induced as an unintended byproduct of government policies are presumably undesirable, but when fluctuations would result from individual choices the question arises of whether the consequent social costs are not outweighed by those of attempting to "iron out" the variations. This is a complex issue, as both psychic and material costs are involved, and there are obvious externalities present. But doubts were expressed as to the benefits of demographic fine-tuning (1). Cohort fertility targets were thought generally preferable to period measures for this reason.

11. An important aspect of choosing among feasible time-paths to be followed is the degree of time preference assumed. Time preference is conveniently indicated by a discount rate; for example, the rate applied to public investments (net of discounting for risk). While this large subject was not explored in any detail the point was made that social discounting should be left to policy makers, with the choices presented to them either in the form of alternative complete time-paths or as a set of net present values computed under different discount rates. Typical levels of the social discount rate exceed three percent, implying that the next generation is weighted less than half the present generation for welfare purposes.

### Criteria for Setting Population Targets

12. Beyond agreeing that the broad underlying objective is an improvement in welfare, there was little consensus on what criteria should be used in setting population growth targets. The distinction between economic and non-economic criteria was less important in the debate than that between macro and micro-level approaches.

At the aggregate level, the search for appropriate criteria is one of identifying the component attributes of "well-being" that are functions of population variables and finding suitable indicators of them. Per capita income is a primitive welfare index, and should either be refined or supplemented to take account of the well-known disutilities associated with high consumption levels and urban concentration. Examples of such improved indices were noted (2). Measures of mortality and morbidity, especially infant mortality and life expectancy, clearly are also social indicators.

13. Other welfare components that may be influenced by population policy were discussed, most involving distributional aspects. Included were nutrition, education, crowding, leisure and income distribution. It was argued that an equitable income distribution was socially desirable, but declining fertility might accentuate maldistribution if fertility declined first among the rich (3). Similarly, social mobility might be impeded. The assumption that leisure was necessarily to be valued was questioned: much leisure is in fact unwanted and this proportion would differ greatly among income groups and between rich and poor nations.

14. A highly important contributor to welfare are children themselves. Thus the psychic or material costs that individuals bear through altering their demographic behaviour, or through trying to persuade others to do so, should certainly, enter the calculations (4). Because of the complexities of imputing a welfare distribution within a family and of taking account of the satisfactions derived from children in any aggregate index, it was suggested that welfare per family would have advantages over a per capita index in circumstances when family-level externalities were not very substantial (5).

15. There was some debate on criteria expressed in terms of minimum acceptable levels of material welfare and the ability to exercise specified freedoms, as a means of ensuring certain standards for deprived groups. To the extent that population size or growth is a factor in determining whether these conditions can be attained, it would be possible to derive from them indications for population policy. It was argued that many such conditions should be designated as basic human rights, extending those so named in the Universal Declaration on Human Rights and other United Nations instruments (6). The helpfulness of such an action in particular thorough legislation was not agreed upon (7).

16. A separate complex of issues in establishing criteria relates to environmental limitations. Over time, the constraints of finite land and natural resources and a fragile ecosystem make themselves felt, and impose

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(1) Recommendation for Research N° 4.

(2) Recommendation for Research N° 10.

(3) Recommendation for Research N° 6.

(4) Recommendation for Research N° 12.

(5) Recommendation for Research N° 16.

(6) Recommendation for Research N° 9.

(7) Recommendation for Research N° 15.

upper bounds on population size. There is disagreement as to which constraints will be of most significance and hence also on the urgency of attempts to take corrective measures. The question of interest is both empirical and ethical : to what degree should anticipated environmental constraints enter present calculations of welfare and thence influence population policy ?

17. Apart from the problem of conflict among different welfare goals (in theory resolved by postulating rates at which they can be traded-off, and in practice through political bargaining) aggregative criteria raise other difficulties. There is a tendency to exclude intangible aspects of welfare because they are not easily quantified. Implicitly it is assumed that relative valuations on different components will remain constant or move in predictable directions. And also implicitly, it is assumed that improvements are necessarily incremental, ignoring the sometimes important possibility that changes in "unfavorable" directions may lead to a radical transformation of the social context and an entirely new situation.

