Life Expectancy at Birth in Iran and Asia: A Six-Decade Comparative Trend Analysis

Masoud Salehi

Iran University of Medical Sciences: Tehran University of Medical Sciences

Mehdi Aziz-Mohammadlooha

Shahid Beheshti University of Medical Sciences School of Paramedical Sciences

Fatemeh Masaebi

Shahid Beheshti University of Medical Sciences School of Paramedical Sciences

Farid Zayeri (✉ fzayeri@gmail.com)

Shahid Beheshti University of Medical Sciences <https://orcid.org/0000-0002-7791-8122>

Research

Keywords: Life Expectancy, Iran, Asia, Trend analysis

Posted Date: August 25th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-812282/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

Abstract

Background: Life expectancy is one the key indicators for investigating the overall health status of a population. Thus, analyzing the trend of this demographic summary measure is of great importance for planning health and social services in different societies. In this study, we aimed to model the long-term trend of life expectancy at birth in Iran and also compare the pattern of life expectancy in Iran with the whole population across Asia over the past six decades.

Methods: The annual life expectancy at birth data sets were extracted for Iran and total Asia between 1960 and 2020 from the database provided by the *Our World in Data* website. The trend analysis was performed using the joinpoint regression model.

Results: During the study period, Iranians and Asians have, respectively, experienced about 32 and 28.6 year increase in life expectancy. In addition, the obtained results from the joinpoint analysis showed that, despite the noticeable decline in life expectancy during the Iran-Iraq war, the average annual percent change of life expectancy in Iranian people was about 0.1 higher than total Asian population (0.9% vs. 0.8%).

Conclusions: Despite protracted wars, poverty and social inequality in some parts of Asia, life expectancy has drastically increased in this continent during the last decades. However, life expectancy in Iranians and Asians is still much lower than those who live in wealthier parts of the world. To elevate life expectancy to a higher level, the policy makers in Asian countries should put more efforts into improving the standards of living and access to health facilities in their societies.

Background

Life expectancy (LE) is one of the most important measures for assessing health status in different populations. It estimates the average number of additional years that an individual of a given age is expected to live. Life expectancy at birth (LEB) is the most commonly used metric which is defined as the average number of years a newborn is expected to live if the current age-specific mortality rates at the time of its birth do not change in the upcoming years (1). As another indicator, some researchers use the healthy life expectancy (HALE) at birth (years) to measure the average number of years that a newborn could expect to live in "full health" by taking into account mortality and disability (2, 3). Recent reports show that the average LEB has doubled in the entire world from the beginning of the twentieth century (4). In addition, the World Health Organization (WHO) reports show about a 10% increase in the average LEB in the last two decades (from 66.8 years in 2000 to 73.4 years in 2019) (5).

Life expectancy in a population is related to its socio-economic condition, level of public health and health care resources (6). Regarding these influential factors, there are still remarkable disparities across and even within the world countries. According to the estimates in 2020, the average LEB was 79 years for males and 82 years for females in developed countries, while males and females had an average LEB of 69 and 73 in less developed territories, respectively (7). The reported estimates by the World Bank reveal a significant gap between different world regions based on the average LEB. For instance, countries in Sub-Saharan Africa had an average LEB of 62 years in 2019, while an average LEB of 81 years was reported for countries in the European Union region in the same year. Among the world countries, the lowest LEB estimates were reported for some African nations such as the Central African Republic, Chad, Lesotho, Nigeria, and Sierra Leone (all with an estimated LEB of less than 55 years) in 2019. In contrast, the highest LEB values were related to some high-income countries such as Hong Kong and Japan (about 85 years) in this year (8). As can be observed, there was an estimated gap of about 30 years in LEB between more developed countries and those in poorer areas of the world. As mentioned, these disparities can also be observed in different sub-populations within each world country. For instance, a study by Singh and Lee in the USA indicated that people with higher levels of education, lower poverty levels, professional or managerial occupations and those who were house owners had considerably higher LE than the others (9).

