MORTALITY PATTERNS AND THEIR IMPLICATIONS

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Summary

The diversity of mortality levels and patterns around the world is currently greater than ever. This directly results from the new historical perspective engaged two and half centuries ago, when some North-Western European countries started to become efficient in their fight against disease and death. But the road of progress has not been straightforward. Until the late 1960s, it was possible to rather clearly oppose high mortality levels of developed countries to the low levels of developing ones. Today, both groups of countries radically split into those that were the most successful and those that lagged behind. Many authors, starting with Abdel Omran and his epidemiological transition theory tried to find out the rationale for the historical mortality changes, and continuing with those who tried to extend Omran's theory to the new facts that contradicted it and with those who preferred to try to assess a new theory, the health transition theory, to take into account non-epidemiological factors. However the current situation is so complex that it is not possible to describe it as the result of only one stream of changes that could universally explain all the different trajectories of individual populations. It appears that the history of human mortality is made of the achievement of successive steps of development that occurred with quite different timing from one population to another, in order to produce at each step a divergence and then convergence wave. And a wave can easily start when the previous one is not completed. Thus explained, the large to-day inequity is far from being reduced. That would need that the most advanced population be stopped in their progress by a supposed biological limit of the human life span-a limit that nothing allows us to fix

today.

1. Introduction

Mortality was high in all human populations up until the eighteenth century. With sometimes brutal variations, the crude death rate stood around 40 per 1,000 population, more or less equivalent to the birth rate. However, crude death rate, obtained by dividing the number of deaths observed during one calendar year by the total mean population of the same year, does not depends only on the level of mortality but also on the age pattern of the population. Indeed, since mortality risks are much higher for old people than for young people, same mortality risks will give an higher crude death rate in a population where the proportion of old people is higher than in a population where such proportion is lower. This is the reason why demographers calculate the life expectancy at birth, which is the mean duration of life that would be experienced by the individuals of a hypothetical birth cohort that would be affected all along the life by age-specific deaths rates observed in the year for which it has been computed. It is an indicator of the level of mortality, independently from the age structure of the population, quite comparable across time and space. Until the eighteenth century life expectancy scarcely exceeded 25 years. Approximately half of all newborns died before the age of five and even 30% before the age of one. To easily focus on the historical importance of the latter, infant mortality rates are very simply computed by dividing the number of deaths under one year of age observed during one calendar year by the number of births observed during the same year. Of course this very simple indicator is also independent from the population age pattern and it allows to fairly represent mortality levels when in the past or still after World War IIin developing countries mortality was very high and data too poor to compute life expectancy precisely.

From the eighteenth century on, the battle against the major epidemics became more efficient, largely thanks to political and administrative progress, while famines became less frequent as a result of agricultural development, improved means of communication, and the opening up of trade. Northwest Europe was the first to benefit from this. By the middle of the nineteenth century, life expectancy in England, the Scandinavian countries and the Netherlands, reached — and even exceeded — 40 years. In the second half of the nineteenth century, the health transition reached North America and Japan while at the same time spreading to southern and eastern Europe. But it did not reach Latin American and parts of Asia and the Middle East until the interwar period, and only spread to the rest of the world after World War II.

Boosted by the economic development that resulted from the industrial revolution, sanitary progress spread world-wide but with major discrepancies of time and pace. Some countries, such as Japan in the past and many developing countries today, benefited from the experience of others and caught up — sometimes even overtaking the forerunners. The result, until the 1980s , was a broad range of situations. But in the past twenty years the trend has been towards a concentration of populations at the higher levels of life expectancy, while maintaining that range.

One might suppose that this trend will ultimately lead to equality of health and the realization, at last, of the World Health Organization's (WHO) slogan "Health for all by

the year 2000". But things are never so simple. Some countries, notably in sub-Saharan Africa, clearly lag behind. Conversely, many developing countries are catching up and even overtaking the life expectancies of the developed countries, because they are winning the battle against infectious diseases but have yet to be hit by the increase in cardio-vascular diseases and cancers that struck most of the developed world during the 1950s and 1960s.

