Individual and contextual factors of depression among older European adults
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2020
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Depression... so mysteriously painful and elusive... remains nearly incomprehensible to those who have not experienced it in its extreme mood, although the... “ blues ” which people go through occasionally... are of such prevalence that they do give many individuals a hint of the illness in its catastrophic form.

William Styron. Darkness Visible: Memoire of Madness
List of abbreviations

YLDs – Years Lived with Disability
DALYs – Disability Adjusted Life Years
AIDS – Acquired Immunodeficiency Syndrome
SHARE – Survey of Health, Ageing and Retirement in Europe
IHME – Institute for Health Metrics and Evaluation
WHO – World Health Organization
OECD – Organization for Economic Co-Operation and Development
EUROSTAT – Statistical Office of the European Union
FRA – European Union Agency for Fundamental Rights
ICD-10 – International Classification of Disease - 10th Revision
HADS – Hospital Anxiety and Depression Scale
USSR – Union of Soviet Socialist Republics
CEDAW – Convention on the Elimination of all Forms of Discrimination Against Women
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1. Abstract

**Background:** Major depression was the fifth cause of years lived with disability in 2017 worldwide and its prevalence tends to be higher among older age groups. Several studies explored the risk factors that could explain the higher prevalence of depression among the older groups but most did not assess the concurrent effect of the individual and contextual factors in the risk of depression among older adults.

**Aim:** To assess the underlying individual (endogenous and exogenous) and contextual determinants of depression among older European groups.

**Methods:** We studied the effect of several individual and contextual risk factors in 302,613 participants aged 50 or over who participated in the sixth wave (2015) of the survey of Health, Ageing, and Retirement in Europe. We conducted four logistic regression analyses in order to gradually analyze the association between depression and, first, individual endogenous factors, subsequently adding to the model exogenous factors, and finally adding contextual factors. We estimated the odds ratios for each factor with 95% confidence intervals.

**Results:** The results revealed a significant relationship between depression and individual (endogenous, exogenous) and contextual variables, even after adjustment for all these independent variables. Women, older individuals, those suffering from chronic disease, functional limitations, or poor hearing capacity had a higher risk of depression (OR 1.121, 1.048, 1.078, 1.172, 1.107, respectively, p<0.001). Having any education level was protective regarding depression (OR 0.967, 0.929, 0.916, respectively, p<0.001), being single, divorced or widowed, unemployed, permanently sick or homemaker were also risk factors for depression (OR 1.014, 1.022, 1.046, 1.059, 1.144, 1.026, respectively, p<0.001). Being able to make ends meet without difficulty was protective against depression (OR 0.908, p<0.001). Furthermore, living in countries where women were more subjected to violence was associated with higher odds of depression (OR 1.007, p<0.001), as well as living in Southern, Bismarckian, Former-USSR, Post-communist countries (OR 1.082, 1.074, 1.089, 1.039, respectively, p<0.001) comparing to living in the Nordic countries. Only being employed became non-significantly associated with depression (compared to being retired) after adjustment for contextual factors.

**Conclusion:** The higher risk of depression among older European adults is explained not only by individual factors, as age, gender, and physical health status, but also by the individual social and economic factors and contextual factors, like welfare regimes and violence against women. As the population is expected to continue aging, depression will remain a significant public health issue. Therefore, it is urgent to reduce depression-related risk factors in European
countries, focusing not only on individual factors but also designing intervention strategies targeting socioeconomic and contextual factors.

**Keywords:** depression, elderly, socioeconomic factors, welfare models, violence against women
2. Introduction:

Population aging is the dominant demographic phenomenon of the 21st century. Europe is aging dramatically: in 2010, more than 17% of Europeans were over 65 years old, and by 2060 it is expected to reach 30% (Lanzieri, 2011; Börsch-Supan et al., 2013). As aging is associated with a deterioration in this group's physical and mental health conditions, the risk of increased health spending and reduced economic performance is significant (Bloom et al., 2011).

Aging is a long, slow, continuous, and irreversible process that is part of the individual's temporality from the start to the end of his/her life. Aging includes a set of physiological and psychological mechanisms that change the organism's structure and functions throughout the lifetime, leading to a succession of cognitive, biological, physiological, and neurological changes. It results from the combined impact of genetic and environmental factors to which the organism is exposed to during life. Due to all these changes, the elderly must continuously adapt to their aging process. Although this process is natural and smooth for some, it generates real difficulties or widens those existing, resulting in and aggravating mental disorders such as depression.