Previously, many researchers investigated the trend of LE and its determinants over the past few decades in our country, Iran. These studies have generally focused on different time intervals after Islamic Revolution in 1979 and all of them indicated an upward trend of life expectancy due to improvements in healthcare access and quality, literacy rate, and socioeconomic status (10–12). Regarding this, the novelty of the present research lies in achieving two main goals. First, to model the long-term trend of LEB in the Iranian population from two decades before the Islamic revolution (1960) to four decades after this historical event (2020). Second, to compare the trend of LEB in Iran and the total Asian population in the described period (1960–2020).

Methods

Data sources

In practice, there are two common methods for calculating life expectancy for different populations which lead to *cohort* and *period* life expectancy. The cohort life expectancy is commonly defined as the average life length of a particular cohort (for instance a group of

individuals who were born in a particular year). To calculate the *cohort* life expectancy at birth, we should follow a cohort of newborns in a specific year and record the exact date of death for each one of them. Then the cohort's life expectancy at birth can be easily calculated as the average ages of all participants. Alternatively, some researchers use a hypothetical cohort to estimate life expectancy. In this approach, we postulate that this hypothetical cohort is exposed to the observed death rates at a particular period of time (for example a year). The estimated life expectancy using this methodology is generally known as *period* life expectancy. Using the period approach is a more common methodology in estimating life expectancy because the cohort data may be inaccessible or incomplete. Most of the available data sources, such as those provided by the United Nations, World Bank, and World Health Organization, are based on the period life expectancy method. Here, it should be noted that in some circumstances, for instance when we wish to estimate life expectancy for world regions, computing the life expectancies based on either cohort or period data is almost impossible. In these cases, a combination of period and cohort data sets might be applied to construct the relevant life tables and estimate the related life expectancies (13, 14, 1).

The life expectancy data sets for all world countries and regions in different periods of time are available in some data sources provided by *Our World in Data*, *World Bank*, and *WHO*. Comparing the reported life expectancies in these data sets shows that the differences between these estimates are quite negligible. In the present study, we extracted the life expectancy data for Iranian and total Asian population in the period 1960–2020 from the data source provided by the *Our World in Data* (4).

Statistical analysis

In this study, we used the joinpoint regression analysis to model the pattern of changes in life expectancies at birth in Iran and total Asia by gender over the study period. To briefly describe this regression modeling approach, suppose a set of n observations $(t_1, y_1), (t_2, y_2), \dots, (t_n, y_n)$. The joinpoint regression model is a statistical tool for relating the study time points (t_i) with the response data (y_i) so that:

$$y_i = \beta_0 + \beta_1 t_i + \gamma_1 (t_i - \tau_1)^+ + \dots + \gamma_k (t_i - \tau_k)^+ + \varepsilon_i, \quad i = 1, \dots, n$$

where t_i indicates the study time points (1960, 1991, ..., 2020) and y_i represents the life expectancy data. The parameter τ_k ($k = 1, 2, \dots, K$) indicates the location of change points, K shows the number of change points, β_0, β_1 and $\gamma_1, \dots, \gamma_k$ are the regression parameters and ε_i is the residual term. The notation $(t_i - \tau_k)^+ = t_i - \tau_k$ if $t_i - \tau_k > 0$, and $(t_i - \tau_k)^+ = 0$ otherwise. After fitting the joinpoint regression model and estimating the described parameters, the Annual Percent Change (APC) from year τ_j to year $(\tau_j + 1)$ can be computed using the following formula:

$$APC = 100 \times (\exp(\beta_1 + \gamma_1 + \gamma_2 + \dots + \gamma_j) - 1)$$

In addition, the weighted mean of the estimated APCs can be reported as the Average Annual Percent Change (AAPC) (15). The joinpoint software version 4.8.0.1 was used to fit the joinpoint regression models and estimate the parameters (16).

Results

In this research, the LE data for Iranian and total Asian populations in 61 years (from 1960 to 2020) was analyzed. Table 1 shows the LE values for the Iranian and Asian populations by sex in the study period.

For Iranian male, female and total population, respectively 65.8%, 76.9%, and 71.2% rise in LE can be observed in this 60-year time interval. In the same time period, the Asian male, female and total population had experienced a 61.6%, 64.6%, and 63.2% increase in LE, respectively. Iranian people have experienced higher growth in LE than Asians in the last six decades (about 4.2%, 12.3%, and 8%, respectively for male, female and total population). Figure 1 displays the trend of LE in Iranian (Figure 1-a) and Asian (Figure 1-b) populations by sex over the period 1960-2020.

