

# The Association between Income and Life Expectancy

## The Israeli Case

### Abstract

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To access the complete study (in Hebrew): <https://tinyurl.com/EHC17a>



## Summary

Income inequality and poverty in Israel as measured in the Household Expenditure Survey of the Central Bureau of Statistics (CBS) have increased significantly, both by international standards and historically. In recent years, there has been a decline in economic inequality (before state intervention in taxes and allowances), after peaking in 2006. However, the overall level of inequality after government intervention has not changed. Moreover, the expenditure and income surveys, while providing cross-sectional data, do not allow for analysis based on permanent income nor an examination as to the effects of ongoing poverty and inequality.

In this study, we examine the association between the level of working age income and life expectancy, based on administrative data collected over time. The population groups in this study include men born between 1930 and 1935 and women born between 1935 and 1940, whose income is identified on the basis of National Insurance Institute (NII) data. By estimating standardized and average annual incomes in the eight years prior to the formal retirement age, the study examines the association between income level and mortality rates in Israel.

The main finding of the study is the inverse relationship between income and mortality rates; the higher the level of income, the lower the mortality rate. The high mortality rates are particularly pronounced among men with very low incomes (up to NIS 175,000 a year). The findings are especially relevant to people and families living in chronic poverty, as high mortality rates and low life expectancy limit their chances of benefiting from the social security system's old age pensions, as well as pensions from the insurance companies.

## Introduction

In recent decades, we have witnessed growing economic disparities around the world. In 2014, income inequality in OECD countries reached its highest level since the start of the index. The average Gini index among OECD member countries was 0.318, while the average wage among the highest decile was nine times higher than the average wage among the lowest decile. In Israel, according to OECD data, the share of the population whose income is 50% lower than the median income is the highest of all OECD member countries, and stands at 18.6%<sup>1</sup>. Similar to the trend among OECD countries, the rates of inequality and poverty in Israel are increasing. According to the Gini coefficient for measuring inequality in income, distribution has steadily increased since the state of Israel was established, and stood at 0.365 in 2014.

Many studies are based on cumulative income data over the life of an individual and life expectancy is either calculated by the NII or the information is obtained from National Insurance files. For example, a study in the United States that examined differences in life expectancy between income groups based on region (Chetty et al., 2016) found a positive correlation between income and life expectancy, as well as sizeable national gaps that continue to widen. This study also found that the life expectancy of men in the upper percentile was 14.6 years higher than that of men in the lower percentile and that the life expectancy of women in the upper percentile was 10.1 years higher than that of women in the lower percentile.<sup>2</sup>

A similar study has not yet been conducted in Israel. However, the Bank of Israel published a report in 2016 that examined the effect of socio-economic level on health status. Among other things, the study found that the mortality rates in socio-economically 'weak' localities are 11% higher than the mortality rate in 'strong' localities.

In this study, we examine the relationship between income and life expectancy in Israel, based on National Insurance Institute data. Our research explores the gap in life expectancy that relates to economic variables as well as its development over time. An examination of these changes across the population according to income level will enable us to find out the relationship between income level and life expectancy, as well as measure the strength of this relationship via the use of regression analysis.

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1 OECD, Inequality and Income; 2014 data.

2 We emphasize that differences between people according to income percentiles are more extreme and pronounced than differences between people who are divided according to quintiles of income.

The findings of our study are significant for the examination of a range of public policy issues, including the eligibility criteria for old age pension benefits and the pension model used by insurance companies. Any reforms to the pension system should be based on an examination of possible implications, taking into consideration demographic changes and shifting patterns of adult labor force participation, which may create actuarial deficits.

## The Study

As part of a collaboration between the Israel Democracy Institute and National Insurance Institute, it was decided to conduct a study examining the gaps in mortality and life expectancy by economic status and the development of inequalities over time. In the future, this study could serve as a basis for more research to gain a greater understanding as to the implications of these gaps on pension and NII benefits. It will then be possible to formulate policy recommendations to reduce inequality. Our study, based on administrative data from the National Insurance Institute, examined mortality rates, changes in income distribution and shifts in the Gini coefficient, among men and women in Israel over time.

