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POPULATION GROWTH: A 1975 WORLD VIEW
FERTILITY VERSUS DEVELOPMENT

By

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Population Growth: A 1975 World View
Fertility versus Development

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I. INTRODUCTION

During the first three quarters of the twentieth century, the world's total population has increased from 1.5 to 4 billion and this despite major wars, famines, epidemics, earthquakes and continued high infant mortality in many places. For the next 25 years of the second millenium, realistic projections predict an increase from 4 to around 6 1/2 billion. While it took the world ten-thousands of years to reach 3 1/4 billion in 1965, only 35 years will be needed to add another 3 1/4 billion people. The number of cities with more than 100,000 inhabitants doubled during the last 25 years (992 in 1950) and is expected to climb to 3600 during the next 25 years.

In the distant future, historians may perceive this explosive growth of mankind as the single most notable revolution. During the twentieth century the population will have quadrupled and the density of the world will have increased from around 12 to 48 persons per square kilometer. The lower death rates resulting from the transfer of medical technology to the developing world without concomitant education in family planning is the major reason for today's excessive population growth in developing countries.

This paper attempts to portray to the obstetrician-gynecologist, as well as to the specialist in reproductive biology, the present dynamics of population growth and to offer a few comments on the major findings. The discussion

includes a description of an interactive model showing the inverse relationship between human reproduction and socioeconomic development. The future contribution of biologists and obstetricians is mentioned.

II. MATERIAL AND METHODS

Three reference sources that appeared in April 1976 serve as a basis for this report: (a) The Population Reference Bureau's "World Population Growth and Response, 1965-1975", (b) The United Nations' Demographic Yearbook, 1974, and (c) The United Nations Fund for Population Activities "Population Programmes and Projects, 1974-1975"[1 2 3]. For two countries, more recent estimates have been considered[4].

More than 200 population subsets were formed to delineate relevant epidemiological patterns and trends.

1. Place. An inventory of the 70 most populous countries in mid-1975 gives an epidemiological description of the world's population distribution by place. This ranking comprises 95 percent of the world's total population with sizes ranging from 823 million (China) down to 6.4 million (Cameroon).

2. Time. A comparison of the populations of a subset of 35 countries for mid-1965 with the 1975 figures gives an epidemiological description of the world's population growth over time. Seven countries from each of the five world regions (Americas, Europe, Africa, West and East Asia), which represent 83 percent of the world's estimated population, are considered. To more clearly delineate population shifts in the recent past and in the near future, a narrow time span of 20 years is suggested. Using the good estimates avail-

able for 1965 and (for the first time) for 1975, this paper projects forward by one decade to establish a three-point time series of population estimates for 1965, 1975, and 1985.

3. The evolution in population density and age structure is compared for two countries, one characteristic of the developing and one characteristic of the developed world. The latest United Nations figures are then developed to show today's growth and age structure of the world's population by macroregion.

Accumulated evidence about the relationship of human reproduction to various sectors of development is organized into a model to stress the contribution needed from both research in reproductive biology and from family planning institutions.

III. FINDINGS AND COMMENTS

1. The World's Population in 1975

By mid-1975, the world's total population was estimated at almost 4 billion. Figure 1 illustrates in decreasing order the seventy most populous countries which comprise 95 percent of the world's population and show the range in national populations from 823 million (China, 20.75%) to 6.4 million (Cameroon, 0.16%). Above the 100 million mark are the seven most populous countries which comprise 56.7 percent of the world's total population. Among the four leading countries, China and India comprise 36.1 percent of the world's total population against 11.8 percent for the USSR and USA. Among the ten leading countries which comprise 62.4 percent of the world's total population, seven are "developing" with 47.8 percent of the world's population and 3 are "developed" with 14.6 percent of the world's population. The extreme skewed distribution of the

national populations emerges from the following relationship: the combined populations of the four most populous countries (1. China - 4. USA) equals the combined populations of the remaining 75 countries (5. Indonesia - 79. Malawi). The future growth rates of China, India, Indonesia and Brazil (see Figure 1) will most heavily affect the world's future growth because these four most populous developing countries contain 42.3 percent of the world's present population. The second quartet of most populous developing countries includes Nigeria, Bangladesh, Pakistan and Mexico with 7.2 percent of the world's population.

2. Two Decades Growth for 35 Selected Countries: 1965 - 1985

Table 1 gives population estimates for 1965 and 1975 and tentative projections for 1985 for 35 selected countries. The table also gives the projected annual percent increase for the decade 1975 to 1985, the time in years before the 1975 population will double, the percent of population under 15 years of age in 1975, and the per capita national product figure most recently available (1973, 1974) for these countries.