Mental health is an inseparable component of public health. It significantly impacts the individuals and population health status and the individuals' and countries' social and economic resources. Mental health is not the lack of mental illness but includes general well-being. Good mental health is a well-being state where a person can improve and use his/her skills, deal with the usual stress of life, work effectively and productively, and contribute to society (WHO, 2018). Additionally, positive mental health allows for cognitive and emotional flexibility, which are the basis for social skills and resilience to face stress. This mental capital is vitally essential for the healthy functioning of families, communities, and societies.

Based on the Institute for Health Metrics and Evaluation (IHME) data (2016), approximately 84 million people across Europe are affected by mental disorders, mainly anxiety (25 million people) and depression (21 million people); that is more than one in six people (17.3%) having a mental illness (OECD, 2018).

Among the European Union (EU) countries, the highest prevalence of mental health disorders per country is reported in Finland, France, and the Netherlands (18.5% of the population have at least one disorder) and the lowest prevalence in Poland, Romania, and Bulgaria (15 %) (OECD, 2018).
There is a wide range of mental disorders, which occur in many different forms. They are generally characterized by an abnormal set of thoughts, perceptions, emotions, behaviors, and interactions with others. Mental disorders include: (James et al., 2017).

- **Depression**: It is the most prevalent mental disorder and one of the leading causes of disability around the world. Nearly 264 million people suffer from depression. It affects women more than men.
- **Bipolar disorders**: It affects approximately 45 million people across the world. It usually consists of manic and depressive episodes generally followed by euthymia (normal mood period).
- **Schizophrenia**: nearly 20 million people suffer from this disorder in the world. It is characterized by cognitive dysfunctions, social and behavioral issues, delusions, hallucinations, and denial of the disease.
- **Dementia**: It affects nearly 50 million people worldwide. It is usually chronic or progressive, and it is characterized by a decline in cognitive function (memory loss and ability to think).
- **Developmental disorders**: The notion of the developmental disorder is a generic term that refers to a delay in developing intellectual skills like Autism.

Depression is one of the most prevalent mental health disorders among the older age groups, and it is a critically significant problem for both the elderly and those who care for them (Andreas et al., 2017). As the elderly population rises, the number of depressed people is expected to increase (Harpole et al., 2005). Therefore, it is necessary to study the risk factors of depression in the elderly. It is well documented that the prevalence of depression is unevenly distributed between different groups of the population and that depression has adverse effects on social and economic well-being, quality of life of individuals, and societies (Rai et al., 2013).

Studies have shown a positive association between depression and age, gender, chronic conditions, and functional disabilities (individual endogenous factors), and unemployment, poverty, education or marital status (individual exogenous factors) (DeJean et al., 2013; Ten Kate et al., 2017; Henderson et al., 2011; Selenko & Batinic 2011). However, most studies have focused on the analysis of single exogenous factors adjusted by age and gender. Few papers have investigated the relative contribution of these several factors in depression, nor their relative effect together with contextual factors. Indeed, little is known about how contextual factors, as the type of welfare regime or the levels of violence in the country where
the individual lives, contribute to depression in older adults. Besides, there is limited research on depression and the Eastern European population (Paykel et al., 2005).

To answer these gaps, this study aims to analyze the association between depression and individual endogenous, exogenous, and contextual factors among European older adults.

2.1 Depression and its risk factors:

2.1.1 Definition

The term "depression" comes from the Latin word "depressare", which means to press down. It was first used as a clinical term in psychology in 1905 (Kanter et al., 2008). Depression is a common mental illness that is characterized by depressed mood (dysphoria), loss of interest (anhedonia), feelings of guilt or low self-esteem, disturbed sleep or appetite, lack of energy, low concentration, chronic fatigue, and recurrent thoughts about death and suicide (Ritchie & Roser, 2018).

The WHO's International Classification of Diseases (ICD-10) (WHO, 1993) defines depression as different from the usual mood swings and quick emotional responses to daily challenges when it persists. Its intensity is moderate to severe; depression can become a severe illness, substantially impairing an individual's ability to function daily, affecting his/her professional and personal life (Lépine & Briley, 2011). At its worst, depression increase the risk of suicide, and approximately 800,000 people die every year due to suicide (WHO, 2017).

