



## Evaluation of life expectancy in Kurdistan Province, Iran, during the years 2006 and 2016

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### Original Article

#### Abstract

**BACKGROUND:** Life expectancy index is used in assessing changes in the health status of Kurdistan Province community, Iran, especially among the elderly, the difference in the health levels of women and men, and also the economic levels and the desired changes. This study aimed to evaluate the life expectancy in the age groups in Kurdistan Province using demographic information and mortality based on age and sex during the years 2006 and 2016.

**METHODS:** In this study, life expectancy was used for calculating life table according to the World Health Organization (WHO). Death information was extracted based on age groups and using demographic data of the statistical centers; in addition, the raw mortality rate was extracted according to age groups and calculated using Chiang method in the stage of life expectancy by sex and location. To analyze the data, Stata 12 and Excel software packages were used for calculations.

**RESULTS:** Life expectancy at birth in Kurdistan Province in the whole population was equal to 74.56 and 78.31 years in 2006 and 2016, respectively, and this rate was higher among women compared to men.

**CONCLUSION:** Extensive factors including medical and health status, well-being, nutrition status and quality, etc., affect the life expectancy index in different societies, and promotion of each criterion increases the life expectancy. It is necessary to establish required fields for establishing these indicators at the provincial level by creating a complete and accurate record of mortality and illness.

**KEYWORDS:** Hope, Life Expectancy, Health Levels

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### Introduction

The existence of accurate mortality data in every community is essential in order to evaluate health system plans to precisely determine and control various diseases and injuries, and this information can be useful for health changes and health transition to

other levels.<sup>1</sup>

One of the important tools in demography is the life table, which have been provided with many demographic indicators. Although the life table has been prepared for mortality rate and other criteria, it is currently used to describe and analyze many fields including demography, public health, economics, population geography, biology, and employment.<sup>2</sup>

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Raw and specific death rates alone cannot reflect the level of mortality of a community. Hence, an appropriate indicator for this purpose is the life expectancy defined in a population as the average of the remaining years of life of individuals at a certain age. This indicator is usually calculated for both men and women using the age table, in addition, income and literacy indicators are introduced along with this indicator as indices of development.<sup>3</sup> The life expectancy index is used to assess changes in the health status of the community, especially among the elderly and the difference in the health levels of women and men regarding the economic levels and the desired changes.<sup>4</sup>

Recently, the life expectancy among the Western societies has grown much higher compared to the past decades, and this dramatic increase over the past century has been one of the great achievements of societies.<sup>5</sup> Various studies have examined the life expectancy in different countries worldwide, which have shown different results from the hope of life in different parts of the world.<sup>1</sup> In the life expectancy calculations of the year 2010, the American population had a life expectancy of 78.80 years.<sup>6</sup> Between 1970 and 2009, the average lifespan in Europe ranged from 68.70 to 78.00 years and from 74.90 to 83.50 years among men and women, respectively.<sup>5</sup>

According to the World Health Organization (WHO), the lowest and highest life expectancy at birth in 1997 was 41 and 80.00 years for the African country of Guinea-Bissau and Japan, respectively; Iran ranked 80<sup>th</sup> in terms of life expectancy among 192 countries.<sup>1</sup> This important health and biological index is estimated to be between 80.00 and 85.00 years for developed countries. On a global scale, life expectancy among women is usually higher compared to men.<sup>3</sup>

An estimate of life expectancy for the Iranian population was carried out at the national and international levels. For example,

life expectancy at birth was directly measured among men and women as respectively 55.10 and 56.30 years for the year 1972 by Tehran University of Medical Sciences, Tehran, Iran;<sup>6,7</sup> moreover, health assessment for 2000 individuals was conducted by the Ministry of Health, Treatment and Medical Education in 1996. Life expectancy was 68.00 and 70.00 years for men and women, respectively.<sup>8,9</sup> Unfortunately, these estimates have not been available for Kurdistan Province, Iran, recently, however according to the latest estimates, Kurdistan Province was among the provinces with the lowest rates of life expectancy.

