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Original Article

Changing Pattern of Mortality Trends in Iran, South, South-West Asia and World, 1970-2010

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Abstract

Background: Mortality refers to the death that occurs within a population. It is linked to many factors such as age, sex, race, occupation and social class. The incidence and prevalence of mortality could affect the population's standard of living and health care. The aim of this study was to explore the pattern of mortality trends in Iran, south-south west Asia and the world in 1970-2010.

Methods: A descriptive study was conducted on the registered data in the Statistical Center of Iran and National Organization of Civil Registration. The data were analyzed using statistical methods and graphs. Finally, the analyzed data were compared with the world and south-south west Asia data.

Results: In Iran, 61.1% of all the registered deaths were in male and 60.4% were in urban areas. Crude death rate, infant mortality rate and under five mortality rate decreased from 13, 164 and 281 per 1000 in 1970-75 to the estimated values of 5, 25 and 35 per 1000 in 2005-2010, respectively.

Conclusion: The results showed that similar to other countries, the trends of all mortality indicators in Iran have been changed and decreased, which is related to many factors such as improvement health situation and medical interventions.

Keywords: *IMR, CDR, U5MR, Mortality trend, Mortality pattern, Iran*

Introduction

In 2010, the population of Iran is more than 74 millions and about 65% of which lives in urban areas. This makes Iran to be the 17th populous country throughout the world. According to the statistical center of Iran (SCI), more than 50% of Iran's population is less than 25 yr old, making as one of the youngest countries in the world. General health status since the Islamic revolution (1979) has been improved significantly during the last three decades after revolution. For example, the Infant Mortality Rate (IMR) decreased as much as about 59% and life expectancy increased as much as about 23.2% (1). Mortality, the death that occurs within a population, is linked to many factors such as age, sex, race, occupation and social class. Mortality is an important component of population that influences population's size and growth. It is also an important factor for socio-economic and health planning of any country. The incidence and prevalence of mortality could affect the population's standard of living and health care. Mortality may have increasing trend in some years and decreasing trend in other years. It is also possible that the distribution of mortality in one period differs from the time period (2). The top ten populous countries in 2009 in the world are China, India, United States, Indonesia, Brazil, Pakistan, Bangladesh, Nigeria, Russia and Japan in descending order. These countries account for 59% of the world population (3). According to the reports by the World Health Organization (WHO) and UNICEF, most of infant mortality is related to five main causes of acute respiratory infections, diarrhea, measles, malaria and malnutrition or a combination of them. Two-thirds of child deaths are preventable by some programs and interven-

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tions. It is necessary to educate mothers about living status, health and nutrition. Near 25,000 young children die everyday in the world commonly from preventable diseases. The Under Five Mortality Rate (U5MR) has fallen from 12.7 millions in 1990 to 9.2 millions in 2007. Most of child mortality (about 50%) occurs in the Africa. The best intervention program with 50% decreasing in child mortality has been occurred in the Latin America and Caribbean. Reduction in child mortality and improvement in maternal health care are the two international development goals of the Millennium Development Goals (MDG) within 1990-2015 (4). Most of countries and, in particular, the developing countries have experienced an increase in life expectancy at birth and a reduction in mortality indicators such as Crude Death Rate (CDR), IMR and U5MR within the past 50 yr, but it is necessary to improve health networks to reach the MDG in future. For medical interventions, diseases and injuries control and preventing mortality causes, it is necessary to have exact data on mortality patterns and indicators (5). In 2009, the life expectancy in Iran was 71.14 yr, which attained the rank of 130 in the world. During the last three decades, an improvement has been observed in the mortality indicators in Iran. For instance, CDR, IMR and U5MR indicators decreased from 11.5, 100 and 135 per 1000 in 1976 to 35.78, 71.14 and 36 per 1000 in 2009, respectively (1).

An important step in understanding the health status is to document changing the pattern of mortality trends. This pattern reflects the important elements that affect population health and can lead to specific interventions, which may modify this pattern. To better understand this pattern, it is necessary to see that how they differ within population by age, gender, social class, geographical distribution, disability status, caste, race and religion (6). The aim of this study is to explore the changing pattern of mortality trends in Iran, south-south west Asia and the world to identify the similarities and differences regarding the mortality indicators among them.