2.1.2 Prevalence and Incidence:

Depression is one of the most disabling diseases, as it causes a significant burden both to the individual and society, affecting in 2017 nearly 264 million people, both males (2.7%) and females (4.1%) worldwide and, in Europe, 40 million people with 3.17% males and 5.31 females (Ritchie & Roser, 2018). The IHME data suggest that depression is responsible for 5.45% of total years lived with disability (YLDs) (4.33%-6.82%) globally and, among adults aged 50-69 years old for 5.2% of total YLDs (3.91%-6.81%), and 3.27 of total YLDs (2.42%-4.27%) in those aged 70+ in Europe (IHME, 2019).
In Europe, one in six people has suffered from a severe mood disorder in their lives in 2016 (OECD, 2018). According to Eurostat (2017), 40 million people suffered from depressive disorders in Europe. Luxembourg had the highest proportion of its population reporting depressive symptoms (10%), followed by Germany and Portugal (9%). In the Czech Republic, Greece, Lithuania, and Slovakia, the proportion of people reporting depression was less than 4% (Hapke et al., 2019). The prevalence of depressive disorders was higher among women than men in most of the EU-28 member states. Portugal presented the highest gender gap, with 13% of women reporting depressive symptoms versus 4.7% of men, and the lowest gender gap was reported in the Czech Republic, with 3.4% in women versus 2% in men (Hapke et al., 2019).

A comparative study of the prevalence of depression in the elderly population of different parts of the world showed that the proportion of elderly affected with depression was significantly higher in Europe (10.9%) and America (8.4%) than in Asia (4.2%) (Barua et al., 2011).

Based on previous research, depression's prevalence in the older adults changes considerably across European countries. Some studies showed that Central, Eastern, and Southern European countries have a higher burden of disease than in Western and Scandinavian countries. (Horackova et al., 2019).

**2.1.3 Risk factors**

The risk factors for depression are multiple. They can be divided into two groups: individual factors (endogenous and exogenous) and contextual factors.

a. **Individual endogenous factors:**

- **Genetic & biological factors:**

Genetic and biological factors include genetic imprints related to deficits or imbalances in the system of neurotransmitters, such as serotonin and dopamine in the brain (Hosseini & Jalali, 2018). Depression seems to have a genetic predisposition that can affect how individuals respond to stressful events (Saveanu & Nemeroff, 2012).
• Psychological factors:

The biological, cognitive, emotional, and behavioral aspects of human functioning are in constant interaction. The onset of the first episodes of depression often occurs in response to a stressor: life events, as illness onsets, divorce, bereavement, separation, sexual abuse, and job redundancy are etiological factors of psychological dysfunctions (Hammen, 2018). The individual perception of life events varies in the extent to which individuals are vulnerable to these stressors. Some individuals have psychological resources and social and environmental, which help them face and more easily overcome these events' consequences. As in a vicious circle, during the depression, reality tends to be perceived more negatively, amplifying depressive emotions (Saveanu & Nemeroff, 2012).

• Age:

According to the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), major depressive disorders can begin at any age, with a median age of onset around 35 years-old. However, depression has classically been regarded as a disease of the middle-aged and elderly (McLeod et al., 2016). The prevalence of depression rises gradually with age, in both women and men, and is especially high in middle-aged people, probably due to the fact that depression is frequently related to poor physical health, lack of social support, and financial constraints (Grundy et al., 2019).

Epidemiological studies have shown that the prevalence of depression among people aged 65 years and more is 8-16%, and for those over 85 years old, it is 12-15% (WHO, 2017). Unipolar depression affects 7% of the elderly population and accounts for 5.7% of the total DALYs among those aged 60 and above (WHO, 2017). As elsewhere, in EU countries, in 2014, the prevalence of chronic depression accounted for 11.4% in women and 7.1% in men for individuals aged 55-64 years old, likewise, for 9.8% in women and 5.3% in men for those aged 65-74 years, and 12.4% in women and 6.5% in men in the age group of 75+ (OECD, 2018). Despite the high burden of depression among the older age groups, it is believed that 60-70% of depressive disorders in the elderly are often ignored or neglected (Friedrich, 2017).
Gender:

The 2014 European Health Interview Survey data revealed a significant gender disparity in self-reported depression: on average, depression affects two times more women than men (WHO, 2017).

