TEXTO PARA DISCUSSÃO Nº 91

**A WINDOW OF OPPORTUNITY: SOME DEMOGRAPHIC
AND SOCIOECONOMIC IMPLICATIONS OF THE RAPID
FERTILITY DECLINE IN BRAZIL**

José Alberto Magno de Carvalho
Laura Rodríguez Wong

Outubro de 1995

Ficha catalográfica

UNIVERSIDADE FEDERAL DE MINAS GERAIS
FACULDADE DE CIÊNCIAS ECONÔMICAS
CENTRO DE DESENVOLVIMENTO E PLANEJAMENTO REGIONAL

A WINDOW OF OPPORTUNITY: SOME DEMOGRAPHIC AND SOCIOECONOMIC IMPLICATIONS OF THE RAPID FERTILITY DECLINE IN BRAZIL

José Alberto Magno de Carvalho
Laura Rodrígues Wong

Departamento de Demografia e Centro de Desenvolvimento e Planejamento Regional (CEDEPLAR) - Universidade Federal de Minas Gerais - Brazil

CEDEPLAR/FACE/UFMG
BELO HORIZONTE
1995

CONTENTS

ABSTRACT

The dramatic change in the Brazilian demographic pattern in the last 30 years, that occurred as a consequence of fertility decline, undoubtedly corresponds to one of the most important structural changes of this century. It is an irreversible and non-conjunctural process that has to be considered in the short, medium and long terms.

Between the 1940's and the 1960's, there was a significant decline in mortality with a relative stability in fertility, and this resulted in a rapid increase in the population growth rate without marked changes in the population age structure. In the following phase, the fertility decline produces not only a lagging population growth pace in the short term, but also, a deep change in age distribution in the medium and long terms.

Among the various social consequences of this demographic change, variations in social demands are outstanding. As young population varies in relative terms at a significant lower rate than that of elderly population, it should be kept in mind that the present moment, demographically speaking, is potentially favourable to work out some social problems afflicting the country.

These questions would count on excellent conditions to be solved from the viewpoint of labour force which is increasing in absolute and relative terms. Possibility of expanding investments in education (coverage and teaching quality) is made easier by lower relative growth of schooling population, while the growth rate speed of elderly dependency ratio and thus the need for funds for retirement and health assistance is still relatively slower. The present favourable conditions brought about by the new population dynamics should be considered to effectively implement social policy.

Considering the long term period, (1920/2100), one may say that Brazil is entering a sort of golden demographic stage. There is an exceptional circumstance for re-applying resources on children's welfare: health, nutrition, education, training and so on. Since quantity is dropping, investment may and must go to quality.

Investments on infancy now might represent a double profit, since they will go into the labour force in 10 or 15 years time, when the elder dependency ratio will be fastly increasing. If the society invests in the quality of the current stock of children, the economy will certainly have a much better performance and the state will have enough resources for investment in social security and properly look after the elderly. Society will provide against the eventually heavy burden of a growing elder dependency by making of the educational provisions now its major government outlay.

A WINDOW OF OPPORTUNITY: SOME DEMOGRAPHIC AND SOCIOECONOMIC IMPLICATIONS OF THE RAPID FERTILITY DECLINE IN BRAZIL[*]

José Alberto M. de Carvalho[**]

Laura R. Wong[**]

INTRODUCTION

The in depth and rapid change in the demographic pattern of the country in the last 30 years, that occurred as a consequence of fertility decline, undoubtedly corresponds to one of the most important structural changes, if not the most important one, in the Brazilian society. It is an irreversible and non-conjunctural process and it has to be considered in the short, medium, and long term.

Decades will elapse until its consequences are completely accomplished, due to the slow pace of demographic changes as far as stock variables are concerned as they are linked to human life cycles and duration.

Between the 1940's and the 1960's, there was a significant decline in mortality with a relative stability in fertility, this resulting in a rapid increase in the population growth rate without marked changes in the population age structure. In the following phase, fertility decline produced not only a lagging population growth pace in the short term, but also, a significant change in age distribution in the medium and long terms.

With the decline in mortality, the belief that the country was condemned to endure a rapidly increasing, extremely young and stable population, has widespreaded. Furthermore, one did not believe that a sustained decline in fertility could become into reality, before the benefits of economic growth could be first extended to the population as a whole with a significant improvement in income distribution, since there would be no reason for the poor, who comprise the population majority, to wish a smaller number of children and consequently regulate fertility.

As a matter of fact, income distribution in the country did not improve, but the population as a whole started to control fertility. This phenomenon, however, is still ignored and even denied by a good portion of public opinion and has not been taken into account by governments and its planning agencies in the definition of social policies. In spite of the enormous changes occurred in terms of demographic growth rates and age structure of population, they are not being considered in the priorities of social policy definition.

[**] Departamento de Demografia and Centro de Desenvolvimento e Planejamento Regional (CEDEPLAR) - Universidade Federal de Minas Gerais - Brazil.

The objective of this paper is, therefore, and above all, to demonstrate the new demographic reality in the country. Also, it discusses the potentiality of the age structure changes in terms of contribution to the solution of some problems as well as to point out the need of the society to face the new context of social demands that the inevitable ageing of the Brazilian population will bring about.

This document presents, in its first part, the evolution of the Brazilian demographic dynamics in the last 5 decades as well as its prospective until the year 2020. Following this, the consequences of the new demographic pattern on some social demands by the young and elderly population will be analyzed. Finally, for a better understanding of changes in the age structure the period considered is that of 1920-2000.

1 THE DEMOGRAPHIC TRANSITION - RECENT TRENDS AND PERSPECTIVES

As a result of high fertility, the Brazilian population may be characterized as a quasi-stable population over the first half of the 20th century and is experiencing significant changes before reaching the next century. This section considers the more relevant changes by emphasizing two periods: 1940/70 and 1970/90.

1.1 Quasi-stable population and high growth rates: 1940/70

Brazil experienced a rapid demographic growth in this period, due to a high natural growth and without relevant international migration flows. Population grew from 41 million to 93 million people at an average annual growth rate (r) of 2.8%. (From 2.4% to 3.0% and 2.9%, for the 40s, 50s and 60s respectively).

The increase in r is almost entirely explained by a mortality decline when life expectancy at birth passed from 44 to 54 years between 1940 and 1960. There were three decades of constant downwards trend, which demonstrated that mortality decline was a lasting phenomenon.

In this meantime, fertility was held at high levels with a slight decrease in total fertility rate (TFR), i.e., from 6.3 to 5.8 children per woman. The differentiated evolution of both mortality and fertility caused a much more rapid decline in the crude mortality rate (d) than in crude birth rate (b) which resulted in a significant increase in r (Carvalho, 1988)

Brazil population was characterized by a quasi-stability in these three decades: in spite of the rapid decline in mortality and increase in growth rate, there was not a significant change in the relative age structure, since fertility was held, if not constant, without a definite decline trend as can be seen below. During the period 1940-70, there was approximately 52% of the total population under 20 years of age and 3% above 65, characterizing an extremely young population. Thus, the age structure of the Brazilian population in the years 1940, 1950, 1960 and 1970 had a similar distribution.

10

In the 60's, in the face of high demographic growth rates in developing countries, worries with such a situation were generalized, mainly as far as the First World's public opinion and governments, on the one hand, and international organizations, on the other, were concerned. It was asserted that, as opposed to what had occurred in developed countries, a natural decline in fertility should not be expected in the poor countries that would decrease the values of r in their population. Demographic transition would not be completed in these countries!

There would be the so-called population explosion which would hinder development and sooner or later cause serious internal social and economic problems and even put international order at risk. It was then held that official policy of birth control should be implemented as the only way to avoid a rapid population increase and consequently allow developing countries to break up the vicious circle of poverty. These were the neo-Malthusian[1] basic analyses and postulations that were accepted in several spheres of the Third World, including Brazil.

1.2 Fertility decrease and lower growth rate, 1970/90

The 1970 census results produced r about 2.9% for the period 1960/70; i.e, the same level of that for the 1950's, which was not surprising even for those who were in opposite sides in the debate on birth control. In the face of the existing theories, there was no reason to expect a decline in fertility in the country and a consequent slower pace in demographic growth. Additionally, the 1970 census returns indicated divergent trends with increased fertility in some regions, as the poorer ones, and slight decrease in others[2].

Data collected during the 70s, however, started to evidence that fertility was declining in the country, it began in the more developed regions and higher social groups and gradually expanded to the other regions and social strata. The phenomenon was irrefutably confirmed by the 1980 census: the enumerated population was of 119 million people and r fell to 2.4% due to a fertility decline; this trend persisted in 1980/91: r was less than 2% and, according to the observed age distribution in the last census, decline in fertility was once again responsible for a slower pace in population growth.

Table 1 presents the TFRs of the several Brazilian regions in 1970 and 1980. Except for the Northern Northeast, with a lower but not negligible decline of 7%, all other regions experienced a sharp drop in fertility in ten years only, with some of them showing a decline of over 30%. Rural fertility decline was also generalized with an average decline of 22.4% at the national level (Carvalho, 1988).

---

[1] For a classic work of this line of thought, see: COALE, A.J., HOOVER, E. M. *Population Growth and Economic Development in Low Income Countries - A case Study of India's Prospects.* 1958 - Princeton University Press.

[2] See, for example: Carvalho, 1974; Carvalho and Fernández, 1986; Frias and Carvalho, 1994.

