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SCHOOL OF ECONOMICS, BUSINESS AND INTERNATIONAL STUDIES

DEPARTMENT OF ECONOMICS

**SOCIAL AND ECONOMIC ASPECTS OF AGING POPULATION**

**Ph.D. Thesis**

**Maria Chounti**

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**ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΕΙΡΑΙΩΣ**

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**Supervisor: Michael Chletsos**

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To my daughters

## **DECLARATION**

I declare that this thesis has been composed by myself and that the work has not been submitted for any other degree or professional qualification. I certify that the intellectual content of this thesis is the product of my work and that all the assistance received in preparing this thesis, and the sources used have been acknowledged.

Part of this thesis has been presented in the:

- International Conference (IMAEF 2022), Meeting on Applied Economics and Finance which was held in Kefalonia, Greece
- 3<sup>rd</sup> European Conference on Aging and Gerontology (EGen2023) which was held in London, United Kingdom

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## ABSTRACT

The subject of the present dissertation focuses on three different topics which are closely related to health economics. The present doctoral thesis consists of three chapters and in each chapter, there are certain research questions that are investigated.

In the first chapter we examine aging of elderly and furthermore we concentrate on the complex clinical condition, the syndrome of frailty. Frailty causes great vulnerability to elderly as it has been associated with many adverse health outcomes. In addition, it affects many aspects of life and causes great impact on the quality of health. Social, economic and health factors play a pivotal role in correlation to frailty. The aim of the current chapter is to investigate the level of fragility and the potential determinants of frailty in the Greek population aged over 65 years old by using an extensive questionnaire and by collecting socio-demographic data.

In the second chapter we examine the out-of-pocket expenses and the inequalities which occur among OECD. Income inequality plays a pivotal role in the distribution of health care services as well as the quality of health level of individuals. The proportion of elderly population tends to increase and so the need for health services shows increasing rate. The aim of the current chapter is to explore the relationship among out-of-pocket expenditure and income inequality. The source of data is from the Standardized World Income Inequality Database and the World Bank World Development Indicators.

In the third chapter we examine the pivotal role of trust and self-assessed indicators for health and life satisfaction that are formed into social networks of communities. Social support can impact positive elderly at both their physical and mental health. Social interactions which occur into an active community impact the perceived health and life satisfaction of elderly. The source of data is from the European Social Survey where we exploited individual-level data across European countries about perceived health, life satisfaction, trust and interest.

**Keywords:** syndrome of frailty, frailty of Greek population, geriatric frailty, health inequality, social trust.

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## INTRODUCTION

Aging is defined as a normal, progressive and irreversible phenomenon which occurs to an organism and affects the normal operation of its mechanisms. The demographic aging of the populations has been a common phenomenon that occurs in recent decades worldwide (Campisi,2019). The rate and the extent of aging varies among each person and each elderly faces differently the influence of aging. There is an increase in life expectancy which can be explained due to the great achievement of health and social welfare systems. Aging by itself seems to be challenging as many issues in both health and social systems affect the stability of the population due to the increased needs that occur (López-Otín,2023).

Elderly appear certain characteristics which increase their possibility to face frailty syndrome. They have greater risk of illness; they have greater risk of chronic diseases; they have greater risk of disability. They also incur higher health care costs as well as they tend to use more health care services. Falls are also a very common situation in the elderly population and unfortunately result in increased higher rates of morbidity and mortality (Walston,2018). Frailty syndrome is found in elderly individuals. Elderly are particularly frail, due to changes in their body functions which result from the aging process (Freid,2001). Frailty is a complicated health situation which affects the person and blocks its capacity to maintain homeostasis and be functionable. It can be defined as a state of vulnerability to stressors resulting from a decrease in functional reserve across multiple systems (Dent,2019).

There are multiple factors which have been correlated for higher prevalence of showing frailty. However, the preventive role of primary care, the healthy lifestyle in areas such as nutrition, active physical and social activity have been associated with lower risk of frailty on elderly. The development of healthy aging by following certain interventions can reduce the incidence of frailty syndrome and thus make the elderly population less vulnerable.

The use of smoke and alcohol induce cellular aging and oxidative stress due to their toxic effect at the organism of the user. Their highly addictive substances create great DNA damage which is irreversible and accelerates the

process of aging (Wahl,2016). As to health conditions which affect the quality of life and the level of health of elderly, mostly all of their health systems show increased vulnerability when they are under the frailty syndrome (Englund,2013). In both basic and complex activities of daily life they may need support by other people as to accomplish them.

Visual impairments, hearing disorders and urinary incontinence which may exist or coexist are also challenging for elderly (Reuben,2009). The main target through the planning interventions for the elderly population is their statement to be stabilized or improved if possible and try to improve the individual as to be more independent and functionable.

Poor nutrition or malnutrition that is usually found in elderly population has pivotal role as it affects negative the right function of their organism. The rhythm of the increase or decrease of the Body Mass Index is responsible as it has been associated with sarcopenia and the increased number of falls per year of the elderly population (Palmer,2019). Moreover, the role of antioxidants components through nutritional intake reduces the oxidative stress and has positive effect on the organism of the individual (Laur,2017). Molecular pathways are under study as it occurs that there is strong connection among healthy aging and nutritional habits (Huisingh,2017). Gait and balance are two indicators which can be checked independently or in coordination as well and show how strong and active is an elderly person. The degree of independence contributes on the better well-being and life status of the elderly. The low results of these indicators have been associated with higher prevalence of frailty and decreased flexibility of daily activities (Phelan,2015).

The role of social networks encourages the psychology of elderly individuals and is associated with greater feelings of satisfaction and well-being among the society (Farrell,2022). The degree of quality and quantity of the social interactions that elderly have, confirm the positive results that occur in comparison to those who live under social isolation and face great consequences (Siette,2021). Mental disorders such as depression are very commonly found in elderly as there are many factors which contribute to this situation. Elderly individuals with mental disorders have greater prevalence of being frail due to comorbidity or of the social isolation they may face from their social network (Boccardi,2017).



Physical activity has been associated with the active functioning of elderly which can influence positive the level of their health status and well-being (Velissaris,2017). It also increases the socialization of elderly individuals which occurs from the increasing self-esteem and life satisfaction. Many intervention plans for the elderly population focus specifically on the maintenance of their independence as they have great need to feel that they can be functionable which improves their mental health (Lee,2012).

Single management plan of elderly patients is quite difficult as usually they are a heterogeneous group and the strategic interventions should be most focused on holistic care than on specific disease or need (Dorr,2008). This phenomenon has as result to affect elderly population as a holistic existence and so the direct and right assessment of prognosis is necessary in order to prevent and manage all possible needs of them. There are the short-term, the medium-term and the long-term management interventions which can be set according to the expected time to achieve the person the desired goal into (Pandey,2019).

Primary health care has important and emerging role in the early evaluation of the frailty syndrome as well as to many other health needs. There is emerging need that the principle of equity about the provided health care services should be affordable and with people-centered approach based on their various needs (Lionis,2009). Due to increase of the proportion of the elderly population worldwide this occurs major challenge for the health care systems which need to adapt effectively due to the new demanding circumstances (Nora,2020).

Health and economic development as sectors influence and affect each other as well as they can create great impact on the health status worldwide. Increased payments as well as out of pocket payments for health care services occur major inequalities and limitations in the access of health distribution (Tur-Sinai,2022). The economic level of each elderly can reveal great inequalities as it affects their access to resources, benefits and privileges. The role of income is crucial as low economic status has been associated with lower quality of life, lower health conditions for elderly, shorter lifespan and faster process of aging (Buckninx,2015).

The **first chapter** of the present thesis investigates the potential determinants of frailty, using own collected microdata in a sample of 500 individuals aged over 65 years. Given the cross-sectional structure of our data, we do not assume a causal interpretation of our findings, due to the usual omitted variables and reverse causality concerns. With these issues in mind, we estimate the association between frailty and a set of socio-demographic characteristics using ordered logit and linear probability regressions. In line with the relevant literature, we consider the potential role of several background characteristics, such as education, income, the presence of relatives, (perceived) health status, quality of nutrition and others in explaining the incidence of frailty. Interestingly, we also find that the covid pandemic might have also influenced the respondents adversely. Ordered logit analysis reveals common factors, among both male and female respondents. The factors that emerge as the most important in explaining the incidence of frailty are physical health, individual's independence in common activities that encounters every day (as measured by the KATZ questionnaire), being treated regularly by physician, income, and covid.

The **second chapter** of the present thesis investigates the factor of out-of-pocket spending, defined as direct payments by households on health services, beyond their contributions on health care systems through taxation. To analyze the impact of out-of-pocket spending on inequality, we estimate cross-country regressions for 29 OECD countries over the period 2000-2021 by using data from two main sources, namely, the Standardized World Income Inequality Database and the World Bank World Development Indicators. To reduce endogeneity concerns, we expand the set of control variables to include several potential confounders, such as income per person, unemployment and government spending on health. By means of OLS estimations, we generally establish a positive association between out-of-pocket expenditures and inequality. We suggest that there is a U-shaped relationship between OOP spending and income inequality. We interpret these findings as suggestive that OOP becomes catastrophic above a certain threshold. The results appear to be quite stable across different regressions which account for the effects of further controls. We also provide qualitatively similar results once we replicate the analysis using the system GMM estimator and internal instruments which

partially debiases our empirical model. The evidence from the system GMM approach in the spirit of Blundell and Bond (1998) indicates that the relationship between the main variables analyzed in this study is weak and insignificant, once we measure OOP as a share of total health expenditure. On the other hand, measuring OOP in per capita terms yields a positive linear association. Most of the remaining covariates included in the regressions do not appear to be significant determinants of inequality.

The **third chapter** of the present thesis investigates the potential role of trust and social networks in explaining the health outcomes of the respondents. We carry out the analysis both for the entire population and the elderly in particular. To do so, we exploit individual-level data from the 2018 European Social Survey. We use two self-assessed indicators as the dependent variable, namely perceived health and life satisfaction. We consider both individual as well as social trust (aggregate trust at the country-level) as the main independent variables of interest. Social interactions are captured by two variables indicating whether individuals meet with friends and relatives regularly, or whether they participate in social activities. We also include a set of further covariates to reduce endogeneity. The findings are consistent with the idea that trust and networks foster the outcomes considered in the analysis. To be able to argue that our findings, relative to the impact of individual trust, are causal, we follow common practice in the literature and replicate the analysis using only the children of immigrants in the sample and substituting individual trust for aggregate trust in their home countries. We find a statistically significant association between the variables under consideration. Our full specifications suggest that a one-point higher trust increases the probability of an individual reporting good health (being happy) by about 1 (1.5) per cent. We have also considered the importance of community trust. According to our findings, social trust displays a much stronger correlation with the outcomes considered in this study. The analysis also reveals that sociable persons, defined as those who meet friends regularly, or those participating in social activities, have an increased probability to report good health or happiness. Interestingly, religiosity, income, and education appear also to be important determinants. The results are broadly consistent once we consider only the elderly in the sample.

However, it should be noted that trust could be a consequence as much as a cause of life satisfaction or health. What is more, unobserved personal factors might influence both the outcomes and the attitudes toward strangers, giving rise to endogeneity. To be able to claim that the correlations discussed represent the causal impact of trust, we restrict the sample to include the children of immigrants only, and substitute their source countries trust for their individual preferences, as in Daniele and Geys (2015). This important empirical exercise implies that the association between trust and life satisfaction can be interpreted as causal. On the contrary, this does not seem to be the case once we consider health as the dependent variable.

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## **CHAPTER 1- Aging and fragility factors**

### **1.1 Introduction**

Aging is a physiological process, dynamic and irreversible which occurs at all living organisms. It is the time related deterioration of the functions of an organism at which various changes occur due to aging. The process of human aging is a complex and individualized phenomenon as a great number of biological factors impact its mechanism. Systemic imbalance of homeostasis result from weakness or failure of the human organism as aging affects organs or whole systems (López-Otín,2023).

Aging can be categorized as typical when it is evenly distributed in time or pathological when aging is rapidly progressive and leads to premature death. Successful aging is another category when aging is evenly distributed but without disease or disability because certain early measures have been taken from the individual in cooperation with health policies of each state (Campisi,2019).

Life expectancy is a complex trait which is affected by many genetic and non-genetic factors. Longevity is the extension of life span which is affected by behavioral and environmental factors. Significant evidence has been found among longevity and healthy aging of individuals or groups of people. The role of genes is very crucial as they are responsible for the lifespan extension of the organisms (Taormina,2019).

Frailty is a complex age-related clinical condition which is accompanied with increased risk of adverse health outcomes. Specific geriatric assessments can identify if a person is non-frail, prefrail or frail. The cycle of frailty is interlinked with five components: weakness, slowness, exhaustion, low activity and weight loss (Walston,2018). Frailty syndrome has been associated with aging, functional decline and the development of chronic diseases. All these health-related conditions affect the quality of life and the level of health status of elderly. The vulnerability which is caused due to frailty has as result many adverse health outcomes (Dent,2019).

The management of frailty is an emerging global need as this syndrome tends to rise alongside with the rapid grow of the aging population. The implications due to frailty syndrome have been associated with increased health

care costs as there is developed a pathological pattern of emerging need and over use of health care services (Abel,2018). The potential targets through health policies to prevent frailty and its early diagnosis through the available evaluation tools are very important as to improve the quality of health and life of each elderly individually based on their health needs (Pandey,2019).

The aim of the current chapter is to analyze the potential determinants of frailty, using own collected microdata on individuals aged over 65 years. Given the cross-sectional structure of our data, we do not assume a causal interpretation of our findings, due to the usual omitted variables and reverse causality concerns. With these issues in mind, we estimate the association between frailty and a set of socio-demographic characteristics using ordered logit and linear probability regressions. Our estimates indicate that physical health, individual's independence in common activities that encounters every day and income are among the most important factors explaining frailty. Interestingly, we also find that the covid pandemic might have also influenced the respondents adversely.

The rest of the chapter is structured as follows. First, we discuss frailty and how it may be related to various social, economic and health factors among the elderly. Next, we describe our data and the empirical model we estimate to explore the correlations between frailty and these factors. We, then, present and discuss the findings. Lastly, we summarize the main conclusions drawn from the analysis.

## **1.2 Definition of aging**

Aging is a natural procedure and on the same time a complicated phenomenon that involves both hereditary and environmental factors. It is a gradual process that appears with slow course and causes irreversible tissue degeneration. In the timeline of life aging is accompanied with many changes in the biological functions of the human body which in the majority involves the synapses which are important structures in the neuronal network. Everyone experiences adverse events during life which may impact the quality of life. Although this phenomenon affects all humans every organism responds in a different way at the aging process (Kligman,1989).

Aging differs between the genders. It is not only due to the biological differences between men and women but also important role plays their different role and existence in the society. Daily behavioral habits that are followed at the duration of life span influence the process of aging. Their better analysis and research will create a better understanding of this phenomenon if they affect positive, negative or neutral. These factors include eating habits, physical activity, use of smoke, social networks and economic status. Successful aging in combination with longevity are able to influence the population to adopt better behavioral habits based on safe principles. Adopting certain behaviors would be helpful by improving and towards preserving the health of the elderly (Kusumastuti,2016). Ageing is closely associated with certain physiological and structural changes that occur in the brain system. The alteration of the microglial cells due to aging are activated and appear systemic inflammation causing potentially severe brain damage and/or death. Also, dementia and Alzheimer's appear as a result of the altered neurons that contribute at high metabolic demands (Song,2011).

The improvement of the life expectancy and the decrease in the number of births are important factors that affect the imbalance of the population. The population shows amazing growth and more specific between 2000 and 2050 the universal ratio of people over the age of 65 years old will be increased up to 16,4%. Aging will cause in the future dramatic increase of the population in ages such as people over 80 years old and 100 years old. Countries worldwide will have to adjust at the demographic changes of their population because this phenomenon will bring abroad many issues on areas such as health and finance (WHO,2011).

Normal aging is a universal and unavoidable process for all multicellular organisms. Many factors affect aging such as biological changes, lifestyle, diseases and environmental factors. As long as we see that there are elderly in many different health conditions, we could consider that aging is just a period in the lifetime of human and it is not supposed to be followed by health problems. Also, certain behavioral factors tend to affect life survival and have significant importance in the procedure of "successful aging" (Miller,2009).

Many theories have been proposed to explain the phenomenon of aging. Some evolutionary biologists define aging on the basis of age. Furthermore,



aging is described as a steady decline of the normal function of the human body. Also, this is followed by increasing percentage of mortality and decreasing percentage of reproduction. This situation may not be stable but it fluctuates in the years. Another study mentions that aging is a complicate procedure because many and different dimensions incorporate. These factors can be biological, cultural and psychological. All these affect the life cycle of each person meaning that aging is not universally accepted as an age limit (Flatt, 2012).

There are the developmental-genetic theories which include the genes of longevity and the theory of mitotic clock. Also, there are stochastic theories which include the theory of somatic mutation and DNA repair, the theory of error and disaster, the theory of protein modification and the theory of oxidative stress. The developmental-genetic theories are based on experiments that their results confirm the theory of the dominant model of aging. They confirm the continuation of growth and maturation. The stochastic theories state that environmental factors affect the phenomenon of aging. It is based on the competitive pluralism which is affected by the pressure of the natural selection (Troen,2003).

There is the theory of the mitotic clock which is also called “apoptosis” and is based on the life cycle of the genes. Meaning that aging is a gene programmed action that normally happens to the cells of the human body. It is a nonstop procedure that happens into the cell cycle with the new cells to be created and other to die. Another theory is supporting that oxidative stress causes aging due to environmental factors to the human body. Oxidation as a phenomenon is involved into the cell cycle and causes toxicity and destroys the normal function of the cells. As a result, the oxidative stress caused by the environmental factors allows the degeneration of the genes and the human body leading finally to aging (Yaar,2003).

Although all these theories follow a certain path latest studies that have been done to explain how aging affects cellular and molecular mechanisms it is clear that aging occurs due to accumulation of molecular damage. The oxidation contributes at this damage in which reactions of free radicals give the final result of creating systematic errors into biochemical process of genes. Also, the same studies mention the importance of general health and its role

throughout the lifespan of individuals. Both the genetic background and the life conditions affect aging as a process. Chronological age and biological age do not always coincide and as a result aging on each person is observed with differences among population (Cefalu,2011).

Elderly population is defined as people aged 65 and over. In most countries this definition is connected with retirement. In many cultures aged people are believed that are wisdom because of their experience and knowledge. However, in western society this belief is not so acceptable, instead age is matched with illness and low function. The elderly dependency rate is defined as the ratio between the elderly population and the working age population. Elderly differ at each country and at every area. According to the number of elderly that each state has there is created imbalance to the demographic trends. Every region has to face different and multiple social and economic challenges in comparison with the living population. Aging worldwide into the populations is mostly a result of low fertility, low immigration and the phenomenon of longevity (Denier,2017).

Community and individual wellbeing tend to be affected by the emerging demographic changes and the mental health issues that are shown in the general population. Aging is a social, economic, demographic and epidemiological phenomenon that has various economic implications and appears impact that needs to be balanced in the network of the society. It is important that good contemporary primary health care can be provided to all citizens and especially to elderly that are have more health needs (Lionis,2009).

Meanwhile not all elderly belong at the same category of lifestyle or behavioral status. There are elderly who live a functional life and are in a mostly good health condition. These people can be determined that have aged successfully and can be part in the society as active members. They are capable to offer their knowledge and experience at the society in any way needed. On the other hand, there are elderly that have many health issues, may face chronic illnesses or even disabilities because they are not functional due to the aging situation. This position which leads elderly to be in need of help from other people because they cannot be autonomous has as result the social isolation of the third age (Kirkwood,2009).

Minimal functional discount and not showing up disease during lifespan consequently consists of a successful aging process. The term of successful aging is multidimensional and is used to characterize a person which has achieved a healthy aging far from disability, psychological problems and illness. These people are able to live with no physical restrictions, keep their social activities while living under a good and supportive social network. Although only a small number of elderly lives under this circumstance. Studies define the importance of physical exercise, nutritional, surgical and pharmacological interventions which can improve the quality of life and provide well-being. This has direct connection with less hospitalization and in general reduced need for health care resources (Rothman,2008). Mechanisms that is associated with aging need to be understood because it has very important role during the gradual transition at the life cycle of human. Life time is not common for all humans because there are important differences in life expectancy, depending on known variables or unknown until today variables (Martin,2015).

Many studies and theories have been trying to give answers at the phenomenon of aging and how this affects the balances into the population. The hypothesis of expansion of morbidity was introduced in 1977 states that although medical technology has reduced morbidity by treating diseases and life expectancy have increased this have a consequence of greater prevalence on such diseases. Furthermore, this statement explains that diseases which were lethal now due to all new advances of medical care are postponed by getting an extension of life. This situation causes people prolongation of life with a parallel extension on disease and disability (Gruenberg,1977).

Other hypothesis is the compression of morbidity which was introduced in 1980 and refers that if aging is delayed and neither disability nor morbidity show up these will be compressed and will appear later or near at the end of life. The practical focus on health improvement mentions that acute disease is equally important to be treated as other diseases instead of turning later to chronic (Fries,1980).

The hypothesis of the dynamic equilibrium of morbidity was introduced in 1982 tried to explain the statement that occurs between compression and expansion of morbidity. This suggests that a balanced condition occurs due to morbidity and mortality. Advanced medical care will be able to prevent or delay

the disease progression before it could cause severe health problems or disability (Manton,1982).

### **1.3 Longevity**

Longevity or exceptional longevity is a phenomenon that a human life cycle expands moreover than the total human life span at a specific region or country and at a time period. At this phenomenon there is expand of the chronic diseases and so patients are more likely to appear mortality rates due to the complications from these chronic diseases. Changes appear over the years on mortality rates causing adults to be more vulnerable due to chronic diseases while dementia and respiratory diseases have greater impact on elderly (Kung,2008).

Longevity can be divided into individual longevity and population longevity. Studies on longevity focus on life expectancy at birth, life expectancy at certain ages, and also on other indicators that prove healthy living. Until today the background of longevity is not clearly determined because there are many factors that play significant role at this process such as genes and the environment. This is an important fact because there is correlation between good health, successful aging, decreased morbidity and decreased disabilities. The general concept of longevity is not only the expectancy of the human life cycle but also the better quality of life dimension. Life expectancy is due to the significant advances in medical research that has provided better options for health, continuously improved health services and has made it possible for human to live a longer and more active life (Stefanadis,2011).

Among genders there are genetic associations with health outcomes which significant differ. In a recent study at the Chinese ethnicity of Han which forms the largest percentage of the Chinese population there were found gender differences due to biochemical pathways which influence longevity (Zeng,2018).

Worldwide in contemporary populations there are groups of people which have higher rate of life expectancy and whose exceptional longevity is under study. These areas are called “blue zones” (BZ) and are found in Greece (Ikaria), Japan (Okinawa), Italy (Sardinia-Ogliastra), Costa Rica (Nicoya) and United States (Loma Linda). the island of Ikaria in Greece). These people live

in specific areas and their common element is that they live under the same circumstances, lifestyle and environment (Poulain,2013).

Important influence is created by the conditions of the adult's early life and parental health as well as factors such as diet, education and physical activity throughout postnatal life has a cumulative effect on mortality rate of the population. As long as mortality rates show to have decreased since 1950 the life survival has radically increase. The clear demographic shift in birth rate and mortality reduction in developed countries has contributed to the aging of the population. The percentage of older people in the population form larger groups while younger people decrease (Cooper,2014).

New demographic equations that are created due to longevity are extremely evolutionary. In recent studies people over 80 tend to be the fastest growing population with parallel significant decrease in morbidity and mortality. Technological improvement combined with better health services has brought a new phenomenon into the cycle of the human life. Automation and artificial intelligence have entered thoroughly and has brought revolution and extension of life creating huge changes and new competitions in society (Manton,2008).

Social environment has radically changed and has made population more adaptable and flexible on life and health wellbeing. This extension of life brings up complications on the most basic phases of the population such as education, employment and retirement. Because the flow of life changes and as more and more needs is required the procedure of renewal is extremely wanted. Longevity cannot be phased as a problematic situation because of the unknown needs that brings along. Of course, it is extremely important for the population and at the same time an inevitable condition. Instead, it is necessary to take all serious measures and compromises due to the new needs that are set by longevity into the total population (Brooks,2013).

#### **1.4 Frailty syndrome**

Frailty is a clinical state characterized by a decrease of an individual's homeostatic reserves. It is a multidimensional situation which is responsible for enhanced vulnerability to endogenous and/or exogenous stressors that the person comes along. It increases with age and is prevalent in the population. Many reasons affect the physical equilibrium of the person's homeostasis such

as physical, social, psychological and environmental factors. There are certain criteria that define this phenotype which is followed by five components: loss of weight, self-reported exhaustion, weakness, slow walking speed and low physical activity (Freid,2001). Aging comes along with gene degeneration which gradually transforms the human body into less function. Elderly and later aged people show up with the frailty syndrome with main characteristic the increased vulnerability (Cesari,2017). It appears as a geriatric syndrome which affects multiple domains of the human functioning. It reduces the quality of life and the independence of older people. A variety of problems contributes to the development of this syndrome. Determinants for the quality of life of elderly are evaluated as long as process of aging tends to increase over the years. Elderly in the population consist of a heterogeneous group of people that create different and multiple needs at the health system (Heuberger,2011).

Fragility can be diagnosed from the symptoms that are found during the clinical examination and is based on specific data that each patient can refer for the quality of their life. Frailty is an important concept that affects seriously the life of an elderly person. Furthermore, research from geriatric medicine and continuous analysis on the symptoms of fragility can provide better preventive and treatment strategies on elderly population (Freid,2001). This syndrome has a great impact on elderly resulting to show increased imbalance while at the same time they self-report lower health quality from many points of view. Health issues such as neoplasm, chronic degenerative diseases and diseases of the cardiovascular system among with frailty show greater risk for adverse outcomes. Also, hypertension and diabetes mellitus in combination with frailty are defined with low quality life due to their increased risk of causing infarction and/or stroke (Taylor-Rowan,2019). Preoperative frailty has been also associated with greater risk of many post-operative complications which occur adverse health outcomes. These include low dependency, disability, numerous falls, fractures, long stay hospitalizations, hospital readmissions, institutionalization and mortality. Most frail patients are at least under one chronic condition which show increase among age average. (Clegg,2013).

Management of frailty due to its complication involves evaluation of the situation by creating a plan in order to individualize the needs and goals on health care. Primary health care physicians should determine and organize the

preventive interventions in order frail patients to have better quality of life and avoid adverse health outcomes. There are highlighted in studies the evaluation of frailty, the medication, the exercise programs for balance and strength endurance of the muscle system and the right management of the surgical procedures based on the needs of each individual.

#### **1.4.1 Biological models and mechanisms of frailty**

Specialized models are used in the laboratory to explain the phenomenon of aging which can be categorized into two groups. There is the in vivo and the in vitro aging that try to resemble the procedures of this phenomenon through studies. Into the population there are human models undergoing “successful” aging and syndromes that get accelerated by aging. There is no disease until today to be clearly associated with aging. Although there are certain genetic diseases that are found into the population such as Hutchinson syndrome-Gilford, Werner's syndrome and Down syndrome that are characteristic accelerated by aging. These diseases are result of some mutations that occur in one or more genes of the DNA or are due to specific chromosomal abnormalities. Common denominators of aging are represented in certain diseases and they are all represented with similar hallmarks (Carlos,2013).

Frailty firstly started to be observed and studied in animal models. Both rats and mouse have been observed in laboratories under experimental circumstances in order to understand the mechanisms of aging and how they develop frailty. There are common founds of the frailty index at rodents and people as well. Pro-inflammatory cytokine levels indicate a critical role in frailty causing many interventions to organ systems (Rockwood,2018).

In a recent two-year cohort study, mice were observed and examined in order to define the frailty syndrome. They researchers developed the mouse clinical frailty index and the mouse frailty phenotype assessment for evaluating preclinical research of frailty. Through the mouse frailty phenotype assessment none mouse was defined as frail except one which was categorized as prefrail. Also, no association was found with serum markers, blood pressure and heart rate with frailty (Kane,2017).

### **1.4.2 Behavioral and Nutritional Factors**

Healthy aging and successful survival are complicated procedures that are influenced by many factors. Physical activity is positively associated with healthy aging and good outcomes (Britton,2008). Prevention by maintaining a good physical condition as an adult can provide a good level of independence to elderly avoiding the possibility of numerous falls. Physical activity is connected with good health and wellbeing. Many studies report that physical activity is associated with lower risk of dementia and it improves cognitive function (Andel,2008). It can protect from the appearance of certain diseases and provide resistance of the organism. In addition, it can help elderly to gain self-confidence and self-esteem because they can be motivated and keep their social network active. Good social and supportive networks contribute in better psychology and symptoms such as depression or early dementia can be extremely reciprocal (Bouchard,2015).

Exercise habits differ among age, gender, ethnicity and other factors. Older people tend to lose their interest for activities although those on higher socioeconomic positions are more likely to remain active. Psychology of the individual and environment plays an important role if through social connections physical activity will be continued by promoting interactions with other people and occurs satisfaction (Dereveux-Fitzgerald,2016). Exercise participation in a survey of 92.000 people in England showed that declines throughout the adult life and as a result the recommended activity levels are worrying low. Inactivity during life is the major problem with impact on low fitness, may result obesity and has a great risk of using smoke and intaking alcohol. Also, people who had low physical activity over the age of 50 years showed higher risk of mortality in comparison to those who had higher physical activity (Lee,2012). Maintaining an active physical activity has as a result better health while aging and promotes longevity (Manini,2006). Lower risk of cardiovascular health issues and metabolic diseases can be achieved due to active exercise. The better control of blood pressure prevents from many serious diseases that may have great impact on the organism such as strokes and infarctions, development of diabetes mellitus, high risk of falls and fractures (Stewart,2005). Elderly need to exercise so they can maintain a good level of health by increasing the balance, strength, size and power of their muscle system. The combination of



increasing strength and endurance while exercising can prevent elderly from the impact of sarcopenia which has great risks for their life and help them maintain a good quality of life (Sillanpaa,2012).

Smoking is an important lifestyle factor that creates major impact and health outcomes. Avoiding the use of smoke can prevent from the burden of chronic diseases. Tobacco is equally high addictive and also contains a large amount of confirmed toxic substances that act on the body causing irrevocable cell damage and oxidative stress. Through the mucous membrane and the blood flow these substances pass easily in the organism. As a result, the use of smoke accelerates the cellular aging because intervenes into the normal cellular function. Parallel the immune system of the body becomes more vulnerable because substances of smoke destroy the macrophages. These are able to protect the cells from infections and other diseases. The toxicity of smoke also is responsible for the increased mortality and affects dramatically the quality of life (Wahl,2016). Although smokers could be hypothesized that they increase their risk of frailty due to their habit. In a cross-sectional study smoking was not associated with frailty but with higher mortality and morbidity resulting decrease of the survival rate (Hubbard,2009). Many studies have evaluated smoking and frailty but they all have associated that smokers showed increased risk of worsening frailty comparing to those who were not smoking. Many health problems such as cardiovascular diseases, respiratory diseases and cancer are common among smokers and are related directly with the use of smoke. Smoking increases inflammation leading later to chronic inflammation. It occurs great impact on the organs, influences the criteria of frailty and is associated with a higher prevalence and incidence of frailty (Kanapuru,2009).

Alcohol intake in elderly needs evaluation because if it is associated with frailty as well it is possible to create major impact on the quality of their life. Alcohol drinkers in studies reported higher odds for health problems and more osteoporotic fractures than non-drinkers (Englund,2013). Elderly who had drinking problems on the past showed more functional problems but these reports were not associated with frailty (Obstbye,2002). Alcohol users who intake high dosages of alcohol have great risk due to its association in studies with many diseases. It causes high risk of cardiovascular diseases such as

strokes and is associated with high mortality, cognitive impairment, metabolic syndromes and certain types of cancer (Elwood,2013).

Malnutrition is associated with frailty and causes serious problems to elderly due to its impact to other organs. This situation is able to affect many functions of the human organism. The lack of nutrition in elderly alters the quality of their life. Health professionals by evaluating frailty with tools can choose the right plan for supplementary support due to the needs of each individual (Palmer,2019). The quality of diet affects the quality of life of elderly. In a study that the Mediterranean-Diet score was evaluated with people who were under a healthy diet an important association occurred between diet and decreased risk of being frail (Bollwein,2013). In another study the intake of fruits and vegetables was associated with lower mortality rates from cardiovascular diseases (Strandhagen,2000). There is a commonly found evidence in many studies that low intake of certain micronutrients such as Vitamins D, E, C, folate and protein as well is associated with high risk of frailty (Lorenzo,2017). Also another study associated high intake of flavonoids with decreased risk of ischemic strokes and lower rate of mortality (Mursu,2008).

Malnutrition while being in hospital is actually a worrying situation because it may cause increase of mortality, readmission, length of hospital stays and as a final result to increase the total cost of the health care. The evaluation of malnutrition is needed in elderly so it can be prevented in frail patients. Frail patients diagnosed with cancer except from their standardized therapy they also need nutritional support and guided management in order to avoid malnutrition or even worse cachexia. Protein supplementation is associated in studies with patients that are also frail that has faster and better results in their assessment report. Proteins influence the human body by increasing the strength and finally the function which is an important factor that needs to be managed in frailty (Huisingh,2017).

There are many assessments such as BMI, Mini Nutritional Assessment, Short Physical Performance Battery, Short Form Late Life Function, Disability Instrument and HGS which are used to evaluate malnutrition in patients in order to diagnose, prevent and treat this serious situation which may cause other major health problems and reduce the life expectancy (Laur,2017).

Body Mass Index known as BMI, is a measure of body fat based on height and weight data. Many studies have associated both high and low BMI scores with high risk of frailty and also the appearance of chronic pain. This is could be explained due to excessive low or high body weight which appears as muscle weakness and also causes reduced function in physical activities. Frail elderly that were either underweight or obese showed higher probability of frailty among other elderly with normal weight (Chen,2019). Beneficial can be a balanced diet with certain calories based on the BMI of each adult. Many researchers try to explain the phenomenon of aging and how nutrition affects its function. Restriction of calories on diet reduces the production of free radicals in the cells which causes gene destruction an important factor of the aging process and prevents from diseases related to bad nutrition. On studies with animal trials longer lifespan appeared to a group of rodents that were fed with the half number of calories in comparison with another group of rodents that were feeding themselves on free number of calories. Also, the rodents that were fed with fewer calories showed up smaller possibility of illness (Anton,2013). BMI is also important as a parameter because it has been associated with surgical results. Patients with low weight or over weight have been identified with adverse health outcomes on surgical procedures (Audisio,2008).

