Original Article

Health Transition in Iran toward Chronic Diseases Based on Results of Global Burden of Disease 2010

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See the pages: 302 – 303, 304 – 320, 336 – 342

Abstract

Background: Drawing on the results of the country-level Global Burden of Diseases, Injuries, and Risk Factors 2010 Study, we attempted to investigate the drivers of change in the healthcare system in terms of mortality and morbidity due to diseases, injuries, and risk factors for the two decades from 1990 to 2010.

Methods: We decomposed trends in mortality, cause of death, years of life lost due to disability, disability-adjusted life years (DALYs), life expectancy, health-adjusted life expectancy, and risk factors into the contribution of total increase in population size, aging of the population, and changes in age-specific and sex-specific rates.

Results: We observed a decrease in age-specific mortality rate for both sexes, with a higher rate for women. The ranking of causes of death and their corresponding number of years of life lost remained unchanged between 1990 and 2010. However, the percentages of change indicate patterns of reduction for most causes, such as ischemic and hemorrhagic stroke, hypertensive heart disease, stomach cancer, lower respiratory infections, and congenital anomalies. The number of years lost due to disability caused by diabetes and drug use disorders has significantly increased in the last two decades. Major causes of DALYs, such as injuries, interpersonal violence, and suicide, showed increasing trends, while rates of communicable diseases, neonatal disorders, and nutritional deficiencies have declined significantly. Life expectancy and health-adjusted life expectancy increased for both sexes by approximately 7 years, with the highest rate of increase pertaining to females over the age 30.

Conclusions: Time trend information presented in this paper can be used to evaluate problems and policies specific to medical conditions or risk factors. Despite recent improvements, implementing policies to reduce the number of deaths and years of life lost due to road traffic injury remains the highest priority for Iranian policymakers. Immediate action by Iranian researchers is required to match Iran's decreasing mortality rate due to liver and stomach cancers to a rate comparable to the global level. Prevention and treatment plans for mental disorders, such as major depressive disorder, anxiety disorder, and particularly drug use disorders, should be considered in reforms of the health, education, and judiciary systems in Iran.

Keywords: Disability, healthcare system, global burden of diseases (GBD), Iran, life expectancy

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Introduction

In the last five decades, from 1960 – 2010, Iran has faced significant economic and social changes. The eight-year Iran-Iraq war, starting 2 years after a major regime change in Iran, left behind more than 200,000 dead, and more than half a million injured. Two devastating earthquakes with over 100,000 fatalities, continuous fluctuation of oil prices, and three decades of international, political, and economic sanctions have drastically affected the society.

A rapid and significant decrease in fertility, increasing urbanization, and increasing population age were three main factors affecting Iran's public health. Total fertility rate dropped from 6.5 children per fertile woman in 1976 to 1.9 in 2006.[1] Urbanization fraction increased from 47% to 71.4%. Similarly, the median population age increased by 10 years over the last 30 years.[2]

Between 1976 and 1988, Iran's gross domestic product (GDP) dropped by more than 50%. This trend continued until 2006, at which point the GDP returned to its 1978 value. Iran's high inflation rate is a continuous challenge that weakens the economy. Similarly, health care consumer price index (CPI) rose by 60% from 1984 to 2007. Out-of-pocket payment has remained as high as 55% or greater since the year 2000.[3] The total health expenditure proportion of GDP was in a fairly stable range of 1.5% to 2.7% between 1996 and 2006.[4]

Providing effective access to primary health care in Iran's rural areas with 90% population coverage, integration of medical education and health care services and establishment of medical schools in all provinces have increased the number of medical

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doctors, and improved accessibility to health care. In 1976, there were five physicians for every 10,000 people. This number increased to 13.4 physicians by 2007, while 13 active hospital beds were available per 10,000 people, of which 82.1% are in public hospitals.[4]

The fraction of under-5 mortality dropped from 40% of total deaths in the late 1960s to 9% in 2005. Infectious and diarrheal diseases were the main causes of death in Iran in 1960; however, the main causes of death had shifted to cardiovascular disease (CVD) to 34.3%, and road traffic injuries to 10.3% by 2005.[5]

The results of the collaborative Global Burden of Disease (GBD) 2010 study provide a unique opportunity to examine changes in the health profile of the country from 1990 to 2010. The GBD study used consistent definitions, data sources, and methods to examine health loss from 291 diseases and injuries and 67 risk factors for 187 countries. Hence, comparisons in country-level health profiles were made possible.[5]

We use GBD results for Iran to examine the performance of its healthcare system in terms of mortality and morbidity due to diseases, injuries and risk factors for two decades between 1990 and 2010. To evaluate the current Iran's health care status, we investigate the trend of mortality, causes of death, morbidity and disabilities over the last 20 years.

Methods

We attempted to identify the drivers of change in the numbers of deaths or disability-adjusted life years (DALYs) by causes using decomposition analysis. These trends were decomposed into the contribution of total increase in population size, aging of the population, and changes in age-specific and sex specific rates. We computed two counterfactual sets of cause of death numbers: 1) a population growth scenario computed as the number of deaths expected in 2010 if only total population numbers increased to the level of 2010 but the age-sex structure of population remained the same as in 1990 and age-sex specific rates remained at 1990 levels; and 2) a population growth and population aging scenario computed as the number of deaths expected in 2010, using 1990 age-sex specific rates and 2010 age-specific and sex-specific population numbers. The difference between 1990 numbers and the population growth scenario is the change in death numbers due strictly to the growth in total population. The change from the population growth scenario to the population growth and aging scenario is the number of deaths due to aging of the population. The difference between 2010 deaths and the population growth and aging scenario is the difference in deaths or DALYs due to epidemiological change in age-specific and sex-specific death rates. Each of these three differences is also presented as a percentage change compared to 1990. Further details on the micro-level calculations of the changes can be found elsewhere.[5]

Results

Trend of Mortality by Age and Sex

Age-specific mortality rate between the years 1990 and 2010 declined with increasing age for both males and females, but with a higher rate in women across all ages. The most rapid rate reduction in women versus men occurred for the age groups between 20 and 40 years old (Table 1 and Figure 1). Sex ratio for death has dramatically increased in the last decade. For the age 20, the sex mortality ratio was between 225 and 243 in the period between 1990 and 2000. However, this ratio grew to approximately 290 from 2000 to 2010 the (Figure 2).

Trends in cause of death and years of life lost

By decomposition of population growth and population aging for the first fifty causes of death in Iran from 1990 to 2010 the true percentage change of causes of mortality is obtained. For most causes, the percentage of change shows a pattern of reduction. However, the percentage of change increased for 12 causes of death. These 12 causes and their 2010 respective ranks are road injury (2nd), diabetes mellitus (19th), Alzheimer's disease and other dementia (22nd), drug use disorders (23rd), liver cancer (31st), prostate cancer (40th), accidental falls (41st), chronic kidney disease (42nd), encephalopathy, birth asphyxia, and birth trauma (45th), sepsis and other infectious disorders of the newborn (49th), and typhoid and paratyphoid fevers (50th). The majority of causes of mortality have decreased, such as ischemic and hemorrhagic stroke (72%), hypertensive heart disease (68%), stomach cancer (71%), lower respiratory infections (45%) and congenital anoma-

Table 1. Age-specific death rate per 100,000 by sex, Iran

Age	Death Rate 1990		Death Rate 2010	
	Male	Female	Male	Female
< 1	5,007.2	4,255.8	2,383.7	2,064.6
1–4	318.5	295.4	132.0	115.5
5–9	85.3	68.6	45.4	36.6
10–14	90.3	56.5	38.9	24.0
15–19	170.5	83.0	90.4	38.0
20–24	244.0	108.2	137.6	47.4
25–29	262.5	128.2	154.4	55.1
30–34	300.1	159.6	179.0	71.5
35–39	390.7	212.6	231.4	98.4
40–44	527.4	290.4	310.0	147.7
45–49	759.1	416.3	450.1	227.0
50–54	1,137.0	617.8	689.5	351.4
55–59	1,680.6	891.2	1,067.3	529.6
60–64	2,543.3	1,424.1	1,724.2	882.5
65–69	3,727.6	2,227.8	2,684.3	1,443.8
70–74	5,543.8	3,667.2	4,195.4	2,469.0
75–79	8,153.7	5,923.7	6,514.2	4,254.8
80+	13,912.1	11,648.2	12,845.3	10,070.0

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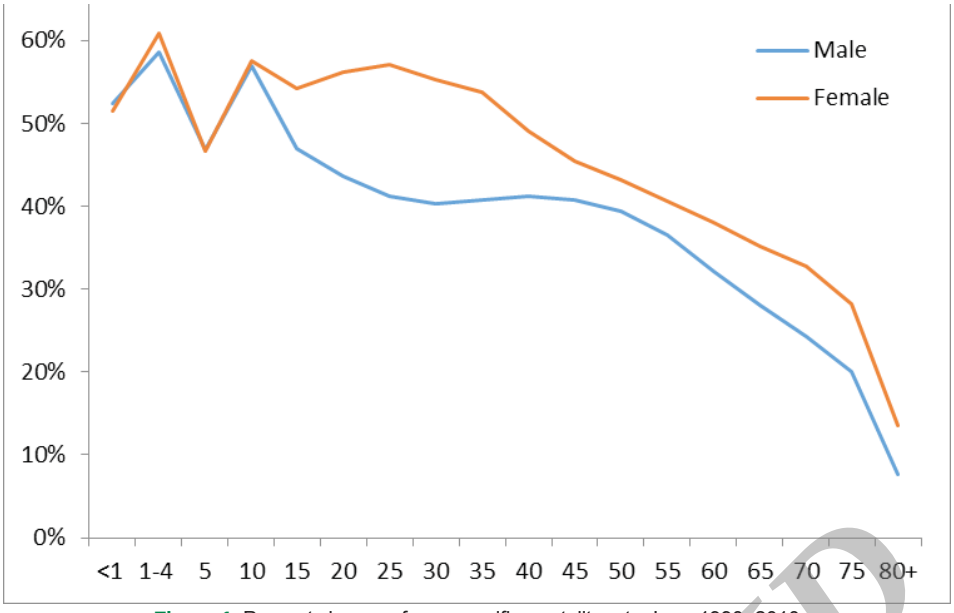