2a. Population Increase. The world's population increased by 658 million in the decade 1965 to 1975 and may increase by an additional 748 million in the decade 1975 to 1985. In essence, in just twenty years the world's population will have increased by the amount of people living on earth towards the end of the nineteenth century (1.4 billion). Such predictions would have sounded lunatic only twenty years ago.

2b. Regional Variation. The great variation in the percentage of increase in country populations is salient with the greatest annual increases in Latin America (2.7 -3.6%), Africa (2.4 -2.9%), and West Asia (2.0 - 2.9%) and the

smallest increases in North America (0.6 - 0.8%) and Europe (-0.2 -1.0%). In general, population growth is inversely related to development and modernity.

2c. Regional Doubling Time. The number of years it would take to double the present population ranges from 20 to 40 years for the developing world and from 60 to infinite years for the "developed world". As an example, while it may take less than 20 years to double the population of Mexico, it may take more than 350 years to double that of Great Britain: and while West Germany has an infinite doubling time, the populations of France and Italy would double in 116 years at the present rate of growth. Two populations with 31.25 million people today and doubling times of 20 and 100 years would attain populations of 1 billion and 62.5 million after 100 years. But if the two populations start out with 62.5 million people they would attain 2 billion and 125 million, respectively. Explosive dynamics!

2d. Age Structure a Function of the Growth Trend. A rapidly increasing population is youthful with more than 40 percent of the population younger than 15 years of age. Two contrasting examples are the populations of the Federal Republic of Germany and the People's Republic of Bangladesh with 23 and 46 percent of the respective populations younger than 15 years of age. Figure 2 shows the fundamental differences in both age structure and secular growth for the two contrasting countries of West and East. In 1965, both countries had reached around 60 million total population. Ten years later, Bangladesh was ahead by 15 million and by 1985 it may be ahead by 39 million. The corresponding percent differences are 2.4, 24.5 and 64.1 percent. In 1965 the subpopulation under 15 years of age in Bangladesh was twice that in the Federal Republic of Germany (27.8 vs 13.6 million). Twenty years later, the ratio will have shifted from 2:1 to 3.3:1 (48.3 vs 14.1 million).

Expressing the population as density per square kilometer, the contrasting structure and evolutionary growth is even more dramatic. Figure 2 shows the virtual stability or equilibrium of the population of a European country compared to the explosive density increase for a country in Asia. From 1965 to 1985 the population density of the Federal Republic of Germany will have remained virtually unaltered: between 240 to 250 people per km^2. In sharp contrast, the density in Bangladesh will have soared from 420 in 1965 to 536 in 1975 and is likely to have attained 700 per km^2 in 1985. Presently, the population density increases by 15 units per km^2 per year in Bangladesh against no addition in the F.R. Germany and other European countries. Typically, these two populations represent two different and distant stages of the world's population evolution--one at the peak of expansion, the other at the end of the expansion (equilibrium).

The below 15 years density in West Germany has reached quasi-stability with 55 to 58 youngsters per km^2 against a dramatic rise for Bangladesh from 193 per km^2 in 1965 to 322 in 1985.

Such unchecked epidemic growth adversely affects the quality of life of the present and future generations and makes questionable whether the orderly development of some less developed nations is even feasible. In various countries of Latin America, Africa, and Asia, population growth has reached pandemic dimensions that nullify or will nullify a great part of past, present, and future developmental inputs in the sectors of education, health, agriculture, and industry. Continued excess growth of populations will nurture continued unemployment, poverty, hunger, disease, and early death leading in turn to further excess reproduction. Breaking this vicious circle is today's challenge and meeting this challenge will require international cooperation of truly enormous

scope. Nevertheless, biologists in human reproduction and obstetrician-gynaecologists can make a signal contribution towards breaking this vicious circle of non-development in the not too distant future. Research in human fertilization will lead to contraceptive discoveries, and responsible fertility care will spread contraceptive use. Indeed, this workshop has a tremendous significance as it shows the intimate relationship between biological research, fertility care and national development.

3. Continental Population Shift: Strain on Modernization by Excess Population Growth

The obvious result of continued differential growth is subtle but continuous shifts in the relative populousness of various countries. Figure 3 gives an overview of such shifts for one decade preceding and following the year 1975 (a) by world region and (b) by development status. While this chart pertains only to the 35 countries selected for this paper, the message is clear. The proportionate population of the developing countries is expanding while that of the developed countries is retracting. Within 20 years the population of the 23 selected developing countries will have increased from 70 to 75 percent of the total population under consideration and, conversely, the proportionate population of the 12 developed countries will have decreased from 30 to 25 percent.

