

Lifetime Effects of Early Mortality Caused by Unintentional Accidents on Fiscal Pressure of Social Security Pension Fund in Iran

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Abstract

The pension systems in Iran are mainly the PAGE-DB ones. Revenues of pension systems in Iran are actuarial-based whereas liabilities are social-based, which is due to pension laws. As a result, there are growing liabilities leading pension systems facing difficulties from imbalance between their liabilities and revenues during the last decades. Therefore, the imbalance cannot be analyzed only with actuarial factors. It is thought provoking that the problem is occurring during the first phase of demographic dividend and Iran still has a young age structure. Given the situation outlined, the impact of other demographic factors should be investigated. One of these factors is early and preventable deaths, such as early mortality caused by unintentional accidents, which has been always the second or third cause of death in Iran. Under the fixed economic and actuarial conditions and using census, registration, and administrative data in 2011 and 2016 and running multi decrement and working-life tables, the research aims to measure and analyze lifetime effects of early death caused by unintentional accidents to address the aforesaid imbalance of Social Security Pension Fund (SSPF). Findings indicate that 595378 years of lost premiums were incurred by early mortality caused by unintentional accidents, which will make the SSPF lose the revenues of 23160 billion IRR. Furthermore, the SSPF will be obliged to pay 272491 years of pension for beneficiaries of the insured died of unintentional accidents i.e. their wives, daughters and sons life, which will impose 18086 billion IRR on the liabilities of the SSPF.

Key Words: Social Security Pension Fund (SSPF), Early Mortality, Unintentional Accidents, Revenues, Liabilities

Introduction

The pension systems in Iran are mainly the PAGE-DB ones. Revenues of pension systems in Iran are actuarial-based whereas liabilities are social-based, which is due to pension laws. One of the important issues that have been a subject of lengthy debates among demographers, economists and actuaries is the issue of the imbalance between liabilities and revenues of pension systems. The liabilities of pension systems are increasing remarkably in Iran during two last decades which made these systems teetering on the edge of bankruptcy. Numerous studies have been carried out concerning substantial liabilities of Social Security Pension Fund (SSPF) in Iran (Koosheshi et al 2016, Jabbari 2013, Khaleghi 2013, Raghfar and Ardalan 2011, Zadegholam 2010, Shakori 2009, Roghanizadeh 2005). Each of these studies has pointed to a reason behind the rising liabilities of pension systems. For instance, Shakori (2009) and Roghanizadeh (2005) have stated the rising liabilities of the SSPF stems from the increase in the number of old people and the changes in the age structure. Whereas Raghfar and et al (2015) are of the opinion that economic changes and its impact on the rate of employment is the reason for the imbalance between the revenues and liabilities of SSPF. The point to consider is that Iran has had the youth bulge during the two last decades and premium payers logically should be higher than pensioners. Accordingly, the rising number of the elderly cannot have a significant impact on the liabilities of the SSPF. In other words, the changes in the age structure of Iran's population in recent decades seem to be more of an advantage for the SSPF than a disadvantage. Thus, the impact of other demographic factors should be investigated. One of these factors is early and preventable deaths, such as early mortality caused by unintentional accidents, which has been always the second or third cause of death in Iran and has been less studied in previous studies concerning the SSPF. Given the existing need, the present study intends to analyses the lifetime effect of mortality of insured population in the working ages caused by unintentional accidents on the balance of revenues and liabilities of the SSPF.

Data and Methods

The data used in this research are extracted from five different sources; deaths data by causes has been extracted from the health registration system, which independently has been conducted by Ministry of Health and Medical Education (MHME) since 2000, the data on death counts to construct life table is based on released data by the Vital Registration System from 2010 to 2015. Other sources of data include census data and 2 percent sample of census data to estimate some socio-economic characteristic of insured people and their survivors, and the last one is administrative data from the SSPF on the number of insured people and their characteristics, particularly salary and premiums. Multiple decrement life tables and working-life tables have been used to estimate lifetime effect of death caused by unintentional on the revenues and liabilities of the SSPF and some other indicators

The number of the insured died of unintentional accidents (and of other causes of death) has been estimated by multiplying death rates caused by unintentional accidents by the number of insured population by sex and age. The lifetime lost premiums of the SSPF has been estimated by multiplying the years of lost working life by average premiums paid by each insured person by age.