As a notable point in Figure 1, it can be seen that while all Asian populations (male, female and total) have experienced a continuous rise in LE, Iranian males (and subsequently total Iranian people) had a considerable fall in LE during the late seventies and early eighties followed by a remarkable increase until early nineties.

In the next step, we utilized the joinpoint regression analysis to model the trend of LE in Iran and the Asia continent in the study period. Table 2 and Figure 2 show the obtained results from fitting joinpoint regression models to the LE data by gender in Iranian and Asian populations.

The estimates for the Iranian male population show four joinpoints in 1969, 1976, 1983, and 1992. These joinpoints resulted in five segments with different LE patterns: (1) 1960-1969 with estimated APC of 1.0, (2) 1969-1976 with estimated APC of 1.8, (3) 1976-1983 with estimated APC of -2.9, (4) 1983-1992 with estimated APC of 4.2, and (5) 1992-2020 with estimated APC of 0.5. For Iranian females, a similar analysis led to five different joinpoints in 1971, 1980, 1986, 1992, and 2008. The estimated APCs for the corresponding segments were 1.4, 1.6, 1.2, 0.9, 0.7, and 0.4, respectively. Finally, the fitted regression model to the LE data in total Iranian population indicated five joinpoints with six segments: 1960-1969 with estimated APC of 1.2, 1969-1976 with estimated APC of 1.2, 1976-1983 with estimated APC of -0.9, 1983-1991 with estimated APC of 2.7, 1991-1995 with estimated APC of 1.2 and 1995-2020 with estimated APC of 0.5. Comparing these findings tells us that Iranian females have continuously experienced an incremental life expectancy with an average annual percent change of 1.0 in the study time period, while Iranian males (and subsequently total population) had a downward pattern between 1976 and 1983 followed by a sharp increase in the period of 1983-1992 (1983-1991). The average annual percent change of life expectancy for both male and total populations was 0.9, which means that Iranian people have annually experienced about a 1% rise in LE during the study period.

Unlike the estimated trends for Iranians, the Asian men, women, and total populations have experienced quite similar trends in the last six decades. For total Asian people, the joinpoint regression model showed five different joinpoints in 1962, 1969, 1975, 1985, and 2014. The estimated APCs for the corresponding segments were 1.2, 2.3, 1.2, 0.8, 0.5 and 0.3, respectively. The estimated AAPC of 0.8 for the total Asian population tells us that these people have annually experienced less than 1 percent increase in LE during the study period.

Discussion

In this study, we examined the six-decade (1960–2020) trend of LEB in Iran and compared this trend with the total Asian population. Overall, when we summarize the obtained findings via the estimated summary measure of AAPC, it can be concluded that both the Iranian and Asian populations have experienced a rather similar trend of LEB over the study period. On the other hand, a more precise comparison between these two trends indicates that Iranian males (and subsequently total Iranian population) have drastically experienced a downward LEB trend in the period of 1976–1983, while the Asian population had a rising trend of LEB with an annual percent change of 0.8 over the same time interval. This remarkable decrease in LEB of the Iranian population is directly the consequence of the revolutionary struggles in Iran and the beginning of the Iran-Iraq war in 1980.