This continental population shift by differential natural increase is accompanied by many secondary effects that adversely affect the needed development. Foremost among these is that gains in total gross national product, related to industrialization, agricultural output, educational facilities, and health services are dramatically diluted because of unprecedented population growth. Per capita gains, for example, have remained quasi-stationary if not regressive in many nations as was recently the case in Bangladesh and India. By

contrast, the momentum of modernization in developed countries coupled with low population growth has accelerated per capita gains, including sector development in education, health and social achievements but at a significant cost in decreased quality of the environment and depleted natural resourses. In essence then, the continental population shifts from developed to developing areas reflects the dynamics of two momentums presently in full operation: excess population growth in developing countries versus excess modernity growth in developed countries. Transfer of "modernity growth" and "family care services" is the most needed help developing countries could receive from the developed world.

4. World Population Growth, by Development: 1950 - 1974

This section gives an epidemiological baseline of differential growth of the world's population during the third quarter of the twentieth century. UN data have been illustrated in Figure 4[2]. In 24 years the population in developing regions had grown by 68.1 percent (2803/1667 million) compared to 30.2 percent (1087/835 million) for the developed regions. The developing world's population share has increased from 66.6 to 72.1 percent while that of Europe has decreased from 15.7 to 12.1 percent (and is likely to shrink to around 8.5 percent in the next 25 years). Hence, within half a century, Europe's population "importance" compared to that of developing countries will have shrunk to half.

Just as important, perhaps, is the differential age structure by development for the world's population. In 1970, the proportion of living offspring under 15 years was highest for the three developing world areas (40 to 44 percent) and lowest for the developed areas (25 to 29 percent). At the upper age extreme, 11 percent of the people in Europe compared to only 3 percent in Africa

were 65 or more years of age.

The structural youthfulness is a demographic mirror reflecting the population's recent fertility. As noted in the lower center frame of Figure 4, Africa's 1965-1974 crude birth rate was 47 per 1000 population against 17 for Europe. By subtracting the corresponding crude death rate, the population growth by natural increase (percent and year) was 0.6 percent for Europe against 2.7 percent for Africa and, because of lower death rates, 2.8 percent for Latin America.

If these trends continued, the populations of Africa and Latin America would double in 25 years while Europe's doubling time would be more than one century.

Figure 4 illustrates both the positive association between a population's youthfulness and the growth rate (gray shading) and between a population's age and the doubling time (black bars).

This then is an epidemiological profile of today's dynamics of world population growth. Nationwide family planning efforts during the seventies in many countries may lead to notable impacts over the next few years[1 2 3 5 6 7]. Hence, a similar profile should be developed in 5 and 10 years to assess the present decade's progress in slowing population growth.

IV. FERTILITY AND DEVELOPMENT

Human fertilization is the "microscale" (=individual) reproductive process that secures continuity and growth of mankind. The "recently empty" earth is

being peopled at an ever increasing speed: 1 billion by 1830, a second billion one hundred years later (1930), a third billion thirty years later (1960), a forth billion fifteen years later (1975).

On the "macroscale" (=society), the peopling of the world is finite because of finite space and resources on earth. In addition to the unprecedented population increase, ever rising expectations of the incoming generations accelerates use of limited resources. The human right for better health, housing, nutrition, education, and employment is now recognized, and coordinated "sectorial activities" of transnational scope are gaining momentum through UN development agencies and bilateral "AID" programs[1 2 3].

However, growth in both populations and expectations will have to subside. Indeed, unless one stipulates that the end--a man-made end through growing dissonance of supply and demand--is near, excess birth and excess use of resources must be viewed as a transient period of mankind's evolution. The model in Figure 5 sketches the interdependence of human reproduction and quality of life. There are only two possible areas of intervention for securing orderly development of societies towards a dynamic equilibrium in both numbers and quality of life: (a) <u>family planning in the context of parental and filial health</u> that secures a dignified population equilibrium and (b) <u>service planning in the context of environmental protection</u>, that is, optimal (not maximal!) development of housing, land and fisheries culture, employment, education and health services. The coalescing result would be seen after some decades as optimal quality of life for present and future generations. It is evident, however, that wars and disproportionate investment in armaments would constantly postpone such development.

The model shows that all sectorial services that improve the societal quality of life are mutually sustaining: they are in positive association. For instance, better nutrition leads to better health and hence higher work performance; decent education and training leads to greater work opportunity and hence to greater investment in the various development sectors. In sharp contrast, the centrality of human fertilization is accentuated by its negative association with all sectorial development services. Excess fertility unfavorably affects family health, food supplies, living conditions, and educational and employment opportunities. In simple terms, humanity's wheel of progress can turn only if the central hub of procreation is harmoniously proportioned to the circular frame of basic modernity needs.

Improved quality of life through family planning at the micro-level and socio-economic development through population control at the macro-level is the future formula for overcoming centuries of backwardness. Various experiments are now underway (China, India, Singapore, etc.) which will present the first national case histories of socio-political experiments in accelerating progress by steering both human fertility and agro-industrial development.