18. A broad alternative exists to the ambitious task of constructing overall measures of social welfare. This is to begin with the assumption that each person is best able to determine what his or her own best interests are and, within the constraints of the socio-economic system, to act on them. So also, families and communities. (For nations, the validity is rarely questioned). The purpose and justification for government intervention is then to determine that the signals received by individuals or families are correct — in the sense that consequent actions are not such as to contravene the social interest. For fertility, where the family is usually the appropriate unit to consider, public policy would aim to ensure that the average cost to society (i.e., the total cost over and above that borne by the family itself) of an additional child was roughly balanced by the expected benefits society would derive. If there were a consensus that these benefits would be small, then families themselves would have to contribute the greater part of the expenses involved, and presumably would do so only if their preference systems valued children highly in comparison to material goods.

19. While much oversimplified in this statement, it was suggested that economic arguments of the sort described could provide a means of avoiding many of the complexities of welfare theory in the large and reduce the inclination towards paternalistic and manipulative attitudes among policy-makers in this area (1). However, there was some feeling that the normative bases of this approach to criteria were not fully spelt out. As presented, it could be regarded as overly individualistic, although there would be no difficulty making analogous cases for larger social units than the family. At least until many of the present externalities were removed there would be far fewer compelling reasons for adducing anti-natalist arguments based on macro-economic considerations. In addition, certain types of action programs would suggest themselves. Targets *per se* do not enter.

20. The assumption is necessary, however, that fertility behaviour is "rational", in the economic sense of according with a reasonably stable and consistent preference system. There was lengthy debate on this question, with interdisciplinary disagreement partly caused by semantic confusion between the economic and intuitive meanings of "rational". The core of the discussion was on the adequacy of the terms "rational" and "a-rational" applied to reproductive behaviour, and in particular whether fertility behaviour could be "a-rational" in the sense of being outside the set of concerns that a person believes are decidable (2).

### Means of Action

21. Most of the discussion on means centred on action programs in the area of fertility control. The means were broadly divided into family planning and others, where "family planning" was narrowly defined as the provision of birth control information or services to fill an existing demand — i.e., a supply function. The category of "others" was chiefly concerned with the demand side of fertility.

Family planning programs, it was pointed out, have a double parentage, deriving on the one hand from the planned parenthood movement (offering services for humanitarian reasons and having as much concern for involuntary sterility as for unwanted births), and on the other hand from arguments indicating the advantages of lowered fertility for economic and social development. The former accounts for the common location of programs in health ministries ; the latter for the incentive components added to many (3).

22. Evaluation of family planning programs based on contraceptives is greatly hindered by the difficulty of estimating births prevented. An intermediate step is to translate a birth rate target into couple-years of protection needed and hence into an estimate of program size and mix. Cost effectiveness studies are often distorted by the fact that some fraction of acceptors of the official program have been previously using

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(1) Recommendation for Research N° 5.

(2) Recommendation for Research N° 8.

(3) Recommendation for Research N° 13.

private services. Moreover numbers of acceptors reported may be seriously inflated for various reasons. Targets expressed in those terms are useful in program administration and when fertility data are inadequate, but should be treated with caution.

Abortion programs are an increasingly important means of birth control. Although relatively few countries as yet condone such programs, they include the four largest. It was noted that over one half of the world's population in effect now has abortion on demand.

23. Various weaknesses of the supply approach as a means of reducing fertility were discussed. It was argued that programs suffered from bureaucratization and excessive control by the medical profession. Ineffectiveness was sometimes blamed on underfinancing ; but the opposite argument could as easily be made, that funds were limited precisely because of the lack of clear evidence of effectiveness.

There is an inclination, once targets have been established, to enshrine them, forgetting their rationale. An extreme case is when "modernization" is proposed as a means of reducing fertility, reversing the usual argument that fertility reduction is a means of promoting modernization. A similar point could be made less strongly about income redistribution, although here the empirical association is also less clear : the relationship between income and fertility varies widely in different social contexts. The "population education" elements combined with many family planning programs raise a related issue : their presumed aim is to persuade people to internalize a new lower family size norm. But if individual preferences are not to be regarded as sovereign it would be equally defensible, except on paternalistic grounds, to try to persuade people to be content at lower consumption levels.

24. Various specific measures on the demand side sometimes advocated to reduce fertility were examined briefly. The establishment of a social security system is often proposed as a means of removing the requirement for children as old-age support, and thus of lowering fertility. It was noted, however, that the fertility impact is not a necessary one : assured old-age security might in some situations serve to stimulate irresponsible fertility. Clearly, other factors, both social and cultural, are also involved in determining the probable response. The effect on fertility of urbanization and of women entering the labor force (1) may be similarly indeterminate in certain situations. Legislation on age at marriage is irrelevant in societies with high proportions of common law marriages or large illegitimacy rates.