Is the future likely to see a possible convergence of all the countries in the world towards a life expectancy that some researchers place at 85 years (Fries, 1989; Olshansky and Ault, 1986)?. That would suppose that the most developed countries do not rise above their present rates, and that those who still lag behind rapidly catch up with them. At the dawn of the XXIst century, Recent recent developments do little to confirm this hypothesis however.

2. The Variety of Situations Today

All countries have been affected by the improvement in life expectancy and the worst situations today resemble the once-privileged situation in Europe, North America and Japan at the beginning of the century. Table 1 summarizes the mortality levels observed in all countries with a population of more than 15 million according to the three classic indicators, in three major regions of the world. Data used in this table are coming from systematic computations done by the Population Division of the United Nations. It is well known that the quality of these estimates varies a lot with the availability and the quality of national data. UN experts do their best to select the most reliable data from each country and to use the best indirect methods to estimate desired indicator that cannot be computed from direct observation. Indeed estimates for some developing countries must be considered as rough estimates and international comparison must be used with caution. Nevertheless, UN databases are the most appropriate to give a rather good overview of the actual diversity of situation.

AREA, country	Population	e^0	IMR	CDR
	2005	2000-05	2000-05	2000-05
World	**6514751**	**66.0**	**49.4**	**8.8**
More developed countries	1215636	75.6	7.1	10.2
Intermediate countries (Less developed – Least developed)	4532300	66.6	43.5	7.6
Least developed countries	766816	52.7	87.9	13.3
Japan	**127897**	**81.9**	**3.2**	**8.0**
Australia/New Zealand	**24407**	**80.2**	**4.5**	**6.9**
Australia	20310	80.4	4.4	6.8
Western Europe (North without Baltic c., South, West)	**426240**	**78.8**	**5.0**	**9.7**
Spain	43397	80.0	4.2	8.7
Italy	58646	79.9	5.0	9.9
France	60991	79.6	4.2	9.2
Germany	82652	78.7	4.3	10.3

Netherlands	16328	78.7	4.7	8.7
United Kingdom	60245	78.5	4.8	10.2
Northern America	**332245**	**77.6**	**6.2**	**8.2**
Canada	32271	79.8	4.8	7.2
United States of America	299846	77.4	6.3	8.3
Eastern Asia (without China and Japan)	**96966**	**74.3**	**16.1**	**6.5**
Taiwan	22770	77.3	5.5	5.8
Republic of Korea	47870	77.0	4.1	5.4
Dem. People's Republic of Korea	23616	66.7	48.2	9.3
China (including Hong Kong and Macao, excluding Taiwan)	**1290079**	**72.0**	**23.0**	**6.6**
Latin America (including the Caribbean)	**557979**	**72.0**	**21.6**	**6.0**
Chile	16295	77.9	7.2	5.0
Mexico	104266	74.9	16.7	4.7
Argentina	38747	74.3	13.4	7.7
Venezuela	26726	72.8	17.0	5.0
Colombia	44946	71.7	19.1	5.6
Brazil	186831	71.0	23.6	6.3
Peru	27274	69.9	21.2	6.2
South-Eastern Asia	**557669**	**68.5**	**27.4**	**6.7**
Malaysia	25653	73.0	8.9	4.5
Viet Nam	85029	73.0	19.5	5.2
Philippines	84566	70.3	23.1	5.1
Indonesia	226063	68.6	26.6	6.6
Thailand	63003	68.6	10.6	8.6
Myanmar	47967	59.9	66.0	10.2
Western Asia	**212088**	**68.3**	**39.3**	**6.2**
Syrian Arab Republic	18894	73.1	16.0	3.6
Saudi Arabia	23612	71.6	18.8	3.8
Turkey	72970	70.8	27.5	5.8
Yemen	21096	60.3	58.6	8.6
Iraq	27996	57.0	81.5	10.6
Eastern Europe (including Baltic countries)	**304847**	**67.9**	**13.4**	**14.3**
Poland	38196	74.6	6.7	9.6
Romania	21628	71.3	14.9	12.2
Ukraine	46918	67.6	12.8	15.8
Russian Federation	143953	64.8	16.6	15.9
Northern Africa	**189562**	**67.1**	**38.3**	**6.7**
Algeria	32854	71.0	31.1	5.0
Egypt	72850	69.8	29.3	5.9
Morocco	30495	69.6	30.6	6.0

