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Mortality Patterns in Newly Industrialized Countries

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Ⅰ. Introduction

The trends of mortality and the factors associated with the trends are known to differ greatly between societies in terms of their status of development and cultural background. The experience of newly industrialized countries in Asia(Asian NICs), which comprised Republic of Korea, Taiwan, Hong Kong and Singapore, will be of great interest in this regard. They have achieved more or less a similar economic success during the last 30 or 40 years, share some important traits of cultural tradition, and appear to have completed the demographic transition recently. One of the most important features in mortality change in these NICs is that the initial decline of mortality started in the absence of societal development. Rather, the colonial occupation either by Japan or Britain is thought to have contributed most directly to the onset of mortality transition through introducing the Western system of public health into the colonies. The onset of mortality decline as a direct result of colonial occupation is well documented in Taiwan and Korea(Barclay, 1954:133-172; Kwon T-H, 1977:49-55).

Another break-through in mortality transition was noticed after the Second World War in these countries. They all achieved a total transformation of the economy and industrial structure, social conditions and life style, so as the conditions surrounding mortality and health. Hong Kong, Singapore and Taiwan are known to have reached a world lowest level of mortality in the early 1970s. Korean mortality has been much higher, but is believed to have declined very rapidly during the last one decade and closed the gap with other Asian INCs. This may be taken as an ample evidence of the strongly suggested relationship between development and mortality on the national level. It is, however, well decumented that the relationship is neither unidirectional nor linear. It rather depends on the availability of innovative technology, health system and social as well as economic system(Preston, 1980). One of the major aims of this paper is to examine this point, the

implications of development for mortality transition in Asian INCs. But because of my limited knowledge on the countries other than Korea, discussions rely largely on Korean experience.

This paper deals with the demographic patterns of mortality. Questions are directed to whether the four countries with relatively homogeneous cultural traditions reveals similar patterns of mortality and its change, and what are the major factors associated with the observed patterns. As a way to determine the major factors in mortality on a micro level, the patterns of mortality differences among individuals will also be discussed. By taking Korea as an example, cultural, environmental and behavioural factors will be stressed.

Ⅱ. Path to Low Mortality

Prior to the Second World War, all the four populations examined here are certain to have had a traditionally high mortality. Crude death rate was reported or estimated over 20 per thousand for Taiwan, Hong Kong and Korea. In Taiwan and Korea for which life tables were compiled for pre-1945 periods, it is evident that the process of continuous mortality decline took place in the early 20th century. The crude death rate was reported as 31 during 1916-20 and declined to 21 during 1936-40 in Taiwan(Barclay, 1954:146). Similar changes in death rate were observed in Korea. According to an estimate by Kwon T-H based on census age distributions, the death rate was reduced from 33 to 23 during the equivalent 30 years in Korea(1986:10). As illustrated by Table 1, a significant extension of longvity was accompanied. The expectation of life at birth reached about 45 and 42 years by the end of 1940s in Taiwan and Korea respectively.

One important feature of this mortality decline under the Japanese colonial regime is that the process was not ralated to any economic or social development. The Japanese increased substantially the land productivity and achieved some industrialization. But the benefit had rarely gone to the original inhabitants and their standard of living had deteriorated along the growth of the colonial regime failed to make any substantial difference in the social structure of its people(1954:133). Though unitended, health policy produced the most pronounced result, as observed in other Western colonies as well(Caldwell, 1987;Preston, 1980). Most health measures are known to have provided to protect the colonials and the Western health and medical systems introduced to Taiwan and Korea were not of good quality. But advantage of the new system could have easily resulted in a substantial mortality decline in a population exposed to a very high risk of dying. The traditional system of Chinese medicine, though much less effective, would have contributed greatly to making it easier for ordinary people to accept the Western medicine. It is still found in Korea that people do not differentiate the two systems and use them alternately(Han & others, 1988:95-117).

Taiwan and Korea were liberated from the Japanese rule as a result of the Second World War. After the war, Singapore was newly created and Hong Kong underwent a period of political uncertainty. During the decade of turmoil following the war, Taiwan and Hong Kong showed continuous improvements in longevity. In Hong Kong, the registered infant mortality rate was reduced from 98 to 61 per thousand births during 1946-56. In Taiwan, the expectation of life at birth(Eo) for 1955 was estimated to be about 58 years(Tsay, 1983:46). A similar trend is expected for the population of Singapore. For Singapore Chinese, the Eo was estimated as 63.5(Saw, 1970). By 1960, these three Chinese populations reached the life expectancy close to the advanced Western countries and Japan. It climbed to the level of 60 years for males and 65 or higher for females, as is clear from Table 1(A).

Korea was an expectian. The country suffered

greatly from the complete disruptions of political and economic systems and the antagonistic division of South and North Korea after the Second World War. In addition, the country was totally destroyed during the three year Korean War period 1950-53. After the war, Korean mortality(in the

Table 1. Expectation of Life at Birth

(A) For Hong Kong, Singapore and Taiwan

Year	Hong Kong		Singapore		Taiwan	
	M	F	M	F	M	F
1926-30					38.8	43.1 [e]
1936-40					41.1	45.7 [e]
1950					48.6	51.0 [f]
1956-58			60.5	66.6 [c]		
1960					61.6	66.4 [f]
1961	63.6	70.5 [a]				
1961-63			63.2	70.6 [c]		
1970			65.1	70.0 [d]	65.7	70.4 [f]
1971	67.4	75.0 [a]			67.2	72.1 [g]
1976	69.9	76.4 [b]			68.7	73.6 [g]
1980			68.7	74.0 [d]	68.3	72.0 [f]
1981	70.3	76.8 [b]			69.7	74.6 [g]
1986					71.0	75.9 [g]

Source: a ESCAP (1974:74); b CSD, Hong Kong(1978); c Saw S-H(1970); d UN(1985); e Barclay(1954:172); f Tsay C-L(1983); g MOI, ROC(1987)

(B) For Korea

Year	NBOS [a]		Kwon [b]		Others	
	M	F	M	F	M	F
1925-30			37.9	37.2		
1935-40			40.4	41.7		
1955-60			46.9	52.5	51.4	53.7 [c]
1961	54.5	60.6				
1960-65			48.1	53.5	52.7	57.7 [d]
1966	59.7	64.1				
1970	59.8	66.7				
1971-75					58.6	63.7 [e]
1975	62.2	70.6				
1976-80					61.3	67.5 [e]
1978-79	62.7	69.0 [g]				
1980					61.2	68.8 [f]

Sources: a KIFP(1978:145-149); b Kwon T-H(1977:311-318); c Koh & Kim(1964); d Lee D (1972); e Kim T-H(1986:60-63); f Kong & others(1983:122-123); g NBOS, Korea(1982).

southern half) returned to the normal tract. According to various estimates as listed in Table 2, the Eo increased to around 50 during 1955-60 as shown in Table 1(B). Since 1960, substantive