Several underlying causes have been described. First, some authors have linked depression to the hormonal impact on women's moods and emotions. Periods where women are most vulnerable to depression, correlate with hormonal changes during puberty, before menstruation, pregnancy, postpartum period, infertility, and perimenopause (Ghaedrahmati et al., 2017). Postpartum depression is frequently evoked, with an incidence in women of 10-20%, appearing during the first six months after giving birth, causing suffering for the mother and unbalancing the "mother-child" relationship and the newborn's development (Gordon & Girdler, 2014). Third, differences in social and contextual factors specific to women's life circumstances, including violence, lower access to education, lower-income, and family-work unbalance, seem to impact women's higher rate of depression (Jordan et al., 2010). The gender difference is also observed in the persistence of depression symptoms; women experience more chronicity than men (Kessler, 2003).

A higher prevalence of depression in women is also captured in the prescription of anti-depressant drugs. In Canada, from 2007 to 2011, doctors have prescribed anti-depressants two times more to women than men (9.3% v. 4.2% respectively in patients aged 25-44 years old; 17.2% v. 8.2% in patients aged 45–64 years old) (Rotermann et al., 2014; Albert, 2015).

The association between gender and depression presents some cross-country variation. The prevalence of depressive disorders was higher among women than men in most of the EU-28 member states. Portugal presented the highest gender gap, with 13% of women reporting depressive symptoms versus 4.7 % of men, and the lowest gender gap was reported in the Czech Republic, with 3.4% in women versus 2% in men (Hapke et al., 2019). The reasons behind this may be sociological and contextual, like those mentioned above and others related to the access to social support, adequate income or employment protection during pregnancy, after delivery, also during children's early years, as in many countries women are still the main responsible for caring for their families. It is also necessary to emphasize that this gender difference is observed in unipolar depressions but not in bipolar depressions (Albert, 2015). Despite these differences in terms of the prevalence of depression, the rate of depression-related suicide is three times higher among males (Oliffe et al., 2016).
§ Chronic diseases and functional limitation:

Depression in the older age groups appears to be associated with functional limitations, chronic diseases, and decreased quality of life. It is often misdiagnosed and treated inappropriately (Braam et al., 2014).

The depressive syndrome may be secondary to a somatic pathology, to the intake of medication or toxic substances, including alcohol (Conner et al., 2009; Duivis et al., 2013). Pathologies identified as being likely to lead to a secondary depression are:

- Illnesses of the central nervous system: Parkinson's disease, cerebrovascular disease, multiple sclerosis (up to 50% of patients), epilepsy, and some forms of dementia (degenerative or vascular) (Alexopoulos, 2005; Feinstein, 2011).
- Illnesses of the endocrine system: including hypothyroidism and diabetes (Tiemeier, 2003; Barakat, 2016).
- Other illnesses: acquired immunodeficiency syndrome (AIDS), tuberculosis, and cardiovascular diseases (Gonzalez et al., 2011; Zhang et al., 2019).

Having a chronic disease and functional limitations may also adversely affect a person's mental wellbeing. When the illness is severe, it is often associated with a sense of diminishment of physical and intellectual capacities, loss of freedom, and loss of autonomy (Black et al., 2017). Depression emerges as a response to a situation in which the ill person grieves his or her good health. It gives up all sorts of activities, dictating a greater difficulty in social interaction, which leads to social isolation and loss of relationships. If most qualitative studies demonstrated that patients perceived their chronic disease as leading to depression, relatively few studies found that patients believed that depression could have contributed to their chronic disease (Katon, 2011).

b. Individual exogenous factors

- Educational Level

"The better educated you are, the less likely you are to suffer from depression" highlights the OECD's annual report on education (OECD, 2016). In the EU, the share of depressed people is two times higher among the elderly who have not completed secondary education (11.1%, total, 8.4% men, 13.7% women) than in those with upper secondary (8% total, 6.5% men, 9.4%
women), and in those with tertiary education (6.5% total, men 5.6%, women 7.3%) (OECD, 2018).