A quick look at the reported life expectancies in the results section reveals that Iranian people have experienced about 32 years increase in LEB during the study period. Now, to describe our findings from another point of view, we can divide the study period into two different time intervals: before and after the victory of the Islamic revolution and the beginning of the Iran-Iraq war (i.e. 1960–1980 and 1980–2020). When we compare the LEB estimates between 1980 and 1960, 9.8%, 34.4%, and 20.4% increase can be observed, respectively in males, females, and the total Iranian population. Moreover, comparing the LEB estimates between 1980 and 2020 tells us that Iranian male, female and total populations have experienced about 51.0%, 31.6%, and 42.2% rise in LEB, respectively. It seems the sharper increasing slope of LEB in Iranian men compared to Iranian women from 1980 to 2020 has compensated for the considerable gap between males and females in 1980. In other words, an estimated difference of more than 9 years in LEB in 1980 has changed to about 2 years difference in 2020. These findings are completely in line with a research by Sepanlou et al. based on the reported data from the Global Burden of Disease (GBD) 2015 study (11). In addition, our reported LEB values are quite similar to those presented by other studies which used different data sets (for example national and subnational data sources) to estimate or predict life expectancy in the Iranian population (10, 12). Regardless of the destructive effect of the Iran-Iraq war on life expectancy in the early 80, the rising trend of life expectancy in Iran could be attributed to several factors such as launching a reformed primary health care system (PHC) after the Islamic revolution which decreased health inequality between urban and rural populations, increased socio-economic growth and literacy, improvement in access to health insurance, safe water, and sanitation as well as a decreased rate of malnutrition (10, 12, 17–19).

According to the presented LEBs, we can observe that the total Asian population has experienced about 28.6 years rise in life expectancy from 1960 to 2020. In addition to the identical average annual percent changes for both Asian genders (AAPC = 0.8), comparing the estimated APCs in different time intervals shows rather similar values for males and females. However, a closer look at the LEBs shows that Asian women had about 1.8 years higher life expectancy than Asian men in 1960, while this difference has increased to 4.3 years in 2020. As another noticeable result, although the Asian population has continuously experienced an upward trend of LEB over the 60-years study period, comparing the estimated APCs in different time intervals demonstrates that the steepest slope of trend has occurred in the 60s. Afterward, a sharp decrease could be seen in slopes of the trend until the ending point of the study (from APC of 2.3 in the 60s to APC of 0.3 in the last decade of the study). This upward trend of life expectancy at birth in Asian territories reflects remarkable declines in death rates,

especially among mothers, newborns, and infants during the previous decades. Along with wider access to health services, improved lifestyles and living standards, better access to healthy food, drinking water, and sanitation facilities, increased rate of educated people are some of the most important indicators of this gain in longevity in the whole population across Asia (11, 20–22).

Now, it is time to compare the trend of LEB in Iran and Asia using the obtained estimates from the joinpoint regression analysis. At first glance, the estimated AAPCs look quite similar in both Iranian and Asian populations (respectively, 0.9 and 0.8). It means that Iranian and total Asian people have annually experienced less than one percent increase in LEB over the past six decades. However, some apparent discrepancies between the observed LEBs and estimated APCs for Iran and Asia could be discovered with a more precise comparison. First, in 1960 Asian people had about 0.3 year higher LEB than Iranians and this difference reached more than 6 years in 1980 and then decreased to about 0.4 year in 1990. From the early 90s, the situation was reversed in favor of Iranians so that Iranian people had a LEB of more than 3 years higher than Asians at the ending point of the study. Second, while Asians had continuously positive slopes of the trend over the study period, Iranians have experienced a negative slope during 1976–1983 as a direct consequence of the Iran-Iraq war. Third, the highest slope of LEB growth in Asian populations has occurred in the sixties (APC of 2.3), while Iranians have witnessed the highest increasing slope in the period 1983–1991 (APC of 2.7). Although, this remarkable rise in LEB during the 60s could be a direct result of the above-mentioned factors in Asia, the extraordinary upward slope of trend during the 80s in Iran might be related to some other causes. Following the Islamic revolution in 1979 and the start of the Iran-Iraq war, the revolutionary government decided to launch new policies which encouraged marriage at younger ages and child-bearing. These policies along with an influx of Afghan refugees raised the level of fertility significantly and led to the highest population growth rate of more than 4 percent from 1980 to 1986 in Iran (23–26).

In this study, we analyzed the LEB data in the period 1960–2020 to investigate the long-term trend of this vital health metric in the Iranian population. To do this, we also used similar data from the whole population as the comparison group. To our knowledge, this is the first work in this field that applies powerful inferential statistical methods for discovering the pattern of changes in LEB and identifying the trend parameters in different time intervals. However, our statistical analysis (joinpoint regression model) does not allow us to assess the effect of different related factors (such as socio-economic variables and health indices) on the trend of LEB. This can be considered as one of the most important limitations of the present study. As another limitation of the present work, it should be noted that the published similar works in this field have generally applied descriptive statistical methods to represent the pattern of LEB in different parts of the world. Since we interpreted our findings according to inferential indices such as APC and AAPC estimates, comparing these analytic measures with descriptive statistics was rather impossible.

