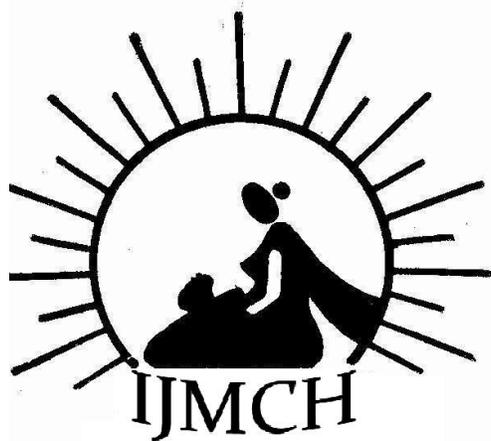


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Mortality is a sure event in anyone's life. We can delay it with development of medical sciences but it is unavoidable. Mortality is related to the social and physical conditions as well as living standard of people.

## Comparison of mortality trends and patterns between India and Japan

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### ABSTRACT

Mortality is a sure event in anyone's life. We can delay it with development of medical sciences but it is unavoidable. Mortality is related to the social and physical conditions as well as living standard of people. There is an empirical relation between development of a society and life expectancy at birth. The present study attempts to compare mortality trend in India and Japan from 1950-2010. India and Japan both have achieved almost equal crude death rate but still India is lagging behind Japan in terms of life expectancy at birth, Infant mortality rate and under five mortality rates which are more refined measures of mortality.

### INTRODUCTION

Mortality is a term used in demography to express the number of deaths occurring in a population. Mortality is related to the social and physical conditions as well as living standard of people. It is also related to the public and social services like health and medical facilities, education, awareness in the public etc. The objective of this study is to compare the trends and patterns of mortality between India and Japan. The study will examine that how the mortality indicators like Crude Death Rate, Infant Mortality Rate, Under 5 Mortality Rate and Life Expectancy at Birth have evolved in the past 60 years for both the countries. The study will also try to find that how starting from the same economic conditions in 1940's, Japan has achieved one of the best figures in mortality and life expectancy in the world while India is still struggling. Since 1950's, most countries have seen an increase in life expectancy and a reduction in mortality. These changes have been more dramatic and noticeable in the developing countries of the world. Despite great improvements in the mortality indicators over the last five decades, large variations still remain between developed and developing countries. The overall objectives of this study are to understand the mortality trends and patterns of India and Japan and to identify the similarities and differences between them to get some idea about the health, economic, environmental and living conditions of the two countries.

Mortality is not only a demographic parameter but is also an indicator of economic and social conditions of a country. Mortality is directly related to the health and living conditions of the population. **Amartya Sen** in his study "*Mortality as an indicator of economic success and failure*" gives reasonable arguments to use mortality as an indicator of economic success and failure<sup>1</sup>. Mortality information can also throw light on the nature of social inequalities like gender bias and racial discriminations. Mortality data are not only informationally rich but are also fast enough to provide guidance on a rapidly changing economic and social situation. The mortality shifts can draw attention to the need of policy change which other economic variables cannot predict. That is why it is very important to analyse and study the trends and patterns of mortality. On comparison with a better performing country we can get already built ideas and policies for making improvements in our own performance. The life expectancy in the developing countries has increased from 40.9 years in 1950 to 63.3 years by 2000, which is a remarkable and rapid achievement. The difference in longevity between developed and developing countries have also decreased over the period from 25.7 years to 11.6 years. As per her study the Infant Mortality Rate in

less developed countries is 7 times more than the developing countries.(63/1000 and 9/1000). On a worldwide comparison of Infant Mortality rate India occupies 50<sup>th</sup> position whereas Japan occupies the second last 220<sup>th</sup> position.<sup>4</sup>As per the comparison of Life Expectancy at birth by United Nations, Japan tops the list securing 1<sup>st</sup> place while India holds the 139<sup>th</sup> place in the world<sup>5</sup>.

#### MATERIAL AND METHODS

Data for the current study have been taken from the various published studies of India and Japan. Crude death rate, under five mortality rate, Number of deaths in various groups and life expectancy at birth was compared in both the countries.

#### Mortality indicators

**Life Expectancy:** Life expectancy at birth is the number of years a new born child is expected to live. Life expectancy at any age means how many years more a person is expected to survive after attaining a particular age.