As such, the education systems may contribute to depression reduction. Indeed, individuals with educational attainment are generally more attractive to the labor market (OECD, 2017). Thus, they have lower unemployment rates and higher incomes, factors that contribute to the reduction of anxiety and depression prevalence (Roser & Ortiz-Ospina, 2017). A study in 2014 showed that higher education levels reduce the risk of unemployment and positively impact income. Consequently, those with higher education levels were less likely to experience depression (Bracke et al., 2014).

- Employment Status

Work nowadays occupies a vital place within our societies. Numerous studies have demonstrated the link between unemployment and an increased risk of mental illness, especially depression (Wanberg, 2012), and it is strongly related to high rates of depressive disorders amongst adults (Paul & Moser, 2009).

Unemployment is a significant social issue as it results in income loss, exacerbates poverty risk, and may affect people's mental health (Leonardi et al., 2018). Indeed, unemployment may cause income loss, and the individual may not be able to make ends meet. The loss of income might have especially a substantial adverse effect on the older adults as older age groups may find it challenging to find a job, and unemployment may impact their future pension benefits, which exposes them to stress and poverty, which may worsen their underlying psychological and physical conditions (Li et al., 2011). Also, unemployment may affect self-confidence and the perception of worth within society (OECD, 2018). It is usual for job seekers to suffer from a highly depreciated self-image (Gebel & Giesecke, 2011) and people with depression to improve their feelings of worth and self-confidence after finding a job. Furthermore, employment offers workers the potential for social interaction needed for their growth and social integration. It is particularly true during emerging adulthood, a phase that requires integration and social recognition.

Nevertheless, research carried out in six European countries (Sweden, Germany, Belgium, Italy, Spain, and Greece) have shown that mental health outcomes resulting from unemployment vary from one country to another. Some cultural and social variations across northern and southern European countries accentuate the stress related to unemployment,
while others seem to provide a protective factor against it. Family ties and social support networks seem to protect against the effects of unemployment as they tend to alleviate social exclusion (Conde-Sala et al., 2017).

Several studies relate unemployment with loss of income, resulting in poorer mental health (Wagenaar et al., 2012). A recent survey by the US-based Gallup Institute found that nearly twice as many job seekers suffer from depression as those in the workforce. The longer the duration of unemployment, the higher the rate of depression. While 15.7% of unemployed people for 12 to 26 weeks suffer from the disease, 19% are unemployed for more than a year. Thus, a vicious circle begins: depression, following the job loss, complicates the return to work (Petrosky-Nadeau & Zhang, 2020).

Although unemployment may affect people of all ages, it has a particular impact on young people. Unemployment rates for individuals aged between 16-24 years old rise by 1.8% for every 1% rise in adult unemployment rates resulting in unfavorable employment prospects and poorer mental health outcomes in later life (Martikainen & Ferrie, 2008). SHARE data suggest that unemployment is related to an increase in depression odds of 45% among older adults. Though reverse causality should be taken into account when determining the effect of depression on employment (Neves et al., 2013)

- **Income**

Financial instability in older age groups often leads to poverty and social exclusion (Binstock et al., 2011). Low socioeconomic status is correlated with greater morbidity and mortality (Lorant et al., 2003). Income loss in the elderly population may have detrimental repercussions on their retirement plans, put them at greater risk of poverty, and make them more prone to mental illnesses, including depression (Li et al., 2011).

Income loss resulting from job loss may lead to a decrease in the person’s living standards or the household. Therefore, insufficient income and economic deprivation are considered factors that contribute to mental pathologies, including depression (Whooley et al., 2002).

Lorant et al. (2003) performed a meta-analysis of over 50 cross-sectional studies on the association between socioeconomic factors and depression. Researchers found that people with low income were two times more likely to suffer from depression than those in higher-income groups. A 7-year cohort study of adults in the UK showed that income decline and an increased financial burden were correlated with an increased risk of depression than no income or financial strain changes (Lorant et al., 2007).
In the EU, individuals with low incomes are more likely to suffer from depression than those with higher incomes. The Eurostat report has shown that Europeans with low incomes were three times affected by depression than those with higher incomes (Eurostat, 2019).

- Marital Status

Most longitudinal and cross-sectional studies have shown that marital status is a factor that may significantly affect depression in the elderly. Social support and social bonds are positively related to mental wellbeing (Thoits, 2011). As such social isolation and lack of social support are associated with depression in the elderly (Sonnenberg et al., 2013).