Whatever the national evolutions, the scientific study of human reproduction and its moderation will produce the more effective, more acceptable contraceptives urgently needed for these societies' development. The Second Essen International Workshop on Human Fertilization may consider as one topic the systematic review of world fertility control in the seventies.

TIME SERIES OF POPULATIONS -- 1965-1975-1985 -- FOR 35 SELECTED COUNTRIES. NATURAL INCREASE, DOUBLING TIME AND AGE STRUCTURE FOR 1975 AND LATEST PER CAPITA GNP

		Population in Millions			Rate of Natural Increase	Time to double Population	Population under Age 15	GNP per capita
		1965	1975	1985				
		Million	Million	Million	Percent	Years	Percent	Dollars
AMERICAS								
1	Canada	19.68	22.81	24.70	0.8	87	29	5'370
2	USA	194.30	213.63	226.80	0.6	116	27	6'210
3	Mexico	41.28	60.15	85.67	3.6	19	46	870
4	Cuba	7.72	9.25	11.17	1.9	37	37	540
5	Colombia	18.04	24.72	33.54	3.1	22	46	410
6	Brazil	81.01	107.16	139.88	2.7	26	42	750
7	Argentina	22.18	25.38	28.59	1.2	56	29	1'250
EUROPE								
8	United Kingdom	54.18	56.02	57.16	0.2	347	24	3'120
9	Germany, F.R.	59.04	61.95	61.33	-0.2	inf.	23	5'620
10	Poland	31.50	34.02	37.21	0.9	77	25	2'090
11	USSR	230.94	254.30	275.39	0.8	87	28	2'300
12	France	48.76	52.69	55.94	0.6	116	24	4'850
13	Spain	32.06	35.60	39.32	1.0	69	28	1'730
14	Italy	51.94	55.81	59.25	0.6	116	24	2'520
AFRICA								
15	Morocco	13.32	17.37	23.12	2.9	24	44	290
16	Egypt	29.39	37.22	46.27	2.2	32	41	260
17	Nigeria	48.76	63.02	83.88	2.9	24	45	250
18	Sudan	13.73	17.76	23.63	2.9	24	45	140
19	Ethiopia	22.70	27.92	35.39	2.4	29	44	80
20	Zaire	17.57	24.90	31.56	2.4	29	44	150
21	Tanzania	11.67	15.16	19.79	2.7	26	44	130
WEST ASIA								
22	Turkey	31.37	39.18	50.65	2.6	27	42	580
23	Iraq	8.05	11.02	15.10	3.2	22	48	640
24	Iran	24.81	33.10	44.06	2.9	24	47	760
25	Afghanistan	15.05	19.11	23.75	2.2	32	44	80
26	Pakistan	50.19	70.33	91.80	2.7	26	46	130
27	India	482.53	608.54	741.81	2.0	35	40	120
28	Bangladesh	60.48	77.13	100.67	2.7	26	46	100
EAST ASIA								
29	China	710.32	824.96	966.87	1.6	41	33	270
30	Thailand	31.03	42.28	53.59	2.4	29	45	230
31	Indonesia	101.88	131.92	162.39	2.1	33	44	120
32	Philippines	31.77	42.76	56.91	2.9	24	43	250
33	Korea, South	28.33	34.13	41.20	1.9	37	40	380
34	Japan	98.88	110.94	123.77	1.1	63	24	3'810
35	Australia	11.39	13.62	16.44	0.9	77	29	4'000
WORLD ESTIMATES		3,289.31	3,947.04	4,694.78	1.75	40	36	1'250