TABLE 1

Brazil and Regions: Total Fertility Rate
1970 and 1980

Region	1970	1980	Variation
Amazônia	8,1	6,4	-21,0
N. North East	7,3	6,8	- 7,0
Central North East	7,8	5,8	- 6,6
S. North East	7,6	6,2	-18,4
East	6,5	4,3	-33,8
Rio de Janeiro	4,2	2,9	-27,5
São Paulo	4,2	3,2	-23,8
Paraná	6,5	4,1	-36,9
South	5,1	3,3	-35,3
Central West	6,6	4,5	-31,8
BRAZIL	5,8	4,3	-25,9

SOURCE: CARVALHO, 1988.

The magnitude of general decline in fertility in Brazil in such a short period of time is surprising when compared with the experience of developed populations. Figure 1 allows the comparison of the TFR's evolution for two European countries and Brazil as an illustration of such a contrast. Sweden and England took nearly half a century (from 1870 to 1920) for diminishing their TFR in 53% and 44% respectively. Although departing from different levels, Brazil had a similar relative decline, 45%, in only 20 years (from 1970 to 1990).

Figure 1

Total Fertility Rate (TFR) for selected countries and years:
Latin American Countries (Brazil, Colombia, Mexico, Peru and Venezuela)
and European Countries (Sweden and England)
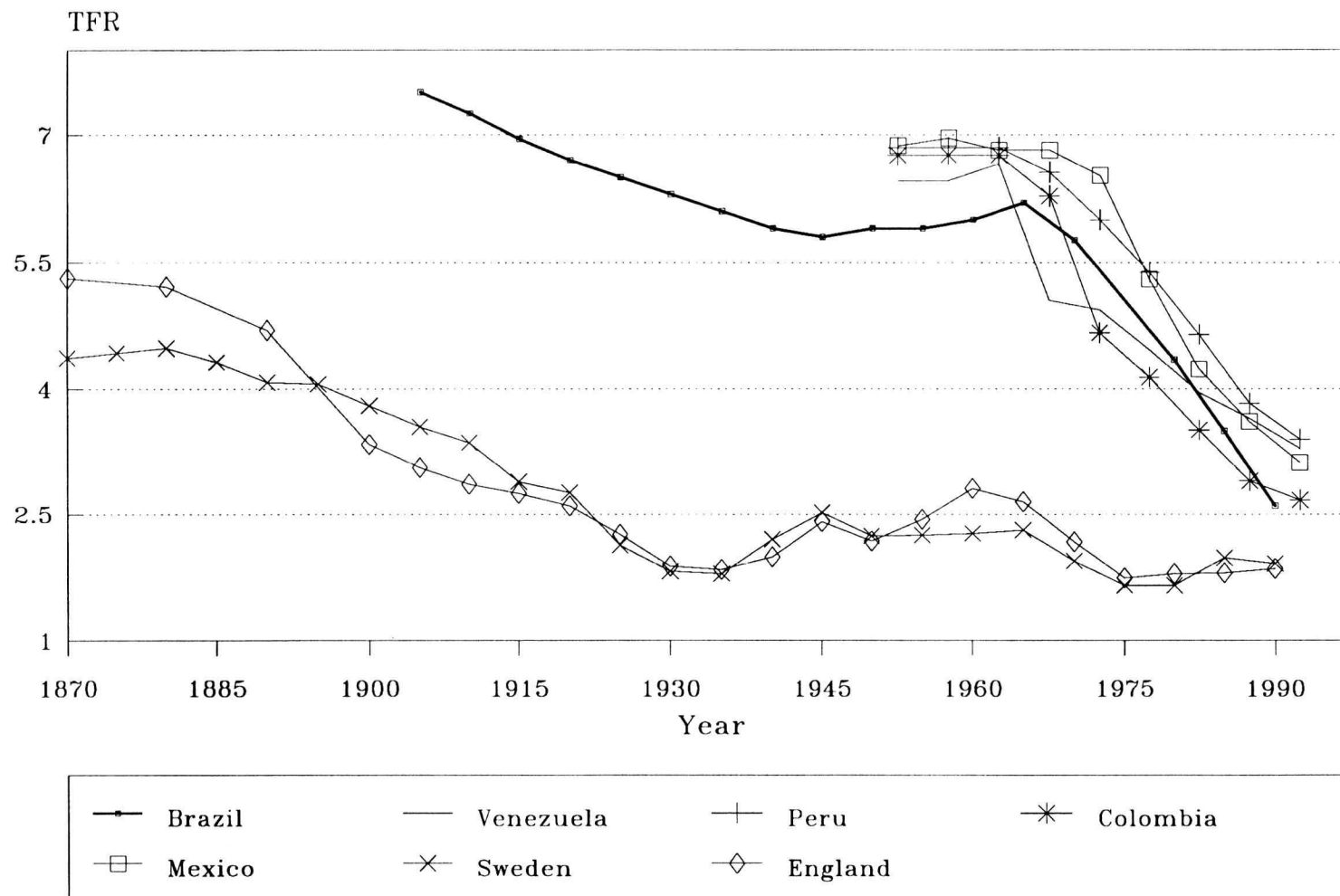
Source: **Carvalho** and Wong, 1995 and CELADE, 1995.

Furthermore, it is worthnoting that such a fertility notable decline occurred in a continental sized country, with a bulky population, greatly heterogenous, and in the absence of an official policy of birth control or family planning.

In a context where a greater portion of the population is in the lower income strata such a decline in the average level of fertility could only take place if the process reached these population segments. Merrick and Berquó (1983), based on data from the census of 1970 and the 1976 PNAD (National Household Sample Survey), showed that the greater relative decline occurred in the poorer income group of the population, i.e., in those families with monthly income lower than one minimum wage. Figure 1 including two Brazilian regions with a notably differentiated development, such as the Northeast and the Southeast, demonstrates the generalized decline.

The most evident effect of decline in fertility is the reduction of r. However, while TFR has dropped 25%, as shown in Table 1, at the same time, r fell only 14%. This lower proportion in decline was due to two reasons: firstly, because in a closed population (as the Brazilian population could be considered) r is the difference between the crude birth rate (b) and the crude death rate (d). In the 1970's, mortality decline caused a drop in d from 13 to 10 per 1000 between the 1960's and 1970's, partially outweighing the effect of fertility decline in terms of population growth. Secondly, with the decline in fertility, the annual number of live births became relatively lower in terms of total population, and this resulted in a narrower base of the age pyramid (population below 10) and a higher relative weight of the other age groups, including those related to women in reproductive age. Thus, annual number of births as a proportion of total population, i.e. b, had a lower decrease than that of 25.9% of fertility decline. This is the reason why b decreased only 17%, from 40.8 to 33.7 per 1000 between the two decades.

The drop in the proportion of children in the Brazilian population as a consequence of fertility decline in 1970/91 became evident in the last censuses results. The relative weight of children under 5 years of age decreased from 15% to 14% and 11%, respectively, in 1970, 1980, and 1991 and that of the age group of 5-9 dropped from 14% to 13% and 12%, respectively. The population pyramids, in Figure 2, clearly show the beginning of population ageing as a consequence of fertility decline.
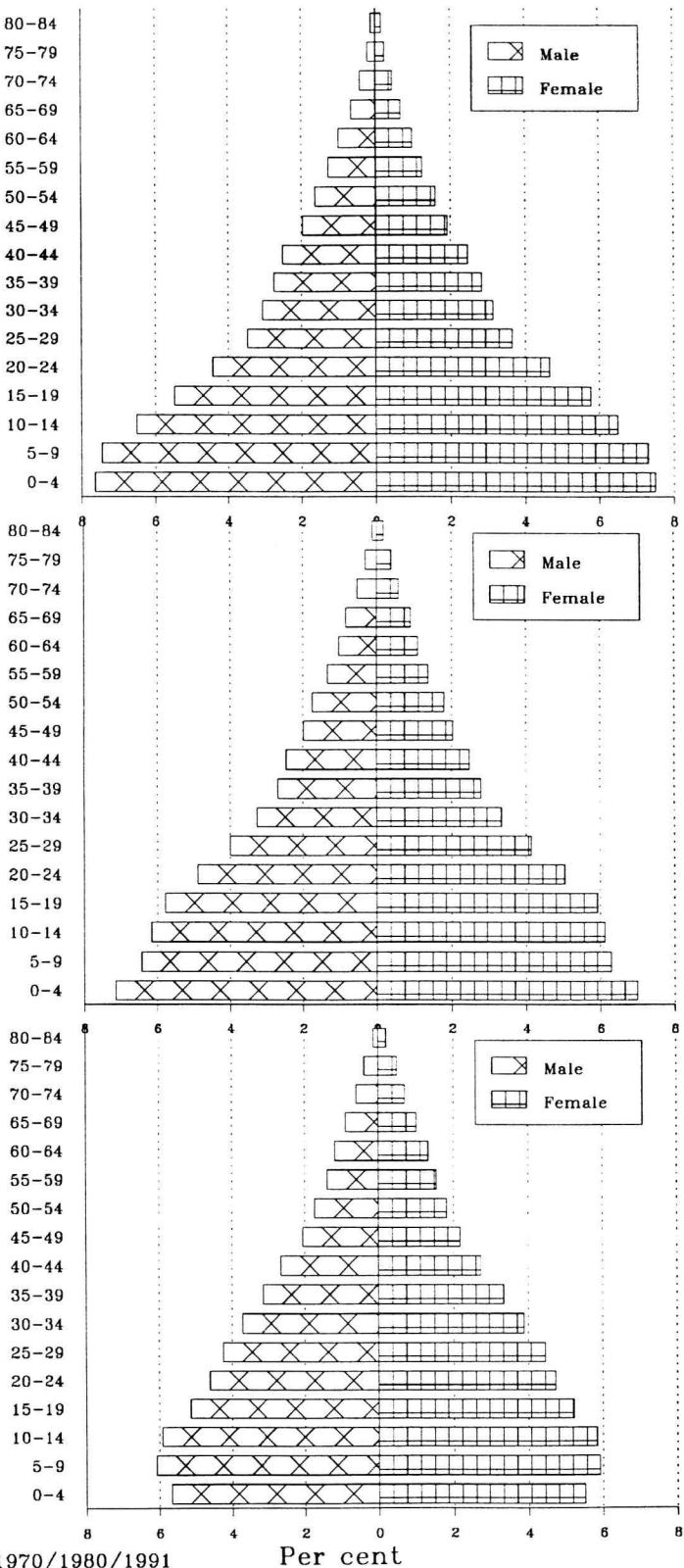
Figure 2.
Brazil (1970/80/91):
Relative age distribution