Antioxidants in nutrition also tend to play an important role because in studies the population that receives them has longer life expectancy. In nutrition the number of calories that is consumed is equally important with the ingredients that get received by the organism. The most famous diets are the Mediterranean and the Okinawa. Their common element is that they contain high dosages in antioxidants and phytochemicals. In antioxidants are included vitamin C and vitamin E. In phytochemicals are included carotenoids and polyphenols. All of them affect the bioactive compounds that occur in the genome of the cell membranes, reduce the oxidative stress and finally contribute to life expectancy (Mourouti,2016).

### **1.4.3 Social and Economic factors**

Social and economic factors affect the living status of each person. Living under better conditions due to better economic status and stable social networks can provide longer living. The economic status of elderly is an important factor because it affects their access to their personal needs. People with good economic status tend to appear with welfare because they have the ability to live under better circumstances. Low income is associated with the appearance of frailty and elderly who had low income while being adults have higher risk to become later frail. Also, low education level has been associated with frailty (Fried,2001).

The education level and marital status are shown to be strong predictors of mortality. Also, good work conditions and good life conditions have as a result the successful aging. Income plays an important role on the society and the economic level of a person. It can provide more function in daily occupations and greater satisfaction at the mental health. The quality is equally necessarily with the quantity of the social relations that elderly has around it. Because elderly usually face social isolation due to their loss of function the decrease number of social contacts threatens their mental health and survival rate (Holt-Lunstad,2010).

Marital status is associated and affects the result of being frail or not. In a study of 360 people in Brazil aged over 65 years old it is reported that the absence of mate is associated with pre-frail condition. In addition, those who were frail elderly reported that they had a caregiver which assists them in their daily activities (Carneiro,2017). Age and gender are two factors that are evaluated in many studies in order to found the correlation among them and how there is connection with frailty. Age is a factor that in studies is shown to have correlation with the appearance of frailty. In addition, gender is a parameter that is shown in studies that women have higher levels of frailty than men. This could be explained due to many roles and types of lifestyles that are chosen among different ages and gender. Also, people with low income and low educational level appear higher rates of frailty and lower quality of life (Buckninx,2015).

## **1.5 Frailty and Organ Systems**

### **Endocrine system**

Hormonal changes are occurring resulting a functional deterioration at all systems of the human body. During aging three major hormones in the circulatory system appear to decline. This is due to the alteration that occurs in the endocrine system which controls the levels of energy and metabolism. IGF, sex hormone and DHEA are identified in studies in association with frailty. This consists of an important biomarker that can be used in further research in order to identify frailty in elderly (Bishop,2010). The ageing immune system is also identified with alterations and significant decline in cells that are activated in acute phases of inflammation. As a result, elderly appear prolonged period times to get over inflammations which are associated with higher mortality rates. Anorexia and catabolism are other factors that affect that quality of life of the elderly which are characterized by frailty (Sahin,2010).

Inflammation has been associated with the aging process which plays an important role in the gradual decline of the life span. Also inflammatory parameters have been found that they have same phenotype with frailty. Increased serum CRP levels are mentioned in many studies with increased incidence of frailty. Many recent studies investigate the possible correlation between CRP (C-reactive protein), white blood cells, fibrinogen, TNF-a (tumor necrosis factor a), IL-6 (interleukin 6), IL-1 (interleukin 1) with frailty. High levels of inflammation combined with frailty are defined that they have negative health outcomes for the elderly. They have been demonstrated to correlate with an important big number of components of frailty such as loss of physical and mental power. Elderly are also easier influenced by them due to the reduction of their immune system to resist in other factors. The chronic activation of the inflammatory response is investigated to be the major developer of frailty. Increased laboratory biomarkers indicate pathogenetic mechanisms that are active and are associated with higher morbidity. More specific increased CRP levels has been identified in studies among people who are frail and have low cognitive function and also they have high risk of sarcopenia and cardiovascular disease. The measurement of biomarkers is still under further study and sooner

identification could be very helpful in order to diagnose frailty by health professionals (Velissaris,2017).

Vitamin D declines with age and is found in low levels in blood examination in elderly people. Those who are frail are in risk of fracture osteoporosis and the low mass of their bones. The low vitamin D status may be caused by poor nutrition, insufficient exposure to sun, chronic diseases and polypharmacy. Also, patients diagnosed with sarcopenia have low levels of vitamin D. Frailty and vitamin D is shown in studies that they have association with higher risk of reduced physical performance and poor functional outcome. PUFA (N-3 polyunsaturated fatty acids) in the InCHIANTI study they were associated with reduction of the inflammatory markers by given as treatment through oral supplement at the patients (Ticinesi,2016).

In addition, metabolic dysregulation creates complications to elderly due to the increase of diabetic patients worldwide. Glycated hemoglobin (HbA1c) is one of the most used measures in laboratory blood test in order to estimate the glucose level for the last three months. In studies HbA1c which was found increased in elderly it has been correlated with greater incidence of frailty. Also, in other studies HbA1c which has been found decreased in elderly it has been correlated with increased number of falls in frail patients (Saedi,2019). Diabetes mellitus in association with frailty shows also higher risk of mortality. This is due to comorbidity, malnutrition and the bad management of the glucose levels. On the other hand, patients with diabetes mellitus that are not diagnosed as frail have higher risk of mortality (Janase,2018). The glycemic control of the elderly is needed so while being frail they will face even less health outcomes.

Homocysteine has been associated in two studies with the appearance of frailty. Elevated plasma homocysteine was proposed as a biomarker of physical function and can be defined as high when it is found in laboratory results over 15 $\mu$ mol/L. The first study associated high levels of homocysteine with the prevalence of FRAIL scale among male elderly aged 70-88 years old (Wong,2013). In the second study high levels of homocysteine were both associated with frailty and prefrailty among elderly aged 65-98 years old (Álvarez-Sánchez,2019). However high level of homocysteine may be the major biomarker that is caused by other factors due to frailty such as chronic

conditions, dysregulation of metabolism and other molecular pathways that are still unknown (Ma,2020).

### **Skeletal-Muscular System**

Low birth weight may have long term consequences for human health and create a great impact on adult's life by affecting many organ systems. Significant decrease of the muscle fiber score has been associated with low birth weight in a study and this may explain the later appearance of sarcopenia (Patel,2012). Sarcopenia is defined as a situation of progressive loss of the skeletal mass leading to decline of strength and power which begins around 50 years of age. As evaluation it requires both clinical examination of the muscle strength and the muscle mass (Faulkner,2007). It is considered by most that it is an inevitable part of aging. This is due to the adverse function of the endocrine system which activates the muscle breakdown. The combination of diminishing hormonal anabolic signals, the promotion of catabolic signals and the decrease of the body's ability to synthesize protein lead to sarcopenia (Ryall,2008). Elderly are identified with loss of mass and declined functional ability under the existence of frailty (Manini,2012). The pathophysiology of frailty and sarcopenia is complex but on the same time able to be reversible. This is due to special exercise programs that elderly have been following in order to increase their gait speed and muscle strength. The results were encouraging because these groups of elderly in studies within 8-12 weeks showed significant improvement (Liu-Ambrose,2004). Several studies have revealed the association between frailty and the increased risk of falls and fractures among elderly (Delgado,2015). This has a massive impact on elderly and results to be less functionable. They also tend to be more vulnerable which leads to increased numbers of falls, illnesses, hospitalization, mortality and institutionalization. Elderly which have been identified with frailty appear lower physical performance in comparison with other elderly which are not frail. Also, frail patients showed higher risk of falls and hospitalization (Morley,2016).

Osteoporosis and osteoporotic fractures remain a major challenge for elderly which is associated with frailty. The systemic skeletal disease whrecognized as low bone mass and deterioration of the bone tissues increases the possibility of fractures. This results with increased hospitalization

and often long-stay, long term care, impaired quality of life, possible disability and increased mortality. In western countries women appear higher risk of osteoporotic fractures within a range of 40%-50% in comparison to men that they appear very low percentage. Frail elderly have increased risk of undergoing an osteoporotic fracture so early evaluation and appropriate management is needed in order to have good outcomes. FRAX is an assessment tool in order to predict the risk of osteoporotic fractures. The follow up of the elderly although is not always easy because frailty may not have been early found and so it cannot be clearly analyzed whether it caused fracture or it came up as a later consequence due to the event (Li,2017).

### **Nervous System**

While aging at the DNA occurs damage affects the brain function and increases its vulnerability. Oxidative stress and increased proinflammatory cytokines are associated with major alterations due to apoptosis causing psychiatric illnesses (Lindqvist,2015). Mitochondria are responsible for the production of energy. Changes that may occur in the mitochondrial function due to aging are associated with reduced adenosine triphosphate (ATP) production which results reduced activity levels and mobility (Tosato,2007).

Frailty is associated to cognitive impairment and decline in late life due to many mental disorders that are related to this syndrome (Boccardi,2017). In many studies there are disorders that have been associated with frailty such as depression, dementia, Alzheimer's disease and Parkinson's disease. All the above can be worsen if not prevented or cured soon when there is poor or not at all supportive social network (Dardiotis,2014).

The reduced levels of dopamine may lead to the onset of depressive symptoms of elderly and also progressively decrease gait speed and cognitive tasks (Rutherford,2017). Depression is associated with poor quality of life, increased risk of falls, incident disability and increased risk of mortality. Depressive symptoms may be difficult to disambiguate from frailty. Both share some common symptoms such as low daily activity, loss of interest and loss of weight (Bandeem-Roche,2006). The first model between the relationship of these defines that if frailty and depression coexist but they are unrelated. Frailty should be treated with nutritional support and exercise programs and



depression with antidepressant medication. The second model between the relationship defines that frailty and depression while coexist result from the same disorder. In this case treatment and the development of a plan is urgent to be created in order to avoid adverse health outcomes for the elderly (Butters,2008). Many studies show the strong association which is created between frailty and depression. Patients that were identified with frailty and were taking medication for treating depression and other mental disorders reported more falls and increased feeling that were under difficulty to perform specific tasks in their daily life (Woo,2015). In another study that frailty was evaluated it was noted that patients reported both worsen of their quality of life and depression so both measures appeared higher scores (Iyasere,2016). Elderly that were hospitalized in the Intensive Care Unit for a certain period were as well identified with worsened quality of life, mental health problems and lower physical function (Bagshaw,2015). Cognitive decline is reported in observational studies as a factor that is closely related with frailty. A prospective cohort study that involved 273 elderly patients identified that the existence of frailty is related with increased risk of developing delirium. The combination of these parallel factors can affect the median survival of the elderly (Eeles,2012).

Both frailty and depression share one important biological characteristic which is the chronic inflammation. High levels of several biomarkers such as IL-6, TNF $\alpha$  and CRP which are found in blood test are common in depression and frailty and have been associated with low physical activity and metabolic syndromes which impact the quality of life (Walston,2009).

### **Circulatory System**

Hypertension is a serious health problem that has not been cleared yet if it is associated with frailty. Only a few studies have been done in order to find the possible association between frailty and hypertension. The guidelines of lowering hypertension through given medication is used as therapy by reducing the mortality risk in elderly. Because frailty is associated with limited life expectancy there have not been recorded enough data from elderly who were under treatment for hypertension. This leads studies to have poor results from frail patients and the beneficial effect of treatment cannot be associated with frailty. Hypertension may lead to other chronic diseases that increase the

mortality risk so it needs to be evaluated soon and the proper given treatment can work as a preventive method in order to extend life expectancy (Vetrano,2018). Another study shows that elderly with frailty show increased comorbidity. This results of elderly with frailty are also closely related with comorbidity and polypharmacy which also affects the quality of their life. Frail patients with chronic kidney disease are recognized with risk of mortality and morbidity. Several studies confirm a strong association between frailty and mortality in dialysis patients. Their inability to adapt and respond to health stressors increases their vulnerability and they present many hospitalizations due to comorbidity (Lee, 2017). However, a study in India among 205 patients found no significant association between mortality and dialysis patients that have been diagnosed with frailty as well (Yadla,2017).

Diseases from cardiovascular system have been also associated with frailty. Frail patients before surgery are important to be evaluated by a feasible assessment tool so the post-operative outcomes will be more valuable and positive. A study in Taiwan showed that frail patients had higher risk of vascular access failure (Chao,2017). A meta-analysis associated frailty and heart failure in elderly patients and reflected that affects their quality of life creating serious impact. Heart failure symptoms are common to frailty and appear heterogenous criteria such as low physical activity and decreased function in general (Denfeld,2017). Increased rates in morbidity are showed between elderly and acute coronary syndromes in many studies. Although frailty has not been fully evaluated how it affects the treatment and the final clinical outcomes of these patients. The newest results show strong association between frailty and long stay hospitalization about cardiovascular admissions (Bebb,2018). There are several areas in which frailty can play important role on how the patient will be treated and which medical option will be more beneficial in order to achieve better quality of life. Studies have revealed that frail patients post operatively may show nutritional, mental, organ complications, comorbidity and disability. These are occurring in co incidence with frailty and so it should be considered the risk before choosing the surgery procedure for a frail patient (Afilalo,2014).

## **1.6 Polypharmacy**

Polypharmacy or the use of multiple medications in elderly is categorized as one of the many geriatric syndromes that is associated with many other problems that affect the life of older people. It is recognized as an important contributor of developing frailty. Medications among them may create interactions which threaten the life of elderly causing adverse health outcomes such as disability, hospitalization and increase mortality (Gutiérrez-Valencia,2018). Excessive polypharmacy and frailty may be two different and independent factors that are associated with mortality but their combination increases and multiplies the risk factor of mortality (Bonaga,2018). Studies reveal that elderly with polypharmacy show greater prevalence of prefrailty. Also, another study associated that the increase of medication which is added to the total taken medication increases the possibility of being frail (Coelho,2017). Studies have not found significant statistical differences between frailty and polypharmacy or hyper polypharmacy. The number of medications shows to play important role on the final results for frailty. A study in Australia in men aged over 70 years old defined that the cut-off score in frailty is those who are taking 6.5 drugs (Gnjidic,2012). Another study in France in both genders aged over 65 years old defined the cut-off score at 6 drugs (Moulis,2015).

## **1.7 Surgeries**

Elderly face an important problem that can delay their direct and right diagnosis of a disease that can be successfully treated which are the atypical symptoms (Stewart,2008). Due to the demands of the aging population and the frailty syndrome the needs for surgical procedures and anesthesia is predicted to be increased in the future (Dall,2013). Although chronological age may differ from biological age elderly until nowadays face prejudice in cases of diseases about treatment and further management. Elderly are more likely to receive palliative care instead of other treatment and/or surgery. However, in certain cases elderly over 80 years old with lung cancer had better rates of life survival than adults after chemotherapy treatment. Therefore, the age should be a parameter of the chosen treatment but not to deter the management plan of the provided care.

Frail elderly during perioperative time show increased high risk of morbidity and mortality as a consequence of this multidimensional syndrome. They do not tolerate the surgery process as good as adults. Geriatric syndromes as frailty combined with surgical procedures and anesthesia demand certain protocols so they will not impact elderly's post-operative outcome (Aubrun,2012). Elderly who are frail as well due to their body mass decrease, they have higher risk of sensitivity in the drugs of anesthesia with longer duration of action and renal toxicity, one of the outcomes that should be avoided (Strom,2016). Surgical complications in frail patients are more likely to occur in comparison with non-frail patients (Chowdhury,2017). The low quality of life was evaluated in one study which showed significant association between surgical complications and frailty (Green,2015).

Cardiovascular health problems have been associated with frailty during perioperative period such as hypertension, hypotension, diastolic dysfunction, cardiac failure which may react as response to the drugs of anesthesia (Butrous,2016). Also, the decreased muscle mass of the frail elderly has been associated with a great number of postoperative pulmonary complications (Rana,2017). Lungs due to aging lose their parenchyma elasticity and show reduced muscle strength which increases the risk of hypoxemia, atelectasis and respiratory failure. Drugs of anesthesia also affect the function of the respiratory system and may lead to adverse health outcomes (Rana,2017).

Anesthesia given to frail patients is also associated with postoperative cognitive dysfunction (POCD) and postoperative delirium (POD). POCD is a situation that is temporary and 99% reversible and is associated with the surgery's anesthesia. It refers on multiple domains of cognitive function which are possible to be affected by the surgery time and the given anesthesia (Abildstrom,2000). POD has a clinical diagnostic criterion and is also associated with adverse outcomes. Delirium is characterized by an acute fluctuating course of cognition and consciousness which lasts 1-3 days. There are many factors that activate this situation occurring from surgical procedures. It may be due to anticholinergic medications combined with anesthesia's impact and systemic inflammation during the perioperative time (Perry,2004). POD has been associated with low quality of life, long stay hospitalization and higher costs for health care, functional decline and increased mortality rates

(Sieber,2009). Major other problems associated with frailty and surgical procedures are the increased long-stay hospitalization and the risk of mortality (Lin,2016). Moreover, anesthesia given to frail patients is required to be under plan in order to minimize the adverse outcomes and not to be excessive. According to the demand of the procedure and the medical history of the patient's theoretical general anesthesia has been avoided to frail patients due to many complications that may cause. Although studies that tried to find possible association of POD/POCD with the technique of anesthesia given (regional or general) defined that there was no significant difference among them (Mason,2010).

Frail patients are more vulnerable in the perioperative period. There are many issues that are associated with frailty, surgical procedures and anesthesia. Assessments of evaluating frailty could be extremely useful in elderly patients to be done before surgical procedures due to studies that have associated frailty and later surgical outcomes. It is reported that elderly undergoing screening methods for frailty have shown improved risk of stratification (Houisman,2015).

### **1.8 Frailty screening methods**

Frailty is characterized as a risk indicator followed by its long-term symptoms which affect elderly both physical and mental. Although until today there has not been created one single tool so it can be evaluated and measured. Identifying frailty in elderly has been an emerging trend worldwide. The most important factor is the ability to recognize the possibility of frailty in order to take the best preventive measures for elderly. The syndrome of frailty has created the need for development of many instruments that can be used by physicians but still it is an area that needs further research. The instruments that are shorter, simpler and need less time have become the most feasible in clinical practice (Xue,2017).

Many frailty assessments have been used in a variety of clinical specialties in order to identify elderly who are in higher risk for adverse outcomes so physicians can take the best options for them. Aging is usually associated with one or more illnesses that have to be prevented or cured by the guidelines of the geriatric medicine. More specifically over 50% of elderly have

three or more diseases at the same time which creates a situation that health needs may later turn to chronic (Vu,2019).

Despite the studies that are working on the frailty syndrome until today there is common agreement that there has not found any single biomarker that may be adequate for frailty prediction or diagnosis. Many studies try to identify the biomarkers that are responsible for the multivariate phenomenon of aging by developing new instruments and methods. Genetic factors are also studied but still they have not been fully evaluated. Due to the genetic predispose of many people to chronic diseases the effect of the genetic factors varies (Rodriguez,2013).

The Short Physical Performance Battery (SPPB) is based on the clinical procedure by the physician who tests the elderly on three separate tests. Skills are measured about balance, four-meter walking speed and chair stand. Each one is scored from 0 to 4 and the maximum score is 12. The final result of the elderly which is less than 8 in physical performance is an important factor that poor function has serious danger of sarcopenia (Gomez,2013).

The Clinical Frailty Scale (CFS) is based on the clinical observation by the physician who assigns a score between one and seven based on clinical judgment for variables such as activity, function and disability of the elderly. Its country of origin is Canada more specific the Dalhousie University and has a time period of less than 5 minutes to be completed. The range is from very fit to terminally ill. Very fit=1 point is someone who is very active and energetic. Well=2 point is someone who has no active disease, exercise occasionally but are less fit than the very fit scale. Well=3 point is someone who has medical problems but they are well controlled. Apparently vulnerable=4 point is someone who is not depending on someone else but their health problems limit their activity. Mildly frail=5 point is someone who depends on other people for help in some of their daily activities such as housework and medications. Moderately frail=6 point is someone who needs help from other people with all outside and inside activities. Severely frail=7 point is someone who is completely depended by another person and needs total personal care from whatever cause. Very Severely frail=8 point is someone who is approaching the end of life and they have reached a level of aging that no disease can be recovered. Terminally ill= 9 point is someone who is evidently frail and their life

expectancy is very small. This measurement has no need for special equipment to be done, it is a valid and reliable tool, it has good outcome prediction and it is mostly used in clinical setting. A person is diagnosed with frailty when its final score is over 5 (Rockwood,2005).

The Fatigue, Resistance, Ambulation, Illness, Loss of weight scale (FRAIL) is based on self-reported fatigue, resistance, ambulation (slow walking speed), illness and loss of weight (5% or more the last year). When three or more of these characteristics are present the elderly is classified as frail. Its country of origin is USA and has a time period of less than 10 minutes to be completed. This measurement has no need for special equipment to be applied and it is a valid and reliable tool. It can be used both in clinical and population setting. The outcome prediction has not been determined yet so more studies need to be done on this tool (Abellan,2008).

The Fried's Frailty phenotype is a measurement of frailty also known as the Cardiovascular Health Study (CHS) Index. Its country of origin is USA and it has a time period of less than 10 minutes to be completed. It defines the condition of the frailty in elderly as there is the presence of three or more physical characteristics. It measures the shrinking (weight loss of 4.5 kg or more in the last year), weakness (low grip strength), self-reported exhaustion, slowness (slow walking speed) and low physical activity. For this measurement there is need for special equipment and it is valid and reliable tool. It has good outcome prediction and it can be used both in population and clinical setting (Buta,2016).

The Gait speed is an instrument that can be used as a single measure or as supplementary for the screening of the frailty. When the time of gait speed is less than 0.8 m/s are this is an important factor and indicates upcoming health issues. In addition, when the time of the gait speed is less than 0.2 m/s this factor indicates serious frailty of the elderly. The importance of gait speed is seriously counted because it has close association with adverse health outcomes. This measurement needs special equipment to be done (Turner,2014).

The G rontop le Frailty Screening Tool (GFST) consists of six questions that have to be answered by the elderly. Its country of origin is France and as a time period it needs less than 5 minutes to be completed. The main points

are if the person lives alone, if there is perceivable weight loss, if the person feels more tired than usual, if there are memory problems, if the person has gait speed less than 1 m/s and if the person faces difficulty to get around. The elderly can give potential answers to all questions such as yes, no, unknown. This measurement has no need for special equipment although more studies have to be done on the population screening in order to be checked as valid and reliable (Subra,2012).

The PRISMA-7 questionnaire consists of seven yes and no self-reported questions. The questionnaire is about age older than 85 years, male, health problems, need of help in daily routine, health problems that need care, need of assistive walking device. Depending on the answers three or more positive answers define the person with frailty. Its country of origin is Canada and it as a time period it needs less than 10 minutes to be completed. There is no need for special equipment, as a tool it has been found reliable and valid although more studied need to be done on the screening of the population (Raiche,2008).

The Timed-Up-and-Go Test is a test that counts the functional mobility of the elderly. The main activity that has to be completed is to stand up from a chair, to walk approximately 3 meters and return back to the chair. If the total time of the activity take more than ten seconds to be completed the elderly is diagnosed with frailty (Podsiadlo,1991).

The Tilburg Frailty Indicator (TFI) is a multidimensional questionnaire based on the physical, psychological, and social aspects. Its country of origin is Netherlands and as a time period it needs less than 15 minutes to be completed. It contains fifteen questions which are self-reported on physical components, psychological factors and social factors. The person is defined with frailty if the score is over five on the given answers. There is no need for special equipment; it has been checked as reliable and valid although more studies need to be done on the screening of the population (Gobbens,2010).

The Groningen Frailty Indicator (GFI) is a popular frailty measurement developed in the Netherlands. It contains fifteen self-reported items which the elderly are asked for physical factors, cognitive components, social factors and psychological components. The person is defined with frailty if the score is over 4. There is no need for special equipment; although it hasn't been evaluated as



valid and reliable and more studies need to be done on the screening of the population (Peters,2012).

The Frailty Index of Accumulative Deficits (FI-CD) is another frailty measurement which involves the accumulation of thirty or more illnesses, symptoms and disabilities. The greater the number of health problems it indicates higher frailty of the elderly. Its country of origin is Canada and it has a time period 20-30 minutes to be completed. There is no need for special equipment and it has been checked as valid and reliable. As a tool it has good outcome prediction and it can be used both in clinical and population setting (Mitnitski,2001).

The Study of Osteoporotic Fractures (SOF) Index defines the presence of frailty when there are two or more positive answers of the following components; weight loss, exhaustion and low mobility. Its country of origin is USA and it has a time period of less than 5 minutes to be completed. There is no need for special equipment and it has been checked as valid and reliable. As a tool it has good outcome prediction and it can be used both in clinical and population setting (Ensrud,2007).

The Edmonton Frailty Scale (EFS) is a measurement tool for the identification of frailty in the hospital setting. The EFS is scored on nine components: cognition; general health status, self-reported health, functional independence, social support, polypharmacy, mood, continence and functional performance. To classify the level of frailty the scores are summed and the results may be; not frail (0–5), apparently vulnerable (6–7), mildly frail (8–9), moderately frail (10–11) and severely frailty (12–17). Its country of origin is Canada and its time period to be completed is less than 5 minutes. There is no need for special equipment and it has been checked as valid and reliable. As a tool it has good outcome prediction and it can be used in clinical setting (Rolfson,2006).

The Multidimensional Prognostic Index (MPI) is another measurement which is derived from 8 components: medication number, instrumental ADLs, ADLs, cognitive status, nutritional status, risk of developing pressure sores, co-morbidity and living status. Each component can be classified as major=1-point, minor=0.5 points or none=0 points. All scores are summed and divided by eight. If the result is over 0.66 the person is defined as frail. Its country of origin is Italy

and it has a time period of less than 15 minutes to be completed. There is no need for equipment for this tool and it has been checked as valid and reliable. Although it is mostly used in clinical setting there is need for more studies of this tool in the frailty area (Pilotto,2012).

The Sherbrooke Postal Questionnaire (SPQ) consists of 6 questions: living alone, taking over 3 medications, mobility, eyesight, hearing and memory problems. The final answers are summed and if the score is over 2 then the person is considered with frailty. Its country of origin is Canada and it has a time period of less than 5 minutes to be completed. There is no need for special equipment, it is not valid and reliable on the population screening and more studies need to be done on this tool (Hebert,1996).

The Kihon Check-list (KCL) is a frailty measurement tool containing 25 items which is widely used in Japan. It is based on the same principles with the FI-CGA As a time period this tool needs less than 10 minutes to be completed. There is no need for special equipment, although it has been checked as valid and reliable more studies need to be done on the screening of the population (Fukutomi,2015).

The SHARE is a frailty instrument which evaluates five variables such as fatigue, appetite loss, grip strength, functional difficulties and the physical activity of the elderly. This type of instrument can define in which category of frailty is a person or whether is not frail at all. The SEGA grid is another frailty tool that can evaluate the elderly and provide important information about the level of frailty and which factors create problem by affecting their function. These factors are scored with 0,1 and 2. If the person is scored over 11 the situation of fragility is very serious and direct help is needed (Romero,2014).

Frailty until today is mistreated. Although many tools have been created it is important that a successful evaluation tool can be useful for all professionals and will provide specific information about the situation of each person. Evaluating frailty is a multidimensional process and forecast can be very helpful so all needs of elderly can be covered in order to have better life quality. A tool should be easy to use, valid and accurate in order right decisions in clinical practice to be taken so frailty can be either prevented or to be stabilized the sooner. In a study about the many tools to evaluate and measure frailty it is mentioned the importance of selecting the appropriate assessment

based on the purpose that is needed and by investigating also other studies that may also have been used to control each assessment for frailty in order to be valid and feasible (Buta,2016).

### **1.9 Primary health care and frailty**

Aging is combined with alterations in the operating system of the human body. Vulnerability is due to multiple factors which cause physical, psychological and social imbalances. Because aging is an inevitable procedure the preventing and the promotion of the good lifestyle is eligible to extend the duration of a healthier and longer lifespan. The need to identify and implement long term models are urgent in order to meet and fully cover the needs of elderly. Frailty syndrome is constantly increasing due to the growth of the aged population but there have not been until today results or findings that can be used into clinical practice. This expanding phenomenon shows multidimensional and heterogenous properties that need to be well understood through a co-operational process of many professions from many systems so a better outcome will be available to elderly in order to diminish the impact of frailty and promote healthy aging (Espinoza,2005).

The rapid acceleration of the elderly population is an important challenge that the global health system is constantly facing. It is estimated that by 2050 people over 65 will be approximately 2.000 million worldwide. The interest that is related with the process of aging is due to the increasing proportion of older people, the changes in the demographic variables and the changes in family and society structure which all together create great impact in the lifespan of the elderly. Studies identify the relation between aging and illness. Elderly show more illnesses than younger people. They tend to be more vulnerable due to many factors which affects their health status. Also, elderly show increasing possibility of co-morbidity which requires more and constant professional health care services and the appropriate measures of support. In addition, elderly show more time to recover but also greater risk of a disease to become later chronic. All these situations of aging create great increase of the demand for more health services and so more medical care costs (Binder,2002).

It is important that elderly can have in general good management of their health needs. There are many factors that affect the health life of the elderly

due to the coexistence of multiple morbidity. One very interesting and important factor for further research is that elderly gradually show reduction of their function which may lead to frailty. As a result, elderly turn out to be less adaptive to their environment as well as the clinical symptoms of their illnesses create many problems to them. The reduction or the gradual loss of function of the elderly has as a result the significant change of their social role in the society. If elderly face difficulty with their functional autonomy and the good quality of their life it is an inevitable consequence that their life is threatened meanwhile there is created a complex pathology around their age status (Anderson,2010).

Elderly do not show the same health profile but there are different groups which creates difficulty in implementing a single management framework. Most of the strategies focus on the frequent syndromes that have clinical symptoms on the elderly. Although these methods are not very efficient because they do not provide fully integrated care on the diversity population of the elderly. There are many parameters (functional, emotional, social) that should be checked on epidemiological research in order to evaluate the needs of the elderly. Great Britain is the first country that has introduced the annual health assessment of the elderly among the population by GP doctors based on these parameters in order to evaluate individually the health needs of the elderly population (Counsell,2007).

High comorbidity is associated with increased mortality. The essential application of guidelines to manage the morbidity of the elderly should be based on the needs of each individual and according to the environment of living. The presence of a disease does not cause significant disability but in combination with other conditions this can lead finally to fragility. The American Geriatrics Society has tried to develop a strategic framework in order to manage the elderly based on specific guidelines in order to benefit and improve the quality of life of the elderly and at the same time to reduce any possible effects. These guidelines focus on the preferences of each elderly, every possible and available evidence of applicability, the direct forecast of the illness or other symptoms from the primary health care, the ease of application and the appropriate choice of management plan based on the needs of each elderly (Lugtenber, 2011).

Primary care is the first stage of the provided health services in a health system. Elderly are suggested to be asked certain questions and run simple diagnostic tests in order to identify potential deficits of their ability of function. Self-rated of the health level can be reported through certain questionnaires in order to evaluate their function. This can provide important information so precautions and measures can be taken in order to improve the quality of life of the elderly. Expertise professional staff can mainly run the certain procedures and by the given answers or the results of the tests the problems can be identified very soon. The management and the plan of an individual framework can be created in order to eliminate the factors that the elderly is endangered by. Some of these tests or questions are about activities of daily living, instrumental activities of daily living, visual difficulty, hearing difficulty, incontinence, bad nutrition, walking-balance-falls, depression, cognitive problems and environmental difficulties that the elderly may face (Reuben,2009).

Many health problems that the elderly may face create important risk for the survival and the quality of life. The family doctor can do the prognosis of the health quality of the elderly and so to estimate the life expectancy. Problems that the elderly faces need to be managed in a plan and given priority should be set on those that may endanger the elderly's life. The family doctor can manage and create a plan based on the health problems of the elderly. The interventions can be staged according to the needed time to be achieved categorized in short term, medium term and long term. Short term interventions are in needed time for benefit within a year. Medium term interventions are in needed time for benefit in five years. Long term interventions are in needed time for benefit for more than five years. The terms are important to be set based on the needs and the life expectancy of the elderly so the plan can be both effective and have the desired outcome (Wieland,2003).

The management of the elderly is a complex procedure due to the possibility of many and various factors that may exist about their health life. The creation and implementation of a health plan requires to take in advance all the needs and personal preferences of the elderly. To ensure a high quality and cost effective the proposed model for assistance should be composed by certain characteristics and criteria that are related with the health needs of the

elderly. In most health systems the primary health care includes these priorities in order to manage the needs of the elderly (Dorr,2008). Encouraging in USA and Canada are the results about the models of integrated health care but only in some individually studies in which further regulations are still needed. However, in the most studies about the effectiveness of the management the results are very low and fragmented because until today there has not been created an integrated model. The provided help is further deteriorated due to two major problems that are most usually faced. The first one is the limited supportive social network that may not be feasible or due to other social reasons may not be significant obvious in the life of the elderly. As a result, the process of health care does not have empowerment from exogenous factors and is ineffective. The second significant problem is the low and poor compliance of the elderly to adopt in certain circumstances which also makes their support difficult and ineffective (Haynes,2002).

Several new integrated health care models are under evaluation and development in order to improve the provided care of the elderly. It is necessary a systematic record of the diseases, disabilities, cognitive disabilities and other health related habits as well as the social support network of the elderly, so it is feasible to understand the needs and the existing capabilities. The monitoring of the plan and the achievement of the set goals are achieved by the successful communication and coordination between the elderly and the health structures. The role of the monitoring is significant for the efficiency of the plan due to the increased needs of the elderly and because of the complication of endogenous and exogenous factors which may not be stable. Expert health professionals are those who provide health services both inpatient and outpatient in order to advance the health quality of the elderly but the support and care by other care givers is also needed in addition for further help in elderly's life. Significant is also the role of the supportive network which may also include care givers. Their active involvement into the elderly's life by providing health services and in general support in daily activities can raise the quality of life of the elderly. Appropriate education and guidance are needed according to the health problems and needs of the elderly for the caregivers in order to cope with them (Chen,2000).

The Frailty phenotype is one of the most commonly used tools in order to evaluate frailty in elderly. However, it is difficult to be applied in clinical practice and especially in the settings of primary health care which has as a result many elderly to not be evaluated and many further problems to not be identified soon. Anthropometry as well has been used in studies as a tool to evaluate some risk factors for frailty. The main purpose of it is to identify prefrailty or frailty in elderly as long as it is easier to be applied in primary health care centers by creating an algorithm for direct evaluation. The importance of using anthropometric measures is that they can identify certain parameters such as health condition, nutritional status and physical status. All these conditions combine the health status of the elderly and are needed in order to identify prefrailty or frailty (Elam,1991).

In addition, depression also affects seriously elderly and is strongly associated with progressive impairment of function and increased mortality and morbidity. Because not all elderly show common characteristics due to the different characteristics of frailty mental disorders has been found to be underestimated. Although established tests can detect the most common such as dementia and depression by using the Mini Mental State Examination Test, the Beck Depression Inventory and the Geriatric Depression Scale-15. These tools are highly sensitive, have good predictive value and suitable to be used along with the primary health care services (Bisschop,2003).