Conclusions

In general, our findings revealed that life expectancy at birth in Iran has increased about 32 years between 1960 and 2020, while total Asian population have experienced less than 29 years rise in LEB during the same period of time. Comparing the pattern of change in LEB in Iran and Asia shows that Iranians have witnessed a sharper increasing trend than total Asian population over the past six decades, except during a seven-year period in late 70s and early 80s. However, the LEB in Iran and Asia is still lower than some other parts of the world such as northern America, Oceania and Europe. In order to elevate life expectancy to a higher level, the policy makers in Iran and Asian countries should put more efforts on promoting the quality of health systems, fair distribution of wealth, improvement in access to health facilities and providing proper nutrition in the upcoming decades.

Abbreviations

Life expectancy: LE; Life expectancy at birth: LEB; Healthy life expectancy: HALE; World Health Organization: WHO; Annual Percent Change: APC; Average Annual Percent Change: AAPC; Global Burden of Disease: GBD; Primary Health Care System: PHC;

Declarations

Acknowledgements

The proposal of this research project has been approved by the Faculty of Allied Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran (Project Code: 26472). The authors would like to express their gratitude to the Research Deputy of this faculty for the facilitation of the process to conduct the present study.

Authors' contributions

MS wrote the manuscript and participated in data analysis. MAM and FM extracted and analyzed the data and participated in writing the initial draft of the manuscript. FZ was the supervisor of the research. All authors read and approved the final manuscript.

Funding

No financial support was received for this research.

Availability of data and materials

We confirm that all methods were performed in accordance with the relevant guidelines and regulations. The datasets analysed in the current study are available at: <https://ourworldindata.org/life-expectancy>.

Ethics approval and consent to participate

In this study, we used a freely available data from the *Our World in Data* website, thus the requirement for informed consent was waived. The ethical aspects of the present study were approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (Ethics code: IR.SBMU.RETECH. REC. 1399.1139).

Consent for publication

In this study, we extracted the life expectancy estimates from the *Our World in Data* website and cited according to the proposed format of this database.

Competing interests

The authors declare that they have no competing interests.

Author details

¹Health Management and Economics Research Centre and Department of Biostatistics, School of Public Health, Iran University of Medical Sciences, Tehran, Iran. ²Department of Biostatistics, School of Allied Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran. ³Proteomics Research Center and Department of Biostatistics, School of Allied Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

References

1. Bilas V, Franc S, Bošnjak M. Determinant factors of life expectancy at birth in the European Union countries. *Coll Antropol*. 2014;38(1):1–9.
2. Sullivan DF. A single index of mortality and morbidity. *HSMHA Health Rep*. 1971;86(4):347–54.
3. Sullivan DF. Disability components for an index of health. *Vital Health Stat 2*. 1971;42:1–40.
4. Roser M, Ortiz-Ospina E, Ritchie H. Life Expectancy. Published online at OurWorldInData.org. 2013. <https://ourworldindata.org/life-expectancy>. Accessed 15 Jan 2021.
5. World Health Organization. The global health observatory. <https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates/ghe-life-expectancy-and-healthy-life-expectancy>. Accessed 15 Jan 2021.
6. Ho JY, Hendi AS. Recent trends in life expectancy across high income countries: retrospective observational study. *BMJ*. 2018;362. doi:10.1136/bmj.k2562.
7. Szmigiera M. Average life expectancy in industrial and developing countries for those born in 2020, by gender (in years). <https://www.statista.com/statistics/274507/life-expectancy-in-industrial-and-developing-countries/>. 2021; Accessed 20 Jun 2021.
8. The World Bank Group. Life expectancy at birth, total (years). <https://data.worldbank.org/indicator/SP.DYN.LE00.IN>. Accessed 15 Jan 2021.
9. Singh GK, Lee H. Marked Disparities in Life Expectancy by Education, Poverty Level, Occupation, and Housing Tenure in the United States, 1997-2014. *Int J MCH AIDS*. 2021;10:7-18.
10. Delavari S, Zandian H, Rezaei S, Moradinazar M, Delavari S, Saber A, et al. Life Expectancy and its Socioeconomic Determinants in Iran. *Electron Physician*. 2016; 8(10):3062-8. doi:10.19082/3062.
11. Sepanlou SG, Parsaeian M, Krohn KJ, Afshin A, Farzadfar F, Roshandel G, et al. Disability-adjusted life-years (dalys) for 315 diseases and injuries and healthy life expectancy (HALE) in Iran and its neighboring countries, 1990-2015: Findings from Global Burden of Disease study 2015. *Arch Iran Med*. 2017;20:403-18.