Considering that the life expectancy index is one of the population summary measures and the time trend of changes is the main result of the performance of the health system and the implementation of health policies, and since no study has been performed so far in Kurdistan Province, the present study was carried out aiming to estimate the life expectancy in Kurdistan Province, which was conducted in 2008 and 2013.

## Materials and Methods

This study was a cross-sectional descriptive study. The study subjects included Kurdistan Province population in 2006 and 2016. To investigate, all deaths were considered in these years and they were taken into account in the study. The reason for choosing these years was that there were almost 5-year intervals between the calculations.

In this study, life expectancy was used by the WHO using the recommended method for calculating life table. For each death according to the place of occurrence (hospital, home), a certificate of death in four forms should be completed at the place by the physician, one copy of which would be completed with the local registration office, a copy for burying permission, a copy for the patient's case, and the fourth copy had to be sent to the health center. In places where the unofficial disaster

exists and the death certificate is not completed, there are web forms that were ultimately completed for each death case and the information on this form and the death certificate was recorded monthly in the mortality registration system of the city. Then, this information was sent seasonally to the provincial health center and was reviewed at the health center of the province and, if necessary, the defects were modified. Finally, the province's data were integrated together. Accordingly, the mortality data of these years were released.

The data were refined by the student and the required information was converted to the desired format. Population demographic data were purchased from the Bureau of Statistics of Iran in different years and, if necessary, computational methods were used for the years when the census was not performed.

In this study, a more common summary table of life was used. First, death rates were calculated for age groups. The age groups in this table included 0 to 11 months, 1 to 4 years, and then age groups ranging from 5 to older than 85 years.

The columns in this table are as follows:

- First column (X): the first year of each age group
- Second column (n): the interval between each age group
- Third column (nPx): population of the age group in the middle of the year
- Fourth column (nDx): the number of deaths in the age group in the target year
- Fifth column (nMx): age-specific mortality rate in the target year as the fourth column divided by the third column.
- Sixth column (a): A fraction of the interval between the age group during which the individuals have died. This fraction was considered for all age groups except for 0.5 and the first group was considered. This means that individuals who have died in any age group have lived on average 2.5 years out

of a 5-year interval of that age group. In the first age group, due to the fact that the probability of death under one year in the first months of life is higher, its value is less than 0.5.

This value is 0.3 and 0.1 in societies with high and low mortality rates, respectively. A value of 0.4 was considered for the parameter a for the second age group, which is more likely to die at the lower ages.

- Seventh column (nqx): the probability of incidence of death at the age range of x and x + n. This probability was calculated from the following equation:

$$(1-3) \\ l_x = l_{x-n} \cdot n P_{x-n}$$

Then, the survival curve of the community was presented according to this information. The survival curve shows what part of a hypothetical group is in what age.

- Eighth column (ndx): The number of individuals who died between age x and x + n. This value was calculated from the following equation:

$$(2-3) \\ ndx = l_x \cdot nqx$$

Given that all individuals in the last age group have died,  $dx + = 1x$

- Ninth column (nLx): The total number of years the individuals lived between x and x + n. Individuals who have lived all this interval ( $l_x + n$ ) are all the interval to the living area ( $n + 1x + n$ ), and individuals who died at that interval (ndx) lived a fraction of this interval ( $n \cdot nax \cdot ndx$ ); Therefore, the value of this column was obtained from the following equation:

$$(3-3) \\ nL_x = n(l_x + n + nax \cdot ndx)$$

For the last age group, the value of this column was obtained from the following equation:

$$(4-3) \\ L_{85+} = d_{85+} / M_{85+}$$

The value of this column is used to calculate the general health indicators of the community.