In a cross-sectional study anthropometric measures were used in order to evaluate 538 elderly which they were firstly classified with the Frailty phenotype and then 26 anthropometric measures were obtained. The final founded predictors which showed the most significant prognostic role were age, weight, bicipital skinfold, abdominal and waist diameter. However, all the predictors have better predictive ability when they are grouped and not observed individually because then the anthropometric tool has more accuracy in order to be used and also is more sufficient predictive (Closs,2017).

The big number of falls approximately 30% - 40% each year due to frailty is an effect that creates major problem to elderly. Falls at people aged 65 years and older can be categorized into environmental factors, behavioral factors and health factors. Although elderly support that being more careful can prevent falling this statement is not accurate. They can be prevented as long as there

has been an evaluation about the statement that the elderly faces. Primary health care can play an important role in order to manage and categorize elderly according to their needs so they can get more professional help. STEADI (stopping elderly accidents and injuries) is a useful procedure that can be used to evaluate elderly and help them reduce both accidents and injuries. Physical examination is important in order to evaluate the strength, gait and balance of the patient. Part of the test is also a clinical practice guideline named AGS/BGS which has the role of the annual control of all adults aged 65 years and older in order to report their falls. Elderly by reporting their falls can get specific management and professional primary prevention (Phelan,2015).

In a cohort study in Canada certain predictions about death, nursing home transfer and hospital admission were evaluated by using frailty measures. The follow-up of 380 elderly lasted 18 months and trained nurses performed all measures. Elderly showed in general good cooperation and the assessment was acceptable in 89% by reporting significant relevance of the study with their health needs. Frailty measures appear to have stronger relevance with the health status of the elderly than individual chronic diseases. Prognostic information is extremely important both for patients and medical care group that are providing care and treatment. Knowing the findings of the frailty phenomenon can help them decide the medical interventions that are needed for each individual because frailty is a situation that demands continuous evaluation and management (Rosenberg,2019).

Another way that has been studied in order to prevent or delay frailty in the community could be through the social prescribing program. By this method health professionals can have direct and accurate data in order to evaluate the elderly. This will create a link through which elderly will get better management based on their individual needs and as a result more efficient health care could be provided. A systematic review studied the significant help that could be provided by social prescription in which participants were people aged 65 years and older. Both frailty and secondary outcomes were measured due to this study. The results were extremely frustrating because although the importance of frailty should be in priority for health professionals there have not been any results about this. The effectiveness of social prescribing has not been fully evaluated. The community could play important role by providing care to elderly



and create the possibility of pausing or delaying frailty. Except from medical health care elderly also need social supportive network in their daily life. The reason may not be only for their daily activities but also for psychological support, so they can feel active for their community and produce volunteering tasks if it is feasible by them. On the other hand, care givers also need support and special education to be provided to them in order to achieve the needs of the elderly that they provide care to. Both health and non-health care professionals should cooperate for the best quality of the provided care to elderly (Smith,2019).

The effectiveness of the planned interventions based on the needs of the population is important to be constantly evaluated so better health services will be provided. Great benefit is shown which has extremely good impact on the quality of life on health plans applied on specific time and with documented intervention. More specific morbidity indicators can provide in local and national level important evidence about health needs and the provided health services. Priorities on health topics can be emphasized so will be provided better distribution of resources in order to influence organizations for further medical research. The ultimate goal is to effectively confront all health problems so will be provided better design, monitoring, treatment and accessible services to all citizens (Susser,1999).

### 1.10 Research case

The hypothesis that is investigated in the first chapter is the phenomenon in the Greek population of people aged  $\geq 65$  years as well as the level of frailty, the factors that contribute to the maintenance of frailty and the effects on the individual as a holistic entity. The resulting effects on the health system are still being studied, mainly in the field of primary care, since frailty creates a cumulative trend for all health services. Variables related to medical, social and economic data of the sample as well as behavioral characteristics that contribute to shaping the individual living pattern are checked at the same time.

**Participation criteria:** The study involved people  $\geq 65$  years who visited the regular outpatient clinics of the Athens Naval Hospital and the private clinics of the Prefecture of Attica in the context of providing health services during the aforementioned time period. The study protocol was approved by the scientific council - Ethics Committee of the Athens Naval Hospital for the present study to be conducted within the hospital (No. Prot.: 11161/30.09.2019) and is in accordance with the principles of the Declaration of Helsinki (World Medical Association, 2013).

**Exclusion criteria:**

- People  $<65$  years
- People who did not speak the Greek language
- Inability to understand the questionnaire
- Positive diagnosis of dementia
- Those who had undergone orthopedic surgery in the last 3 months
- Patients diagnosed respiratory or heart failure
- Bedridden patients

**Sample collection:** Before the start of each assessment, the researcher approached each patient and verbally informed them about the study. It was explained the topic of the questionnaire, the procedures and purposes of the study by giving clear instructions for correct completion. Afterwards, they were also given the printed informational material. Patients who agreed to participate

in the study signed the written consent form. Questionnaires were completed by each patient. The researcher also recorded the mobility assessment (TUG) and the hand grip strength test for each patient. The measuring tools that were used is a stopwatch, tape measure and a chair. For the hand grip strength, it was used the JAMAR dynamometer.

#### **Measurable questionnaire features:**

- Demographic data (gender, age, marital status, number of children and grandchildren, education level, profession, years of work and retirement, geographic region of permanent residence)
- Assessment of vulnerability (Frail scale)
- Mobility assessment (TUG)
- Hand grip strength test
- Medical data (chronic conditions, taking medication, physiotherapy, falls)
- Assessment of Activities of Daily Living (KATZ)
- Nutrition Assessment (MNA)
- Health expenses
- Caregiver and help at home
- Use of Primary Health Care (PHC)
- Geriatric Depression Score (GDS)
- Lifestyle characteristics (tobacco and alcohol use) - before and after 65 years
- Dietary habits and activities before and after 65 years
- Change of physical and emotional in the last year
- COVID-19 (disease liability and death anxiety)

#### **Methods for estimating the sample:**

- **Frail scale:** The evaluation of the sample in terms of the degree of fragility was done using the Frail scale. It is an important and easy measurement tool that is widely used in the elderly population. Frail scores range 0-5 and represent 0=normal, 1-2=prefrail, 3-5=frail status (Freid LP, Tangen CM, Walston J et al, 2001). The level of frailty is an important prognostic indicator as in many studies it has been associated

with serious effects on the level of health in the elderly population such as dependency, disability, falls, long stay hospitalization, chronic health conditions and mortality (Abellan van Kan G, Rolland Y, Bergman H et al, 2008 & Clegg A, Young J, Iliffe S et al, 2013).

- **Mobility assessment (TUG):** The assessment of the sample for the level of mobility was done using the TUG test. The TUG as an assessment tool includes the process of functionality and muscle strength of the lower limbs, walking speed, balance and cognitive ability of the individual. TUG scores represent  $<13,5$ =normal and  $\geq 13,5$ =high risk of falling (Savva GM, Donoghue OA, Horgan F et al, 2013). The materials used for its execution are a chair, a timer and a measuring tape. In studies it has been associated that the longer it takes the person to complete the test the greater the risk of falls. The TUG test is a useful prognostic indicator as frailty affects the person in terms of their functionality and mobility. Individual performance on TUG measures has also been correlated with level of cognitive function as individuals with dementia perform less well (Yoon DH, Lee JY, Song W, 2018).
- **Hand grip strength:** The evaluation of the sample in terms of hand grip strength was done using the JAMAR dynamometer. The measurements were recorded in kilograms. Grip strength in the elderly population has been correlated with the level of frailty as the results are directly influenced by the individual's overall health (Savino E, Martini E, Lauretani F et al, 2013). Studies associate grip strength in elderly patients with falls and consequent orthopedic fractures as well as cognitive loss with age (Fritz NE, McCarthy CJ, Adamo DE, 2017). Hand grip strength is another predictor of the level of frailty in the elderly population as it also affects the level of functional status (Rijk JM, Roos PR, Deckx L et al, 2016).
- **Assessment of activities of daily living (KATZ):** The assessment of the sample in terms of activities of daily living was done with the KATZ questionnaire. It is a tool for measuring the individual's independence in

common activities that encounters every day. KATZ scores range from 0-6 and represent 0-2,5=severe function, 3-4,5=moderate function and 5-6=full function (Katz S, Ford AB, Moskowitz RW et al, 1963). The decline in individual functioning has been associated in many studies with the phenomenon of frailty in the elderly population and is used as a predictor of mortality (Arika G, Varana HD, Yavuza BB et al, 2015). Through the result of KATZ measurement, it can be also estimated the level of living environment and how it affects their health level.

- **Nutrition assessment (MNA):** The evaluation of the sample in terms of its nutritional status was done with the MNA questionnaire. It is a measurement tool to check if calories intake is adequate based on anthropometric parameters. MNA scores range from 0-14 and represent 0-7=malnutrition, 8-11=risk of nutrition and 12-14=normal (Vellas B, Guigoz Y, Garry PJ et al, 1999). The MNA scale has prognostic significance for the level of frailty and mortality (Fatyga - Kotula P, Wizner B, Fedyk-Łukasik M et al, 2022). It has also been associated with other related geriatric syndromes such as cognitive decline, fractures, sarcopenia and falls (Salis F, Loddo S, Zanda F et al, 2022).
- **Geriatric Depression Assessment (GDS):** The assessment of the sample regarding the psychological profile of whether they experience depression was done with the GDS questionnaire. It is an assessment tool to check if the person is experiencing depression and at what level based on the score. GDS scores range 0-15 and represent 0-4=normal, 5-9=mild depression and 10-15=severe depression (Kozicka I, Guligowska A, Chrobak - Bień J et al, 2022). The elderly, due to complex factors related to aging, are a vulnerable group and show an increased likelihood of being depressed (Su H, Zhou Y, Sun Y, Cai Y, 2022). The GDS scale has prognostic significance as frailty combined with reduced functionality and cognitive decline are co-responsible for the appearance of depression in the elderly population (Ferrer - Cairols I, Montoliu T, Crespo - Sanmiguel I et al, 2022).

### **1.11 Data and Methods**

Our analysis is based on microdata collected during the period between January 2022 and August 2022. Overall, we have information on 500 individuals aged above 65 years and residing over the entire Greek territory. The questionnaire asks the respondents about their background characteristics (such as, age, education, marital status, number of children, occupation, and so on), and their lifestyle habits (related to nutrition, alcohol use or smoking). It also collects information on spending time with relatives and whether the covid pandemic has affected them physically or mentally. There are also questions related to their perceived health status.

Our main independent variable of interest is the frail score, which ranges between 1 and 3, corresponding to the following three states, normal, pre-frail, and frail. Alternatively, we use the TUG metric, which is a composite measure of functionality and muscle strength of the lower limbs, walking speed, balance and cognitive ability of the individual.

Table 1 reports summary statistics by gender on the main variables included in the empirical analysis. With few exceptions, there are no marked differences between the two sexes. The average frail score for both sexes is around the value 2. About one third of the elderly report spending some time with their grandchildren. About 39 (45) percent of men (women) receive visits by their children. Men are slightly more educated than their female counterparts. Almost equal shares of individuals report being treated regularly or taking physical therapy. Both sexes score similarly in terms of the health indicators considered, such as Katz, MNA, and GDS. This is also the case for the self-assessed health status, either physical or emotional. Lastly, covid pandemic seems to have affected both male and female individuals equally.

**Table 1 - Summary statistics**

		Mean	Min	Max	observations
<b>Men</b>	Frail score	2.041322	1	3	242
	Tug score	1.086777	1	2	242
	Age	78.3719	65	100	242
	# Children	1.18595	0	5	242
	Children visits	0.38843	0	1	242
	Time with grandchildren	0.330579	0	2	242
	Education	2.946281	1	6	242
	Treatment	0.433884	0	1	242
	Physical therapy	0.144628	0	1	242
	Falls	0.338843	0	1	242
	KATZ	2.830579	1	3	242
	MNA	2.297521	1	3	242
	GDS	1.152893	0	3	242
	Physical health	2.512397	1	5	242
	Emotional health	2.446281	1	5	242
	Income	2.5	1	5	242
	Nutrition	3.599174	1	6	242
	Covid pandemic effects1	3.301653	1	5	242
	Covid pandemic effects2	3.909091	1	5	242
<b>Women</b>	Frail score	1.968992	1	3	258
	Tug score	1.077519	1	2	258
	Age	77.68992	65	101	258
	# Children	1.403101	0	6	258
	Children visits	0.457364	0	1	258
	Time with grandchildren	0.352713	0	1	258
	Education	2.817829	1	5	258
	Treatment	0.449612	0	1	258
	Physical therapy	0.147287	0	1	258
	Falls	0.360465	0	1	258
	KATZ	2.810078	1	5	258
	MNA	2.395349	1	3	258
	GDS	1.147287	1	3	258
	Physical health	2.585271	1	5	258
	Emotional health	2.534884	1	5	258
	Income	2.515504	1	4	258
	Nutrition	3.682171	1	5	258
	Covid pandemic effects1	3.399225	1	5	258
	Covid pandemic effects2	4.081395	1	5	258

Given the ordered nature of our main independent variable, we estimate an ordered logit regression. Assuming that  $y^*$  is a latent variable of frailty, the empirical model is specified as follows: (see, e.g., Cameron and Trivedi, 2009):

$$y_i^* = X_i' \beta + u_i \quad (1)$$

For our 3 alternative ordered outcomes, we have

$$y_i = j \text{ if } a_{j-1} < y_i^* \leq a_j, \quad j = 1, 2, 3$$

where  $a$  are thresholds above which the physical condition deteriorates. The parameters of interest,  $\beta$ 's, are obtained by maximizing the log likelihood

$$p_{ij} = \Pr(y_i = j) = \Pr(a_{j-1} < X_i' \beta + u_i \leq a_j) \quad (2)$$

Further assuming that the error is logistically distributed, equation (2) is estimated by means of an ordered logit. To make the results from this empirical exercise more easily interpretable, we report the odds ratios, defined as follows:

$$\text{odds}(\text{frail} = j) = \frac{p(\text{frail} > j)}{p(\text{frail} \leq j)} \quad (3)$$

An odds ratio greater (less) than one means that the probability of being in state  $j$  rises (declines). For instance, consider the association between spending time with offsprings and frailty. An odds ratio equal to 0.6 implies that frailty is 40 per cent less likely among the elderly who meet their children regularly. On the other hand, an odds ratio equal to 1.6, means that the incidence of frailty is more likely.

As a check of robustness, we re-estimate our model using a multinomial logit regression, as well, which specifies that (see, e.g., Cameron and Trivedi, 2009):

$$p_{ij} = \frac{\exp(X_i' \beta_j)}{\sum_{L=1}^3 \exp(X_i' \beta_L)} \quad (4)$$



where the dependent variable,  $p_{ij}$ , the probability of being into one of the following three states, normal ( $j=1$ ), pre-frail ( $j=2$ ), or frail ( $j=3$ ), is estimated conditional on vector  $X$ , which involves the set of explanatory variables described above.

## 1.12 Results

This section summarizes the main findings of this study, concerning the determinants of frailty, using Greece as a case study. Based on the estimation strategy described in the previous section, we begin by estimating the ordered logit model described above, separately for male and female individuals. The results from this exercise are displayed in Table 2. Specifically, we report the odds ratios and in parenthesis the associated standard errors.

Beginning with male individuals, the coefficient on the age variable in column (1), implies a positive association with frailty, which, nevertheless, appears to be insignificant. This is also the case for the sample of female individuals in column (2). Having one additional child reduces the odds of being in frailty condition by about 22 percent, when female individuals are considered. On the other hand, spending time with their grandchildren does not appear to be significantly correlated with the outcome variable. The same holds true when the highest level of education attained is considered as a frailty determinant.

Being treated by a physician appears to be the most significant determinant of frailty for both the demographic groups considered in this analysis. By contrast, there is no statistically significant correlation between physical therapy and frailty. Neither our three health indicators, namely KATZ, MNA, GDS nor past nutrition habits enter with significant coefficients through specifications. However, perceived health, as measured by the physical and the emotional health variables, are positively associated with the incidence of frailty. Lastly, income and the covid pandemic are associated with a higher frailty score.

Taken together, it appears that the most important determinants of frailty are treatment, perceived health, and income. Nevertheless, it should be also highlighted that there might be reverse causality or unobserved confounding and, thus, the correlations discussed above should not necessarily imply causation.

**Table 2 - Frailty determinants - Ordered logit regressions by gender**

VARIABLES	(1) Men	(2) Women
Age	1.033 (0.0250)	0.973 (0.0257)
# Children	0.945 (0.137)	0.789* (0.1000)
Children visits	1.373 (0.617)	1.529 (0.639)
Time with grandchildren	1.567 (0.671)	1.462 (0.559)
Educ 1	0.459 (0.226)	0.769 (0.349)
Educ 2	0.734 (0.353)	0.766 (0.383)
Educ 3	0.785 (0.470)	0.919 (0.532)
Educ 4	1.037 (0.656)	1.014 (0.691)
Treatment	2.646*** (0.783)	3.131*** (0.880)
Physical_therapy	0.827 (0.312)	1.159 (0.426)
Falls	1.015 (0.384)	0.543* (0.189)
KATZ	0.803 (0.271)	0.719 (0.224)
MNA	0.869 (0.203)	1.146 (0.261)
GDS	1.398 (0.492)	0.697 (0.238)
Physical health	0.503** (0.153)	0.346*** (0.0907)
Emotional health	1.176 (0.351)	1.704** (0.438)
Income	2.350*** (0.484)	1.600** (0.347)
Nutrition	1.143 (0.236)	0.893 (0.173)
Covid 1	0.923 (0.0892)	0.923 (0.0907)
Covid 2	1.406*** (0.166)	1.400*** (0.177)
Observations	242	258

Standard errors in parenthesis

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

The findings discussed above are largely confirmed once we replicate the analysis, assuming a multinomial model instead of the ordered logit. Columns (1) and (2) present the results for the male sample and columns (3) and (4) for the female sample. The odds ratios reported therein are interpreted as the probability of being in pre-frail or in frail condition against the probability of a normal condition, which is assumed as the reference outcome.

As can be observed, concerning the probability of pre-frail against the base category, MNA, physical health, treatment, and covid appear to be significant factors for both sexes. Qualitatively similar inferences can be drawn once the probability of frailty is considered. Notably, the most significant factor is treatment by a physician. Being treated increases the odds of frail by about 300 and 400 percent for male and female individuals, respectively.

Notice, also, that income appears to play a significant role in explaining frailty rather than pre-frailty. Covid pandemic, also appears to induce a sizable effect on the odds of frailty versus the odds of being normal. Overall, both applications yield comparable results, that, nevertheless, should be interpreted with caution due to the usual reverse causality issues.

Before concluding this section, we replicate the analysis using an alternative measure as the dependent variable, instead the frailty score. Specifically, we use the TUG, which assesses the process of functionality and muscle strength of the lower limbs, walking speed, balance and cognitive ability of the individual. TUG scores represent  $<13,5$ =normal and  $\geq 13,5$ =high risk of falling. We estimate a linear probability model where the dependent variable is a dichotomous one, taking the value one if  $TUG \geq 13.5$  and zero otherwise.

The results are shown in Table 3 concerning men in column (1), the coefficients on the KATZ index and the Physical health variable are negatively related to the probability of being in the high-risk group. On the other hand, income is positively associated with the risk of being in that same group. The estimates for women suggest an increased probability with age. This is also the case once the covid variable is considered. By contrast, KATZ, MNA and physical health enter with a negative probability.

**Table 3 - Frailty determinants - Multinomial logit regressions by gender**

	Men		Women	
	(1) Pre-frail	(2) Frail	(3) Pre-frail	(4) Frail
Age	1.002 (0.0335)	1.054 (0.0369)	0.981 (0.0339)	0.955 (0.0354)
# Children	0.724 (0.151)	0.907 (0.184)	1.315 (0.225)	0.673** (0.136)
Children visits	1.662 (1.056)	1.688 (1.089)	2.182 (1.234)	1.780 (1.148)
Time with grandchildren	1.241 (0.767)	1.715 (1.067)	0.481 (0.258)	1.952 (1.148)
Educ 1	0.311 (0.240)	0.263* (0.203)	0.582 (0.372)	0.700 (0.452)
Educ 2	0.412 (0.309)	0.553 (0.421)	0.390 (0.267)	0.648 (0.457)
Educ 3	0.677 (0.598)	0.610 (0.568)	0.360 (0.284)	0.759 (0.616)
Educ 4	0.816 (0.763)	0.870 (0.855)	0.574 (0.525)	0.959 (0.928)
Treatment	1.875 (0.789)	3.916*** (1.682)	2.011* (0.793)	5.043*** (2.029)
Physical_therapy	0.999 (0.514)	0.744 (0.426)	2.736** (1.394)	1.025 (0.586)
Falls	0.855 (0.453)	0.931 (0.507)	0.172*** (0.0894)	0.495 (0.242)
KATZ	1.001 (0.573)	0.624 (0.353)	0.733 (0.326)	0.647 (0.308)
MNA	0.483** (0.166)	0.742 (0.269)	0.555* (0.185)	1.120 (0.365)
GDS	1.683 (0.850)	1.723 (0.950)	0.923 (0.448)	0.685 (0.360)
Physical health	0.425** (0.181)	0.387** (0.178)	0.422** (0.151)	0.206*** (0.0809)
Emotional health	1.047 (0.457)	1.327 (0.625)	1.193 (0.436)	2.047* (0.808)
Income	1.537 (0.447)	3.125*** (0.960)	1.590 (0.481)	2.120** (0.656)
Nutrition	1.450 (0.418)	1.204 (0.366)	0.829 (0.222)	0.853 (0.236)
Covid 1	0.811 (0.116)	0.899 (0.134)	1.084 (0.146)	0.869 (0.118)
Covid 2	1.623*** (0.268)	1.516** (0.258)	1.197 (0.204)	1.634*** (0.298)
Observations	242	242	258	258

Standard Errors in parenthesis

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

**Table 4 - Frailty determinants - Using TUG as the dependent variable.  
Linear probability models by gender**

VARIABLES	(1) Men	(2) Women
Age	0.00362 (0.00291)	0.00529* (0.00300)
# Children	0.0173 (0.0172)	-0.00736 (0.0147)
Children visits	0.0168 (0.0537)	0.0223 (0.0496)
Time with grandchildren	0.0495 (0.0511)	-0.0300 (0.0460)
Educ 1	-0.00573 (0.0576)	-0.111** (0.0532)
Educ 2	-0.0521 (0.0573)	-0.0951 (0.0579)
Educ 3	-0.0749 (0.0716)	-0.0909 (0.0672)
Educ 4	-0.0191 (0.00362)	-0.0373 (0.0775)
Treatment	-0.0148 (0.0353)	0.0230 (0.0319)
Physical_therapy	8.23e-05 (0.0466)	0.0383 (0.0437)
Falls	0.0169 (0.0459)	0.0548 (0.0407)
KATZ	-0.214*** (0.0396)	-0.0613* (0.0367)
MNA	-0.0122 (0.0290)	-0.0817*** (0.0275)
GDS	0.0348 (0.0436)	0.00816 (0.0389)
Physical health	-0.0607* (0.0357)	-0.0981*** (0.0287)
Emotional health	-0.0300 (0.0353)	0.123*** (0.0302)
Income	0.0488** (0.0227)	0.00819 (0.0248)
Nutrition	0.0443* (0.0246)	0.0189 (0.0235)
Covid 1	-0.0188 (0.0119)	-0.0138 (0.0115)
Covid 2	0.00604 (0.0141)	0.0316** (0.0147)
Observations	242	258

Standard errors in parenthesis

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

### **1.13 Conclusion**

This chapter explores the potential gendered determinants of frailty, using individual-level data for Greece. Our sample consists of 500 individuals aged  $\geq 65$  years. In line with the relevant literature, we consider the potential role of several background characteristics, such as education, income, the presence of relatives, (perceived) health status, quality of nutrition and others in explaining the incidence of frailty.

Ordered logit analysis reveals common factors, among both male and female respondents. The factors that emerge as the most important in explaining the incidence of frailty are physical health, individual's independence in common activities that encounters every day (as measured by the KATZ questionnaire), being treated regularly by physician, income, and covid.

Overall, the results should be interpreted with some caution, due to the usual endogeneity concerns. This might stem from omitted variables and reverse causality. On balance, however, we consider the analysis for the Greek case as informative, as it is the first exploring potential determinants of frailty using own collected data from Athens Naval Hospital (outpatients) and private clinics in the Prefecture of Attica.

## **CHAPTER 2 - Health inequality and out of pocket expenses**

### **2.1 Introduction**

Income inequality has increased at alarming levels over the past few decades. In particular, in the OECD countries the average Gini index increased from 27 percent to about 33 percent (Tridico, 2018). Existing literature has identified several important factors contributing to these trends. Some economists posit that globalization, and especially international trade, has adversely affected the distribution of income in advanced economies (Dorn et al., 2022). Others suggest that economic and financial deregulation jointly, account for a large portion of the unequal income distribution (Tridico, 2018). On the other hand, some scholars argue that wage inequality has also played a significant role in explaining these developments. For instance, Borjas and Ramey (1995) identify de-unionization as the main determinant of earnings inequality. On the other hand, Lemieux et al. (2009) attributes it to skill-biased technical change, i.e., technological progress that fosters the earnings of the university educated individuals disproportionately as compared to the earnings of their non-university educated counterparts.

This chapter contributes to the existing literature by examining another potential factor, the so-called out-of-pocket spending, defined as direct payments by households on health services, beyond their contributions on health care systems through taxation. Despite the fact that states have devised universal healthcare systems, households are often involved in transactions related to market provided healthcare services.

Health and economic development are two very interconnected sectors which affect each other and can create impact on the status of global health. The role of economics is an important factor in health as it can significantly improve the quality of the provided health care. Also, health economics are influenced by trends in health policy and they are involved in supporting the development of health sector (Abel-Smith, 1989). Income is a contributory factor for healthy lifestyle and positive health outcome. Total health care spending represents a significant proportion of each national economy. Financial risk protection in health care is a critical component which is included in the Universal Health Coverage plan. It is crucial among health systems the

distribution of health care services to be equally provided without being affected by multiple and bilateral factors (Mullins, 2020). Increased payments as well as out of pocket payments for health care services occur major inequalities and limitations in the access of health distribution (Tur-Sinai,2022).

Most countries provide some form of primary health care, which is the first level of care in a health system which has as main role by using preventive medicine the better and more effective management of health (Nora,2020). Through primary health care there is covered the principle of equity of the provided health care services which should be affordable and with people-centered approach based on their various needs. As the proportion of the elderly population is increased in a global ratio this demonstrates the change of the health needs that health care systems need to adapt to (Frost,2015). Phenomena as aging, longevity, health challenges such as COVID-19 and increase of disability in the population create severe needs for medical care and health services (e-prescribing, treatment, hospitalization, rehabilitation, continuation of follow-up) (Zeber,2021).

The rapid expand of expenses as well as out of pocket expenses for any kind of health services bring up heavy financial burdens for individuals and elderly which tend to have even more increased health needs (Moody, 2022). The role of every health care system should be to improve the level of health of each individual while it maintains stable, available, effective, equal and accessible without any limitation the provided health services to all. On the other hand, there are many countries globally as well as in OECD that they are socioeconomically disadvantaged, and the great number of health expenses cause devastating conditions to them (Papanicolas,2018). Catastrophic expenses have great impact as the inability of balance among economic resources as to consume basic goods and health services also cause harsh living conditions for people. This has been strongly connected with poor health of individuals as well as further limitations to the distribution of health care services (Tur-Sinai,2022).

To analyze the impact of out-of-pocket spending on inequality, we estimate cross-country regressions using data from two main sources, namely, the Standardized World Income Inequality Database and the World Bank World Development Indicators. To reduce endogeneity concerns, we expand the set



of control variables to include several potential confounders, such as income per person, unemployment and government spending on health. By means of OLS estimations, we generally establish a positive association between out-of-pocket expenditures and inequality. We also provide qualitatively similar results once we replicate the analysis using the system GMM estimator and internal instruments which partially debiases our empirical model.

The rest of the chapter is organized as follows. The next section systematically discusses how individual expenses on health services are expected to affect the welfare of the households and the role of health care systems. Section 3 describes the data and the empirical model we estimate to assess the impact of out-of-pocket spending on income inequality. Section 4 presents the main findings, while Section 5 concludes this chapter.

## **2.2 The impact of out-of-pocket spending on inequality**

Each health system has a unique structure which reflects the philosophy of the system itself. The major points of a health care system are the health level of the population, the production of health services and the cost of the coverage. The main purpose of a health system is to ensure and improve the health of the population and to improve the level of well-being as well as the quality of life of the population in order all of their health needs to be covered (Borras,1994).

Worldwide there are many health systems that can be found. Some health systems have similarities while some other have differences. Also, all health systems have advantages and disadvantages. Health systems are divided into liberal, social security and national. Liberal health systems have limited role in the health market, they support the organizational framework of health services in the systems that are formed by the consumers. Social security health system is controlled by the state in which funds come from health or diseases. National health systems are controlled by the state which has direct control over the production and distribution of health services and there is free access with no charge for the population (Tanner,2008).

The level of health of the citizens is an important factor because it may cause a significant impact on the country's economy. People that are not healthy because they are treated poorly by their country's health system are

more possible to be less productive at their work (Yuan,2018). The maintenance of good health of the population is one of the most important goals of each country and its government is responsible to take all needed measures to ensure its success and normal process. The level of health is measured by the health of the population, the accessibility of health services, the lack of health inequalities and the quality and quantity of the provided health services. The demand of health services affects the health of each person individually. People with good health can be motivated to be more productive, achieve their goals and be able to promote the financial development (WHO, 2002).

The economic level of a country is highly affected by its environment in which people, the main users of health services are those who manage processes as production, distribution, exchange and consumption. All these elements are necessary for the survival of the human species. The size of production and consumption in the economy area is related exclusively to the law of supply and demand which defines the quantity of goods or services offered in an economy. Although when the price is low, this results higher supply and demand of a good (Koplan,2009).

Health insurance systems apply managed competition principles in order to control of the cost and the quality of the provided health care. Socio-economic factors and further setting-oriented reasons affect and influence the price elasticity of health. Demand is defined as the relationship which occurs among the quantity and the price of a demanded good while all other factors influencing purchasing plans remain constant. This results the direct increase of the price of a demanded good. The increase in the price of a good directly affects the demanded demand of the corresponding good. If the price is lower, the higher are shown both the supply and demand (Pendzialek,2016).

Price elasticity of demand is another important factor which is defined by the response or sensitivity of the demanded quantity to a change in its price while all other influencing factors keep their stability. Price inelasticity of demand is defined as the percentage change in quantity demanded is lower than the percentage change on its price. Fully elasticity of demand is when the quantity of the demanded product changes by a large percentage while in price there is no important increase. Fully inelasticity of demand is defined when the quantity remains constant while the price changes (Yeung,2018).

The purchasing power of health users is an important element which affects and influences the economic market, as a consequence the price of all goods and services. Through the law of demand and market it is indicated the amount of money which is spent by the user in order to get health services. Health expenses of people are connected with their monthly/yearly income which allows them to use health care services in order to maintain a good level of health (Schulte,2018).

### **2.3 Financial protection**

Financial protection of health is an important factor for all countries worldwide. It works as a key component of universal health coverage so the population will have the ability for access to health despite the available expenses. It protects individuals and their households from the financial burden associated with health care payments. Countries with high income tend to have higher direct payments which consist of a large percentage of the total health expenditure. Lack of economic protection of the population can cause many adverse effects in their health level such as inequality, reduction or total absence of health care services due to financial hardship (Saksena,2014).

Universal health coverage until nowadays is not provided in all countries as it varies while almost all require the mandatory co-payment from patients. In addition, it is usually found that many countries still have insufficient public funding to cover medical needs such as certain medicines in outpatients. The economic crisis has resulted great number of households with financial hardships and so vulnerable groups should be protected about their health needs to have more effective protection without burdens. Certain demographic data are collected in order to measure and analyze financial protection that a country provides to its population. Those are the level of household expenditures, the direct payments for health in general and by sector, the food and utilities expenditure consist of the total socio-economic data about the expenditures of a population (Thomson,2016).

### **2.4 Catastrophic expenses**

The impoverishing health expenditure and the catastrophic health expenditure are two significant indicators which combine the result of the

measurement of the provided financial protection. Impoverishment due to health needs which may occur and demand direct health payments can lead households at the poverty line and if poverty is already existing it increases even more this circumstance. There is a certain level for each country to categorize a household if it is in poverty or under the poverty line (individual/family) based on the average national gross of all household's income (Thomson,2016).

Catastrophic health expenditure is a specific circumstance under which households have to pay greater amount on direct payments which exceeds their available financial resources. As available resources of a household are measured its income, expenditure and consumption. Due to financial hardships of households, there is significant great possibility to face major burdens in buying other goods and services. Excessive costs of out-of-pocket expenses, increase of health payments and the lack of public funding are responsible for great socio-economic risks due to financial corruption. This results also to unpaid services, limited access and unmet needs for health care services. (Xu,2005).

Catastrophic health expenditure is a measure of universal health coverage which provides information about the existence of inequalities in the population and the social and economic characteristics which are in need for social protection. Countries which offer financial protection are those who control direct health payments affordable and low, protect vulnerable groups and ensure the universal health coverage by eliminating inequalities or other burdens on health services for the population (Saksena,2014).

To measure the available resources of each household it can be used the income, expenditure or consumption. Most studies use consumption or expenditure as it is available. Each measure has advantages and disadvantages as they may differ among households and many other factors to contribute in order to have final result. Although most methods of measuring catastrophic health costs tend to use a certain threshold limitation among the many different levels of financial hardships of households (Saksena,2014).

"Budget share approach" defines direct household health payments, those who exceed available resources of household. Catastrophic costs show higher concentration among higher financial levels of households. It results by

multiplying the price of a good by the demanded quantity and divided by the total consumer spending or income. “Willingness to pay approach” is another way of measurement as it is considered that households firstly cover their basic financial needs. It results as the maximum price of a customer is willing to pay for a good or service. “Actual food spending approach” is another type of measurement in which expenses about feeding total consumption are removed as these are not part of household resources for health services. “Partial normative food spending” is also another method which explains the needed expenses for food consumption, equivalent per each household member. In order to measure catastrophic costs, there are certain limitations that may create burdens to have results (Cylus,2018).

Catastrophic health costs can provide only a part of the financial impact about the presence of hardships among the households of populations. The household impact from the expenses shows the phenomenon due to health costs. Representative data can be collected and result due to measurement of the incidence of catastrophic and impoverishing out of pocket expenses.

