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Population, Resources, Migration, and Jobs

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## POPULATION, RESOURCES, MIGRATION, AND JOBS

I'm delighted to have an opportunity to talk with you about population and how it relates to the quality of our lives, especially through its impact on resources, migration, and jobs.

Things haven't always been this way. When I was a student at the University I entered a public speaking contest. I brought my completed speech to the speech coach. He looked it over and told me I couldn't give it. It was a speech on the world population problem. I thought it was a good speech. But since "establishment" wouldn't let me give it, I went home and wrote a speech on "Monetary and Fiscal Policy." I lost the contest...

Well, things have changed. Today we do a lot of talking and thinking about population. In fact, the third most important magazine in North America, in terms of circulation, recently carried an article by Dr. Paul Ehrlich, the leading proponent of population control in our country. Population is a popular topic today.

### Population growth

Why are people so worried about too rapid population growth now? They didn't use to be. In fact, during the middle ages, when a good deal of our present population policies originated, policy makers were justifiably concerned that population wasn't growing fast enough. The population of Europe actually declined by one third between 1300 and 1350!<sup>1</sup> There was a valid concern for developing policies which would stimulate population growth.

<sup>1</sup>Slichter Van Bath, Agrarian History of Western Europe, A.D. 500-1850, (London: Edward Arnold, Ltd., 1966), p. 9.

But today's population is growing much faster than population grew in the past, (Figure 1).

Some people think we could run out of space. If we wait long enough we will. "In 6,200 years," a U. S. Congressional committee was told, "the present rate of world population growth would produce a mass of human flesh whose radius would be expanding as rapidly as the speed of light."<sup>1</sup> And some people think we are already running out of space around the North American Cities (Figure 2).

The present world population is growing at the rate of 2 percent a year. Many Latin American countries are growing faster than this, (Table 1).

#### Population growth and Natural Resources

Some people worry about population growth because the world seems to be running out of raw materials, (Figure 3). Running out of natural resources is a problem, but there is also a problem of pollution generated by increased resource use. You might appreciate what one of our more famous humorists had to say on pollution about this time last year. His article was called "And God Saw It Was Good." Then Mankind Took Over...

IN THE BEGINNING God created Man, which according to all the latest birth control statistics was a big mistake.

And God said, "let there be light," and there was light, and Man called this light. fire, and at first it was used to warm him and and let him cook his food, and protect him from the wild animals.

<sup>1</sup>Ben J. Wattenberg with Richard M. Scammon, "Our Population: The Statistics Explosion," The Reporter, March 25, 1965, p. 40

TABLE 1  
POPULATION GROWTH DATA SHEET, LATIN AMERICA, 1970

Region or Country	Births per 1000 Population	Deaths per 1000 Population	Current Rate of Population Growth	Population under 15 Years (Percent)
World	34	14	2.0	37
NORTHERN AMERICA	18	9	1.1	30
Canada	18	7	1.7	33
United States	18	10	1.0	30
LATIN AMERICA	38	9	2.9	42
MIDDLE AMERICA	43	9	3.4	46
Costa Rica	45	8	3.8	48
El Salvador	48	13	3.4	45
Guatemala	46	16	2.9	46
Honduras	49	16	3.4	51
Mexico	44	10	3.4	46
Nicaragua	47	16	3.0	48
Panama	42	10	3.3	43
CARIBBEAN	35	11	2.2	40
Barbados	20	9	0.8	38
Cuba	28	8	1.9	37
Dominican Republic	48	15	3.4	47
Guadeloupe	32	8	2.4	42
Haiti	45	20	2.5	42
Jamaica	39	8	2.1	41
Martinique	30	7	2.0	42
Puerto Rico	25	6	1.4	39
Trinidad and Tobago	30	8	1.8	43

TABLE 1 continued

Region or Country	Births per 1000 Population	Deaths per 1000 Population	Current Rate of Population Growth	Population under 15 Years (Percent)
<b>TROPICAL SOUTH AMERICA</b>	<b>39</b>	<b>9</b>	<b>3.0</b>	<b>43</b>
Bolivia	44	20	2.4	44
Brazil	39	11	2.8	43
Colombia	44	11	3.4	47
Ecuador	47	13	3.4	48
Guyana	40	10	2.9	46
Peru	44	12	3.1	45
Venezuela	46	10	3.4	46
<b>TEMPERATE SOUTH AMERICA</b>	<b>26</b>	<b>9</b>	<b>1.8</b>	<b>33</b>
Argentina	22	8	1.5	29
Chile	34	11	2.3	40
Paraguay	45	12	3.4	45
Uruguay	24	9	1.2	28

Source: Population Reference Bureau, Washington, D. C.

NOTE: To get your country's population growth rate, you subtract the deaths per thousand from the births per thousand and move the decimal point to the left one place. To estimate the number of years it takes your country's population to double, divide 69 by the annual rate of growth of population.