Table 2. Selected Socio-economic Indicators, 1960-79

	Hong Kong	Singapore	Taiwan	Korea
Population (in million)				
Mid 1976	5.0	2.4	21.5	37.8
Adult Literacy Rate(%)				
1960	71		54	71
1974	90	75	82	92
1976	90			93
Per Capita GNP(Current US Dollars)				
1976	2,110	2,700	1,070	670
1979	3,760	3,830	1,892 *	1,480
Per Capita GNP Growth Rate(%)				
1960-79	7.0	7.4	6.3 [A]	7.1
GDP Distribution, Agriculture(%)				
1960	4	4	28	37
1976	2	2	12	27
1979		2		20
GDP Distribution, Industry(%)				
1960	34	18	29	20
1976	34	35	45	27
1979		36		39
Per Capita Energy Consumption(Kilograms in Coal Equivalent)				
1960	468	518		261
1975	1,119	2,151	1,427	1,038
1979	2,401	6,211		1,642
Proportion of Urban Population(%)				
1960	89	69	35	28
1975	95	90	65	47
1980	90	100		55
Toral Fertility Rate				
1975	3.0	2.8	2.8	4.0
1979	2.3	2.1		3.3
Per Capita Calorie Supply(Kcal)				
1977	2,883	3,074	2,805	2,785

[A] : For 1960-76

Sources : World Bank(1979;1981) ; *CEPD(1987)

mortality declines have taken place but the pace was still slower. In the mid 1970s, Korean mortality reached to those of Taiwan, Hong Kong and Singapore around 1960. Mortality has declined incessantly since 1960 in all the four populations. The Eo reached aroune 70 years for males and 75 years for females in the latter group, whereas it rose to 62 and 69 in Korea, manifesting still a considerable gap between the two groups. Although no life table was constructed for Korea for the post 1980 period, various circumstantial evidences and scattered pieces of information, such as the adoption of the population and the recent trend of infant mortality, are enough to suggest a drastic drop of mortality in Korea after 1980 (Kwon, 1986:48-59:Kim & Choi, 1988).

Such a rapid transition of mortality in Taiwan, Singapore and Hong Kong in the 1950s and a continuous decline of mortality since 1960 in all the four populations appear to fit well to the Preston's observation in 1980. The change in mortality was concomitant with the changes in various development indicators such as per capita national income, educational level, total fertility rate, nutritional status and so forth(see Table 2). Improvement in housing conditions, water supply system and general sanitary conditions in the 1950s was also cited as the leading cause of mortality decline in Hong Kong(ESCAP, 1974: 80), which might be equally applicable to Singapore and Taiwan. In other words, development and government intervention in environmental sanitation can be viewed as the major forces of the revolutionary changes in national mortality, along the rapid dissemination and greater availability of new efficient health technologies and drugs.

But the level of mortality and the pace of mortality change as functions of various types of social and economic development do not agree at all between countries. For example, adult literacy rate was the highest for Korean and lowest for Singapore contrary to what would be expected. Also, Taiwan showed a much lower level of per capita GNP than Singapore and Hong Kong, while their levels of life expectancy have shown little difference since 1960, probably since 1945. This observation suggests that although societal development is a crucial factor in mortality transition, the patterns of relationship between development and mortality may vary condiderably among societies. Caldwell's emphasis on the historical experience and cultural traits in explaining low mortality in poor societies would be of some relevance in this regard(1986). The experience of colonial rule would have increased their adaptability to various types of social change, foreign ideas and new innovative technologies in these countries.

The Confucian tradition is characterized by a very strong "this world orientation" which puts utomost importance on the success in this world regardless what means are used. Longevity and wealth are valued as a symbol of this success. Other major cmponents of Chinese cultural heritage include the prime emphasis on education as the most important and legitimate means of success, the adoption of universal examination principles in recruiting government officials of all ranks, the stress on bureaucratic authority, familism and collective orientation. It is well known that these cultural traits consist of the major forces of development or modernization in the countries of Confucian or Chinese heritage. If development as a whole is considerd to be a major determinant of mortality, it would be natural to assume those cultural determinants of development as the prime forces of mortality transition. It is also apparent, as in the case of fertility control, that the government intervention on health has been very effective in the Asian NICs, and this is, in turn, explained by their common cultural elements mentioned above. Smallness of the population may be an additional advantage for an effective control of the goverment on people's behaviour. In a word,

major cultural heritage, historical experience and ecological characters can be assumed to be the basic determinants of mortality in the Asian NICs.

III. Patterns of Mortality

Diversity of mortality patterns has been one of the major interests of demographers since the construction of Regional Model Life Tables by Coale and Demeny in 1966. More recently, the United Nations constructed a series of model life tables for developing countries in recognition of the wide deviation of their patterns from the existing UN and Regional Models(UN, 1982). In this new UN models, Far Eastern pattern was constructed to incorporate the particular patterns manifested by some Asian countries like Hong Kong, Singapore and Korea. But Korean pattern for females was classified not to belong to the group. Compared to the Western Model, the Far Eastern pattern has a characteristic of lower risk of dying at ages below 35, and higher risk at ages 40 and upward if the expectation of life at birth is controlled(Goldman, 1980). The difference is much greater for males.

In this paper, we have tried to examine the patterns of mortality for each country in reference to the West and Far Eastern Models. The age pattern of mortality was examined based on the life table mortality rates for each country. The Eo value in the West Life Tables or the Far Eastern Model which the country life table rate for each five year age group corresponds to was taken as a comparative index of mortality for the age group. The results are illustrated in Figure 1. Because of data problems and controversies over the method of estimation concerning the infant and early childhood mortality(Sullivan, 1973a for Taiwan and Kwon, 1986:9-14 for Korea), the pattern was examined for ages between 5 and 69 only. For a comparative purpose, life tables constructed for the 1970s were extensively utilized.

As shown in Figure 1, the national life mortality rates fit better to the Far Eastern Model than to the Western Model in the case of males. Taiwan is an exception. The 1971 Taiwan life table for males show a pattern closer to the Far Eastern mortality pattern, but those for the years after 1975 appear to fit better to the West pattern. Female mortality resembles the West pattern in general in the case of Hong Kong, Taiwan and Korea on the one hand, and the Singapore pattern is closer to the Far Eastern one on the other.

Although we may be able to identify the type of model life tables which fits more or less to the mortality shape of a country, it is apparent from Figure 1 that the degree of fitness changes along the changes in mortality level of the country. In the case of Hong Kong, the 1961 male mortality pattern was deviated profoundly from the West pattern. But the degree of deviation had been reduced greatly during 1961-81 along with an increasing level of life expectancy. On the contrary, the fitness to the Far Eastern Model diminished. The 1981 Hong Kong pattern for males shows relatively a higher level of mortality in the upper age bracket compared to the Western Model and a lower level compared to the Far Eastern Model. In Singapore, a similar tendency is observed for males, though the pattern change is rather gradual. The 1980 pattern fits better to the Western Model than the 1970 one does. The change in male mortality pattern from the Far Eastern pattern to that of the West in Taiwan may be viewed in the same context. No such change in mortality pattern are seen in Korea. The pattern of deviation from the West Model seems to have persisted since 1955. Unlike male patterns, no significant changes in female pattern are observed for all the four populations examined.