Materials and Methods

Data source and collection method

We used two sources of data like vital statistics and population census data obtain from the vital statistics data bank of National Organization of Civil Registration (NOCR) and SCI (7).

Study design and outcomes

A descriptive study was conducted on Iran's registered data and the obtained data were analyzed using statistical methods and graphs by comparing with the world and south-south west Asian data. Also, a systematic review was conducted on governmental reports from various organizations and all published and unpublished documents (in Persian and English) concerning child mortality in Iran within 1970-2008 (8).

Statistical analysis

Descriptive methods through comparison were used to analyze the pattern of mortality in Iran, south-south west Asia and the world using CDR, IMR, U5MR and life expectancy at birth as the major mortality indicators. The data were analyzed using SPSS version 13 for frequency analysis and cross-tabulation, and excel 2003 for graphs. We used Minitab package and time series menu to forecast the values of CDR, IMR, U5MR and life expectancy for the years after 2009. The validity of used methods and the estimated values were guaranteed by the accuracy of the methods used in time series menu of Minitab package. The assumptions theory of time series was checked. For data quality assessment, we re-estimated three mortality indicators (CDR, IMR, U5MR) and life expectancy by CIA World Fact Book, Earth trends and WHO.

Results

A total of 9.7 million deaths were registered in Iran during 1970-2010, about 5.9 millions (61.1%) were in males and 3.8 millions (38.9%) in females by sex ratio 1.6. From all the registered deaths, 5.86 millions (60.4%) were in urban and 3.84 millions (39.6%) in the rural areas. According to the census statistics, during 1970-2010, the CDR

was 5.2 per 1000. The results showed that the CDR in Iran was 13 per 1000 in 1970-75, which was dropped to 5 per 1000 in 2005-2010 (Fig.1). Life expectancy at birth increased more rapidly during the last 40 yr from 55.2 yr in 1970-75 to 71 yr in 2005-2010. The results revealed that Iran has been successful in decreasing the rate of IMR because it was reduced from 164 per 1000 in 1970-75 to the estimated value of 25 per 1000 live births during 2005-2010 by CIA World Fact Book. The results showed that the life expectancy at birth in Iran was better than the world and south, south- west Asia during 1990-2010. Life expectancy at birth in Iran was lowest during 1970-90, compared with the world and south, south-west Asia. IMR in Iran was higher than the world during 1970-85. In 1970-75, IMR in Iran was higher than south, south-west Asia, but after 1975, this rate has been decreased and reached to the lowest amount (Fig. 2).

The U5MR in Iran was higher than the world during 1970-1985, and after 1985, it has been decreased from 130 per 1000 in 1985 to 35 per 1000 in 2005-2010 (Fig. 3).

The value of U5MR was estimated for the years 2005-2010 by CIA World Fact Book. Trend of life expectancy in Iran was lower than south-south west Asia and the world during 1970-90. After 1990, this pattern was changed. So that Iran stands at the top in this regard. Also the rate of life expectancy increased from 55.2 in 1970-75 to 71 yr in 2005-2010 (Fig. 4). The results showed that the highest amount of U5MR related to Sub-Saharan with 148 and south, south- west Asia with 78 per 1000. Also, results showed that the trend of U5MR in the whole world was decreased in 2007 (Fig. 5).

The world's highest child mortality rate (278.1 in 2009) was related to Sierra Leone and the lower child mortality was related to Iceland with 3.9 per 1000 births. A child born in Sierra Leone almost 92 times is more likely to die than the one born in Iceland with a rate of 3.9 (Table1). The four leading causes of death globally in 2030 are projected to be coronary heart diseases, stroke, chronic obstructive pulmonary diseases and pneumonia. Total registered deaths in the world were 49.4 millions, of which, 25.7% is related to coronary heart diseases and stroke. The total deaths in Iran were 324,718, of which, 35% was related to coronary heart diseases and stroke. The rank of Iran in mortality is 98 in the world. By dividing this number to all deaths in the world, we reach to 0.66 percent (Table 2).