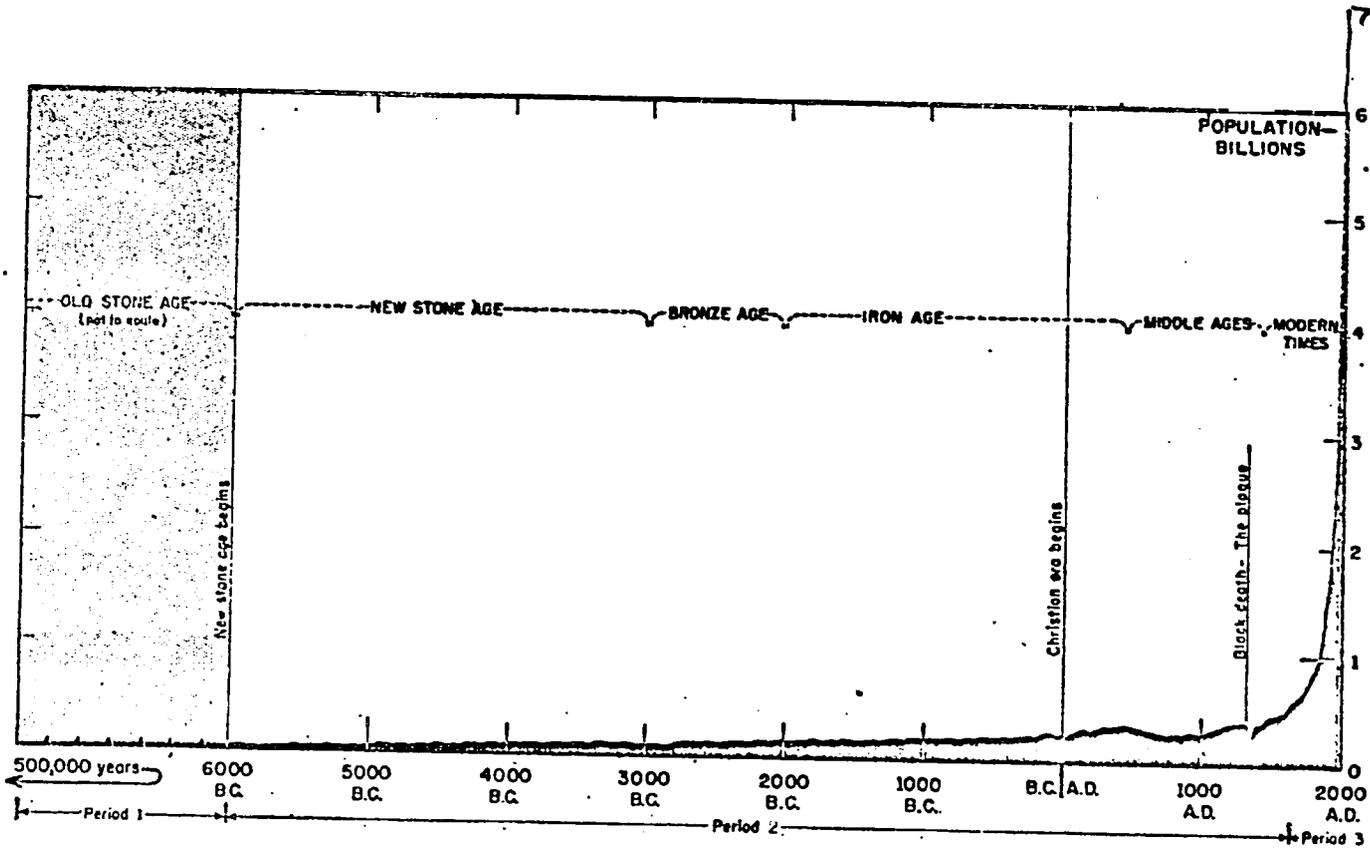


FIGURE 1: GROWTH OF HUMAN NUMBERS

It has taken all the hundreds of thousands of years of man's existence on earth for his numbers to reach three billion. But in only 10 more years population will grow to six billion, if current growth rates remain unchanged. If the Old Stone Age were in scale, its base line would extend 35 feet to the left!

35

seven

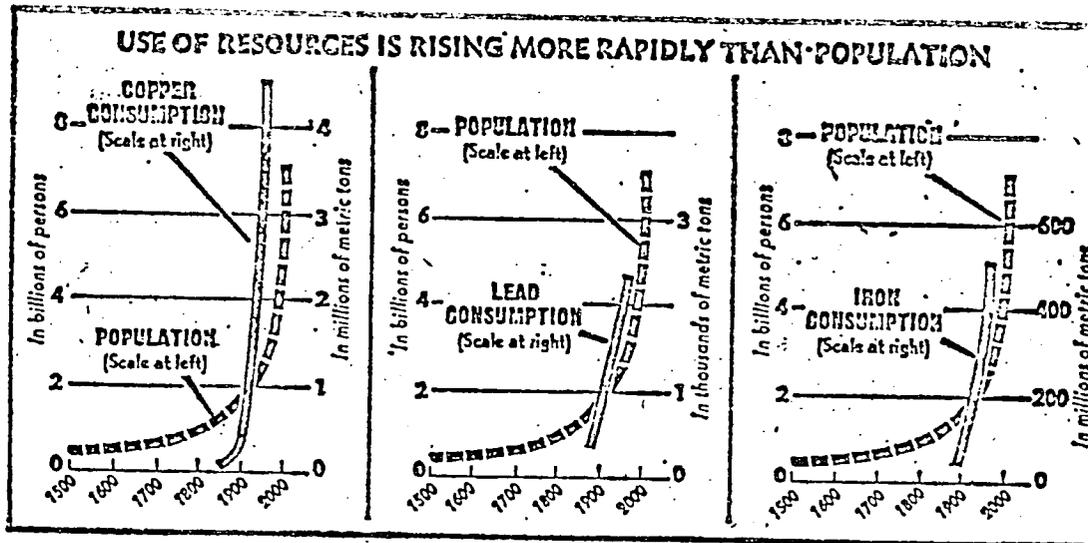
and a half

Fig. 2.-- Cartoon

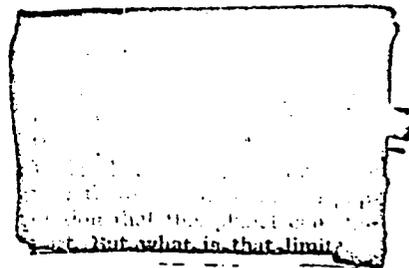
This is your flying traffic reporter. Traffic is normal in all directions.