A few points can be made from the above discussions. Althought some similarities in the age pattern of mortality are observed among the NICs in Asia, each country reveals more or less distin-

Figure 1(A). Expectation of Life at Birth in the West Model Life Tables to which Country Life Table Mortality Rates Correspond

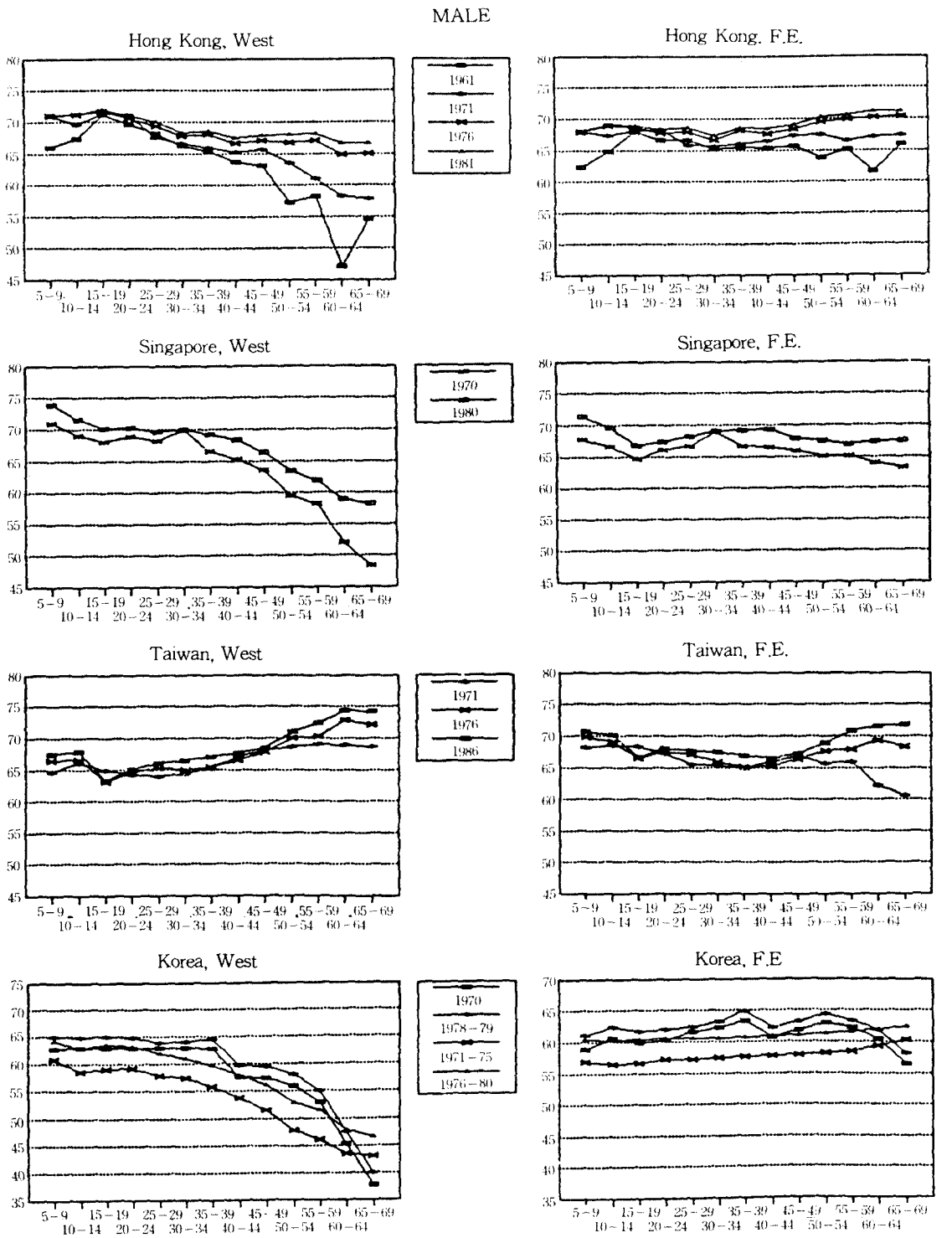
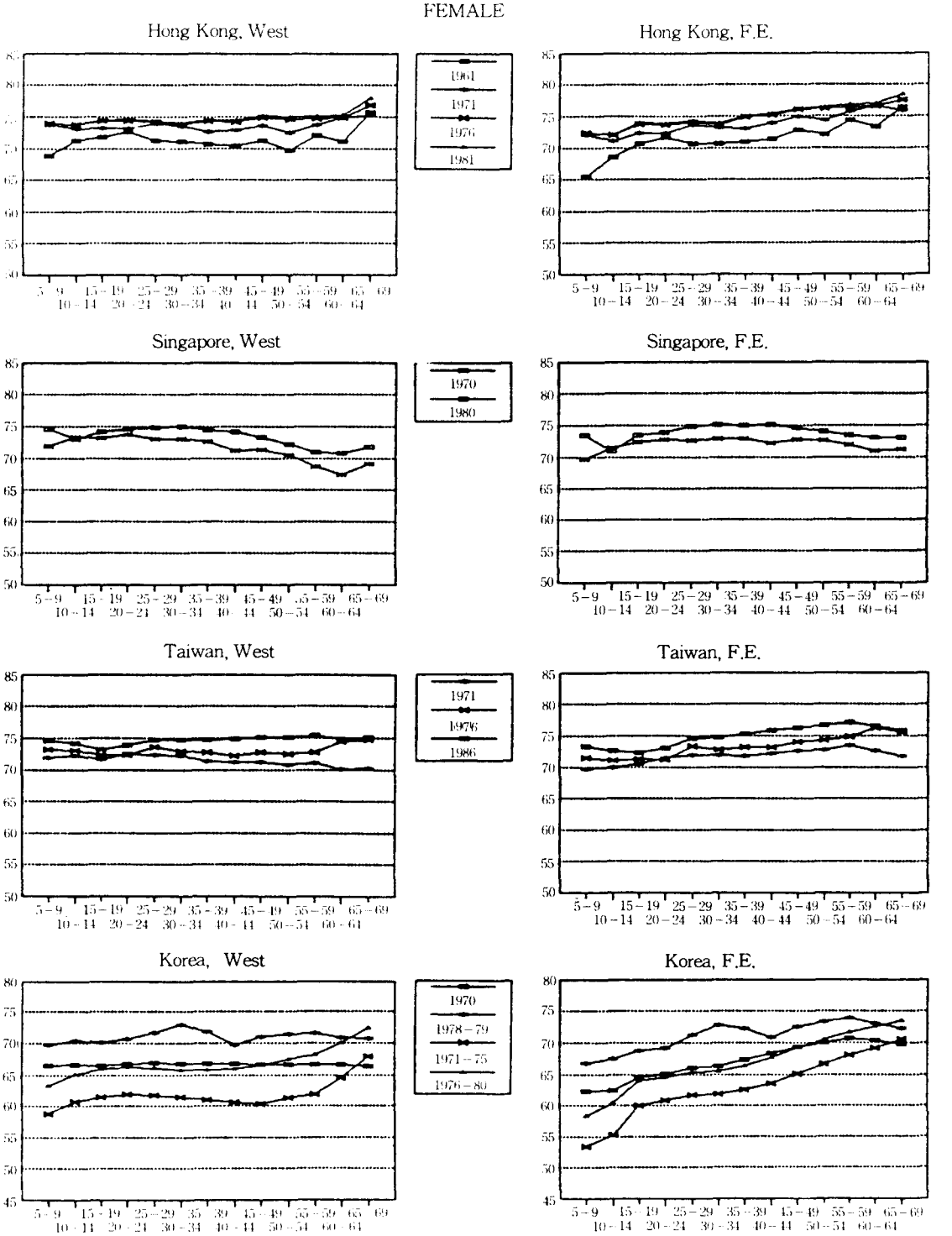