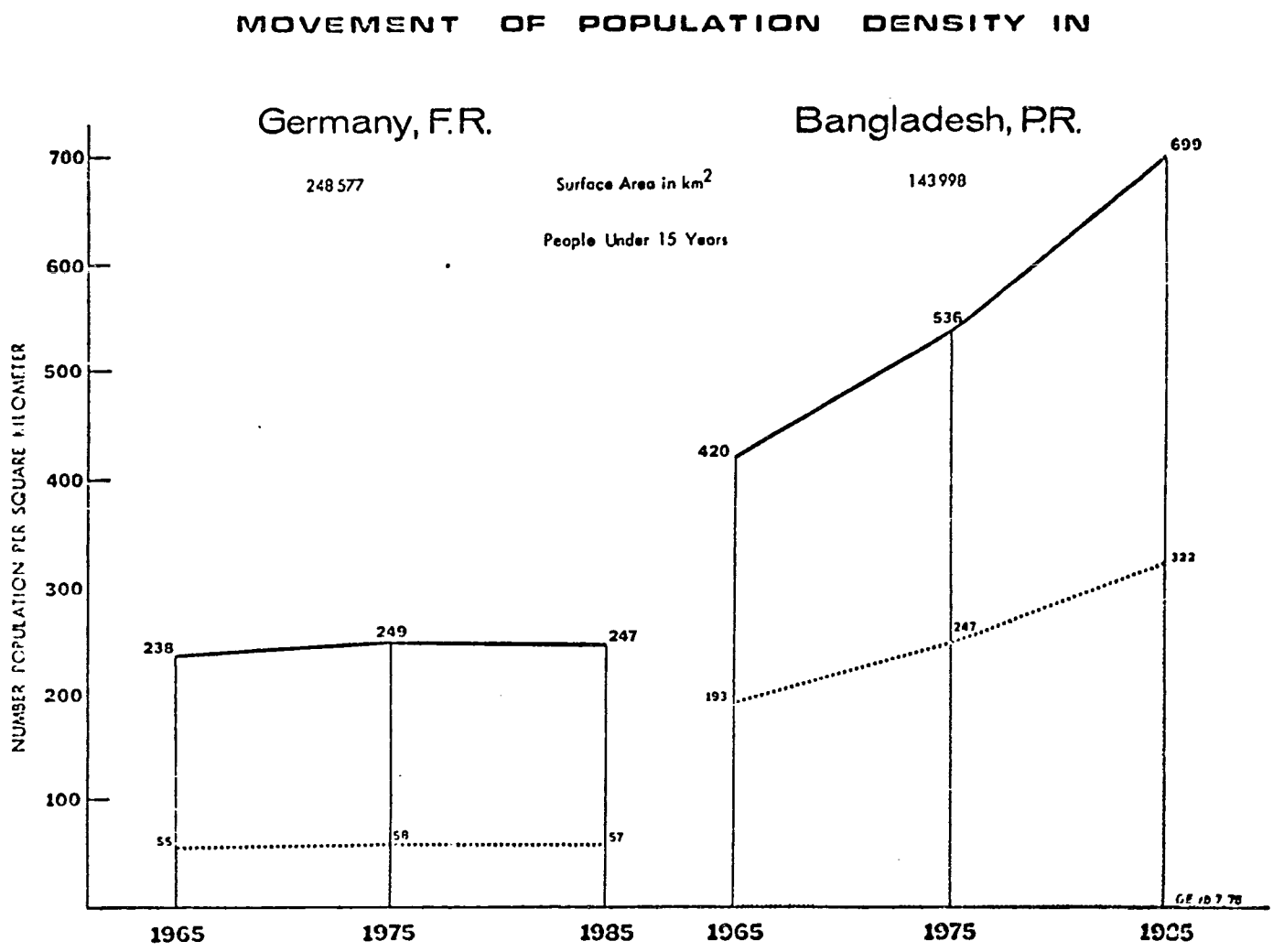


Figure 2. Age structure and growth for a stationary and expanding population.