Figure 1. Percent change of age-specific mortality rate, Iran, 1990–2010

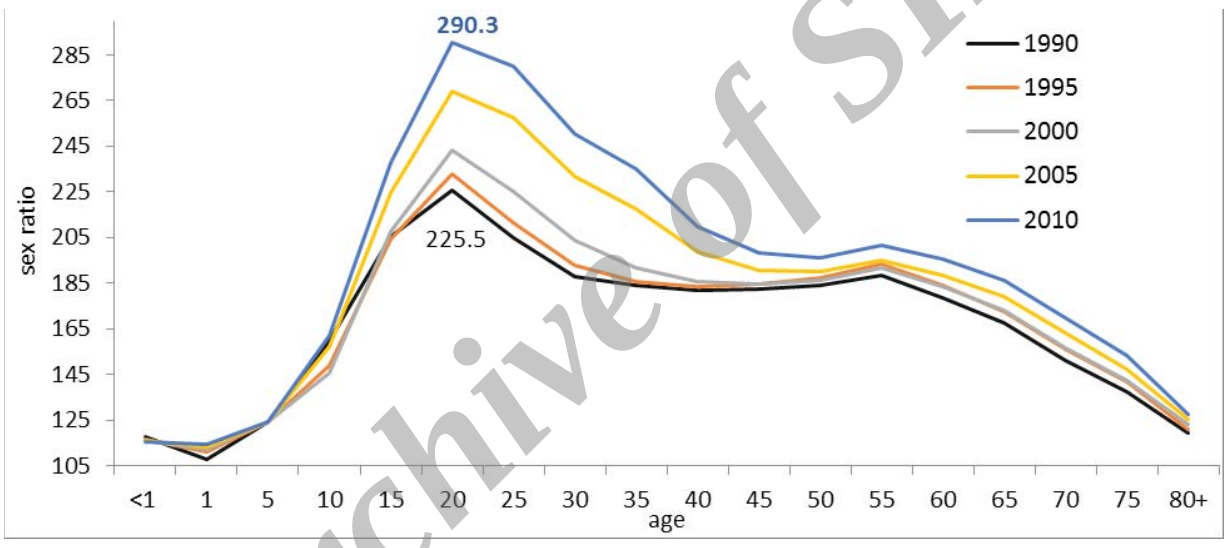

Figure 2. Mortality sex ratio (number of male deaths for 100 female deaths) by age and year

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lies (30%). Appendix Table 1 shows details such as age-standardized death rate (ASDR) by cause and gender in 1990 and 2010. In addition, Figure 3 shows the pattern of cause of death numbers between 1990 and 2010.

From 1990 to 2010, the ranking of causes of death and their corresponding number of years of life lost (YLLs) remained unchanged. However, the number of YLLs changed for the same cause pattern in 2010. The causes with an increasing trend adjusted by the effect of population growth and aging from 1990 to 2010 showed a particular pattern depending on age-specific mortality rate. For example, comparing the pattern of age-specific mortality rate between mortality due to two-wheeled motorized vehicle accidents and liver cancer shows early and later peaks, respectively. The pattern of increase in mortality rate due to liver cancer is around age 40, which is explained by drug use disorders at an earlier age. However, the rate of death due to two-wheeled vehicle accidents increases in age groups above 10 years olds. Among children, 15 years old and younger, YLLs due to congenital anomalies ranked third among all other causes (Figures 6, 7, and 8).

Causes of years lost due to disability (YLDs)

Similar to the trend for YLLs over time, causes of YLDs showed small changes between 1990 and 2010. Among females, the top causes of YLDs stayed the same in both periods; these were major depressive disorders, low back pain, iron deficiency anemia, anxiety disorders, and osteoarthritis. In males, the top three causes of YLDs were low back pain, major depressive disorders, and iron deficiency anemia for both time periods. By 2010, drug use disorders and diabetes replaced road injuries and neck pain as the fourth and fifth leading causes among men (Figures 9 and 10).

Figure 11 conveys information on percent changes in 50 YLD causes between the two time periods after adjusting for the effect of population growth and aging. In the top 10 causes of YLD, only three causes, other than transport injuries, migraine, and chronic kidney diseases, showed true increases from 1990. Diabetes and

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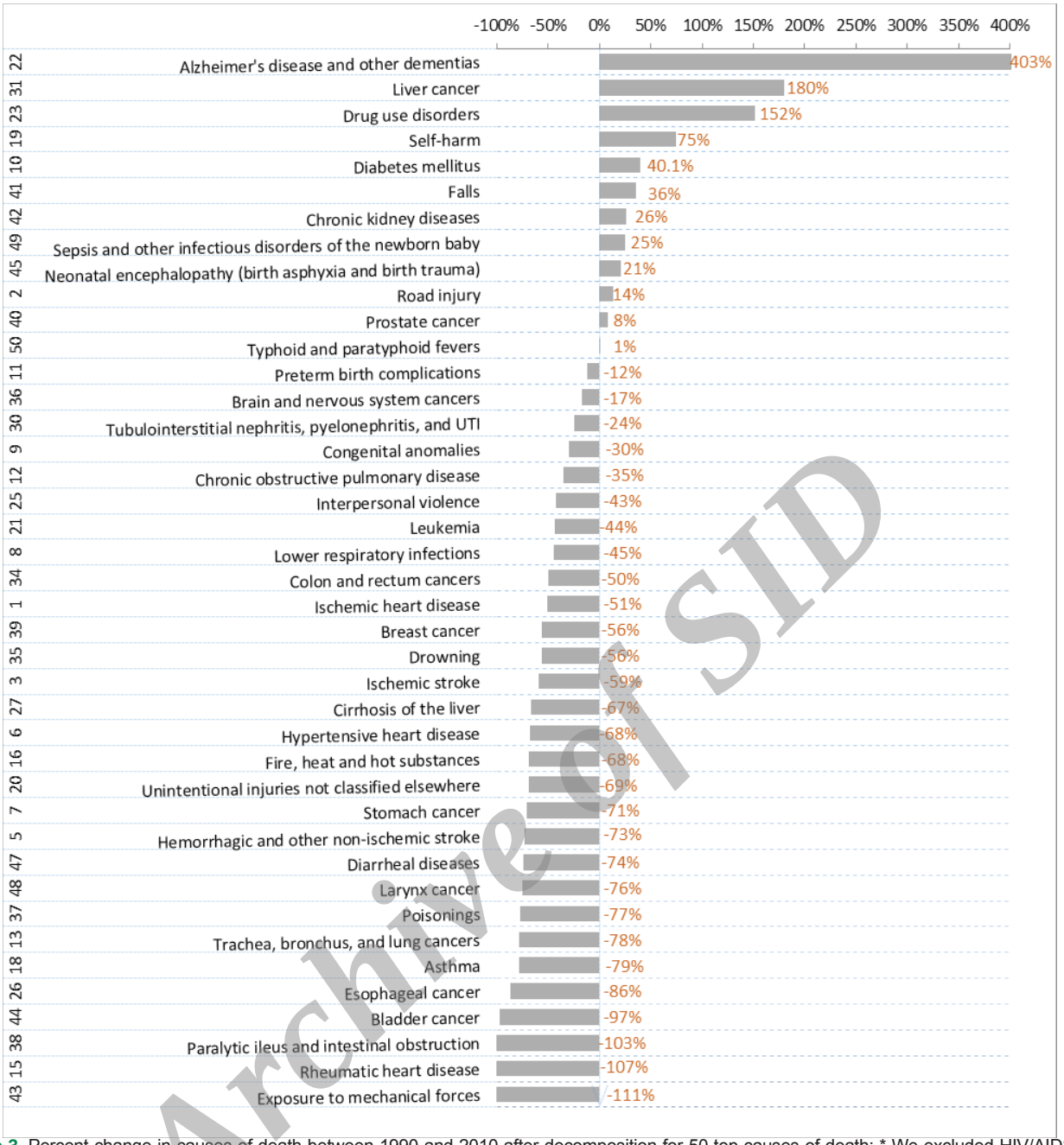

Figure 3. Percent change in causes of death between 1990 and 2010 after decomposition for 50 top causes of death; * We excluded HIV/AIDS and other causes in each disease group.

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drug disorders were among the tenth- to fiftieth-ranked causes that have significantly increased in the last two decade.

DALYs trend

The top cause of DALYs in males was ischemic heart disease for both periods. The subsequent four causes by DALYs in 2010 were road injuries (fourth in 1990), low back pain (seventh in 1990), depression (eleventh in 1990), and stroke (eighth in 1990). Some of major DALYs' causes related to injuries, such as accidental falls, interpersonal violence and suicides, showed increasing trend in the two-decade interval. On the other hand, ranks of DALYs due to communicable diseases, neonatal and nutritional deficiencies have declined significantly (Figure 12).

Two significant causes of DALYs in males were ischemic heart disease (IHD) and road injuries, both fatal and disabling conditions. However, the two main causes of DALYs in women are low back pain and major depression which are nonfatal but disabling (Figures 12 and 13). Factoring out the impacts of population growth and population aging, drug use disorders, diabetes mellitus, and Alzheimer's disease remain as the highest-ranking causes of DALYs for both sexes combined between 1990 and 2010. Figure 14 inclusively visualizes the changes over time in top-ranked DALYs' causes. It is important to note that despite the constant patterns of self-harm between 1990 and 2010, the rate nearly doubled by 2010 for young adults (Figure 15).