Table 1: Infant mortality rate and under five mortality rate ranking in the world (2009)

The top five countries by IMR			**The lowest five countries by IMR**		
Country	**Rank**	**Rate (per 1000)**	**Country**	**Rank**	**Rate (per 1000)**
Angola	1	180.2	Hong Kong	219	2.93
Sierra Leone	2	154.4	Japan	220	2.8
Afghanistan	3	152	Sweden	221	2.75
Liberia	4	138.2	Bermuda	222	2.46
Niger	5	116.7	Singapore	223	2.3
Iran	69	35.78			
The top five countries by U5MR			**The lowest five countries by U5MR**		
Country	**Rank**	**Rate (per 1000)**	**Country**	**Rank**	**Rate (per 1000)**
Sierra Leone	1	278.1	Iceland	195	3.9
Afghanistan	2	235.4	Sweden	192	4
Angola	3	230.8	Singapore	194	4.1
Liberia	4	205.2	Japan	193	4.2
Mali	5	199.7	Norway	191	4.4
Iran	119	35.5			

Source: CIA World Fact Book, 2009; www.cia.gov

Table 2: Top ten causes of death in the world by Iran ranking (2007)

Causes of death	World			Iran		
	no.	%	rank	no.	%	rank
Coronary heart diseases	7,195,450	14.6	1	81,983	25.2	1
Stroke	5,501,933	11.1	2	31,768	9.8	3
Influenza\ Pneumonia	3,939,154	8	3	6,892	2.1	11
HIV/AIDS	2,917,116	5.9	4	544	0.2	48
Lung diseases	2,745,919	5.6	5	8,991	2.8	6
Diarrhea	1,868,390	3.8	6	8,682	2.7	7
Tuberculosis	1,564,877	3.2	7	2,290	0.7	27
Low birth weight	1,268,851	2.6	8	8,157	2.5	8
Lung cancers	1,241,820	2.5	9	5,860	1.8	13
Road traffic Accidents	1,189,586	2.4	10	40,524	12.5	2
Total	29,433,096	59.5	-	195,691	60.3	-