**Crude Death Rate:** The crude death rate is defined as the number of deaths in a specified period per 1,000 population. More specifically, it refers to the total number of deaths in a given geographic area, over a given period of time, divided by the mid-year population of the same geographic area, during the same time period (i.e., the population that is “exposed to risk” of death during the year). **Infant Mortality Rate:** IMR refers to the number of deaths among children under the age of one (i.e., infants) of a geographic area in a particular year per 1,000 live births of the same geographic area during the same year. It is calculated by dividing the number of infants who died within the first year of life by the number of live births in that year, times 1,000. Infant mortality rate (IMR) is the most widely used measure of mortality as it is highly sensitive to the health conditions of a population.

**Under-five Mortality Rate:** Under five mortality rate is the probability (expressed as per 1000 live births) of a child born in a specific year dying before reaching the age of five years, if subjected to current age specific mortality rates.

#### RESULT & ANALYSIS

The data for various mortality indicators has been collected from **United Nations, Department of Economics and Social Affairs, Population Division, Population Estimates and Projections Section**<sup>6</sup> The various sets of data used for comparison are listed below-

#### Life expectancy at birth for both sexes combined (years)

Period	1950-1955	1955-1960	1960-1965	1965-1970	1970-1975	1975-1980	1980-1985	1985-1990	1990-1995	1995-2000	2000-2005	2005-2010
India	37.91	40.89	44.09	47.51	50.77	54.16	56.20	57.71	58.98	60.70	62.47	64.19
Japan	62.17	66.25	68.97	71.29	73.14	75.31	76.95	78.51	79.45	80.48	81.83	82.73

Life expectancies for both the countries have shown a remarkable increase, with life expectancy in India increasing from 37.91 in 1950 to 64.19 years in 2010, and in Japan increasing from 62.17 in 1950 to 82.73 years in 2010. However the difference in life expectancy has not improved much. In 1950-1955 the difference in life expectancy was 24 years and now in 2005-2010 it is 18 years. In spite of great economic developments in India, this difference in life expectancy is large. The reason which one may attribute to this is the over or effective performance of Japan in reducing mortality. Japan presently tops the world list in life expectancy.

**Life expectancy at birth (years)**

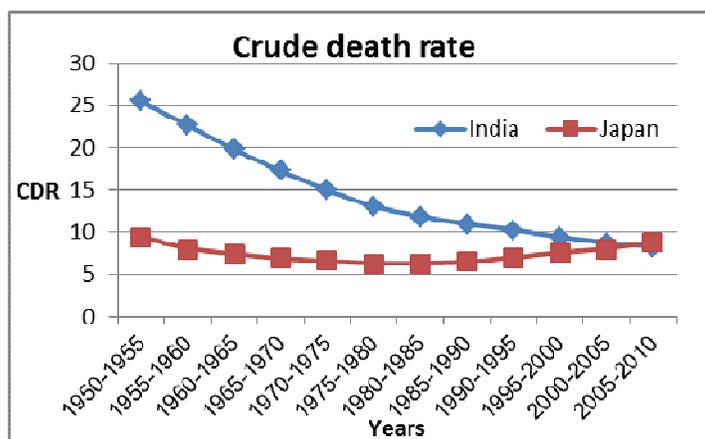
Period		1950-1955	1955-1960	1960-1965	1965-1970	1970-1975	1975-1980	1980-1985	1985-1990	1990-1995	1995-2000	2000-2005	2005-2010
India	Male	38.72	41.76	44.9	48.21	51.32	54.3	56.2	57.65	58.48	59.92	61.38	62.8
	Female	37.06	39.95	43.23	46.77	50.21	54.07	56.23	57.81	59.56	61.58	63.68	65.73
Japan	Male	60.4	64.07	66.5	68.68	70.47	72.64	74.12	75.53	76.27	77.07	78.28	79.25
	Female	63.93	68.47	71.48	73.93	75.78	77.88	79.63	81.31	82.44	83.71	85.21	86.06

Table shows the comparison of female and male life expectancy between India and Japan respectively. There has been an increase in female life expectancies for both the countries showing that the conditions of living for women have improved. The female life expectancy has increased to 86 years in Japan and 65.7 years in India. One interesting thing to note is that while comparing the male and female life expectancies for Japan, we find that female life expectancy has always been greater than male life expectancy. The reason for this is biologically given as the women are genetically superior to men. But when we compare male and female life expectancies for India, we find that during 1950-1955 female life expectancy was less than male life expectancy. Presently in 2005-2010 we see that female life expectancy has left behind the male life expectancy. This fact shows the dramatic change in life of women which has occurred in India after independence. In the early to mid 20<sup>th</sup> century the position of women in Indian society was not good. They had to face deprivation at all levels including health and medical facilities. However with education and increasing awareness about sex equality such differences has been reduced significantly.