Risk Factors

Four major risk factors causing childhood illnesses and infec-

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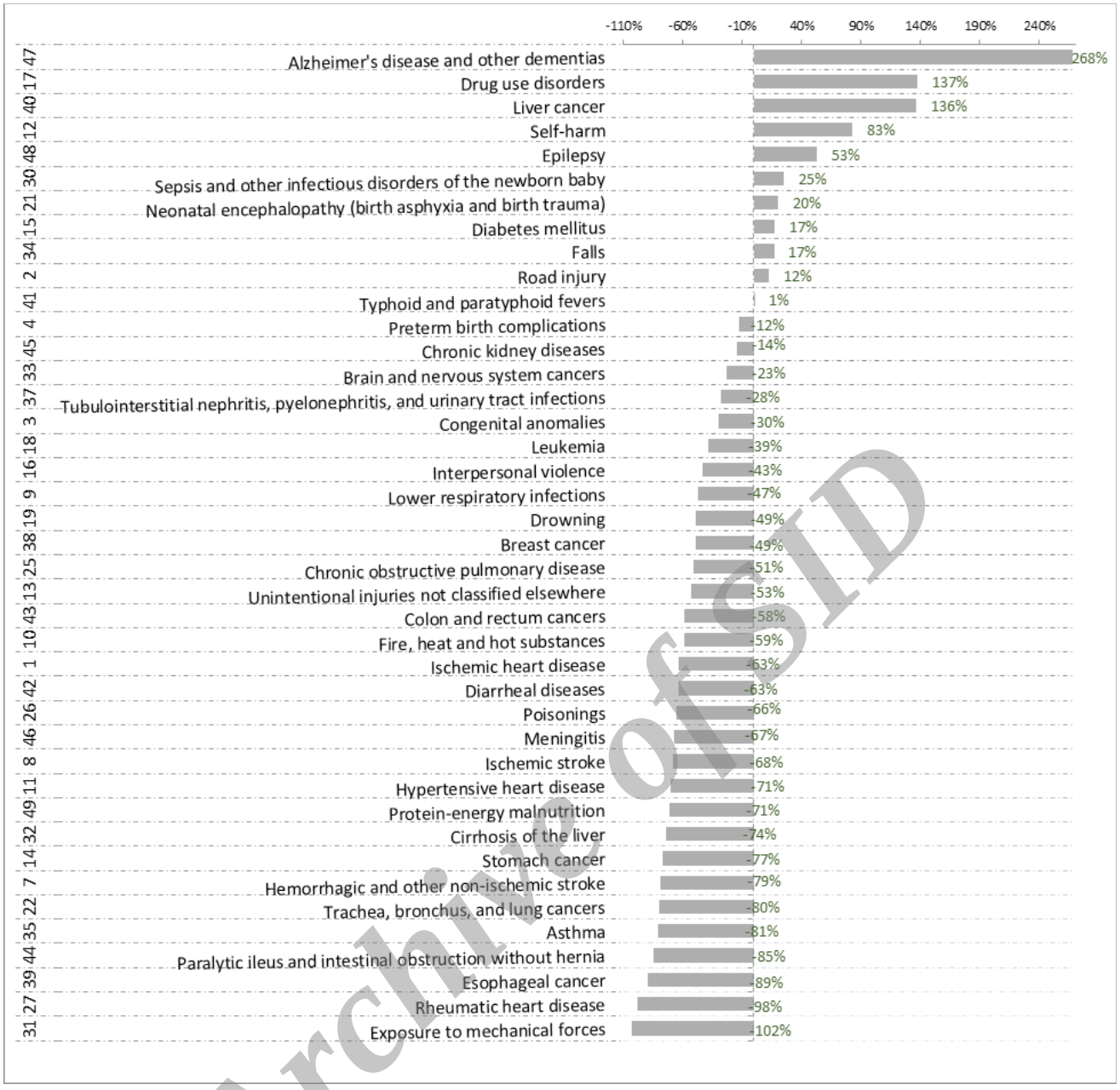

Figure 4. Percent change in causes of YLLs between 1990 and 2010 after decomposition for 50 top causes of death; * We excluded HIV/AIDS and other causes in each disease group.

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tions are childhood underweight, household air pollution, sanitation, and unimproved water. Figure 16 shows the decreasing trend of these risk factors over the two-decade period. Contrary to this downward shift, risk factors such as high body mass index and low bone mineral density demonstrated an upward trend in all age groups over the same period. Dietary risks, high blood pressure, high body mass index, and physical inactivity made up the four leading health risk factors for the year 2010. Figures 17 to 19 present more information on the ranks of the measured risk factors by age groups which provide a more inclusive picture of risk factors change over the study period. For instance, changing the importance of ambient air pollution and cigarette smoking over time can be easily evident from these illustrations. Dietary risk factors, primarily low fruit consumption, were estimated to make up to 7% to 10% of the CVD burden. Closely followed by this risk factor were high blood pressure and high body mass index, which also contributed significantly to CVD burden.

(Health-adjusted) Life Expectancy

Life expectancy (LE) and health-adjusted life expectancy (HALE) both grew in value from 1990 to 2010 for both sexes by approximately 7 years. The rate of increase for these two indicators was higher in males aged 0 to 15 than females of the same age group. For the age range of 20 to 30, LE and HALE increased at a comparable rate from the age group above 30, the incremental rate was higher in females compared to their male counterparts. The highest leading female gap in the inter-gender growth of the LE and HALE rates was seen for the age group 60 to 70 years

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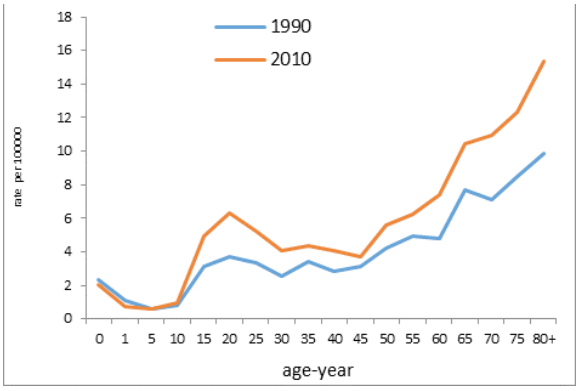
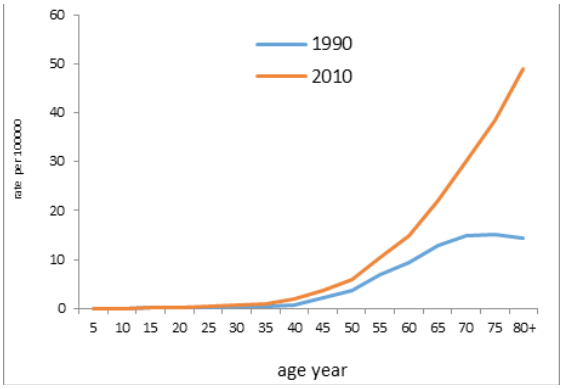
Comparison of age-specific mortality rate due to Motorized vehicle with two wheels, 1990-2010



Comparison of age-specific mortality rate due to liver cancer, 1990-2010



Comparison of age-specific mortality rate due to drug use disorders, 1990-2010

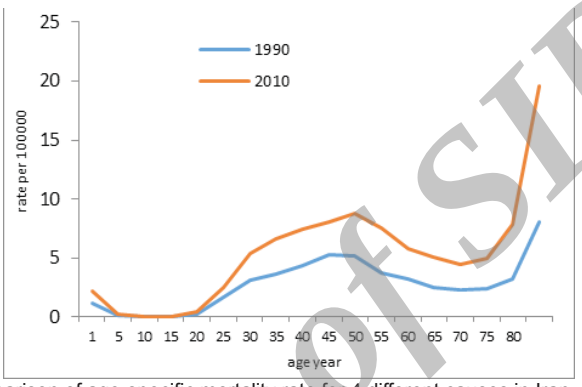


Figure 5. Comparison of age-specific mortality rate for 4 different causes in Iran, 1990–2010

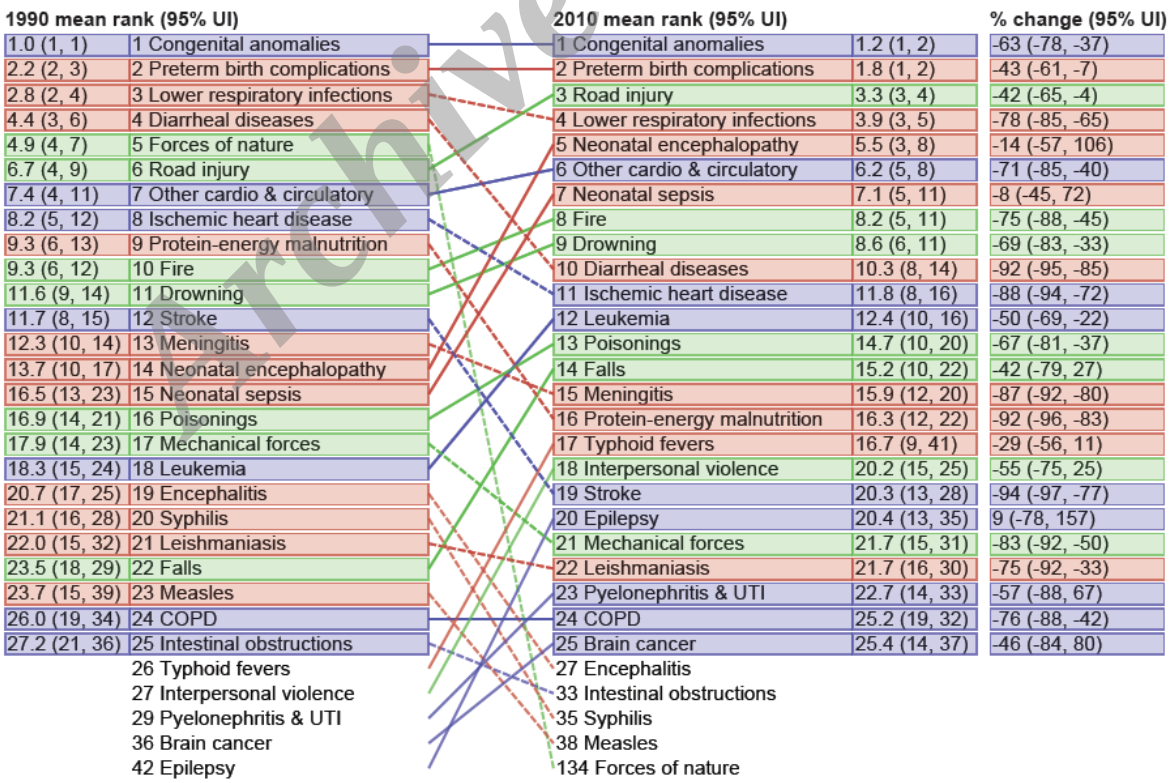


Figure 6. YLL ranks in Iran, top 30 causes and percentage change, both sexes, ages under 15, 1990–2010

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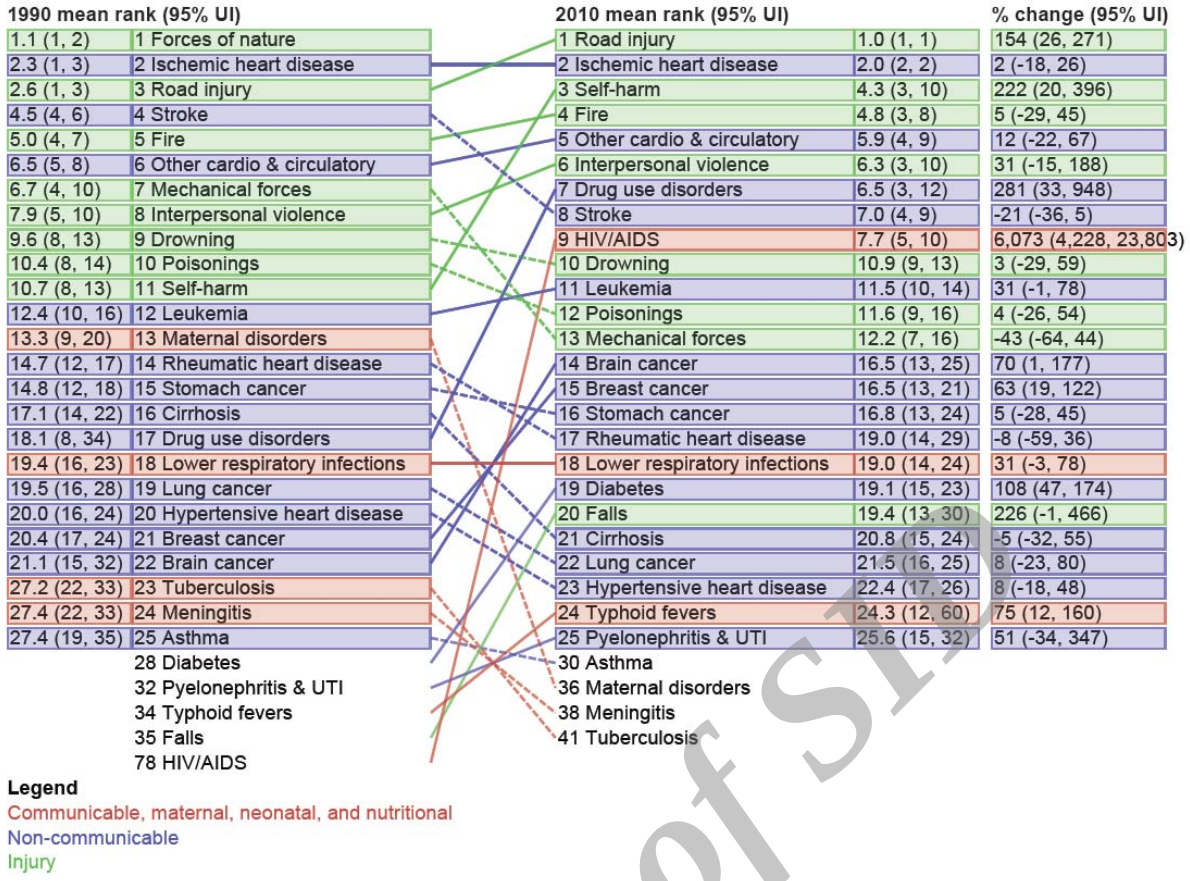