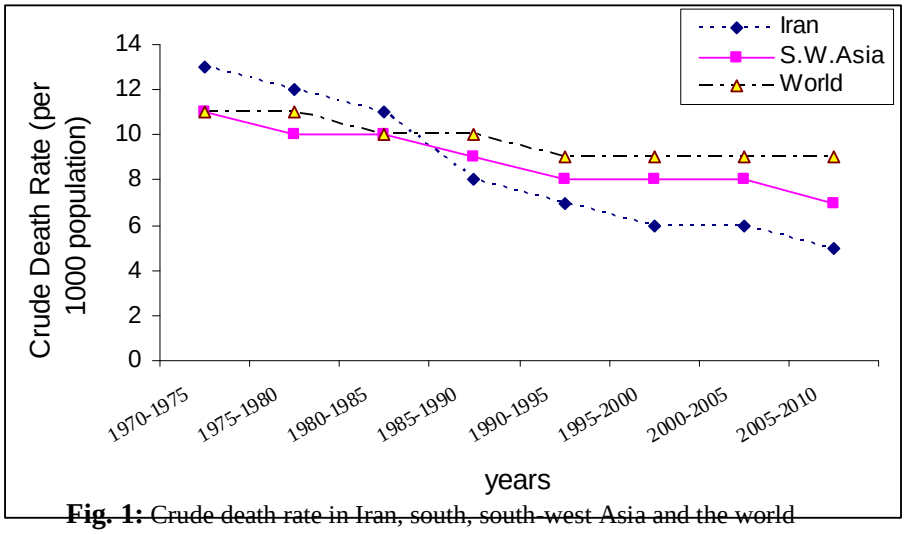


Fig. 1: Crude death rate in Iran, south, south-west Asia and the world

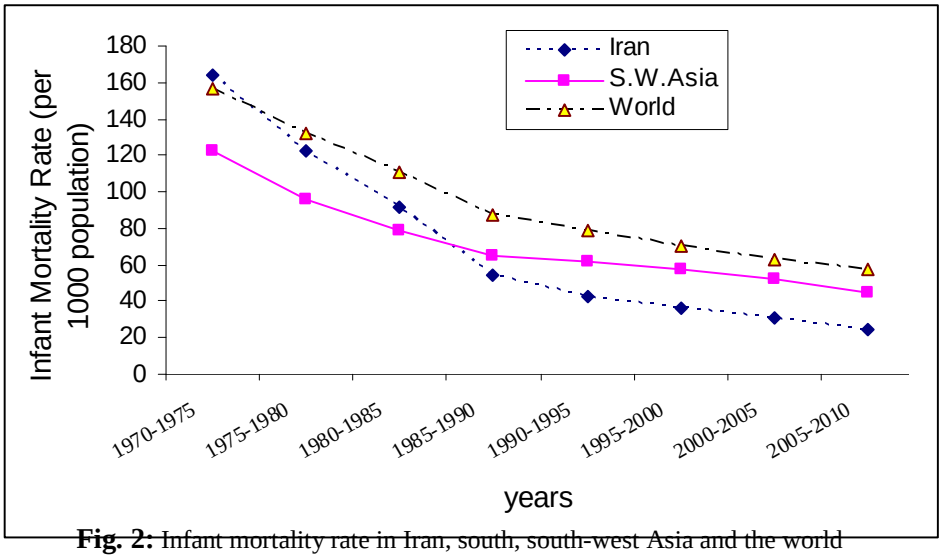
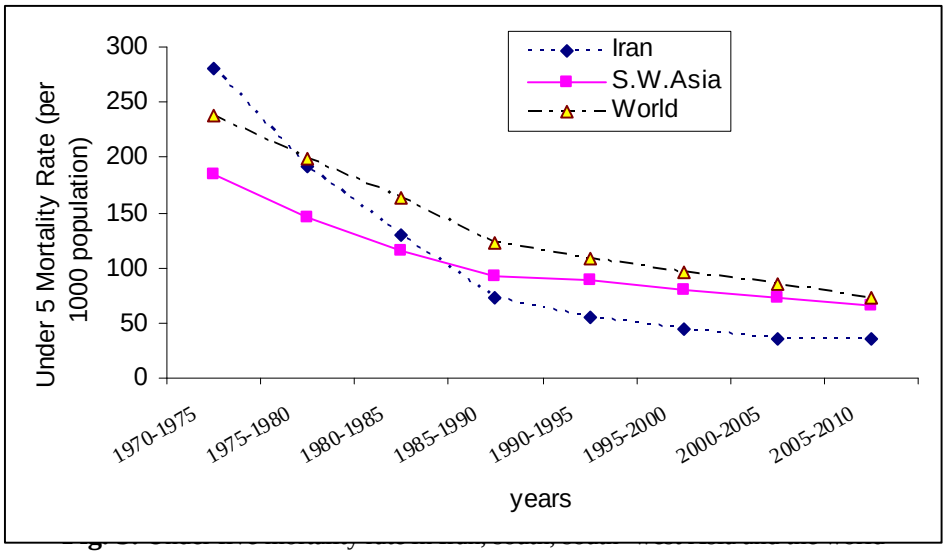
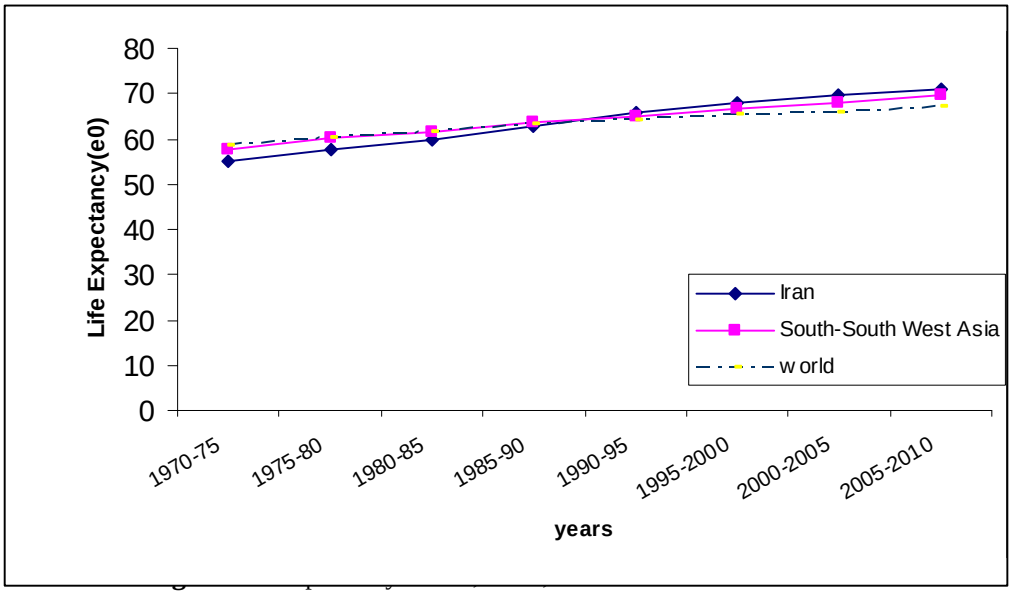