# The World Is Running Out of Raw Materials

WALTER SULLIVAN



In recent years the world's consumption of raw materials has risen even more sharply than population, leading to predictions that material shortages will lead to widespread poverty and hunger by the end of this century. Recent rises in the use of copper, lead and iron are compared to population growth in these charts, adapted from "Affluence in Jeopardy" by Dr. Charles F. Park Jr.



THE NEW YORK TIMES, SUNDAY, JUNE 22, 1969

But then Man discovered you could use fire to burn down a forest or burn someone else's hut or tree house, or a witch at a stake, or soft coal or oil, which makes the air turn dark gray and black. And this made Man start to cough and his eyes to run and his sinuses to hurt. And Man finally said, "God, what are you doing to me?"

And after God made the rivers and lakes and streams and oceans, Man dumped all the refuse from the earth into the waters and it killed the fish and the plants and even used up the oxygen, and the waters turned muddy and brown and smelled and no one could drink from them or bathe in them, or even sail in them, and finally Man shook his fist at the heavens and said, "for God's sake, knock it off!"<sup>1</sup>

So, as we use up some of our resources (like coal), we pollute and make less useable or even unusable other resources, (like water and air). And with economic growth, the problem of pollution of such vital resources as land and water and air will get harder to solve, not easier to solve.

In North America our average productivity per worker increases about three percent per year. So even with no change at all in labor force, we can expect our output to go on rising in the future by some 3 percent per year. What does output mean?

--It means electric power produced--and smoke produced.

--It means cans and bottles produced.

<sup>1</sup>Art Buchwald, Washington Post, April 21, 1970.

--It means steel produced--and unless something is done about it,  
water and air polluted.

--It means paper produced--with the same result as for steel.

--And so on and on.<sup>1</sup>

Now let's look at what the law of compound interest does to us on pollution. In 1957 (just over 13 years ago) United States Gross National Product (GNP) was \$453 billion. In 1969, in constant dollars, it was \$728 billion. That's an increase of nearly \$300 billion in tin cans, electric power, automobiles, paper, chemicals and all the rest.

So? So that wasn't the result of an unusually rapid growth rate. But in the previous 13 years (before 1957) our GNP has grown by only \$100 billion. We were the same nation, growing at approximately the same rate. But in the first 13 years of this example, GNP rose \$100 billion, and in the second 13 it rose \$300 billion.

And in the next 13 years it will rise more than \$500 billion! That's a rise in GNP greater than the total GNP of 1957!<sup>1</sup>

I fear this is not just a North American problem. Look at Table 2 and you will see that most Latin American countries are growing faster than the United States. Last year I visited the beautiful cities of Santiago and Rio de Janeiro and was surprised to find the air in these cities just as bad as in Washington, D. C.

Some of our best thinkers are beginning to question what may happen to the biosphere of the earth if we succeed in our best efforts at economic development.

<sup>1</sup>Edwin L. Dale, Jr., "The Economics of Pollution," New York Times Magazine,  
, 1970, p. 27.

<sup>1</sup>Ibid, p. 40.

TABLE 2

RECENT GROSS NATIONAL PRODUCT GROWTH RATES, WESTERN HEMISPHERE 1966-68

Region or Country	Arithmetic average of percent change of 1967/66 and 1968/67.
NORTHERN AMERICA	
Canada	3.6
United States	3.8
MIDDLE AMERICA	
Costa Rica	6.5
El Salvador	4.4
Guatemala	4.3
Honduras	4.5
Mexico	6.8
Nicaragua	4.9
Panama	5.7
CARIBBEAN	
Dominican Republic	3.7
Jamaica	1.6
TROPICAL SOUTH AMERICA	
Bolivia	5.0
Brazil	6.0
Colombia	4.5
Ecuador	5.2
Peru	3.3
Venezuela	5.3
TEMPERATE SOUTH AMERICA	
Argentina	3.2
Chile	2.4
Paraguay	4.5
Uruguay	-2.3

Source: A.I.D. as quoted in New York Times Encyclopedic Almanac, 1970, p. 647.

I'd like to quote Lester Brown in a recent article in Scientific American,

There is growing doubt that the agricultural ecosystem will be able to accommodate both the anticipated increase of the human population to seven billion by the end of the century and the universal desire of the world's hungry for a better diet. The central question is no longer, "Can we produce enough food?" but "What are the environmental consequences of attempting to do so?"<sup>1</sup>

#### Population Growth and Migration

During the eighteenth century (1800's) the Western Hemisphere was able to absorb on its farm land most of its expanding farm population as well as significant quantities of immigrants from Europe. But today the situation is different. Practically all of our best farm land is now being used for farms. We can absorb more labor in agriculture, but the productivity of the extra laborers absorbed will be rather low.

It's the nature of production that, as you add more of an input such as labor, you get more output. But each successive unit of input gives you a little less output, (Figure 4). We economists call the product produced by the last unit of labor, the "marginal product" from labor. The marginal product from labor gets less and less as you use more and more labor, (Figure 5). Some economists argue that in a labor surplus economy such as we typically find in the less developed world, the marginal product from farm labor approaches zero. Certainly the productivity of an extra man in agriculture in today's world is low.