**Research Population.** Our research uses data of male cohorts born between 1930 and 1935, and female cohorts born between 1935 and 1940. These populations reached retirement age in the years 1995-2000 and therefore it is possible to estimate their income levels, assuming that they were of working age for at least eight years. Reliance on income data over a period of eight years is intended to overcome income level volatility over short periods, which commonly is the result of changes in employment or health status.

For this study, we used only data of people who had immigrated to Israel no later than December 31, 1989, or who had died not earlier than January 1, 1990. Neither does our research include persons identified as permanent army personnel, since the National Insurance Institute does not have complete income information about them.

The income data is based on the information available at the National Insurance Institute, and includes income from salaried and independent work of the surveyed population and their spouses, as well as income from early retirement or insurance companies in the years prior to their retirement.

Assuming that investment in one's personal wellbeing is affected by the household's income level, total gross household income (in 2015 prices) was divided equally between spouses. The level of income of an individual in the research population

was determined according to the average adjusted annual income in the eight years prior to reaching retirement age. This study is based on approximately 93,000 men born between 1935 and 1930, about 62% of the potential population according to the Israeli Population Registry, and about 84,000 women born between 1935 and 1940, about 48% of the women in the Population Registry.

## Study Results

### Mortality Rates Based on Income Level

Tables 1 and 2 present the mortality rates among men born in 1930 and 1935 and among women born in 1935 and 1940. The focus is on income levels 15 years after the research subjects' formal retirement. As can be seen, the mortality rate decreases as income level increases, both among men and women. However, it appears that the decline in mortality rate in relation to income level exists primarily among men with low incomes. From an annual income level of approximately 175,000 NIS, the relation between mortality and income ceases. The high volatility in high income levels is probably due to the low number of observations in these categories.

Figure 1 Mortality Rate Based on Income Level, 15 Years after Formal Retirement Age, Men