Fig. 2: Infant mortality rate in Iran, south, south-west Asia and the world





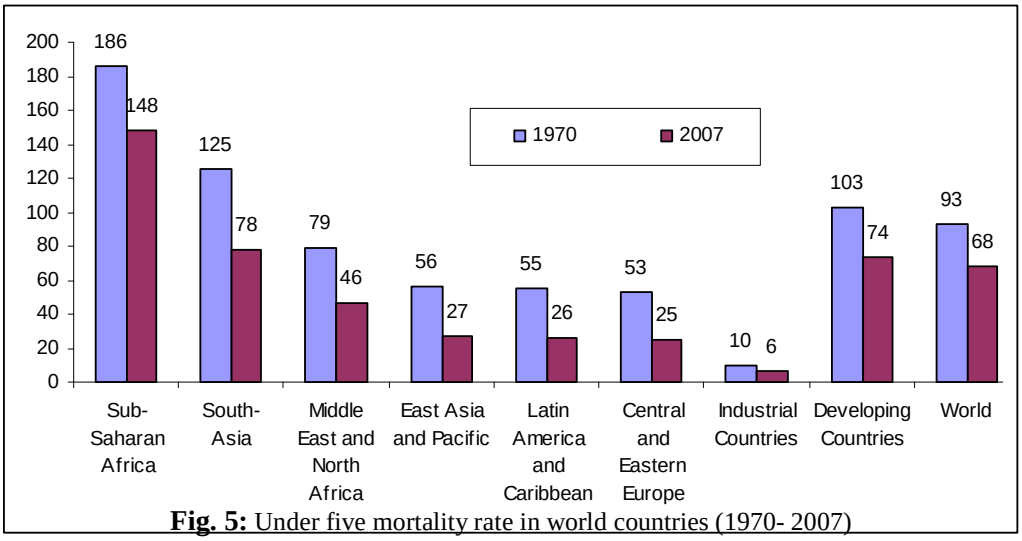


Fig. 5: Under five mortality rate in world countries (1970- 2007)

Discussion

This study is a comprehensive analysis of mortality pattern and trends in the Islamic Republic of Iran, using different methods and sources of published, unpublished and registered data (8, 9). The results showed that all mortality indicators have been decreased in Iran, south, south- west Asia and the world during time studied. However, the rate of decrease in CDR, IMR and U5MR from 1970-75 to 2005-2010 in Iran (with the respective values of 61.5%, 85% and 87.5%) is more than those in south, south-west Asia (36.3%, 63.7% and 69.7%) and the world (18.2%, 63.1% and 64.7%). Life expectancy at birth in Iran with 28.6% increase is higher than those in south, south-west Asia (20.2%) and the world (15.3%). Our estimation for all vital indicators is similar to those made by UNICEF and other organizations (6, 9-11).

Other sources including surveys, censuses and registration systems confirmed that IMR trends have been decreased in Iran during the last three decades, which are related to the expansion of the Iranian health network and increased access to primary health care, particularly in the rural areas (10, 12).

Despite the NOCR long history of death registration, non-reporting of death is common in Iran, leading to death delay registration by individuals and consequently changing of mortality indicators. The main aim of death registration system in Iran is to collect the causes of death from different sources. Decreasing of child mortality indicates a decline in infectious and nutritional diseases. It is possible that the leading causes of death will shift to chronic diseases in adults in the future.

The results showed that the pattern of mortality in Iran has been changed significantly during 1970-2010, mainly because of improved health conditions and increased health services. The pattern of mortality in Iran was similar to that of south, south-west Asia and the world. Therefore, one could say that the world experienced a decreasing trend in all mortality indicators during the recent years.

In the past, many of deaths in children under five years occurred in the Asian countries, but in the recent years, the pattern of U5MR has changed because all countries in this continent have experienced decreasing in U5MR. For example, U5MR in China and India has fallen from 45 and 115 per 1000 in 1990 to 24 and 76 per 1000 in 2006 with reduction of 47% and 34%, respectively. Also in 2007, the estimation average of U5MR was 68 in the world, 79 in the developing countries, and 6 in industrialized countries (1, 2).