<sup>1</sup>Lester Brown, Scientific American, September, 1970, Vol. 223, No. 3 p. 170.

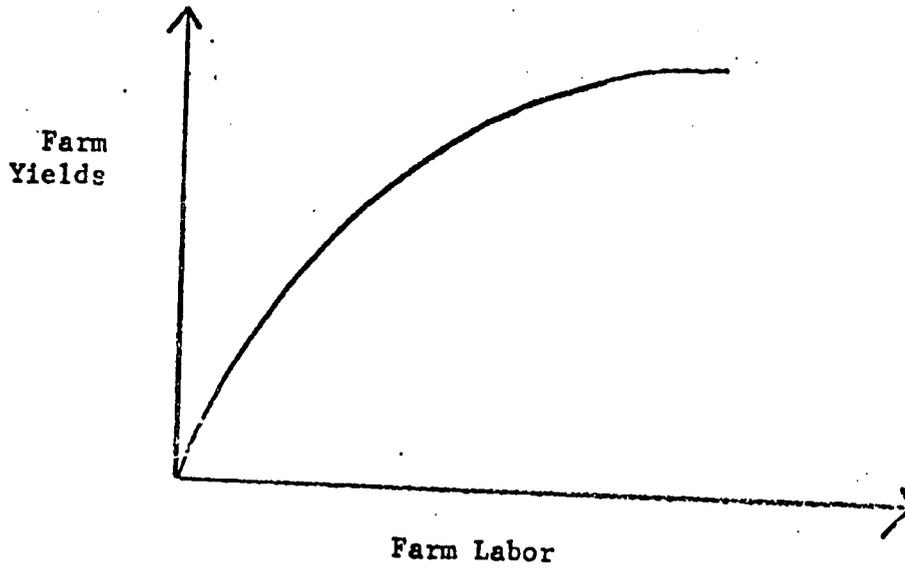


Figure 4: Diminishing Returns to Farm Labor.

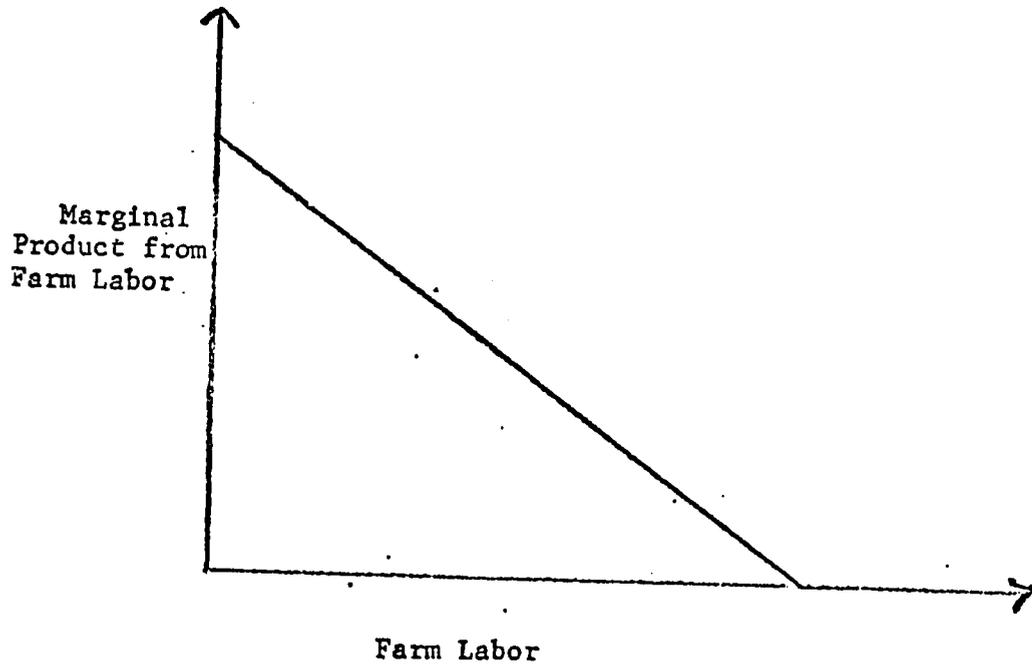


Figure 5: Marginal Product from Farm Labor.

Not only do economists think that marginal productivity of labor in agriculture is low--rural people seem to agree. For rural people are flocking to the city in ever increasing numbers. Look at the trend toward urbanization in the United States (Figure 6). In Latin America the rush to the city may have begun later, but I fear it is proceeding even faster there. I understand you have a special name for the people who have come in from the countryside and have settled down in the suburban slums surrounding the large cities. You call these people "marginal population" or poblaciones marginales. I like this term because it emphasizes the marginal nature of these people. In large measure, these marginal populations must be the result of population growth in an economy with diminishing marginal productivity from labor applied to agriculture.

But migration to the city doesn't necessarily produce the good life for these marginal populations. There just aren't that many city jobs. And increasingly, education is required for a good job.

#### Population Growth and Jobs

Our technology, especially our agricultural technology, has enabled us to hold a greatly increased population on this earth. Simultaneously, it has put a premium on education. No longer do we need vast supplies of uneducated, unskilled laborers. We need educated laborers. Getting and holding a job increasingly depends on education. Future supplies of uneducated, unskilled laborers will be more of a liability than an asset!