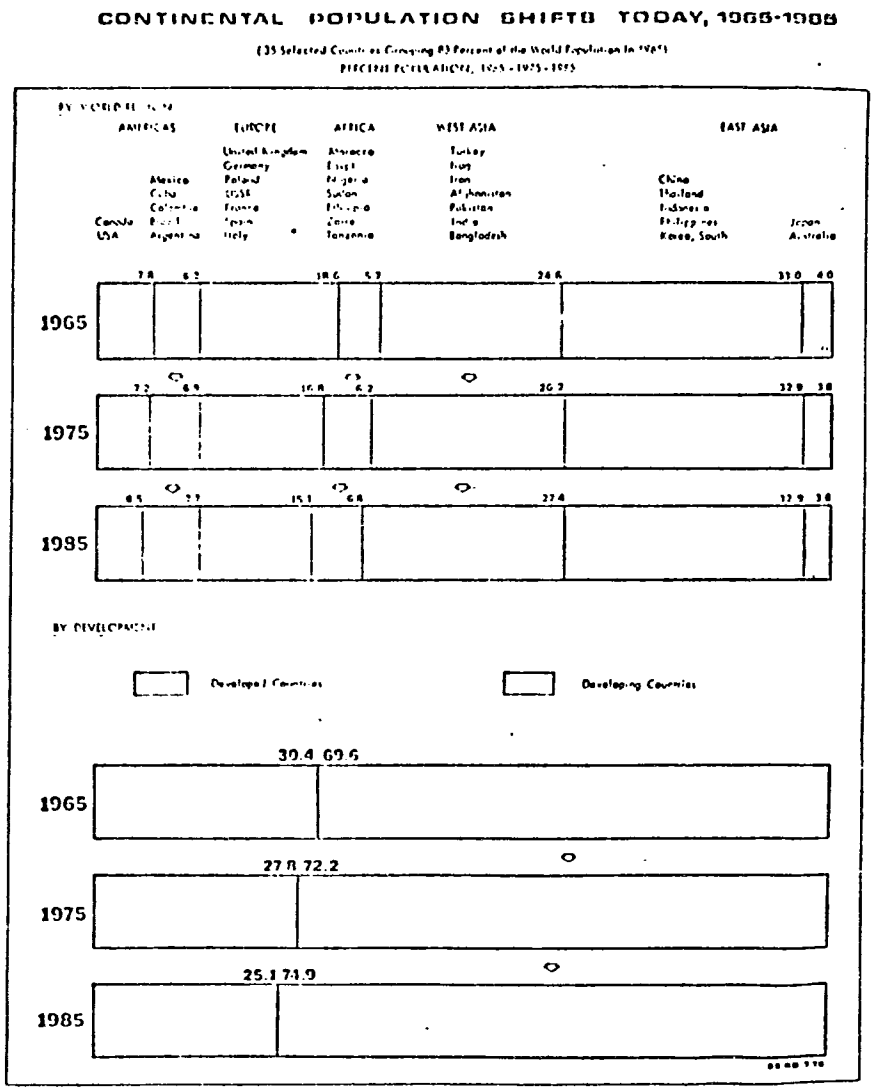
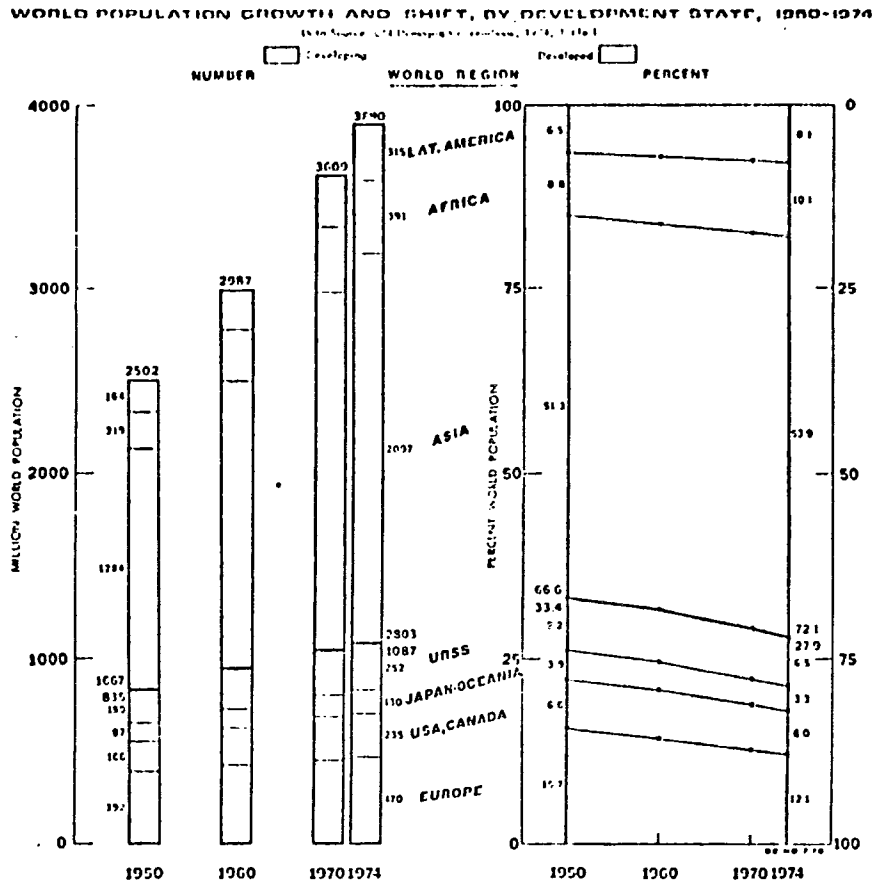


Figure 3. Increase in populousness of the developing world regions.