In general, studies have shown that married people have better mental health than their single, widowed, separated, and divorced counterparts (Jang et al., 2009). A meta-analysis of individuals over 55 years of age demonstrated that being single is a significant risk factor for late-life depression (Yan et al., 2011). Similarly, a European study conducted in Sweden, Denmark, Spain, and England highlighted that divorced individuals report lower levels of physical and mental wellbeing (Amato, 2014). Previous research also suggests that older widows present more depression symptoms than their married peers (Schaan, 2013).

Nevertheless, the impact of marriage on men and women's mental health might differ. It is especially relevant in older cohorts, where marital life-span, obligations, and roles change from those of younger cohorts. Indeed, depression odds ratios seemed smaller for females (vs. males) who were single, widowed, or separated compared to married people (Bulloch et al., 2017) and married men report lower depression rates than single men, whereas differences between married and unmarried women were not found (St John & Montgomery, 2009).

c. Contextual Factors

- Violence against women

Violence against women is universally recognized as a violation of human rights. However, it is still a major public health issue. Violence against women encompasses crimes that are more commonly committed against women, such as sexual and physical abuse, which violate
women's fundamental rights to dignity, equality, and access to justice. The prevalence of domestic violence figures varies across countries, but studies showed that 8% to 12% of women are abused annually by their intimate partners (Bornstein, 2006). In the EU countries, one in five (22%) women since the age of 15 suffered from sexual or physical intimate partner violence in 2012. In the 28 EU Member States, the average 12-months prevalence of sexual and partner violence is 4% (FRA, 2014). The rates vary from 6% of women experiencing physical and/or sexual intimate partner violence in Belgium, Bulgaria, Hungary, Greece, Italy, Romania, and Slovakia, to 2% in Estonia, Poland, Spain, and Slovenia (FRA, 2014).

Evidence suggests a positive association between violence and mental health issues (Scott et al., 2013). In 2012, a study conducted by the European Union Agency for Fundamental Rights (FRA) on 42,000 women aged 18-74 from the 28 EU Member States had shown that approximately 13 million women have experienced physical violence, and 3.7 million women have suffered from sexual violence in the course of 12 months (FRA, 2014).

Violence leads to health problems, both physical and mental. According to the World Health Organization (WHO), violence is a major contributor to women's mental health problems: women who have experienced violence from their partners are two times more likely to experience depression than women who have not experienced any form of violence (FRA, 2014). More than one-quarter of domestic violence victims reported taking medication to deal with depression; these proportions were significantly higher than those of non-abused women (27% vs. 18%) (WHO, 2005). In a longitudinal study, Johnson and colleagues (2014) found that exposure to physical domestic violence was related to depressive symptoms. Similarly, sexual violence has been defined as a major and independent risk factor for later depression in women (Johnson et al., 2014). The consequences of violence and abuse can also affect the next generation and significantly impact a wide range of health and well-being outcomes for infants and children (Scott, 2015) and may reflect a macro effect. Countries with a higher prevalence of violence against women may have a higher prevalence of violence, which may contribute to poorer mental health. Though the literature about the effect of country-, region- or city-level violence in mental health is scarce, Benjet et al. (2019) have found a positive association between neighborhood-level violence and internalizing disorders in Latin American cities. Similarly, we consider that violence against women may reflect an unbalance of power between genders and, consequently, gender inequalities, which may globally affect mental health. Yu (2018) has shown that gender inequality is correlated with gender disparities in mental health and that these disparities are globally associated with the countries' wealth.
• Welfare state regimes and social protection

Country-level policies can improve the lives of their citizens. As previously mentioned, education, employment, and income contribute to the protection against mental illness, beyond access to healthcare services. Providing social protection during unemployment or guaranteeing adequate retirement benefits may decrease stress related to economic deprivation and diminish individual assets' exhaustion.

The principle of social protection and welfare system was born in Europe at the end of the 19th century due to the emergence of an important working class during the industrial revolution. The rise of social risks related to old age, disability, sickness, maternity, unemployment, and housing influences individuals' financial security and has favored the establishment of public social protection to protect all citizens (Adascalitei, 2012). Social protection varies from country to country and can be organized, together with cultural factors, into six different European welfare system regimes. These differ in terms of characteristics, quality, efficiency, and equity.