#### Population Growth and Education

I'd like to bring you some material from Mauritius, to help illustrate the relationship between population growth and education. Mauritius is a tiny island

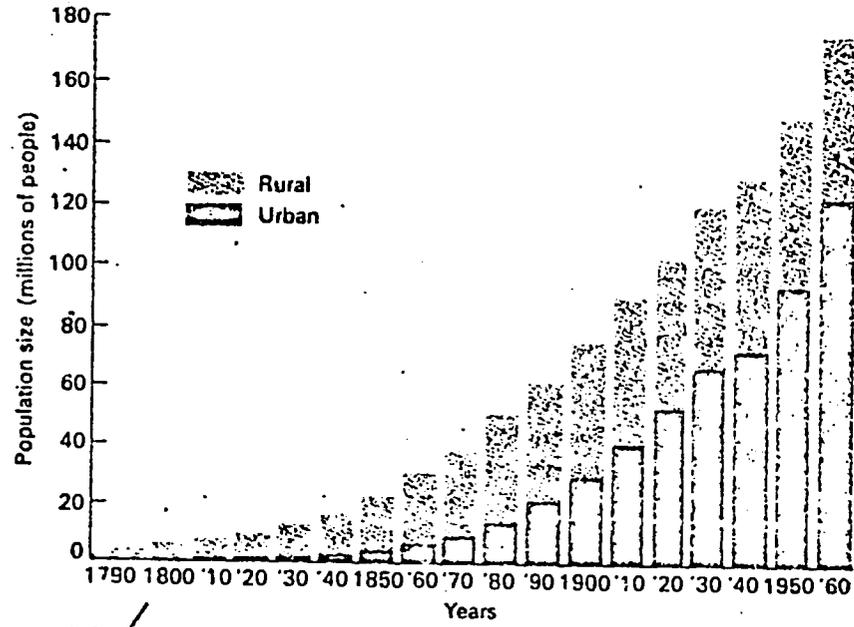


FIGURE 5-6

Urbanization of the United States. In 1960 70 percent of Americans were living in towns or cities and 63 percent were living in large cities and their surroundings (metropolitan areas). The 1970 census will certainly show these percentages increased. [After *Population Bulletin*, vol. 19, no. 2.]

in the Indian Ocean. Mauritius is interesting to me because it has a rapidly growing population with statistics going back over a long period of time, for it is a former British colony. You may think you've never heard of Mauritius, but it was once famous because it was the home of the dodo bird (now extinct). When you see the population statistics perhaps you'll think Mauritius ought to be famous not as the home of the dodo bird, but of the stork! (Figure 7).

Now let's look at Figure 8. The wildly fluctuating death rate before 1947 is typical of a pre-industrial society, as is the modestly fluctuating birth rate. Notice how the death rate went sky high with the influenza epidemic just before 1920 and shot up again with the hurricane and economic depression in the early 30's, and again just after World War II. But then Mauritius's population did what so many populations have done recently. It underwent a baby boom at the same time health campaigns brought the number of deaths down to about 10 per thousand. The result was the population explosion we saw in Figure 7.

During this baby boom, the family size in Mauritius has been much greater than in countries with a much slower population growth rate, such as the United Kingdom (Figure 9). Having large size families naturally leads to a population profile with a large number of people in the dependent children category, (Figures 10 and 11).

The dependency load is very important when it comes to educating children. If the U. K. and Mauritius both had the same per capita income, which country would have the more difficult job of educating it's children? Education and productivity in today's world relate to each other like a feedback loop in electronics. A good quality of education stimulates productivity of the people in the society, who in

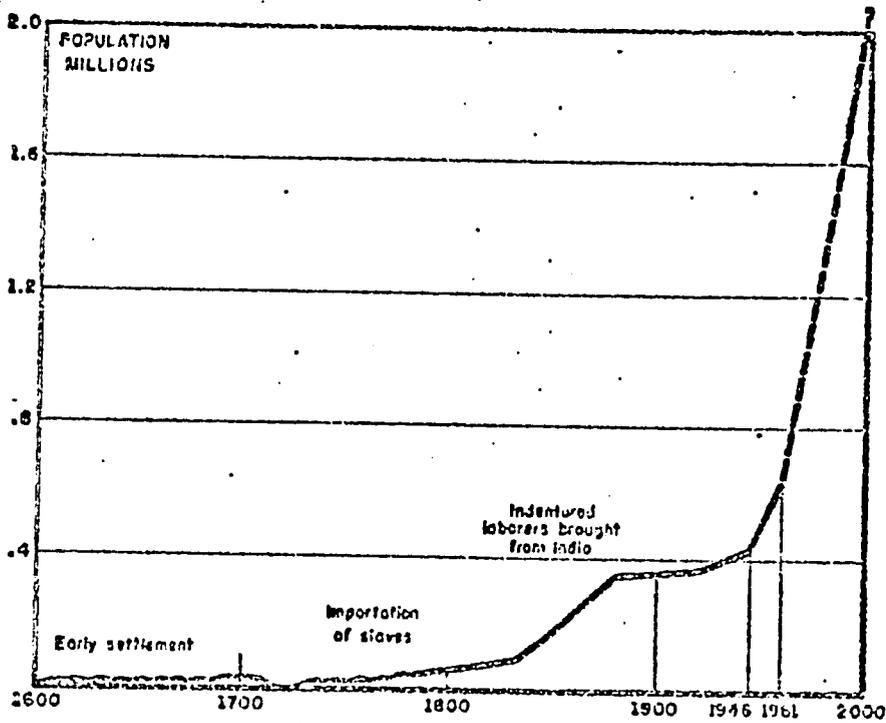


FIGURE 7. MAURITIUS' POPULATION GROWTH

Early settlements on Mauritius never exceeded a few hundred people. After 1721, African slaves and Indian indentured laborers were imported to work the sugar plantations. Immigration accounted for almost half of Mauritius' population growth until recently. Since 1946, natural increase has averaged 2.6 percent a year, one of the highest rates in the world, (although we should note that

several Latin American countries have even higher population growth rates).

