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⇒ CITIES AND MORTALITY. [EN, Summary in FR]

⇒ Kingsley DAVIS (*)
International Population and Urban Research
University of California, Berkeley

CITIES AND MORTALITY

Prior to the modern age, there were three empirical rules about cities. First, cities eventually died; although some were reborn on the same site, virtually none survived as a city from inception to the present. Second, the regions where cities once flourished tended to return eventually to a rural condition, other regions becoming the bearers of cities. Third, no region became highly urbanized; cities, when they appeared, always existed in a sea of rurality [1]. These generalizations do not hold during the last six centuries, but only because the technological revolution intervened during the last two and a half centuries. With that momentous development, city building was continuous and was spread around the world; it gave rise to cities of unprecedented size and to societies predominantly urbanized. This city development would not have been possible if an alteration of human mortality had not occurred.

The reason why cities failed to survive in ancient and classical times, and why whole regions did not become highly urbanized, was that cities were too deadly. Three of their main traits -- the crowding of many people in little space, their independence on widespread contacts, and their wealth -- laid them open to contagious diseases, environmental contamination, occasional starvation, and warfare. As a consequence, until very recently, city populations did not replace themselves. They depended on migrants from rural villages not only to give them their growth but even to maintain their population. This histori-

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cal lack of city replacement has often been attributed to low fertility, because urban fertility was usually below rural fertility, but high mortality seems to have been the main factor. City mortality was generally so high that the fertility, whatever it was, was insufficient to come even close to providing replacement.

The demography of cities in the classical world cannot be documented in detail, but more evidence is available for cities in the early stages of the modern era. This evidence shows that although the developing nations of northwestern Europe were the cradle of modern urbanization, their cities grew slowly prior to the industrial revolution and, by present-day standards, somewhat after that. The reason for the slowness was that the cities were not achieving a positive crude rate of natural increase. They had to depend exclusively on rural-urban migration for their growth. The condition of negative crude natural increase persisted up to various dates in different countries and cities, but in general it seems to have lasted into the second half of the nineteenth century. However, even when the natural increase in these cities turned positive, the city-born population was still failing to replace itself. The crude natural increase had in most cases become positive only because of the bulge of young adults in the city population. Since this bulge came from in-migration, the positive natural increase should be attributed to that factor, not to self-replacement by the city-born inhabitants. Age-standardized rates of natural increase show that these cities generally did not achieve self-replacement until around World War II, if they ever did. By that time, rural-urban migration was drying up as a source of growth, because the rural (and especially the agricultural) proportion had diminished.

The fact that West European cities went through much or all of their evolution with a negative replacement rate is the opposite of the demographic transition found in industrial countries taken as wholes. By the time these cities began to have a fertility level near or above their mortality level, the countries in which they were found had long since dropped to a lower natural increase. The demography of cities thus throws new light on the theory of population changes accompanying modern economic development. Let us take a closer look.

MORTALITY IN CITIES OF INDUSTRIAL COUNTRIES

An approximate computation based on Graunt's Table of Survivors in London in the first half of the 17th century yields only 18.2 years as the average length of life [2]. (London was not a large city then -- population approximately 225,000 in 1605; about 425,000 in 1650.) Throughout the 17th and most of the 18th century [3], burials exceeded births on the average, even when London's

population was growing at 1.4 per cent per year. In Paris, which was also growing, Henry finds for 1740-90 an annual excess of deaths over births of 6.5 per 1000 [4]. Henry seems to regard fertility as mainly responsible for this negative rate compared to the rest of France, but his life expectancy for Crulai and Levignac-s. - Save -- 33 years -- is high compared to Deparcieux's estimate for Paris -- 23.5 years -- at the end of the period.

With a population of 50,000 in 1730 and 93,000 in 1850, Stockholm was smaller than London or Paris, but its death rate was also frightful. In every decade for 140 years (from 1721 to 1860), deaths in Stockholm exceeded births. The mean excess of deaths over births in that period was 10.8 per 1000 per year; yet the city's population rose from 45,000 to 110,000, the mean annual growth rate being 6.4 per 1000. The net in-migration was therefore 17.2 per 1000 per year [5]. After 1860, Stockholm's natural increase turned positive and was never again negative. However, it was never large and it never implied self-replacement. The crude natural increase reached its maximum in the period 1881-1910, when it averaged 8.5 (See Table 1).

TABLE 1 [6]
MEAN ANNUAL NATURAL INCREASE AND NET IN-MIGRATION RATES,
STOCKHOLM, 1721-1966

	RATES PER 100			
	Mid- Population	Natural Increase	Net In- Migration	Popula- tion Growth
1721-60	51,500	- 10.4	+ 21.1	+ 10.7
1761-1810	74,430	- 12.8	+ 11.7	- 1.1
1811-60	82,650	- 9.3	+ 19.6	+ 10.3
1861-1910	211,449	+ 5.8	+ 16.3	+ 22.1
1911-40	449,760	+ 1.7	+ 13.6	+ 18.0 (1)
1941-60	745,936	+ 7.0	+ 7.5	+ 19.3 (1)
1961-66	795,819	+ 2.2	- 8.2	- 6.0

It reached another maximum after World War II but this was short-lived.

(1) Lack of exact correspondence between the figures for population growth and the sum of natural increase plus net migration is due to the treatment of territory added to the metropolitan area as in-migration.