2 percent of population census has been used to estimate the number of beneficiaries of the deceased insured i.e. their wives (either remarries or not), their under 18 years old or unmarried and unemployed daughters and their under-18-years-old sons. Following the estimation of the wives and daughters and the under-18-years-old sons of insured population, the number of the deceased insured's wives by age is multiplied by life expectancy for females in each age to estimate lifetime wives pensioners. The number of the deceased insured's daughters is multiplied by years of being unemployed and unmarried using working-life tables and then multiplying by expectancy of life at each age of them to estimate lifetime daughter pensioners. The number of under-18-years boy pensioners has been calculated as person years lived to benefit pensions until 18 years old.

Findings

Table 1 and 2 indicate the number of the insured died of unintentional accidents and cardiovascular diseases, years of lost working life (YLL_c), lifetime years of lost working life and lifetime lost premium by age. As shown in the tables, 7780 insured persons and 9762 insured persons died of cardiovascular diseases. Additionally, unintentional accidents and cardiovascular diseases are responsible for 34624 and 20347 person-years of lost life in one year. Moreover, 595378 and 281965 lifetime years of lost working life for the insured are brought about by unintentional accidents and cardiovascular diseases, respectively. Further, the SSPF lost revenues of 23160 and 10980 billion IRR by unintentional accidents and cardiovascular diseases. Put it differently, if early deaths merely by unintentional accidents during one year had been prevented, revenues of the SSPF would have increased by 23160 billion IRR. Although the number of the insured died of cardiovascular diseases is higher than the insured died of unintentional accidents, Lifetime years of lost working life and therefore lost revenues caused by unintentional accidents is noticeably higher than the ones caused by cardiovascular diseases.

Table 3, 4 and 5 also indicate life expectancy of beneficiaries, number of beneficiaries of the deceased insured, expected years of pensions for beneficiaries, annual average pensions paid to beneficiaries and lifetime pensions paid to beneficiaries by age and their relation to the deceased. As shown in the tables, the insured died of unintentional accidents have 5413 wives, who will enjoy survivor's pension for 216054 years. Moreover, they have also 6634 unmarried and unemployed daughters, who will be given survivor's pension for 39343 years and they have 4815 under-20-years-old boys, who will receive survivor's pension for 14155 years. Overall, 16862 beneficiaries of the insured died of unintentional accidents qualify for survivor's pension, which the SSPF will be obligated to provide these beneficiaries with survivor's pension for 269553 years. The insured died of cardiovascular diseases have 7753 wives, 8196 unmarried and unemployed daughters and 7914 under-20-years-old boys, which will live on survivor's pensions for 256832, 34243 and 14157 years, respectively.

As shown in table 5. Wives and unmarried and unemployed daughters and under-20-years-old boys of the insured died of unintentional accidents are expected to receive 16,613 1,118 and 354 billion IRR survivor's pensions, respectively during their life. In addition, wives, unmarried and unemployed daughters and under-20-years-old boys of the insured died of

cardiovascular diseases are expected to receive 12,735, 984 and 430 billion IRR, respectively. As can be seen, beneficiaries of the insured died of unintentional accident are expected receive more of survivor's pensions than ones died of cardiovascular diseases. One reason is the age pattern of deaths caused by unintentional accidents, which happens at younger ages. Therefore, beneficiaries of the insured died of unintentional accidents are young and accordingly will receive survivor's pensions for longer years.