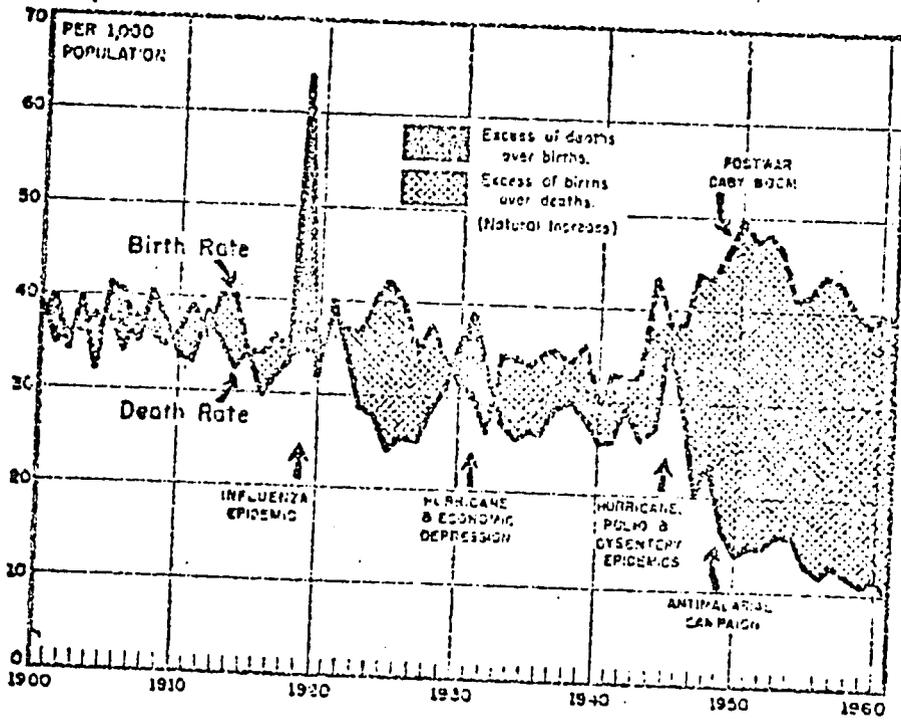


FIGURE 3: THE BALANCE OF BIRTHS AND DEATHS

Because deaths almost balanced births, Mauritius' rate of natural increase was low until 1945. Since then, death rates have declined rapidly; birth rates have risen; and population has increased by over 50 percent.

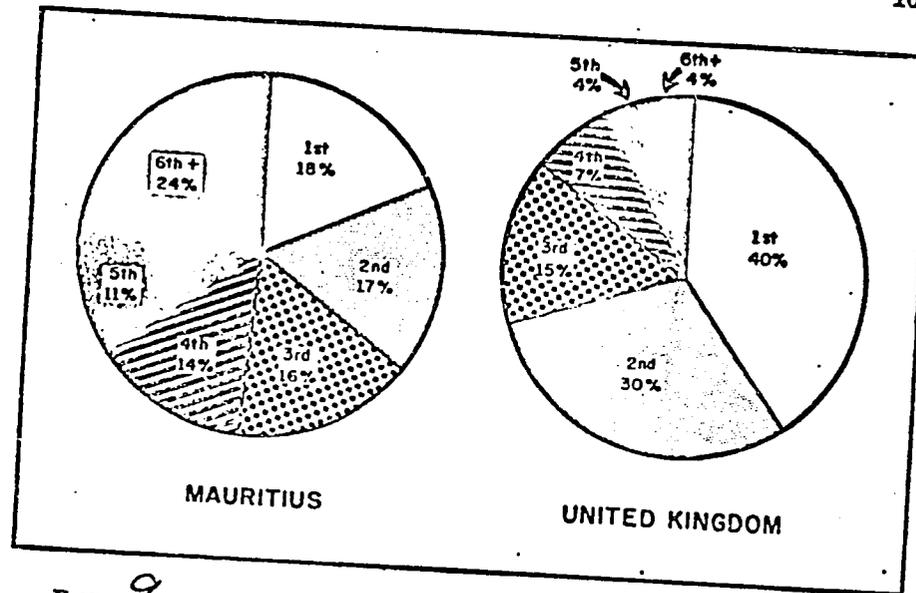


FIGURE 2: BIRTH ORDER IN MAURITIUS AND IN THE UNITED KINGDOM (1957)

In Mauritius, where birth rates are double those of the United Kingdom and where women marry earlier, almost 50 percent of all births are fourth, fifth, sixth and higher order births. This compares with only 15 percent in the U. K., where the small family pattern prevails. In other words, if you ~~had been~~ were a child in

Mauritius, you had a much greater chance of being the 4th, 5th, or 6th child than if you were a child in the U. K.