Age Groups

1970

1980

1991

Per cent

As previously mentioned, the decline in mortality from the 1940's caused basically the significant rise of population growth pace with negligible effects on the relative age structure as its sole consequence. On the other hand, the decline in fertility, besides causing a drop in r, is not neutral in relation to age distribution and necessarily conduces to a significant change in the age composition of population.

1.3 The probable trajectory of the Brazilian population in the next decades, 1990-2020

The Brazilian population was projected by adopting fertility and mortality functions for 1990-95 compatible with the census results and with this functions being fixed for the period of 2015-2020 producing a net reproduction rate equal to 1.0 (See Machado, 1993). Consequently, the Brazilian population was considered to be reaching an intrinsic growth rate equal to zero by 2015.

The adjusted population for 1990, and that projected for 2000, 2010, and 2020 as well as average growth rates for each age group are presented in Table 2. Figure 3 shows the projected age distributions.

TABLE 2

**BRAZIL: Estimated Population in 1990 and Projected Population
and Growth Rate for 2000, 2010 e 2020**

Age Groups	1990	2000	2010	2020	Annual Growth Rate		
					1990/2000	2000/2010	2010/2020
00--04	16043	17512	16466	16982	0,8	-0,6	0,3
05--09	17217	17041	17135	16479	-0,1	0,1	-0,4
10--14	16886	15732	17227	16245	-0,7	0,9	-0,6
15--19	14874	17096	16939	17046	1,4	-0,1	0,1
20--24	13384	16730	15609	17114	2,3	-0,7	0,9
25--29	12471	14679	16909	16786	0,7	1,4	-0,1
30--34	10914	13150	16489	15427	1,9	2,3	-0,1
35--39	9327	12182	14398	16645	2,7	1,7	1,5
40--44	7742	10569	12800	16123	3,2	1,9	2,3
45--49	6055	8918	11722	13934	4,0	2,8	1,7
50--54	5093	7264	9994	12193	3,6	3,2	2,0
55--59	4193	5515	8204	10889	2,8	4,1	2,9
60--64	3588	4425	6391	8916	2,1	3,7	3,4
65--69	2746	3395	4536	6871	2,1	2,9	4,2
70 or +	4261	5263	6656	9353	2,1	2,4	3,5
Total	144794	169471	191475	211003	1,6	1,2	1,0
00--14	50146	50285	50828	49706	0,0	0,1	-0,2
15--64	87641	110528	129455	145073	2,4	1,6	1,2
65 or +	7007	8658	11192	16224	2,1	2,6	3,8

SOURCE: Machado (1993).

16

Figure 3:
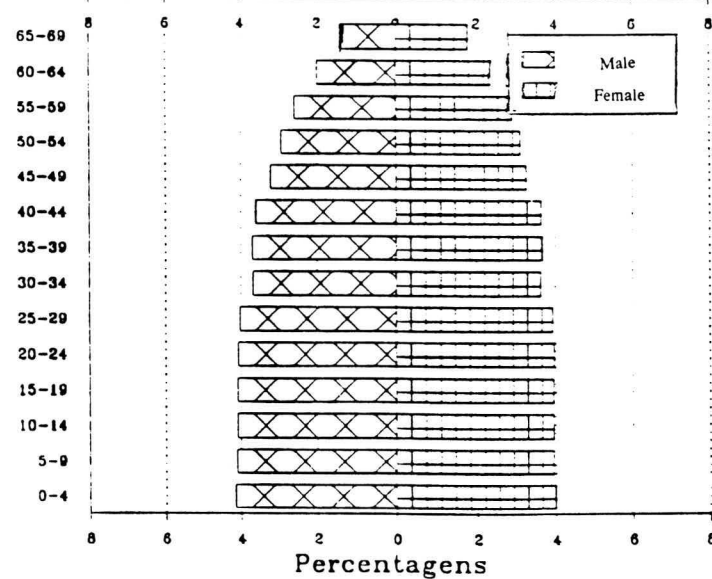Brazil (2000/2010/2020):
Projected relative age distribution
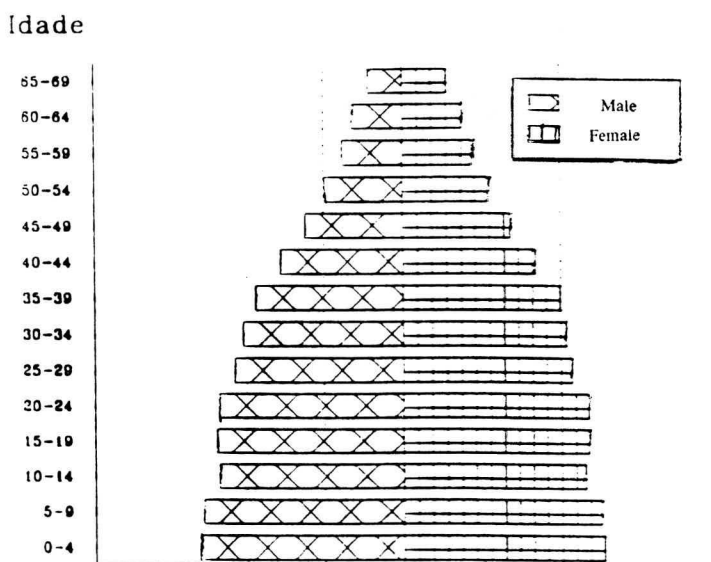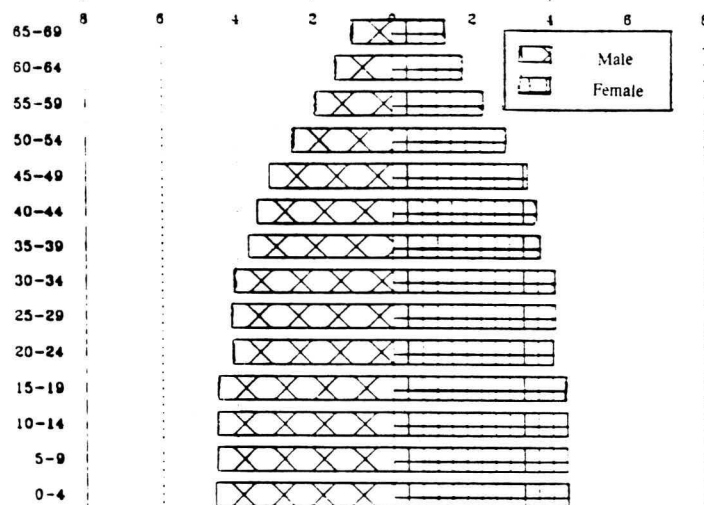
Idade

2000

2010

2020

Percentagens

Brazilian population would rise from 145 million people in 1990 to 211 million in 2020. It would count 169 million in 2000. It is worth mentioning that official projections in the beginning of the 1970's indicated a total population of 201 million for the year 2000 (FIBGE, 1974). The 32 million people that will be "missing" in 2000 are obviously due to the fertility decline occurring between 1970 and 2000. They would be under 30 years of age then. The number of "avoided" births will be larger, since the 32 million refer to "survivors" in 2000.

According to Table 2, population under 15 will probably not increase between 1990 and 2020 and its component age groups will even present negative growth rates in some quinqueniums. The population between 15 and 65 will grow above total average at a rapidly decreasing pace however. Such a decrease will happen, since the generations born after the fertility decline will increasingly make part of this population. It should be observed that young quinquennial age groups of the age interval between 15 and 65 will present very low and even negative r in the last two decades.

The elder population (65 and over) will also grow above total average, but at increasing rates. In 2020, only the generations born before the decline in fertility will still make part of it.

Table 3 presents the Brazilian population projections until the end of the 21st century with presupposed functions of fertility and mortality for 2015/2020 held constant. As can be observed, r would decline rapidly from the second decennium in the next century, reaching 0.2% a year in mid-century. With these values, Brazil would be about reaching a stationary population.