12. Ebrahimi N, Mehdipour P, Mohebi F, Ghanbari A, Azmin M, Farzadfar F. Improved population health in Iran from 1979 to 2019; Decreasing mortality rates and increasing life expectancy. *Arch Iran Med*. 2020;23(2):61–8.
13. Riley JC. Estimates of Regional and Global Life Expectancy, 1800–2001. *Popul Dev Rev*. 2005;31(3):537–43. doi:10.1111/j.1728-4457.2005.00083.x.
14. Perron L, Simard M, Brisson J, Hamel D, Lo E. Standard period life table used to compute the life expectancy of diseased subpopulations: more confusing than useful. *Am J Public Health*. 2017;107:1615–20. doi: 10.2105/AJPH.2017.303932.
15. Kim HJ, Fay MP, Yu B, Barrett MJ, Feuer EJ. Comparability of segmented line regression models. *Biometrics*. 2004;60(4):1005-14.
16. National Cancer Institute. Joinpoint Trend Analysis Software, Version 4.8.0.1. National Cancer Institute, Division of Cancer Control & Population Sciences. 2020. <https://surveillance.cancer.gov/joinpoint/>. Accessed 1 Jan 2021.
17. Naghavi M, Shahrzad S, Sepanlou SG, BESc PN, Pourmalek F, Lozano R, et al. Health transition in Iran toward chronic diseases based on results of Global Burden of Disease 2010. *Arch Iran Med*. 2014;7(5):321-35.
18. Moradi-Lakeh M, Esteghamati A. National Immunization Program in Iran: whys and why not. *Hum Vaccin Immunother*. 2013;9(1):112-4. doi: 10.4161/hv.22521.
19. Mohammadi Y, Parsaeian M, Mehdipour P, Khosravi A, Larijani B, Sheidaei A, et al. Measuring Iran's success in achieving Millennium Development Goal 4: a systematic analysis of under-5 mortality at national and subnational levels from 1990 to 2015. *Lancet Glob Health*. 2017;5(5):e537-e544. doi:10.1016/S2214-109X(17)30105-5.
20. Bayati M, Akbarian R, Kavosi Z. Determinants of life expectancy in eastern mediterranean region: A health production function. *Int J Health Policy Manag*. 2013;1(1):57-61. doi: 10.15171/ijhpm.2013.09.
21. Chan MF, Kamala Devi M. Factors affecting life expectancy: evidence from 1980-2009 data in Singapore, Malaysia, and Thailand. *Asia Pacific J Public Health*. 2015;27(2): 136-146. doi:10.1177/1010539512454163.
22. Lin R-T, Chen Y-M, Chien L-C, Chan C-C. Political and social determinants of life expectancy in less developed countries: A longitudinal study. *BMC Public Health*. 2012;12:85. doi:10.1186/1471-2458-12-85.
23. Aghajanian A. Population change in Iran, 1966-1986: a stalled demographic transition? *Popul Dev Rev*. 1999;17:703-15.
24. Aghajanian A, Mehryar AH. Fertility transition in the Islamic Republic of Iran: 1976-1996. *Asia Pac Popul J*. 1999;14(1):21-42.
25. Abbasi-Shavazi MJ, McDonald P, Hosseini-Chavoshi M. *The Fertility Transition in Iran: Revolution and Reproduction*. Springer; 2009.
26. Malekafzali H. Population Control and reproductive health In the Islamic Republic of Iran *Arch Iran Med*. 2004;7(4):247-50.