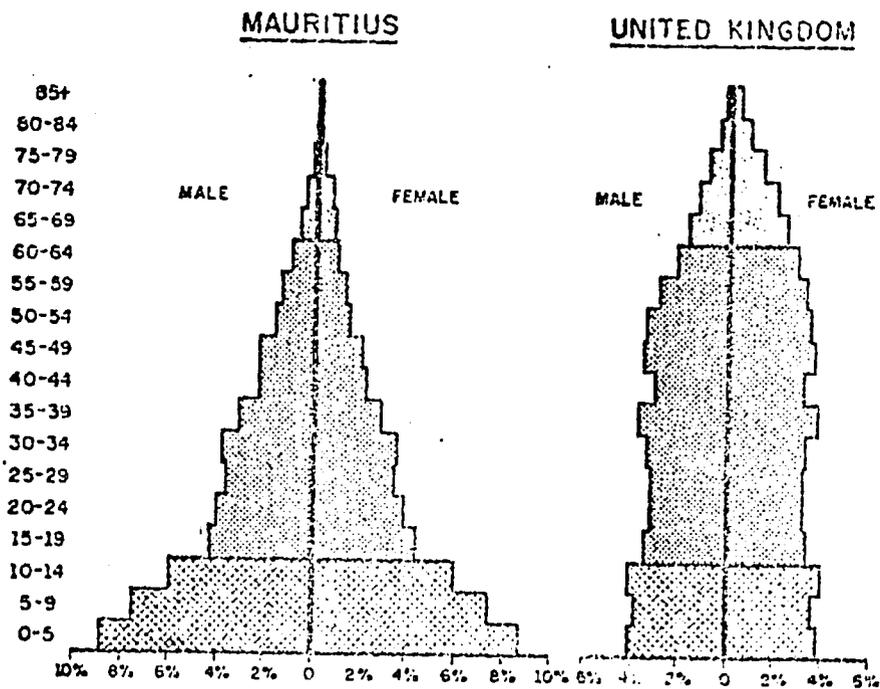
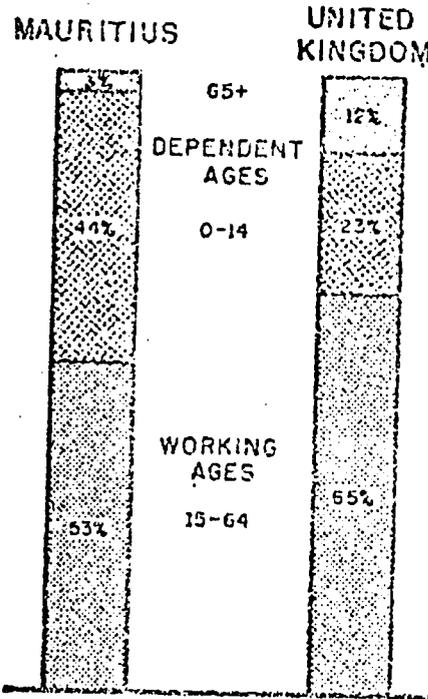


FIGURE 10 AGE DISTRIBUTION, MAURITIUS AND THE U.K. (1953)

An age profile shows the per cent of total population in each of the age and sex categories. What per cent of the population of Mauritius is male and between 10 and 14 years of age? What per cent of the population of the U. K. is male and between 10 and 14 years of age?

The age profile of the Mauritian population is typical of countries where death rates are declining while birth rates remain high: young people predominate; there are relatively fewer in the working ages; and very few older people. In the industrially advanced United Kingdom, where birth and death rates have been low for decades, the population is more evenly distributed over the age spectrum.



**FIGURE //: THE DEPENDENCY LOAD**  
 The economic significance of the different age patterns is enormous. Economically active people in Mauritius have many more dependents, proportionately, than those in the U. K.

produce more real goods and services and thus can pay higher taxes to support a better quality of education for their children, and the loop is closed, (Figure 12). But population growth acts as a squelch to this feedback loop. The heavier the load of children fed into the system, (that is, the heavier the dependency burden) the poorer job of education the system can do, and the slower is the growth of level of education per capita and therefore the slower is the growth in per capita income which slows still further the growth in quality of education. This is a very important relationship, and is evidently not well understood, perhaps because the idea of analyzing feedback loops (sometimes called systems analysis) is a fairly new science.

#### Population Growth and Capital Formation

I want to go back to the concept of resources for a minute to show one more relationship between population growth and the quality of human life. Let's talk about capital, which is such an important resource in economic development. The more capital; the more tools a man has to work with, the more productive he can be, and the higher valued will be his job. A man who drives a truck to town with a load of farm produce is said to have a higher valued job (with more capital) than does a man (with less capital) who walks to town beside his produce-laden donkey.

Now the availability of capital per person is closely related to population growth. Let's say you live in a country where the ratio of capital to annual value of production (or output) is 3 to 1. If your gross national product (GNP) happens to be 100 then your capital stock will be 300. Let's also