- Tenth column ( $T_x$ ): Total number of years Individuals lived after age  $x$ . For the last age group

(5-3)

$$T_{85+} = L_{85+}$$

And for other age groups:

(6-3)

$$T_x = T_{x+n} + nL_x$$

- Eleventh column ( $e_x$ ): Life expectancy at age  $x$  was derived from the following:

(7-3)

$$e_x = T_x / l_x$$

Finally, the life expectancy for each age group was calculated.

Death information was extracted based on age groups and using demographic data of the statistical center, in addition, the raw mortality rate was extracted according to age groups and calculated by the Chiang method in the stage of life expectancy by sex and location.<sup>10</sup> The demographic data were obtained from the Statistics Bureau of Iran in different years.

## Results

According to the results, the number of deaths in 2006 and 2016 was 6728 and 6812, respectively. Of the deaths occurred in 2006, 3443 and 3285 individuals were urban and rural, respectively. In addition, of this rate, 2588 and 4140 were women and men, respectively. Moreover, of the deaths occurred in 2016, 4410 and 2240 were urban and rural, respectively, in addition, 2908 and 3904 were women and men, respectively. In 2006, the mean life expectancy of the age group of 1-4 years was 74.77 and 77.40 years for men (Figure 1) and women (Figure 2), respectively. The mean life expectancy of the age group of 1-4 years was 76.46 years in both sexes and

74.56 years in the age group less than 1 year old (at birth) (Figure 3).

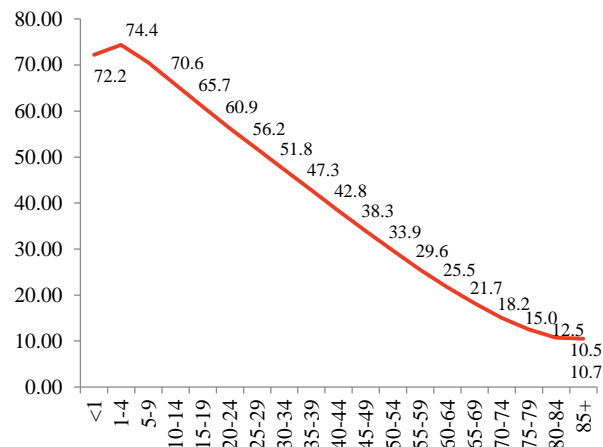


Figure 1. Life expectancy calculations among men by age group in Kurdistan Province, Iran, in 2006

In calculations related to 2016, the mean life expectancy at birth was 76.93 and 66.69 years among men and women, respectively (Figure 4).

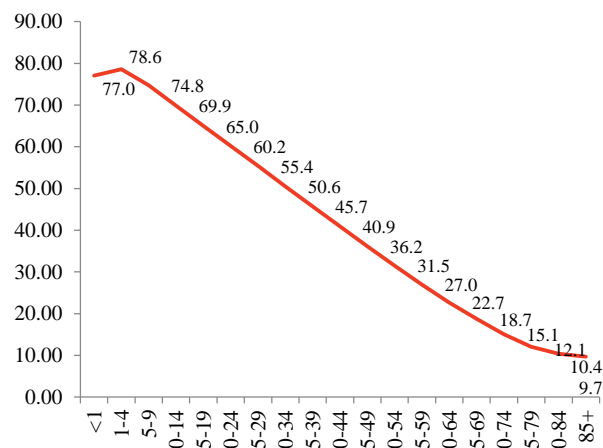
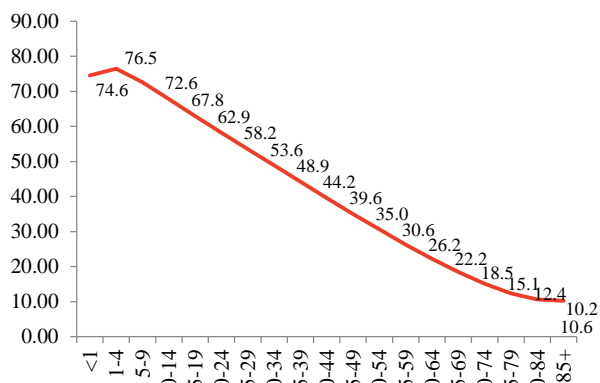
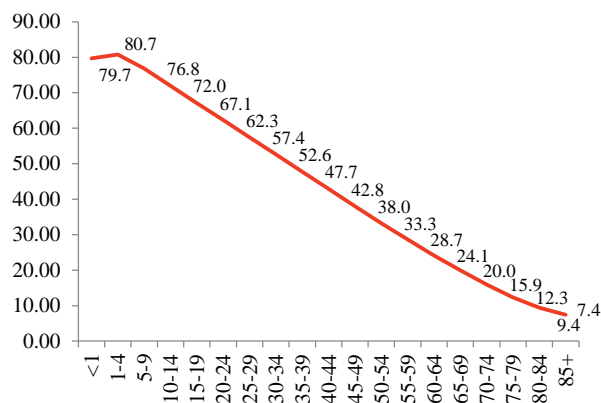