In 2006, 67% of people lived in urban areas with the annual growth rate of 4.9% in 1970-90 and 2.5% in 1990-2006. The decrease in the growth rate of urban populations in recent years suggests that the pattern of mortality has been changed because of improvements in health conditions and the health interventions provided for many peoples in the urban areas.

In 1950, the total population up to age 65 yr was 131 millions in the world. While in 1995, this number was estimated to be 371 millions. It is estimated that in 2025, this figure will be more than double again; and by 2050, we will possibly have more than 1.4 billions of elderly worldwide. The percentage of elderly increased from 5.2 in 1950 to 6.2 in 1995 and is expected to reach near 10% by 2050. The combination of the age groups of 0-14 yr (with 27%) and 60+ (with 7%) in Iran is similar to that of south- southwest Asia (32% and 8%) and the world (27% and 8%). Accordingly, we can conclude that the trends of all indicators in Iran are similar to the other countries throughout the world. The results showed that the control programs and preventive methods for decreasing U5MR in the Latin American and European countries (each with 52.8%) were the best but in the sub-Saharan (with 20.4%) and worldwide (with 26.9%), they were the worst. U5MR decreasing in Iran was about 88% during 1990-2007 that is very good estimate for Iran among the south-south west Asian countries. The risk of death for children less than 5 yr is projected to fall by nearly 50% during 2002-2030. This indicates that all countries in the world with

higher mortality rates should develop programs to improve health conditions and decrease mortality rate in all age groups to reach the development goals similar to those of the developed countries that enjoy lower mortality trends (4, 13). Our finding also showed that the trend of mortality in Iran has been decreased during the study years. One can see that the mortality indicators in Iran have been smaller than those of both south, south-west Asia and the world in the last two decades. In addition, the health indicators have been improved largely in Iran during the last three decades.

Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc) have been completely observed by the authors.

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The authors declare that they have no conflict of interests.

References

1. Amani F, Kazemnejad A, Habibi R (2009). Changing trend of mortality indicators in Iran during 1971-2007. *J of Ardabil Medical Science*, 9(3): 210-15.
2. Mohammad I (2006). Trends and patterns of mortality in China, Japan and India: A comparative analysis. *The Social Sciences*, 1(2): 149-53.
3. Argaez E (2002).The world population and the top ten countries with the highest population. Colombia, South America. Available from: *www.google.com.*
4. Heidari RN (2009). Iran Millennium Development Goal's in a Glance. *Iranian J Publ Health*, 38:63-64.
5. Murray CJL, Lopez AD (1997). Mortality by cause for eight regions of the world: Global burden of disease study. *Lancet*, 349: 1269-76.
6. Malekafzali H (1994). *The health situation of mothers and children in the Islamic Republic of Iran.* Ministry of Health & Medical Education, Tehran, UNICEF, pp: 75-78.
7. Khosravi A, Taylor R, Naghavi M, Lopez AD (2007). Mortality in the Islamic Republic of Iran, 1964-2004. *Bull World Health Organ*, 85(8): 607-14.
8. Yavari P, Abadi A, Mehrabi Y (2003). Mortality and changing epidemiological trends in Iran during 1979-2001. *J Epidemiology of Iran*, 6(3):7-14.
9. Nehapetian V, Khazaneh H (1974). *Vital indices in Iran: mortality, fertility, growth population and life tables*. 3ed. Tehran University, School of Public Health, Tehran, pp: 129-30.
10. Naghavi M (2006). Changing pattern of health in Iran. *J Epidemiology of Iran*, 1(3):13-25.
11. Zanjani H, Nourollahi T (2000). *The Iranian life tables for 1996 (by sex for national and provincial levels according to urban and rural areas)*. High Institute for Research, the Iranian Social Security Organization, Tehran.
12. Abbasi MJ (2004). Preliminary notes on trends and emerging issues of mortality in Iran. In: *Economic and social commission for Asia and the Pacific.* Bangkok. Available from: *www.google.com*
13. Mathers CD, Loncar D (2006). Projections of global mortality and burden of disease from 2002 to 2030. *PLOS Medicine*, 3: 2011-30.