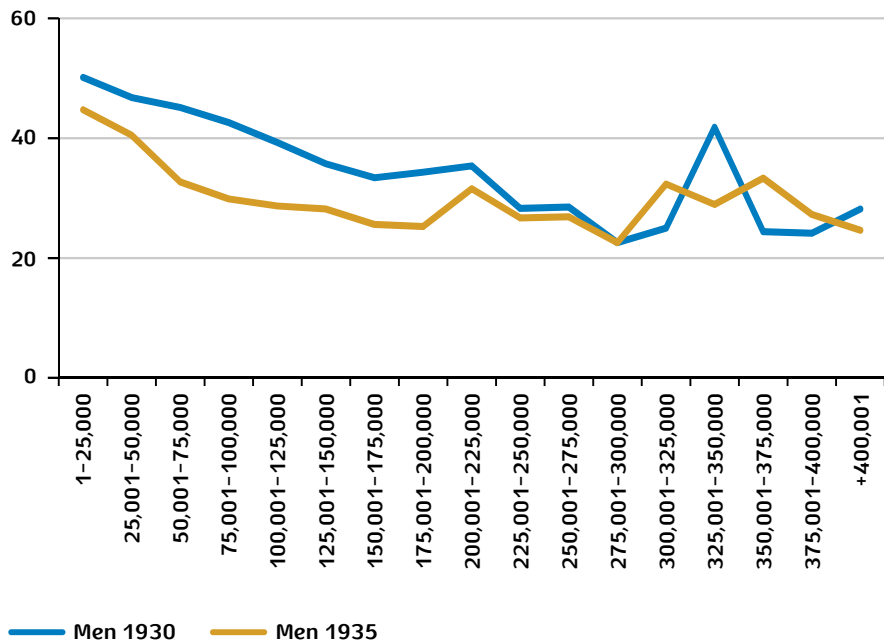
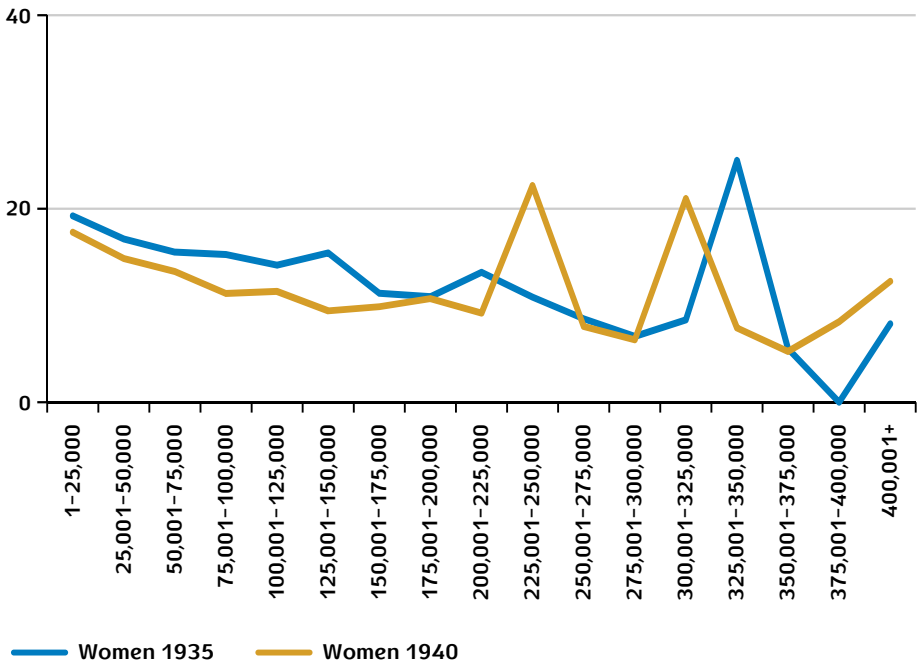


Figure 2 Mortality Rate Based on Income Level, 15 Years after Formal Retirement Age, Women



## Gini Index over Time

Changes of the Gini coefficient (figures 3 and 4) over time exhibit the development in income inequality levels for men and women between two periods. If the index declines, it means that inequality has narrowed and the population is more homogenous with regards to income. Along with lower mortality rates among those with higher incomes than people with lower incomes, this indicates that in the surviving population the income level is higher. The graphs show that the Gini changes pattern for men born in 1930 and men born in 1935 is the same and that the Gini index has declined over the years at a growing rate. The results indicate that in the 20 years measured (five years before retirement and 15 years after retirement), the Gini index decreased equally among the two cohorts, by about 17 percentage points, in light of the differences in the life expectancy of high income earners as compared to people with low incomes.

With regards to the female population group, the picture is similar to what was found among men. In both cases, there was a decline in the Gini index over a period

of time for both years measured. However, the decrease among the female cohort was much smaller. Moreover, the inequality index for the younger age group (born in 1940) is lower than that of the older cohort (born in 1935). Yet, the gap between the age groups is significantly higher than that of the male groups, about seven percentage points (greater inequality among the older group). It is worth exploring further the reasons for the different pattern for males and females.

Figure 3 Development of Gini Coefficient for Income Inequality, Men Born in 1930 and 1935