Tables

Table 1. Life expectancy of the Iranian population (by gender) and Asia

Location	Gender	Year												
		1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015	2020
Iran	Male	45.71	47.95	50.78	55.41	50.18	48.92	61.65	67.98	69.26	70.44	72.48	74.76	75.78
	Female	44.15	47.49	50.94	55.00	59.33	63.16	66.26	68.75	71.13	73.50	75.43	76.92	78.09
	Total	44.95	47.73	50.86	55.26	54.11	55.20	63.84	68.38	70.18	71.92	73.91	75.80	76.93
Asia	Male	44.36	48.45	53.67	56.79	59.04	61.07	62.73	64.04	65.72	67.45	69.02	70.55	71.69
	Female	46.18	50.52	55.94	59.08	61.82	64.05	65.88	67.60	69.27	71.02	73.02	74.84	76.02
	Total	45.24	49.46	54.78	57.90	60.39	62.51	64.25	65.75	67.43	69.18	70.95	72.62	73.85

Table 2. Joinpoint regression estimates for life expectancy data in the Iranian population and Asia from 1960 to 2020

Location	Trend	Total		Male		Female	
		Year	APC (95 % CI)	Year	APC (95 % CI)	Year	APC (95 % CI)
Iran	Trend 1	1960-1969	1.2* (1.1, 1.3)	1960-1969	1.0* (0.9, 1.1)	1960-1971	1.4* (1.4, 1.4)
	Trend 2	1969-1976	1.7* (1.5, 1.8)	1969-1976	1.8* (1.5, 2.0)	1971-1980	1.6* (1.5, 1.6)
	Trend 3	1976-1983	-0.9* (-1, -0.8)	1976-1983	-2.9* (-3.2, -2.7)	1980-1986	1.2* (1.2, 1.3)
	Trend 4	1983-1991	2.7* (2.6, 2.8)	1983-1992	4.2* (4.0, 4.4)	1986-1992	0.9* (0.8, 0.9)
	Trend 5	1991-1995	1.2* (0.8, 1.5)	1992-2020	0.5* (0.5, 0.5)	1992-2008	0.7* (0.7, 0.7)
	Trend 6	1995-2020	0.5* (0.5, 0.5)	—	—	2008-2020	0.4* (0.3, 0.4)
	AAPC	1960-2020	0.9* (0.9, 9.0)	1960-2020	0.9* (0.8, 0.9)	1960-2020	1.0* (0.9-1.0)
Asia	Trend 1	1960-1962	1.2* (1.0, 1.4)	1960-1963	1.5* (1.3, 1.7)	1960-1962	1.2* (0.9, 1.5)
	Trend 2	1962-1969	2.3* (2.2, 2.3)	1963-1969	2.3* (2.2, 2.4)	1962-1969	2.3* (2.2, 2.3)
	Trend 3	1969-1975	1.2* (1.1, 1.2)	1969-1975	1.2* (1.1, 1.3)	1969-1975	1.1* (1.1, 1.2)
	Trend 4	1975-1985	0.8* (0.7, 0.8)	1975-1985	0.7* (0.7, 0.7)	1975-1984	0.8* (0.8, 0.9)
	Trend 5	1985-2014	0.5* (0.5, 0.5)	1985-2013	0.5* (0.5, 0.5)	1984-2015	0.5* (0.5, 0.5)
	Trend 6	2014-2020	0.3* (0.3, 0.4)	2013-2020	0.3* (0.3, 0.4)	2015-2020	0.3* (0.3, 0.4)
	AAPC	1960-2020	0.8* (0.8, 0.8)	1960-2020	0.8* (0.8, 0.8)	1960-2020	0.8* (0.8, 0.8)

Figures

A

B

Figure 1

Trend of life expectancy at birth in (a) Iran, and (b) Asia by gender over the time-period 1960-2020

A

B

Figure 2

Results of joinpoint regression analysis for estimating the trend of life expectancy at birth in (a) Iran, and (b) Asia by gender over the time-period 1960-2020