TABLE 3

**BRAZIL, 2020/2100: Projected Population, Annual Growth Rate
and Relative Age Distribution**

Period	Population (Thousands)	Annual Growth Rate	Relative Age Distribution		
			00-14	15-64	65 or more
2020	211002	1,10*	23,5	68,7	7,7
2040	236884	0,58	21,3	66,7	12,0
2050	242700	0,24	20,8	65,0	14,2
2060	244926	0,09	20,6	64,7	14,7
2080	245880	0,02	20,5	64,4	15,1
2100	246109	0,00**	20,5	64,2	15,3

SOURCE: Machado (1993).

    * r for the period 2000/2020
    ** Less than 0,01%

From 2050 the population would grow at rates near to zero and would be stabilized under 250 million people. All over the century the Brazilian population would rise from 169 million to 246 million; this is about the same increase in absolute terms observed between 1940 and 1980.

2 CONSEQUENCES OF CHANGE IN THE BRAZILIAN DEMOGRAPHIC PATTERN ON THE DEMAND BY THE YOUNG AND ELDERLY POPULATION FOR SOME SOCIAL SERVICES

It is worth reminding that the expected trajectory of the Brazilian population for the next 25 years is not sheer speculation, but it is based on sound hypotheses, for more than twenty-five years have elapsed since the beginning of the rapid decline in fertility. It is an irreversible process that has already defined what will basically happen in terms of population an age distribution in the next decades. It is surprising that such a significant change are being ignored in most of the Brazilian development plans and social policy projects.

Some old and new prejudices persist simultaneously with hasty forecasts. On the one hand, it is still present in the mind of a good many of planners a view of an extremely young population, constant age distribution, with high growth rates in an inevitable trajectory towards a demographic explosion along the 21st century, unless the government intervenes. On the other hand, there appears an alarmist view indicating a bewildering growth of the elderly and that the state apparatus, through institutions as social security, will not be able to support its social costs.

To ignore the new reality implies in loosing the opportunity for benefiting the country's poorer, taking advantage of favourable conditions created by the new demographic pattern and to prepare the country to face some other problems that may come in the medium and long term.

It would be simplistic to believe that the sole reduction of fertility with the consequent relative decrease in the number of people would automatically solve the Brazilian social problems. In spite of the significant decline in fertility, problems like that of homeless children and juvenile delinquency in large cities have not been solved yet; on the contrary, the situation has worsened. As matter of fact, favourable conditions created by the relative and even absolute reduction of goal-populations size to be reached by some social policies will only be fully explored, if priorities are defined, decisions taken, and programs really implemented. In a country with so great social needs, undergoing a serious and lasting economic crisis, the definition of public policy must be selective, by giving priority to those sectors which are able to guarantee better social yields in the medium and long terms.

As previously seen, the Brazilian population is already undergoing low growth rates among younger ages and high ones among elder ages, which, as an obvious consequence, will result in a change of the social demands profile. In the following analysis, the proportional distribution and annual average growth rate in the age groups of 0-14, 15-64, and 65 and over will be considered for the period 1900-2020. For a better understanding of the changes in the age structure these same age groups are analyzed regarding a long term approach (1920/2100).

Due to the emphases in the social polices in this study, the consequences of the fertility decline in Brazil are analyzed here regarding the aggregated dimensions, such as population size and age distribution.

It is also clear, however, that fertility decline has many other consequences at individual and family level. In fact, on the way of the current Brazilian demographic trend, there is room for individual welfare improvements: parents will be able to afford schooling for their children more easily on account of latter marriage (making for a better conjunction of schooling expenditures with the life cycle of income), wider spacing of children and fewer children. Lower fertility will make for lesser health risk particularly to mothers and infants, and finally, parental resources per child for child care will tend to increase.(United Nations, 1984).

On the other hand, there are also potential negative effects; among them, a higher fragility of the elderly if they have less children to look after them in the absence of a sound social security system.

2.1 Evolution of the demand by the youth

As can be seen on Table 2, *the infant population (that under 5 years of age)* shall increase at the very low rate of 0.2% between 1990-2020. There will be decades, however, in which r will be significantly positive, as the 1990's (0.9%), and others negative, as the first decade of the next century (-0.6%). This will due to oscillations in b, caused by the combined effect of changes in fertility level and structure as well as changes in the age profile of reproductive women, provoked by those generations born after the rapid decline in fertility.

Until the 1970's, this age group, as the others, grew at basically constant r over 2.5%. There was then a sudden fall to a situation of low and oscillating rates. The decrease in r has been enormous and as mentioned before will be negative in the beginning of the 21st century. The decrease will be so dramatic that in 2020 the number of children under 5 will probably be only 6% higher than that for 1990. If the same average growth rate observed for 1940 and 1970 was maintained, the increase would be of 114%.

In absolute terms, the number of children under 5 in 2020 will be approximately 17 million. As compared to the 16 million for 1990, there will be an increase of only 1 million in the next 30 years. If population under 5 between 1990 and 2020 had the same observed r for 1940 and 1970, it would have increased from 16 million to 34.4 million.[3] Thus, 18.4 million children under 5 would be "missing" in 2020.

---

[3]   The number of children in 2020, if there was no fertility decline from the end of the 60's, would be even greater than 34.4 million , since the total number of children enumerated in 1990 (16 million) already embodies the effect of the sharp fertility decline between the end of 60's and the 90's.

Childhood public policies, as those concerning health, food and support for the youngest would greatly contribute for a qualitative difference in favour of the new generations which present favourable conditions on the demand side. It should be kept in mind that the current young population, i.e., under 15, as it was born after the beginning of fertility decline already has, *cæteris paribus*, greater changes to receive better assistance at family level as for health and food at least in view of its lower weight *vis-à-vis* the adult population that support it. A national survey on health and nutrition, showed for 1984 a smaller prevalence of malnutrition among children under 5 years of age than that revealed for 1974. This result was unexpected due to de 1980's economic crisis. Part of the improvement would be probably explained by the decline in fertility that had as its consequence not only a smaller number of children by couple, but also a greater age difference among them and this would have contributed to a better nutritional level of poor children (Peliano, 1990). Another example can be found in the health services, with real possibilities of eradication of some diseases. In fact, if the fertility decline trend persists, in a short period of time, with few extra efforts, total coverage of preventive care might be reached (Albuquerque e Duarte, 1988). This would be the case of polio and measles, for instance, given that vaccination coverage for preventing them is already reasonably high.

As for population of 5-14 years of age, figures from Table 2 indicated a relatively high growth rate. The value of *r* for 1980/1991 for this group : 1.6%, which is, nonetheless, lower than that for 1940/1970 (2.8) and smaller than those for the rest of population. Between 1990 and 2020, *r* shall experience a sharp drop, reaching a negative value. However, there will be oscillations with *r* ranging from -0.4% in 1990/2000 to 0.5% in 2000/2010.

In case the same *r* for 1940-1970 were held for 1990-2000 the population of 5-14 would reach 77.8 million people in 2020. Thus, 45.1 million youth will have been "missing", i.e., a contingent 1.38 times greater than that probably present in 2020 (32.7 million)[4].

The population aged 5-14 is, grossly speaking, that which should be covered by the elementary school system. The unusual and favourable opportunity that the Brazilian Society has to define and implement a policy in this area is obvious. The country has now excellent circumstances to overcome the shortcomings in the elementary school such as unsatisfactory coverage, very high rates of repetition and drop out, low wage and poor qualification of educational staff[5].

As an absolute decrease in the size of population demanding elementary school shall occur in the present decade (See Table 2), the 1990's are of crucial importance for the definition and implementation of a new educational model for Brazil. A demand fall is occurring, due particularly to the decline in the

---

[4] The same observation made in the previous note is valid here.

[5] National statistics for primary school indicate about 27 students per classroom. This may not indicate an uncomfortable situation at first glance, however, it is necessary to bear in mind that, a brazilian school very often runs 2, 3 or even 4 day-shifts and that a teacher, also, very often, works in more than one or two classes during the same academic term. In addition, minimum supplies, as chairs/tables or blackboard are privileges of only 72% of the students (estimates derived from figures published in FIBGE, 1993). Elementary school teachers are very poorly paid, they usually earn less than the legal minimum wage per month (about US$ 100.00 in 1995).

absolute number of children at the age of entering the elementary school (7 years). The 1991 census showed that the number of children under 5 years of age is smaller than that of children between 5 and 10. As the pressure for young children entering school lessens, or even disappears, more attention can be given to those already enroled, raising, for instance, the teaching quality and attainment levels. As a consequence of this, the annual failure rates in the primary school, which are extremely high - particularly among the poor - and leads to high drop out rates, might experienced cut backs[6]. In this way, more financial resources will be spared and could be oriented to elementary school itself or high school, which system has now a days, lower coverage as compared to that of the elementary school.

The new educational model must be flexible enough so as to be able to anticipate oscillations that will necessarily occur on the demand side, presenting both positive and negative growth rates in the country as a whole. At the local level, a continuous follow up of demand will be even more important, since migration will play an important role in its evolution, being able to intensify or attenuate oscillations in the short run.

Brazil's present demographic situation points out an improvement in educational policies, as problems generated by quantitative pressure on the demand side will be reduced. It is an extremely favourable situation to surmount one of the major problems of the Brazilian society, a reason why a case should be made for expansion of investment in the area, instead of reducing it due to decreasing demand and the State fiscal crisis. It should be kept in mind that a lower growth pace already happened between 1970 and 1990, without any improvement in elementary education in Brazil. The same demand trend occurs as far as secondary education is concerned.