**Crude death rate (deaths per 1,000 populations)**

Period	1950-1955	1955-1960	1960-1965	1965-1970	1970-1975	1975-1980	1980-1985	1985-1990	1990-1995	1995-2000	2000-2005	2005-2010
India	26	23	20	17	15	13	12	11	10	9	9	8
Japan	9	8	7	7	7	6	6	6	7	8	8	9

Below figure shows the comparison of Crude Death Rate between the two countries from 1950 to 2010. There has been a tremendous decrease in crude death rate in India from a value of 26 to 8 in 60 years. This is well predicted by the patterns of life expectancy also. One important thing to note here in case of India is that the decrease in CDR was more from 1950 to 1980. It has gradually slowed down from 1980 onwards. In the mid century the major causes of deaths were bacterial and other infectious diseases. There was a great emphasis on controlling these diseases by improving the quality of living areas, sanitation, water supply and other public amenities. That rapid decrement is because of these reasons. Whereas after 1980's the contribution of these reasons to death was already reduced so there was not



enough scope of improvement. Now to reduce the death rate further down India needs to pay emphasis on improving the medical and health facilities.

On observing the crude death rate trend of Japan, we see that there has been an increase in Crude death rate of Japan after 1980, which is quite opposite to one normally expects. The increase in life expectancy as shown above seems contradictory to the Crude death rate pattern. The explanation for this ambiguity is that the present population of Japan consists of a higher ratio of senior population, which has higher chances of death. According to an estimate of National Institute of Population and Social Security Research, Japan this trend will continue for Japan and its crude death rate will achieve a value of 12.1 in 2020 and 16.2 in 2050.<sup>7</sup>

#### Infant mortality rate, for both sexes combined (infant deaths per 1,000 live births)

Period	1950-1955	1955-1960	1960-1965	1965-1970	1970-1975	1975-1980	1980-1985	1985-1990	1990-1995	1995-2000	2000-2005	2005-2010
India	165	153	140	128	118	106	95	85	76	69	61	53
Japan	50	37	26	16	12	9	7	5	4	4	3	3

Table compares the infant mortality rate between India and Japan. Japan has one of the lowest infant mortality rates in the world whereas India is yet struggling to achieve the Millennium Development Goal. Japan reduced its IMR significantly from 1950 to 1980. India is also continuously reducing the infant mortality rate. It has decreased from a value of 165 in 1950-55 to 53 in 2005-10. The factors responsible for this reduction are improving literacy rate of females, good medical and educational facilities close to the place of residence and effective means of transportation and communication. However there have been reductions, India is yet far behind as compared to other countries. Some states of India like UP have still high infant mortality rates.

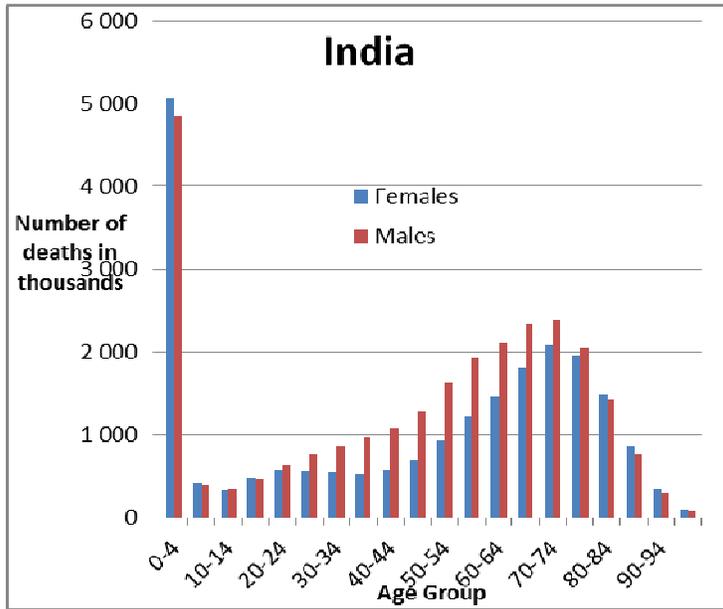
#### Under-five mortality, 5q0, for both sexes combined (deaths under age five per 1,000 live births)

Period	1980-1985	1985-1990	1990-1995	1995-2000	2000-2005	2005-2010
India	135	120	108	96	84	72
Japan	9	7	6	5	4	4

Table compares the Under-five mortality rate between the two countries. Japan already achieved a low value of under-five mortality rate (9) in 1980 and has reduced it further down to 4 in 2010. India too has reduced the under-five mortality rate from 135 in 1980 to almost half ie- 72 in 2010. As per the Millennium Development Goals, India should have reduced its under-five mortality rate to 1/3<sup>rd</sup> of that in 1990 ie to a value of 40. So still there is a huge difference to cover. According to the UNICEF report India accounts for 21 percent of the under-five children dying in the world.<sup>8</sup>

The life expectancy and crude death rate data used here are from 1950-2010, infant mortality data is from 1980-2010 and age specific death data is for the year 2010. The data seems to be consistent with the normal observations, however there may be some discrepancies because of the data collection techniques (surveys and census). As some of the data is based on estimates, so it may also be the cause of errors.