Figure 7. YLL ranks in Iran, top 30 causes and percentage change, both sexes, ages 15 – 49, 1990–2010

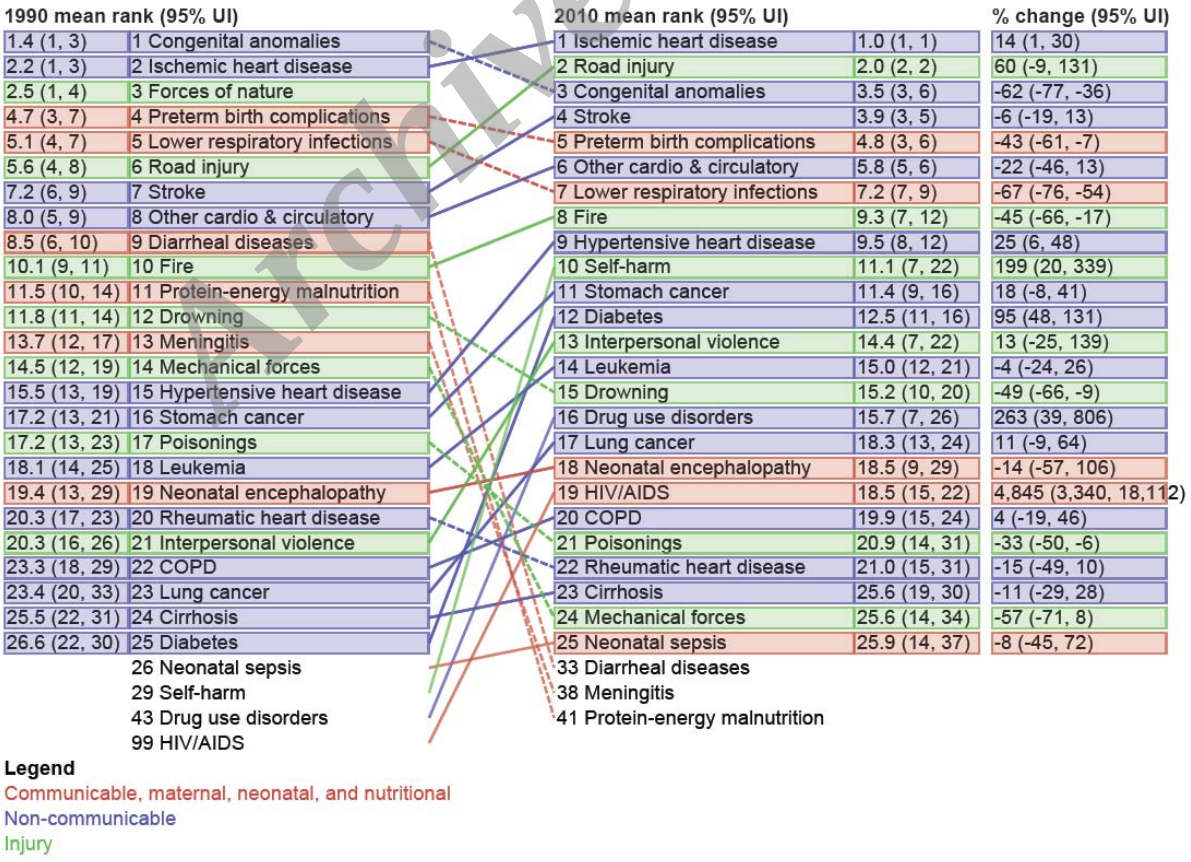

Figure 8. YLL ranks in Iran, top 30 causes and percentage change, both sexes, all ages, 1990–2010

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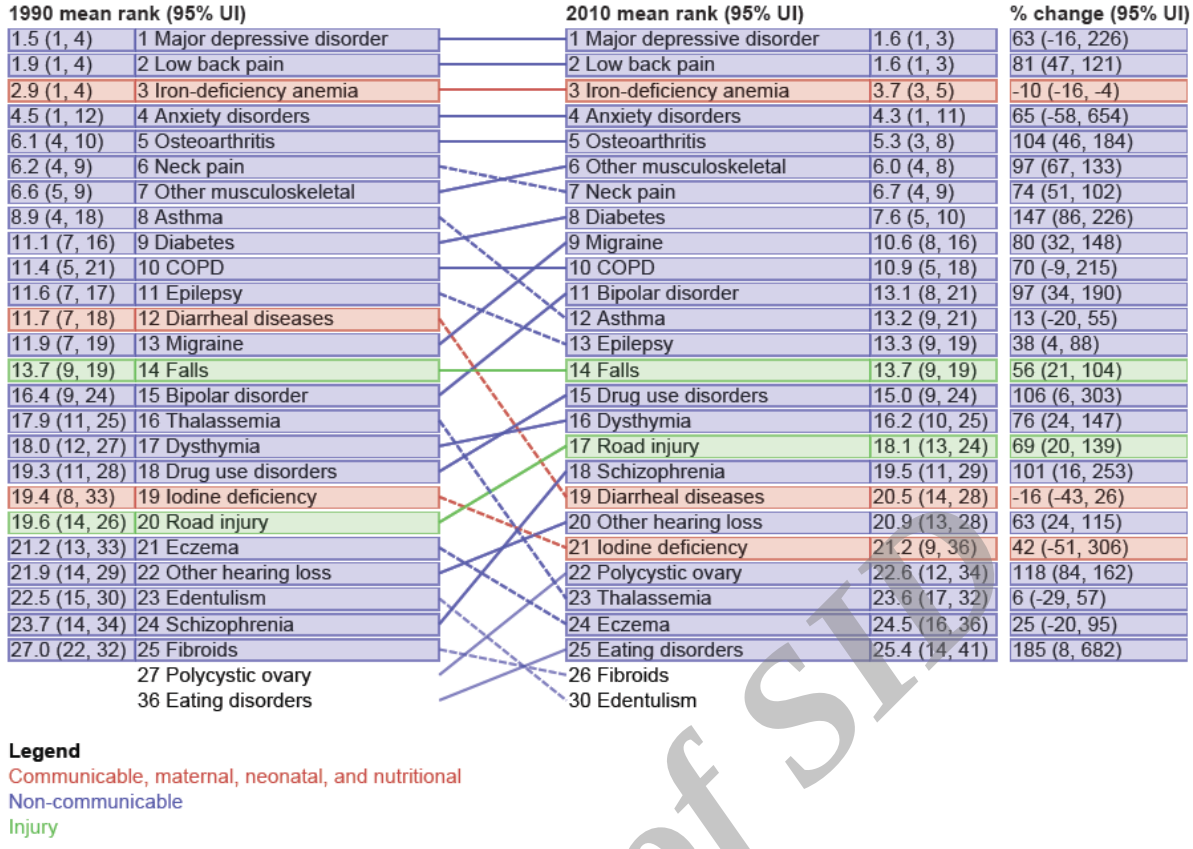

Figure 9. YLDs ranks in Iran, top 25 causes and percentage change, females, all ages, 1990–2010

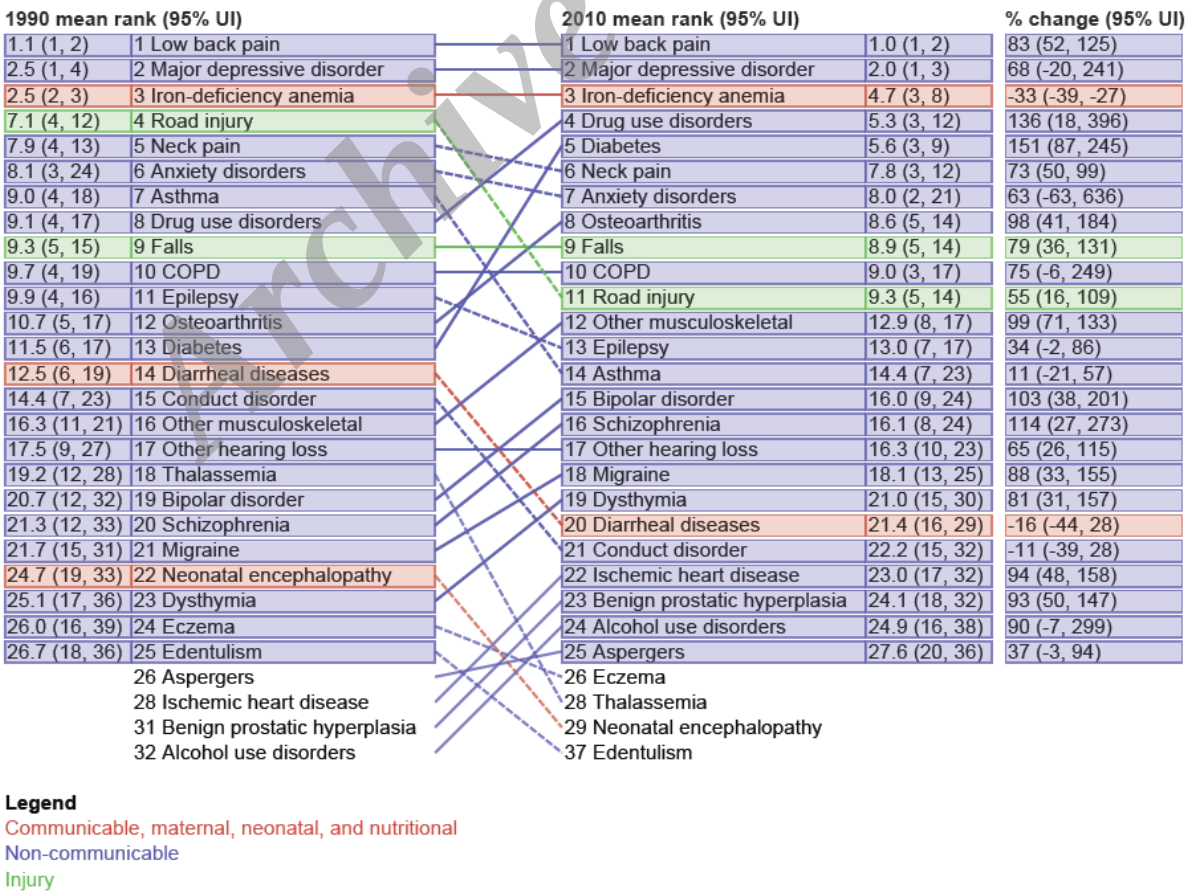

Figure 10. YLDs ranks in Iran, top 30 causes and percentage change, males, all ages, 1990–2000