As noted already, a positive rate of natural increase in a city does not mean the city is replacing itself. From 1721 to the present Stockholm never replaced itself. The age distortion produced by in-migration exaggerates the crude birth rate, minimizes the death rate, and so doubly maximizes the natural increase. During Stockholm's period of highest natural increase, its net reproduction rate was below unity [7] :

1931-35	.42	1941-45	.90	1957-60	.92
1936-40	.51	1946-50	.94	1961-65	.94

The distortion produced by migration seems to be greater for the crude death rate than for the crude birth rate. For example, in both 1851-60 and 1901-10, the age standardized rate for Stockholm deviated from the actual more for deaths than births. The figures are as follows :

ANNUAL RATE PER 1000			
	Births [8]	Deaths	Natural Increase
Actual			
1851 - 60			
Standardized [8]	33.2	37.7	- 4.4
Difference as % of Actual	7.2	17.5	233.1
Actual			
1901 - 10			
Standardized [8]	24.6	15.3	+ 9.3
Difference as % of Actual	8.2	22.0	42.4

In addition to the switch from negative to positive natural increase (unstandardized), one should also note Stockholm's slow population growth. The city's fastest increase occurred during 1871-1900, when the average annual growth was 2.63 per cent. At that time, around 14 per cent of Sweden's population was in Stockholm, the only city of more than 100,000. This is the same percentage in 100,000+ cities that is found in 1970 in all the world's less developed countries combined, but in these countries increasing at a rate of 4.72 per cent per year [10] -- almost double the rate in Sweden at the same stage of urbanization.

How did mortality and fertility figure in Stockholm's growth or lack of it? From 1721 to World War II, the main factor in changing the city's unstandardized natural increase from negative to positive was the drop in the death rate. The death rate began at a very high level and remained high for nearly a century, but after 1810 it began to drop noticeably and after 1860 the rate of decline accelerated remarkably, as Table 2 shows. The city's crude death rate in 1941-60 was only a fifth of what it was in 1721-60, whereas the crude birth rate was nearly half of what it was then.

Since both the recenty of high mortality in cities and the subsequent speed of mortality decline have been overlooked in demographic theory, the case of Stockholm merits careful study.

Only a century ago, in 1861-70, the average lifetime at birth in Stockholm was 27.6 years! At that time the figure was 44.6 in Sweden as a whole. At no time in known Swedish history (which goes back to 1751-90 for life tables) did the country have a life-expectancy as low as that of Stockholm in 1861-70. Subsequently, the city's life-expectancy rose rapidly to 72.8 in 1965. It is impossible to compare the speed of this change with that of Sweden as a whole for the entire period, because of lack of a comparable starting level in Sweden. However, we can compare

Greater exaggeration of the death rate than the birth rate, and gross exaggeration of the natural increase rate are also found in Japan for all communities of 100,000+ in 1930 [9] :

	Birth Rate	Death Rate	Natural Increase
Actual	26.3	15.7	10.5
Standardized	23.0	18.4	4.6

Difference as % of Actual
12.5

It is of interest that the natural increase of these communities was less than a third of that of the country as a whole at the time.

Since both the recenty of high mortality in cities and the

the relative speed after Stockholm reached Sweden's 1751-90 level. From that level it took Sweden approximately 187 years to get to Stockholm's 1965 figure, whereas it took Stockholm itself only about 87 years [12].

MEAN BIRTH AND DEATH RATES, STOCKHOLM, 1721-1965

	RATES PER 1000		
	Births	Deaths	Natural Increase
1721-60	38.1	48.5	- 10.4
1761-1810	34.3	47.1	- 12.8
1811-60	33.6	42.8	- 9.3
1861-1910	29.8	42.0	+ 5.8
1911-40	13.8	12.2	+ 1.6
1941-60	16.6	9.6	+ 7.0
1961-65	13.1	10.6	+ 2.5

It is clear that mortality dropped in the cities much faster than it did in the nations taken as wholes. Was the drop the fastest on record? A comparison with present-day underdeveloped countries is instructive. As is well known, the drop in mortality in these countries has been extremely rapid [13]. When Stockholm's performance is compared to theirs, it seems to be equally if not more rapid. For instance, the mortality decline in Latin American countries from Stockholm's 1861-70 level shows a slightly less rapid rate of change than Stockholm showed. On the average, the Latin American countries reached Stockholm's 1861-70 level of mortality about 1902. The level they had reached by 1960, which was 58 years later [14], was reached by Stockholm in 52 years.

The explanation of the unprecedentedly rapid fall in mortality in underdeveloped countries is that they have been the sudden beneficiaries of medical technology that had to be slowly invented in the advanced countries, the transfer being helped by medical personnel and funds from the industrial nations. If so, how do we explain the equally rapid drop in mortality in cities of the industrial countries at an earlier time? The answer is to be found, I think, in the nature of cities. They are the first beneficiaries of whatever advances in technology are made. Until the

latter half of the nineteenth century, cities were not benefiting much from innovations applied to health because those innovations were few in number and not particularly beneficial. It is likely that the increase in size of cities tended to cancel out the medical gains being made. In any case, it was inadvisable to live in a city if one wished to live long. In the latter half of the nineteenth century, however, the medical innovations began to pay off. At long last, after some six thousand years of experience in trying to make cities habitable for human beings, they were being made habitable. They were the places in which the medical inventions were made and in which they were first applied. It can hardly be claimed that the rapid mortality decline came because cities were the focal points of economic development and therefore gave their citizens whatever advantages this development brought in terms of health. Cities have always been the focal points of whatever economic development was occurring, and always gave their citizens advantages over the rural population. However, until the invention of effective medical technology, this advantage was more than counter balanced by the negative effects of city life. What happened in the last half of the nineteenth century was that specifically medical technology was invented, was first applied in cities, and had more effect in correcting specifically urban dangers to health than in correcting rural dangers to health.