## **2.5 Universal health coverage & health promotion**

Significant changes due to aging take place and affect the functional autonomy and quality of life of the elderly. To achieve a satisfactory level of health quality there is a complex procedure in which health services are in charge to accomplice the needs of each individual user. Health promotion is recognized as an important element for health development in which each individual is allowed to have control of their health level and be able to improve it through actions of the provided health services. It has significant importance that each person can have a greater benefit on their provided health services which can eventually evolve and change the lifestyle of the society or even appear a greater impact on further social, economic and environmental conditions. Health empowerment as part of health promotion can be achieved through intervention of participation in health programs which target to help the population to maintain good health by affecting positive their quality of life (Arsenijevic,2016).

The term of “health promotion” firstly started to be in use around 1970 in which the main idea and concept was to found and promote all the possible

ways and so to increase the level of health worldwide. The goal through health promotion is that by maintaining good mental and physical health it is achieved a good quality of life. Important and necessary is the key role that plays an organized and well-developed health care system that can overcome the health needs with equality by eliminating any kind of discrimination (Scriven,2010).

The worldwide call for more and better health promotion raised the need to achieve and maintain universal health coverage without burdens. The main meaning and goal of the Universal Health Coverage (UHC) is that all people either as individuals or as societies are able to have access in health care services without any borders or limitations and without the risk of financial hardship. Through UHC are observed and collected information and data about the provided health services and the achieved progress of them. Satisfaction of the users in correlation with the cost-related barriers and further factors of the provided services are systematically collected and monitored in EU countries (Boerma,2014).

The role of UHC is multidimensional as it includes all elements that constitute of a health system in general. It also extends in wider issues about health, equal access, elimination of inequalities, quality of the provided services and development. The UHC also includes a big range of preventive services and health promotion, treatment, rehabilitation and palliative care programs. The aim through this is the unlimited offer of health care services in both quality and quantity worldwide. The risk of health quality arises due to the increase of health spending and so the UHC aims to gradual expand the health services and make them more available under any financial circumstances of each population. Households which face financial difficulties are in danger and have greater risk to receive limited or only the necessary health services as long as their access to them is connected with many obstacles (WHO,2019).

Two are the factors which mainly interact and function in this proportion, the needs of the population for health services and the total cost of the provided services funded by collected funds. The UHC also deals with the kind of funding and how they can be organized so the final user will get the better care. Significant suggestions are offered by UHC in order to modify and increase financial and health protection of the countries (WHO,2019).

Although free providing of health care services is obviously impossible to occur as no state or government could support financially such legislation and take this series of measures. However, the existence of UHC states that direct payments of households should be required to be paid at a certain level based on their income which does not affect or stands barrier at their access at health care services. Also, direct payments for health would not impose a financial burden on the population and so financial protection should be a priority worldwide to prevent even greater health impacts (Boerma,2014).

Through UHC financial protection which is in the area of health services is needed to be provided with no limitations. Financial burdens due to health payments which tend to increase have great impact and lead the population in many disadvantages (WHO,2019).

## **2.6 Declaration of health – OECD – WHO**

The Declaration of Alma-Ata in 1978 stated that all PHC services worldwide must have five common characteristics. At this conference were placed for the first time new and innovative guidelines for the PHC needs in order to get better organized. These are the easy access at the entire population, the active involvement of its community members, the prevention and promotion of health, the use of technology and application of scientific methods and the cooperation of multiple other sectors in order to improve the public health and the quality of life. The continuous role of the primary health care is to design and provide health services at a specific population based on their needs (Pires-Alves,2017).

The Alma-Ata Declaration referred at a significant issue of “health promotion” which was a result through the conversation for the importance of primary health care among the countries in order each population to elevate and improve their health services. The main principles of health promotion are firstly that the population can have the control of their health, at both national and worldwide level there will be cooperation among health organizations, multiple variety of approaches will be used including educational and informative methods for health development with the parallel active participation of the society. The level and quality of the environment affects health in total and in multiple ways. The meaning of the “environment” consists

of different areas such as economic factors, environmental factors, social factors and habits of people. In combination they are capable to threaten the level of health status. The existence of supportive network is important as long as it can provide empowerment through its framework in which all people will have equal access to all health services and common opportunities due to their needs (Birn,2018).

The Declaration of Astana in 2008 restated that there is worldwide responsibility to ensure that all people have the right to exercise their fundamental right for health services. There are significant global inequities on health services that people face and also there are still obstacles that have to overcome. This declaration states the importance of access to accessible, safe and high-quality health services which can be affordable and provided by skilled health professionals (Chokshi,2018).

The European Economic Co-operation OEEC was founded in 1948 in order to manage the reconstruction of Europe after World War II and it is known as the Marshall's plan. After the end of this plan there was a created a new set up based on the main idea of a common union which replaced OEEC (Papadopoulos,1994).

The Organization of the Economic Co-operation and Development OECD was founded in 1960 and it's based on the representative democracy and the free market economy. It has connected its existence with the idea of globalization. OECD is an international organization with main purposes the exchange of in information and implementation among countries which show mutual interaction. Issues about economy, trade, education, environment and corruption are under promotion in order to be reformed (Beech,2009).

Today the number of countries which are members are in total 37 while Greece joined OECD in 1961. The organization provides the good practices and values which can be formed and promoted among the countries so to be adopted and set the developmental framework for economic and social discussion policies. The member countries and other partners are brought together and collaborate for global issues through negotiations in order to set better conditions for all. Major priorities of the OECD for its member countries are the economic growth, the employment, the economic stability, the good living conditions for the citizens in a safe environment and finally the



harmonization of all with the international regulations without discrimination on all fields. The positions of the OECD are redefined based on the circumstances and the needs of the member countries (Rinne,2008).

The priorities are defined by the conditions and the needed assistance of each country. OECD is responsible to organize and cooperate activities through certain operations which take place in order to achieve the goals of the OECD. The economic support through financial benefits is important so to promote and benefit the participation of the member countries into specific programs. The European Union has the ability to finance and support major European projects by promoting specific actions. The results from all member countries are collected, measured and analyzed at a reference system as statistical data which are available at an open database. This occurs due to the need to measure the effectiveness and productivity of many variables in many fields of each member country in order to compare and suggest new reforms and make available the needed redefinition on certain policies (Schuetze,2006).

The World Health Organization WHO is an international organization and was founded in 1948. It is part of the United Nations and deals with international health as an epidemiological service. Health is a clear goal for WHO and a fundamental ambition for all member countries. The activities of WHO expand worldwide with many countries in order to deal with health problems that can be effectively and efficiently be solved. The World Health Organization (WHO) defines that health is "the state of complete physical, mental and social well-being, and not the mere absence of illness or disability". The health system consists of individual components that cooperate in order to cover the different needs of the population (WHO,1946).

Main goal of WHO is to enhance health worldwide by eliminating any health danger but also to deal with the consequences through a global network of observation. Another goal of WHO is to inform accurately about health issues, run and support special educational programs, give specific guidelines and promote good health habits in order to increase the health level and improve the living conditions worldwide. WHO is also dealing with the national health systems in order to offer advanced healthcare, provide equal health

services, and eliminate discrimination so all people will be able to receive the same health benefits (WHO,1946).

WHO has many roles that tries to fulfill and many missions to accomplish with the parallel and continuous role of negotiating for both public and global health issues. Although this procedure is undermined between the technical and political mandates that are under negotiation and the final decisions that need to be taken every time due to the circumstances. The result is that WHO has not achieved to design a common intergovernmental platform leading to inability which affects the strength of the entire organization. There has been a suggestion of WHO to be divided in two segments in order to provide more effective support. There would be created the political board and the technical board which will cooperate but they will not overlap one another. By revising and reforming WHO's constitution and through simpler mechanisms the progress in global health will be elevated while also the member countries will acquire and demand a more active role in decision-making through their continuous cooperation.

WHO is an organization with great potential which in the past has achieved important progress in many health issues. However, the proposal for reforming should be consider as a measure to overgo outdated institutional arrangements and to modernize by its division and total structural redefinition (Hoffman,2014).

## **2.7 Types of health systems**

***Liberal health system – private insurance.*** The state has limited role in the transactions between consumers and producers. However, the state forms the institutional framework so the market will function properly. The liberal health system is based on the complete freedom of health care in which health coverage is a personal and free choice for everyone. This health system gives everyone the free option to decide whether or not to be insured. There are many private health insurance companies that give at customer the option to be insured under the existence of plenty of packages that can be afford either by them or their employee. Although there are those who remain uninsured and have to pay their personal income expenses every time, they make use of health services. This type of health system is shaped by the customers that

make use of the health services that are insured in private companies. This has as a result that supply and demand are determined by the customer's payment ability. The advantage of this system is that the patient can choose the doctor and the hospital that wants to be treated. The disadvantage of this system is the major health inequality that is occurring since the coverage of health services depend on the financial capacity of the patient. This health system is not universal and does not provide full coverage of the population. Also, as long as the number of the doctors is increased and the state's role is limited this leads to an increase of unnecessary use of health services due to the phenomenon of challenging demand (Gruber,2017).

**National health system.** It is based on social solidarity through equal coverage of the needs of the population and fair distribution of the recourses in which there are no inequalities. The national health system depends on that the state has direct control over the production and distribution of health services and there is free access and use without charge. The national health system can be funded by national security and/or by the state budget. In the option that health systems are funded by social security this is due to many social insurance funds, which finance the system through employers and employees' contributions. This system has the advantage that everyone can cover their health needs by paying their contributions through social security. In the option that health system can be funded by state taxes or local taxation this is due to the principle that health is a public good and for this every state is obliged to provide the necessary health services. This health system has disadvantages such as the development of bureaucracy which burdens the services, the priority to serious incidents which causes lists of long waiting, the benefits vary from person to person depending on their insurance fund and also there is no freedom of choosing doctor or hospital (Sasaki,2015).

**Social security health system.** It is based on the universal coverage of the population's needs for health services in which there are no health inequalities. All citizens are treated equally regardless their economic situation. In this type of health system funds come from the taxation. The active role of the state is able to ensure the good management of the system and to control the costs. Public health as well as prevention is a priority for all citizens. Although there is the disadvantage that when professionals are insured their

benefits may vary from one person to another depending on the fund that they are insured (Auerbach,2018).

## **2.8 Health inequality**

Independently from the type of each health system which country may have it is a very usual condition the increase of demand for more health services to create unbalance in it. It is important for the users/patients to be able to fulfill their needs, create satisfaction, inspire safety and provide full coverage for the whole population. The management of each health system is a multidimensional sector because it absorbs a significant share from the GDP of the country (Proto,2013).

Inequalities in health services may occur by the low income and financially disadvantaged consumers. The necessary need for health services by the consumer who belongs to the lower economic groups who cannot afford the payments or has not the ability to any private payments leads to health inequalities among the population. It has been observed that if the full coverage of hospital care is funded by the insurance there are created greater variations in outpatient services among social groups. Users that struggle with their payments for health tend to limit their visits for health care services which creates an inequality affecting direct the level of health of these people. Also, inequalities have been observed among users who have private health insurance and those who only have social health insurance. It all depends on the use of health services and the financial status of the user who demands the health service based on their needs (Vanroelen, 2001).

The phase of the economic descent is characterized as financial crisis. An economic crisis may create off balance of the economy system and affect the economic growth of it. There is a strong connection between the economic status and the level of health. The existence of social and economic differences creates disparity among the people. Inequalities on health affect the life of people which is shown from the percentages of general and infant mortality. (Figueras,2008).

Elderly is a group of people who appear with gradual deterioration of their functions with main characteristic the reduction of their mechanisms to be adjusted. The terms “health”, “healthcare” and “preventive medicine” have

raised questions since antiquity due to the need of people to understand how to prevent, cure and preserve a good level of health as part of their living conditions. There have been found documents from ancient philosophers and ancient physicians who tried to understand the concept of health, made multiple studies and analysis and tried to find solutions in many health problems in order to promote health conditions among populations. This information has been the basis in many fields of medicine (Ifanti,2011).

Health is one of the basic human rights which is essential for social and economic development. Nowadays the changes that occur in each society affect the health of people as new challenges are needed to be faced and managed. New policies need to be developed and health strategies to be promoted in order to improve the holistic approach of healthy life. Health is one of the most important factors of the status of the population which is also highly affected by the living conditions and is recognized as one of the most important and valuable good. Therefore, the term “health” is multidimensional with both common and different meanings for each individual. From antiquity until nowadays health has been strongly connected with the quality of life (Orme, 2010).

The state of health is affected by both endogenous and exogenous factors. It can be stable for a specific time period but due to multiple factors it can be unbalanced at a given time. The level of health is affected by genes, family status, financial status, age and gender, working and living conditions, health services, educational level and the environmental framework. Empowerment of the body and mind consist of a statement of good health. The key role of empowerment is extremely valuable and it is needed to be treated as a fundamental and holistic procedure among the population (McKague,2003).

There are three health models which have undergone many changes over the last decades. The medical model emphasizes only on treatment which is provided exclusively by the doctor and defines health as the total absence of disease (Barrett,2004). The holistic model emphasizes the health level with the importance of wellbeing. It is represented by the definition which was given by WHO. The main concept is that when biological, mental and social factors are in balance there has been achieved a dynamic holistic health (Barrett,2004).

The wellness model or Salutogenic model emphasizes that health and disease can be one situation that varies depending on the circumstances. A wider dimension is created as people with disabilities can also have a productive life (Antonovsky,1996).

Among countries there are many factors which play their role in shaping and influencing health conditions worldwide. The correlation between health and social factors is very strong and so this creates a great controversy about how they affect each other. As a phenomenon health inequality occurs because health services are limited but also due to behavioral causes of the potential patients (Marmot,2012).

The availability of medical care without the presence of disparities has proven positive result on health because it increases life expectancy and eliminates infant mortality (Martinson,2012).

The term of “health inequality” refers at the differences of the provided health care which may vary among individuals and/or social groups. As a result, they get direct exposure at greater risk factors due to their health needs and this affects their health status and also their life expectancy. The existence of health inequalities is one of the most important problems until today that it is tried to be faced and eliminated worldwide. Although the Declaration of Human Rights and the World Health Organization have recognized the health equity as one of the major obligations of each country for all individuals there are evidence that health inequalities still exist (WHO,1985).

The term “health inequity” refers at a specific type of health inequality that can be prevented but it happens due to factors of injustice. The unfair distribution of health care services and resources among specific social groups with different race, religion or socioeconomic level create health inequalities among the population (Marmot,2012).

Certain factors have been analyzed and categorized to measure their responsibility for the existing health inequalities among individuals and populations. These factors are important to be mentioned because they are influenced by social policies and shape the level of health worldwide. However many and different factors matter for health inequalities and they also vary among each country. The most effective indicators that create great impact on

the level of the provided health care and cause a wide range of health outcomes are education, income and wealth (Dressler,2005).

There is an important correlation which is created among the years of education and its positive impact on better health. This is due to behavioral factors that are formed through education. Habits such as use of smoke, use of drugs, bad nutrition and lack of preventive medicine create health behaviors that face increased risk factors of health disparity. Even personal options such as risky health behavior increases rapidly the exposure of the individual at worse health status (Berkman,2000).

Income of each individual but also the overall distribution of income in a population creates great correlation with the health services that are been provided. The importance of material factors concludes an environment where resources are available and wealth is improved (Kawachi,2002).

Countries with low wealth factor such as those with higher poverty have been observed to have lower level of health status (Kawachi,2010).

The existence of geographic differences is another factor that creates health inequality due to the available and provided health services. It is not easy to overcome the difficulties that occur while at the same time the health risks are increased for individuals that cannot get the same health care among a country (Arcaya,2012).

In Greece access at health services in the public sector is equal for all citizens. The main problem that the Greek population faces is in the increased demand of health services. There have been observed major problems such as the inability of medical and nursing staff to cope with the demand, the great delay of the provided health services and the low-quality health services which is provided at the final users. As a result, great number of consumers which has the financial ability uses the private sector, does informal payments, or even accepts the increase of the participation cost (Tountas,2005).

During the economic crisis there were many measures taken so services continued to work and function with limited resources. Public hospitals got reduced funding between the timeline 2009-2015 while at the same time the salaries of the health professionals decreased twice during the year 2010. Firstly, new staff did not get hired to cover those who had retired and this resulted the suspension of the recruitment of new staff which had great impact

on the quality of the provided health services. Public hospitals went through a lot of hardships with the increasing number of patients to not be able to be satisfied (Chantzaras,2018).

The existence of private insurance affects the demand of health services. The importance of the private insurance in health services is that it takes part into the cost-sharing expenses of the consumer. Furthermore, about the demand of outpatient health services they have been observed to be increased in conditions where there is private health insurance. Although the health care services remain the same, the demand of their use changes depending on the type of contract of each user (Ensor,2004).

The health facilities, staffing and medical equipment as well as the health care professionals are unevenly distributed across Greece which is a major burden and leads to great health inequality. There are examples of oversupply in health services and staff in areas where the population is greater although the demand for all these health services results of unmet need. In contrast there are other areas among the country which have very low number of health care services and staff and so on users are lead either at private expenses, poor health services and health inequalities. Also, there are high rates of self-reported unmet needs for health care services due to the cost of distance and the big waiting lists. Despite the differences that are met in the health care system until today Greece records the highest rate in doctors (6.3 per 1.000) while nurses have the lowest rate (3.2 per 1.000) among the other EU countries (OECD,2017).

The existence of big waiting lists of patients in Greek public hospitals creates an important obstacle in the provided health care which impacts most important the level of their health. The understaffed public health sector impacts on the population as there is low respond on the needs of the users (Economou,2014).

The redesign of the Primary Health Care (PHC) has not been successful as the measure for family doctors did not overcome the problem of the centralized hospital care that the population of Greece is used to. On the other hand, uninsured citizens earned an important benefit of hospitalization for inpatient care meanwhile further inequalities in the health sector did not achieve to overcome other problems (Economou,2015).



In 2016 a new legislation passed in order to limit health inequalities in groups of the population which are financial vulnerable. Uninsured, refugees and immigrants were secured under the universal health coverage in public health services as the rest of the population (OECD,2017). Another measure was the local health units named TOMY which started and developed in 2017 in order to cover health needs of the population and provide health care to them per area. They are staffed with a small number of health professionals and social specialties. Citizens per each area were asked to enroll at the TOMY they belonged to as well as to register at the family doctor who are contracted through EOPYY. These measures were part of the health project of PHC in order to promote the health of the population and eliminate health inequalities independently the household budget (Baeten,2018).

The issue which is still a major burden in the provided health care of the population and has not been solved yet is the inadequate staffing of public hospitals and other public structures. The continuous limitation of the resources due to economic crisis if could be overcome, this would be the key for a better health system and successful health promotion of the universal population (OECD,2017).

## **2.9 Insurance system in Greece**

The Greek health care system is categorized as a mixed system. It is based on the compulsory social health insurance and operates according to the Bismarck model. Meanwhile the health sector has borrowed data from the Beveridge model. The National Health System (NHS) has a central financing, it was founded in 1983 and had as basic aim to reform the health system. The financing comes from the social insurance contributions of the citizens, general taxation and private spending. NHS is responsible for the development of primary health care, the equal provision and financing of health services and the universal health coverage of the population without inequalities (Nikolentzos,2015).

The NHS services are delivered in a mix of public facilities. All private providers are obligated and contracted by EOPYY. There have been done many acts in order to fulfill the needs of the population for primary care services.

Primary care is provided by health centers, outpatient clinics and private doctors. Secondary care is provided by hospitals which are funded by the state budget. However, the results among the coordination of primary health care providers and hospital doctors remain quite disappointing (OECD,2017).

The insurance system in Greece consists of a large number of funds which are under the control of the Ministry of Labor and Social Security. Each fund is under different legislation in which are due to the contributions that are paid, the provided coverage and benefits. Also, there are a large number of citizens that use for their health services out-of-pocket spending. All these factors had been creating serious disparity in access and financing of health services. However, in 2011 the vote of the Law 3918 brought up new structural changes in the health insurance systems of the entire country. There was created the National Health Service Provider (EOPYY) which coordinates with all the insurance funds such as (OPAD, IKA, OGA, OAEE) in order to negotiate and have the total control of all economic transactions on the area of health care. Acts as the main purchaser of all health services with the overall goal to transfer more power to the regional health authorities (Simou,2014).

In Greece all people regardless their legal status has still right to access the Emergency Department and no person is examined by any committee in order to have approval to be examined by public health system. In 2016 with Law 4368 there was a fundamental change at the right of free access to all public health structures for uninsured and vulnerable social groups. This introduced an institutional framework about the equalization of all citizens and their free access to the public health system (hospitalization, diagnostic and pharmaceutical coverage). The National Organization for the Provision of Health Services (EOPPY) is in kind of illness benefits for employees insured with the National Social Security Fund (EFKA). There are certain conditions to be met in order to gain access to illness insurance benefits. It should have been paid the insurance contributions for at least 50 days during a year preceding the illness or during a 12-month period preceding the illness. Greek citizens have access to all health services with their AMKA (social security number). Vulnerable groups who do not live legally in Greece are entitled to the Foreigner Health Care Card (K.Y.P.A.) which can be used by them and have health benefits in health services of the public sector. Offices for the protection

of Rights or the Administrative Services of Hospitals can inform vulnerable groups how to receive the K.Y.P.A. card.

The Ministry of Health and Social Solidarity is in charge of the development of health policies in Greece. Since 2004 there is launched a new process of social protection which is based on three categories of intervention. The first one is the financial viability and the improvement of the social security system. The second one is the improvement of the quality of the provided health services along with the equality and universality of access to all the population. The third one is to achieve to modernize the social welfare and to promote the social inclusion of vulnerable population groups (Nikolentzos,2015).

The insurance system in Greece of its health services faces important problems such as the high costs of health care and the low development of the primary health care. Also, there is limited freedom of choosing doctor or hospital. The citizens may find inequalities due to their geographical location or inequalities due to their economic status. Until today there is lack of correct information, increasing of demand, informal payments, big waiting lists and malpractice from the doctors (Alexopoulos,2009).

### **2.9.1 Economic crisis in Greece**

Greek economy the last two decades has been under serious issues which impacts greatly both households and the level of health of the population, while until today the country still tries to recover. References at the health system in Greece show that problems had shown up before the onset of the financial crisis. Most of these problems are related to its structure and function. (Economou,2014).

The major financial crisis after the end of 2009 appeared with two main features, the high public debt and the large budget deficit of the country. The current economic condition has been categorized as one of the longest in duration and density period and one of the worst in OECD countries among other of EU after the post-war period (Kyriakopoulos,2019).

In addition, Greece has been strongly influenced by both global and economic crisis and has been through a whole new process over the last decade for change and structural reform. These terms have been set by the

loan agreement which has been signed with Troika and the Economic Adjustment Program (Economou,2016).

A number of consequences has occurred due to this economic phenomenon and in the social level it has been obvious that many indicators have been seriously affected. The increase of the unemployment rate, the poverty rates, the number of people without the ability to pay their insurance fees, the decline in GDP and the rise of health inequalities are results due to the long-lasting socioeconomic crisis in the country (Stylianidis, 2019).

The GDP of Greece after 2008 followed a downward trend until 2016. Between the timeline 2009 and 2013 there was a rapid decline in GDP. Greece among EU countries was the only with negative rate in 2015 and 2016. After 2016 there was a slight increase of it, although it remained lower than the rate before the start of economic crisis. In addition, Greece for the timeline 2007-2017 had the lowest average of GDP per capita among EU countries (Eurostat, 2018a).

The mandatory adoption of certain austerity policies has set more difficult challenges for the health system that need to be solved. As a result, these terms put enormous pressure into the health system by providing health care with fewer resources making it unable to respond at the increased needs of the citizens (Economou,2017).

The health care system in Greece faces many unsolved problems which leads the citizens to prefer the private care instead of the public. This has been occurred because the primary health care and prevention poorly exist. For example, the primary health care centers have become more suitable for doing the medicine prescription of the citizens. Also, the secondary health care which is provided by the hospitals also does not satisfy the needs of the citizens because there is no good management of them and very low organization. Hospitals are in bad condition, there is lack of technological equipment and there is lack of medical staff. At least but not last important is that there are only a few research centers in the country that try to bring up new data in the research community working with very small amount of financing (Mossialos,2005).

The low quality of the health services which is provided causes great dissatisfaction at a very large percentage of the population. The existence of

informal payments, inequalities in access and supply, low financing of the health services and the bad management of the health system form a general condition in which trust and secure have been lost or are under restrictions. This explains the increasing development of the private health in Greece which has been created by the demand for better and faster health services (Tountas,2005).

### **2.9.2 Levels of health services in Greece**

All the set of structures and infrastructures that produce health and prevention services in a country are into a pyramid of health system. The healthcare providers or professionals can be from various fields such as nurses, doctors, physicians, physiotherapists, psychologists and other which all cooperate. The health system operates according to the state's rules and its main purpose is to continuously maintain and promote the level of health at all citizens and to cover their multidimensional needs.

In many studies it is stated that populations that face low health care encounter serious adverse effects in their health statement and the countries also face financial burden. In Greece the health system and the provision of services are characterized by many different levels of health. Hippocrates of Kos (460-377 BC) was the first that stated the importance of primary care with his saying that 'preventing is better than treating'. Healthcare is not the same during the decades because is influenced by many factors such as social, economic conditions and health policies which may vary among countries and groups of people (Malathi,2012).

In Greece the law N. 3527/2007 divided the National Health System and created the 7 regional health systems among the country. Main purpose of this act was the efficient organization and management of the health services with better economic efficiency, cover nationwide the health needs of all citizens and eliminate health inequalities among regions. The role of the regional health system is to decide and plan health policies as well as to organize and allocate the resources based on the needs of each region (Tountas,2005).

**Primary health care.** The primary health care constitutes one of the most important areas among the health services. All the provided services are designed and implemented by a group of health professionals and also the

main medical specialty are general practitioners. Their role is to evaluate and design protocols based on both the health needs of each individual and their community. Primary health care is one of the most important levels of the provided health care services. Main purpose is that all health levels function complementary and not competitively so improved health services can be provided at the entire population of each country. Every population shows special features which have been formed by certain demographic, epidemiological, cultural, social and environmental characteristics. The individualized assessment of the health needs differs among individuals, populations and even entire countries (Schoen,2004).

In Greece services for health are provided by both public and private sector so citizens are able to choose freely. The definition of primary health care has evolved over the years but its main goal remains the same which is the preventive care of the public health. Also, it includes home care, patient rehabilitation, health education and in general improvement of the public health. This level of health care is also part of the outpatient care. The person can get quick health service about prevention and diagnosis without the need of hospitalization. Many countries have shared a common goal to establish strong and functional primary health care systems. The efficient role of the primary health care is important because it reduces healthcare spending and health disparities. However, in Greece the austerity period due to Troika created significant impact on the structure and quality of health care services creating decrease of effectiveness of the health sector (Schafer, 2011).

Studies on primary health care services prove that patients have mostly scored well general professionals in specific aspects related with communication and the provided patient centered care. However, there has not been created an electronic platform to be used by medical professionals in order to register all information about each patient's health condition. As a result, the continuous lack of medical history is a serious problem that causes inadequacy at the patient's treatment. Until today there is only an electronic platform that is created to make each patient's prescriptions. Also, patient's score low and support that there is limited use of multiple groups of professionals in order to cooperate for better providing care. Score low also receives the coordination between the levels of health services which creates

delays and the existence of mistakes. The primary health care in Greece appears with weaknesses in which there is serious lack of focus on prevention and promotion of health level (Souliotis,2016).

After the establishment of NHS in Greece there were created health centers and regional clinics in order to cover the health needs of the population. The health centers are decentralized units of hospitals that cover each specific area in which are located. They provide health services 24 hours a day and 7 days a week. Health centers provide primary health care, medical services and social care. Their most important role is the primary and the secondary prevention of diseases. The continuous active and supportive involvement of the community in the design and evaluation of health programs can be extremely effective in order to raise the level of health care. In 2017 in Greece there was established new community based primary health care units. This was a new structure for health services, the local health teams in Greek named TOMY. The TOMY are the first point of health contact which coordinates the care of people over the area that is located. Each TOMY is staffed by 12 employees that provide public health services at the area where TOMY is located. The professionals are 4 physicians or general practitioners, 1 pediatrician, 1 social officer, 2 nurses, 2 health visitors and 2 office administrators. The TOMY has working hours 08:00-21:00, the schedule is 2 shifts morning and evening and operates 5 days a week (Lionis, 2019).

**Secondary health care.** In secondary health care patients are treated from public or private services. There are hospital departments, day care clinics, clinics, mental health units and rehabilitation centers. There are many professionals from various fields but also there are medical specialists for specialized health problems. In tertiary health care patients are treated by special consultants who can provide special healthcare on health issues that are still under research (Couturier, 2016). Psychiatric units also have an important factor as health services in order to cure the psychiatric patient, design personalized therapy by healthcare providers, evaluate the level of health, support at the rehabilitation and create suitable environment for successful return into the society. The mental health has significant role and is relevant to global health. Mental disorders appear to be broadly growing which creates the need for

better acknowledgment and methods of cure for the global health action (Patel,2014).

***Emergency medical care.*** The national emergency assistance center in Greece named EKAB constitutes an important structure of health service which was introduced in 1976 and is divided nationwide in 12 annexes. It is the only official emergency medical service and nursing care which is responsible for the advanced support and consolidation of the vital functions of the patient. Also, it is in charge for the safe and quick transportation of the patients during emergency situations. It cooperates with the department of Disasters in order to do the management of crises (Lionis, 2019).

### **2.9.3 Health expenses and out of pocket expenses in Greece**

The health level of the Greek population has been observed that improves steadily over the recent decades. Significant changes have been done in order to provide better health services, increase the level of health of the population and decrease inequalities. The country's Economic Adjustment Program has as main role to transfer more responsibilities and power at the regional health authorities but until nowadays the health system remains mostly centralized (OECD,2017).

In the Greek population 74% of the self-reported results about the quality of life are higher among other EU countries. In Greece life expectancy is 81.5 years which is above the EU average, but after 65 years old over two-thirds of the population is accompanied by some type of disability. Due to the large number of elderlies into the population health services are necessary in order to maintain a good level of health. Health care services can be obtained by either social or private sector. Income and health security play an important role in order to cover the expenses of health care. The increased number of the aging population due to diseases and disabilities need continuous medical support and overall health care services. This support is translated into medical costs, which are the expenses of the users/patients. The last three decades in Greek population has been observed the phenomenon of the aging of its population in high rates while at the same time the low birth rates have affected the structure of the total population. The low birth rates in combination with the increase in life expectancy show great consequences for both social and



economic factors for the country. The reduction of the size of the population creates new conditions for both needs and requirements of the now and later generations which have to be faced and resolved by the government (Daniilidou,2003).

The increase of elderly population and the decrease in birth rates create great pressure and many expenses for health needs such as medical care and pharmaceutical coverage (OECD,2014).

The years of life after the age of 65 are accompanied by chronic diseases and disabilities. This is due to increase in life expectancy and low fertility rates, more than one in five (22%) people in Greece are aged 65 and over, a ratio that is projected to increase to more than a third (34%) by 2070. In 2017, life expectancy at age 65 was 20.1 years slightly higher than in all EU countries (OECD,2017).

The rate of the treatable mortality (125 per 100.000) of the population is just below the EU average although there is a significant disparity in the rate of mortality among men and women. Although life expectancy at birth has been increasing at the same time the quality of life and the level of health status are seriously declining. The life expectancy in 2015 had a mean 81.1 years which was slightly higher than the mean 80.6 in EU countries. There has been observed a gender gap among men and women about the life expectancy. The good health of people over the age of 65 is decreasing as it is parallel accompanied with chronic diseases and/or disabilities. Educational level of both genders plays an important role as it is a factor that affects the total years of living due to the possibility to live with a disease of high risk. People that have higher educational level have less risk to live with a chronic condition than those with lower educational level (OECD,2017).

Economic crisis has also affected the socioeconomic context in Greece and so on there are higher risks of poverty, unemployment and decreased household budgets. As a result, "crisis" on the economic area has been shown to have great impact on both health status and health behavior over the population. There has been observed a slight increase in deaths from suicide but in the opposite deaths from traffic accidents have been declined although in Greek population still appear in very high rates (OECD,2017).

Cardiovascular diseases and cancer are two of the most usual causes and responsible that lead to death of the aged population. Since 2000 the number of deaths in Greece had been significant decreasing within a rate of 14%. Diseases such as strokes, ischemic episodes and other heart diseases are some from the most usual that have the greatest impact on health level and are responsible for the increase of the mortality rate overall (among the total number of 45.000 deaths). Cancer as well has great impact on the level of health and increases mortality rate in both genders, with men to have greater rate 30% to women with rate 20%. The highest rates of the types of cancer disease are observed in lung cancer, colorectal cancer, pancreatic cancer, breast cancer and prostate cancer. Due to low preventive screening of the population, direct treatment and right follow up have been observed to lack, resulting great health impact and high mortality rate at the Greek population (OECD,2017).

The major problem that is caused by the existence of chronic conditions to the population over the age of 65 years old is that it affects the quality of their life. The main determinant for the quality of life of a person is measured with the DALY's tool which works as an indicator for specific diseases and certain risk factors. Health situations that are mostly met in the Greek population are hypertension, diabetes, respiratory diseases such as asthma and chronic depression. All the above taken in account with the DALYs score can be found how they burden on both rates of mortality and morbidity (OECD,2017).

There are certain risk factors in Greek population that are connected with their daily life and are mainly responsible for the low quality of their health. The use of smoke in Greece has a high rate which is also among the second higher in EU countries. Teenagers have been recorded that they tend to do regular use of smoke approximately from the age of 15 years old with both girls and boys to have very close rates, 13% and 16%. Men in the population do higher use of smoke in rate 34% in comparison to women who have rate 21%. The consumption of alcohol is quite low in comparison to other EU countries in rate 10%. The good health status of the population is also connected with the following of a healthy diet. However, there are observed high levels of obesity in childhood and teenagers. Higher rates are mostly met among boys in rate

32% while girls have rate 16%. Responsible for obesity are the factors of low education and the lack of regular physical activity (OECD,2017).

The level and composition of the economic development of a country is related with the financing of health expenses in transition and all of the changes that take place. The main characteristic is that while a country develops and increases the per capita health expenditure is also in the ability to keep the direct payments of the users reduced (Global Burden of Disease Financing Collaborator Network,2017).

During the economic crisis many countries of OECD as well as Greece followed a great number of measures in order to limit their expenditures. At the health sector were observed significant cuts which in correlation with the decline of the income resulted unbalance in the access to health services and major inequalities (OECD,2018b).

In the OECD countries the main funding of health expenditure is from both government expenditure and compulsory health insurance of the population. However, in Greece there is observed the almost equal percentage of funding from both sources. According to the available income of each user there is certain ability to do health expenses such as for doctor visits, diagnostic examinations and buy of medications (OECD, 2018a).