Table 1. Number of insured and dead caused by Cardio-Vascular and Unintentional Accident, remaining years of premium payment, and Years of Lost Life, 2015

| Age | Number of the insured died of | | Remaining years of premium payments | YLL _c | |
|-------|-------------------------------|------------------------|-------------------------------------|-------------------------|------------------------|
| | Unintentional accidents | cardiovascular disease | | Unintentional accidents | cardiovascular disease |
| 15-19 | 20 | 4 | 34.2 | 40 | 13 |
| 20-24 | 356 | 83 | 28.4 | 619 | 174 |
| 25-29 | 1197 | 394 | 26.9 | 2316 | 639 |
| 30-34 | 1594 | 823 | 24.2 | 4151 | 1242 |
| 35-39 | 1445 | 1056 | 21.4 | 5172 | 1790 |
| 40-44 | 1150 | 1377 | 19.0 | 5766 | 2496 |
| 45-49 | 905 | 1870 | 16.8 | 6017 | 3530 |
| 50-54 | 675 | 2103 | 6.3 | 5602 | 4641 |
| 55-59 | 437 | 2051 | 6.3 | 4941 | 5820 |

Table 2. Lifetime lost premiums caused by unintentional accident and cardiovascular diseases, 2015

| Age | total years of lost premiums caused by | | Average ¹ annual premiums per person | lifetime lost premiums (Billion IRR), caused by | |
|-------|--|----------------|---|---|----------------|
| | unintentional accidents | cardiovascular | | unintentional accidents | cardiovascular |
| 15-19 | 1429 | 477 | 29533717 | 42 | 14 |
| 20-24 | 18605 | 5481 | 31322690 | 584 | 172 |
| 25-29 | 66263 | 19280 | 34260537 | 2273 | 662 |
| 30-34 | 106388 | 33520 | 37931526 | 4031 | 1269 |
| 35-39 | 116679 | 42301 | 40551278 | 4724 | 1711 |
| 40-44 | 114688 | 51508 | 41025190 | 4689 | 2100 |
| 45-49 | 104096 | 62333 | 41624331 | 4312 | 2574 |
| 50-54 | 36055 | 30297 | 38862746 | 1395 | 1170 |
| 55-59 | 31175 | 36768 | 35591666 | 1109 | 1308 |

Remaining years of premium payments*YLL=lifetime years of lost premiums caused by unintentional accidents. lifetime years of lost premiums caused by cardiovascular * Average annual premiums per person= Lost premiums caused by unintentional accidents

It is assumed that the deceased insured pay premiums for the rest of his life same as the age group they have ¹ died.

Table3. Years of pension payments for beneficiaries of the insured died of Cardiovascular Diseases and Unintentional Accident, 2015

| Age group | life expectancy | | | Number of beneficiaries | | | | | |
|-----------|-----------------|----------------------------------|-----------------|-------------------------|-------|------|-------------------------|-------|------|
| | wives | girls (unmarried and unemployed) | boys (until 20) | Cardiovascular diseases | | | Unintentional accidents | | |
| | | | | wives | girls | boys | wives | girls | boys |
| 0-4 | | 18.5 | 17.913 | 0 | 1127 | 1040 | 0 | 1829 | 1314 |
| 5--9 | | 18.4 | 14.16 | 0 | 1706 | 1712 | 0 | 2001 | 1397 |
| 10--14 | | 14.6 | 9.49 | 0 | 2039 | 2927 | 0 | 1445 | 1372 |
| 15-19 | 62.0 | 14.5 | 4.69 | 0 | 1886 | 2236 | 0 | 914 | 732 |
| 20 - 24 | 57.2 | 3.8 | - | 14 | 992 | - | 64 | 331 | - |
| 25- 29 | 52.4 | 4.4 | - | 173 | 328 | - | 541 | 88 | - |
| 30 - 34 | 47.6 | 6.9 | - | 510 | 90 | - | 1050 | 21 | - |
| 35- 39 | 42.8 | 9.9 | - | 769 | 21 | - | 1113 | 4 | - |
| 40 - 44 | 38.0 | 11.7 | - | 1125 | 5 | - | 945 | 1 | - |
| 45- 49 | 33.3 | 12.1 | - | 1560 | 1 | - | 747 | 0 | - |
| 50 - 54 | 28.7 | 11.0 | - | 1767 | 0 | - | 562 | 0 | - |
| 55 - 59 | 24.2 | - | - | 1835 | 0 | - | 390 | 0 | - |