In any case the demographic evolution of cities in the industrial countries was different from that of the countries considered as wholes. The cities generally exhibited a faster population growth, but in the early stages this growth was due entirely, and later it was due mostly, to net in-migration. The natural increase, unlike that in the countries at large, was negative down to a late point; and when the influence of immigration on the age structure is removed (that is, when the city's vital rates are age-standardized), the natural increase either turned only slightly positive very late or never turned positive at all. Such rise in city natural increase as did occur in the last third of the nineteenth and the first third of the twentieth century was due to a faster decline in mortality than fertility—a decline far more rapid than that experienced by the nations at large.

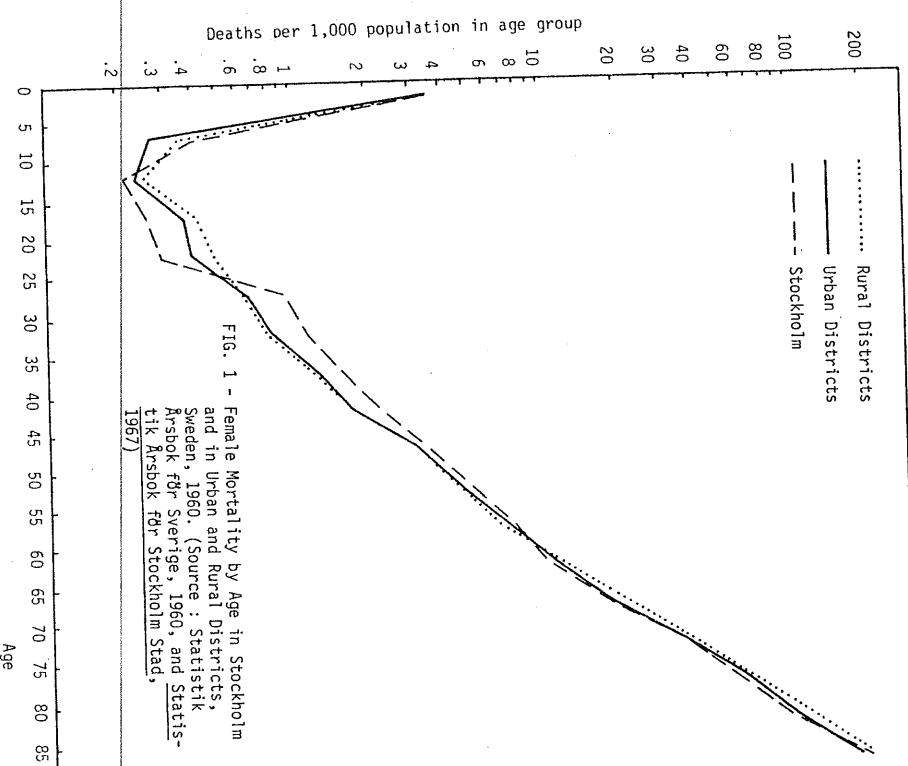
Eventually, as a result of their fast drop in mortality, city death rates in industrial nations came to resemble rural death rates. In Sweden, life-expectancy shifted as follows [15]:

By 1945 Stockholm had virtually caught up with the rural districts. Males in the city, however, had not done as well as females --

a typical finding in industrial countries. The convergence of city and rural mortality and the better survival of females than males in cities are both shown in Figures 1-4 for Sweden and the United States in 1960. Accidents may account for excess male mortality at young ages in rural areas, and lack of exercise for excess male mortality at older ages in urban areas. Smoking among recent generations may account for excess urban mortality of females aged 25 to 60.

The rapid fall of city mortality in industrial nations was all the more remarkable in view of the fact that the cities were increasing in size. Stockholm's population in 1965 was 10.4 times its population in 1800. Obviously, during the last half of the nineteenth century and the first half of the twentieth century, the industrializing peoples learned how to do something that humanity had not learned in more than 6000 years of city building -- how to control mortality in large urban aggregations. If they had not learned how to do this, the full process of urbanization and the later stages of modern economic development would not have been possible. If the decimating mortality characteristic of cities prior to 1850 had continued, the urbanization of the population would have stopped when the proportion living in cities reached about one-third, because at that point the natural increase of the remaining rural population could no longer have furnished enough migrants for continued city growth. The contamination of the entire population by the city would be sufficient to give the rural population a high death rate. If a third of a nation's population were in cities, and if these cities had a net replacement rate of .98 per year, the rest of the population would have to increase at 1 per cent per year simply to maintain, much less increase, the city population. Under a condition of little or no modern death control, a rural population is not likely to exceed a 1 per cent growth rate, and it is certainly not likely to do so under heavy urban contamination. In the eighteenth century the population of Sweden grew at only .6 per cent per year, although the country was only slightly urban.