If the criterion underlying population policy starts with the given patterns of individual or family preferences, then the sorts of policies indicated to ensure a socially desirable outcome would be those that adjusted the perceived costs of child bearing relative to birth control in the appropriate direction. Social arrangements would have to be devised to make the necessary transfer payments and contraceptive methods sought with lower disutilities (2).

25. Concluding this session, some mention was made of international migration as a means of attaining population growth targets. Emigration is of much numerical relevance only in very small countries. Here it can be counterproductive as a policy measure, since the outflow is largely controlled by the recipient nations. When stopped for any reason, the continued existence of high fertility rates may suddenly become threatening.

### Problems of Compatibility : National versus International Approaches

26. The main issue discussed at the final session of the Seminar was the relation between national and international approaches to population problems. The subject was recognized to be complex, politically laden, and difficult to treat in isolation from other aspects of the world situation. Indeed some participants doubted the appropriateness of a meeting of population experts as a venue for such an examination.

The arguments at this level closely parallel those made concerning national population policies and programs. The "supply" approach would draw a clear-cut distinction between technical or scientific problems (whether in contraceptive technology or broader social and economic aspects), that are seen as a proper object of international study and attention, and the actual policies, that are a purely national responsibility. The world population problem is thus regarded as a set of 120 national population problems. International responsibility for population control is denied, or at least deferred until similar responsibility is extended to other characteristics such as the distribution of wealth or resources.

27. A more interventionist attitude could be justified if there were obvious population-related spillover effects between nations. But there is little empirical knowledge of these (3). Adverse environmental effects are

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(1) Recommendation for Research N° 7.

(2) Recommendation for Research N° 14.

(3) Recommendation for Research N° 17.



indirect, while financial and resource transfers probably penalize rather than benefit the high fertility nations. Migration is mostly already under direct national control.

28. It was noted that there is no necessary conflict between national sovereignty and international action in population control. The cases of the nuclear test ban treaty and various anti-pollution agreements were illustrations of a community of interest – constituting Pareto improvements, where no one is harmed and many are benefited. Population might be a candidate for a similar type of convention (1).

29. The chief difference between the national and international policy contexts is that only in the former are there accepted grounds (such as majority decisions) for taking action in non-Paretal situations, together with enforcement procedures when needed. However, just as the modification of incentive structures and adjustment of perceived benefits and costs of childbearing at the family or community level provide important avenues of national population policy development, so also analogous international mechanisms might be sought to provide incentives for nations to modify their policies. It is not apparent that acceptance of national sovereignty implies approval of attempts to prevent action to contain international spillovers.

30. A third approach to world population problems presented at the Seminar identified a major source of difficulty in the conflicting national ideologies. The development of a global ideology was needed as the basis for a broad international effort to restrain population growth. Such an ideology would also encompass the goals of social and economic development.

## APPENDIX : RECOMMENDATIONS FOR RESEARCH

1. Establishment of minimum data requirements for setting targets of population size or growth rates (or components of growth) and for monitoring subsequent performance (see para. 6).
2. Further application of formal demographic methods in selecting or evaluating population targets (see para. 8).
3. Social implications of family size variance in conditions of low fertility (see para. 7).
4. Economic and welfare implications of fluctuating birth cohorts. Costs and benefits of efforts to prevent such fluctuations (see para. 10).
5. Research on basic empirical facts of economic-demographic interactions. What is the relative importance of the various posited mechanisms? Are significant interactions being overlooked because of modelling difficulties? (see para. 19).
6. Relationships between fertility and income distribution. What mechanisms are involved? In what situations would income redistribution help to lower fertility? (see para. 13).
7. Relationships between fertility and female labour force participation, based on longitudinal studies (see para. 24).
8. Relation between degree of acceptance of contraception and variability or predictability of fertility levels. Consequent policy implications (see para. 20).
9. Impact of demographic factors on "human rights"; "human rights" as criteria for selecting population targets (see para. 15).
10. Identification of social indicators useful in designing population policy. To what degree are such indicators valid in different cultures? Development of an operational concept of "quality of life". (see para. 12).
11. The concept and appropriate indices of population density. Incorporation of density or maldistribution considerations in aggregate measures of welfare and in population policy criteria (see para. 7).
12. Social psychological research on determinants of desired family size (see para. 14).
13. Politics and administration of family planning programs; significance of their separation from economic planning bureaus (see para. 21).
14. Problems of integrating economic and demographic planning, both on a theoretical level and in the context of administrative structures that separate the two functions (see para. 24).