Table 4. Lifetime pension imposed on liabilities of the SSPF resulting from death caused by Cardiovascular Diseases and Unintentional Accident, 2015

| age | years of pension payments for beneficiaries of the insured died of: | | | | | | Average annual pension per beneficiaries (Million IRR) | | |
|--------|---|-------|------|-------------------------|-------|------|--|-------|-------|
| | cardiovascular diseases | | | unintentional accidents | | | wives | girls | boys |
| | wives | girls | boys | wives | girls | boys | | | |
| 0-4 | - | 11780 | 4132 | 0 | 13310 | 5624 | - | 23.73 | 23.73 |
| 5--9 | - | 11009 | 5114 | 0 | 12598 | 4601 | - | 25.14 | 25.14 |
| 10--14 | - | 6557 | 5841 | 0 | 7664 | 3089 | - | 26.11 | 26.11 |
| 15-19 | 5 | 3352 | 2236 | 27 | 3940 | 842 | - | 27.31 | 27.31 |
| 20-24 | 779 | 1051 | - | 3641 | 1243 | - | 72.76 | 30.13 | - |
| 25-29 | 9040 | 324 | - | 28361 | 386 | - | 67.95 | 32.42 | - |
| 30-34 | 24277 | 120 | - | 49986 | 144 | - | 61.51 | 35.30 | - |
| 35-39 | 32926 | 36 | - | 47633 | 43 | - | 55.38 | 39.42 | - |
| 40-44 | 42776 | 9 | - | 35950 | 11 | - | 51.49 | 45.62 | - |
| 45-49 | 51982 | 3 | - | 24909 | 3 | - | 55.04 | 54.28 | - |
| 50-54 | 50705 | 1 | - | 16137 | 1 | - | 64.38 | 62.46 | - |
| 55-59 | 44341 | 0 | - | 9411 | - | - | 73.83 | - | - |

Table 5. Lifetime pension imposed on liabilities of the SSPF resulting from death caused by Cardiovascular Diseases and Unintentional Accident, 2015

| Lifetime Pension which must be paid to beneficiaries of (Billion IRR) | | | | | | |
|--|-------------------------|-------|-------|-------------------------|-------|------|
| age | unintentional accidents | | | cardiovascular diseases | | |
| | wives | girls | boys | wives | girls | boys |
| 0-4 | - | 352.7 | 143.8 | - | 329 | 106 |
| 5-9 | - | 346.1 | 120.5 | - | 311 | 134 |
| 10--14 | - | 224.3 | 70.3 | - | 192 | 138 |
| 15-19 | 0.4 | 126.6 | 19.3 | 2 | 100 | 53 |
| 20-24 | 53.0 | 43.5 | - | 247 | 32 | - |
| 25-29 | 556.1 | 15.8 | - | 1745 | 11 | - |
| 30-34 | 1344.5 | 6.9 | - | 2768 | 4 | - |
| 35-39 | 1695.2 | 1.5 | - | 2452 | 4 | - |
| 40-44 | 2354.3 | 0.7 | - | 1979 | - | - |
| 45-49 | 3346.5 | 0.2 | - | 1604 | - | - |
| 50-54 | 3743.6 | 0.1 | - | 1191 | - | - |
| 55-59 | 3520.0 | - | - | 747 | - | - |

Conclusion

Deaths caused by unintentional accidents influence The SSPF in two ways: when the insured die of unintentional accidents, their premium payments terminate and as a result, reduce revenues of the SSPF. Given the insured died of unintentional accidents are young, they have few years of premium payments and as per Social Security laws, regardless of their records of premium payments, their beneficiaries are eligible for Social Security benefits . Further, they have young beneficiaries, i.e. wives, daughters and boys. Therefore, their beneficiaries will receive long years of survivor's pensions, resulting in increasing liabilities of the SSPF.

The emphasis on deaths caused by unintentional accidents in comparison with other causes of early deaths stems from the fact that they are preventable provided appropriate policies are implemented. Further, although number of deaths caused by unintentional accidents is fewer than deaths caused by cardiovascular diseases, they are exerting higher fiscal pressure on the revenues and liabilities of the SSPF.

However, some in-depth studies regarding other causes of early deaths such as cardiovascular debases, cancer and metabolic deceases and their impacts on pension systems can reveal more details concerning the impact of early deaths on pension systems.

Finally, it should be mentioned that preventing early deaths can raise the fiscal sustainability of pension systems and avoids their bankruptcy.

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