	Males		Females	
	Stockholm	Rural	Stockholm	Rural
1861-70	24.6	44.0	30.7	47.2
1901-10	45.4	56.1	53.7	57.3
1941-50	66.0	68.6	71.2	70.3
% Change	126.8	55.9	131.9	48.9



200

100

80

60

40

30

20

10

8

6

4

3

2

1

.8

.6

.4

.3

Deaths per 1,000 population in age group

..... Rural Districts
 - - - Urban Districts
 - - - Stockholm

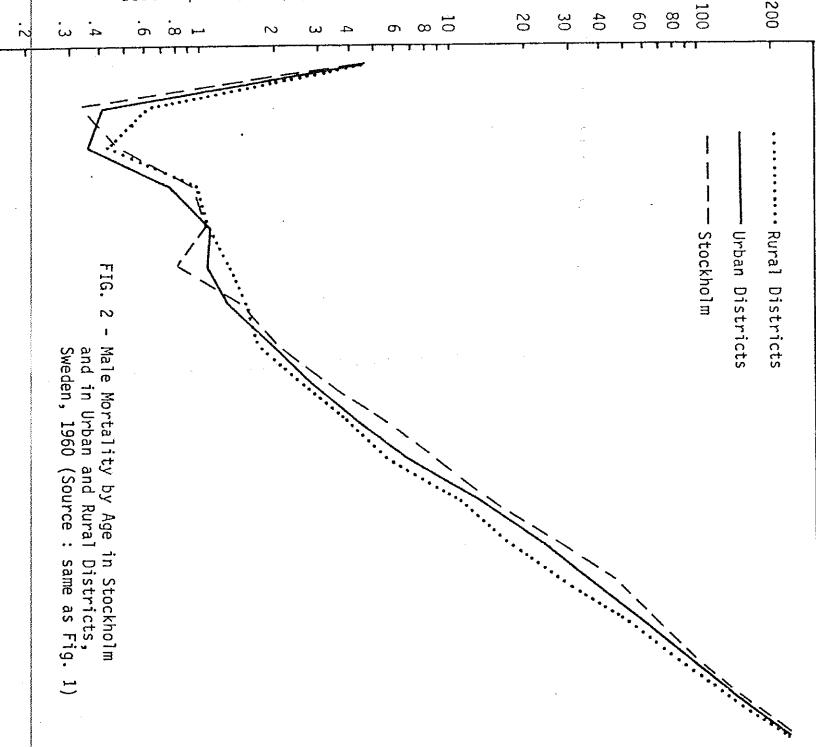


FIG. 2 - Male Mortality by Age in Stockholm and in Urban and Rural Districts, Sweden, 1960 (Source : same as Fig. 1)

200

100

80

60

40

30

20

10

8

6

4

3

2

1

.8

.6

.4

.3

Deaths per 1,000 population in age group

- - - Outside S.M.S.A.
 - - - Inside S.M.S.A.

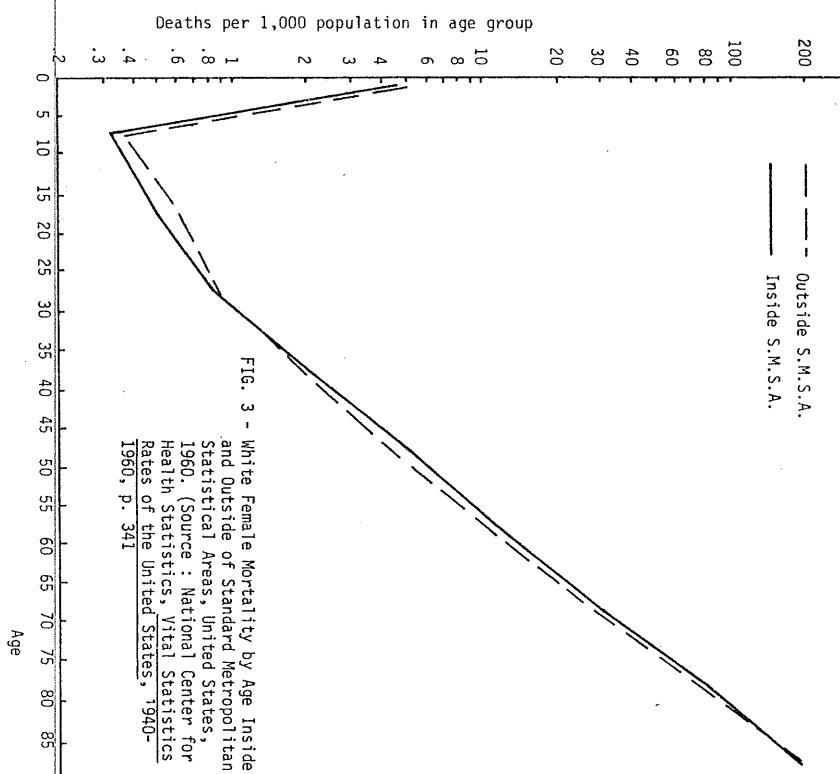


FIG. 3 - White Female Mortality by Age Inside and Outside of Standard Metropolitan Statistical Areas, United States, 1960. (Source : National Center for Health Statistics, Vital Statistics Rates of the United States, 1940-1960, p. 341)