Qualitative change in the children's demands

The analysis of the positive side of this window of opportunity for the children must consider, on the other hand, that Brazilian population is, at the same time, undergoing, in one way or another, its own developing process and modernization, which also means new emergent needs and demands that shall be attended.

The actual reduction in absolute numbers does not mean that necessarily less children will demand public services, because, in general, service's coverage does not reach 100%. On the other side, this reduction is consequence of the fertility decline, which on turn is associated to increases in female labour force participation and to modernization. The new behaviours that the whole process generates may increase demand for public services proportionally more than the decrease of population size. This is the case, for example, of pre-schools, nurseries or day-care centres. Demand for these services may be better attended due to the reduction of the population size, however, it should be emphasized that the significant

---

[6] According to the Governor of São Paulo, the richest Brazilian state, "...among 100 children entering the first year of elementary school, only 33 successfully finish the 8th academic-years required to complete primary school; among these 33, only 5 spend 8 years for obtaining the degree. In general, students that manage to finish the primary school spend, on average, 12 years" (ESTADO DE MINAS, Sunday, 3rd of September, 1995, pp. 2). Figures for the whole country are similar: Among those enroled in the first year of primary school, 39% reach the 5th academic year. (UNICEF, 1995).

increase of female participation in labour force, and also the sole widespreading of modern ideas stimulating the children to interact among them, in places other than their own residence may, disproportionably increase such demands. Rosemberg (1995) forecasts a substantial more demand for preschool education; since those demands will have at any rate to be satisfied, she points out the need of huge investments in getting skilled staff. Otherwise the actual young generations will be at risk of confinements, thus, developing or perpetuating adverse psychological and professional conditions.

About health care issues, disease prevention, oriented to children under 5, which is improving now a days, is expected to undergo a further increase following modernization diffusion. In that sense, education spreading through mass media will expand demand for avoiding illness instead of curing them, which will result, for instance, in more parents looking for nutritional information rather than oral rehydration treatment. Consequently it will be necessary to re-address and improve that side of health services: prevention care.

Considering schoolaged population, although low r among the younger, may easy education problems, it is worth to have in mind what Potter's calls 'perverse consequences' on the educational levels of the rapid fertility decline in developed countries (Potter, 1990). United States is a good example: Preston (1984) argues that the fast fertility change experienced by this country contributed to deteriorate children's welfare. Worse education results were attributed to downwards demand for teachers because of the declining schoolaged population. "This shift led to a lower wage for teachers, which induced a disproportionate number of the better teachers to leave the field or to avoid it altogether" (Preston, 1984, pp. 449). This may not be the case of the current Brazilian situation, since, as mentioned before, school staff deficit is chronic in quantitative and qualitatively terms.

Brazil should mirror the East Asian countries's transition, where the young population, still growing at relatively high rates and with high skills attained trough technical education contributed to the progress in these countries (Bowman, 1987). The quality and levels of schooling attained and by them were such, that a succession of smaller cohorts of youth did not pose problems for quality of the forthcoming labour force.

Regarding adolescents' skills, and considering previous comments, Brazilian economy will have a better performance if policies of technical training are further reinforced, as rates of the youngest labour force are still high. According to Bowman (1987), where there is already at least some diversity in economic activity and organization and high rates growth of youngest labour force - as is the Brazilian case - more doors are already partly open for progress in formal schooling, in learning at work, and in the transmission of new ways of doing things. "It is no accident that SENA[7] and related programs were developed in Colombia and Brazil, that in China have played a major role, well-recognized part in the economic progress of Malaysia, that the Ivory Coast has been among the most successful of the countries of sub-Sahara Africa, or that South Korea is among the so called 'Third World' countries that is on the forefront in the economic challenges to Japan and the West." (Bowman, pp 88-89). Thus, continued learning through the post-school years must be of increasing importance as the 21th century is approaching.

---

[7] National Services for technical training on industry, trading, business, etc., oriented to young labour force.

2.2 Evolution of demand by the elderly

While total Brazilian population shall grow at an average r of 1.3% between 1990 and 2020 that of 65 and over will increase at about 2.8% p.a.

Such a rapid pace is due to the fact that, until the year of 2030, its components will totally belong to the relatively large generations that were born before the decline in fertility and that have benefited from the significant decline in mortality occurred in Brazil.

From 2030 onwards, this group will present decreasing rates, because it will increasingly count as its component on people born after the decline in fertility. However, even when it reaches a lower growth rate (say, about zero) in the long term, the relative weight of the elderly population will not be reduced as proportion of the total population. In fact, on the assumption that Brazil will have r of 0.0 from the period 2015/2020 onwards, the population aged 65 or more would represent 14.2% in the total population by 2050. This proportion would stabilize at about 15% during the second half of the next century (Table 3).

As population ageing is a consequence of fertility decline, it will occur much more rapidly in Brazil than was the case of developed countries, since fertility decline, once initiated, had a much more rapid pace as was shown in Figure 1.

In the analysis of the evolution of social demand by the elderly, two important issues must be taken into account: 1) absolute size of the group in question and its growth pace, and 2) its relative size, particularly related to the labour force, since its components are usually not in productive activities and shall be assisted, directly or indirectly, by the labour force.

From 1990 onwards, the population above 65 will be increasingly constituted by generations of parents responsible for the fertility decline in Brazil. They are people with an increasingly smaller number of children. The traditional role of family as the elderly's both material and phycological necessities supplier will be increasingly feeble. Even if there were no change in the society in terms of parental solidarity, a smaller number of children will significantly increase the average burden per child in the case of parents assistance.

A second major point in this discussion refers to the low sex ratio among the elderly which will tend to decrease even more with mortality decline. In view of the higher male mortality at these ages, there will be relatively more surviving elder females than surviving elder males, i.e., in a society that customarily discriminates women there will be an increasing female contingent in those age groups which are more easily exposed to the social system's inequities.

Health assistance to the elderly

The morbidity profile of the elderly is completely different of that of the rest of the population, obviously with greater incidence of terminal diseases and prevalence of chronic-degenerative diseases, the treatment of which, by its very nature, requires greater inputs in equipment, medicine, and specialized personnel (Jones, 1975).

Even if the Brazilian health system functions well, increase in expenditure in the sector in the next 30 years should be above the value of r of the population. This is the case, since the growth rate of the elderly (as shown in Table 3) will be significantly higher than the average and the cost involved in supporting old people aged 65 or more until death is higher than that of the population at different ages.

Given the public health system failure in Brazil, the rapid pace of population ageing points out the need to redefine this sector's policy in order to prevent or at least attenuate destitution of older generations that have contributed for the nation's building in their active lifetime.

The retirement question

As the social security system in Brazil is now under debate[8], it is absolutely necessary to consider the new Brazilian demographic pattern and its consequences in the medium and long term aiming at the definition of an alternative system to be implanted (Martine, Carvalho and Arias, 1994).

The need for a change in retirement age legislation has been put under the Brazilian society's consideration with a demographic argument, i.e., it is a must to define a minimum age until people are allowed retire in view of the life expectancy increase of the Brazilian people.

For the discussion of this problem, it is worth keeping in mind the two "pure"social security systems: the so-called 'fully funded' and the 'pay-as-you-go' system.

In the first system, the payments made by each contributor to the system make up a fund which aims at assuring him/her future benefits as a retired person. Average value of benefits will depend on the accumulated volume of contributions made in the past, the fund management, and the beneficiaries' expected number of surviving years. In the second, the pay-as-you-go system would have to balance current revenues and expenditures. If the average value of benefit is the element that must adjust itself for the system's equilibrium, it will be defined by the number of contributors, beneficiaries and average value of contributions. If the adjustment element is the average value of contributions, it will depend on the number of contributors and beneficiaries as well as the average value of benefit. The Brazilian social security, as all official social security systems, is a pay-as-you-go system.

The argument of increasing life expectancy at birth as a result of mortality decline, in order to define a minimum age for retirement would be valid for a 'fully funded' system, since it implicitly refers to an increase in the average number of years the beneficiary will survive after retiring *vis-à-vis* the average number of years he has contributed to the system so as to make up the retirement fund. If the system was that of fully funded, however, in terms of generations, increase in life expectancy at birth

---

8   The Brazilian complex social security system is one of the few in the world that does not impose a minimum age requirement to retire. After 30 years (women) or 35 years (men) of social security contribution, anybody is entitled to retire. On the other hand, after, at least, 78 of monthly continuous contribution, one can apply for retirement at the age of 60 (women) or 65 (men). Furthermore, there are several professional groups that are allowed retirement after a shorter period of contribution, as teachers of any level: 25 years (women) and 30 years (men).

would not necessarily require increase in the minimum age for retirement. On the one hand, if the decline in mortality increases survival from a certain age (that for retirement), on the other, for the same cohort, it also increases the average number of years of active life and, as a result, of contribution. With mortality decline and the consequent increase in life expectancy at birth, the results in terms of retirement age in a fully funded system will depend on the years of life gains (persons-year) by each generation during the contribution period (active life) and the gain after retirement age (non-active life).

From a purely demographic point of view, life tables for Brazil defining generational hypothetical trajectories submitted to the current mortality function in each period have to be used for the analysis of the virtual impact of mortality decline on the minimum age for retirement in the case of the fully funded system.

Table 4 shows a proportional distribution of the number of persons-year of hypothetical cohorts submitted to average function of observed mortality in Brazil in the 1930's, 1940's, 1950's, 1960's, and 1970's.