Figure 1(B). Expectation of Life at Birth in the West Model Life Tables to which Country Life Table Mortality Rates Correspond

FEMALE



ctive mortality pattern from the others. One thing noted here is that male populations, except for Taiwan after 1976, show a somewhat systematic variations of mortality from the Western Model pattern, that is a lower level of mortality at ages upto 35 and a higher level at ages from 40 upward, if compared to the corresponding Western model levels. The deviation is most considerable and persistent in Korea, while the patterns of Hong Kong and Singapore are getting closer to the West pattern.

It is questioned whether the pattern is transitory resulting from a rapid transition of mortality. For instance, we may argue that such a pattern may have caused by the different cohort experience of the past. It may be partly true, but there are indications in some societies that the peculiarities of mortality patterns are genuine. Great diversity, of mortality patterns which are observed in various parts of developing world can not be ignored as exceptions. Rather it may be taken as to pointing to the importance of cultural and social factors in comprehending properly the mortality pattern of an individual country. In Korea, the current pattern in sound to have persisted since the 192 0s, though the diviation from the West Model or other Regional Model Life tables became more salient since 1955(Kwon, 1977:26-44).

In all the four societies in question, female mortality reveals generally minor, but mostly systematic, deviations from the Western pattern. This clearly indicates that various social, environmental and technological changes have had different health implications for different age groups in the case of males, while the significance has been very homogeneous for females. This gender different may well be related to the fact that women's world is rather confined to or constituted around the family in these societies even when they are employed outside. This means that health of a woman is largely conditioned by the family structure and situation regardless of her age. But the family control on the everyday livig of men diminishes sharply with the increase of age. In societies where housewife is responsible for the care of her family members including health and the hazard of health outside the family is not controlled properly or increased greatly by industrialization, as the case of Korea, adult men may well be subject to an additional risk of death. In sum, it is very likely due to te family ststem and life style that adult men are more exposed to the negative effect of economic or industrial development on health than women and children and that the effect accumulates with aging. In other words, the relatively high level of mortality for men at adult ages 40 and upward would be expected to disappear condiderably if the environmental sanitation improves and life style changes.

In Korea, the life style or culture is known to have associated greatly with the pattern of male mortality. It is widely told in Korea that the heavy consumption of alcohol creates various types of health problems for men in the late thirties and forties. Statistics show that per capita consumption of alcohol is not greater in Korea than some European countries like West Germany(Kim T-H, 1986:121-122). But it does not necessarily mean that the health problems related to alcohol are not particulary important in Korea. Unlike in the West, the consumption of alcohol by woman and children under 19 is negligible in Korea. Furthermore, illegal brewery prevails widely which escapes the statistical enumeration. Thus, considering only the adult men, the per capita alcohol consumption would be far more in Korea than in any other society. On top of this, Korean liquors were often said of inferior quality compared to the Western ones.

The heavy consumption of alcohol among Korean men has a deep rooted tradition. Early historical writings of China described the love for drinking, singing and dancing as the major character of Korean people, as in the present time.

Drinking is an essential component in the men's world in Korea. Without liquor, there is no business, no friendship and no social gatherings. They drink in a compectitive manner for prolonged hours, which frequently results in an excessive drinking and half or total uncosciousness. It often develops abdominal pains, headache or diarrhoea next morning. Wives or mothers are expect not to nag but to serve a special soup to sooth the troubled stomach. With booming economy and the increasing chance of opportunity, drinking for business became an everyday routine for men. Also Korean men are heavy smokers, while women mostly abstain from smoking. Men usually work and take a rest in a filthy environment filled with cigarette smokes. The worst place in this regard is public bars, which Korean men spend much time after work.

In addition, overwork and heavy work had been a major phenomenon in Korean employment regardless of the types of work and position. The pressure for success has been incremented as well. For many, it was a routine to work for about 60 hours a week or more. They usually left for work about seven o'clock in the morning and returned home around midnight after being drunken. For white collar workers, the heavy work and servere work pressure were a common excuse for the trip to a public bar after work. It is often heard that only drinking can free people from the work pressure and other worries, so it helps their mental health.

Such drinking behaviour and work pressure begin to pay a toll after their age reaches mid thirties. Many began to complain stomach ucler and liver problems, and deaths due to diseases of the digestive organs including stomach cancer and liver problems increase sharply in the later working ages(NBOS, 1987:84-85). Recently, there are some signs of changes in this type of behavi our among adult men. As economic development continues, the owenership of private cars has greatly increased and people relieved considerably from economic anxiety. Less drinking and less work are the outcome of this change. Instead, toll from traffic accidents has risen sharply(ibid), suggesting a change in pattern of male mortality in Korea.

Ⅳ. Patterns of Change

It is generally accepted that the increase of life expectancy at birth is most greatly attributed by the decline of mortality at infant and early childhood ages at the early stage of mortality transition and by the decline at old ages at the late stage. In developing societies, the pattern is known to be more distinctive because imported drugs and health technology have been very effective to reduce health hazard of infants and young children whose risk of dying is largely determined by biological factors. A significant portion of infant and children deaths in high mortality societies can allegedly be saved if a diarrhoea syndrome, org-astro-enteritis, is controlled which can be easily achieved with modern technology(Preston, 1980:Sullivan, 1973b:152). Afte achieving low infant and childhood mortality, changes in life expectancy at birth should largely be the function of old age mortality.

Apart from the absolute contributory share of each age group to the change of life expectancy at birth, the patterns of mortality change can also be examined with the degree of change relative to that of a reference population. In this section, we have tried to examine the age pattern of mortality change by adopting the latter strategy. Either the Western Model populations or the Far Eastern Moder populations were taken as reference for selected counrty life tables depending on the examination of fitness done in the above. Then, the model life table expectation of life at birth which each selected life table mortality rate corresponds to is used as a comparative mortality

indicator. Finally, the difference of those values between two points of time were transformed for each age group into a ratio to the change in the actual Eo values in the selected country life tables. In the following, we will examine first the changing pattern of infant mortality and the discussion will proceed to the age patterns of mortality change in relative terms.