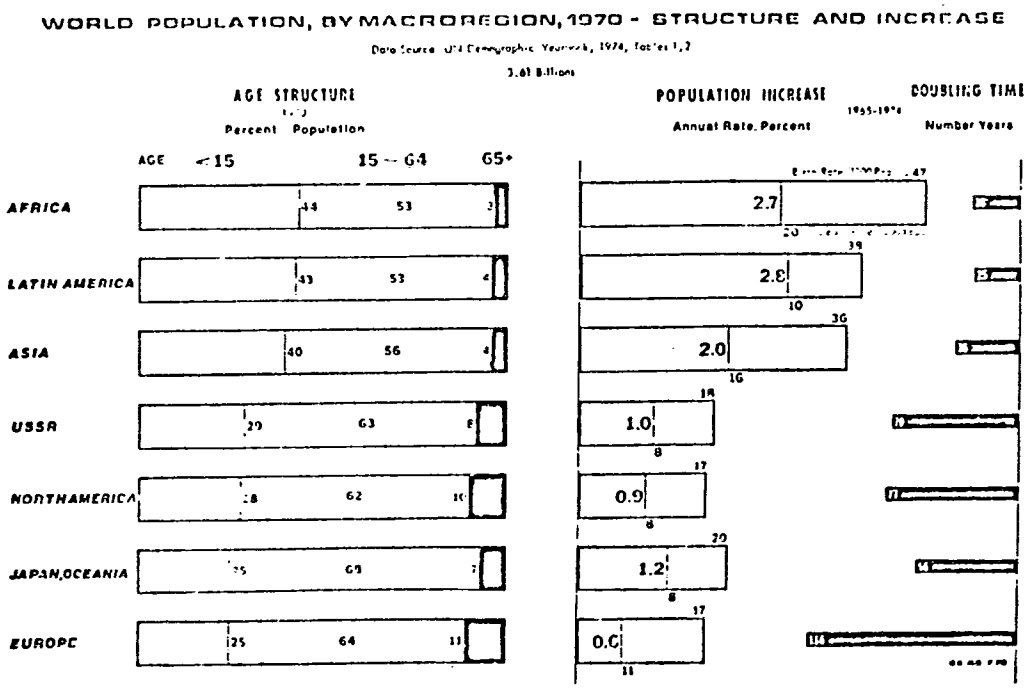


Figure 4. Growth and age structure of world population, by macro region

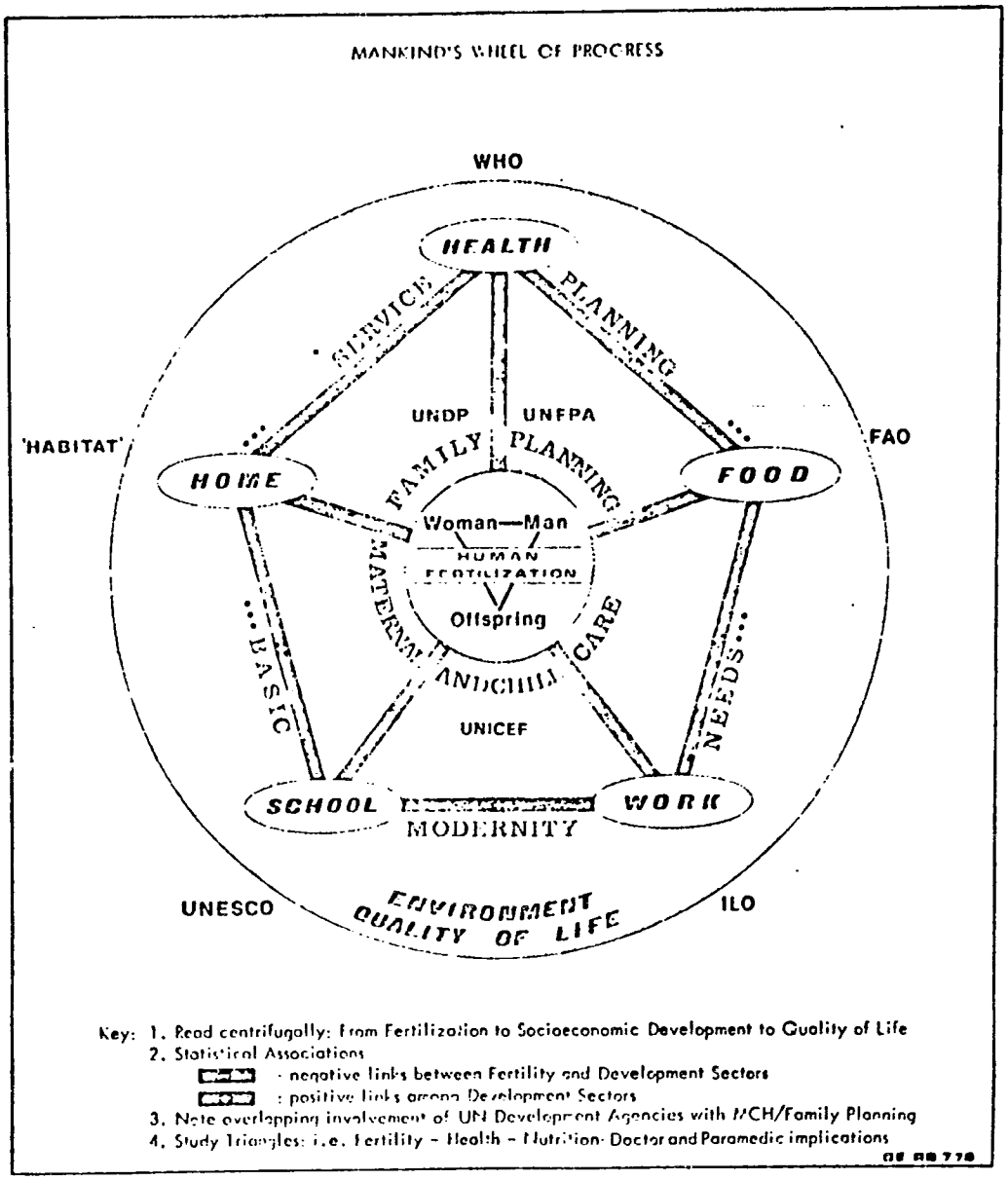


