



## Data Mining Analysis on Healthy Aging in Turkey

Arzu Baloglu \*

Marmara University, Istanbul, Turkey

Evrin Zeynep Unlu

Yeditepe University, Istanbul, Turkey

**Abstract:** Longevity has become a reality of life. Global average life expectancy has increased by five years between 2000 and 2015. This increase does not promise a healthy life; physical, financial, and mental constraints associate with aging. Obstacles in the path to successful aging are connected with behavioural determinants and genetic determinants. Major risk factors of behavioral determinants can be restrained at an early age, and factors can be mitigated. We studied successful aging determinants in 68 old age (65+) humans. Through our survey, we have gathered information related to behavioral determinants (smoking, alcohol use, diet, BMI index, physical activity, sleep patterns, education level), genetic determinants (diabetes, anemia, hemochromatosis, breast cancer, allergy, mental illnesses), socio-psychological determinants (marital status, interest in arts, and music, having a child, happiness index, relationship with friends & family, loneliness, financial situation). Survey results help us understand and measure behavioral, genetic, and socio-psychological effects on biological aging at the micro-level. Results can be used to understand major risk factors among determinants.

**Keywords:** Longevity, healthy aging, successful aging, healthy aging analysis, healthy aging, determinants, aging

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### I. INTRODUCTION

Life expectancy is increasing due to improvements in the health industry and economic, social, and educational, scientific developments [1, 2, 3]. World Health Organization stated that between 2015 and 2050, the proportion of the world's population over 60 years would nearly double from 12% to 22%, and today the speed of population aging is much faster than in the past [4]. Per Capita Income is a very important indicator of life expectancy. According to World Bank Income Groups, high-income group countries' average life expectancy is 79.83 years, while low-income group countries' life expectancy average is 60.75 for both sexes [5, 6]. Average life expectancy at the age of 60 in low-income group countries is 16.39, and 22.87 in high-income group countries. There is a strong indication of the "income of a country as well as the income of an individual." Healthy aging is about benefiting opportunities for a good state of health, contributing to

active social life independently, and having a high-quality life. By aging, functional/psychological limitations, financial and social constraints can be experienced. While citizens are experiencing such limitations in their lives on a daily basis, governments' health expenditures are rising [7, 8, 9]. UN Public health expenditure in the EU's 27 member States was, on average, 5.9% of GDP in 1990, 7.2% in 2010, and the projections show that expenditure may continue to grow to 8.5% of GDP in 2060 due to the aging population and other socio-economic and cultural factors [10]. Besides, the projected expenditure in the long-term will double over the projection period. Concurrently, between 2010-2060, the working-age contingent is expected to fall dramatically from 61% to 51% of the population, while the proportion of older adults (65+) and old-old (80+) population in the EU is projected to grow, 17.4% to 30% and 4.7% to 12.1% respectively [5]. These findings are the result of factors that affect aging

\*Correspondence concerning this article should be addressed to Arzu Baloglu, Marmara University, Istanbul, Turkey. E-mail: [karzubaloglu@gmail.com](mailto:karzubaloglu@gmail.com)

and longevity. As life expectancy is directly related to a country's income in macro terms, a person born in Angola has an average life expectancy of 52.4 years while a child born in Japan expects to live 83.7 years [11]. Not only is income a major impacting factor of longevity, but demographic factors as well. According to estimates by WHO, the number of deaths due to lack of health environment is estimated as 12.6 million in 2012, nearly 1 in 4 of total global deaths [12]. There is a 72% negative correlation between life expectancy and deaths attributable to the environment, according to WHO 196 countries' data [13]. 13% of the world population has no access to any form of sanitation facility, resulting in high levels of environmental contamination and exposure to the risks of microbial infections, diarrhoeal diseases, hepatitis, trachoma, according to WHO [14]. The use of improved sanitation facilities is 6.7% in Sudan and 10.4% in Niger; life expectancy in these countries is respectively 57.3 and 61.8. Not only fulfilling basic physical needs such as clean water, shelter, improved health care facilities, prevention of diseases are important for maintaining health and well-being; but social needs such as contribution to society, mental health, psychological support for elderly people, maintaining a friendly environment for elderly people are all important for active aging. Providing bet-

ter opportunities for elderly people with the contribution of geriatric knowledge will prevent their disabilities and reduce risk factors of major diseases.

There are other preventable factors on the individual level, and do affect successful aging as a society; smoking, alcohol consumption, physical activity, healthy diet, and social contribution to society. In 2014, more than 1.9 billion adults aged 18 years and older were overweight. Of these, over 600 million adults were obese, and so physical activity is low [15]. This leads to cardiovascular diseases, hypertension, diabetes, depression, breast cancer, and colon cancer. 72.8% of males (age 25+) in the USA have BMI index 25 or above, and 37% of elderly people are obese, according to Centres for Disease Control and Prevention [16].