Sudan	36900	56.4	64.9	11.2
India	**1134403**	**62.9**	**55.0**	**8.7**
South-central Asia without India	**511387**	**62.4**	**65.0**	**8.3**
Sri Lanka	19121	70.8	11.0	7.3
Iran (Islamic Republic of)	69421	69.5	30.6	5.5
Uzbekistan	26593	66.5	55.0	6.8
Kazakhstan	15211	64.9	24.1	10.6
Pakistan	158081	63.6	67.5	7.7
Bangladesh	153281	62.0	52.5	8.2
Nepal	27094	61.3	53.9	8.7
Afghanistan	25067	42.1	157.0	21.6
Melanesia, Micronesia, Polynesia	**9003**	**60.5**	**50.7**	**8.6**
Southern Africa	**54900**	**52.5**	**46.4**	**13.8**
South Africa	47939	53.4	44.8	13.5
Tropical Africa (Eastern, Middle, Western)	**677549**	**48.4**	**96.2**	**15.3**
Ghana	22535	58.5	56.6	10.0
Madagascar	18643	57.3	65.5	11.0
Kenya	35599	51.0	64.4	13.2
Ethiopia	78986	50.7	86.9	14.4
Cameroon	17795	49.9	87.5	15.0
United Republic of Tanzania	38478	49.7	72.6	14.6
Uganda	28947	47.8	76.9	15.5
Côte d'Ivoire	18585	46.8	116.9	16.5
Nigeria	141356	46.6	109.5	17.5
Democratic Republic of the Congo	58741	45.0	113.5	19.3
Mozambique	20533	44.0	95.9	19.2
Angola	16095	41.0	131.9	22.1
Source: United Nation 2006 World Population Prospects (for Taiwan, see http://www.moi.gov.tw/stat/english/).				

Table 1. Mortality indicators for 2000-05 in 62 countries with a population of more than 15 million in 2005, ranked according to life expectancy at birth (e0 = life expectancy at birth, IMR = infant mortality rate, CDR = crude death rate).
Source: United Nations, 2006

In Angola, the least favored nation today, the crude death rate is close to 22 per 1,000 (versus 18 in England/Wales, 20 in Japan and 22 in France in 1900), infant mortality is 132 per 1,000 (versus 154, 215 and 164 in 1900 for the same three countries respectively), and life expectancy at birth is 41 years (versus 47, 38 and 45). But however bad, these cases are still a far cry from the severe conditions that existed before the health transition and that still prevailed in many countries at the end of World War II.