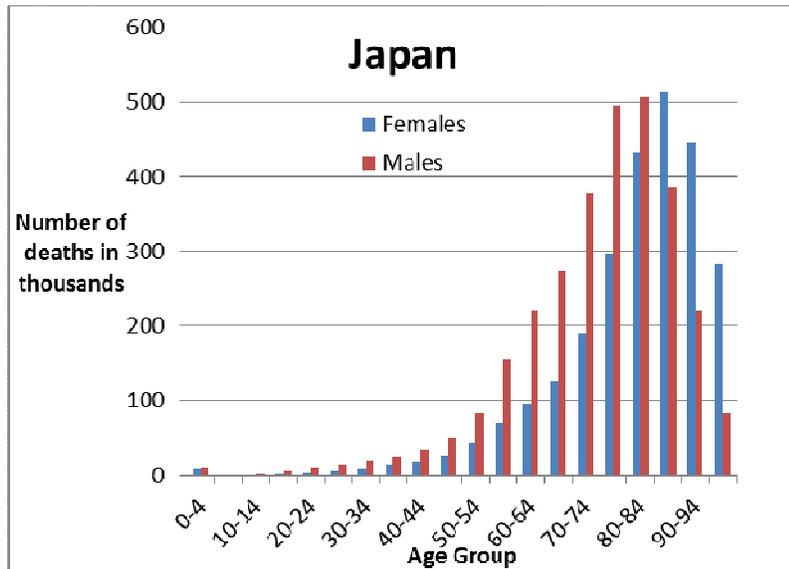
**Deaths (at 5yr age groups)**



Below the figures shows the comparison of number of deaths by age group of males and females for the period 2005-10 for India and Japan respectively. If we observe the two graphs closely we would notice a selective discrimination against girl child in India. In Japan the number of deaths of male children under-five years of age is more than female, whereas in India it's the opposite. The scenario is opposite to what it should be biologically in the case of India. This is basically due to

discrimination against girl child in India for the health and care in early years of childhood. Also there arise many cases of intentional killing of girl child. Going beyond 5 years of age, in the age group 5 to 9 in India, still there is higher number of girl child deaths as compared to male child deaths. In the age group 20-80 numbers of male deaths is higher than the female

deaths. This is because of the high risk of loss of life of male population which may be related to natural deficiency, bad habits like drinking, smoking or involvement in risky jobs. In case of Japan the number of male deaths is more than the number of female deaths for the age group 0- 85. It clearly depicts the better position enjoyed by women in Japanese



society. We must very well appreciate here that how mortality data can be used to predict the social conditions of a country or region.

**A comparison of Causes of Deaths:**

In Table, a list of top ten causes of deaths has been given for both the countries India and Japan.<sup>9</sup> In the case of India most people die because of heart problems and in Japan because of stroke. One important feature to note in this comparison is that the diseases like Diarrhoea, tuberculosis and low birth weight still account for top ten causes of deaths in India where as these diseases

S. No.	India	Japan
1	Coronary heart disease	Stroke
2	Diarrhoeal diseases	Influenza & Pneumonia
3	Lung disease	Coronary heart disease
4	Stroke	Lung Cancers
5	Influenza & Pneumonia	Stomach cancer
6	Tuberculosis	Colon-rectum cancers
7	Low Birth Weight	Liver cancer
8	Suicide	Suicide
9	Liver disease	Pancreas cancer
10	Road traffic accidents	Kidney disease

are not predominant causes of deaths in Japan. In case of Japan we see that the various types of cancers like lung, stomach, colon-rectum, pancreas and stomach account for most of the deaths. This comparison clearly illustrates that how the major causes of deaths in a developing country are infectious, viral and heart diseases (arising because of poor living and medical facilities), whereas in a developed country these are non-communicable diseases like stroke and cancer (arising because of bad life style).