Private payments in Greece for health services there have been always high with the form of direct payments. Health inequalities have been observed to be increasing in groups with high income but this phenomenon almost occurs in all EU countries. Until today health sector is observed to be still highly centralized. Many factors contribute such as the unbalance of the organization of the health system, the inadequate public funding, the large differences among the actual charges and the extra charges of health services, the lack of referral system among the levels of health, the payments of the afternoon outpatient clinics and the pricing problems of the health care providers (Siskou,2008).

The coverage of the health system is mainly linked at the employment status due to employees and members that consist of their family. In the period 2009 to 2013 Greece had the highest decline in the growth rate of health spending compared to the other OECD countries with a decrease 8.7% on average per year (OECD,2018b).

In 2015 Greece spend 8,4% of its GDP on health care. In the same year public expenditure on health constituted 5% of GDP. The proportion from the share of public expenditure was 59% while the 41% was from private payments. The per capita income measures the average income per person in a given region (country, city) at a given time. It is calculated by dividing the total income of the area by the total population (OECD,2017).

The impact of the economic crisis on health expenditures was great due to the shrinking of GDP of the country. The per capita spending in 2009 was EUR 2.287 while in 2015 declined to EUR 1.650. This important reduction of 28% put Greece for its per capita spending lower than other EU countries. Although health coverage since 2016 adjusted to fully universal for all the population nevertheless they are active working or unemployed that cannot pay their contributions (OECD,2017).

In general, public health expenditures declined due to the financial crisis. In 2015 costs for long term care were 0.2% of the GDP while the outpatient care cost of the hospital expenditure was 6%. In 2016 Greece presented the highest expenditures for inpatient care among the other EU countries with 42% of the total health expenditure. In 2017 the total public expenditures were decreased by 1.2%, while the total private funding decreased by 0.2% compared to 2016. There was a decrease in the total funding from the public sector in a rate 61.1% to 60.8% The government spending on health as percentage of GDP was 5.2% and the total expenditure was 11,1% which is from the lower in the average among other EU countries with rate 15,3% (OECD,2018b).

The very hospital-focused health system in Greece impacts health services in general as it causes at hyperfunction of hospitals. Outpatient services in 2014 were imposed with a EUR 5 charge of the user, which increased from the previous EUR 3 until that time (Liaropoulos,2008).

Also, in 2010 there was put into compulsory all day operation of public hospitals with the ability of afternoon clinics by payment for the provided health services. However, the citizens' visits were declined in rate more possible due to the inability to afford this kind of expenditure as well as in 2013 there was a 20% cut in all relevant fees (Economou,2014).

All health systems include direct payments for health services and each one in different level. Direct payments for health come directly from the primary income of a household and are made directly by the user due to the need to use or buy a certain health service. Households with lower or declined income face major problem to pay direct payments for health services causing inequalities in access to health and care services. As a consequence, the inability for direct payments results deterioration of the level of health and increases the level of poverty of a population (OECD,2018b).

Finally, there is creating a strong feeling of financial insecurity which has great impact at the households in general. Due to the increase of direct payments and the inability of the households to follow this circumstance there is a strong possibility of need to reduce the total consumption or undermine the payments even on basic goods. As a consequence, economic unbalance can be destructive for both households and the quality of the health level of the total population (Grigorakis,2016).

Payments for health include the direct, the cost sharing and the indirect type. The direct payments are related with the cost which is not covered by any insurance of the user. The cost sharing payments are related with a percentage of cost which the user pays while the rest of the cost is covered by the user's public or/and private insurance. The informal payments are related with a cost which is in a form of either monetary amount or gift and is given by the user at the health care provider for their health care services (Grigorakis,2014).

The phenomenon of private payment through informal payment or "under the table payment" has been since always into the Greek population as a marked feature by which health seems to not be faced as a "universal good". It is based on the need of patients for further demand of health services, the better and fastest access on health services, the avoidance of long waiting lists and to get "probably" better attention by medical staff or other health professionals (Grigorakis,2016).

However, this situation seems to be long-standing with the increased health demand by the citizens in addition with the extensive private payments for health services to bring up inequalities in the access to health services. Also, barriers to access are shown through the failure of the health system to cover the needs of the patients. The impact is not only great for the quality and

quantity of the provided health services but also for the health sector itself as there has been grown a “black economy” with devastating results (Economou,2015).

Informal payments are divided into two subtypes. The first refers to the amount that a user is asked to spend in order to get a health service although actually there is no cost and is free of charge. The second is that the user is asked to pay in addition to the official charge for a health service (Economou,2017).

In Greece most expenditures made by households are for the needs of medicines and inpatient health care due to the style of the health system which is mostly centralized around hospital care. It has been observed in health system that occur extremely high spending mainly in the form of out-of-pocket payments by patients for their health services. The private payments were always high and kept the same high rate even during the economic crisis.

During the timeline 2009 and 2015 the direct payments for medical products in Greece showed significant increase due to the stricter exemptions and the increase of co-insurance for certain medical treatments (Economou,2015).

Greece is observed that almost every year highly exceeds the total health expenditure in comparison to the other OECD countries. The total of private payments is direct from the users and is attributed to a corresponding increase in the burden of family budgets on medical expenses. The direct payments in comparison to co-payments constitute higher share of private expenditure on health (OECD,2017).

Private spending is unavoidable as it is needed for certain health care services such as co-payment for diagnostic, laboratory tests, private doctors and outpatient medicines contracted by EOPPY. Although through legislation it has been ensured that vulnerable groups or those with certain health conditions have protected access in order to be able to use the health services without burdens (OECD,2017).

In 2015 OECD presented great variances of the countries in their direct payments for health as a percentage of the total household expenditure. While the OECD average for direct health payments by households was 3%, Greece had higher rate 4.4%. As a percentage of total household expenditure Greece

had one of the highest percentages with rate 4% almost double from the EU average 2.3%. Also, direct payments for medical products and other pharmaceuticals accounted for the largest share of total costs at 35% which was about even with the average of other OECD countries at 36% (Baeten,2018).

Although health coverage of the whole population in Greece has been under legislation to eliminate any kind of inequality a wide range of health services such as dental or home care have a cost which demand the patient to make direct payments. It has been observed that direct payments for dental care are systematic almost in all OECD countries. In Greece this is due to the limited or lack of coverage for dental care by either EOPPY or private insurance with rate 13% which is though lower than the average of other OECD countries with rate 20% (Economou,2017).

Many OECD countries have very high percentage of payments for outpatient health care. While in Greece there are also very high rates of direct payments for inpatient care as well. Inpatient health care in Greece is in the top area of expenditure by the population with rate 32% as it is one of the highest among the average rate among other OECD countries (OECD,2017).

In this phenomenon contribute additional co-payments and additional service charges that the users may need to do. Even though users do not pay for their hospital care in public hospitals there are services that may arise payments such as those who are not covered by EOPPY, certain categories of medicines and examinations due to diagnosis. Additionally, in the private sector may also arise payments while hospitalization has been set at 30% at their cost services in the contracted private hospitals (Economou,2017).

The health system in Greece although it provides universal health coverage at the population remains until today one of the most privatized models of health system in Europe (Siskou,2008).

Even the coverage is by the public insurance with low cost for the users there is observed the circumstance of the “Greek paradox” in which the percentage of the direct payments is very high and compared to other health care systems who provide insufficient social health insurance at their users (Grigorakis,2016).

In a recent study of EU countries from OECD the direct payments for health services data were collected from all national family budget surveys. Catastrophic expenditures were measured and studied based on the ability of households to pay the direct health payments which exceeded 40% of their total expenditure without to count other basic costs for living. There were found high rates of expenditures among EU countries and Greece had rate 9,7% (OECD,2018b).

High non satisfied health need rates have been recorded in almost all EU countries with Greece to have one of the highest. Catastrophic costs for health are combined with large income inequality and so barriers to health access have great disadvantages on the population. Despite the change in the legislation in 2016 on universal population health coverage there are found differences in health access in comparison to those who are insured by EOPPY. Users who are covered under the new legislation can be only addressed at public health services while the users with EOPPY can also use private health providers. Although the new legislation showed positive results, health inequality to access for health services has not been eliminated yet. There are still gaps that have not been covered and this results the existence of more economic inequalities as well as further burdens tend to extent and impact the population (WHO,2019).

In a comparative study of 2018 for catastrophic health expenditures in Greece there was used a sample of 33,091 households. For the timeline between 2008 and 2015 there were studied from the sample the direct payments for health from households which showed increase from 6.9% to 7.8%. More specific there were recorded 20.2% increase for medical products and 63% increase for impatient care. On the contrary there was recorded -62% decrease of expenses for outpatient care (Chantzaras,2018).

In another comparative study of 2018 for catastrophic health expenditures in Greece for the timeline between 2010 and 2015 there were examined the impacts as a percentage of total household expenditures which exceeded a predetermined threshold. It was recorded that from 2012 catastrophic health expenditures tended to increase onwards and this was independent the used threshold percentage for this study (Kyriopoulos,2018).



In a cross-sectional study of 2013 in Greece there was studied a sample of 1,600 patients diagnosed with diabetes, hypertension, chronic obstructive pulmonary disease (COPD) and Alzheimer's disease. The catastrophic cost of health was defined as the health expenditure to excess the rate 20% of the total family income. There were recorded their health expenses for both primary and secondary health care services as well as their payments for medicines. It was found that in 2013 at every household who had at least one patient with one or more of the above chronic diseases it was under catastrophic cost in rate 7,8% while in 2010 the rate was 3,6%. The catastrophic health expenditures in 2013 were 4,6% of the total sample while in 2010 it was 1,6% (Skroumpelos,2014).

In another comparative study in Greece in 2013 there was studied a sample of 413 insured patients who were hospitalized in private contracted clinics with EOPPY. Main goal was to measure if the social health insurance protects and how much individuals who need to use emergency inpatient structures of the health system in the private sector. The catastrophic health expense was defined as the direct payments that exceed the national gross household income in thresholds among 5% to 25%. The sample which appeared catastrophic expenditure for health tended to decrease as threshold was increased. Users with lower household income had greater health costs for inpatient health care services in private providers. In rate 69% of the insured paid more than 5% of their gross national household income for inpatient care at private health providers while 37,8% paid more than 10% and 9,75% paid more than 25% of their national gross income (Grigorakis,2014).

## 2.10 Data and Methods

The main aim of the chapter is to explore the relationship between out-of-pocket expenditure (OOP) and income inequality. To do so, we exploit annual data spanning the period 2000–2021 for 29 OECD countries.<sup>1</sup> Due to some missing observations our panel dataset is somewhat unbalanced. Our key independent variable of interest concerns direct household spending on health services, without including indirect insurance contributions. We use two alternative definitions of it, namely, OOP as a percentage of total health spending and OOP in per capita terms. Both measures are expressed in PPP (Purchasing Power Parities) terms and were drawn from World Bank's World Development Indicators (WDI).

The empirical exercises presented in the next section use the Gini disposable index as the dependent variable, that is gini post taxes and transfers, downloaded from Solt's Standardized World Income Inequality Database (SWIID).<sup>23</sup> This is the standard inequality measure ranging between 0 and 100. A zero value corresponds to perfect equality, whereas a value of 100 means perfect inequality. Compared with similar inequality measures from other resources, the SWIID database is generally considered superior in terms of coverage (see, e.g., Solt, 2009).

Our analysis also includes a set of explanatory variables, related to the macroeconomic environment prevailing in each country, the labor market, and demographics. More precisely, we control for the log of per capita GDP, the ratio of exports to GDP, the unemployment rate (i.e., the number of unemployed divided by the labor force), government health expenditure and the share of university educated individuals. Table 5 summarizes the variables used in the analysis for the panel of countries considered in this chapter.

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<sup>1</sup> Specifically, our sample includes the following countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States

<sup>2</sup> The dataset is available at <http://fsolt.org/swiid/>

<sup>3</sup> We have also experimented with an alternative dependent variable, the WDI poverty rate capturing the share of population living below the poverty threshold, set at \$2.15 per day at 2017 Purchasing Power adjusted prices. Given that there are numerous missing observations, our preferable measure is the gini index.

**Table 5 - Summary statistics**

	Mean	Min	Max	Obs.
OOP1 (per person)	583.6256	75.00001	1838	609
OOP2 (as a share of health spending)	18.82003	7.1	55.7	609
Gini disposable	29.83072	23	49	638
GDP/capita (logged)	6.036442	2.13	10.06	638
Unemployment (%)	6.96048	1.3	26.5	625
Exports/GDP	51.76282	9.04	211.43	638
Health expenditure	8.85313	4.4	18.8	623

**Notes:** Descriptive statistics on the main variables included in the empirical analysis. OOP measures are direct spending of families on health, beyond taxes and social contributions. Gini is the after taxes and transfers gini (disposable) coefficient from SWIID. GDP is in 2017 dollars PPP. Unemployment is the ratio of the unemployed to the labour force. Exports and government expenditure on health are expressed as a share of gdp. With the exception of the gini coefficient, the remaining variables were drawn from World Bank's World Development Indicators (WDI).

The analysis considered below, assumes that out-of-pocket spending exhibits a non-linear relationship with our inequality index. This choice is motivated by our expectation that the effects of OOP expenditures might differ below and above a certain threshold value. That is, only “considerably high” individual payments on health are catastrophic. With these issues in mind, we specify the following empirical model:

$$\begin{aligned}
 Gini_{it} = & \beta_1 OOP_{it} + \beta_2 OOP_{it}^2 + \beta_3 \ln GDP_{it} + \beta_4 Une_{it} \\
 & + \beta_5 X + \beta_6 Hexp_{it} + \beta_7 Univ + \gamma_i + \lambda_t + u_{it}
 \end{aligned}
 \tag{1}$$

where Y stands for the poverty rate or the gini coefficient in each country-year pair  $(i,t)$ . The main regressor of interest is out-of-pocket spending, OOP and its square. The last term is used in order to capture potential non-linearities in data. If the coefficient on the squared term appears to be insignificant, then the effects, if any, should be considered as linear. The remaining covariates are, in turn, the logarithm of GDP, the unemployment rate, the ratio of exports to GDP, Government expenditures on health, and the share of tertiary graduates. The model also includes time and country dummies, intended to purge the

equation from temporal fixed effects and unobserved confounders that are specific to each country and fixed over time.

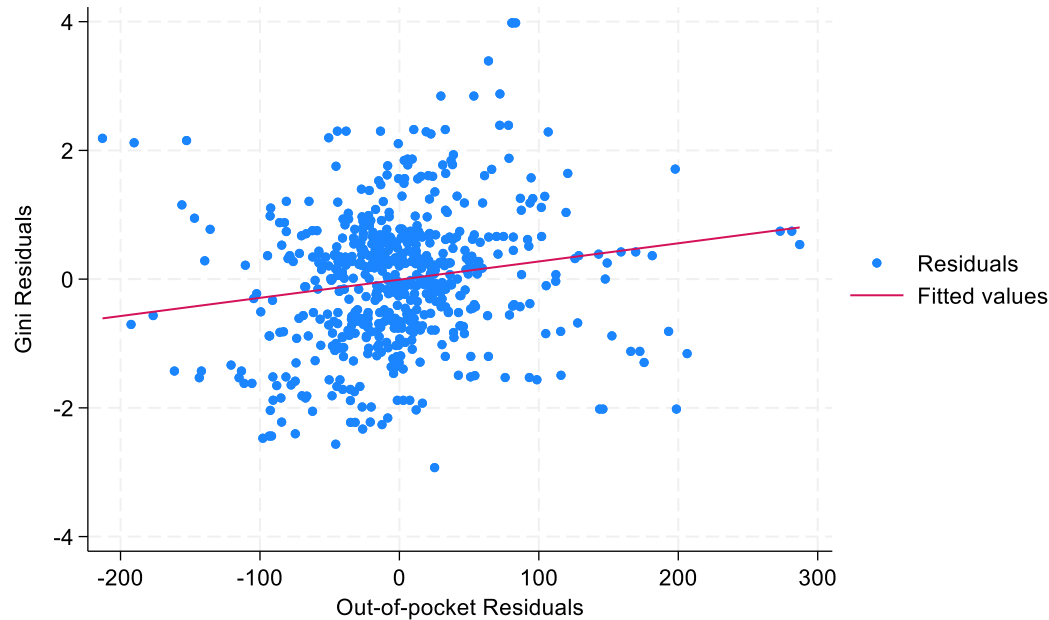
The main identification challenge stems from potential endogeneity due to unobserved determinants of the Gini index that are also related to out-of-pocket spending. What is more, it might also be the case of reverse causality running from out-of-pocket spending to inequality. To partially address these concerns, we estimate a dynamic version of equation 1 (i.e., introducing the lagged Gini in the set of regressors) by means of the system GMM developed by Blundell and Bond (1998). As compared to the Arellano and Bond (1991) difference-GMM estimator, the system GMM entails adding the level equation to the model in first differences and using internal instruments, that is, lags of the potentially endogenous covariates, with the lagged dependent variable included.

The system GMM approach yields robust results if there is no second-order serial correlation. We inquire the validity of the above hypothesis by employing the Arellano-Bond AR(2) test. We also test the validity of the instruments using the Sargan test of overidentifying restrictions. These statistics, which are reported at the bottom of the tables shown in the next section, are usually suggestive that the GMM analysis remains robust to these considerations.

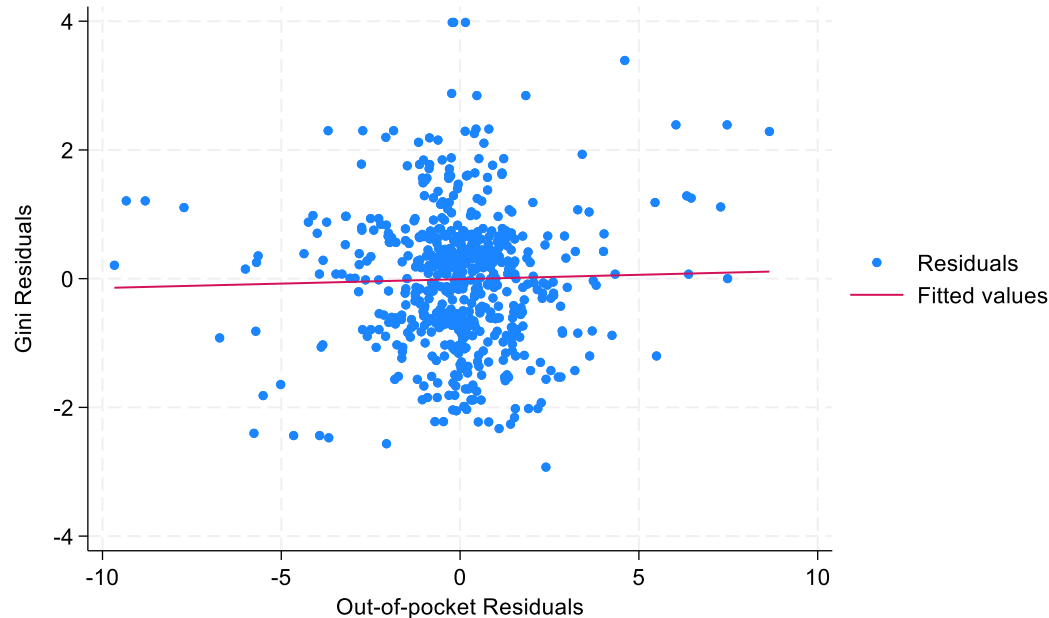
Before we proceed to the empirical analysis we described above, we provide some preliminary correlations between the two main variables of interest, without considering the OOP squared. Figure 1 plots the association of gini and out-of-pocket spending, conditional on country and year fixed effects. Panel A of this figure concerns OOP per capita, while Panel B uses OOP as a share of health spending. As can be easily observed, both measures exhibit a positive correlation with the gini index, though this is stronger once the first measure of OOP is considered. Overall, however, we do not assume a causal interpretation on these diagrams, and we explore the link between OOP and inequality more formally in the next section.

**Figure 1 - Correlations between OOP measures and the Gini index conditional on country and year fixed effects**

**A. OOP per capita and Gini index**



**B. OOP as a share of health spending and Gini index**



## 2.11 Results

In this section we estimate the relationship between OOP and inequality using the two alternative methods discussed in the previous section. We begin by presenting the two-way fixed effects estimates (TWFE) in Table 6 and Table 7 the associated clustered robust standard errors at the country level.

Then in Table 8 and 9 we discuss the results obtained through the system GMM estimator devised by Blundell and Bond (1998). The dependent variable is the SWIID Gini index, after taxes and transfers. We add the covariates sequentially in columns (1) through (6).

Out-of-pocket spending per capita enters with a negative (-0.301) and highly significant coefficient in column (1). The OOP variable in squared terms turns out also to be significant, but with a positive sign, implying a U-shaped effect of OOP on income inequality. Columns (2) through (6) assess the validity of the analysis to the inclusion of further controls. Accounting for GDP per person in column (2), does not affect the results. Next, we control for unemployment.

Again, the estimates in column (3) suggest a robust non-linear relationship between the two main variables of interest, similar to the one we found previously. In column (4) we add the exports to GDP ratio in the set of controls, while in column (5) we consider whether government expenditure on health confounds the relationship between OOP and inequality. However, even after these modifications, OOP continues to exhibit a non-linear correlation with gini.

Lastly, column (6) includes the share of university educated individuals. Once again, the main findings remain robust to the inclusion of this variable. Notably, none of these variables enter significantly, though we do not assume a causal interpretation.

**Table 6 - Share of out-of-pocket expenditure and income inequality, TWFE estimates**

	(1)	(2)	(3)	(4)	(5)	(6)
OOP1	-0.310*** (0.086)	-0.311*** (0.093)	-0.276*** (0.097)	-0.270** (0.115)	-0.280*** (0.108)	-0.324*** (0.099)
OOP1sq	0.006*** (0.001)	0.006*** (0.001)	0.004*** (0.001)	0.004*** (0.002)	0.004*** (0.002)	0.005*** (0.001)
GDP/capita		-1.450 (1.414)	-1.165 (1.901)	-1.004 (2.011)	-0.800 (2.037)	-0.327 (2.300)
Unemployment			0.031 (0.059)	0.034 (0.058)	0.033 (0.060)	0.050 (0.057)
Exports				-0.004 (0.022)	0.012 (0.022)	-0.000 (0.019)
Health exp.					0.321 (0.288)	0.194 (0.193)
University						-0.071
Observations	609	609	596	596	596	565
R-squared	0.954	0.954	0.949	0.949	0.950	0.957

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

In Table 7 we re-estimate the quadratic specification (1), using out-of-pocket expenditure as a share of total health spending as the main regressor of interest. As can be observed, the results remain qualitatively similar to those we found earlier. However, the estimated coefficients on the OOP variable and its square appear to be much weaker and close to zero. The OOP variable enters again with a negative, but insignificant sign through specifications, On the other hand, the squared term appears to be positively related to income inequality, and statistically different from zero at conventional levels of significance. Concerning the remaining control variables, none of them appears to be a significant determinant of inequality.

**Table 7 - Out-of-pocket expenditure per capita and income inequality, TWFE estimates**

	(1)	(2)	(3)	(4)	(5)	(6)
OOP2	-0.001 (0.005)	-0.001 (0.005)	-0.001 (0.005)	-0.001 (0.004)	-0.003 (0.004)	-0.004 (0.004)
OOP2sq	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000* (0.000)	0.000** (0.000)
GDP/capita		-1.360 (1.546)	-0.920 (1.986)	-0.752 (2.012)	-0.384 (2.072)	-0.109 (2.269)
Unemployment			0.033 (0.061)	0.035 (0.062)	0.029 (0.063)	0.040 (0.062)
Exports				-0.004 (0.019)	0.006 (0.020)	-0.007 (0.018)
Health exp.					0.312 (0.296)	0.209 (0.204)
University						-0.053
Observations	609	609	596	596	596	565
R-squared	0.952	0.952	0.949	0.949	0.950	0.956

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The results discussed above, though we control for macroeconomic and demographic factors and year and country fixed effects, might be spurious due to endogeneity, either due to unobserved confounding or reverse causality. For instance, it might be the case that the gini coefficient is the forcing variable, if less economically privileged households are more prone to pay directly for health services in the market. To mitigate these endogeneity concerns, we re-estimate a dynamic version of the baseline model by means of the system GMM. We consider all the right-hand side regressors as endogenous and use internal instruments (i.e., lags) to address endogeneity. The results are shown in Tables 8 and 9, along with the statistics for first- and second order autocorrelations and instruments' validity. The positive and highly significant lagged gini in both tables implies persistence in income inequality across countries. The coefficient on the share of OOP spending and its square in Table 8 ceases to be significant.



On the other hand, Table 9 suggests that the association between per capita OOP and inequality is linear, as the squared term is not statistically different from zero.

On balance, the general picture from tables 6 through 9 is consistent with the idea that OOP exerts an income inequality increasing effect. However, the linkage between our key variables of interest is weaker once we account for potential endogeneity using the Blundell and Bond (1998).

**Table 8 - Share of out-of-pocket expenditure and income inequality, sGMM estimates**

	(1)	(2)	(3)	(4)	(5)	(6)
Gini <sub>t-1</sub>	0.983*** (0.006)	0.969*** (0.010)	0.972*** (0.010)	0.973*** (0.009)	0.972*** (0.008)	0.972*** (0.008)
OOP1	-0.007 (0.008)	0.006 (0.011)	-0.015 (0.014)	-0.018 (0.013)	-0.007 (0.012)	-0.006 (0.012)
OOP1sq	0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.000* (0.000)	0.000 (0.000)	0.000 (0.000)
GDP/capita		0.055** (0.021)	0.030 (0.025)	0.038 (0.029)	0.026 (0.030)	0.044* (0.025)
Unemployment			-0.000 (0.006)	0.002 (0.006)	0.002 (0.006)	0.004 (0.006)
Exports				0.001 (0.002)	0.001 (0.002)	0.002 (0.001)
Health exp.					0.015 (0.019)	0.019 (0.020)
University						-0.001 (0.003)
Observations	596	596	583	583	583	552
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
AR1	1.02e-05	1.08e-05	1.12e-05	1.06e-05	1.14e-05	1.58e-05
AR2	0.684	0.702	0.618	0.621	0.621	0.832
Sargan	0.565	0.112	0.0469	0.108	0.190	0.438

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 9 - Out-of-pocket expenditure per capita and income inequality, sGMM estimates**

	(1)	(2)	(3)	(4)	(5)	(6)
Gini <sub>t-1</sub>	0.981*** (0.003)	0.976*** (0.013)	0.977*** (0.010)	0.979*** (0.008)	0.978*** (0.007)	0.978*** (0.006)
OOP2	0.000 (0.000)	0.001 (0.000)	0.001* (0.000)	0.001** (0.000)	0.001** (0.000)	0.001** (0.000)
OOP2sq	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000* (0.000)	-0.000 (0.000)
GDP/capita		0.026 (0.038)	0.014 (0.032)	0.014 (0.036)	0.019 (0.037)	0.046 (0.028)
Unemployment			0.002 (0.007)	0.006 (0.008)	0.008 (0.008)	0.008 (0.008)
Exports				0.001 (0.002)	0.001 (0.001)	0.002 (0.001)
Health exp.					-0.015 (0.022)	-0.008 (0.021)
University OOP1						-0.003 (0.003)
Observations	596	596	583	583	583	552
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
AR1	1.02e-05	1.08e-05	1.12e-05	1.06e-05	1.14e-05	1.58e-05
AR2	0.684	0.702	0.618	0.621	0.621	0.832
Sargan	0.565	0.112	0.0469	0.108	0.190	0.438

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## **2.12 Conclusions**

This chapter analyzed the OOP spending-inequality nexus for 29 OECD countries over the period 2000-2021, using OLS and system GMM methods. Our findings from the OLS specifications suggest that there is a U-shaped relationship between OOP spending and income inequality. We interpret these findings as suggestive that OOP becomes catastrophic above a certain threshold. The results appear to be quite stable across different regressions which account for the effects of further controls.

The evidence from the system GMM approach in the spirit of Blundell and Bond (1998) indicates that the relationship between the main variables analyzed in this study is weak and insignificant, once we measure OOP as a share of total health expenditure. On the other hand, measuring OOP in per capita terms yields a positive linear association. Most of the remaining covariates included in the regressions do not appear to be significant determinants of inequality.

The empirical findings on the relation between OOP expenditure and income inequality might be useful to policy makers in OECD countries, especially in the aftermath of the Covid pandemic in strengthening the health care systems to reduce out-of-pocket spending. Lastly, future work should focus on the particular mechanisms through which OOP spending affects the distribution of income.

## **CHAPTER 3 - Trust, social interactions and perceived health**

### **3.1. Introduction**

Humans are inherently a social species which interact through forming relationships with others. A social network is created from the relationships with other individuals, families, groups, corporations and organizations. Interactions in social networks are an integral part of a person's life which affects positive their physical and mental health (Farrell,2022). Social interactions include all these procedures as behavioral decisions of the individuals are intimately linked with their actions and reaction with one another. The framework of the communication has been adjusted with the decision-making as to response, behave and interact with others. Good level of health and holistic well-being of people depends on the quality and quantity of social interactions (Guadalupe,2021).

Closely related to the concept of social interactions is interpersonal trust and its impact on perceived health and life satisfaction. As has been shown by previous research, positive attitudes toward fellow citizens are associated with better perceptions on one's health and quality of life (see, e.g., Barefoot et al.,1998; Schneider et al., 2011; Chan et al., 2017; Hamamura et al., 2017; Adjaye-Gbewonyo, 2018).

Social networks promote social activity such as interaction, engagement, participation and volunteering based on their needs. The quality and the quantity of social networks play an important role as they cover the people's expectations, mental needs and need of satisfaction. Higher quality of social networks forms better connectivity among its members which is a valuable aspect for a better quality of life (Siette,2021). Social isolation and loneliness have been described as major issues which affect negative both physical and mental health of individuals. Chronic stress in elderly occurs due to their limited social interactions as demographic and social needs have changed the behavioral lifestyle of people. Elderly who have limited social interactions have a higher prevalence of depression, reduction of cognitive function and morbidity. The lack of social interactions unfortunately may result in social isolation from the community that

has been associated with increased risk for early mortality of elderly (Freedman,2020).

Physical health is also negatively influenced by loneliness. It has been studied extensively in elderly populations and the results show the detrimental impact that social isolation has in their life. Also, an increase in obesity and mortality have been correlated with both loneliness and social isolation (Fakoya,2020). Elderly population in studies have been shown that exercise and walk less and also make greater use of smoke. It is profound that living alone without a support by any kind of network affects their mental health. However, healthy aging of elderly through advanced and promoted social networks offers social support. This type of intervention should be used as a strategic framework although full evidence of effectiveness is limited (Courtin,2017).

Aggregate shocks, such as the recent coronavirus SARS-CoV-2 pandemic (known as COVID-19) might also influence the quality of life, and especially for the elderly, who faced a challenging health situation since December 2019. This severe infectious disease started to spread around the world very fast mostly through travelers and World Health Organization declared a state of a pandemic. Elderly and people with chronic diseases have greater risk to be infected by COVID-19 including the involvement of frequent comorbidities which complicates their management. Strategic frameworks worldwide were set, as most of the countries realized soon enough the emerging need to decrease the spread of this infectious disease. Total lockdowns, quarantines and physical distance were chosen as the need to socially isolate the population was emerging. These measures implied a drastic change in the behavioral lifestyle of people and resulted to severe outcomes in both physical and mental health. Due to the silent fear of this pandemic, social trust was shaken for topics such as management and treatment about COVID-19. Psychiatric and neurological disorders were increased which resulted from the long period of social distance among people.

The main aim of the present chapter is to analyze the potential role of trust and social networks in explaining the health outcomes of the respondents. We carry out the analysis both for the entire population and the elderly in particular. To

do so, we exploit individual-level data from the European Social Survey. We use two self-assessed indicators as the dependent variable, namely perceived health and life satisfaction. We consider both individual as well as social trust (aggregate trust at the country-level) as the main independent variables of interest. Social interactions are captured by two variables indicating whether individuals meet with friends and relatives regularly, or whether they participate in social activities. We also include a set of further covariates to reduce endogeneity.

The findings are consistent with the idea that trust and networks foster the outcomes considered in the analysis. To be able to argue that our findings, relative to the impact of individual trust, are causal, we follow common practice in the literature (see, e.g., Daniele and Geys, 2015), and replicate the analysis using only the children of immigrants in the sample and substituting individual trust for aggregate trust in their home countries. On the basis of this empirical exercise, we are confident that the association between trust and life satisfaction can be considered as causal. On the other, this does not seem to be case once we consider the relationship between trust and perceived health.

Before we proceed to the empirical analysis, we briefly review the related literature on the determinants of health and life satisfaction. Next, we describe the data used in the main analysis and the empirical model we estimate to address the trust-health nexus. We, then, present and discuss the results. The last section offers the main conclusions drawn from the analysis of this chapter.

### **3.2 Social support**

The promotion of active and healthy ageing becomes over the years necessary worldwide as the population ages in increasingly rate. Social support among communities is an important proportion as it compromises better and holistic health level for the majority of the population. Satisfaction and subjective well-being occur as further result of active ageing which is strongly associated with social support through available networks. Social support is an important function which includes structural characteristics from the social network and social environment of every individual. It includes certain characteristics, frequency of

social contacts and the emotional satisfaction of being surrounded by others in a common network (Litwin,2007).

Social support is based on the exchange of material resources, information, and services by the given network. Social support includes a wide variety of networks which consists of many factors such as network, contacts, further relations, interactions and other social related factors which interfere with the individual's behavior (Hajek,2019). Also, multiple functions occur due to the existence of social networks such as social influence, guidance, and psychological support (Fernández-Ballesteros,2018).

Social interaction is a fundamental feature of social life in which people interact with each other under certain circumstances. The ability to interact among an environment is strongly associated with the quality of mental health and wellbeing. Positive attitude towards life is proved that may overcome the decline in mobility and physical power. The presence of social isolation deteriorates geriatric syndromes and further chronic health conditions as it causes adverse reactions to multiple health situations (Hajek,2019).

Social relationships that are formed encompass a wide variety of aspects among the social environment of the individual. In a larger scale social networks mostly describe the social contacts which may differ in some characteristics such as the size, density, frequency, and duration. Social support encompasses the functional role in terms of the provided sources (Kawachi,2014).

The sequence of all social actions is a complicated and dynamic procedure between individuals and community groups. This consists of a social exchange between two people or more individuals. It has been categorized into four types that form social interactions based on the time duration: regular, regulated, repeated and accidental (Gale,2018).

Among each society there are formed groups that consist of designed rules, institutions and systems in which people learn and adjust through their life span. Social interaction among social groups appears and share certain characteristics, have common expectations and follow obligations due to their common identity.

Although not all social interactions result either in positive or negative relationships (Tough,2017).

The quality of satisfaction is an important factor that is resulting by the dynamic of a specific relationship, and this explains the subjective feeling overall. People show this characteristic that during their entire life need social support in which they can be part of. The absence of holistic support even from early childhood may result in the person having unpredictable psychological damage and in later life to live with detrimental effects in both physical and mental health (Gale,2018).