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(1) Recommendation for Research N° 18.

15. Law as an instrument of population policy (see para. 15).
16. Search for effective "social technology" for internalizing family-level externalities of childbearing. Inventory of already existing experience in this area from societies where fertility reduction has occurred (see para. 14).
17. Identification and evaluation of international negative externalities resulting from continued population growth (see para. 27).
18. Search for acceptable world policies that would provide incentives for nations to modify their demographic behaviour in a globally desirable direction (see para. 28).

## ANNEX 1

# LIST OF PARTICIPANTS

**Director of the Seminar :** Jack Harewood (The West Indies University, Trinidad and Tobago).

**Co-Director of the Seminar :** H.V. Muhsam (The Hebrew University of Jerusalem, Israel).

**General rapporteur :** G. McNicoll (East-West Population Institute, Hawaii).

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A. Chandra Sekhar (Registrar General, Ministry of Home Affairs, New Delhi, India).

K.T. de Graft-Johnson (Census Office, Accra, Ghana)

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J. Harewood, N. Federici, already appear in list I.

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Organization for Economic Co-operation and Development : R. Black

Intergovernmental Committee for European Migration : F. Bueno do Prado

International Statistical Office : K.T. de Graft-Johnson (already appears in list II).

### *E) Other representatives :*

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Central Statistical Office of Trinidad and Tobago : 1 person

University of Guyana : 1 person

## III – Secretariat

Jean Trillat

Elisabeth Garlot

Nadia Nardo

## ANNEX 2

## PROGRAMME OF THE SEMINAR

Date	Topic of the discussion	Time schedule	Chairman	Discussant	Author of Background Paper	Rapporteur
Tuesday April 3 <sup>d</sup>	Opening ceremony. Adoption of the programme. Election of the various officers. Introductory statement by the co-director.	1. 10h – 13h	J. Harewood			
	<i>The concept of "Population Growth Targets".</i>	2. 15h – 18h	G. Maccio	G. Nair	N. Iskandar	M. Gandotra
Wednesday April 4 <sup>th</sup>	<i>Level versus Rates</i>	3. 9h30 – 12h30	M. Concepcion	A. Golini	S. Singer	S. Kshirsagar
	<i>Levels</i> <i>Rates</i> <i>Paths and Timing</i>	4. 14h – 16h	P. Matthiessen	L. Lee – M. B'Chir O. Vitali	A. Sauvy T. Frejka K. Weichselberger	S. Raghavachari
Thursday April 5 <sup>th</sup>	<i>Criteria</i>	5. 9h30 – 12h30	H. Wander	K. Han	P. Demeny	M. Sotoudeh-Zand
	Economic criteria Non-economic criteria Urbanism Other criteria	6. 14h – 16h	M. B'Chir	V. Piché I. Sirageldin	Ph. Hauser L. Day	L. Day
Friday April 6 <sup>th</sup>	<i>Means of action</i>	7. 9h30 – 12h30	A. Khalifa	Eui Yong-Yu	J. Ross	P. Desai
	Family planning Non-family planning Migrations Other means	8. 14h – 16h	Ph. Hauser	D. Friedlander H. Gérard	C. Price R. Weller	F. Zumbado
Saturday April 7 <sup>th</sup> Sunday April 8 <sup>th</sup>	Preparation of the final report					
Monday April 9 <sup>th</sup>	<i>Compatibilities of the various targets</i>	9. 9h30 – 13h	P. Demeny	K. Dandekar	Documents of sittings 3, 4 and 5	G. Zarkovic
	Closing session	10. 14h – 16h	M. Macura	Presentation of the final report by the general rapporteur		G. McNicoll

ANNEX 3

## COUNCIL OF CICRED

**Chairman :** Jean Bourgeois-Pichat

**Members :** Wilfred D. Borrie  
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One representative from the International Union for the Scientific Study of Population.  
One representative from the United Nations Fund for Population Activities.  
One representative from the Population Division of the United Nations.

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