Also, tobacco is killing more than 7 million people each year; more than 6 million of those deaths are the result of direct tobacco use, while 890.000 are the result of non-smokers being exposed to second-hand smoke, according to WHO [17]. These are preventable factors that affect healthy aging and the threat of life directly and society. Only 1 in 3 countries, representing one-third of the world's population, monitors tobacco use by repeating nationally representative youth and adult surveys at least once every 5 years [17].

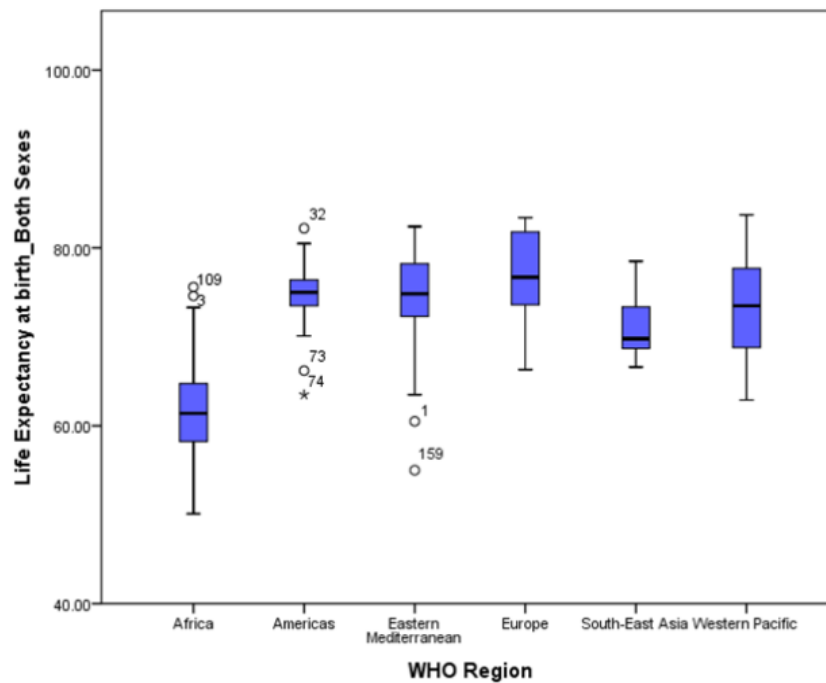


Fig. 1. Life expectancy according to regions

## II. RESEARCH METHODOLOGY

A survey is conducted by distributing questionnaires to people having age 65+. All participants are residents

in Istanbul. In total, 68 people ( $n = 68$ , Age > 65) were participated to survey that consists of 18 questions. Survey questions cover participants' behavioural determi-

nants (smoking/alcohol consumption, physical activity, level of education), genetic determinants (genetic disease history in the family; diseases covered are; dementia, cardiovascular diseases, diabetics, depression), socio-psychological diseases (marital status, interest in arts/music/painting, having a child, loneliness, financial situation, working life, relationship with a spouse, relationship with children, psychological status). Normality Tests, then Spearman Rank Correlation Tests, Chi-Square Tests, and Kruskal Wallis Tests were conducted, respectively.

Survey includes following questions: Gender: female = 1 male = 2. Age: 1 = 60-65, 2 = 66-70, 3 = 71-75, 4 = 76-80, 5 = 80+ Marital Status: 1 = Never Married, 2 = Married, 3 = Widowed, 4 = Divorced. Number of Children: 1 = None, 2 = 1, 3 = 2, 4 = 3, 5 = 3+. Work-Life: 1 = Never Worked, 2 = Retired, 3 = Still Working. Education: 1 = Elementary School, 2 = Secondary School, 3 = Lycee, 4 = University, 5 = Masters Degree, Ph.D. Genetic Disease History in the Family: 1 = Not available,

2 = Dementia, 3 = Cardiovascular diseases, 4 = Diabetics, 5 = Depression, 6 = Cardiovascular, and diabetics. Relationship with Spouse: 1 = I had a happy marriage, 2 = I sometimes had some problems in my marriage, 3 = I can't get along with my spouse, 4 = I don't want to answer. Relationship with Children: 1 = I have a good relationship with my children, 2 = I can't get along with my children, 3 = My children made me feel sorry for some reason. Exercise Habit: 1 = I have never exercised, 2 = I exercise several times a week, 3 = I used to exercise in the past, now I can't, 4 = I exercise almost every day. Interest in Arts: 1 = No interest, 2 = I deal with arts a few times a week, 3 = I used to deal with arts in the past, not I don't, 4 = I deal with arts almost every day.

### III. FINDINGS

The study is conducted with 68 participants, of which 42 are female and 26 are male.