### **3.2.1 Evaluation tools of social support**

The Multidimensional Scale of Perceived Social Support (MSPSS) is a 12-item self-report instrument of perceived adequacy of social support from 3 factor groups (family, friends, and significant-other). The answers given are on a 7-point Likert-type scale ranging from (1) very strongly disagree to (7) very strongly agree. The higher the score it indicates very high level of social support (Zimet,1988).

The Duke Social Support Index is a 10-item generic self-report instrument containing six health measures and four dysfunction measures. The health measures are physical, mental, social, general, perceived health and self-esteem. The dysfunction measures are depression, pain, anxiety, and disability (Parkerson,1990).

The Social Support Questionnaire (SSQ) is a 27-item self-report instrument which examines the perceived support and level of satisfaction from the individual's social network. Firstly, the person is asked to make a list of a maximum of nine people who will help them in a certain circumstance and secondly, they mention the level of satisfaction they feel for them (Sarason,1983). Also there is the revised version (SSQ6) which is a six-item measure of social support, answering if there is available provided support in their life (Sarason,1987).

The Social Provisions Scale is a self-report instrument which consists of 24 questions split in six dimensions, asking about the relations among an individuals' network. It is divided into two parts including presence and absence of the network.



The given answers are on a 4-point likert-type scale with larger final score to indicate greater degree of perceived support (Cutrona,1983).

The Lubben Social Network Scale is an evaluation instrument which measures the perceived social support by family and friends. It also correlates with mortality, hospitalization, health behaviors, depressive symptoms, and overall physical health. The scoring for each question can be from 0 (less social engagement) to 5 (more social engagement) with the total sum of 30. The cut of score is 12 and if it indicates that the person has great risk of experiencing social isolation (Lubben,2006).

De Jong Gierveld Loneliness scale is an evaluation tool for measuring emotional and social loneliness of the person. It is categorized in six statements each measuring three emotional and three social loneliness. Score ranges from 0 to 6, with 6 to indicate the higher statement of being reporting loneliness (Gierveld,2010).

The UCLA Loneliness Scale version 3 is a 20-item evaluation tool which measures and identifies the loneliness of a person due to social isolation. The total score ranges from 20 to 80 and higher scores indicate higher degree of loneliness (Hughes, 2004).

### **3.3 Social networks**

Health status is influenced by many factors categorized as intrinsic and extrinsic. Health diseases are intrinsic while all other factors such as social and environmental as extrinsic. Repetitive hospital admissions, multiple health complications and mortality rates have been positively associated with the existence of social isolation. In addition, certain common barriers have been associated with aging such as transportation needs, sensory loss and mobility restrictions and income (Andrew, 2008).

Loneliness is considered as an important parameter of disease progression. The unpleasant and discomfort feeling of loneliness has been proved to be correlated to multiple health related problems including heart and lung diseases. The impact on the quality of health status has been correlated with the existence

of cognitive impairment. As it has been identified in studies that people with cognitive impairment show a higher prevalence of facing social vulnerability (Theou, 2015).

Aging by itself plays a crucial role as the person who is older has a gradual weakness in their ability to overcome daily challenges. The lowering of the physical activity that these people may have, immobility due to orthopedic and neurologic diseases, urinary incontinence, the gradual and insidious decline of the brain function and the absence of support in the fear of multiple falls raises the geriatric syndrome to a central position in its life. Aging relates to increased injury admissions for both male and female elderly. Although the rate of fall is twice as high in women than in men. Elderly who experience frailty have higher rates of fall and greater risk for disability (Rubenstein,2006).

Falls are a very common and often devastating problem which occurs to the elderly. The most usual identified factors are weakness, unsteady gait, confusion and the intake of certain medication. Due to falls finally occurs a tremendous need of using health care services. Moreover, elderly face minor or major injuries due to falling which causes increased rates of disability, morbidity, mortality, and health care costs. All these contribute to the urgent need to control and prevent falls as a main assessment of public health priority (Ganz,2007).

The elderly who experience yearly increased number of yearly falls are mostly those who are not physically active and need help as well as support for their daily activities. Falls causing injuries relate to poor health outcomes which affects severely elderly. Moreover, elderly people may show depressive symptoms, loneliness and decreased well-being overall (Peel,2002).

Lack of autonomy worsens the emotional statement of elderly resulting in social isolation. The association of falls and autonomy has been tried to be identified to examine their interdependence. The elderly who had experienced falls or did not understand under which circumstances it occurred due to fear of revision tend to put their personal and social life under restriction. The elderly diagnosed with frailty have greater prevalence to report social isolation due to their living conditions. The rate of hospital admissions in isolated people is also higher as well

as the number of readmissions. Also, marital status is responsible for how socially vulnerable the person may feel. Divorced or widowed persons are also more vulnerable in their health issues and the presence of frailty is also higher in these categories (Ryan,2000).

The support from social networks to obtain self-efficacy and autonomy through caregivers can change their possible negative health outcomes (Brown,2003). The most common injuries from falls are fractures of the hip and head injuries. These do not result only from the fall itself. There are factors such as exercise, dietary supplementation, and early prevention as well as treatment of osteoporosis which can prevent this circumstance (Roe,2008).

Disability in ageing populations is another increasing major health problem which affects the quality of their life. Disability is defined as the limitation of carrying out daily or certain activities which are necessary for the individual (Vellas,1997). Functional limitations of elderly result in great negative impact although it contradicts the basic human rights. Wellbeing is seriously affected leading to social isolation associated with poor health, increased number of falls and mortality. In addition, limited social participation due to disability leads to reduced mental health because of poor social relationships (Whiteford,2013).

### **3.4 Social interactions**

The crucial need for social interaction rises as a main human characteristic associated with companionship and bonding among others. Acceptance from family, friends and community is mostly equally important for the psychology of every person. Participation to social activities has been associated with better mental health (Kato,2017).

The feeling of membership and being useful results in the person to be more active, creative and having better health in comparison to those who live isolated. Social isolation of a person under any circumstances may lead to gradually unretrievable health conditions of high risk. Even those who report low social isolation experience higher rate of developing depression symptoms (Chen,2014).

Social connections are essential for health and well-being at all ages in order to result promotion of health. Through social interaction can be achieved the feeling of recognition and acceptance. The participation of elderly in social activities plays an important role in the quality of their health status. More specific the participation of elderly in social activities is resulting positive impact on their cognitive function (Fu,2018).

The gradual decline of cognitive function is one of the most important issues that elderly must deal with. It is a common feature of aging which is associated with lower quality of life and lack of functional independence. Risk factors such as socio-demographic data, life habits, social networks and chronic diseases affect the quality of their life (Gaugler,2007).

Mental diseases such as dementia and cognitive decline seriously affect the quality of life of the elderly and dramatically increases the burden of their family and social insurance funds. This results elderly to have lower participation in social interactions through daily activities and increases their need for continuous help in most of their needs (Aartsen,2002).

Participation and encouraging elderly to be active, by taking part in social activities and belonging in social networks shows that has positive impact in general for the aging population with good health outcomes. Elderly who are more socially active may potentially experience less cognitive decline on average (Ertel,2008).

Many studies mention the importance of social activities for the aging population due to their beneficial action. Low participation of the elderly showed increased rates of depression, cognitive decline, and high dependence for their activities of daily living by caregivers (Tomioka, 2016). Although among societies and groups there can be found different social and cultural backgrounds which affect the types of connection between social networks (Nie,2011).

Also gender difference is mentioned as an important factor in studies which impacts the participation differently in social activities. Elderly women tend to be more sociable unlike men who tend to be benefited by their wife's support (Norton,2006). A significant association for elderly women has been also found

among volunteer work and cognitive function because they show wider range of emotional support sources which benefits their health outcome more than men (Takagi,2013).

On the other hand, men after retirement tend to minimize their social network and thus feel less self-esteem as elderly. Retirement has been identified as a risk factor which increases loneliness and the feeling of having no purpose. Social support and being active can provide significant improvement in this situation (Litwin,2007).

Moreover, the quality and quantity of the frequency of the social interaction impacts the health status of elderly (Fuhrer,2002). Those who participated too little and less frequently had later in their life negative impact on their cognitive function (Musick,1999). Social roles which are given among social networks are important for elderly because it provides them a continuous sense of purpose and emotional validation through the complex exchanges of socializing (Berkman,2000). Also, the influence of extensive social network on dementia is identified to have protective role for elderly (Wang,2015). Better health related information can be provided to them and moreover to have positive impact on their health outcomes (Cohen,2004). The continuous interaction among social networks and volunteering work has shown positive results that improve significant cognitive function (Hsu,2007).

In the contrary there are studies about elderly which indicate that social relationships may have adverse effect on their health due to potential psychological factors which mostly increases stress (Mu,2011). Lack of social support may have severe and negative impact on health caused by the dangerous influence from the contacts, the exposure to infectious diseases and the adoption of dangerous health-related behavior such as malnutrition and use of smoke (McLeroy,1988).

In addition, in another study there was identified significant negative impact for both genders but there was found no association with their cognitive function (Kawachi,2001). It is mentioned that frequent participation in social activities and community related activities with strict mandatory procedures showed increased

psychological stress. Social networks showed no improvement on cognitive function but although in this study there were many limitations. The most important indicator which is the quantity and the quality of the social participation of the elderly can either impact positive or negative the total health outcome (Thomas,2011).

### **3.5 Social trust**

Human evolution brought up the need to increase contact with people, except from those as their known familiar tribe. This inevitably created the condition to start sharing common thoughts, beliefs and needs with strangers. Trust has played a significant role for the members among communities whose interactions constitute the essence of social life.

As for the development of social relationships and so on a functionable society, the meaning of social trust is necessary as it sets up the variety of social settings. Individuals and other members of social networks which share common values, interests and beliefs have greater chance to raise social trust among them. Social norms consist of acceptable social behaviors that follow a public standard, known as moral rules among communities. Trust as a social feature has been used in order to promote and maintain strong bonding among social relationships of growing communities (Rosario Gonzalez, 2021).

Although it remains a difficult task to create and maintain trust among society it plays the role of requirement as for human interactions to keep existing. Social trust has beneficial effects on communities as this element enables people to form meaningful connections among each other. Trust as well has been positively associated as a public good necessary which contributes for the raise and success of market economy. The promotion of economic progress, reflects even further social capital functions such as interaction and cooperation which enhance economic exchanges. Social trust is been considered as an element of social capital. Sources of social capital include many categories of social networks such as family, friends, neighbors, colleagues (Brudner,2023).

The scale of social organization from smaller such as family to larger such as community affects the level of trust and how can be maintained among its participants. Social networks among the community which are embedded by trust show stronger interactions and their members are more tolerant and empathetic towards others. Absence of trust in all types of social networks can be a variable to which social breakdown can be attributed. In groups and organizations, the role of trust can influence positively their members to be more productive in order to cooperate more effectively and achieve their shared goals (Farrell,2022).

### **3.6 Social isolation**

Social isolation in elderly is a multidimensional and multifactorial phenomenon. It has been defined as a situation where the person has low quality and quantity of contact with others. Measuring social isolation can be achieved through observations about the social network of the person as it is mostly an objective factor (James,2011). It has been associated with aging and thus if frailty is present, it has been identified to create an even greater impact on the person. The health issues that are accompanied by frailty appear to contribute so the person will face greater social isolation. Frailty causes radical changes physically and mentally, especially if there is delayed diagnosis and management of the needed conditions. All the above are responsible for the gradual decline of the elderly both physically and mentally (Freedman,2020).

Social isolation due to aging and frailty poses to the elderly a constant risk which threatens their well-being in all possible aspects of life. It has great impact on frailty syndrome which reflects the lack of interest and the incapability in social engagement (Makizako,2018). It has been associated with decline or absence in three social needs, affection-behavioral confirmation-status. Isolation contributes to the development of frailty among elderly and causes great impact on the level of health. Frailty also can be worsened by this situation and causes an enforced withdrawal from the social network of the elderly (Clegg,2013).

Social support by social networks has been found to have correlation with lower level of frailty. In addition, low frequent contact with others can lead to greater

odds of prevalent frailty (Chon,2018). Socially involved elderly are more likely to have better health, report wellbeing and live longer in comparison to those who report isolated from their social network (Vozikaki, 2017).

Social isolation is reflected by two main parts, the quantity, and the quality of the social network. The quantity is the number of social contacts and groups that the elderly is surrounded by. The quality is the amount of activity that the elderly engage among the social network (Cornwell,2009). Social networks can consist of family members, friends, and neighbors. Although it has not been analyzed yet the correlation among which category of social network is resulting more beneficial and shows better health outcome. Frequent social contact has beneficial effects in health for elderly due to the given support that can be provided (Chon,2018).

The quantity and quality of social relationships play an important key role for the aging society. Social isolation and loneliness are two common factors which elderly mention most often in their questionnaires when they are asked about the status of their relationships (Valtorta,2018). They also mention that they feel lonely and distant from their social network. It has been identified that older people have up to 50% risk of social isolation and that one third of elderly over 60 years old experience loneliness during their later life (Merz,2010). Through their social network elderly have the emotional and material support that they need. Having a purpose encourages them and has positive impact in both physical and mental health (Chon,2018).

In addition, social activities which require physical participation from the elderly are those who improve their cardiovascular system. Sharing information and seeking help if needed abandons risky health behavior that elderly could adopt due to social isolation (Vozikaki, 2017).

### **3.7 Loneliness of elderly**

Loneliness is usually considered to be the psychological manifestation of social isolation. It is a subjective statement that results due to social isolation. In this situation the actual feeling is a bad temper of personal experience associated



with the lack of happiness and satisfaction in the relationships. This type of feeling is related to the number or the quality of the experience. The person may be surrounded by social networks and still feel great loneliness or can have the feeling of being dissatisfied due to the circumstances of their life status (Yamada,2009).

Behavioral characteristics have been found to affect the quality of life in correlation with loneliness. The level of physical and mental health plays an important role in the overall health status of elderly. The feeling of loneliness can cause tremendous psychological complications such as depression, uncontrollable stress and social anxiety. It has been also correlated with multiple hospital admissions. Overall, the health needs of elderly are strongly connected with the perceived social support to achieve healthy well-being (Kawamoto,2005).

Family as a supportive network is used to demonstrate the close relationship between their members. Elderly who had active support by their family were found with good self-awareness, lower prevalence of anxiety, reduced stress, enhanced autonomy, and better quality of life (Fange,2009). Loneliness has been associated with greater risk of morbidity and mortality and has adverse effects on mental health of elderly even whether social network is available or not (Kawachi,2001). Social loneliness has been found to be very common to emotional loneliness for elderly and each one is able to be extremely damaging for the overall health outcome while its existence increases the risk for many health problems. Frailty has been associated with a high report of loneliness. Complications by higher levels of cortisol due to depression and anxiety as well as an impaired immune system are responsible for the low quality of health status a person may face. Hypertension, diabetes, metabolic syndromes and endocrine deterioration are some of the most common met health issues frail people face (Diehl,2018).

Emotional loneliness arises out of the loss or lack of a close emotional attachment figure while social loneliness arises out of the absence of a close network. Social support as being a member of a network or a community provides a wide circle of emotions and purpose. Emotional loneliness has a great impact on mental health as it arises the feeling of anxiety, aloneness, abandonment, and

isolation. Additionally, social loneliness also arises the feeling of depression and having no aim to be active in a network (Brown,2018).

The elderly who live under the condition of loneliness show greater fear about present and possibly future diseases and their complications. In most situations if there is not such a provision in advance the person is unprepared for the future that will face. Living outside a social and supportive network occurs elderly to face greater loneliness and of course in every aspect of their life. In studies there have been mentioned that loneliness is closely linked to increased rates of cardiovascular diseases, dementia, depression, cognitive decline, disability, mortality, morbidity and use of smoke (Li,2015). Also, loneliness due to lower quality of life is resulting to elderly to be referred to at either long term residential or nursing care units (Cornwell,2009).

There is a contrary among studies which type of loneliness causes greater health impact, but this is due to the many components that need to be estimated to have result. In a study it has been identified that emotional loneliness is linked with higher mortality in elderly who live without companion. Elderly who lives alone experience greater feeling of being abandoned and anxiety in contrast to those who live at least with one more person (O'Súilleabháin,2019).

Loneliness can be either subjective or objective which occurs when either elderly choose to keep distance from others, or the social network cannot correlate with them. Except from the existence of social support it is important to evaluate the quality of these relationships as well. As has been mentioned by studies, the person may have support by others but the quality of interactions to be very low and the results not to be helpful. On the other hand, the person may have an extremely supportive network but still have the belief of being isolated and lonely (Kiuper,2015).

Also, the possible interaction among various medical conditions, older age and mental issues can result biased answers at the evaluation tools. Chronic illness and disability as well have a crucial role in the way that the person may face loneliness and isolation. Mobility has been identified as an important factor that influences daily activities of elderly and so this causes the person to difficult

estimate the real situation to grade the feeling of loneliness and isolation into their social interactions (Kiuper,2015).

### **3.8 Social impact of covid-19**

Coronavirus disease 2019 caused serious consequences on all aspects of societies worldwide. It has been described as one of the most difficult challenges that has affected humanity in recent decades. This pandemic situation resulted domino changes among communities which had to adapt and set strategic frameworks in order to face all kinds of emerging needs. Major sectors of all countries such as health system, economy (social capital, social welfare), education and social life (social vulnerability, social relationships & mobility) were vastly affected from the pandemic spread of the virus (Wassler,2021).

In order to protect the populations global measures were taken as the virus caused a considerable burden on health care systems. Vaccines, masking, treatment interventions during hospitalizations, quarantines, lockdowns and social distancing were used so the spread of the virus could be under limitation (Chakraborty,2020). The quality of life for people all over the world was dramatically affected as the health care systems, governments and societies were not prepared for such a devastating health situation. COVID-19 also caused long-term implications known as “LONG COVID” syndrome which affected patients both physically and mentally due to its consequences (Mofijur,2020).

While many global measures were taken in order to slower the spread of the coronavirus disease studies have shown that people were affected psychologically (Alizadeh, 2023). This major challenge on health system caused huge uncertainty worldwide about the consequences and outcomes that may occur. Psychological issues such as mental crisis, stress, anxiety, depression showed increased rates. This was mainly attributed to the rapid spread of the virus which affected people in their daily routine and their social activities (Brady,2021).

Dramatic social limitations, changes on lifestyle behaviors, breakdown of trust in science and health systems had negative impact on populations. At the same line major changes on employment patterns for employees due to COVID-

19 that lasted for a very long time in negative results. (Alizadeh,2023). The demographic risk factors indicated that males, adults older than 65 years old and chronic health conditions have greater impact from COVID-19. Low socioeconomic communities also have greater impact from COVID-19 due to limited resources and benefits that were not available in comparison with other countries with higher level of economy (Kithiia,2020). The trust of the population was affected as well as the emerging situation of COVID-19 brought up difficulties for health care systems, public health and health care providers (Elgar,2020).

The measure of lockdown which was taken, eventually socially separated people and the loss of freedom occurred as to limit the spread of virus. This had great impact as it caused widespread psychological distress among the population, as those who were more vulnerable were mostly affected (Brady,2021). The vast number of deaths due to COVID-19, increased the fear of death and loss of beloved persons as well as the sense of helplessness and the uncertainty for the future affected the psychology of the people dramatically negative (Alizadeh,2023). Studies show that the cases of mental disorders and suicides where increased as well as feelings as frustration, anger and loneliness during the period of COVID-19 in the general population (Robinson,2021).

During the pandemic period of COVID-19 countries enforced restrictions on physical social contacts, recommended to keep physical distance from other people and to obey to lockdowns of communities in most of the countries. These measures increased the risk of a negative feeling known as loneliness which occurs from a perceived discrepancy between a person's desired and achieved social relations (Meier,2021). Social isolation is a risk factor for loneliness if the person lives alone but also if there is limitation of social contacts and social activity due to the taken measures. Studies focusing on older adults in many countries have found increased or even higher level of loneliness during the pandemic period which affected the level of their mental health (Dahlberg,2021).

### **3.9 Management of social vulnerability**

The main difficulty is to analyze all parameters which lead to the condition of social imbalance. The setting-up of a strategic framework could manage and provide a helpful solution to this. The process starts with the realization of the situation. After the diagnosis is established, all parameters which are related to the condition in its dimensions should be analyzed. It is equally important to have a clear understanding of the importance of social vulnerability in comparison to the other health issues that the person may face, or other psychiatric diagnoses that may already coexist (Freedman,2020).

Management is established by collecting information and further data about the situation that needs intervention. The proposed interventions in most studies are targeted to specific age and interest. They also refer to specific groups of people. They usually give a wide range of support to their activities and include education and constant information on the timetables and new facilities that may arise. Most people find this type of support attractive and are willing to participate at least as their health situation permits them to do so. There are many levels of these activities, but they are divided into four major categories. The interventions that increase social skills, those that are aimed at strengthening social support, those that increase opportunities for social interaction and those aimed at socio-cognitive training. (Masi, 2011).

Clinical care setting should be included in all plans so that universal data collection with an algorithmic approach will provide elderly diagnosed with frailty the opportunity to benefit the most from the availability of the strategy. The way that the state organizations and non-governmental organizations will be members of the same approach of course is not an easy task. The close collaboration between these scientific teams must be centrally organized for the best results to be achieved. The analysis of the social frameworks of the population of the specific area will reveal the potential actions that may be immediately implemented or will be able to start in a short-term time frame. This is especially important as in many cases the situation may be in desperate status with a very serious deterioration of the daily ability of the person to live (Freedman, 2020).

The data collection for the social environment of a person needs to include access to available home care and insurance, the proper directions and support for medical issues if they exist and the financial needs of a person. Of course, the existence of family members and relatives is crucial as the support and help that they can offer could help the elderly overcome their obstacles.

Socially vulnerable people such as those with frailty could also get supportive assistance by community teams that can provide psychological support. These community teams can be consisted of health professionals and volunteers specified in this type of support. Supportive programs for older people do exist in most areas of the western's countries giving opportunities for aid in transportation to areas of interest or implementing programs of assisted living, at least in the daily time. Home care services are available in most areas and all these mechanisms must get into the life of a person who lives in frailty under the fear of social isolation and loneliness (Andrew, 2014).

Various studies have tried to measure the effectiveness of these types of programs and correlate the provided interventions with positive results. The development of the personal and the societal skills assisted by the transportation facilities was the first one of the programs. This type made it very easy for the elderly and those with mobility problems to attend. In this type of assisted program all the volunteers effectively participated in an educational process and there were many round table discussions on issues related to healthy aging and the development of a personal way of taking care of themselves. This type of intervention gives the answer to the common problem of the inability of the person to participate. Many people, especially these that are in a satisfactory mental status really want to go out and attend the organized programs available for their interests and age. It is well understood that if they face mobility or transportation problems, then the whole intervention is impossible to achieve (Bartlet, 2013).

Another type of intervention program is the created connection among elderly and volunteers who work on these programs. There are a great number of volunteers worldwide that participate in such types of programs. From their point of view, they want to provide social support in any possible way through special

programs to those who are socially vulnerable. Socially isolated elderly want to feel that their needs and problems are listened to and well understood. Major part of all interventions is the creation of trust and support among the participants. Positive correlation was found among elderly who appeared more active to participate in social activities. With these types of interventions, they promoted their independence and there was a lack of feeling of social isolation. It was also found that by gaining their active participation they promoted their independence. Social support by all available social networks improved the feeling of loneliness. Simple interventions that targeted elderly to participate in community membership tasks promoted also their self-esteem (Tay,2023).

Strategic framework interventions have as major task to deal with the feeling of social isolation of those who are vulnerable. Through better understanding of the needs of elderly efficient management can be provided and eliminate of the phenomenon of social isolation. Special education and training of those who participate in community programs have as major target to improve active participation of elderly as well. Overcoming borders through specific training of healthcare workers and volunteers can provide a better social environment for elderly to satisfy their needs and goals. Further can be achieved to gain more social skills and interact with others more sufficient. Although creating interest in life is maybe a difficult part to accomplish due to the factor of aging, supporting and improving the quality of relationships among them can assist in eliminating the feeling of social isolation (Freedman,2020).

There are further studies that mention the positive impact of enrolling elderly into other types of programs such as art, gardening and education. The use of outdoor spaces of course started with a wider focus on well-being activities as it was found to improve self-esteem through meaningful occupation. The main target is to combine physical and mental patterns, to mitigate social isolation and enable real and active involvement of the person in the community. The last decades there has been growing impetus for social interventions that support psychosocial health outcomes into the community. Non-medical interventions such as creative

and cultural activities seem to be also important for elderly to promote their level of health and well-being (Bungay,2010).

Mental health recovery is crucial for the elderly, as is for those who face social isolation in the community. By improving the level of empowerment, it can impact positively the psychology of elderly. Active participation at art sessions and drawing has been associated with lowering the level of anxiety and depression and improving lifelong learning of elderly. Further education of elderly eliminated social isolation, by helping them to open their social networks, learn new information about further topics and develop new skills they may have never gotten involved in their past (Thomson,2020).

Nature-based activities such as gardening have been also found to have positive impact on the mental health of elderly. Gardening is another way of keeping the body and the mind in good condition. The factor of obesity could be controlled under this activity in lower levels. Outdoor activities if they are available and efficient to occur have been found to improve health and wellbeing of elderly. It represents another way of offering to the others by taking care of a small garden or a yard. By doing everyday work in a garden, it keeps the mind and the body of the older people in a better condition (Howarth,2018). In most of these types of social interaction there is a form of collaboration with other people or with other specialists in agriculture. There is a continuing exchange of ideas and actions on the farm plan that has been applied. This generates a new will to achieve the best results for the project and get all available sources in a row to achieve a specific target. Through these types of actions there is a progressive decline in the feeling of loneliness, social isolation and keep the social relationships active through doing activities by having nature as a major task to focus (Clatworthy,2013).

Animal assisted therapy is another type of intervention that has been mostly applied in specific medical situations where people had to be in social isolation due to their health problems like hospitalization or chronic health issues. It has been mostly studied in long term care facilities and demonstrated that interaction with pets reduced the feeling of loneliness and promoted social behavior of the elderly (Hagan, 2014). In addition, interventions to manage loneliness through pets could



be an effective way to improve this feeling by adoption or live animal visits. Pet ownership has not been studied thoroughly but there are reports that promoted well-being resulting in better mental health. People at this age show a peculiar way to interact with smaller animals and they have a great will to deal with a small family pet and take care of it in its daily activities. It could offer the elderly the feeling of belongingness and motivate them to accomplish the task of taking care of a pet (Peluso,2018).

The Internet and all sources of new technology is also another type of social interaction that could be used by the elderly. The use of modern technology is an attractive way of creating an open wire line between the person who is in danger of social isolation and loneliness and society who has the ability and willingness to assist in alleviating the situation (Fokkema,2007). Modern technologies may be used also for the motivation mentally or physically of the participants (Shapira,2007). The Internet could be used by the elderly as a means of communication to eliminate distance and all other types of borders among them and others. Higher levels of internet use by elderly could be a powerful tool in their hands to improve their social interactions. New technologies can promote and enhance the social adaptation of the elderly as it can help them keep in touch with their family and friends. The Internet could play an important role in gathering ideas for activities, help with further social discussions and problem solving in the daily life of elderly. However, there are also medical barriers such as poor memory, dementia, reduced vision and low adoption of learning new procedures which could make the use of internet difficult for them. But in this situation community programs and community volunteers could provide support so to overcome any of these barriers (Zhang,2021).

All interventions about the management of social vulnerability of elderly have as main task through many and different activities to create the interest in the life of an elderly person that has been under the impact of aging. Frailty, depression, loneliness and the feeling of social isolation are the key points on which every scheduled program aims. The role of mental intervention is equally important as the role of the physical strengthen activity programs. They must be

employed at the same time to gain better results. The participation of older people in exercise programs which involve nature environment have shown better results due to physical and mental satisfaction as well.

The meaning of all interventions to be successful is if the participant at some point starts to show an interest in some form of activity through which they start to plan again their life and themselves. It is well understood that elderly who live under the circumstance of threat, in their life, then some form of the above strategies should be implemented to reverse any possible health outcomes.

Most types of interventions show promising results in reducing the feelings of loneliness and emotional stress that derive from social isolation. There is a clear association between these conditions and the health issues arising especially for older people. This may lead to frailty and other serious complications both physical and mentally. Although the improvement in the social networks is a documented advantage of these types of interventions it is still unclear if they can reverse the deleterious effects that isolation bears to the health of the participants. In most cases this is a reality for older people that have multiple medical issues to be solved and that collectively lead to the frailty status and its consequences. There is usually a combination of health issues along with a variety of diagnoses regarding psychological and mental disorders difficult to diagnose and deal with.

The programs of course need to be carefully scheduled to cover holistic needs and the of elderly participants. It is imperative to mention that these programs must be adapted to specific cultures and languages for various types of ethnological origins. Each person is a different personality and the needs are not the same through the difference in educational status, age, gender and previous social standing. By improving communication each person will be able to share thoughts and beliefs and give an important insight on the emotional needs that must be met for its future. Groups should be created separately for that reason and elderly will be able to join freely in each group so that can choose the new type of relationships that they wish to have.

Worldwide a great number of programs and strategic frameworks take place in order elderly to be evaluated about their social connections and their provided

support. It is well understood that these tasks have usually many barriers to be faced and overcome further problems. Promoting social life for elderly is a double way procedure. From the one side it is needed to be set up strategic framework based on the needs of elderly and from the other side elderly to be able to take part and cooperate in order to advance their level of health status.

Health professionals through thorough evaluation of social needs of elderly can set up the right programs that need to be applied and followed. Despite any possible barrier main purpose of all programs and interventions should be the promotion of better health level through active social interactions and available social networks in the majority of elderly.

### **3.10 Data and Methods**

This chapter explores the relationship between trust and self-assessed indicators for health and life satisfaction. The analysis is based on cross-country data from the 2018 wave of the European Social Survey (ESS).<sup>4</sup> The ESS has been conducted on bi-annual frequency since 2001 by Eurostat and several national institutions. The main aim of the ESS is to measure the living conditions and public opinion across European countries, based on face-to-face interviews. It also contains a wealth of information on socio-demographic and socio-economic indicators.

Our outcome variables are perceived health and life satisfaction. Health is measured on a 1-5 scale, based on the question: “How is your health in general? Would you say it is ....” We convert it to a dummy (0/1) variable, where the value of one corresponds to answers very good or good, and of zero to answers fair, bad, or very bad. Life satisfaction assessment ranges between extremely dissatisfied (0) and extremely satisfied (10). We have also converted this variable into a dichotomous, drawing a distinction below and above the median of the original values. Our main independent variable of interest, trust, is the sum each individual’s perceptions, as captured by questions `ppltrst`, `pplfair`, and `pplhlp`, which measure, in turn, attitudes toward strangers’ trustworthiness, fairness, and

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<sup>4</sup> Available at <https://ess.sikt.no/en/?tab=overview>.

selfishness. These variables range from zero to nine, with higher values indicating better perceptions about strangers. We also consider the impact of social (community-level) interpersonal trust on the outcome variables, obtained by aggregating individual responses by country. The rationale is to estimate community trust externalities on individual outcomes. With these issues in mind, we estimate a linear probability model, as follows:<sup>5</sup>

$$y_{ic} = \beta_1 Soc\_Trust_c + \beta_2 I\_Trust_{ic} + \beta_3 X_{ic} + \varphi_c + u_i \quad (1)$$

where  $y_i$  is either perceived health or life satisfaction for individual  $i$  residing in country  $c$ ,  $Soc\_Trust$  is the mean value of trust in each country  $c$  in the sample,  $I\_Trust$  is the individual-level trust, and  $X$  is a vector of individual covariates. Specifically, we consider background characteristics, such as age (and its square), gender, marital status, immigrant status, the highest level of educational attainment completed, and income. Immigrants are defined as persons born in abroad. We consider three broad levels of education, namely, unskilled (those with at most a lower secondary diploma), medium-skilled (those with a high-school diploma), and skilled (university educated individuals). The set of controls also includes religiosity, participation in social activities, and whether the individual spends time with friends, relatives, or colleagues.<sup>6</sup> These variables have been converted to dichotomous variables, with one suggesting strong religious adherence or a high degree of socialization and zero otherwise. Lastly, the model includes country dummies, designated by  $\varphi_c$ , and  $u$  is the error term.

With the exception of age, the remaining right-hand side variables in eq. (1) are likely to be endogenous, either due to omitted variable bias, (stemming from factors correlated simultaneously with both the dependent and each independent variable) or due to reverse causality. Since it is not possible to follow the same individuals over time, it is important to note that we cannot assume a causal

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<sup>5</sup> The main advantage of the linear probability model (LPM) over the non-linear alternatives (i.e., logit or probit models) is that the estimated coefficients can be easily interpreted. It also allows us to include country fixed effects, in order to absorb country-specific unobserved heterogeneity. Nevertheless, we have also replicated the main analysis by estimating a probit regression as a check of robustness. The results, shown in Table 17 are consistent with the ones reported in Table 11 in the main text.

<sup>6</sup> In particular, we use the ESS variables *rigdgr*, *sclmeet*, and *sclact*.

interpretation of the estimates reported in the next section. Hence, we consider these correlations as informative on the main patterns in the data but not as reflecting causal effects. We, nevertheless, follow existing studies (e.g., Daniele and Geys, 2015) to provide suggestive evidence that the impact of trust is causal, using a sample of second-generation immigrants and the average trust level in the origin countries instead of their individual perceptions.

Before proceeding to the formal empirical analysis, we present in Table 10 the descriptive statistics of the main variables included in the analysis. As can be observed, about two thirds of the respondents report good health or feeling happy with life. The average age in the sample is nearly 50 years. About 57 percent are single and 9 percent are immigrants (i.e., foreign-born). Nearly half of the respondents are unskilled and fall into the 5th decile of the income distribution. Social and individual trust, both measured on a scale 0-30, are nearly 15 points. About 40 percent report being strongly attached to a religion. Lastly, nearly 20 percent participate in social activities and about 50 percent meet regularly with friends and family members.

**Table 10 - Descriptive statistics**

	Mean	Min	Max
Life Satisfaction	0.66	0	1
Health	0.66	0	1
Age	46.95	15	90
Male	0.44	0	1
Divorced	0.19	0	1
Widowed	0.19	0	1
Single	0.57	0	1
Immigrant	0.09	0	1
Medium-skilled	0.35	0	1
High-skilled	0.22	0	1
Income decile	4.50	1	10
Social trust	15.73	10.68	20.63
Individual trust	15.56	0	30
Religious	0.37	0	1
Social activities	0.18	0	1
Meeting with friends, relatives or colleagues	0.48	0	1

Source: Author's calculation based on ESS 2018 data.