Figure 2. Life expectancy calculations among women by age group in Kurdistan Province, Iran, in 2006

The mean life expectancy of the age group of 1-4 years was 79.66 years among both sexes (Figure 5), in addition, the age group less than 1 year (at birth) was calculated as 78.31 years (Figure 6).



**Figure 3. Life expectancy calculations among both sexes by age group in Kurdistan Province, Iran, in 2006**

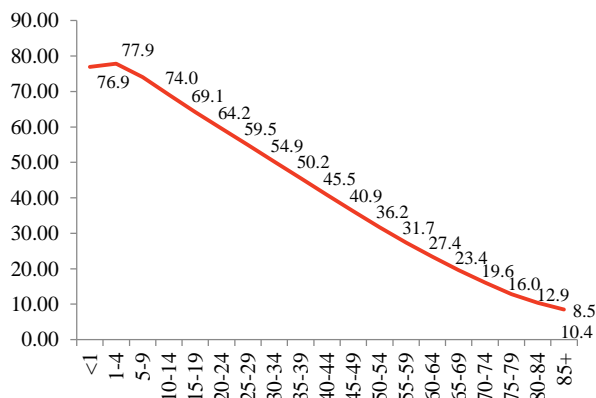


**Figure 5. Life expectancy calculations among women by age group in Kurdistan Province, Iran, in 2016**

### Discussion

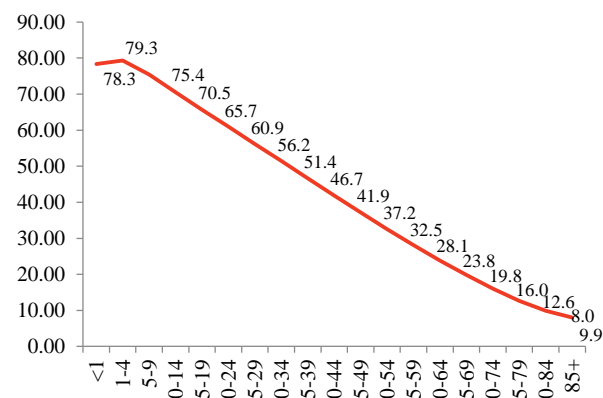
In recent decades, the world has witnessed an increase in life expectancy. The increase in life expectancy is not limited to advanced countries, and has also been observed in developing countries in the second half of the twentieth century.

Recent studies on life expectancy and well-being have shown that increased life expectancy was not associated with the same trend in disability-adjusted life expectancy (DALE),<sup>12,13</sup> in contrast to life expectancy, the proportion of years with chronic diseases, disability and social and economic disadvantages.<sup>14-18</sup>



**Figure 4. Life expectancy calculations among men by age group in Kurdistan Province, Iran, in 2016**

According to the United Nations Organization (UN) estimates, Latin American countries showed an increase of 14 years between the years 1950 and 2000.<sup>9</sup> Reducing deaths at young ages, increasing longevity, reducing fertility, and increasing chronic illnesses with the demographic changes of society have emerged as new challenges.<sup>11</sup>