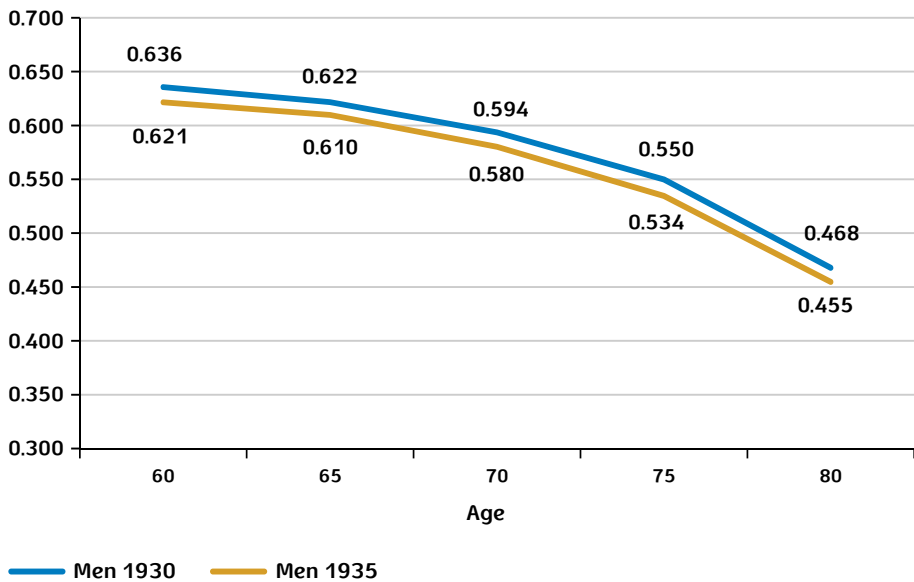
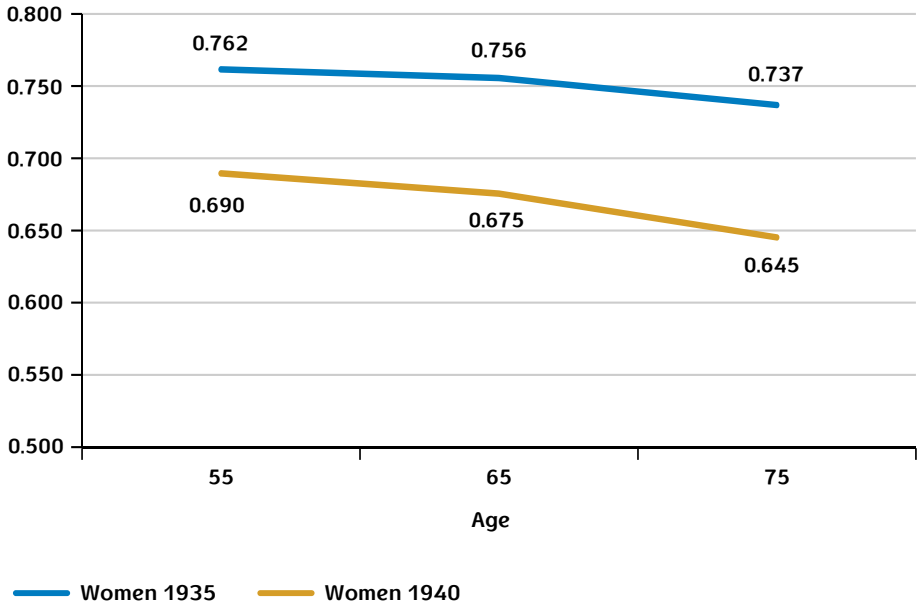


Figure 4 Development of Gini Coefficient for Income Inequality, Women Born in 1935 and 1940



## Survival Regression Test

A survival regression test for estimating life expectancy differences was conducted for all men born from 1930 to 1935 and all women born between 1935 and 1940. The dependent variable is the age as of December 2016 (for the living) or the age of death, whichever comes first. The independent variables are: sex; year of birth; ethnicity (Jews except ultra-Orthodox, ultra-Orthodox Jews and Israeli Arabs); number of years residing in Israel prior to retirement; in a relationship prior to retirement; and income quintiles (differences in relation to the upper quintile).<sup>3</sup> It

<sup>3</sup> Since the income we based our research on is annual income, the presentation of differences in life expectancy as a function of income quintiles is intended to enable the identification of these differences.



should be noted that the regression's findings are preliminary and, subsequently, we plan to further invest this model.