Figure 5. Interdependence of human reproduction and quality of life.

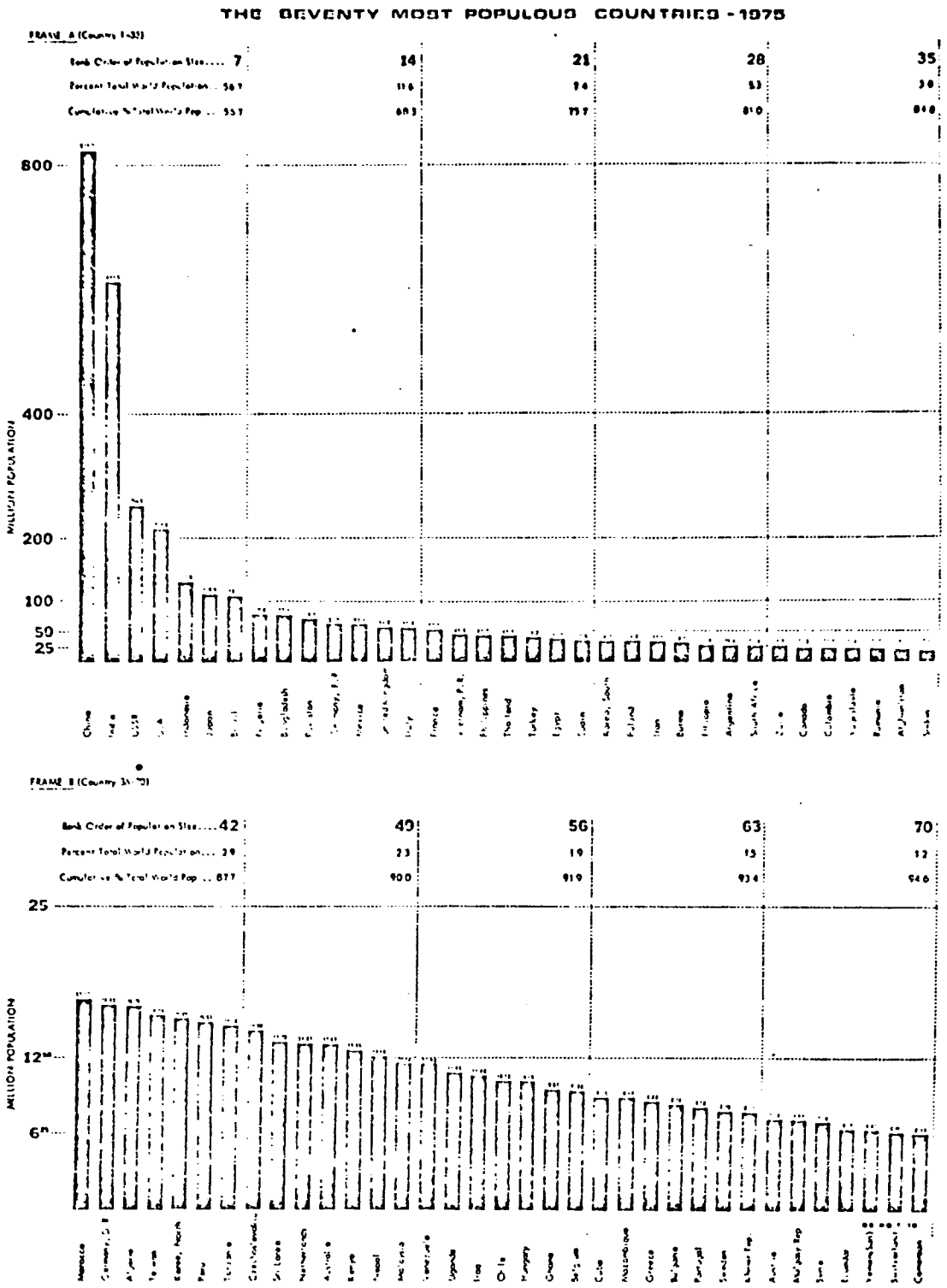


Figure 1. Rank oder of national population sizes in 1975 . The skewed distribution