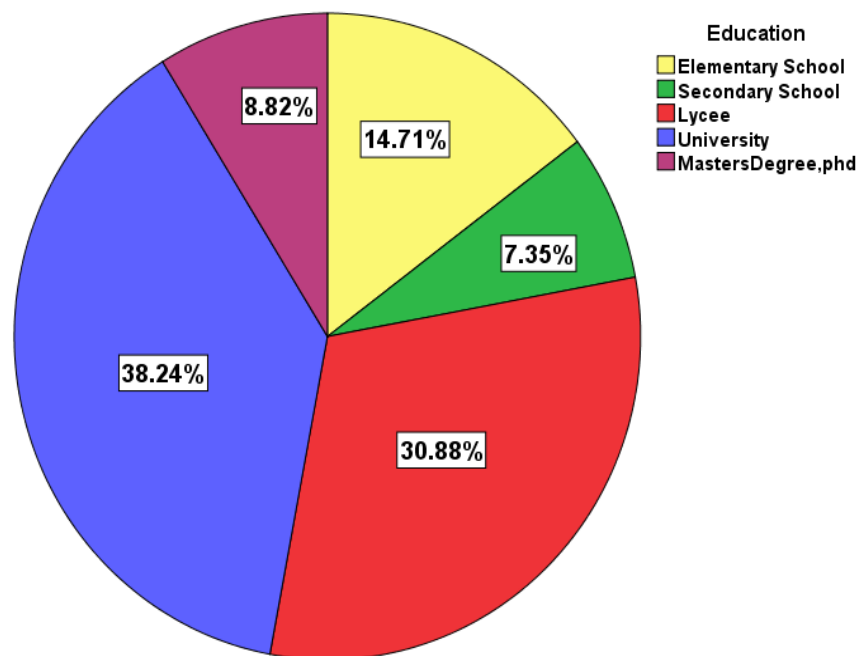


Fig. 2. Participant education distribution

Spearman Rank Correlation test results are as follows;

1. There is a 45.8% correlation between psychological status and social life in a positive direction; people who are more active psychologically are happier.

2. Education has a 21.2% positive influence on general appearance. Educated people look healthier.

3. As financial status increase (income), people tend to get healthier. 32% positive correlation exists between financial status and general appearance.

4. There is a 15.9% correlation between general

appearance and smoking & alcohol consumption in a negative direction. Smoking and drinking alcohol has a negative effect on a healthy appearance.

5. People who exercise look healthier. There is a 21.7% correlation between general appearance and exercise habits in a positive direction.

6. There is an 18.9% correlation between general appearance and interest in arts. People who interest in arts look healthier.

Chi-Square Test results are as follows;

1. Sig > 0.05, there is no meaningful difference between females' psychological status and males' psychological status (64.3% of females are happy, 35.7% are unhappy; while 76.9% males are happy, 23.1% are unhappy).

2. Sig > 0.05, no meaningful difference exists between females' and males' physical appearance (60% of females are in good condition, while 40% of males are in good condition).

3. Sig > 0.05, there is no meaningful difference between general appearance and education. 60% of elementary school graduates are unhealthy, and 40% are healthy; 20% of secondary school graduates are unhealthy, 80% are healthy; 38.1% of lycee graduates are unhealthy, and 61.9% are healthy; 26.9% of university graduates are unhealthy 73.1% are healthy, 16.7% of participants who have masters degree or hold Ph.D. are unhealthy, and 83.3% are healthy.

4. Asymp. Sig > 0.05, statistically, there is no meaningful difference between genders' exercise habits. 73.8% of females have never exercised, 11.9% of females exercise several times a week, 4.8% of females used to exercise in the past, nor they can't, 9.5% of females exercise every day. 61.5% of males have never exercised, 23.1% of male exercise several times a week, 3.8% of males used to exercise in the past, now they can't, 11.5% of male exercise almost every day.

According to Kruskal Wallis Test results;

- $p = 0.05$ , there is a significant difference in general appearance according to social life statuses. We execute the "Tamhane Post Hoc Test." There is a significant difference in means of general appearance between "lovable persons among relatives and friends" and "people who feel socially isolated"; "people who rarely see friends and relatives," "People who have problems with a relative.

#### IV. CONCLUSION

Aging is a biological process and cannot be prevented, but healthy aging can be maintained. Studies show that there is a significant relationship between healthy aging and physical activity and happiness. 45.8% positive correlation supports this theory; happier elder people are those who exercise regularly. Exercising should be understood and accepted as a lifestyle habit starting from childhood, which can help prevent certain diseases that can arise in old age. As being another behavioural determinant that helps mitigate risk factors of diseases; is an individual's lifestyle. Alcohol consumption and smoking associate with cancers, chronic liver disease, cardiovascular disease, alcohol poisoning, and lung disease, all of which can be prevented by lifestyle change. Mortality

is associated with smoking and alcohol usage. None the less, socially active people who have a positive relationship with friends and relatives keep a healthy mood and appearance throughout their lifetime. After retirement, elderly people lose their status of being dynamic society members and productivity and contribution to work life. Social interaction increases "healthy aging" after retirement. Studies show a positive correlation between income and longevity. Hence, the elderly have increased health care needs, such as home-based care and medical care, so income can help them get better treatment.

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