### 3.11 Results

This section presents the main results of the analysis described in the previous section, estimating linear probability models on the likelihood of being satisfied with life or of being in good health, conditional on an interpersonal trust at the country- as well as at the individual-level. We also include several individual variables aiming to reduce endogeneity concerns, due to omitted variables bias. Specifications (10) through (14) in the tables displayed below introduce sequentially socio-demographic controls, socio-economic controls, and controls for religiosity and socialization. Given the aggregate nature of the social trust variable, which is combined with individual-level data, we pay attention to Moulton (1990) who suggests using corrected standard errors. The robust standard errors are reported in parenthesis below the estimated coefficients. We estimate the model for the entire population in the sample, and, then, replicate the analysis including the elderly only (that is, respondents aged over 65 years). We have also carried out a causality test using the children of immigrant and trust in the source countries as a regressor.

Table 11 uses the dichotomous version of perceived life satisfaction discussed above as the dependent variable. Column (1) includes only background characteristics as explanatory variables, most of which appear to be significantly correlated with the outcome considered. Age displays a U-shaped association with life satisfaction. Men, divorced or widowed individuals are less likely to report satisfaction, as compared to female and married respondents, respectively. For instance, the probability of reporting being satisfied with life for men is 1.4 percent lower than the one for female respondents. Immigrants are also less likely to be happy in the host communities relative to their native counterparts.

In column (2) we add indicators of skills and income (deciles). Medium skilled are those having completed high-school, and high-skilled are university educated individuals. The omitted categories are the unskilled (i.e., those with at most a lower secondary education and the lowest paid workers (i.e., those who fall into the 1<sup>st</sup> income decile). Notably, the point estimates are highly significant, indicating that those individuals are better off than those in the omitted categories.

The third specification expands the set of controls to include the aggregate measure of social trust. As can be seen, the estimated coefficient on the trust variable suggests that it is correlated with increased likelihood of reporting life satisfaction.

The last column includes individual interpersonal trust, a dummy variable indicating whether an individual has religious affection, another one for participating in social activities, and yet another dummy for meeting frequently with relatives, colleagues, and friends. Individual trust enters with a positive and significant coefficient, while, at the same time, the coefficient on the social trust variable becomes somewhat lower in magnitude. Religiosity is also related to an increased probability of reporting satisfaction. This also appears to be the case when we consider socializing, as measured by participation in social activities and meeting with friends.

We next examine the effects on perceived health in Table 12. Generally, the patterns that emerge in the data are qualitatively similar to the ones we found in Table 11. A notable exception concerns men who are more likely to report being healthy than their female counterparts, though the coefficient on the male dummy is significant in column (1) only. Also, we find linear effects of age, in contrast with the U-shaped effects of age on life satisfaction.

Widowed, immigrants, and skilled individuals are more likely to report good health than those in the omitted, baseline categories. Belonging into a highest income decile also increases the likelihood of good health. As far as the main independent variables of interest are concerned, social and individual interpersonal trust exhibit a robust positive association with health. Once again, the coefficient on the aggregate trust variable is much stronger. Whilst religiosity does not appear to be a significant determinant of health, socializing is strongly associated with better health. All in all, the findings point to significant disparities in life satisfaction and health between high and low trust communities.

**Table 11 - Determinants of perceived life satisfaction, Linear Probability Model, Full Sample**

VARIABLES	(1)	(2)	(3)	(4)
Age	-0.013*** (0.001)	-0.016*** (0.001)	-0.016*** (0.001)	-0.014*** (0.001)
Age sq.	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Male	-0.014** (0.006)	-0.023*** (0.006)	-0.023*** (0.006)	-0.017*** (0.006)
Divorced	-0.024* (0.014)	0.003 (0.016)	0.003 (0.016)	0.013 (0.016)
Widowed	-0.062*** (0.015)	-0.022 (0.017)	-0.022 (0.017)	-0.023 (0.017)
Single	-0.009 (0.014)	-0.001 (0.015)	-0.001 (0.015)	0.007 (0.015)
Immigrant	-0.038*** (0.010)	-0.012 (0.011)	-0.012 (0.011)	-0.009 (0.011)
Medium-skilled		0.052*** (0.008)	0.052*** (0.008)	0.031*** (0.007)
High-skilled		0.103*** (0.008)	0.103*** (0.008)	0.063*** (0.008)
2nd income decile		0.059*** (0.012)	0.059*** (0.012)	0.050*** (0.012)
3rd income decile		0.102*** (0.013)	0.102*** (0.013)	0.094*** (0.012)
4th income decile		0.147*** (0.013)	0.147*** (0.013)	0.134*** (0.013)
5th income decile		0.197*** (0.013)	0.197*** (0.013)	0.181*** (0.013)
6th income decile		0.191*** (0.014)	0.191*** (0.014)	0.176*** (0.014)
7th income decile		0.220*** (0.014)	0.220*** (0.014)	0.202*** (0.014)
8th income decile		0.244*** (0.014)	0.244*** (0.014)	0.225*** (0.014)
9th income decile		0.261*** (0.014)	0.261*** (0.014)	0.236*** (0.014)
10th income decile		0.270*** (0.015)	0.270*** (0.015)	0.246*** (0.015)
Social trust			0.065*** (0.005)	0.046*** (0.005)
Individual trust				0.015*** (0.001)
Religious				0.041*** (0.007)
Social activities				0.067***



Friends, relatives or colleagues				(0.008) 0.067*** (0.007)
Observations	25,068	19,901	19,901	19,405
R-squared	0.132	0.178	0.178	0.217

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.

**Table 12 - Determinants of perceived health, Linear Probability Model, Full Sample**

VARIABLES	(1)	(2)	(3)	(4)
Age	-0.004*** (0.001)	-0.008*** (0.001)	-0.008*** (0.001)	-0.006*** (0.001)
Age sq.	-0.000*** (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)
Male	0.015*** (0.005)	0.009 (0.006)	0.009 (0.006)	0.008 (0.006)
Divorced	-0.008 (0.014)	0.001 (0.016)	0.001 (0.016)	0.005 (0.016)
Widowed	-0.091*** (0.016)	-0.068*** (0.017)	-0.068*** (0.017)	-0.064*** (0.017)
Single	-0.011 (0.014)	-0.017 (0.015)	-0.017 (0.015)	-0.014 (0.015)
Immigrant	-0.017* (0.009)	-0.006 (0.010)	-0.006 (0.010)	-0.001 (0.011)
Medium-skilled		0.056*** (0.007)	0.056*** (0.007)	0.043*** (0.007)
High-skilled		0.111*** (0.008)	0.111*** (0.008)	0.085*** (0.008)
2nd income decile		0.071*** (0.012)	0.071*** (0.012)	0.063*** (0.012)
3rd income decile		0.120*** (0.012)	0.120*** (0.012)	0.106*** (0.012)
4th income decile		0.157*** (0.013)	0.157*** (0.013)	0.142*** (0.013)
5th income decile		0.176*** (0.013)	0.176*** (0.013)	0.163*** (0.013)
6th income decile		0.190*** (0.013)	0.190*** (0.013)	0.175*** (0.013)
7th income decile		0.192*** (0.013)	0.192*** (0.013)	0.175*** (0.013)
8th income decile		0.212*** (0.014)	0.212*** (0.014)	0.195*** (0.014)
9th income decile		0.213*** (0.014)	0.213*** (0.014)	0.193*** (0.015)
10th income decile		0.225*** (0.014)	0.225*** (0.014)	0.205*** (0.015)
Social trust			0.034*** (0.005)	0.020*** (0.005)
Individual trust				0.009*** (0.001)
Religious				-0.009 (0.007)
Social activities				0.072*** (0.008)

Friends, relatives or colleagues				0.032*** (0.007)
Observations	25,213	19,972	19,972	19,463
R-squared	0.220	0.243	0.243	0.253

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

In Tables 13 and 14 we re-estimate equation (1), limiting the sample to include the elderly respondents only (i.e., those aged over 64 years). The sample size declines from about 25,000 observations in specification (1) to about 6,000. Overall, the results corroborate the ones we found when using the full sample.

Focusing on the main explanatory variables, social trust continues to serve as an important determinant of self-assessed life satisfaction. This is also the case once we consider individual trust, though the estimated coefficient is slightly lower than the one reported on the entire adult population. Importantly, social activities display a stronger correlation with life satisfaction, whereas the coefficient on the dummy variable, capturing whether the respondent meets with friends and relatives, appears to be somewhat smaller in magnitude.

The general picture that emerges in Table 14 confirms our prior findings. Living in a community with increased social trust raises the probability of an elderly to report being in good health. Likewise, an individual who trusts strangers is more likely to report being healthy, as compared to a suspicious person. This also holds true for religious and sociable individuals.

**Table 13 - Determinants of perceived life satisfaction, Linear Probability Model, Elderly individuals**

VARIABLES	(1)	(2)	(3)	(4)
Age	-0.063*** (0.018)	-0.035* (0.020)	-0.035* (0.020)	-0.035* (0.020)
Age sq.	0.000*** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Male	0.012 (0.013)	0.002 (0.014)	0.002 (0.014)	0.009 (0.015)
Divorced	-0.010 (0.027)	-0.028 (0.030)	-0.028 (0.030)	-0.027 (0.031)
Widowed	-0.042* (0.025)	-0.044 (0.028)	-0.044 (0.028)	-0.046 (0.029)
Single	-0.038 (0.029)	-0.038 (0.032)	-0.038 (0.032)	-0.034 (0.033)
Immigrant	-0.030 (0.023)	-0.032 (0.024)	-0.032 (0.024)	-0.041* (0.024)
Medium-skilled		0.050*** (0.015)	0.050*** (0.015)	0.039** (0.015)
High-skilled		0.130*** (0.021)	0.130*** (0.021)	0.098*** (0.021)
2nd income decile		0.041** (0.018)	0.041** (0.018)	0.035* (0.018)
3rd income decile		0.051** (0.021)	0.051** (0.021)	0.036* (0.021)
4th income decile		0.097*** (0.025)	0.097*** (0.025)	0.079*** (0.025)
5th income decile		0.093*** (0.029)	0.093*** (0.029)	0.073** (0.029)
6th income decile		0.127*** (0.032)	0.127*** (0.032)	0.120*** (0.032)
7th income decile		0.129*** (0.038)	0.129*** (0.038)	0.118*** (0.038)
8th income decile		0.157*** (0.045)	0.157*** (0.045)	0.139*** (0.045)
9th income decile		0.084* (0.050)	0.084* (0.050)	0.070 (0.050)
10th income decile		0.152** (0.065)	0.152** (0.065)	0.143** (0.069)
Social trust			0.053*** (0.008)	0.041*** (0.008)
Individual trust				0.006*** (0.001)
Religious				-0.011 (0.014)
Social activities				0.123*** (0.018)

Friends, relatives or colleagues				0.041*** (0.014)
Observations	6,309	5,254	5,254	5,015
R-squared	0.141	0.164	0.164	0.182

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Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 14 - Determinants of perceived health, Linear Probability Model, Elderly individuals**

VARIABLES	(1)	(2)	(3)	(4)
Age	-0.013 (0.018)	-0.008 (0.020)	-0.008 (0.020)	-0.010 (0.020)
Age sq.	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Male	0.006 (0.013)	-0.018 (0.014)	-0.018 (0.014)	-0.000 (0.013)
Divorced	-0.049* (0.026)	-0.026 (0.029)	-0.026 (0.029)	-0.005 (0.029)
Widowed	-0.055** (0.024)	-0.022 (0.027)	-0.022 (0.027)	-0.023 (0.027)
Single	-0.065** (0.028)	-0.026 (0.031)	-0.026 (0.031)	-0.007 (0.031)
Immigrant	0.023 (0.024)	0.034 (0.025)	0.034 (0.025)	0.015 (0.025)
Medium-skilled		0.037** (0.015)	0.037** (0.015)	0.017 (0.015)
High-skilled		0.089*** (0.019)	0.089*** (0.019)	0.052*** (0.019)
2nd income decile		0.038** (0.018)	0.038** (0.018)	0.034* (0.018)
3rd income decile		0.092*** (0.021)	0.092*** (0.021)	0.091*** (0.021)
4th income decile		0.114*** (0.024)	0.114*** (0.024)	0.099*** (0.023)
5th income decile		0.138*** (0.028)	0.138*** (0.028)	0.116*** (0.027)
6th income decile		0.147*** (0.029)	0.147*** (0.029)	0.136*** (0.029)
7th income decile		0.183*** (0.034)	0.183*** (0.034)	0.172*** (0.035)
8th income decile		0.151*** (0.043)	0.151*** (0.043)	0.139*** (0.042)
9th income decile		0.224*** (0.044)	0.224*** (0.044)	0.218*** (0.042)
10th income decile		0.164*** (0.058)	0.164*** (0.058)	0.184*** (0.060)
Social trust			0.074*** (0.008)	0.055*** (0.008)
Individual trust				0.014*** (0.001)
Religious				0.048*** (0.013)
Social activities				0.081*** (0.015)
Friends, relatives or colleagues				0.077***

Observations	6,257	5,226	5,226	(0.014) 4,994
R-squared	0.165	0.193	0.193	0.241

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Robust standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Before concluding this chapter, we perform a causality test in the spirit of Daniele and Geys (2015), and others, using the sample of second-generation immigrants only and overall trust in the origin countries instead of the individual attitudes toward strangers.<sup>7</sup> As discussed in Alesina and Guiliano (2010), by assigning second-generation immigrants a sort of “cultural baggage” (for instance, trust inherited from their parents), enables one to isolate the exogenous component of their reported cultural trait (in this study trust), and, thus, to infer its causal effect on the outcomes considered. To do so, we use data from the Integrated Values Survey (IVS),<sup>8</sup> in order to compute the level of trust in source countries. We are based on the responses to the IVS question A165, which has two possible answers: Most people can be trusted, and Can’t be too careful. We collapse the individual attitudes at the country level using all the available waves since 1981 and compute the share of persons who feel that most people can be trusted. We, then, attribute each immigrant these origin country trust values. The rationale is that the aggregate source country trust is, presumably, exogenous, thereby circumventing the issue of the potentially endogenous formation of individual perceptions.

The results from this empirical exercise are summarized in Tables 15 and 16. Though we lose a significant number of observations, the results are generally consistent through specifications, highlighting patterns similar to those obtained previously. Focusing on the expressions about individual trust, as now measured by the origin country trust, the evidence suggests that the effects could not be considered causal once we use as self-rated health as the dependent variable. By contrast, the significant coefficient of the trust variable in Table 15 implies a causal

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<sup>7</sup> We define second generation immigrants as those individuals whose parents were born outside their current country of residence, using the ESS questions *facntr* and *mocntr*.

<sup>8</sup> Available at: <https://europeanvaluesstudy.eu/methodology-data-documentation/integrated-values-surveys/>

relationship running from trust to life satisfaction. As far as the variable social trust in the receiving country is concerned, it retains its positive sign in both tables, though it ceases to be significant, mainly due to the inflated standard errors that might stem from the reduced sample size.



**Table 15 - Determinants of perceived life satisfaction, Linear Probability Model, Second Generation Immigrants**

VARIABLES	(1)	(2)	(3)	(4)
Age	-0.012*** (0.003)	-0.017*** (0.003)	-0.017*** (0.003)	-0.015*** (0.004)
Age sq.	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Male	-0.043** (0.019)	-0.071*** (0.021)	-0.071*** (0.021)	-0.091*** (0.026)
Divorced	-0.013 (0.040)	-0.026 (0.044)	-0.026 (0.044)	-0.027 (0.057)
Widowed	-0.041 (0.048)	-0.040 (0.052)	-0.040 (0.052)	-0.065 (0.065)
Single	-0.000 (0.038)	-0.027 (0.044)	-0.027 (0.044)	0.009 (0.055)
Immigrant	0.020 (0.022)	0.040* (0.024)	0.040* (0.024)	0.082*** (0.030)
Medium-skilled		0.078*** (0.025)	0.078*** (0.025)	0.076** (0.031)
High-skilled		0.135*** (0.029)	0.135*** (0.029)	0.110*** (0.035)
2nd income decile		0.061* (0.036)	0.061* (0.036)	0.104** (0.044)
3rd income decile		0.063 (0.040)	0.063 (0.040)	0.041 (0.049)
4th income decile		0.098** (0.040)	0.098** (0.040)	0.079 (0.049)
5th income decile		0.105** (0.044)	0.105** (0.044)	0.146*** (0.054)
6th income decile		0.182*** (0.042)	0.182*** (0.042)	0.170*** (0.052)
7th income decile		0.171*** (0.044)	0.171*** (0.044)	0.220*** (0.053)
8th income decile		0.203*** (0.048)	0.203*** (0.048)	0.227*** (0.061)
9th income decile		0.220*** (0.051)	0.220*** (0.051)	0.197*** (0.062)
10th income decile		0.243*** (0.048)	0.243*** (0.048)	0.247*** (0.062)
Social trust			0.044 (0.032)	0.050 (0.031)
Individual trust				0.002* (0.001)
Religious				0.120*** (0.026)
Social activities				0.028 (0.034)
Friends, relatives or colleagues				0.077***

Observations	2,463	1,956	1,956	(0.027)
R-squared	0.091	0.132	0.132	1,296
<hr/>				
Robust standard errors in parentheses				

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 16 - Determinants of perceived health, Linear Probability Model, Second Generation Immigrants**

VARIABLES	(1)	(2)	(3)	(4)
Age	-0.001 (0.002)	-0.006** (0.003)	-0.006** (0.003)	-0.002 (0.004)
Age sq.	-0.000*** (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000** (0.000)
Male	0.028 (0.017)	0.026 (0.019)	0.026 (0.019)	0.040* (0.024)
Divorced	-0.057 (0.038)	-0.065 (0.042)	-0.065 (0.042)	-0.044 (0.050)
Widowed	-0.081* (0.045)	-0.067 (0.048)	-0.067 (0.048)	-0.102* (0.060)
Single	-0.032 (0.036)	-0.080* (0.041)	-0.080* (0.041)	-0.075 (0.049)
Immigrant	0.022 (0.020)	0.024 (0.023)	0.024 (0.023)	0.040 (0.029)
Medium-skilled		0.063*** (0.023)	0.063*** (0.023)	0.063** (0.028)
High-skilled		0.146*** (0.026)	0.146*** (0.026)	0.122*** (0.032)
2nd income decile		0.077** (0.032)	0.077** (0.032)	0.089** (0.041)
3rd income decile		0.119*** (0.035)	0.119*** (0.035)	0.105** (0.044)
4th income decile		0.135*** (0.037)	0.135*** (0.037)	0.164*** (0.045)
5th income decile		0.111*** (0.039)	0.111*** (0.039)	0.117** (0.049)
6th income decile		0.143*** (0.042)	0.143*** (0.042)	0.134*** (0.051)
7th income decile		0.169*** (0.042)	0.169*** (0.042)	0.179*** (0.051)
8th income decile		0.181*** (0.044)	0.181*** (0.044)	0.165*** (0.058)
9th income decile		0.114** (0.052)	0.114** (0.052)	0.081 (0.064)
10th income decile		0.197*** (0.046)	0.197*** (0.046)	0.169*** (0.058)
Social trust			0.004 (0.028)	-0.005 (0.029)
Individual trust				0.000 (0.001)
Religious				0.019 (0.024)
Social activities				0.094*** (0.030)
Friends, relatives or colleagues				0.057** (0.025)
Observations	2,478	1,963	1,963	1,302
R-squared	0.251	0.288	0.288	0.288

Robust standard errors in parentheses

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

### 3.12 Conclusions

In this chapter, we examined the potential role of individual perceptions on interpersonal trust on explaining self-rated life satisfaction and health. Using the 2018 ESS wave, we find a statistically significant association between the variables under consideration. Our full specifications suggest that a one-point higher trust increases the probability of an individual reporting good health (being happy) by about 1 (1.5) per cent. We have also considered the importance of community trust. According to our findings, social trust displays a much stronger correlation with the outcomes considered in this study. The analysis also reveals that sociable persons, defined as those who meet friends regularly, or those participating in social activities, have an increased probability to report good health or happiness. Interestingly, religiosity, income, and education appear also to be important determinants. The results are broadly consistent once we consider only the elderly in the sample.

However, it should be noted that trust could be a consequence as much as a cause of life satisfaction or health. What is more, unobserved personal factors might influence both the outcomes and the attitudes toward strangers, giving rise to endogeneity. To be able to claim that the correlations discussed represent the causal impact of trust, we restrict the sample to include the children of immigrants only, and substitute their source countries trust for their individual preferences, as in Daniele and Geys (2015). This important empirical exercise implies that the association between trust and life satisfaction can be interpreted as causal. On the contrary, this does not seem to be the case once we consider health as the dependent variable.

**Table 17 - Determinants of perceived life satisfaction, Probit Model, Full Sample**

	(1)	(2)	(3)	(4)
Age	-0.013*** (0.001)	-0.016*** (0.001)	-0.016*** (0.001)	-0.013*** (0.001)
Age sq.	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Male	-0.014** (0.006)	-0.023*** (0.006)	-0.023*** (0.006)	-0.019*** (0.006)
Divorced	-0.022 (0.014)	0.003 (0.015)	0.003 (0.015)	0.012 (0.015)
Widowed	-0.054*** (0.015)	-0.015 (0.016)	-0.015 (0.016)	-0.019 (0.016)
Single	-0.009 (0.013)	-0.001 (0.015)	-0.001 (0.015)	0.006 (0.015)
Immigrant	-0.039*** (0.010)	-0.014 (0.011)	-0.014 (0.011)	-0.013 (0.011)
Medium-skilled		0.047*** (0.007)	0.047*** (0.007)	0.025*** (0.007)
High-skilled		0.097*** (0.008)	0.097*** (0.008)	0.058*** (0.009)
2nd income decile		0.057*** (0.012)	0.057*** (0.012)	0.049*** (0.012)
3rd income decile		0.098*** (0.013)	0.098*** (0.013)	0.090*** (0.012)
4th income decile		0.141*** (0.013)	0.141*** (0.013)	0.128*** (0.013)
5th income decile		0.192*** (0.013)	0.192*** (0.013)	0.175*** (0.013)
6th income decile		0.187*** (0.014)	0.187*** (0.014)	0.169*** (0.014)
7th income decile		0.218*** (0.014)	0.218*** (0.014)	0.197*** (0.014)
8th income decile		0.239*** (0.015)	0.239*** (0.015)	0.219*** (0.014)
9th income decile		0.261*** (0.015)	0.261*** (0.015)	0.233*** (0.015)
10th income decile		0.276*** (0.016)	0.276*** (0.016)	0.251*** (0.016)
Social trust			0.058*** (0.005)	0.040*** (0.005)
Individual trust				0.014*** (0.001)
Religious				0.040*** (0.007)
Social activities				0.071*** (0.008)
Friends, relatives or colleagues				0.067*** (0.007)
<i>N</i>	25068	19901	19901	19405

Robust Standard errors in parentheses below the estimated marginal effects

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

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## B. APPENDICES

### 1. Approval of the study



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ

ΠΟΛΕΜΙΚΟ ΝΑΥΤΙΚΟ

ΝΑΥΤΙΚΟ ΝΟΣΟΚΟΜΕΙΟ ΑΘΗΝΩΝ

ΕΠΙΣΤΗΜΟΝΙΚΟ ΣΥΜΒΟΥΛΙΟ-ΕΠΙΤΡΟΠΗ ΗΘΙΚΗΣ ΚΑΙ ΔΕΟΝΤΟΛΟΓΙΑΣ

ΑΡΙΘΜΟΣ ΠΡΩΤΟΚΟΛΛΟΥ: 8/19

ΑΘΗΝΑ, 22 ΝΟΕΜΒΡΙΟΥ 2019

ΑΠΟΣΠΑΣΜΑ ΠΡΑΚΤΙΚΩΝ 8ης ΣΥΝΕΔΡΙΑΣΗΣ/2019

ΣΧΕΤ: α. Υπληρ Σημ Υπ.Αριθμ. 8/19 Υδντη ΝΝΑ από 18 Νοε 2019

β. Άρθρο 24 ΚΟΛ/ΝΝΑ

1. Σε εκτέλεση σχετικού (α) συνεδρίασε σήμερα Παρασκευή 22/11/2019 το Ε.Σ./Ν.Ν.Α. υπό την προεδρία του Πχου (ΥΙ) Α. Παπαγεωργίου Π.Ν., Υποδιευθυντή Ν.Ν.Α., και μέλη του, τους:

- α. Πλοίαρχο (ΥΙ) Χ. Αγγελικόπουλο ΠΝ - Διευθυντή Ιατρικής Υπηρεσίας
- β. Πλοίαρχο (ΥΙ) Α. Διαμαντή ΠΝ - Διευθυντή Εργαστηριακού Τομέα
- γ. Πλοίαρχο (ΥΙ) Δ. Τρύφο ΠΝ - Διευθυντή Χειρουργικού Τομέα
- δ. Πλοίαρχο (ΥΙ) Λ. Μπιλάλη ΠΝ - Διευθυντή Παθολογικού Τομέα
- ε. Πλοίαρχο (ΥΙ) Α. Αντωνίου ΠΝ - Διευθυντή Εκπαίδευσης και Έρευνας
- στ. Πλοίαρχο (ΥΝ) Σ. Σιγάλα ΠΝ - Διευθύντρια Νοσηλευτικής Υπηρεσίας
- ζ. Πλοίαρχο (ΥΟ) Θ. Μητσιάνη ΠΝ - Διευθύντρια Οδοντιατρικού Τομέα
- η. Πλοίαρχο (ΥΝ) Α. Αργυράκου ΠΝ –Επόπτρια/Τομεάρχη Νοσηλευτικής Υπηρεσίας
- θ. Αντιπλοίαρχο (ΥΟ) Ν. Αντωνέλλο ΠΝ –ΔΙ.ΦΑ ΝΝΑ

και αφού έλαβε υπόψη του:

- Τις διαδικασίες και τους κανονισμούς υποβολής πρωτοκόλλων για τη διενέργεια κλινικών δοκιμών στο Νοσοκομείο
- Το γεγονός ότι όλοι οι φάκελοι είναι πλήρεις και καλύπτουν όλες τις προϋποθέσεις για τη διεξαγωγή μελετών

- Ότι από τη διενέργεια των μελετών δεν προκύπτει οικονομική επιβάρυνση για το Νοσοκομείο

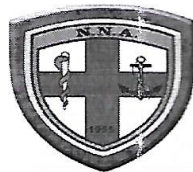
Ομόφωνα αποφασίζει και εγκρίνει το παρακάτω θέμα

(Σημ.: α. Στα θέματα που είναι εισηγητές μέλη του Ε.Σ. δεν προσμετράται η ψήφος τους. β. Ο γραμματέας δε φέρει δικαίωμα ψήφου)

Κατάθεση προς έγκριση εκπόνησης διδακτορικής διατριβής με τίτλο: «Κοινωνικό-οικονομικές διαστάσεις της γήρανσης του πληθυσμού »

ΕΙΣΗΓΗΤΗΣ: ΧΟΥΝΤΗ ΜΑΡΙΑ

ΑΡ. ΠΡΩΤ. : 11161/30.09.2019



Χειριστής: Αντιπλοίαρχος (ΥΝ) Ε. Μαντζάρα Π.Ν., Γραμματέας Ε.Σ./Ν.Ν.Α., τηλ 210 7261458-364

Η ΓΡΑΜΜΑΤΕΑΣ

Αντιπλοίαρχος (ΥΝ) Ε. Μαντζάρα Π.Ν

Ο ΠΡΟΕΔΡΟΣ

Πλοίαρχος (ΥΙ) Α. Ραπαγεωργίου ΠΝ

## **2. Declaration of consent (Greek)**

### **ΤΙΤΛΟΣ ΜΕΛΕΤΗΣ**

«Κοινωνικο-οικονομικές διαστάσεις της γήρανσης του Πληθυσμού»

### **ΚΥΡΙΟΣ ΕΡΕΥΝΗΤΗΣ**

Χουντή Μαρία

Υποψήφια Διδάκτωρ Πανεπιστημίου Πειραιώς

Τμήμα Οικονομικής Επιστήμης

[Maria.chounti@hotmail.com](mailto:Maria.chounti@hotmail.com)

Τηλ. Επικοινωνίας: 6980148094

### **ΣΥΜΜΕΤΟΧΗ ΣΤΗ ΜΕΛΕΤΗ**

- Άτομα 65 ετών και άνω
- Αδιάγνωστοι για άνοια
- Δεν έχουν υποβληθεί σε ορθοπεδικό χειρουργείο τους τελευταίους 3 μήνες
- Δεν πάσχουν από αναπνευστική ή καρδιακή ανεπάρκεια
- Δεν υπάρχει αδυναμία κατανόησης του ερωτηματολογίου
- Δεν είναι κλινήρεις
- Κινητοποιημένοι με ή χωρίς υποβοήθημα

### **ΕΙΔΟΣ ΤΗΣ ΜΕΛΕΤΗΣ**

Προοπτική μελέτη παρατήρησης στα τακτικά εξωτερικά ιατρεία του Ναυτικού Νοσοκομείου Αθηνών και σε ιδιωτικά ιατρεία του Νομού Αττικής.

### **ΔΙΑΡΚΕΙΑ ΜΕΛΕΤΗΣ**

Η συνολική συλλογή δεδομένων θα γίνει κατά το διάστημα Ιανουάριος 2022 έως Αύγουστος 2022. Ο αριθμός του δείγματος θα είναι 500 ασθενείς. Το πρωτόκολλο της μελέτης έχει λάβει έγκριση από το επιστημονικό συμβούλιο - Επιτροπή Ηθικής και Δεοντολογίας του Ναυτικού Νοσοκομείου Αθηνών για να διεξαχθεί η παρούσα μελέτη (Αρ. Πρωτ.:11161/30.09.2019).

## **ΣΚΟΠΟΣ ΤΗΣ ΜΕΛΕΤΗΣ**

Η παρούσα μελέτη διερευνά το φαινόμενο της ευθραυστότητας στον ελληνικό πληθυσμό σε άτομα  $\geq 65$  ετών.

Στο πλαίσιο της έρευνας στην οποία καλείστε να λάβετε μέρος θα συγκεντρώσουμε συγκεκριμένες πληροφορίες μέσω της συμπλήρωσης του παρακάτω ερωτηματολογίου που ακολουθεί.

Πιο αναλυτικά θα μελετηθούν:

- το επίπεδο της ευθραυστότητας
- οι παράγοντες που συμβάλλουν στην διατήρηση της ευθραυστότητας
- οι επιπτώσεις στο άτομο
- οι επιπτώσεις στον τομέα της πρωτοβάθμιας περίθαλψης
- οι μεταβλητές που αφορούν ιατρικά, κοινωνικά και οικονομικά δεδομένα του δείγματος καθώς και συμπεριφορικά χαρακτηριστικά που συμβάλλουν στη διαμόρφωση του ατομικού μοτίβου διαβίωσης.

## **ΔΙΑΔΙΚΑΣΙΕΣ ΤΗΣ ΜΕΛΕΤΗΣ**

\*Πριν από την έναρξη συμπλήρωσης του ερωτηματολογίου θα σας εξηγηθεί αναλυτικά το ερωτηματολόγιο και όπου χρήζει παρέμβασης ο ερευνητής θα σας καθοδηγεί. Μαζί με τον ερευνητή θα διενεργήσετε την αξιολόγηση κινητικότητας TUG καθώς και τη δοκιμή χεριού Hand Grip Strenght με τη χρήση του JAMAR Dynamometer.

## **ΚΙΝΔΥΝΟΙ**

Δεν προκύπτει κανένας κίνδυνος κατά τη διάρκεια της μελέτης.

## **ΟΦΕΛΕΙΑ**

Δεν υπάρχει άμεσο όφελος ή αποζημίωση του συμμετέχοντα από τη μελέτη. Ωστόσο τα δεδομένα που θα συλλεχθούν έχουν ως σκοπό την εξαγωγή αποτελεσμάτων στην επιστημονική κοινότητα σχετικά με το θέμα της ευθραυστότητας στον πληθυσμό ατόμων 65 ετών και άνω.

## **ΟΙΚΕΙΟΘΕΛΗΣ ΣΥΜΜΕΤΟΧΗ**

Η συμμετοχή σας στην παρούσα μελέτη είναι οικειοθελής. Σε περίπτωση που αποφασίσετε να λάβετε μέρος, θα σας ζητηθεί να υπογράψετε το έντυπο

συγκατάθεσης. Οποιαδήποτε στιγμή κατά τη διάρκεια της μελέτης μπορείτε να αποσυρθείτε από τη διαδικασία και θα διαγραφούν άμεσα όλες οι πληροφορίες και τα δεδομένα που είχατε καταγράψει.

### **ΕΜΠΙΣΤΕΥΤΙΚΟΤΗΤΑ**

Η επεξεργασία προσωπικών δεδομένων θα γίνει σύμφωνα με τον Ευρωπαϊκό Κανονισμό 2016/679 (ΓΚΠΔ) και την Ελληνική Νομοθεσία, συμπεριλαμβανομένου του ν. 4624/ 2019. Τα δεδομένα που θα συλλεχθούν θα κωδικοποιηθούν με τέτοιο τρόπο ώστε να είναι αδύνατον να αποκαλυφθεί η ταυτότητά σας σε τρίτους. Επίσης, η ταυτότητά σας δεν θα αποκαλυφθεί σε πιθανές δημοσιεύσεις, παρουσιάσεις ή επιστημονικές αναφορές που θα λάβουν χώρα σε σχέση με την συγκεκριμένη μελέτη. Μόνο τα μέλη της ερευνητικής ομάδας που δεσμεύονται με όρους εμπιστευτικότητας και εχεμύθειας θα έχουν πρόσβαση σε αυτά.

### **ΔΗΛΩΣΗ ΣΥΓΚΑΤΑΘΕΣΗΣ ΓΙΑ ΣΥΜΜΕΤΟΧΗ ΣΤΗ ΜΕΛΕΤΗ**

Έχω διαβάσει και κατανοήσει την πληροφορία που μου δόθηκε. Είχα την ευκαιρία να επιλύσω όποια ερώτηση είχα αναφορικά με τη συμμετοχή μου στη μελέτη. Κατανοώ ότι η συμμετοχή μου είναι οικειοθελής και ότι μπορώ να αποσυρθώ οποιαδήποτε στιγμή το επιθυμώ χωρίς να χρειάζεται να το αιτιολογήσω και χωρίς οποιαδήποτε συνέπεια. Συμφωνώ οικειοθελώς να συμμετέχω στην παρούσα μελέτη.