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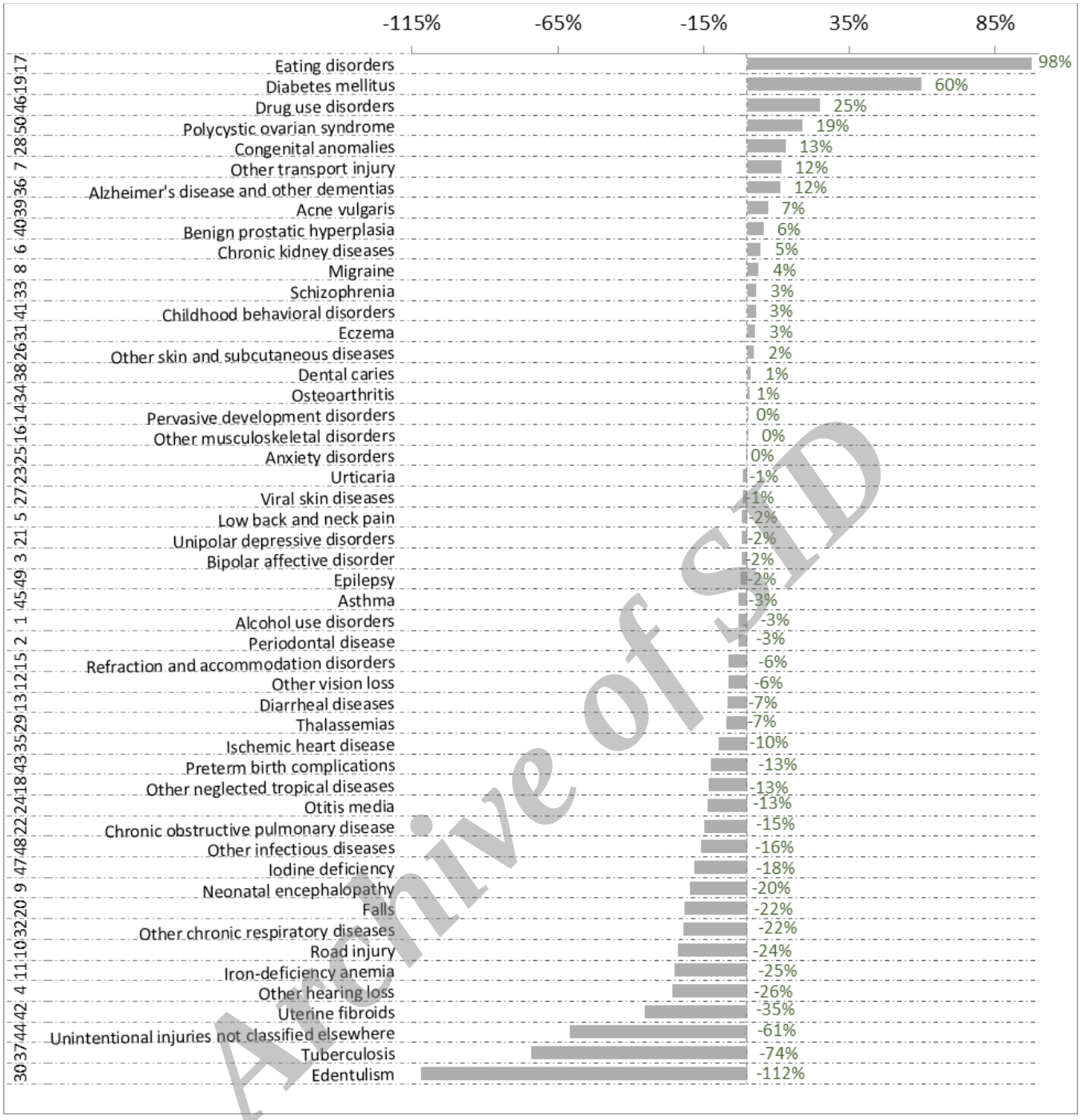

Figure 11. Percent change in causes of YLDs after decomposition for 50 top causes of YLDs, 1990–2010

old. Figure 20 and Table 2 provide visual and numerical reference information on LE and HALE in Iran for the two periods.

Discussion

The current study presents multiple health indicators that help assess the healthcare sector's overall performance in the last two decades. While many indicators have improved over time, the profile of diseases and risk factors has changed dramatically. The mean mortality age increased from 38.04 years in 1990 to 59.17 years in 2010. Age-specific mortality rate declined between 13% and 61% over this period. LE rose by 21 years for males and 22 years for females from 1970 to 2010.[6] This increase in life expectancy places Iran among countries with the highest positive change in LE.[6] Of important note, compared to females, the age-specific mortality rate in males showed slow growth, in particular in younger age groups. The mortality sex ratio for the young age category increased by 29% from 1990 to 2010. This was caused by relatively more deaths due to injuries and drug use in males.[5,7]

Time trend information furnished by this paper can be used to evaluate problems and policies specific to a medical condition or risk factor. For example, in 1990, stomach cancer was the chief cause of mortality among all cancers for both genders. In 2010, however, stomach cancer was replaced by breast cancer in fe-

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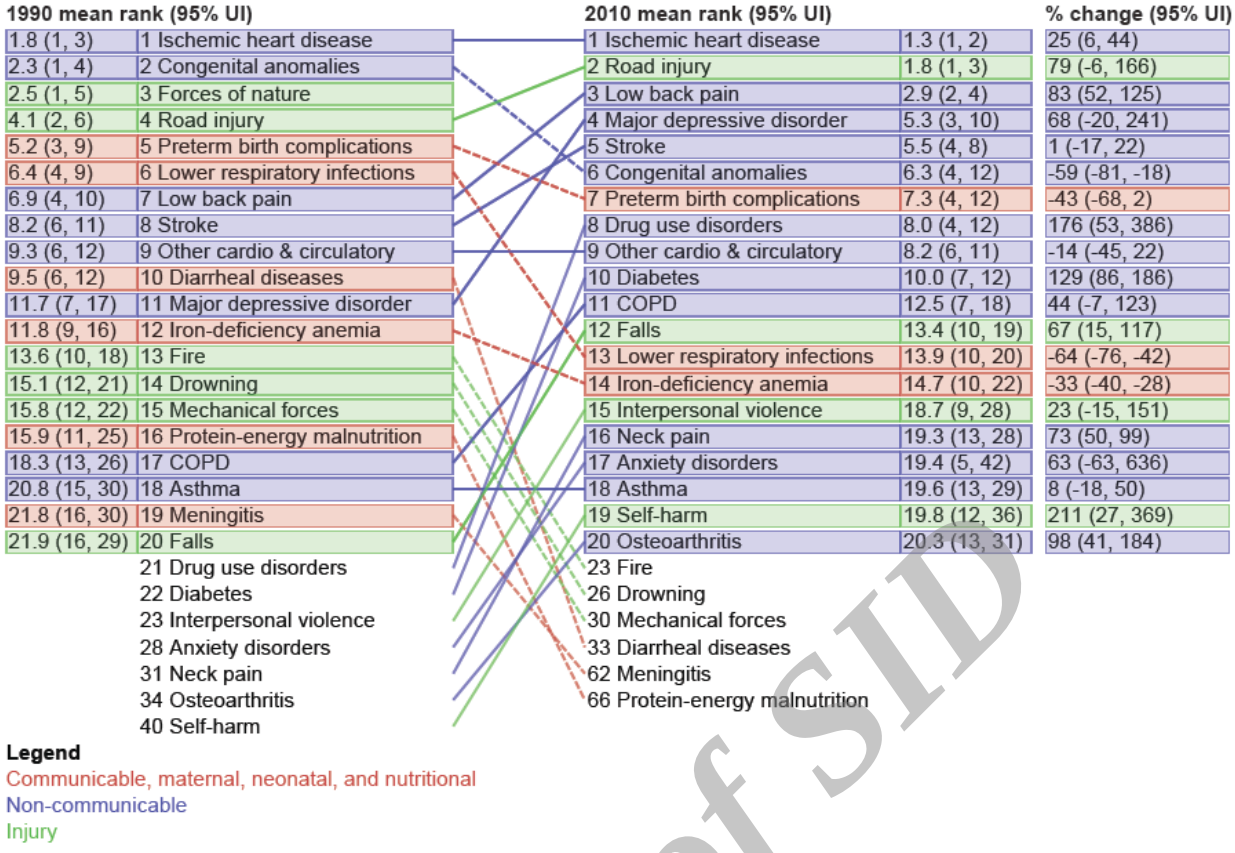