**Nordic social democratic:** (Denmark, Sweden, and Norway)
The Scandinavian social model is often praised by the European leaders. Strong social cohesion, low unemployment rates, good quality of life, all of which make us envious of our Scandinavian neighbors. It is characterized by universal coverage for social risks, enormous public net spending (including health care), expanded welfare allowances, and a strong prominence is given to social services provision and redistribution through the tax and transfer mechanism. Although differences between countries cannot be disregarded, and public services have come under strain over the last few years, the Nordic countries have demonstrated the highest social security spending for the elderly in Europe.

**Bismarckian:** (Austria, Belgium, France, Germany, and Luxembourg)
The principle of participation is the cornerstone of this model, based essentially on transactions. This model depends on paid participation and almost full social protection coverage. In the case of unemployment, these contributions provide job-seekers a substitute salary for a given period. This system is predominantly class-based and family-based. Compared to the Nordic countries, fund cash benefits are favored to social welfare services.

**Southern:** (Cyprus, Spain, Greece, Italy, Portugal, and Malta)
This model is based on the principle where the family plays a key role in supporting its socially unprotected members. Familism and filial piety that characterize this regime are seen in high levels of multigenerational household co-residence and mutual help and financial support.
(Popova & Kozhevnikova, 2013). It is close to the Bismarckian model, but the labor market is not very versatile due to the protectionist employment policies. Healthcare is legitimatized as a right of citizenship in these countries. Another characteristic is the high degree of particularism about cash subsidies and financing, reflected in high clientelism levels. Furthermore, welfare is directed towards generous pensions benefits entitlement and early retirement to improve working conditions. Consequently, the level of social support is much lower than in other countries.

**Post-communist:** (Czech Republic, Hungary, Poland, Slovenia, and Slovakia)
In general, these countries went through major economic shifts in the 1990s and made significant social-policy reforms. They witnessed the fall of the universalism social welfare regime and moved towards more liberal social welfare policies, particularly marketization and decentralization. These countries' health systems rely on participation and employment social security systems; both the insured employees and their families are covered. They are doing relatively well in tackling disparities and promoting social inclusion while focusing on capital-intensive industries and skills (Bohle & Greskovits, 2007).

**Former-USSR:** (Estonia, Latvia, and Lithuania)
Between 1940–1941 and 1945–1991, the Baltic states witnessed the Soviet authoritarian rule, which impacted their respective development paths. Over more than 20 years, they have undergone drastic reforms in their social policies. Researchers agree that the Baltic states' welfare model is a mix of various regimes and does not match the current typology well. The main conclusion is that Estonia, Latvia, and Lithuania combine traits of both liberal and conservative corporatist welfare regimes, though to a different extent, which means more individual responsibility for its welfare and less government responsibility for guaranteeing a decent standard of living for its citizens. In general terms, the welfare system of the Baltics is a mix of characteristics adopted from the basic security features (where eligibility relies on participation or citizenship) and corporate (where eligibility relies on employees' participation and income-related benefits) systems. However, amid some progress throughout the post-communist shift, the three countries are still falling behind the advanced democracies, particularly when the average wage, welfare spending, and income disparities are compared to Western democracies. Nonetheless, despite relatively good economic growth, the Baltic States do not invest much in social protection, measured as a share of GDP compared to the EU-28 Member States (Aidukaitė, 2013).
3. Methods

3.1 Objective

The main objective of this study is to assess the underlying individual (exogenous and endogenous) and contextual determinants of depression among older Europeans.

3.2 Data source

We used data from the SHARE survey (Börsch-Supan, 2019). This is an international, longitudinal, and multidisciplinary survey of over 80,000 Europeans aged 50 years old and above. It was launched in 2002, and the first wave was conducted in 2004 across 11 European countries. Since then, the Survey is conducted every two years, and today it covers 27 European countries and Israel. It is a valuable tool for understanding health, the labor market and its workforce participation, and the social history of elder care in Europe. SHARE's main objective is to provide data on individuals as they grow old and their environment to understand better the process of aging among Europeans (Bergmann et al., 2017).

The SHARE target population consists of all individuals aged 50 years and more, who are domiciled regularly in the respective SHARE country at the time of sampling. Individuals who are imprisoned, hospitalized, or absent from the country all along the survey period, incapable of speaking one of the country's official language(s), or have relocated to an unknown address/location are excluded from the study (Börsch-Supan et al., 2013).