	(Male)		
	Urban	Rural	Stockholm
0-4	4.62	4.59	4.74
5-9	0.40	0.62	0.321
10-14	0.35	0.42	0.447
15-19	0.75	0.95	0.920
20-24	1.07	1.05	1.020
25-29	1.03	1.28	0.789
30-34	1.26	1.49	1.446
35-39	1.83	1.65	1.967
40-44	2.63	2.40	3.141
45-49	4.16	3.77	5.278
50-54	6.88	5.48	8.522
55-59	12.58	10.20	13.759
60-64	21.39	15.93	24.482
65-69	34.38	26.37	42.769
70-74	55.07	47.27	63.419
75-79	87.26	75.62	93.509
80-84	138.07	128.94	146.002
85+	230.42	224.29	238.393
All Ages	9.806	11.326	11.117

(White Female)

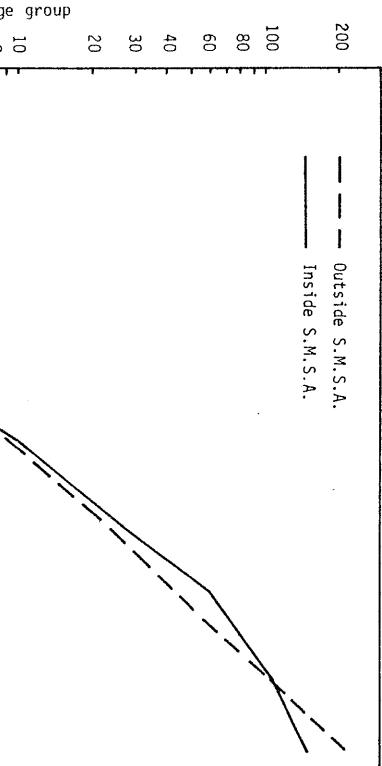


FIG. 4 - White Male Mortality by Age Inside and Outside of Standard Metropolitan Statistical Areas, United States, 1950 (Source : Same as in FIG. 3)

	(White Male)	
	SNSA	Non-SNSA
0-4	6.07	6.50
5-9	0.48	0.50
10-14	1.23	1.15
15-24	1.47	1.95
25-34	3.21	3.56
35-44	9.60	8.84
45-54	23.22	20.62
55-64	50.92	44.90
65-74	105.90	99.48
75-84	215.27	220.11
All Ages	10.67	11.51

In the American colonies during the same period the natural increase may have exceeded 2 per cent per year (excluding the effect of immigration and counting the decimation of the Indians), this was with very little urbanization and under exceptionally favorable natural conditions seldom encountered in the world. Wrigley estimates that London, which had a population of about 600,000 in 1700, was using up the entire natural increase of two million people [16]. In 1965 Stockholm had 10.1 per cent of Sweden's population; if at that time it had had the mortality it had in 1851-60, it would have claimed 49 per cent of Sweden's deaths. The ability to control city mortality was a necessary condition of the industrial transition.

CITY MORTALITY IN LESS DEVELOPED COUNTRIES

When we turn to the cities of the less developed world, do we find the same type of changes that occurred in the cities of the industrial countries at an earlier time? The answer is no. As nations, the present-day underdeveloped countries are not repeating the same pattern of demographic change that the industrial countries exhibited during their earlier history; their cities are not likely to be repeating a similar history either; and that is what the evidence (admittedly difficult to assemble) seems to show. A further question, then, is how mortality figures in the way the evolution of these cities differs from that of cities in the industrial countries at a similar stage of development.

The first thing to note is that during the last three decades the population of cities in the underdeveloped world has been growing faster than that of cities in industrial countries when these countries were at a similar stage. The slow growth of Stockholm compared to cities in currently underdeveloped countries has already been noted. Further comparisons, which are given in Table 3, yield the same contrast. Among the industrial nations, there is a slight tendency for those whose urbanization came later to show a faster rate of city growth, but it is hard to find even a

single industrial nation which matches the fantastic average shown for all 171 less developed countries combined during 1950-1970. These countries, it must be remembered, represent a majority of the world. They contained 68 per cent of the world's population in 1950 and 71 percent in 1970, and at the two dates they contained 36 and 47 per cent respectively of the world's city population [22]. The rapid growth of their cities is beginning to dominate the world's urban situation. Further, the cities in the underdeveloped world have in many cases reached a size that no city in the industrial world had reached by the end of the nineteenth century. By 1970 there were 83 cities of over a million inhabitants in the 171 less developed countries referred to in Table 3.

TABLE 3

ANNUAL RATE OF POPULATION GROWTH IN CITIES OF 100,000+
AT COMPARABLE STAGES OF DEVELOPMENT

	Period	% of National Population in Cities at Start of Period	Annual % Growth of Population in Cities
17.1 Less Developed Countries [17]	1950-70	8.6	5.3
U.S.S.R. [18]	1926-39	6.5	3.8
United States [19]	1860-80	8.4	4.4
France [20]	1851-91	4.6	2.6
England and Wales [21]	1801-21	9.7	3.2

The extraordinary growth being exhibited by cities in less developed lands is often carelessly attributed to an unusually high rate of internal migration. This interpretation apparently rests on the automatic assumption that with respect to the components of population growth, contemporary cities in non-industrial countries are like those of the past in industrial nations. There, as we have seen, migration was the overriding factor in population growth. The reasoning is that if present-day cities at an early stage of economic development are growing faster, it must be because the migration is greater. However, I can find no evidence that the rate of migration into cities is any greater in today's developing countries than it used to be in industrial countries.