Although infant mortality is the most crucial component in assessing the mortality level of a country, data on infant deaths are grossly suspected in most developing countries. In Korea, data on deaths from the registration, particularly those on infant deaths, lack reliability at all. Accordingly, there has been a wide disagreement among demographers and statisticians on the level of infant deaths deppending on the assumptions and the method they chose to calculate infant mortality. For example, the infant mortality rate for 1960-65 ranges between 88 and 60 depending upon estimates (Kwon T-H, 1986:12). Such a disagreement on infant mortality leads easily to a difference of five years in the expectation of birth at birth. Underregistration of infant deaths is apparent in Taiwan as well, according to Sullivan's evalation(1973a). Although it may cause controversies, the trend of infant mortality here is examined based on data from vital registration, adjusted or unadjusted, except for Korea prior to 1960.

As shown in Table 3, the infant mortality rate was recorded or estimated as around 100 per thousand births immediately after the Second World War in all the four populations. Disparities between countries begn to notice since 1950. The most profound improvement in the situation surrounding deaths during infancy was noticed in Singapore and the improvement was followed in Taiwan and Hong Kong. A high level of infant mortality in view of the health technology of the time persisted by the late half of the 1950s in Korea, while a rapid transition has been apparent at least since the early 1950s in the other countries. The Korean War between 1950-53 was the major cause of the delay in Korea. Such change in the health situation of infants is apparently coincided with the large availality of various new effective drugs including antibiotics and the pattern of epidemiological transition in each country. Nowadays, all the Asin NICs show a infant mortality rate below 15, probably below 10 but Korea.

According to the Korean experience, several other factors are seemingly attendant in this rapid decline of infant mortality. Fertility reduction is evaluated to have been the most important determinant of infant mortality. It results in the increase of birth or open interval which is found to have been the most crucial discriminator of the risk of infant and early childhood deaths in Korea as discussed presently. In this context, adoption of the nationl family planning programme in the earlty 1960s should be regarded as a major contributor in the transition of infnt mortality. The programme initiation has contributed to the decline of infant mortality still in another way. The government established health centres in all county level adminstrative units by 1965 as the responsible agency for family planning implementation. The F.P. programme was later carried out in part under the maternal and child health scheme.

The rates of prenatal care and deliveries attended by qualified personnel, mostly doctors, have increased markedly since the mid 1970s in Korea. For instance, only a 20% of deliveries were reported to have been attended by medical or para medical persons in 1974, but the proportion increased to about 40% in 1977 and 75% in 1983. The rate of prenatal care at medical and health institutions was changed from 57% in 1977 to 94% in 1986, according to Social Statistical Surveys (Kwon, 1986:58-60; EPB, 1986:2-223). Although the picture is not known, similar changes are expected with postnatal care. Many factors were associted with such changes, which include the

Table 3. Infant Mortality Rates, 1935-86

Year	Hong Kong	Singapore	Taiwan	Korea
1935-40				139 [f]
1946			135 [f]	
1945-49	100 [a]	99 [a]		
1950			87 [g]	
1950-54	82 [a]	69 [a]		
1955-59	57 [a]	72 [a]		
1955-60				94 [i]
1960			41 [g]	
1961	38 [b]		55 [h]	69 [j]
1966		26 [d]		52 [j]
1965-70				69 [j]
1970		21 [e]	27 [g] ; 34 [h]	49 [j]
1971	20 [b]	20 [d]		
1971-75				43 [k]
1976	14 [c]			
1976-80				38 [k]
1978-79				36 [l]
1980		12 [e]	21 [g]	
1981	13 [c]	11 [d]		17 [m]
1986		9 [d]	6 [n]	13 [m]

Sources: a Ruzicka & Hansluwka(1982:137); b ESCAP(1974:73);
c CSD(1978); d DOS(various years);
e UN(1985:992-993); f Barclay(1954:172);
g Tsay(1983:40); h Sullivan(1973a:147);
i Kwon T-H(1977:311-318); j KIFP(1978:145-149);
k Kim T-H(1986:60-63); l NBOS(1982);
m Kim & Choi(1988:82); n MOI(1987:82-83).

betterment of living standard, the growing level of women's education, urbanization, a small family size and the rapidly increasing coverage of population by medical insurance. Among them, the policy on medical insurance, which was first adopted in 1977, has played major role in breaking the wall long existed between ordinary people and medical institutions in Korea.

Despite strong son prefersnce in Confucian culture, vital registration reveals consistently much higher mortality for males than for females in infancy. The 1978-79 Korean data may be an exception in this regard. But this data contradict to the earlier as well as well as the late registration statistics. The 1974 Korean National Fertility Survey (KNFS) confirms the same tendency of higher mortality for infant males. On the other hand, the survey shows substantially higher female mortality at childhood ages 1-4 during 1956-70. Vital statistics for the 1970s still confirms this childhood mortality pattern(Kim T-H, 1986:60-63). Such a pattern is apparent as well in Hong Kong until the early 1980s according to the official life tables(CDS, 1978). This pattern of sex diffe-

rentials in mortality between infant and childhood ages on mortality immediately after birth and gains significance with aging.

Figure 2 shows the age patterns of mortality change in relavive terms to the change in the actual expectation of life at birth for selected periods in the four countries. Mortality is here indicated by the Eo vlues in model life tables to which the actual life table mortality correspond. In Hong Kong, the pttern contrasts between the 1960s and the 1970s. During 1961-71, highly significant mortality changes occured at ages below 10 for both males and females and at ages 60-64 for males. The least change took place at young adult or crucial working ages for men and at young reproductive or marriageable ages for women. But the pattern changed in the 1970s. Considerable relative declines of mortality were observed in the later, or older, age groups and very minor changes in young age groups in the case of males. A similar pattern is manifested by females though greater irregularities are noticed. The pattern discerned from the 1970 and 1980 Singapore life tables reveals little similarity with the Hong Kong 1971-81 pattern. It shows relatively greater changes in mortality at ages under 9 regardless of sex and over 60 for males. In Taiwan, the pattern of mortality change in relative terms has transformed during the period of observation 1971-86 into the direction of lesser difference between age groups and smaller mortality change for women in their sixties.

The degree of overall change in mortality differs markedly between the two sets of life tables for Korean used in this paper. The official life tables constructed by the Nathioal Bureau of Statistics show contrasting patterns between men and women. For men, all five year age groups from 5-9 through 65-69, the level of mortality change corresponds to 30-75 per cent of the national level, which means that the increase of life expectancy at birth was mostly contributed to the changes in infant and early childhood mortality, as is shown clearly by Table 4 as well. On the contrary, the mortality change for every age group is above the national level in the case of women. This contrasting pattern may be an indication of poor quality of the official life tables in Koreaa. The other set constructed by Kim T-H presents a completely different picture: very small changes at ages 0-4 for both sexes, changes above the national average in the age groups between 5 and 59 for women, and the decreasing degree of change with aging for men and the increasing degree for women.