As child mortality is one of the most important mortality indicators, and in India there is high under-five mortality rate, it is important to visit the causes of child mortality separately. As per the UNICEF report<sup>9</sup> the major causes of child mortality in India are neonatal (37 per cent), pneumonia (19 per cent), diarrhoea (17 per cent), and AIDS (3 per cent). The high percentage contribution of neonatal deaths reflects the poor maternal and child care. The deaths because of pneumonia and diarrhoea may be attributed to the unavailability of health services near to the households and also to the unawareness or illiteracy of the masses. On the other hand Japan has one of the lowest child mortality rates in the world.

**Explanation of the observed mortality trends through some Classical theories:**

The Epidemiological Transition theory<sup>10</sup> very well explains the mortality trends especially life expectancy and crude death rate patterns for India and Japan. According to this theory there are three stages of the epidemiological transition- Age of pestilence and famine, Age of receding pandemics and Age of degenerative and man-made diseases. In the age of pestilence and famine life expectancy at birth is low- between 20-40 years. The period till 1960 in India belongs to this stage where life expectancy was quite low. The main factors of death were infectious and parasitic diseases, plagues, natural disasters and famines. In the age of receding pandemics life expectancy at birth is between 30 and 50 years. The period from 1960-1975 in India fits in this category. In this period there was a significant decline in epidemics and infectious diseases as predicted by this theory. The decline in mortality was mainly because of improved food and overall living conditions. In the third stage ie- Age of degenerative and man-made diseases life expectancy reaches 70 years. In this stage typhoid, tuberculosis, smallpox and cholera are replaced by chronic diseases such as heart disease, cancer, stroke, diabetes, and the like. India is presently in a shift from second stage to third stage. The present top ten causes (Table 1) of deaths in India very well support this fact. The contribution of the diseases like small pox, cholera and tuberculosis in total deaths

is decreasing and heart diseases and cancer are taking their place slowly. In Japan this shift from second stage to third stage was seen in the period of 1950 to 1970. Presently Japan has a life expectancy of more than 70 years and can be said to have reached the third stage of epidemiological transition. The top ten causes of deaths in Japan very well support this argument. In the list we can see the presence of diseases like stroke, heart diseases and cancers.

According to the theory of Thomas McKeown on mortality declines in the industrialized world, the decline in mortality has been more attributable to the “environmental factors”. Environmental factors include improvement in nutrition due to greater food supplies, the introduction of hygiene measures such as the purification of water, efficient sewage disposal, and improved food hygiene. The sharp decline in mortality in India in the period from 1950-1970 can be well explained by this theory.

### CONCLUSION

India and Japan have shown distinct patterns of mortality over the last 60 years. Japan has achieved greatly in terms of reducing its mortality indicators whereas India is yet struggling to cope up with the rest of the world in reducing few parameters like child mortality rate. Both the countries have shown constant increment in life expectancy since 1960 and decrement in infant and child mortality rates. Japan has the highest life expectancy and lowest infant mortality in the world. India on the other hand does not hold good position in both. The difference in life expectancy between both the countries is still 18 years, which is very high. There has also been a significant decrease in crude death rate in India since 1950. The decrement in crude death rate and increment in life expectancy may be attributed to the improved living conditions, better health and medical facilities, education and improved means of transportation and communication. In India there have been decrements in infant and child mortality rates but it is still far behind to achieve its millennium development goals. Japan however shows a dramatic pattern in crude death rate, with its crude death rate constantly increasing from 1980's till today. The reason for such a pattern is the ageing population of Japan. With a larger composition of old age population which is more prone to death, the crude death rate of Japan is increasing and is expected to increase further till 2050. On comparing the number of male and female deaths between both the countries we observe an unnatural trend of child death rate in India with number of female deaths being more than males. This trend shows us the glimpse of selective discrimination against girl child in India.

The facts and findings obtained in this study are well supported by the previous studies. The trends observed can be well explained by theories like Epidemiological transition theory. In India the period till 1960 belongs to the age of pestilence and famine, the period from 1960 to 1975 to the age of receding pandemics and right now it is witnessing a change from this second stage to the third stage called Age of degenerative and man-made diseases. Japan on the other hand showed this shift from second stage to the third stage in 1950 to 1970. Presently it is in the third stage of epidemiological transition. These facts are well supported by the top ten causes of deaths in both the countries. In India we still have diseases like diarrhoea, tuberculosis, low birth weight as major causes of deaths while in Japan the chronic and non-communicable diseases like stroke and cancer comprise the major causes of deaths.

This study provides a thorough comparison of different mortality parameters between both the countries. As Japan is way ahead of India in most of these, so India can observe the

steps and policies used by Japan to reach this level. India still needs to lower down its infant and child mortality rates. Therefore policies must be brought in which focus on maternal and child health care. Improvements in living standards, primary health and education should be made because all these things directly or indirectly affect the various mortality indicators.

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