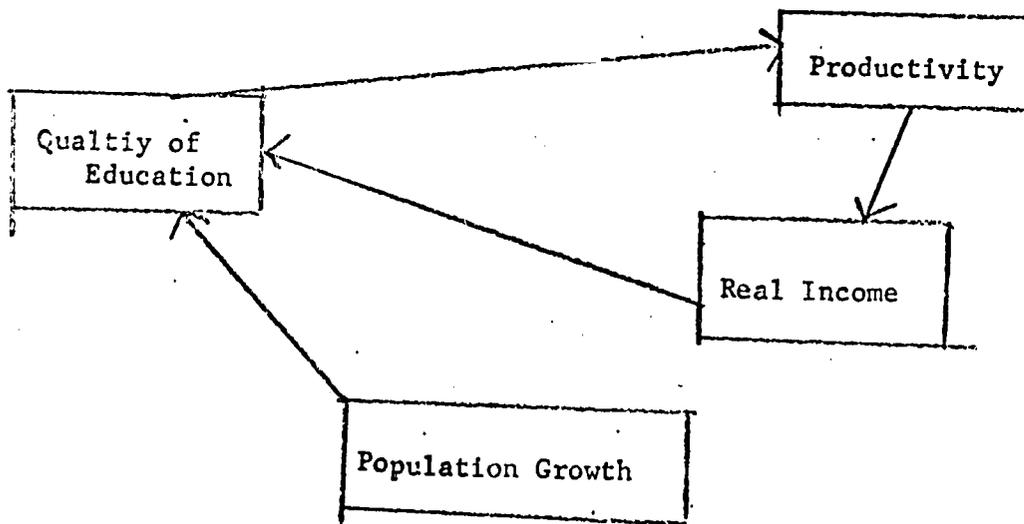


Figure 12: The feedback loop involving quality of education, productivity and real income is heavily influenced by population growth through its impact on quality of education.

say that your current objective is to merely maintain per capita output.<sup>1</sup>

If your population doesn't grow at all during the year, then you don't have to hold back any current output to maintain the current capital output ratio of 3 to 1 and thus maintain a constant productivity per person.

But if your population grows 1 percent during the year, then you will have to hold back 3 percent of your current output as investment capital in order to maintain GNP per capita the same, for at the end of the year you will have to have an annual output rate of 101 (to take care of the 1 percent increase in population) and a capital stock of 303 to support the new population at the old 3 to 1 capital-output ratio, (Table 3).

If your population grows at the annual rate of 3 percent, then you will have to hold back 9 percent of your current output to maintain per capita productivity, for at the end of the year you must produce at the rate of 103 (with 3 percent more people) and three times that figure is 309, the amount of capital necessary for that output.

So you see you can get a preliminary estimate of the amount of current output your economy must save just to make it possible to maintain per capita productivity. All you have to do is multiply your population growth rate by the capital-output ratio. (Taking account of depreciation would raise the figure, and allowing for increase in technology would lower the figure, so maybe this estimate is fairly close to the actual case.)

<sup>1</sup>We will further assume that there is no depreciation, no change in technology, and that the economy has a linear homogeneous production function in which production depends only on population and capital, (i.e. our production function shows constant returns to scale).

TABLE 3

POPULATION GROWTH, CAPITAL FORMATION AND THE SAVINGS RATE  
WITH A CAPITAL-OUTPUT RATIO OF THREE TO ONE

	Initial Situation	-----After One Year-----		
		If population doesn't grow at all	If population grows 1%	If population grows 3%
$\frac{\$ \$ \text{ Capital}}{\$ \text{ Output}}$	$\frac{300}{100}$	$\frac{300}{100}$	$\frac{303}{101}$	$\frac{309}{103}$

Percent of Current  
output (income) which  
must be held back  
(saved) to maintain  
present per capita  
income with present  
capital output ratio.<sup>1</sup>  
of 3 to 1.<sup>1</sup>

0

3

9

Source:

Adapted from Ansley J. Coale and Edgar M. Hoover, Population  
Growth and Economic Development in Low-Income Countries,  
Princeton, Princeton University Press, 1958, Chapter III.

<sup>1</sup>This analysis ignores depreciation and assumes no change in technology and a linear homogeneous production function for the economy in which production depends only on population and capital.

Just in case you'd like to go through this exercise with your country, I've included a table showing all the gross capital-output ratios for Latin America I could find, (Table 4). Note that many Latin American countries have a capital-output ratio above 3 to 1. These high capital-output ratios combined with the generally high rates of growth of population make it necessary for Latin American countries to achieve high savings rates just to maintain per capita productivity. To increase per capita productivity, of course, requires even greater savings rates.

TABLE 4

ESTIMATED GROSS INCREMENTAL CAPITAL-OUTPUT RATIOS  
FOR SELECTED WESTERN HEMISPHERE COUNTRIES, 1960-65

Region or Country	<u>Change in Capital Stock</u> Change in G.N.P.
NORTHERN AMERICA	
Canada	5.1
United States	3.1
MIDDLE AMERICA	
Costa Rica	2.4
El Salvador	2.2
Guatemala	2.1
Honduras	5.1
Mexico	2.0
Nicaragua	1.8
Panama	2.1
CARIBBEAN	
Dominican Republic	1.6
Jamaica	5.0
TROPICAL SOUTH AMERICA	
Bolivia	3.4
Brazil	4.3
Colombia	3.9
Ecuador	2.6
Peru	3.3
Venezuela	4.6
TEMPERATE SOUTH AMERICA	
Argentina	5.6
Chile	2.1
Paraguay	3.8

Source: Robert Bennett, Financing Growth and Development: A Handbook of Comparative Statistics, College Park, Maryland, University of Maryland Economics Department Mimeograph, 1962.

SUMMARY

I am increasingly convinced that one of the most important things we can do to maintain and improve the quality of life on this earth is to embark on a vigorous, direct, frontal attack on population growth. Slowing down population growth rates, preferably to zero,

1. Will help us create the capital we need to make people more productive.
2. Will make it more likely to provide education our masses so desperately need in this age of technology--education which is becoming so critical to finding a good job in the modern job market.
3. Will reduce somewhat the pressure that migrating marginal populations put on our already overcrowded cities.
4. Will take some of the pressure off the dwindeling natural resource base.
5. Will slow down the rate of increase in the pressure of pollution on the biosphere which maintains this very important animal we call mankind.

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