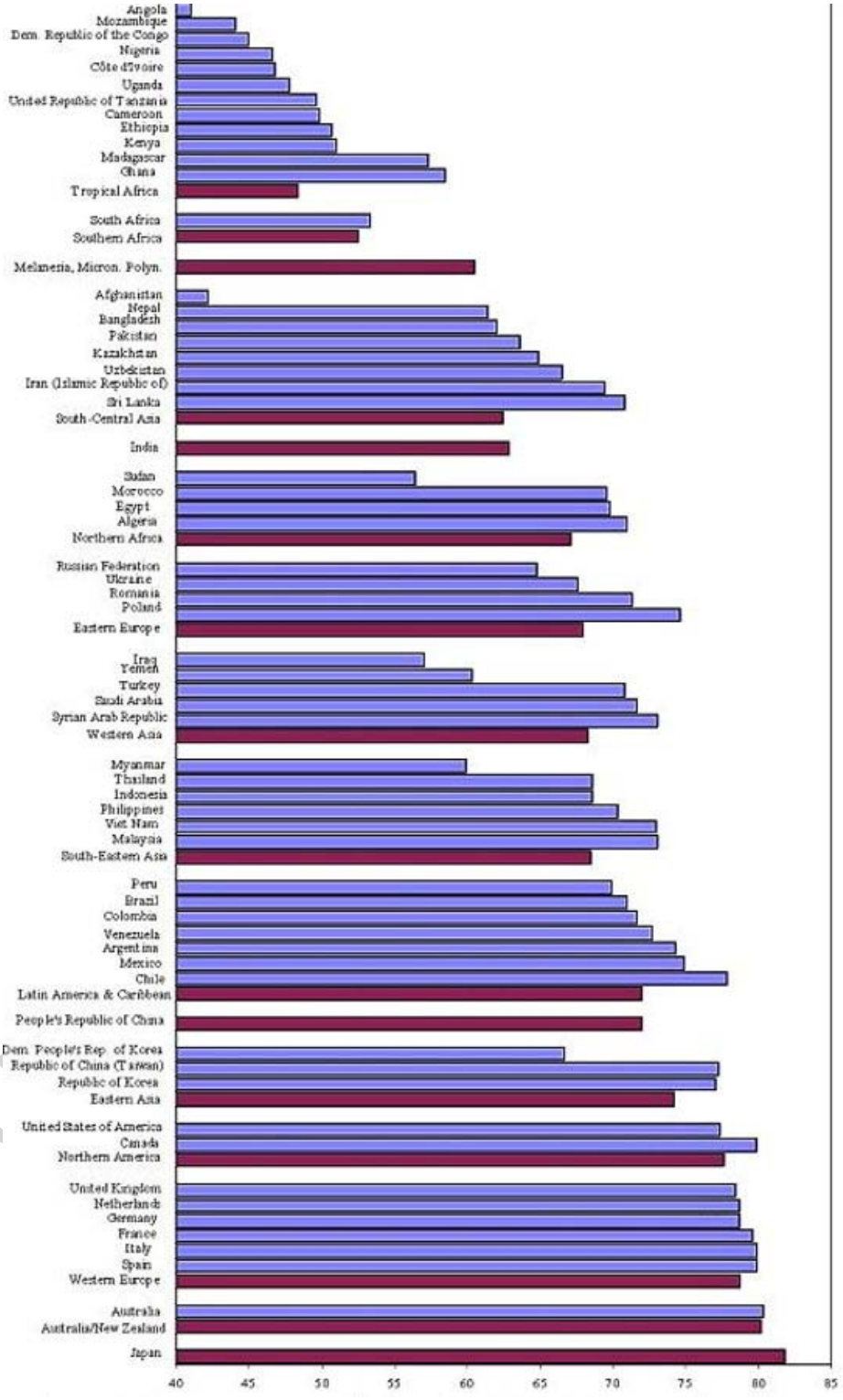

Figure1. Life expectancy at birth in 2000-2005, in 62 countries with a population of more than 15 million in 2005
Source: United Nations, 2006 (for Taiwan, see http://www.moi.gov.tw/stat/english/)

Nevertheless, there is a broad disparity of situations. Going from one extreme to another in the six-country list, Angola's life expectancy of 41 years is to be compared with Japan's 82 (Figure 1). But this disparity does not simply contrast developed nations with developing ones. It occurs within the same region, for instance in South Asia where Afghanistan (life expectancy of 42.1 years) is almost as far removed from Sri Lanka (70.8 years) as it is from the Western countries. In Southeast Asia, life expectancy ranges from 59.9 years in Myanmar to 73 in Malaysia, while in North Africa it ranges from 56.4 years in Sudan to 71 in Algeria, and so forth.