Table 4 presents the absolute changes in the expectation of life at selected ages in the 1970s. From this table, we can obtain a coarse idea on the different path of mortality change among the NICs in Asia. No uniformity in the pattern is observed from the table among the four countries, confirming the findings from the above discussion. Sex difference in mortality change can be glimpsed from Table 5 which gives the sex difference in the expection of life at selected ages for each designated year. According to the table, mortality decline was greater for men than for women during the 1970s in Hong Kong, thus reducing the gap in mortality between men and women. The trend was reversed in Singapore and Korea. In Taiwan, little change is noticed between ages 5 to 40, and the gap increased at ages 0-4 and decreased at age 60 and upward. This table also confirms the above finding that each of the Asian NICs has taken her own distinctive path of mortality transition at least in the 1970s, but more probably during the last 30 years.

Figure 2. Degree of Changes in Eo Values in Selected Model Life Tables to Which Country Life Table Mortality Rates Correspond, Relative to Change in Actual E^o Value

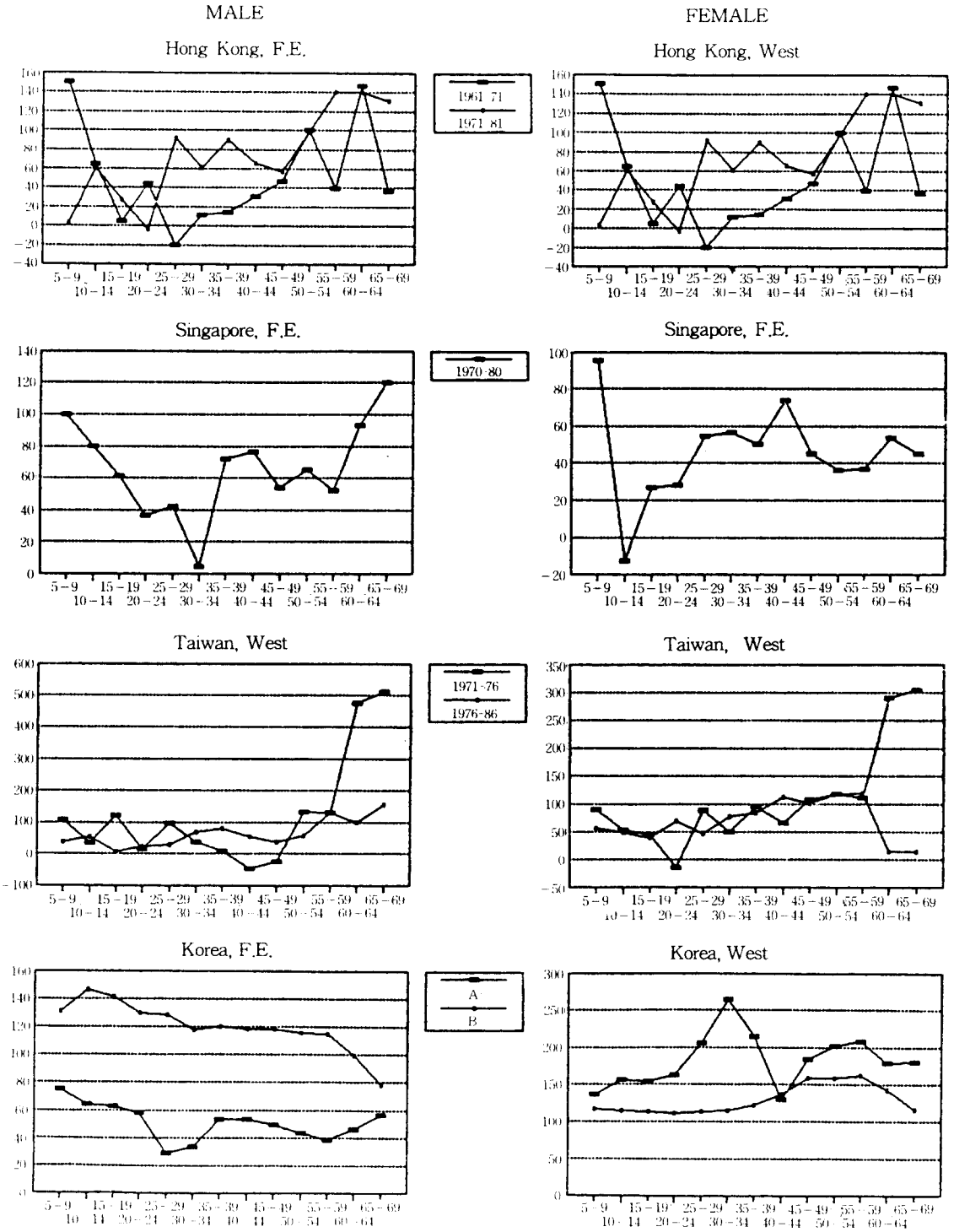


Table 4. Absolute Changes in Expectation of Life at Selected Ages between Two Selected Years

Age →	0	5	20	40	60
Hong Kong, 1971-1981					
Male	2.9	2.3		1.9	
Female	1.7	1.4		1.2	
Singapore, 1970-80					
Male	3.6	2.8	2.7	2.5	2.3
Female	4.0	4.1	3.4	3.3	5.9
Taiwan, 1971-81					
Male	0.6	1.8	1.9	1.8	1.9
Female	2.6	1.8	1.7	1.5	1.0
Korea, 1970-79					
Male	2.9	1.0	0.8	0.6	0.3
Female	2.4	2.5	2.1	1.3	0.6

Sources: See Sources a, b, d, g in Table 1(A) and a, g in Table 1(B).

Table 5. Absolute Sex Difference in Expectation of Life at Selected Ages for Selected Years between 1970 and 1981

Age →	0	5	20	40	60
Hong Kong					
1971	7.7	7.3		6.7	
1981	6.5	6.4	6.3	5.9	4.7
Singapore					
1970	4.9	4.0	4.5	4.1	2.7
1980	5.3	5.3	5.2	4.9	3.6
Taiwan					
1971	4.9	4.8	4.6	3.9	3.1
1981	6.9	4.8	4.5	3.6	2.3
Korea					
1970	6.9	6.4	6.3	6.3	4.9
1978-79	6.4	7.9	7.6	6.9	6.1

Sources: Same as Table 4.

Ⅴ. Mortality Differentials : the Case of Korea

Mortality differences among various social strata of a country are one of the most difficult subjects in the study of health and mortlity. On top of the problems involved in the study on the national level, it has to encounter additional problems of the availability, completeness, comparability and reliability of data for subpopulations. Though rare, most mortality surveys failed to secure a satisfactory set of information in this regard. There are many reasons for this. For the study of mortality differentials, the sample should be very large. Besides, information on the dead can only be obtained from others, usually from family members. In many cases, death, particularly that of an adult is followd by family dissolution and the division of an extended family into two or more family units. For psychological or cultural reasons, the respondents often provide with false information on death and the dead. Another source of data for mortality differentials is vital statistics of vital registration reports. But it usually contains limited information. Moreover, its quality is highly suspected in many societies including Korea. Complicated registration procedures and the resultant poor quality of registration data have long been a major concern of demographers and statisticians in Korea. Accordingly, discussions of mortality differentials in Korea should be understood bearing such data problems in mind.