In ratio to the rural or agricultural population, the rate of rural-urban migration is in fact less. Furthermore, in 1965 I showed that rural-urban migration, as a component of city population growth, is far less of a factor than it formerly was [23].

Since that analysis, other investigators have confirmed the results [24]. Let us examine the nature and contribution of the components.

For any class of urban places whose lower boundary is fixed in terms of a minimum population size, the sources of population growth are international migration, internal migration, natural increase, and reclassification (both by graduation and by absorption). The more rapid the overall population growth, the greater the contribution of reclassification. For all cities of the less developed world combined, I have estimated on conservative

assumptions, that 36.4 per cent of city growth between 1950 and 1970 was due to the natural increase of the cities' starting population [25], and at least 15 per cent was due to reclassification. This leaves only half the growth to be explained by migration, including as an effect of migration the contribution made by these migrants to city natural increase during each ten-year period. Others, using detailed data for particular countries, have found a greater role for natural increase. Pernia found the direct effect of migration on Manila's growth to be 32.5 per cent in 1960, and 28.7 per cent in 1970 [26]. For cities of 100,000 or more in Chile, Venezuela, and Mexico, Arriaga found less than 40 per cent of growth between 1950 and 1960 to be due to migration [27]; and in Colombia, between 1951 and 1964, Venez found less than 50 per cent to be due to that factor [28].

If in the underdeveloped majority of the world, the city natural increase is not only high but is accounting for half or more of rapid city growth, the contrast with the past history of cities in industrial countries is profound. At a similar stage of national economic development, those cities, as we have seen, had a negative rate of natural increase. Even when the natural increase turned positive (usually in the latter half of the nineteenth century) it was so slight that its contribution to city growth was minor until extremely late in the urbanization process. In contrast, the cities of the underdeveloped world are exhibiting a natural increase that exceeds even that of the past rural population of industrial countries. Comparison with past cities is found in the last column of Table 4. The natural increase is three times what it was in Paris in 1876-81. One should recall that the highest natural increase achieved by Stockholm in any decade was 9.8 per 1000 in 181-90. All of the underdeveloped cities listed in Table 4 are more than doubling that rate.

If natural increase in underdeveloped cities is so much higher now than it was in past industrializing cities, where does the main difference lie -- in mortality or fertility? The answer is suggested in Table 4. The crude birth rates in contemporary underdeveloped cities seem no higher than they were in Stockholm in the nineteenth century. In fact, the highest birth rate recorded for Stockholm -- 39.3 in 1741-50 -- was not much higher than that for the manifold larger city of Singapore in 1950-69. On the other hand, the crude death rates in cities of currently less developed countries bear no resemblance to those in cities of the nineteenth century. Stockholm's death rate in 1811-60 was nearly ten times that of Taipei in 1961. It is therefore the mortality difference that explains most of the difference in natural increase.

TABLE 4
UNSTANDARDIZED CRUDE VITAL RATES, CITIES IN CURRENTLY
MESS DEVELOPED COUNTRIES COMPARED WITH NINETEENTH CENTURY
INDUSTRIALIZING CITIES

This can be seen by comparing Taipei with Stockholm even as late as 1901-10.

DIFFERENCE BETWEEN ACTUAL AND STANDARDIZED RATE AS % OF ACTUAL

	PERIOD	RATES PER 1000 POPULATION		
		Births	Deaths	Natural Increase
<i>Currently Less Developed</i>				
Colombo, Ceylon [29]	1947-53	33.3	12.5	20.9
Singapore [30]	1950-69	37.7	7.3	30.4
Hong Kong [30]	1950-70	31.9	6.7	25.2
Sao Paulo, Brazil [31]	1965	29.2	8.3	20.1
Taipei, Taiwan [32]	1961	32.3	4.4	27.9
San Jose, Costa Rica [33]	1970	29.4	6.3	23.2
<i>Historical Developed</i>				
Stockholm [34]	1811-60	33.6	42.8	-9.3
25 German Cities [35]	1861-71	N.A.	N.A.	6.2
Paris [35]	1876-81	N.A.	N.A.	8.3

Of course, the natural increase of city populations is inflated today by cityward migration, as it was in past history, and the distortion is again greater for the death rate than the birth rate. For instance, here are standardized and non-standardized rates for Taipei in 1961:

		Birth Rate	Death Rate	Natural Increase
Actual	Taipei, 1961	32.3	4.4	27.9
Standardized	Stockholm, 1951-60	33.2	37.7	-4.4

As a consequence of lesser distortion, the cities of the non-industrial world today differ from those of yesterday more in age-standardized than in actual rates. In Stockholm in 1851-60 the rates, compared to those of Taipei, were as follows:

		Birth Rate	Death Rate	Natural Increase
Actual	Taipei, 1961	32.3	4.4	27.9
Standardized	Stockholm	31.8	45.7	27.0

Other measures of fertility and mortality independent of the age structure tell the same story. The mean lifetime at birth in a city such as Singapore or Hong Kong is more like that of contemporary Stockholm than like that of nineteenth-century Stockholm. In Hong Kong in 1968 the figure was 70.0; in Singapore in 1965-70, it was 68.2; and in Stockholm in 1965 it was 72.8. Although Stockholm has never, within recorded history, achieved population replacement, the net reproduction rate in Singapore in 1963-68 was 2.06.