Figure 12. Shifts in top 20 causes of DALYs for males, all ages, Iran, 1990–2010

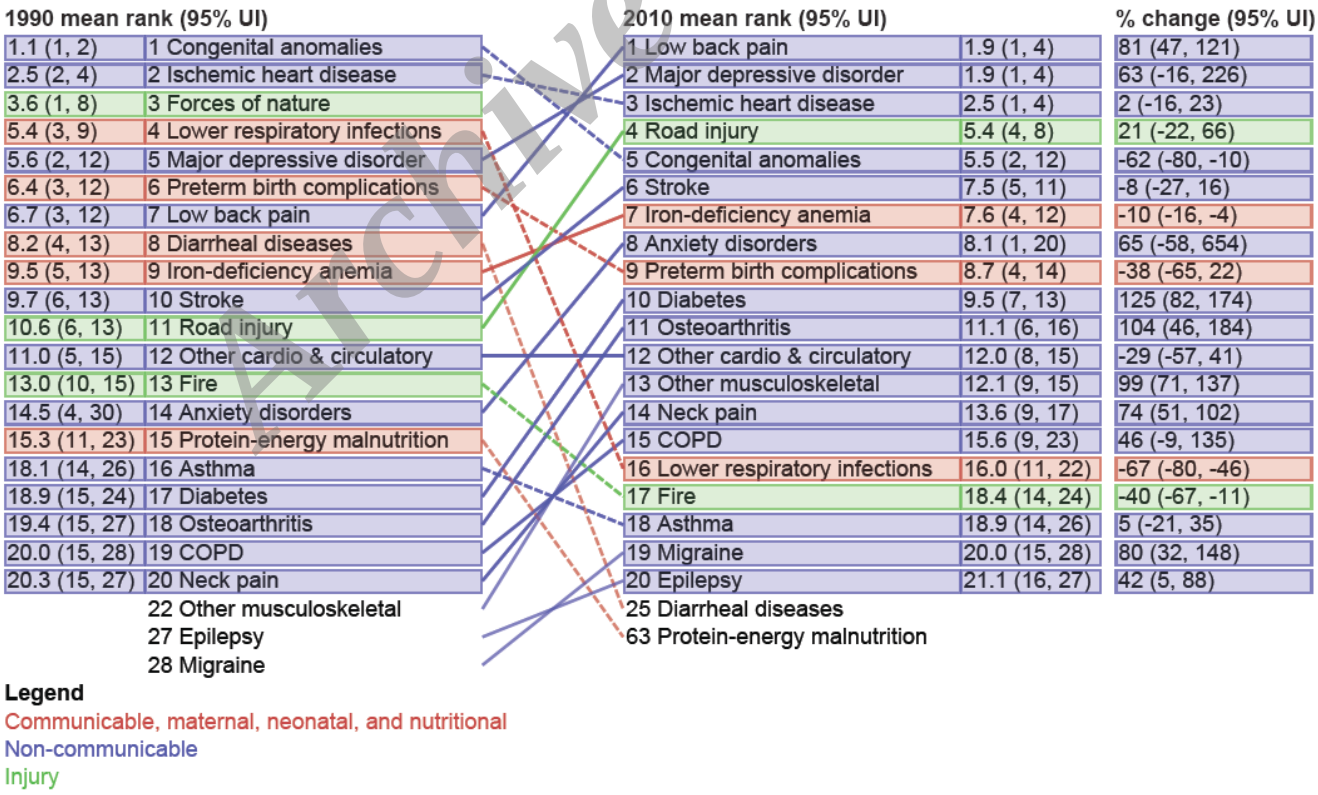

Figure 13. Shifts in top 20 causes of DALYs for females, all ages, Iran, 1990–2010

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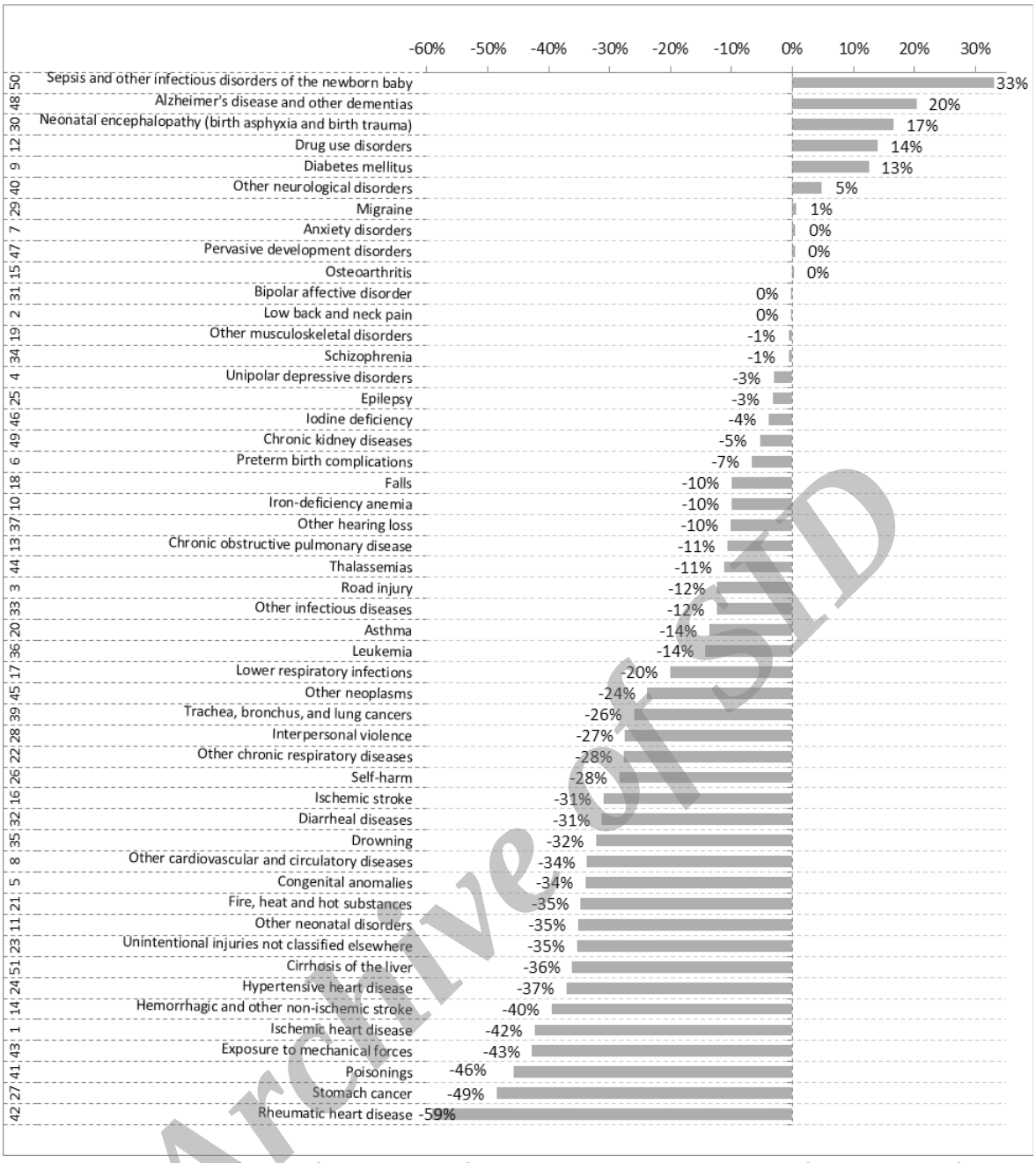

Figure 14. Percent change in causes of DALYs after decomposition for population growth and population aging for 50 top causes of death, 1990–2010

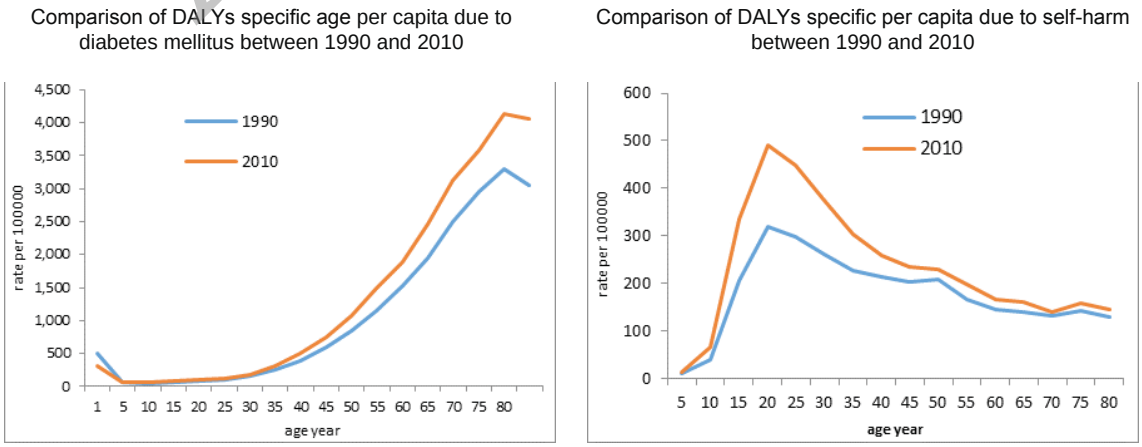

Figure 15. Comparison of DALYs specific age per capita due to diabetes mellitus and suicide between 1990 and 2010

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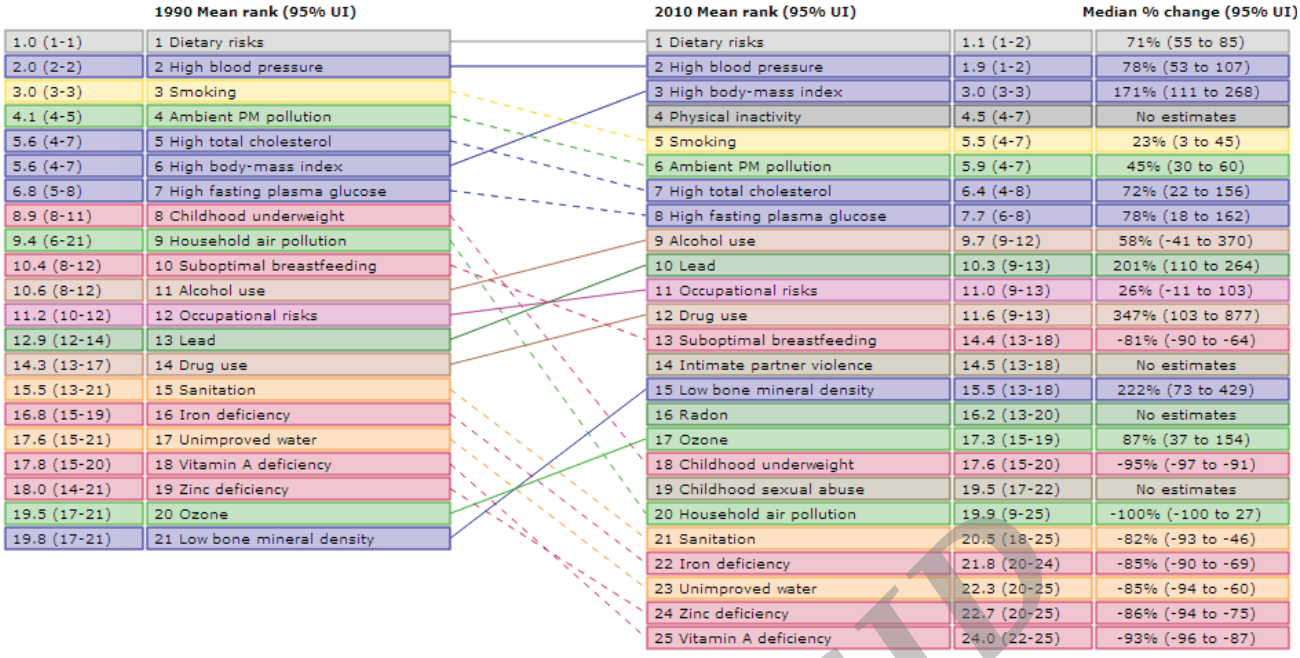