There are two types of data which can be used for examining the differential patterns of mortality in Korea at the moment. The first is maternity history data from fertility surveys. There have been several attempts in Korea to discern the determinants of infant and childhood mortality based on fertility survey information. The second set consists of vital statistics. Though problematic, an outlook of the differences of general mortality among broad regions and selected socio-economic groups can be made from vital statistics.

The most extensive analysis of adult mortality differences by socio-economic status in recent Korea was done by Kim T-H(1986 : 133-141). The summary result of this study is illustrated in Table 6. According to his analysis based on the registration files for 1979-81 and the 1980 population census, significant difference in adult mortality is clearly seen in terms of marital status, the level of educational attainment and the current urban-rural residence for both men and women after the effect is controlled for the other factors. For men, somewhat systematic occupational disparities are also observed.

The most considerable disparity in mortality is shown by marital status. In all age group regardless of sex, currently married persons show a far lower risk of dying than the never married or the once married, as expected. The highest probability of death is revealed by never married persons except for men aged 25~34, and their probability sharply increases with aging. The reason for this may be simple ; that is, mostly those who have serious health problems do not marry dispite that marriage is universal and socially improtant in Korea. The extremely hiher risk for never married women at ages 35 and upward may be explained by additional socio-economic disaadvantages such as increasing social isolation and economic hardship with aging in the case of women due to the custom of sex and marital segregation. for widowed, divorced or separated persons, the probability of dying relative to the national average decreases with the increase of age and differs markedly between men and women.

The differentials by the lelvel of educational attainment are more important in younger ages than in old ages for both men and women. The college educated are associated with the lowest level of mortality and there is a cutting point between primary schooling and high school atten-

dance. Between urban and rural areas, the former reveals persistently lower risk of dying, though the degree of difference is relatively samll compared to those by marital status and educational level. When controlled for the above three variables, men's occupational activity status is found to be associated with the level of mortality for all the three age groups except white collar workers at ages 55-64. Unemployed and economically nonactive persons show the highest mortality. The level of mortality for white collar workers is above the national average and the lowest level is revealed by farmers. This unexpected pattern appears to confirm, however, the alleged importance of mental pressure coming from work and employment on the risk of dying and health.

Overall, Table 6 shows a clear negative relationship between age and mortality difference among various socio-economic strata except for the difference by marital status. This may be accepted to indicate a widening disparity in mortality and health with the general improvement of health conditions in recent years. In the past, Korean society was extremely homogeneous. Most people was poor and on the virtually same nutritional conditions regardless of their social status. But social disparities has widened with the rapid economic development, so the accessibility to health resources among different socio-economic sectors of the population. In other words, it may possible to assume that the older a person is, the longer he or she has lived under more similar societal conditions of health with other people.

More detailed examination of regional variations of mortality was conducted by Kim N I based on vital statistics (1986:18-21). His analysis of standard death rates for provinces suggests the existence of a significant difference in general mortality between urban and rural areas, and a relationship between general mortality and the development status of a region. The results show, throughout the 1970s, the lowest mortality for Seoul and the level below the national average in Pusan, Kyunggi and Jeju Provinces which are known to have more developed and more urbanized than other provinces. Highest levels are observed in Junnam, Junbug and Kangwon which are classified to belong to the least developed and urbanized area in the country. Very similar regional differences in mortality is disclosed by the latest vital statistics compiled. According to the 1986 vital registration, when two metropolitan cities, Taegu and Inchon, are separated from the former Kyunggi and Kyungbug Provinces, their standardized death rates are found to be about 25% lower than the remaining areas of the provinces(NBOS, 1987:12). Although various reservations are needed in interpreting those results, they are enough to indicate the pattern of regional disparities in mortality in relation to development and urbanization in recent years. It is interesting to note here that such a pattern of regional disparities persisted even in the colonial period in Korea, unlike what is oserved in western societies and Japan which highlights the overwhelming negative effects of the early industrialization on health situations of the affected region, mostly urban areas (Mosk & Johansson, 1986). According to the 1940 registration data, it is found that the crude death rates for urban areas were lower than those for rural areas in all provinces by 50 to 80 % except for two provinces out of 13. Among provinces, the lowest rates were shown by Junnam and Junbug which were then the most advantageous agricultural area. In a word, the positive effect of urbanization on health and the negative relationships between the levels of development and mortality may be though to have persisted in Korea since the colonial days.

Studies on differential mortality have been mostly concerned with infant and childhood mortality in Korea. Most of them conducted multivariate analyses by taking four or five variables as explanators without giving proper con-

sideration to their logical status in explaining the difference in mortality. For example, the same variable status was assigned to socio-cultural factors with biological ones, thus unconsciously

Table 6. Odd Ratios of the Net Effects of Selected Social Variables on Adult Mortality by Sex and 10 Year Age Group, Korea, 1979-81

Variables	25-34	35-34	45-54	55-64
MALES:				
Marital Status				
Never Married	1.75	5.68	12.09	13.20
Cur. Married	.80	.96	.95	.93
Once Married	6.28	4.46	3.57	3.05
Educational Attainment				
None	7.65	2.81	1.36	.90
Primary School	3.05	2.34	1.56	1.30
High School	.92	.79	.73	.82
College +	.30	.33	.43	.65
Occupation				
White Collar	1.84	1.54	1.06	.58
Sales & Services	.79	.84	.86	.77
Blue Collar	.87	.89	.92	.99
Farmers	.65	.73	.72	.77
Unemployed & Others	3.03	3.44	2.81	1.56
Place of Residence				
Urban	.82	.89	.93	.88
Rural	1.50	1.20	1.07	1.10
FEMALES:				
Marital Status				
Never Married	10.11	46.82	92.44	73.02
Cur. Married	.77	.89	.87	.86
Once Married	5.93	2.74	1.62	1.18
Educational Attainment				
None	8.52	2.11	1.11	.92
Primary School	2.32	1.34	1.12	1.31
High School	.59	.54	.62	.76
College +	.36	.24	.24	.24
Place of Residence				
Urban	.78	.84	.90	.87
Rural	1.68	1.27	1.11	1.12

Source: Kim T-H(1986:136 & 139).

insignifying the former as determinants of mortality. Taking this problem into consideration, Kwon T-H distinguished four types of factors and examined their impact on infant and childhood mortality separately for three five year periods between 1956 and 70 based on the 1974 KNFS maternity data (1986:18-31). The four groups consisted of demographic variables, bio-physio logical factors, socio-economic variables and cultural factors. Some variables like sex and birth order have dubious status. They are definitely bio-physiological variables, but also have very important cultural meanings in child care in Korea. In such cases, double classification was allowed. The summary of findings of this analysis is presented below.