However, the distortion is not so great because the age structure of the city, being less dependent on migration, is more normal.

My first hypothesis was that, with mortality so low at present in the cities of less developed regions, these cities must have had a mortality decline that would make the nineteenth

century drop in West European cities look pale. Actually, this appears to be untrue. As near as the scarce evidence can get us to the facts, the cities of the third world seem to have had an impressive but nevertheless not unprecedented mortality decline. Their mortality at the beginning of the rapid drop in death rates in the underdeveloped world generally, after World War I, was apparently better than the rural mortality of the countries in which they were located. Subsequently, then, they did not have to have a faster drop to come out ahead of their rural hinterlands today.

Gwendolyn Johnson was one of the first to point out the general tendency of city mortality to be less than that in the countryside [37]. Subsequently, Arriaga used Mexico as a case to suggest that one reason for the common assumption that rural death rates are lower than urban (other than the fact that this was historically the case in developed countries) is that under-registration tends to be greater in the rural areas of less developed countries [38]. Neither author attempted to document how far back the relationship existed. My hypothesis is that it goes back at least to the period just following World War I.

How would it happen that the early cities of industrial countries had such decimating mortality while those coming later in the developing world managed, at a similar stage of economic modernization, to have not only a lower mortality but also one that was probably less than that in the rural zones? The answer lies, I think, in the fact that the cities of the developing countries have been the outposts of the advanced nations. As such they were the first places to receive the technological and medical advances being made in the industrial nations. It was in these cities that the personnel from industrial nations lived, in them that mass public health programs could be conducted at minimum cost per person, in them that improvershared governments mainly invested their scarce funds. As they grew by commercial contact with the advanced nations, they naturally began to approach their performance in controlling city mortality, which by then (in the twentieth century) had gone far, and they got ahead of the rural hinterland in this respect.

Mainly as a result of this mortality control at an early stage of development, the population growth of cities in non-industrial countries is, as we have seen, extraordinarily rapid. Fertility has not had a chance to fall in the cities as it did historically. It is falling in the most advanced of them, and will fall in all of them, but not in time to prevent further massive increase. If this development were occurring only on the cities, it would not have the economic and social repercussions it is having. The fact is however, that the city pattern and the rural pattern are now very similar. Mortality is usually somewhat higher in the countryside, but so is fertility. As a

result, the natural increase of the rural areas is far larger than it was historically in industrializing countries. Even if the cities had no natural increase of their own at all, they would have great difficulty absorbing a sizable portion of this rural excess of births. As it stands, growing rapidly by their own human multiplication, they are incapable in many underdeveloped countries of absorbing enough rural migrants to have much effect on rural population increase and rural crowding on the agricultural land. Thus has man's great achievement in learning how to control city mortality led to problems he did not anticipate and did not want.

RESUME

Villes et mortalité

La présente étude démontre le rôle de la mortalité dans l'évolution des centres urbains. Avant le début de l'ère moderne, la mortalité urbaine immobile a empêché les villes de survivre. Durant cette période de l'histoire, le progrès initial des villes fut extrêmement minime, sinon nul. Dans les villes des pays industrialisés, à cause de cette mortalité excessive, nous remarquons généralement un taux d'accroissement naturel négatif et, cela, jusque vers les années 1850. L'accroissement de la taille de ces dernières fut causé, non par un taux de remplacement naturel, mais, plutôt, par de l'exode du rural. Et, lorsque nous standardisons les taux selon l'âge, nous remarquons qu'à partir seulement du vingtième siècle, les villes des pays avancés se sont accrues d'elles-mêmes, si jamais elles se sont réellement remplacées de cette façon. Les taux différenciels entre le rural et l'urbain furent toujours de beaucoup plus remarquables dans la comparaison de la mortalité que dans celle de la fécondité. De plus, à partir des années 1850, en comparant les pays riches et les pays pauvres, nous remarquons une diminution plus rapide de la mortalité dans les centres urbains des pays développés que dans ceux des pays en voie de développement. La raison de ce déclin inégal à partir de cette date, se retrouve dans la logique de la transition économique. Les villes furent les plus grandes bénéficiaires de l'avancement médical et du progrès technique et les premières à appliquer ces améliorations. La baisse de la mortalité fut si rapide, que vers les années 1950, le différentiel urbain-rural fut réduit à la parité.

En ce qui concerne les pays en voie de développement, l'évolution démographique des centres urbains diffère énormément. Non seulement nous observons une augmentation plus rapide de la taille de la population mais, surtout, nous remarquons que cet accroissement est le résultat de leur accroissement naturel plutôt que causé par la migration à partir de régions rurales. Lorsque

nous comparons, à une étape similaire du développement, ces villes à celles des pays avancés avant 1850, les centres urbains des pays pauvres se caractérisent principalement par un taux d'accroissement naturel élevé et positif tandis que celles des pays riches, dans le passé, démontraient un taux de remplacement naturel négatif. Dans les pays en voie de développement, cet accroissement naturel positif et élevé est, en partie, causé par un taux de fécondité élevé. Mais la caractéristique la plus importante réside dans le faible taux de mortalité, taux similaire à celui remarqué dans les centres urbains des pays industrialisés d'aujourd'hui.