Figure 16. Top risk factors and their rank change, for all ages and both sexes, 1990–2010

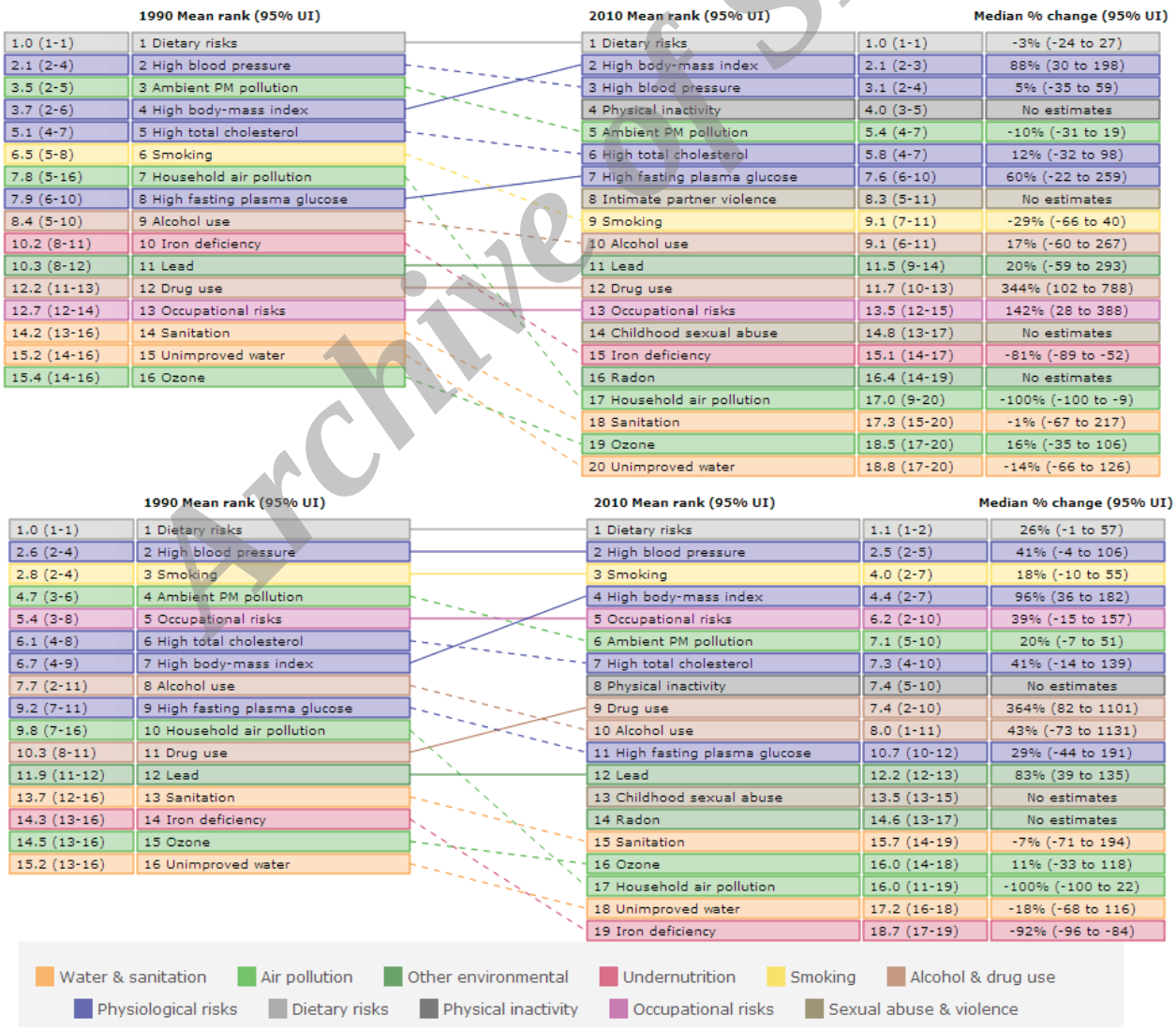

Figure 17. Top risk factors and their rank change, age 15 to 49 years, female and male, 1990–2010

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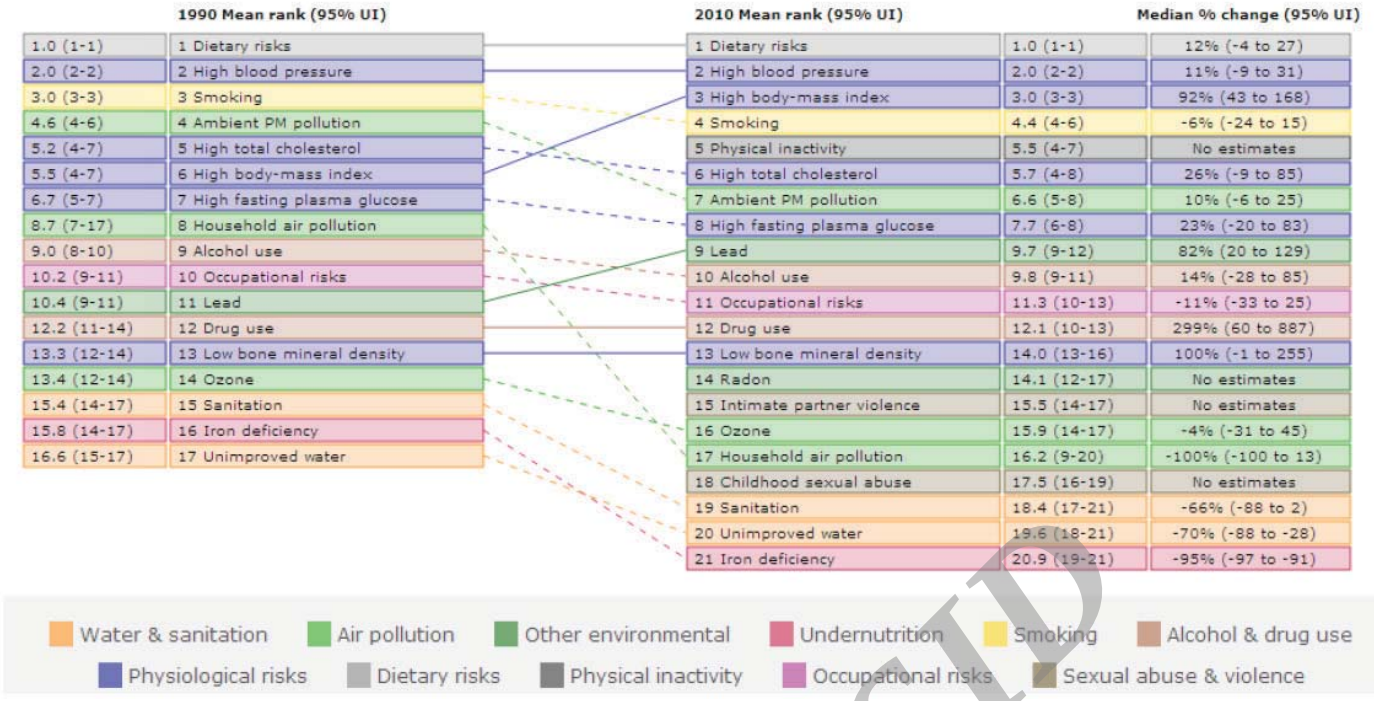

Figure 18. Top risk factors and their rank change, age 50 to 69 years, both sexes, 1990–2010

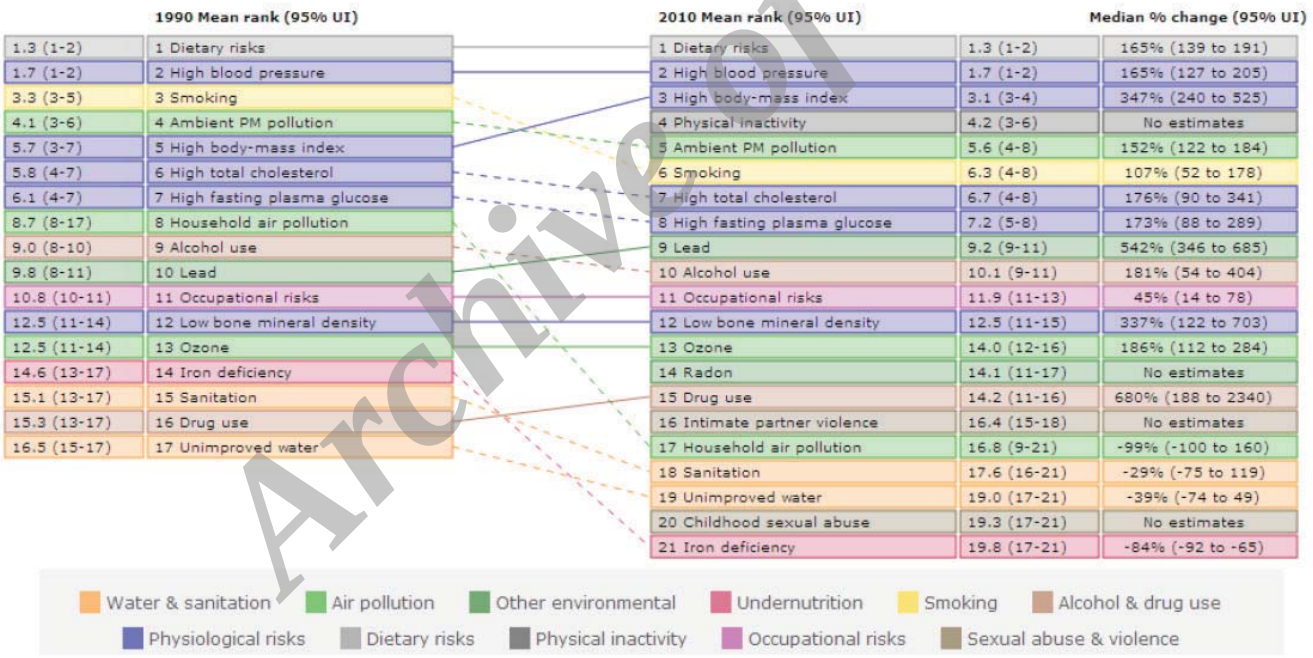

Figure 19. Top risk factors and their rank change, age 70+ years, both sexes, 1990–2010

males while remaining the top cancer in males.