TABLE 4

BRAZIL - Person-years distribution (*) from a hypothetic cohort given the Brazilian mortality function for the periods 1930/1940, 1940/1950, 1960/1970 and 1970/1980 and ratios between elder people and population at working ages

Age Groups and Elders Dependency Ratio	1930/1940	1940/1950	1960/1970	1970/1980
00 - 14	27.3	26.2	25.1	22.4
15 - 54	56.2	56,2	55.5	55,1
15 - 59	60.9	61.0	60.6	60.8
15 - 64	64.9	65.1	65.0	65.9
55 or more	16.5	17.1	19.4	22.5
60 or more	11,7	12.3	14.3	16,7
65 or more	7.8	8.1	9.8	11.7
Ratios				
55 or more/15-54	0.29	0.30	0.35	0.41
60 or more/15-59	0.19	0.20	0.24	0.27
65 or more/15-64	0,12	0.12	0.15	0,18

(*) Relative to the total population.(%)
SOURCE: Original data from MOREIRA and CARVALHO, 1992.

Whatever the minimum age for retirement, the ratio *'years of benefit (open interval age group) / years of contribution (from age 15 to the lower limit age of open interval age group)'* increased with the decline in mortality. This means that in terms of relative gains in years of life, decline in mortality has benefited more each generation in elder ages. In a fully funded system, *cæteris paribus*, average benefit should decrease if the minimum age of retirement were to be kept constant.

In case the minimum age for retirement increased the ratio *'year of benefits / years of contribution'* would decline significantly. For example, between the 1960's and 1970's, the rise in minimum age from 55 to 60 would result in a decrease in the ratio years of benefits/years of contribution of 0.35 to 0.27 (-23%) and from 60 to 65 a decrease of 0.24 to 0.18 (-25%).

One may conclude that in a fully funded system and in the face of decline in mortality in a pattern similar to that observed in Brazil, the minimum age for retirement would have to be increased for the same level of benefit. The Brazilian social security system, however, as mentioned before, is not a 'fully funded' one, but a 'pay-as-you-go' system. In the latter, the fundamental element for its equilibrium, demographically speaking, is the age distribution of population at every moment, which hypothetically would define the ratio between beneficiaries (elderly population) and contributors (labour force)[9].

The age distribution of population is scarcely dependent on its mortality levels, but almost exclusively on past and recent fertility history, as was seen in section 1 for the Brazilian case. On the other hand, the present crisis of the Brazilian social security system has nothing to do with the ageing of the population, since the effect of fertility decline on the ratio *'inactive (elderly people) / active (labour force)'* was only marginal during the last decade, as can be seen in Table 5. Given the situation of financial disequilibrium in the Brazilian social security system, the country's demographic dynamics will irreversible aggravate the present shortcomings, if nothing changes. Considering a limit age of 55 for retirement, the *'inactive/active'* ratio would raise 56% between 1990 and 2020; and 42%, considering the limit age 65. This ratio, with the limit age of 55 in 1970 (0.15) would probably be equalled in 2020 between the limit ages 60 and 65 (0.18 and 0.11 respectively)[10].

---

[9] Only in the case of the stationary population it would be indifferent to consider in both security systems either the population age structure or the trajectory of a cohort defined by the life table. The reason is that, in this case, the actual age structure (from the given population) coincides with the L_x distribution (from the life table).

[10] As a matter of fact, the elder people may have been over-enumerated in the 1991 Census. There is no justification for the age group 65 and over to present r equal to 3.9% for the period 1980/90.

TABLE 5

'Inactive/Active' Ratios according to different age limits

Period	55 or more/15-54	60 or more/15-59	65 or more/15-64
1970	0.15	0.10	0.06
1980	0.16	0.11	0.07
1990	0.19	0.13	0.08
2000	0.19	0.12	0.08
2010	0.23	0.14	0.09
2020	0.29	0.18	0.11
2020/1990	1.56	1.46	1.42

SOURCE: 1970,1980: IBGE - Demographic Census. 1990 to 2020: Carvalho, 1993.

In short, in discussing the definition of an alternative system for social security in Brazil, one can not ignore the country's new demographic pattern that will irreversibly cause the relative ageing of Brazilian population in the next decades. In this context, it is indispensable to define a minimum age for retirement, which, of course, does not depend exclusively on demographic variables.

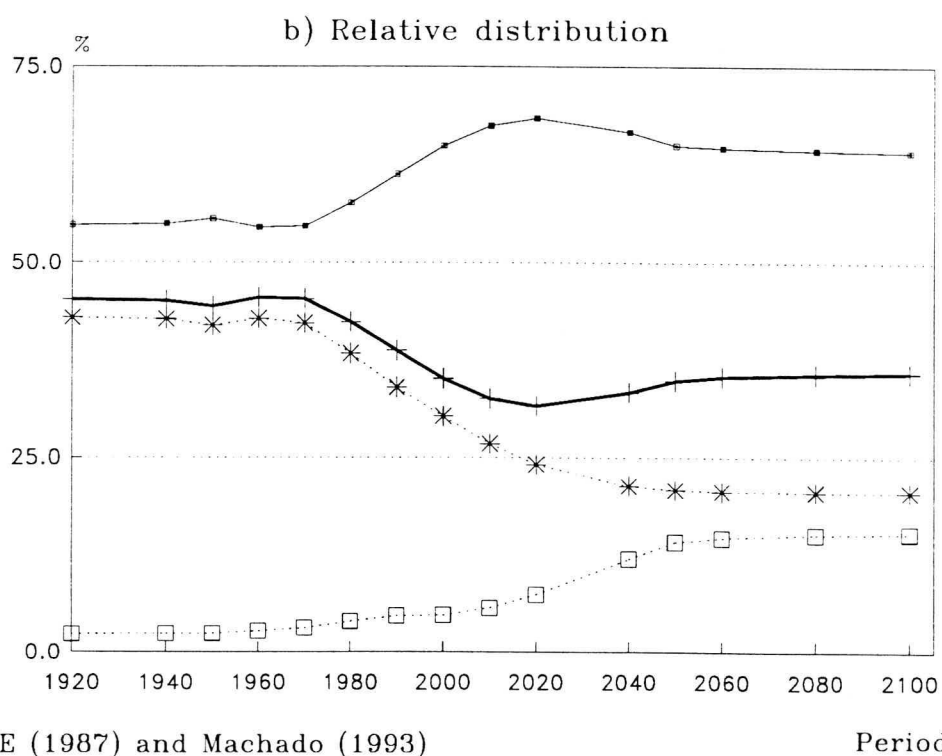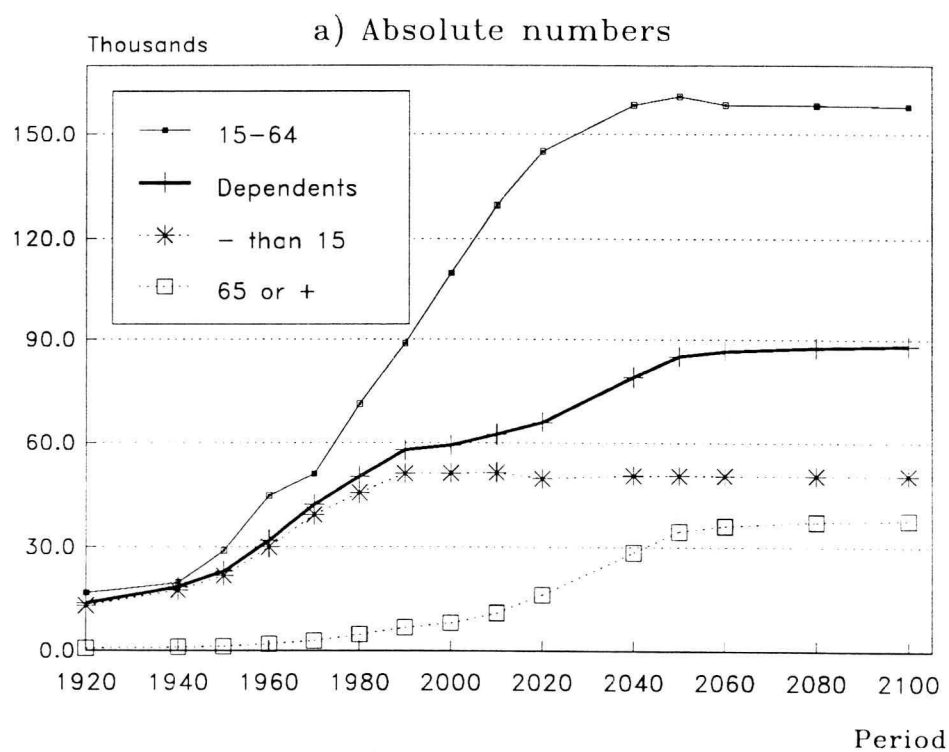## 3 THE GOLDEN AGE OF THE BRAZILIAN DEMOGRAPHIC TRANSITION

Previous comments have signalled the advantages of the young population reduction in the total population and have point out the extra burden of having higher proportions of elderly people than in the past. The comparison of the relationship between these 'dependent' groups and the 'productive' population, in a larger period of time, may provide important insights for a better understanding of these changes[11].

Age structure changes, due to mortality decline and the dramatic fertility fall, may be seen in Figure 4, which includes both absolute and relative distribution of the population for the period 1920/2100.