**Figure 6. Life expectancy calculations among both sexes by age group in Kurdistan Province, Iran, in 2016**

Progress in technology to save lives provides appropriate medical services and has contributed to a contradictory increase in the incidence of chronic diseases.<sup>15-21</sup>

The results of this study showed that the life expectancy in Kurdistan Province in the age group of 1-4 years had highest rate among the different age groups and also among the



two sexes. The age group of less than 1 year accounted for the second highest rate among the other age groups and for both sexes. An increase in the life expectancy rate from birth to 1 year is observed when the proportion of deaths under 1 year to 1 to four years was relatively high.<sup>1,22-26</sup>

Similar increase was observed for lifetime table that was estimated by School of Public Health and the Institute of Health Research of the University of Tehran, Iran in 1974,<sup>27</sup> WHO in 1999,<sup>28</sup> 2000 and 2001,<sup>29</sup> by USA life schedule in 1960,<sup>30</sup> and by India in 1996.<sup>31</sup> In addition, a greater life expectancy was also obtained for women compared to men.<sup>24,30,32,33</sup> In addition, the results of the study showed a significant increase of at least three years in the life expectancy of the year 2016 compared to 2006.

The life expectancy at birth in Kurdistan province among the whole population was 74.56 and 78.31 years in 2006 and 2016, respectively, and this rate was higher among women in comparison with men. One of the possible reasons for the increase in the life expectancy can be the improvement and development of health care services, the reduction of mortality among children under 1 year, the growth of literacy and higher education in the province, and especially among women, the establishment and development of infrastructures. Moreover, the probable reasons for higher levels of women's life expectancy than men can be attributed to men's physiological sensitivity to diseases, risky behaviors, increased exposure to environmental pollutants, unsafe conditions of work, stress and care seeking differentiation.<sup>34-36</sup>

Comparing the results of this study with the previous estimates on the region and the latest estimates of the country indicate an increase in life expectancy in the province. An estimate of life expectancy for the Iranian population was carried out at the national and international levels. For example, life expectancy at birth was directly measured as 55.10 and 56.30 years

in 1972 respectively among men and women by Tehran University of Medical Sciences.<sup>37</sup>

In addition, in the health assessment for the whole population in the country by 2000, which was conducted by the Ministry of Health, Treatment and Medical Education in 1996, the life expectancy was obtained as 68.00 and 70.00 years for men and women, respectively.<sup>38</sup> According to the WHO report in 2012, life expectancy at birth in Iran was 72.00 and 76.00 years for men and women, respectively. Therefore, according to the results of the present study, the life expectancy at birth in 2017 was 76.93 and 66.69 years among men and women, respectively. These two values were nearly 5 and 7.7 years higher than the total life expectancy in the whole country.

Compared to the international level, life expectancy is lower for both men and women, as a survey in 2012 revealed that the highest life expectancy for men in Iceland was observed in the age range of 81.2 years old and the highest life expectancy for women in Japan was observed in the age range 87 years old.<sup>37</sup>

Comparing the life expectancy of this study with the those in other provinces of the country, it was found that life expectancy in Kurdistan province in 2006 was higher than the life expectancy of Chaharmahal and Bakhtiari Province, Isfahan Province, and Khuzestan Province with 55.70 and 74.80 years, 73.70 and 75.70 years, and 74.30 and 72.70 years, for men and women, respectively. Life expectancy in Kurdistan province was also higher compared to Kohgiluyeh and Boyer-Ahmad and Lorestan provinces.<sup>26</sup>

## Conclusion

Extensive factors including medical and health status, well-being, nutrition status and quality, etc., affect the life expectancy index in different societies, and promotion of each criterion increases the life expectancy. In order to measure the impact of health programs in the community, it is necessary to calculate the life

expectancy and DALE and establish the required field for determining these indicators in Kurdistan province by establishing a complete and accurate registration system for mortality and illness rates.

### Conflict of Interests

Authors have no conflict of interests.

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