Worldwide and regional trends of major causes of death and morbidity derived from the GBD 2010 study help better assess the measured outcomes in Iran. For example, worldwide age-standardized death rate (per 100,000 population) due to IHD dropped from 131.28 (95% UI: 126.44 – 142.2) in 1990 to 105.73 (95% UI: 98.83 – 111.88) in 2010. While the decrement in this rate was also observed for Iran (174.9 per 100,000 in 2010), it is still well above the global average. In the third paper of this series, we will compare Iran with its neighbors in greater detail. Lowering overall and cause-specific death rates to more acceptable levels requires critical and immediate action by the Iranian government.[8] As another useful example, we can discuss stomach cancer and liver cancer. The rate of stomach cancer dropped both in Iran and on the global level over the study period. Compared to most other countries and the worldwide estimates, the rate of this cancer in Iran decreased considerably more slowly. More specifically, Iran's mortality rate due to stomach cancer for both sexes

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Table 2. Life expectancy and health-adjusted life expectancy, Iran, 1990 and 2010

Age	Both Sexes				Males				Females			
	1990		2010		1990		2010		1990		2010	
	LE	HALE	LE	HALE	LE	HALE	LE	HALE	LE	HALE	LE	HALE
0	67.5	57.2	74.4	63.2	64.6	55.3	71.6	61.5	71.0	59.5	77.8	65.3
1	69.6	58.9	74.9	63.6	66.8	57.2	72.2	61.9	73.0	61.1	78.3	65.7
5	66.5	55.9	71.4	60.2	63.7	54.2	68.7	58.5	69.9	58.1	74.7	62.2
10	61.8	51.4	66.5	55.5	59.0	49.7	63.8	53.9	65.2	53.6	69.9	57.6
15	57.0	47.0	61.6	51.0	54.2	45.3	58.9	49.4	60.4	49.1	65.0	53.1
20	52.3	42.8	56.8	46.6	49.7	41.1	54.2	45.0	55.6	44.8	60.1	48.7
25	47.8	38.7	52.1	42.4	45.2	37.1	49.5	40.8	50.9	40.6	55.2	44.3
30	43.2	34.6	47.3	38.1	40.8	33.1	44.9	36.6	46.2	36.5	50.4	40.1
35	38.7	30.6	42.6	34.0	36.4	29.2	40.3	32.5	41.5	32.5	45.5	35.9
40	34.2	26.8	38.0	29.9	32.0	25.4	35.7	28.5	37.0	28.6	40.7	31.8
45	29.9	23.1	33.4	26.0	27.8	21.7	31.2	24.6	32.5	24.8	36.0	27.8
50	25.7	19.6	28.9	22.2	23.8	18.3	26.9	20.9	28.1	21.2	31.4	24.0
55	21.7	16.3	24.6	18.7	20.0	15.1	22.7	17.4	23.9	17.8	26.9	20.3
60	18.0	13.3	20.5	15.3	16.6	12.3	18.8	14.1	19.9	14.6	22.6	16.8
65	14.6	10.6	16.7	12.2	13.5	9.8	15.3	11.2	16.1	11.6	18.5	13.5
70	11.6	8.2	13.2	9.5	10.7	7.6	12.1	8.7	12.7	9.0	14.6	10.5
75	9.0	6.2	10.2	7.1	8.3	5.7	9.4	6.6	9.8	6.7	11.2	7.9
80	6.8	4.6	7.6	5.2	6.3	4.2	7.0	4.8	7.3	4.9	8.3	5.7

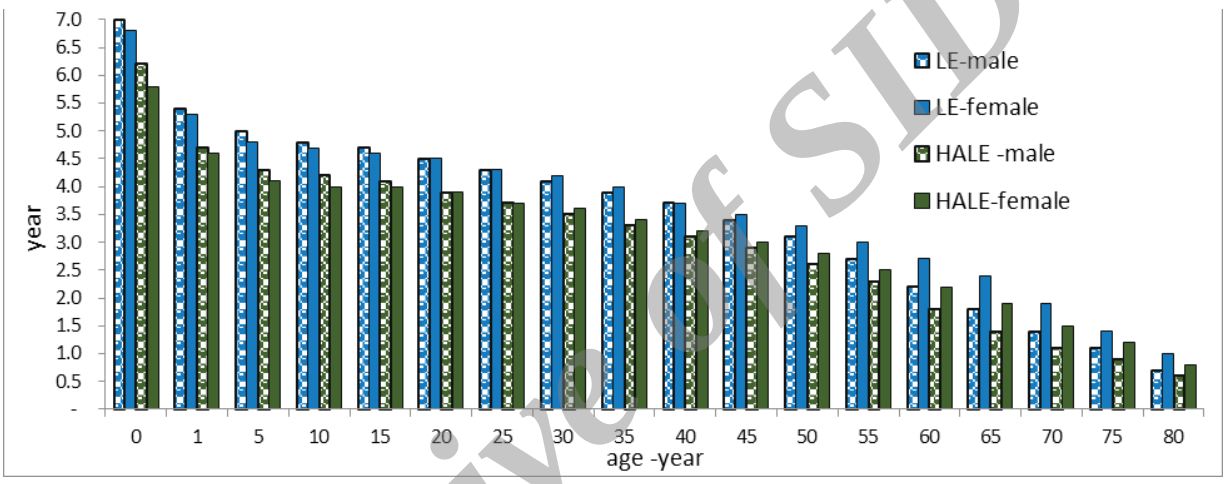

Figure 20. Comparison of increase in life expectancy and health-adjusted life expectancy by sex, Iran 1990–2010

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was 24.09 in 1990; with a 31% decrease, this rate dropped to 16.3 per 100,000 in 2010. On the other hand, Japan's mortality rate due to stomach cancer decreased by 45%, from 33.6 in 1990 to 18.4 in 2010. Similar to Japan, China's mortality rate due to stomach cancer decreased significantly, by 39%, from 34.2 in 1990 to 20.8 in 2010 for both genders. For liver cancer, the age-standardized death rate for the global level has increased between 2% and 3% for both sexes. However, Iran's mortality rate due to liver cancer has increased by 88% in males and 103% in females. These two latter examples warn policymakers to plan condition-specific policies to search for possible triggers of the problems and to prevent these fatal conditions. It is essential to consider some immediate actions by Iranian public health researchers to plan and apply interventions in order to break these patterns and improve public health in Iran.

Mental and behavioral disorders are of special prominence. Major depressive disorders have risen 81% since 1990 and become the top condition as measured by DALYs in 2010. Anxiety disorders also showed a dramatic rise of 65% during this period. The suicide death rate, after adjusting for population growth and population age pattern, grew by 75%. Adjusted for the same population factors, death rate due to drug use disorders showed a 152% increase. We believe this is convincing evidence that emphasizes a specific direction for any future reforms in healthcare, education and justice system with consideration of improvement of societies' mental health the country.

The GBD results for injuries in Iran and in particular for road injuries should gain considerable attention. The increasing fatality rate of 14% for road injuries over these two decades caused YLLs for this condition to rank first in 2010. A qualitative assessment of probable causes of the increase in road injuries in Iran has been published elsewhere. A sharp boost in production of unsafe cars and motorcycles and driving on unsafe roads were deemed to be the major contributing factors in rising road injury death in the country during these two decades.[9] Road injury fatality reduction was particularly emphasized in the fourth five-year (2005 – 2009) National Development Plan.[7] The current report and the ensuing GBD results will be an invaluable benchmark for the evaluation of the national five-year policies with a specific goal of reducing the burden of road injuries.

Expanding urbanization and low fertility together brought about a demographic transition that in turn developed into an epidemiological transition, which is evident from predominant and rising mortality due to non-communicable conditions. We posit that the

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disease- and injury-related death events that occurred over the last two decades could have been prevented to a large extent if the country had a coordinated plan to control the important risk factors and expanded the primary preventive healthcare network to effectively cover non-communicable diseases and injuries.

The GBD study team holds the commitment to promote the quality of the data and regular reporting. The health sector of the country can benefit from the data for disease monitoring and surveillance. Equally important, interacting with the GBD team provides the opportunity to improve local burden statistics.

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Reference

1. Abbasi-Shavazi MJ, McDonald P, Hosseini-Chavoshi M. The fertility transition in Iran: Revolution and Reproduction, Springer, Dordrecht. 2009;
2. Iran SCI. Available from: URL: http://www.amar.org.ir/Default.aspx?tabid=96&agentType=ViewType&PropertyTypeID=4.
3. Wang H, Dwyer-Lindgren L, Lofg ren KT, Rajaratnam JK, Marcus JR, Levin-Rector A, et al. www.thelancet.com Vol 380 December 15/22/29, 2012.
4. President Deputy Offices for Strategic Planning and Supervision: Law of the Fourth Economic, Social, and Cultural Development Plan of the Islamic Republic of Iran, 2005–2009. Tehran 2004 –table 7.
5. NaghaviM, Shahraz S, Bhalla K, Jafari N, Pourmalek F, Bartels D, et al. Adverse Health Outcomes of Road Traffic Injuries in Iran after Rapid Motorization. *Arch Iran Med*. 2009; **12(3):** 284 – 294.
6. Age-specific and sex-specific mortality in 187 countries, 1970–2010: a systematic analysis for Global Burden of Disease Study 2010.
7. Naghavi M, Abolhassani F, Pourmalek F, Moradi Lakeh M, Jafari N, Vaseghi S, et al. The burden of disease and injury in Iran 2003. *Population Health Metrics*. 2009; **7:** 9. doi : 10.1186/1478-7954-7-9.
8. Available from: URL: http://viz.healthmetricsandevaluation.org/gbd-compare/ (5/26/2013 -11 AM).
9. Naghavi M, Jamshidi HR. Utilization of Health Services in I. R. Iran in year 2002. Tehran 2006.
10. Khosravi A, Taylor R, Naghavi M, Lopez AD. Mortality in the Islamic Republic of Iran: 1964–2004. *Bulletin of the World Health Organization*. 2007; 85: 607–614.
11. Khosravi A, Taylor R, Naghavi M, Lopez AD. Differential mortality in Iran. *Population Health Metrics*. 2007; doi:10.1186/1478-7954-5-7.
12. Mehryar AH, Naghavi M, Ahmad-Nia S, Kazemipour S. Vital Horoscope: Longitudinal data collection in the Iranian Primary Health Care System. *Asia-Pacific Population Journal*. 2008; 55.
13. Pourmalek F, Abolhassani F, Naghavi M, Mohammad K, Majdzadeh R, Holakouie Naeini K, et al. Direct estimation of life expectancy in the Islamic Republic of Iran in 2003. *Eastern Mediterranean Health Journal*. 2009; **15(1):** 76 – 85.
14. Naghavi M.Transition in health status in Islamic Republic of Iran. *Iranian Journal of Epidemiology*. 2006; **1(3):** 13 – 25.
15. Naghavi M, Jamshidi HR. Utilization of Health Services in I. R. Iran in year 2002. Tehran 2006.

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