Ενημερώθηκα επαρκώς και αποδέχομαι την επεξεργασία των προσωπικών μου δεδομένων, όπως περιγράφεται στο παρόν έντυπο.  
ΝΑΙ                      ΟΧΙ

Υπογραφή συμμετέχοντα: \_\_\_\_\_ Ημερ/νία: \_\_\_\_\_

### 3. Questionnaire on fragility (Greek)

#### 1. ΔΗΜΟΓΡΑΦΙΚΑ ΣΤΟΙΧΕΙΑ

##### 1.1. Φύλο

Άνδρας	Γυναίκα
1	2

##### 1.2. Ηλικία .....

##### 1.3. Οικογενειακή κατάσταση

Έγγαμος	Άγαμος	Διαζευγμένος/η	Χήρος/α	Συζώ
1	2	3	4	5

##### 1.4. Αριθμός τέκνων .....

##### 1.5. Αν έχετε παιδιά, σας επισκέπτονται συχνά;

Ναι	Όχι
1	0

##### 1.6. Αριθμός εγγονιών .....

##### 1.7. Αν έχετε εγγόνια, περνάτε αρκετό χρόνο μαζί τους;

Ναι	Όχι
1	0

##### 1.8. Εκπαιδευτικό επίπεδο

Αναλφάβητος / δεν τελείωσε δημοτικό σχολείο	Απόφοιτος γυμνασίου	Απόφοιτος λυκείου	Μεταλυκειακή εκπαίδευση (ΚΕΚ, ΙΕΚ)	Πτυχιούχος ΑΕΙ-ΤΕΙ	Κάτοχος μεταπτυχιακού-διδακτορικού
1	2	3	4	5	6

##### 1.9. Κατηγορία επαγγέλματος

Αγρότης	Εργάτης	Υπάλληλος	Επιστήμονας	Επιχειρηματίας	Οικιακά	Άλλο
1	2	3	4	5	6	7

##### 1.10. Έτη εργασίας .....

##### 1.11. Έτη συνταξιοδότησης .....

##### 1.12. Γεωγραφική περιφέρεια μόνιμης διαμονής

Περιφέρεια Αττικής	1
Περιφέρεια Ανατολικής Μακεδονίας & Θράκης	2
Περιφέρεια Βορείου Αιγαίου	3
Περιφέρεια Δυτικής Ελλάδας	4
Περιφέρεια Δυτικής Μακεδονίας	5
Περιφέρεια Θεσσαλίας	6
Περιφέρεια Ηπείρου	7
Περιφέρεια Ιονίων Νήσων	8
Περιφέρεια Στερεάς Ελλάδας	9
Περιφέρεια Πελοποννήσου	10

Περιφέρεια Νοτίου Αιγαίου	11
Περιφέρεια Κρήτης	12
Περιφέρεια Κεντρικής Μακεδονίας	13

1.13. Σε τι περιβάλλον έχετε περάσει το μεγαλύτερο χρονικό διάστημα της ζωής σας;

Χωριό σε βουνό	Χωριό σε θάλασσα	Πόλη κοντά σε θάλασσα	Πόλη κοντά σε βουνό	Πόλη στην ενδοχώρα
1	2	3	4	5

1.14. Σε τι περιβάλλον κατοικείτε σήμερα;

Χωριό σε βουνό	Χωριό σε θάλασσα	Πόλη κοντά σε θάλασσα	Πόλη κοντά σε βουνό	Πόλη στην ενδοχώρα
1	2	3	4	5

## 2. ΕΚΤΙΜΗΣΗ ΕΥΠΑΘΕΙΑΣ (FRAIL SCALE)

		Ναι	Όχι
2.1.	Κατά τη διάρκεια του τελευταίου μήνα αισθανόσασταν σε μεγάλο βαθμό κουρασμένος;	1	0
2.2.	Για να ανέβετε δέκα σκαλοπάτια χρειάζεστε κάποιον να σας υποστηρίξει ή σταματάτε για να ξεκουραστείτε;	1	0
2.3.	Αντιμετωπίζετε πρόβλημα ή δεν αισθάνεστε καλά όταν διανύετε μία απόσταση περίπου 500 μέτρων;	1	0
2.4.	Πάσχετε από πέντε ή και περισσότερα νοσήματα;	1	0
2.5.	Έχετε χάσει 5% και πάνω του βάρους σας το τελευταίο εξάμηνο;	1	0

## 3. ΠΟΙΟ ΧΕΡΙ ΧΡΗΣΙΜΟΠΟΙΕΙΤΕ;

Δεξί	Αριστερό	Αμφίχειρας (Και τα δύο)
1	2	3

## 4. ΑΞΙΟΛΟΓΗΣΗ ΚΙΝΗΤΙΚΟΤΗΤΑΣ (TUG)

Ο χρόνος που απαιτείται για την έγερση του ατόμου από την καρέκλα, το περπάτημα μιας απόστασης 3 μέτρων, στροφή, περπάτημα πίσω στην καρέκλα και κάθισμα σ' αυτήν.

4.1. Χρόνος:.....

4.2.	≤10sec	>10sec	≥20sec
	0	1	2

## 5. ΔΟΚΙΜΗ HAND GRIP STRENGTH /KG

	1 <sup>η</sup> μέτρηση	2 <sup>η</sup> μέτρηση	Μέσος όρος
5.1. Αριστερό χέρι			
5.2. Δεξί χέρι			

## 6. ΙΑΤΡΙΚΑ ΔΕΔΟΜΕΝΑ

6.1. Αναφέρετε από ποια χρόνια νοσήματα πάσχετε.

ΣΥΣΤΗΜΑΤΑ	Ναι	Όχι
6.1.1. Ενδοκρινικό	1	0
6.2.1. Ανοσοποιητικό	1	0
6.3.1. Πεπτικό/Γαστρεντερικό	1	0
6.4.1. Αναπνευστικό	1	0
6.5.1. Ουροποιητικό	1	0
6.6.1. Δερματικό/Καλυπτήριο	1	0
6.7.1. Αισθητηριακό	1	0

6.8.1.	Νευρολογικό	1	0
6.9.1.	Σκελετικό/Ερειστικό	1	0
6.10.1.	Μυϊκό	1	0
6.11.1.	Κυκλοφορικό	1	0
6.12.1.	Λεμφικό	1	0
6.13.1.	Αναπαραγωγικό/Γεννητικό	1	0

6.2. Λαμβάνετε συστηματική αγωγή;

Ναι	Όχι
1	0

6.3. Αν ναι, για πόσα έτη; (μέγιστο χρονικό διάστημα) .....

6.4. Κάνετε φυσιοθεραπεία σε τακτική βάση (10 συνεδρίες/εξάμηνο);

Ναι	Όχι
1	0

6.5. Είχατε πτώση επί εδάφους κατά το τελευταίο έτος;

Ναι	Όχι
1	0

## 7. ΕΚΤΙΜΗΣΗ ΔΡΑΣΤΗΡΙΟΤΗΤΩΝ ΚΑΘΗΜΕΡΙΝΗΣ ΖΩΗΣ (KATZ)

		Όχι	Μερικώς	Ναι
7.1.	Παίρνετε μόνος/η το μπάνιο σας χωρίς καμία βοήθεια ή χρειάζεστε μικρή βοήθεια για το πλύσιμο σας μόνο ενός μέρους του σώματος σας, όπως η πλάτη, τα γεννητικά όργανα ή ένα ανάπηρο άκρο;	0	0,5	1
7.2.	Βγάζετε τα ενδύματα από τη ντουλάπα και τα συρτάρια, φοράτε τα ρούχα και τα πανωφόρια μόνος/η πλήρως; Χρειάζεστε βοήθεια για το δέσιμο των κορδονιών;	0	0,5	1
7.3.	Πηγαίνετε μόνος/η στην τουαλέτα, ανεβάζετε, κατεβάζετε και τακτοποιείτε τα ρούχα, καθαρίζετε τις ευαίσθητες περιοχές χωρίς βοήθεια;	0	0,5	1
7.4.	Μετακινείστε μόνος σας από το κρεβάτι, καρέκλα ή πολυθρόνα χωρίς βοήθεια; Είναι αποδεκτά μηχανικά μέσα υποβοήθησης;	0	0,5	1
7.5.	Έχετε τον έλεγχο της ούρησης και της αφόδευσης;	0	0,5	1
7.6.	Μπορείτε να μεταφέρετε την τροφή από το πιάτο στο στόμα χωρίς βοήθεια; Η προετοιμασία του φαγητού γίνεται από τρίτο άτομο;	0	0,5	1

## 8. ΕΚΤΙΜΗΣΗ ΘΡΕΨΗΣ (MNA)

8.1 Έχει η πρόσληψη τροφής μειωθεί κατά τη διάρκεια των τελευταίων 3 μηνών λόγω μείωσης όρεξης, λόγω διαταραχών πέψης, λόγω δυσκολίας μάσησης ή κατάποσης;

1=Σοβαρή μείωση πρόσληψης τροφής

2=Μέτρια μείωση πρόσληψης τροφής

3=Καμία μείωση πρόσληψης τροφή

8.2 Απώλεια βάρους κατά τη διάρκεια των 3 τελευταίων μηνών;

0=απώλεια βάρους μεγαλύτερη από 3 κιλά

1=δε γνωρίζει

2=απώλεια βάρους από 1 έως 3 κιλά

3=καμία απώλεια βάρους

8.3 Κινητικότητα

0=κλινήρης ή/και καθηλωμένος σε καρέκλα

1=μη κλινήρης ή/και καθηλωμένος σε καρέκλα αλλά χωρίς να βγαίνει έξω από το σπίτι

2= βγαίνει εκτός σπιτιού

8.4 Έχει ο ασθενής υποστεί ψυχολογικό στρες ή οξύ νόσημα τους τελευταίους τρεις μήνες;

0=όχι

2=ναι



- 8.5 Νευρολογικά νοσήματα  
0=σοβαρή άνοια ή κατάθλιψη  
1=μέτρια άνοια  
2=χωρίς ψυχολογικά προβλήματα

8.6 Βάρος:.....

8.7 Ύψος:.....

8.8 ΔΜΣ:.....

< 18.5	18.5 - 24.9	25.0 - 29.9	> 30
0	1	2	3

## 9. ΔΑΠΑΝΕΣ ΥΓΕΙΑΣ

- 9.1. Πόσα χρήματα δαπανάτε μηνιαίως για φάρμακα; .....
- 9.2. Πόσα χρήματα δαπανάτε ετησίως για υπηρεσίες υγείας; (ιατρικές υπηρεσίες, διαγνωστικές εξετάσεις) .....
- 9.3. Πόσα χρήματα δαπανάτε ετησίως για φυσικοθεραπείες; .....

## 10. ΦΡΟΝΤΙΣΤΗΣ/ΚΑΤ' ΟΙΚΟΝ ΒΟΗΘΕΙΑ

- 10.1. Σε ποιο βαθμό μπορείτε να κάνετε μόνος/η σας δουλειές του σπιτιού;

Καθόλου	Σχεδόν Καθόλου	Μέτρια	Αρκετά	Πολύ
1	2	3	4	5

- 10.2. Υπάρχει κάποιο άτομο που σας φροντίζει σε καθημερινή βάση;

Ναι	Όχι
1	0

- 10.3. Πόσα χρήματα δαπανάτε μηνιαίως για κάποιον φροντιστή σας;.....

- 10.4. Αν σας φροντίζει κάποιο άτομο, αυτό το άτομο είναι ;

Δεν έχω φροντιστή	Σύζυγος	Γιός	Κόρη	Συγγενής / Φίλος	Ξένο πρόσωπο επ' αμοιβή
0	1	2	3	4	5

- 10.5. Αν δεν σας φροντίζει κανείς σε καθημερινή βάση, νιώθετε την ανάγκη ότι θα έπρεπε να έχετε κάποιον να σας φροντίζει;

Ναι	Όχι
1	0

- 10.6. Σας βοηθάει οικονομικά κάποιο συγγενικό σας πρόσωπο;

Ναι	Όχι
1	0

## 11. ΠΡΩΤΟΒΑΘΜΙΑ ΦΡΟΝΤΙΔΑ ΥΓΕΙΑΣ (ΠΦΥ)

Τον τελευταίο χρόνο πόσο συχνά χρησιμοποιείτε υπηρεσίες ΠΦΥ;

		Καμία Φορά	1-2 Φορές Το Μήνα	Κάθε 2 Μήνες	Κάθε 3 Μήνες	Κάθε 6 Μήνες	Ετήσια
11.1.	Ιατρό	1	2	3	4	5	6
11.2.	Οδοντίατρο	1	2	3	4	5	6
11.3.	Διαγνωστικά Κέντρα	1	2	3	4	5	6
11.4.	Φυσιοθεραπευτή	1	2	3	4	5	6

**12. ΕΚΤΙΜΗΣΗ ΓΗΡΙΑΤΡΙΚΗΣ ΚΑΤΑΘΛΙΨΗΣ (GDS)**

		Ναι	Όχι
12.1.	Είστε γενικά ευχαριστημένος από τη ζωή σας;	0	1
12.2.	Έχετε αποτραβηχτεί από σας περισσότερες δραστηριότητες / ενδιαφέροντα σας;	1	0
12.3.	Αισθάνεστε ότι η ζωή σας είναι άδεια;	1	0
12.4.	Βαριέστε συχνά;	1	0
12.5.	Έχετε καλή διάθεση τον περισσότερο καιρό;	0	1
12.6.	Φοβάστε ότι θα συμβεί κάτι κακό;	1	0
12.7.	Αισθάνεστε ευτυχισμένος τον περισσότερο καιρό;	0	1
12.8.	Αισθάνεστε συχνά αβοήθητος;	1	0
12.9.	Προτιμάτε να μένετε στο σπίτι παρά να βγαίνετε έξω και να κάνετε καινούρια πράγματα;	1	0
12.10.	Αισθάνεστε να έχετε πρόβλημα στη μνήμη περισσότερο από ότι οι άλλοι;	1	0
12.11.	Νομίζετε ότι είναι σπουδαίο το ότι ζείτε σήμερα;	0	1
12.12.	Νομίζετε ότι δεν είστε αρκετά χρήσιμος στην κατάσταση που είστε σήμερα;	1	0
12.13.	Αισθάνεστε ότι είστε γεμάτος από ζωντάνια ή από ενέργεια;	0	1
12.14.	Αισθάνεστε ότι η κατάστασή σας είναι απογοητευτική;	1	0
12.15.	Αισθάνεστε ότι ο περισσότερος κόσμος είναι καλύτερα από εσάς;	1	0

**13. ΚΑΠΝΙΣΜΑ**

13.1 Κάνετε χρήση καπνού πριν τα 65 έτη;

Ναι	Όχι
1	0

13.2. Αν ναι, πόσα τσιγάρα καπνίζατε ημερησίως; .....

13.3. Κάνετε χρήση καπνού μετά τα 65 έτη;

Ναι	Όχι
1	0

13.4 Αν ναι, πόσα τσιγάρα καπνίζατε ημερησίως; .....

**14. ΑΛΚΟΟΛ**

14.1. Κάνετε χρήση αλκοόλ πριν τα 65 έτη;

Ναι	Όχι
1	0

14.2. Πόσο συχνά καταναλώνατε αλκοόλ πριν τα 65 έτη;

Καθόλου	Λίγο	Αρκετά	Πολύ	Πάρα πολύ
1	2	3	4	5

14.3. Κάνετε χρήση αλκοόλ μετά τα 65 έτη;

Ναι	Όχι
1	0

14.4. Πόσο συχνά καταναλώνετε αλκοόλ μετά τα 65 έτη;

Καθόλου	Λίγο	Αρκετά	Πολύ	Πάρα πολύ
1	2	3	4	5

15. Πως θα χαρακτηρίζατε τη σωματική σας υγεία σήμερα;

Πολύ κακή	Κακή	Ούτε κακή / ούτε καλή	Καλή	Πολύ καλή
1	2	3	4	5

16. Πως θα χαρακτηρίζατε τη ψυχική σας υγεία σήμερα;

Πολύ κακή	Κακή	Ούτε κακή / ούτε καλή	Καλή	Πολύ καλή
1	2	3	4	5

17. Πως θα χαρακτηρίζατε την οικονομική σας κατάσταση;

Πολύ κακή	Κακή	Ούτε κακή / ούτε καλή	Καλή	Πολύ καλή
1	2	3	4	5

18. **ΣΥΝΟΛΟ ΓΕΥΜΑΤΩΝ** (πολύ ελαφρύ πρωινό θα μπορούσαμε να το θεωρήσουμε μισό γεύμα).

18.1. Πόσα γεύματα λαμβάνετε συνολικά (πριν τα 65 έτη); .....

18.2. Πόσα γεύματα λαμβάνετε συνολικά (μετά τα 65 έτη); .....

19. **ΔΙΑΤΡΟΦΙΚΕΣ ΣΥΝΗΘΕΙΕΣ (πριν τα 65 έτη)**

		Σχεδόν ποτέ / σπάνια	1 – 2 φορές την εβδομάδα	3 – 4 φορές την εβδομάδα	5 – 6 φορές την εβδομάδα	Κάθε μέρα
		1	2	3	4	5
19.1.	Πόσο συχνά καταναλώνετε κόκκινο κρέας;					
19.2.	Πόσο συχνά καταναλώνετε λευκό κρέας;					
19.3.	Πόσο συχνά καταναλώνετε ψάρι;					
19.4.	Πόσο συχνά καταναλώνετε αυγά και γαλακτοκομικά προϊόντα;					
19.5.	Πόσο συχνά καταναλώνετε όσπρια ;					
19.6.	Πόσο συχνά καταναλώνετε λαχανικά;					
19.7.	Πόσο συχνά καταναλώνετε ζυμαρικά;					
19.8.	Πόσο συχνά καταναλώνετε φρούτα;					

20. **ΔΡΑΣΤΗΡΙΟΤΗΤΕΣ (πριν τα 65 έτη)**

		Καθόλο υ	Λίγο	Μέτρια	Πολύ	Πάρα πολύ
20.1.	Κάποιο είδος άσκησης	1	2	3	4	5
20.2.	Περπάτημα	1	2	3	4	5
20.3.	Μαστορέματα στο σπίτι	1	2	3	4	5
20.4.	Κηπουρική (με λουλούδια σε κήπο ή στο μπαλκόνι)	1	2	3	4	5
20.5.	Διάβασμα	1	2	3	4	5
20.6.	Μαγείρεμα – Συγύρισμα του σπιτιού	1	2	3	4	5
20.7.	Πλέξιμο – Ραπτική	1	2	3	4	5
20.8.	Βλέπατε συγγενείς και φίλους	1	2	3	4	5
20.9.	Συχνάζατε σε πολιτιστικούς ή πολιτικούς συλλόγους, συνδικαλιστικούς ή και κοινωνικούς ομίλους	1	2	3	4	5
20.10.	Παρακολουθούσατε λειτουργία σε εκκλησία	1	2	3	4	5
20.11.	Ταξιδεύατε για διακοπές	1	2	3	4	5
20.12.	Διασκεδάζατε εκτός σπιτιού	1	2	3	4	5

21. **ΔΙΑΤΡΟΦΙΚΕΣ ΣΥΝΗΘΕΙΕΣ (μετά τα 65 έτη)**

		Σχεδόν ποτέ / σπάνια	1 – 2 φορές την εβδομάδα	3 – 4 φορές την εβδομάδα	5 – 6 φορές την εβδομάδα	Κάθε μέρα
		1	2	3	4	5
21.1.	Πόσο συχνά καταναλώνετε κόκκινο κρέας;					
21.2.	Πόσο συχνά καταναλώνετε λευκό κρέας;					
21.3.	Πόσο συχνά καταναλώνετε ψάρι;					

21.4.	Πόσο συχνά καταναλώνετε αυγά και γαλακτοκομικά προϊόντα;					
21.5.	Πόσο συχνά καταναλώνετε όσπρια;					
21.6.	Πόσο συχνά καταναλώνετε λαχανικά;					
21.7.	Πόσο συχνά καταναλώνετε ζυμαρικά;					
21.8.	Πόσο συχνά καταναλώνετε φρούτα;					

## 22. ΔΡΑΣΤΗΡΙΟΤΗΤΕΣ (μετά τα 65 έτη)

		Καθόλου	Λίγο	Μέτρια	Πολύ	Πάρα πολύ
22.1.	Κάποιο είδος άσκησης	1	2	3	4	5
22.2.	Περπάτημα	1	2	3	4	5
22.3.	Μαστορέματα στο σπίτι	1	2	3	4	5
22.4.	Κηπουρική (με λουλούδια σε κήπο ή στο μπαλκόνι)	1	2	3	4	5
22.5.	Διάβασμα	1	2	3	4	5
22.6.	Μαγείρεμα – Συγύρισμα του σπιτιού	1	2	3	4	5
22.7.	Πλέξιμο – Ραπτική	1	2	3	4	5
22.8.	Βλέπετε συγγενείς και φίλους	1	2	3	4	5
22.9.	Συχνάζετε σε πολιτιστικούς ή πολιτικούς συλλόγους, συνδικαλιστικούς ή και κοινωνικούς ομίλους	1	2	3	4	5
22.10.	Παρακολουθείτε λειτουργία σε εκκλησία	1	2	3	4	5
22.11.	Ταξιδεύετε για διακοπές	1	2	3	4	5
22.12.	Διασκεδάζετε εκτός σπιτιού	1	2	3	4	5

## 23. ΤΟΝ ΤΕΛΕΥΤΑΙΟ ΧΡΟΝΟ ΣΕ ΠΟΙΟ ΒΑΘΜΟ ΜΕΤΑΒΛΗΘΗΚΕ

		Μειώθηκε πολύ	Μειώθηκε λίγο	Ούτε μειώθηκε Ούτε αυξήθηκε	Αυξήθηκε λίγο	Αυξήθηκε πολύ
23.1.	Ο ρυθμός βαδισματός σας στο δρόμο	1	2	3	4	5
23.2.	Η ποσότητα τροφής που καταναλώνετε	1	2	3	4	5
23.3.	Η επιθυμία σας να φροντίζετε τον εαυτό σας	1	2	3	4	5
23.4.	Η καθημερινή σας διάθεση	1	2	3	4	5

## 24. Επηρεάστηκε η ψυχική σας διάθεση λόγω της υποχρεωτικότητας που δημιούργησε η καραντίνα του COVID-19; (να παραμένετε εντός της οικίας, συχνή χρήση προστατευτικής μάσκας, διατήρηση απόστασης μεταξύ των ατόμων)

Καθόλου	Λίγο	Αρκετά	Πολύ	Πάρα πολύ
1	2	3	4	5

## 25. Επηρεάστηκε το αίσθημα άγχους για την πιθανότητα θανάτου (εσείς η/και κοντινό σας άτομο) λόγω του COVID-19;

Καθόλου	Λίγο	Αρκετά	Πολύ	Πάρα πολύ
1	2	3	4	5

#### 4. Questionnaire on fragility (English)

##### 1. DEMOGRAPHICS

###### 1.1. Gender

Man	Woman
1	2

###### 1.2. Age .....

###### 1.3. Family status

Married	Unmarried	Divorced	Widowed	Cohabit
1	2	3	4	5

###### 1.4. Number of children .....

###### 1.5. If you have children, do they visit you often?

Yes	No
1	0

###### 1.6. Number of grandchildren .....

###### 1.7. If you have grandchildren, do you spend enough time with them?

Yes	No
1	0

###### 1.8. Educational level

Illiterate / did not finish primary school	Middle school graduate	High school graduate	Post-secondary education	Graduated from Higher/ Technological Educational Institute	Master's-PhD holder
1	2	3	4	5	6

###### 1.9. Occupation category

Farmer	Worker	Employee	Scientist	Businessman	Household	Other
1	2	3	4	5	6	7

###### 1.10. Years of work.....

###### 1.11 Year of retirement .....

###### 1.12. Geographical region of permanent residence

Region of Attica	1
Region of Eastern Macedonia & Thrace	2
North Aegean Region	3
Region of Western Greece	4
Region of Western Macedonia	5
Region of Thessaly	6
Region of Epirus	7
Region of the Ionian Islands	8
Region of Sterea Hellas	9
Region of Peloponnese	10

South Aegean Region	11
Region of Crete	12
Region of Central Macedonia	13

1.13. In what environment have you spent the longest period of your life?

Village on a mountain	Village by the sea	City near the sea	City near a mountain	Inland city
1	2	3	4	5

1.14. In what environment do you live today?

Village on a mountain	Village by the sea	City near the sea	City near a mountain	Inland city
1	2	3	4	5

## 2. FRAIL SCALE

		Yes	No
2.1.	During the past month, have you felt a great deal of fatigue?	1	0
2.2.	Do you need someone to support you to climb ten flights of stairs or do you stop to rest?	1	0
2.3.	Having trouble or feeling unwell when you walk a distance of about 500 meters?	1	0
2.4.	Do you suffer from five or more diseases?	1	0
2.5.	You have lost 5% or more of your weight. How was your last semester?	1	0

## 3. WHICH HAND DO YOU USE (Dominant)?

Right	Left	Ambidextrous
1	2	3

## 4. MOBILITY ASSESSMENT (TUG)

The time required for the person to stand up from the chair, walk a distance of 3 meters, turn, walk back to the chair and sit in it.

4.1. Time :.....

4.2.	≤10 sec	> 10sec	≥20sec
	0	1	2

## 5. TEST OF HAND GRIP STRENGTH

	1st	2nd	Average
5.1. Left hand			
5.2. Right hand			

## 6. MEDICAL DATA

6.1. State which chronic diseases you suffer from.

	SYSTEMS	Yes	No
6.1. 1 .	Endocrine	1	0
6.2. 1 .	Immune	1	0
6.3. 1 .	Digestive/ Gastrointestinal	1	0
6.4. 1 .	Respiratory	1	0
6.5. 1 .	Urinary	1	0
6.6. 1 .	Integumentary	1	0
6.7. 1 .	Sensory	1	0
6.8. 1 .	Neurological	1	0
6.9. 1 .	Skeletal	1	0
6.10.1.	Muscular	1	0
6.11. 1 .	Circulatory	1	0

6.12. 1 .	Lymphatic	1	0
6.13. 1 .	Reproductive/Genital	1	0

6.3. Are you receiving systemic treatment?

Yes	No
1	0

6.3. If yes, for how many years? (maximum time period) .....

6.4. Do you do physiotherapy on a regular basis (10 sessions/semester)?

Yes	No
1	0

6.5. Have you had a fall on the ground in the last year?

Yes	No
1	0

## 7. ASSESSMENT OF ACTIVITIES OF DAILY LIVING (KATZ)

		No	Partly	Yes
7.1 .	Do you bathe alone without any help, or do you need a little help washing just one part of your body, such as your back, genitals, or a disabled limb?	0	0.5	1
7.2 .	Do you take clothes out of the wardrobe and drawers, put on clothes and coats by yourself or completely? Need help tying shoelaces?	0	0.5	1
7.3 .	Do you go to the bathroom alone, put on, take off and arrange clothes, clean sensitive areas without help?	0	0.5	1
7.4 .	Do you move yourself from bed, chair or armchair without help? Are mechanical aids acceptable?	0	0.5	1
7.5 .	Do you have control over urination and defecation?	0	0.5	1
7.6 .	Can you move food from plate to mouth without help? Is the food prepared by a third person?	0	0.5	1

## 8. MINI NUTRITIONAL ASSESSMENT (MNA)

a. Has food intake decreased during the past 3 months due to decreased appetite, indigestion, difficulty chewing or swallowing?

1=Severe reduction in food intake

2=Moderate reduction in food intake

3=No reduction in food intake

b. Weight loss during the last 3 months?

0=weight loss greater than 3 kg

1=don't know

2=weight loss of 1 to 3 kg

3=no weight loss

c. Mobility

0=bedridden and/or confined to a chair

1=not bedridden and/or confined to a chair but not leaving the house

2 = goes out of the house

d. Has the patient suffered psychological stress or acute illness in the last three months?

0=no

2=yes

e. Neurological diseases

0=severe dementia or depression

1=moderate dementia

2=no mental disease

- f. Weight : .....
- g. Height : .....
- h. BMI : .....

< 18.5	18.5 - 24.9	25.0 - 29.9	> 30
0	1	2	3

## 9. HEALTH COSTS

- 9.1 How much money do you spend monthly on medicine? .....
- 9.2 How much money do you spend annually on health services? (medical services, diagnostic tests) .....
- 9.3 How much money do you spend annually on physical therapy? .....

## 10. CAREGIVER/HOUSEWORK

10.1 To what extent can you do housework by yourself?

Not at all	Almost none	Moderate	Enough	Very Much
1	2	3	4	5

10.2 Is there someone who takes care of you on a daily basis?

Yes	No
1	0

10.3 How much money do you spend monthly on one of your caregivers?.....

10.4 If someone is looking after you, is that person?

I don't have a caregiver	Wife/Husband	Son	Daughter	Relative / Friend	Foreign person by payment
0	1	2	3	4	5

10.5 If you don't have someone to take care of you on a daily basis, do you feel the need to have someone take care of you?

Yes	No
1	0

10.6 Does a relative help you financially?

Yes	No
1	0

## 11. PRIMARY HEALTH CARE (PHY)

In the last year, how often have you used PHC services?

		Never	1-2 Times A Month	Every 2 Months	Every 3 Months	Every 6 Months	Annually
	Doctor	1	2	3	4	5	6
1 1.2 .	Dentist	1	2	3	4	5	6
1 1 .3.	Diagnostic Centers	1	2	3	4	5	6
1 1 .4.	Physiotherapist	1	2	3	4	5	6

## 12. GERIATRIC DEPRESSION SCALE (GDS)

		Yes	No
12.1.	Are you generally happy with your life?	0	1
12.2.	Have you withdrawn from most of your activities/interests?	1	0
12.3.	Do you feel like your life is empty?	1	0
12.4.	Are you often bored?	1	0
12.5.	Are you in a good mood most of the time?	0	1
12.6.	Are you afraid something bad will happen?	1	0



12.7.	Do you feel happy most of the time?	0	1
12.8	Do you often feel helpless?	1	0
12.9.	Would you rather stay at home than go out and do new things?	1	0
12.10.	Do you feel like you have a memory problem more than others?	1	0
12.11 .	Do you think it is important that you are alive today?	0	1
12.12 .	Do you think you are not useful enough in your current situation?	1	0
12.13.	Do you feel full of vitality or energy?	0	1
12.14.	Do you feel that your situation is frustrating?	1	0
12.15.	Do you feel like most of the world is better off than you?	1	0

### 13. SMOKING

13.1 Did you use tobacco before age 65?

Yes	No
1	0

13.2 If so, how many cigarettes did you smoke per day? .....

13.3 Do you use tobacco after 65 years?

Yes	No
1	0

13.4 If so, how many cigarettes do you smoke per day? .....

### 14. ALCOHOL

14.1 Did you use alcohol before age 65?

Yes	No
1	0

14.2 How often did you drink alcohol before age 65?

Not at all	A Little	Enough	Very Much	Too Much
1	2	3	4	5

14.3. Do you use alcohol after 65 years?

Yes	No
1	0

14.4 How often do you drink alcohol after age 65?

Not at all	A Little	Enough	Very Much	Too Much
1	2	3	4	5

15. How would you describe your physical health today?

Very bad	Bad	Neither bad / nor good	Good	Very good
1	2	3	4	5

16. How would you describe your mental health today?

Very bad	Bad	Neither bad / nor good	Good	Very good
1	2	3	4	5

17. How would you describe your financial situation?

Very bad	Bad	Neither bad / nor good	Good	Very good
1	2	3	4	5

18. **TOTAL MEALS** (a very light breakfast could be considered half a meal).

18.3. How many meals did you eat in total (before age 65)? .....

18.4. How many meals do you get in total (after age 65)? .....

**19. DIETARY HABITS (before 65 years)**

		Almost never / rarely	1-2 times a week	3-4 times a week	5-6 times a week	Every day
		1	2	3	4	5
19.1.	How often did you consume red meat?					
19.2.	How often did you eat white meat?					
19.3.	How often did you eat fish ?					
19.4.	How often did you consume eggs and dairy products?					
19.5.	How often did you consume legumes ?					
19.6.	How often did you eat vegetables ?					
19.7.	How often did you eat pasta ?					
19.8.	How often did you consume fruit ?					

**20. ACTIVITIES (before 65 years)**

		Not at all	A Little	Enough	Very Much	Too Much
20.1.	Some kind of exercise	1	2	3	4	5
20.2.	Walking	1	2	3	4	5
20.3.	Crafts at home	1	2	3	4	5
20.4.	Gardening (with flowers in the garden or on the balcony)	1	2	3	4	5
20.5.	Reading	1	2	3	4	5
20.6.	Cooking – Preparing the house	1	2	3	4	5
20.7.	Knitting – Sewing	1	2	3	4	5
20.8.	You saw relatives and friends	1	2	3	4	5
20.9.	You frequented cultural or political clubs, trade unions or even social groups	1	2	3	4	5
20.10.	You were attending a church service	1	2	3	4	5
20.11.	You were traveling on holiday	1	2	3	4	5
20.12.	You had fun away from home	1	2	3	4	5

**21. DIETARY HABITS (after 65 years)**

		Almost never / rarely	1-2 times a week	3-4 times a week	5-6 times a week	Every day
		1	2	3	4	5
21.1.	How often do you consume red meat?					
21.2.	How often do you eat white meat?					
21.3.	How often do you eat fish ?					
21.4.	How often do you consume eggs and dairy products?					
21.5.	How often do you consume legumes ?					
21.6.	How often do you eat vegetables ?					
21.7.	How often do you eat pasta ?					
21.8.	How often do you eat fruit ?					

**22. ACTIVITIES (after 65 years)**

		Not at all	A Little	Enough	Very Much	Too Much
2 2 .1 .	Some kind of exercise	1	2	3	4	5
2 2 .2 .	Walking	1	2	3	4	5
2 2 .3 .	Crafts at home	1	2	3	4	5
2 2 .4 .	Gardening (with flowers in the garden or on the balcony)	1	2	3	4	5
2 2 .5 .	Reading	1	2	3	4	5
2 2 .6 .	Cooking – Preparing the house	1	2	3	4	5
2 2 .7 .	Knitting – Sewing	1	2	3	4	5
2 2 .8 .	You see relatives and friends	1	2	3	4	5
2 2 .9 .	You frequent cultural or political clubs, trade unions or even social groups	1	2	3	4	5
2 2 .10 .	You are attending a church service	1	2	3	4	5
2 2 .11 .	You are traveling on vacation	1	2	3	4	5
2 2 .12 .	You have fun away from home	1	2	3	4	5

**23. IN THE LAST YEAR DEGREE HAS IT CHANGED?**

		It was greatly decreased	It decreased a little	Neither decreased nor increased	It increased a little	It increased a lot
23.1.	Your walking pace on the road	1	2	3	4	5
23.2.	The amount of food you consume	1	2	3	4	5
23.3	Your desire to take care of yourself	1	2	3	4	5
23.4.	Your daily mood	1	2	3	4	5

**24. Has your mood been affected by the compulsion created by the COVID -19 quarantine? (stay indoors, frequent use of a protective mask, maintain distance between people)**

Not at all	A Little	Enough	Very Much	Too Much
1	2	3	4	5

**25. Has the feeling of anxiety about the possibility of death (you and/or someone close to you) affected by COVID -19?**

Not at all	A Little	Enough	Very Much	Too Much
1	2	3	4	5