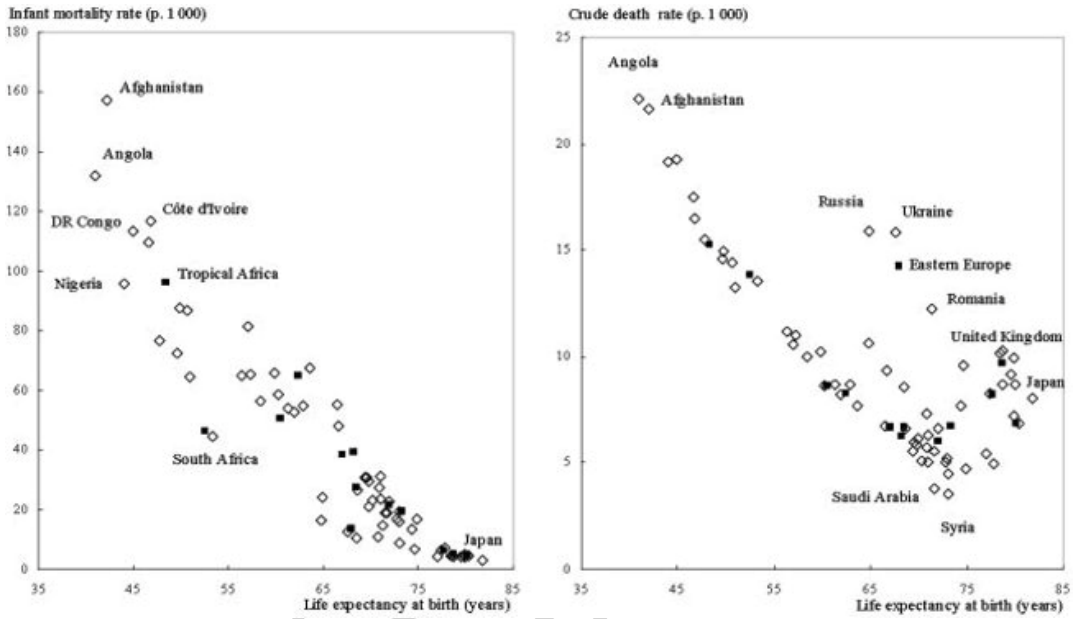

Figure 2. Correlation between life expectancy at birth and infant mortality rates (a) and between life expectancy at birth and crude death rate (b) in 2000-2005
(the white diamonds correspond to countries while the black squares correspond to regions)

Of the three indicators in Table 1(Source: United Nations, 2006), only two, life expectancy and the infant mortality rate are a true reflection of a populations' state of health. The third, the crude death rate, obviously depends on the age distribution of the population. This is easy to see from Figures 2a and 2b. As it was said above, data plotted here are not all of the same quality. In particular, for some developing countries, the UN made indirect estimates of life expectancy, sometimes based on infant and child mortality rates. However, only countries with more than 15 million population are selected here and in only few of them data on adult mortality are totally lacking. Indeed if all low levels of life expectancy would have been deduced from infant mortality rates only, the correlation would be perfect for the left upper part of the graph, which is not the case.

Thus, Figure 2a confirms the close correlation between life expectancy and infant mortality; while Figure 2b reveals two distinct sets of countries: the industrial nations that are already demographically aged by the long-standing low birth rates, and the

developing countries where the population pyramid still comprises a large proportion of young people. Indeed, some countries with fairly similar life expectancy levels, such as Chile and Germany (77.9 and 78.7 years) nevertheless have crude death rates that vary by a factor of two (5.0 for Chile versus 10.3 p. 1,000 for Germany).

One might be tempted to reject crude rates as a mortality indicator. However we believe it is useful to mention their distribution here, since it is the difference between the crude death rate and the birth rate which determines population growth, depending on countries' stage of progress in their demographic transition. Comparing the crude death rate with specific mortality indicators thus broadens the diversity of health situations by placing it in its historic context.

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