Dependent population (people aged less than 15 and 65 or more) in Brazil were nearly half of the total population at the beginning of the century when more than 90% of the dependents were children below age 15. Decrease in the proportion of dependents started during the 60's. By the end of the 20th century they would represent around only a third of the total population, the major part of them being less than 15 years old. That proportion will probably start to increase by 2020, when the minimum (31.3%) would be reached; by that year, three quarters of them would be children. From that point onwards, the total dependents would expand, reaching 38% by 2100. The increase would be totally explained by the growth of the elderly that would tend to values similar to those of the children. Nonetheless the proportion of dependents in the total population will probably never reach again the high values observed before the fertility transition.

---

[11] The 'productive' population is defined here as the population aged 15-64.

Figure 4: Brazil, 1920/2100: Population by selected age groups

a) Absolute numbers

Thousands

Legend:
- 15-64
- Dependents
- — than 15
- 65 or +

Period

b) Relative distribution

%

Period

Source: IBGE (1987) and Machado (1993)

The expected evolution of the Brazilian age structure in the short, medium and long term presents characteristics such as the interaction between the different age groups may optimize their socio-economic role in society.

The proportion of children below age 15, as seen before, is diminishing since the 60's, and their absolute size is not increasing since the 80's, which means that pressure for sustaining young people has decreased in recent past. Furthermore, considering the projected numbers plotted in Figure 4, this group would not increase either in absolute or relative terms. Therefore, it would not exist demographic pressure neither at short, nor at medium or long term for expanding resources expenditure. Pressure should come for improving children's welfare instead.

The population at the economically active age, due to the same demographic dynamics - high fertility levels in the past and continuous improvements in survivorship - is still increasing. Although their proportion would start to decrease by 2020, their absolute figures would continue to grow up until Brazil reaches a nearly stationary growth, i.e, by 2050. In other words, despite the increase of the elderly, it would come a long period of time in which population at productive age would be numerically and proportionally increasing and so their role in the economy. Figure 4 indicates that Brazil is entering this phase: working-aged population is increasing fast, albeit at declining rates it will continue to do so until 2020. From a demographic point of view, this large proportion of 'productive' population would have better conditions than before for sustaining dependents. The difference between population at productive age and the dependents started to enlarge during the 70's in relative terms. It is still expanding and it would remain substantial after reaching stability with no population growth.

The dependency ratios[12], showed in Figure 5, clarifies the relationship between the different age groups mentioned. There is no doubt that the burden on the 'productive' population had been heavy and constant until 1970. The TDR has been decreasing since then and, consequently with the population trends perspectives, it will continue to decrease until 2020. It can be seen that constraints, expressed through these dependency ratios, are at lower levels now than before, and will be even lower in the next decades. The TDR downwards trend is defined by both, the significant increase of adults and the stabilization of the population below age 15. It is worth noting that the TDR, will never go back to the high levels it had at the beginning of the 20th century. In addition to the fact that the end of this century will be marked by an exceptional growth of the share of the working-aged population, which is a merely age structure effect, the labour force is expected to be further strengthened as a consequence of the increase in the female labour force participation, partly due to the persisted fall in fertility.

---

[12] We are considering:
  1. Children Dependency Ratio (CDR), as the number of people less than 15 divided by population aged 15-64.
  2. Elderly Dependency Ratio (EDR), as the number of people more than 65 divided by population aged 15-64.
  3. Total Dependency Ratio (TDR) as the sum of CDR and EDR.

Figure 5: Brazil – 1920/2100: Dependency Ratios

Dependency Ratio (%)
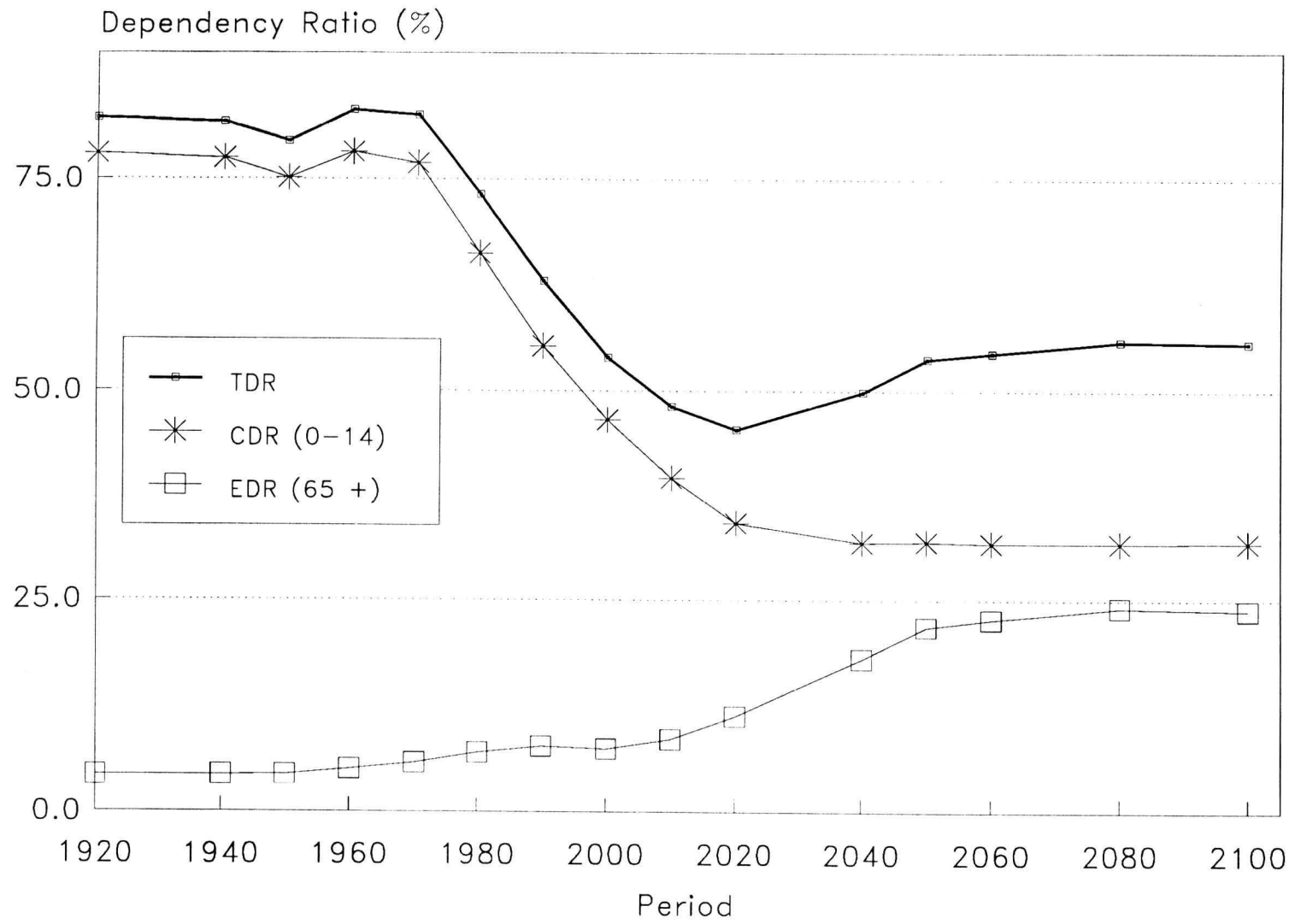
Source: IBGE (1987) and Table 3.

4 CONCLUSIONS

Brazil is presently going through a rather comfortable demographic process considering the combination of the three analyzed age groups in the previous section. The country is next to achieve the lowest TDR, due to the expansion of the labour force, the fast decrease of young people and the - still - relatively low growth rate of the elderly. It is a double encouraging structural situation.

Firstly, because in the short and medium term, the smaller size of current children generations, which is pushing down the TDR, makes more feasible the re-orientation of children social expenditure in which efficacy should be most the important criteria. At the same time, the large proportion of working-aged population causes low demographic dependency ratios either from children or the elderly and should, in principle, relieve the burden of the current social welfare system, until the EDR enters the phase of fast growth. This situation, certainly gives favourable conditions to the society for re-formulating the present social security scheme taking in due consideration the irreversible process of population ageing.

Secondly, given the facts that elder dependency ratio will be significantly high from 2020, and that the children of today -who belong to smaller generations than before- will be the labour force of tomorrow, who in turn, will have to face rapidly increasing in elder dependency ratios, a logical conclusion emerges: society vitally needs to invest in current children, particularly in the areas of health and education. This is not only a matter of human rights, but also because they (again, a part of smaller generations) will have to sustain, as a part of the labour force the economy and a highly increasing proportion of elderly. Therefore, they will need to be better qualified than the previous generations.

Ignoring this reality implies in loosing an opportunity to benefit the poor in the country. It is naïve to believe that the relative decrease in the number of births and reduction of total population growth rate as a consequence of fertility decline would automatically result in the solution of social difficulties. The opportunity of favorable conditions brought about by the new population dynamics should be effectively weighted in the implement of social policies. Definition of priorities based on the new demographic patterns in which allocation of resources in sectors guaranteeing higher social yields in the medium and long term is urgent.

REFERENCES

ALBURQUERQUE, S.P. and DUARTE, F.J. (1988): A queda da fecundidade e as demandas sociais básicas: 1980-2000. *Anais do VI Encontro de Estudos Populacionais.* ABEP - Recife.