REFERENCES

- [1] For further discussion, see the writer's *Cities : Their Origin, Growth and Human Impact* (San Francisco : Freeman, forthcoming), Part I.
- [2] Louis I. Dublin, A.J. Lotka, and M. Spiiegelman, *Length of Life* (New York : Ronald Press, 1949), p. 33.
- [3] T.H. Hollingsworth, *Historical Demography* (Ithaca, N.Y. : Cornell University Press, 1969), p. 146.
- [4] Louis Henry, "The Population of France in the Eighteenth Century," in D.V. Glass and D.E.C. Eversley, *Population in History* (Chicago : Aldine Publishing Co., 1965), p. 444.
- * * *
- [5] *Statistisk Årsbok för Stockholms Stad*, 1967, pp. 52-53.
- [6] *Statistisk Årsbok för Stockholms Stad*, 1967, p. 53.
- [7] *Ibid.*, p. 68.
- [8] The rates are standardized on the basis of the age structure of Sweden. Births by age were not available in the sources, so maternities were used. Calculated from data in *Statistisk Årsbok för Stockholms Stad*, 1967, Tables 10, 14 and 46; and from *Historisk Statistisk för Sverige*, Vol. I, Table 18.
- [9] Masao Ueda, *Urban Concentration and Internal Migration in Japan* (Tokyo : Japanese National Commission for Unesco, 1965), pp. 62-63.
- [10] K. Davis, *World Urbanization 1950-1970*, Vol. II (Berkeley : Institute of International Studies, 1972), p. 310.
- [11] *Statistisk Årsbok för Stockholms Stad*, 1967, p. 62.
- [12] *Statistisk Årsbok för Stockholms Stad*, 1967, pp. 67-68; *Historisk Statistisk för Sverige*, Vol. I (Stockholm : Statistiska Centralbyrån, 1955), p. 61.

- [13] Geo. J. Stolnitz, "A Century of International Mortality Trends", *Population Studies*, Vol. 9 (1955), pp. 24-55.
- K. Davis, "The Amazing Decline of Mortality in Underdeveloped Areas", *American Economic Review*, Vol. 46 (1956), pp. 305-318.
- Eduardo E. Arriaga and K. Davis, "The Pattern of Mortality Change in Latin America", *Demography*, Vol. 6 (August 1969), pp. 223-242.
- [14] Arriaga and Davis, *op cit.*, p. 231.
- [15] *Statistisk Årsbok för Stockholms Stad*, 1967, p. 67.
- [16] *Population and History*, p. 97.
- [17] Based on data in K. Davis, *World Urbanization 1950-1970*, Vol. I. The identity of the countries is given in Vol. II, p. 239.
- [18] R.A. Lewis & R.H. Rowland, "Urbanization in Russia and the USSR: 1897-1966", *Annals, Association of American Geographers*, Vol. 59 (Dec. 1969), p. 780.
- [19] Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1957*, p. 14.
- [20] Adna Weber, *The Growth of Cities in the Nineteenth Century* (New York : Columbia University Press, 1899), p. 71.
- [21] *Ibid.*, p. 46.
- [22] Derived from data in K. Davis, *World Urbanization 1950-1970*, Vol. I.
- [23] "The Urbanization of the Human Population", *Scientific American*, Vol. 213 (September 1965), pp. 40-53. Reprinted in *Cities* (New York : Alfred A. Knopf, 1969), pp. 3-24.
- [24] Eduardo E. Arriaga, "Components of City Growth in Selected Latin American Countries", *Milbank Memorial Fund Quarterly*, Vol. 46 (April 1968), pp. 237-252.
- Ernesto M. Pernia, "City Growth and Urbanization in the Philippines", (Unpublished, available at IPUR).
- Georges Vernez, "El proceso de urbanización de Colombia", *Revista de la Sociedad Interamericana de Planificación*, Vol. V (September 1971), pp. 24-26.
- [25] *World Urbanization 1950-1970*, Vol. II, pp. 308-313.
- [26] *op. cit.*
- [27] *op. cit.*, p. 241.
- [28] *op. cit.*, p. 24.
- [29] Ceylon, Department of Census and Statistics, *Demographic Study of the City of Colombo* (Ceylon : Government Press, 1954), p. 30.
- [30] United Nations, *Demographic Yearbook*.
- [31] Elza S. Berquo et al., "Levels and Variations in Fertility in São Paulo", *Milbank Memorial Fund Quarterly*, Vol. 46 (July 1968), Part 2, p. 167.
- [32] *Taiwan Demographic Fact Book*, 1961, pp. 63-68, 75-176.
- [33] *Anuario Estadístico de Costa Rica*, 1970, pp. 20, 27.
- [34] From Table 2.
- [35] Adna Weber, *Growth of Cities in the Nineteenth Century* (New York : Columbia University Press, 1899), pp. 245-246.
- [36] Calculated on less rounded figures.
- [37] "Health Conditions in Rural and Urban Areas of Developing Countries", *Population Studies*, Vol. 17 (March 1964), pp. 293-309.
- [38] "Rural-Urban Mortality in Developing Countries : An Index for Detecting Rural Underregistration", *Demography*, Vol. 4 (December 1967), pp. 98-107.
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