It is observed that the major determinants of infant mortality on the individual level differ for the most part from those affecting mortality at the childhood ages 1-4. The difference in infant mortality is explained mostly by bio-physiological factors, and its differentials by social and cultural status are not much significant. The pattern of association is reversed with childhood mortality. In explaining the level of childhood mortality, social, economic and cultural variables demonstrate the crucial significance, while the impact of bio-physio logical factors diminish greatly. In other words, mortality is largely geverned by biological factors immediately after birth and socio-cultural factors gain importance with the aging of children. A higher mortality for boys than girls during infancy and the reversed tendency during early childhood after passing infancy are an good evidence for this argument. Demographic variables such as mother's age at birth and marriage duration at birth are found to have little association with both infant and childhood mortality. Among bio-physiological factors, birth interval or child spacing is the most important explanator of the different risk of dying during infancy and childhood ages as well. Another important bio-physio logical explanator is the mother's experience of children's death before the birth. This observation clearly indicates that the fertility behaviour of women has played a crucial role in enhancing the survivorship of infant and young children in Korea since the early 1960s. An analysis of infant mortality differentials based on a 1984 rural fertility survey data, reached virtually the same conclusion (Han S-H, 1987). The study disclosed birth interval, previous experience of child death and chronic ill health of the mother as the major determinants.

Of socio-economic variables, the educational level of parents reveals the highest relationship with children's survivorship, particularly at ages 1-4. Other factors such as the place of current residence and father's occupation are associated little with child mortality if these are controlled for the other socio-economic variables. The analysis also clearly demonstrates that cultural elements associated with child rearing and the value of children are the major factors differentiating the survivorship of children after passing infancy. For instance, the survivorship of children at ages 1-4 is closely associated with the valuation system of children in terms of sex and parity. The first sons, the most favoured in Korean culture, show the lowest mortality and daughters, the least favoured, manifest the highest mortality.

One interesting observation can be made when the differential mortality patterns are compared between adults and children. For adults, all selected social variables including the place of residence and occupational status show significant net effects on mortality. But the level of educational attainment of the parents is found to be the only significant discriminator of mortality in the case of children. This may be interpreted to indicate

that the type of factors regulating the level of mortality changes with aging. During infancy, mortality appears to be biologically determined to the most part. Then the risk of dying is larely governed by cultural elements in child rearing. But for adults, particularly for those in young working ages, personal socio-economic backround seems to limit greatly the choice of health related behaviour and conditions, as well as other aspects of life.

VI. Concluding Remarks

In this paper, we have briefly examined various aspects of mortality in the so-called newly developed countries in Asia, Hong Kong, Singapore, Taiwan and Korea. The leading questions asked here were whether those countries share a basic pattern of mortality, whether their mortality change follows a certain path and reveals a definitive pattern, and how development and culture are associated with such patterns. To explore the meaning of development and culture for mortality in more detail, the differential patterns of mortality were examined by taking Korea as an example.

Asian NICs are known to share Confucian cultural heritage to a great extent and to have achieved modernization in a relatively short period composed of such elements as economic development, social structure and demographic transition. Despite this common outlook, the countries do not show any common pattern of mortality from each other. The United Nations' Far Eastern patterns have more or less good fittings to the male populations of Hong Kong, Singapore and Korea, but its degree of fitness was reduced recently. The reason may be that the model was constructed with their experience until the early 1970s. For females, except for Singapore, the age pattern of mortality seems very close to the West Regional pattern.

As already observed with Asian populations, mortality "change is generally not uniform in every age group" (UN, 1982: 133) even in our four populations. There is a tendency that the pace of mortality decline is faster for infant and child ages up to the medium level of life expectancy. Approaching to a high life expectancy, mortality decline accelerates in old ages. Except this rough observation, no uniform or systematic age patterns of change is noticed between countries and between two points of time in a country. This, together with the above observation, casts a doubt on the usefulness of model life tables in projecting the levels and patterns of mortality, particularly for males, in the countries with somewhat reliable registration data and census populations. It is obvious that mortality decline accompanies societal development in most societies, but the pace and patterns of decline appear not to be determined by a handful of easily accessible factors which can be identified through statistical analyses. Rather all aspects of society and culture are intertwined with life phenomena of people within the given biological and technological limitations. This would suggest that the study on the relationship of mortality with societal development or social, economic and cultural factors will be more benefited by a comprehensive case study than by a comparative analysis of many countries relying on statistical reasoning, as already sugested by Ruzicka and Hansuluwka some time ago (1982: 134).

The case of Korea demonstrates how the major socio-cultural and developmental factors are associated with the level and patterns of mortality in various ages. The alcohol taking behaviour of Koreans which is embedded in Korean culture explains largely the adult male pattern of mortality and its change which are distinctive from other populations. Unique food taste and dietary habit such as taking of a large amount of hot chili, and sharingg of bowls in every meal may be related to the relative large prevalence of the diseases

of the digest organs, stomach cancer and hepatitis in Korea and delimit the reduction of mortality to some extent. All types of data confirm that mortality at childhood ages 1-4 and sometimes 1-9 has been persistently higher for females that for males due to the custom of strong son preference. The importance of first sons in the Korean family further differentiates the level of mortality between first sons and other sons.

Health policies were usually discredited in Korea and people had a preoccupation that the policies have little to do with their health. But the introduction of a compulsory medical insurance scheme to some population sectors in the late 1970s created the cry for the expansion of medical insurance system all over the country. The policy is evaluated to have changed the people's concept of medical care and medical institutions and to have contributed to longevity greatly for housewives, children and the elderly. It is also evident that the fertility control policy have had a significant impact on infant and childhood mortality.

Development upgraded the health situation noticeably, but the negative effects of development appear to have been greater in Korea than other NICs. It generated the spirit of keen competition in schooling, work and even in leisure. Sudden deaths due to overwork and anxiety became a common syndrome. Deterioration of sanitary environment due to industrialization are seen everywhere in Korea. Severe air pollution is seen in large cities and industrial areas. Although most village now have simple piped water supply systems, all other water sources are exposed to pollution. The reliance of farming on chemicals is known to be a major cause of food contamination and a large, still increasing, number of poisoning of farmers in rural areas. With a rapidly increasing use of car and the world highest rate of car accidents, the mortality of young men at ages 25~34 would have risen sharply recently, as evidenced by the 1986 cause of death statistics which revealed accidents the most important cause of death in this age group (NBOS, 1987:184~185). It is undoubted that the negative effects of development has canceled greatly its positive effects on health in Korea since 1960, thus holding down the level of life expectancy significantly. Nowadays, many Koreans concern seriously about the health implication of environmental deterioration as a real and immediate threat to their life.

Inequality also poses an important problem in the national health in Korea. Nutritional deficiency is still common among children from poor families and studies in squatter areas invariably report very poor health conditions of the residents, raising the issue of equity in health.

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