ARRUDA, J.M.. et alii.(1987): *Pesquisa nacional sobre saúde materno-infantil e planejamento familiar, PNSMIPF -Brasil, 1986, Rio de Janeiro: BEMFAM.*

BOWMAN, M.J. (1987): Education, Population Trends, and Technological Change. In, Espenshade and Stolnnitz (eds.): *Technological Prospects and Population Trends.* AAAS Selected Symposium - 103. Washington, D.C.

CARVALHO, J.A.M. (1974): Tendências Regionais de Fecundidade e Mortalidade no Brasil. Belo Horizonte: CEDEPLAR/UFMG. Monografia N. 8.

----- (1988): "O tamanho da população brasileira e sua distribuição etária: uma visão prospectiva", São Paulo : ABEP, *Anais V Encontro Nacional de Estudos Populacionais.*

----- (1993): *Crescimento populacional e estrutura demográfica no Brasil,* Belo Horizonte: CEDEPLAR/UFMG. (Paper presented at the Seminar: "Crescimento Populacional e Estrutura Demográfica", Ministério das Relações Exteriores/IBGE, Rio de Janeiro, May/1993).

DEMOGRAPHIC AND HEALTH SURVEYS - MACRO INTERNATIONAL INC. & SOCIEDADE CIVIL BEM-ESTAR FAMILIAR NO BRASIL - BEMFAM (1992): *Nordeste, Brasil, pesquisa Sobre Saúde familiar no Nordeste Brasil - 1991* - Rio de Janeiro.

ESTADO DE MINAS - Ano LXVIII - Número 19.701 - Belo Horizonte, MG.

FERNÁNDEZ, R.E.and CARVALHO, J.A.M. de.(1986): A evolução da fecundidade no Brasil: período de 1957-1979. *Revista Brasileira de Estudos de População,* Campinas, v. 3, n. 3, p. 67-86, Jul./Dec. 1986.

FIBGE (1974): Projeção da população brasileira por idade e sexo, 1975-2000. In, *Revista Brasileira de Estatística,* 35(139):357-370. Rio de Janeiro.

FIBGE (1987): *Estatísticas Históricas (Part I).* Rio de Janeiro.

FIBGE (1988): *Anuário Estatístico do Brasil, 1987/1988,* Rio de Janeiro.

FIBGE (1993): *Anuário Estatístico do Brasil, 1993,* Rio de Janeiro.

FRIAS de M.,L.A. and CARVALHO J.A.M. (1994): 'Fecundidade nas regiões brasileiras a partir de 1903 - Uma Tentativa de Reconstrução do Passado através das Gerações'. *Anais do IX Encontro Associação de Estudos Populacionais* - ABEP. Caxambú.

JONES, G.W. (1975):"Crecimiento de la población y la planificación de la salud y de la familia". In: ROBINSON, W.C.(ed.) *Planificación para la población y el desarrollo.* Nueva York: Population Council.

MACHADO, C.C. (1993): Projeções Multirregionais de população: O caso Brasileiro (1980-2020). Belo Horizonte. Ph.D Theses - Universidade Federal de Minas Gerais/CEDEPLAR.

MARTINE G, CARVALHO, J.A.M. and ARIAS, A. R. (1994): *Mudanças Recentes no Padrão Demográfico e Implicações para a Agenda Social* - Texto para Discussão N. 345. IPEA - Rio de Janeiro.

MERRICK, T.W., BERQUÓ, E.S. *The determinants of Brazil's recent rapid decline in fertility.* Washington: National Academy Press, 1983. (Report, 23).

MOREIRA, M. M. and CARVALHO, J.A.M.(1992): Envelhecimento da População e Aposentadoria por Idade. - *Previdência em Dados*, Rio de Janeiro: 7(4):27-40, Oct./Dec. 1992.

PELIANO, A.M. et alii *Pesquisa Nacional de Saúde e Nutrição*. Brasília: INAN/IBGE/IPEA, 1990.

POTTER, J.E. (1990): 'Social and Economic Consequences of Rapid Fertility Decline in a Period of Economic Crisis'. Paper presented at Seminar on the Fertility Transition in Latin America. IUSSP/CELADE/CENEP. Buenos Aires, 2-5 April, 1990.

PRESTON, S.H. (1984): Children and the Elderly: Divergent Paths for America's Dependents. *Demography* - 21(4):435-457.

ROSENBERG, F. (1995): 'Fecundidade, Educação Infantil e Gênero'. Paper presented at: Seminar Rapid Fertiltiy Decline in Brazil and India: Social Determinants and Consequences. Harvard Center for Population and Developments Studies. Cambridge, 3-4 April, 1995.

UNICEF (1995): The State of the World's Children. Oxford, New York: Oxford University Press.

UNITED NATIONS (1984): *Population, Resources, Environment and Development.* - Proceedings of the Expert Group on Population, Resources, Environment and Development; Geneva. 25-29 April, 1983 - International Conference on Population.

ANNEX

**Sweden, England and Brazil (Including Southeast and Northeast Regions):
Total Fertility Rate for Selected Periods**

Period	Sweden	England	Brazil		
			Total	Southeast	Northeast
1870	4.37	5.31	---	---	---
1875	4.43	5.21	---	---	---
1890	4.49	4.70	---	---	---
1895	4.32	---	---	---	---
1900	4.08	3.34	---	---	---
1905	4.06	3.06	7.50	7.90	6.75
1910	3.80	2.86	7.25	7.80	6.70
1915	3.55	2.75	6.95	7.50	6.60
1920	3.36	2.60	6.70	7.10	6.60
1925	2.89	2.26	6.50	6.60	6.65
1930	2.76	1.88	6.30	6.20	6.70
1935	2.13	1.84	6.10	5.80	6.75
1940	1.82	1.99	5.90	5.35	6.80
1945	1.79	2.41	5.80	5.10	6.90
1950	2.20	2.18	5.90	5.00	7.10
1955	2.52	2.44	5.90	5.00	7.25
1960	2.24	2.81	6.00	5.10	7.40
1965	2.25	2.65	6.20	4.80	7.35
1970	2.27	2.17	5.76	4.60	7.25
1975	2.31	1.74	---	---	---
1980	1.94	1.79	4.35	3.45	6.13
1985	1.65	1.80	3.50*	2.70*	4.20*
1990	1.65	1.85	2.70**	2.30(**)	3.60

(---) N.A.(*) Estimated for 1984.(**) Preliminary Estimations

SOURCES FOR SWEDEN:

1870-1905:   BRECKENRIDGE M.B. (1983): *Age, Time and Fertility. Applications of Exploratory Analysis..* Studies in Population - Academic Press - University of Wisconsin - Madison, Wisconsin.

1890-1910:   SVERIGES OFFCIELLA STATISTIK *Befolknings statistik* - Statistiska Centralbyrans - Underdanigs Beratelse -Centralbyran; Stockholm.

1911-1965:   SVERIGES OFFCIELLA STATISTIK *Befolkningsrorelsen au Statistiska.* (Folkmangden och dess Forandringar) -Centralbyran; Stockholm.

1965 onwards: UNITED NATIONS: *Demographic Yearbook* - Department of International, Economic and Social Affairs. Statistical Office - New York

SOURCES FOR ENGLAND:

1870-1905:   KEYFITZ N. and FLIEGER W. (1968): *World Population: An Analysis of Vital Data.* University of Chicago, Chicago.

1905-1920:   THE REGISTER GENERAL: *Annual Report of the Registrar General of Births, Deaths and Marriages in England and Wales.* HMSO-London.

1921-1969:   THE REGISTER GENERAL: *Statistics Review of England and Wales.* Series: New Annual Series - Tables - Part I: Medical and II: Civil. London.

1970 onwards   OFFICE OF POPULATION, CENSUSES AND SURVEYS *Birth Status.* Series FM1 no. 13 - A publication of the Government Statistical Service. London.

SOURCES FOR BRAZIL:

1905-1965:   FRIAS de M..L.A. and CARVALHO J.A.M. (1994): 'Fecundidade nas regiões brasileiras a partir de 1903 - Uma Tentativa de Reconstrução do Passado através das Gerações'. *Anais do IX Encontro Associação de Estudos Populacionais* - ABEP. Caxambú.

1970-1980:   LEITE, V. da M. (1981): Níveis e Tendências da Mortalidade e da Fecundidade no Brasil a Partir de 1940. pp. 581-609. *Anais Segundo Encontro Nacional* - ABEP. Águas de São Pedro.

1986:   OLIVEIRA, L.A.P. and SILVA N.L.P. (1986): Tendências da fecundidade nos primeiros anos da década de 80. pp 213-231. In: Anais V Encontro Nacional - ABEP. Águas de São Pedro.

1991:   DEMOGRAPHIC AND HEALTH SURVEYS - MACRO INTERNATIONAL INC. & SOCIEDADE CIVIL BEM-ESTAR FAMILIAR NO BRASIL - BEMFAM (1992): *Nordeste, Brasil, pesquisa Sobre Saúde familiar no Nordeste Brasil - 1991* - Rio de Janeiro." and BERCOVICH, A., OLIVEIRA, J. C., MENDES, M. M. *Estimativas preliminares de fecundidade considerando os censos demográficos, pesquisas por amostragem e o registro civil.* Rio de Janeiro: DEPOP/DPE/IBGE (unpublished).