Findings of the regression test:

- Life expectancy is shorter for the lower income quintiles: **on average, the risk of people in the lowest income quintile for a shorter life expectancy is 57% higher than those in the highest income quintile. This negative effect decreases as the economic status increases.**<sup>4</sup>
- Relative to women, men's risk of a shorter life expectancy is 47% higher.
- Among the Arab population, life expectancy is shorter than that of the general population.
- Among the Haredi population, life expectancy is significantly higher than that of the general population.<sup>5</sup>
- The likelihood that people in relationships prior to retirement will live longer is greater than those who lived alone right before retiring.
- Life expectancy is increasing for younger cohorts.
- Number of years living in Israel prior to retirement has a positive and significant effect on life expectancy.

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4 In the future, we will add a Wald test with regards to the significance of the gaps in these coefficients.

5 The algorithm by which we identify Jews as ultra-Orthodox may be problematic for people of advanced age. In the future, we intend to reexamine this hypothesis.

Table 1 COX Survival Regression Test to Examine the Factors Correlated with Life Expectancy  
(Explained variable: age as of December 2016 or date of death, whichever comes first)

Variables	Estimates	Standard Deviation	Level of Significance
Men	-0.469	0.014	0001.>
Date of Birth	0.032	0.002	0001.>
Arabs	-0.180	0.015	0001.>
Haredim	0.756	0.033	0001.>
Number of Years Residing in Israel Prior to Retirement	0.001	0.000	0.0001
In a Relationship Prior to Retirement	0.105	0.008	0001.>
Quintile 1	-0.572	0.013	0001.>
Quintile 2	-0.430	0.013	0001.>
Quintile 3	-0.365	0.013	0001.>
Quintile 4	-0.236	0.013	0001.>
-2 LOG L	1,506,558.2		
Pseudo R-Square	5.1%		
Number of Observations	176,937		

## Discussion and Conclusions

**The results of the study indicate a negative correlation between life expectancy and income.** This effect was found mainly at annual income levels of up to 175,000 NIS. People with a very low income level (lower quintile) had a 57% chance of not living as long as people who are at higher income levels (upper quintile), with all other variables being consistent. This result is probably correlated with the level of access to health services in Israel. The findings also indicate that, over time, the mortality rate among the general population has been declining.

Similar to previous studies conducted around the world, these trends are more pronounced among men. Among other things, this can be attributed to the low variance in women's income, as women's rate of employment at these ages is rather

low.<sup>6</sup> However, it is important to remember that the income variable reflects the average income of both spouses. As such, it is possible that the spouse's income level influences this trend among women from the outset.

The decline in the Gini index over time shows that the group of people from the same cohort becomes more homogenous as they grow older; while a higher rate of those with lower incomes pass away. Thus, the decline in the Gini index means that inequality has narrowed and people have more similar incomes. Given the finding that mortality rates are higher among those with low incomes, it can be said that the remaining population is "richer."

These results may have significant implications for policies guiding Israel's social security and pension systems. If our findings are correct, the chances of people and families who live in persistent poverty to benefit from pensions and old-age allowances are low compared to the people and families of Israel's upper class.

In the near future, we will look in depth at the differences in life expectancy among the various income deciles and explore the implications of these differences on the pension system. Moreover, we intend to analyze whether the current pension system supports cross-subsidization between the poor and rich, so that the former, whose life expectancy is shorter, are effectively subsidizing payments to the latter.

## Sources

Bank of Israel, 2016. "The Relationship between Socio-Economic Status and Health: Periodic Fiscal Review and Research Analysis."

Chetty, Raj, Michael Stepner, Sarah Abraham, Shelby Lin, Benjamin Scuderi, Nicholas Turner, Augustin Bergeron, and David Cutler, 2016. "The Association between Income and Life Expectancy in the United States, 2001-2014": [www.equality-of-opportunity.org/assets/documents/healthineq\\_slides.pdf](http://www.equality-of-opportunity.org/assets/documents/healthineq_slides.pdf)

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6 In addition, the employment rate among women in Israel has increased significantly in recent decades, with a bias in favor of educated women.