We used cross-sectional data from its sixth wave (Börsch-Supan, A, 2019), implemented in eighteen European countries, including Israel, between February 2015 to November 2015 (Bergmann et al., 2017). Data collection was carried out using computer-assisted personal interviewing. The average interview time for a single person is 80 minutes and 125 minutes for a couple for the refreshment sample, which consists of new individuals randomly selected from the National Registry and 75 minutes and 130 minutes respectively for the longitudinal sample, which consists of individuals who participated in the Survey in previous waves. The
questionnaire is common to all countries and comprises various well-being, economy, and social/family. SHARE has been validated and reviewed regularly by the Ethics Committee Council of the Max Planck Society, and all participants provided written consent.

In order to evaluate the impact of individual and contextual factors on the distribution of depression among the elderly in Europe, we selected data from sixteen countries (n=316,950 individuals): Austria (n=17,010); Germany (n=22,060); Sweden (n=19,530); Spain (n=28,180); Italy (n=26,565); France (n=19,740); Denmark (n=18,665); Greece (n=24,685); Belgium (n=29,115); Czech Republic (n=24,290); Poland (n=9,130); Luxembourg (n=7,820); Portugal (n=8,380); Slovenia (n=21,120); Estonia (n=28,190); Croatia (n=12,470). The sixteen countries were chosen to provide a wide representation through various regions of Europe (north, central, east, and south), particularly for the Eastern European population where there is limited research on depression in the elderly, and we only selected countries with data available on contextual factors (namely, on violence against women). We excluded individuals with missing data regarding the dependent and independent variables (n=14337; 4.5%). The final sample contained 302,613 participants.

### 3.3 Dependent variable

The dependent variable to be explained in this study is depression. Depressive symptoms were assessed based on the EURO-D scale, a depression-screening instrument designed for cross-country comparisons of older people (Guerra et al., 2015). It encompasses 12 items, which account for one value: depressed mood, death wishing, pessimism, feelings of guiltiness, sleep disorders, lack of interest, appetite and enjoyment, irascibility, tiredness, concentration difficulties, and tearfulness. Its score varies from 0, not depressed, to 12, very depressed. Its criterion validity and psychometric properties have been confirmed previously (Castro-Costa et al., 2008). Depression was considered when four or more symptoms were identified by the participant, as in Börsch-Supan et al. (2005).
3.4 Independent variables

We considered age, gender, long-term illness, functional limitations, and hearing limitations as individual endogenous variables, and marital status, educational level, employment status, and household ability to make ends meet as individual exogenous variables.

Age was divided into three age intervals: 50-64 years old (reference category), 65-79 years old, and older than 80. Gender was divided into two groups: male (reference category) and female.

Health variables were obtained by asking respondents if they were suffering from long term illnesses (yes as reference category), if they have been limited in activities due to a health condition (limited as reference category), and how was their hearing using a hearing aid (fair/good/very good/excellent were grouped into a reference category).

Marital status was broken down into four groups: married (reference category), never married, divorced, widowed. Education was categorized into four groups: no education (reference category), primary, secondary and tertiary education. Employment status was categorized into six groups: retired (reference category), employed or self-employed, unemployed, permanently sick, and other. Household ability to make ends meet was classified into two groups: with difficulty (reference category) and without difficulty.

We included two contextual variables in our models: welfare models and violence against women. To investigate how the welfare models may influence the depression in the elderly, we adopted the welfare state classification recently used in public health research (Campos-Matos & Kawachi, 2015; Leão et al., 2018). As such, we categorized the sixteen countries into six groups: Scandinavian (Denmark and Sweden) (reference category), southern (Spain, Greece, Italy, and Portugal), Bismarckian (Austria, Belgium, France, Germany, and Luxembourg), Post-communist (Croatia, Czech Republic, Poland, and Slovenia), Former-USSR (Estonia).

Violence against women was defined by the proportion of women (age 15-49) subjected to physical and/or sexual violence in the last 12 months in a certain country (World Bank database, 2019). This was included as a continuous variable.
3.5 Statistical analysis

We performed a descriptive analysis to describe our sample and first assess the difference in the prevalence rates of depression between the different subgroups of the sample. We then analyzed the association between depression, individual (endogenous and exogenous), and contextual factors using logistic regression models estimating odds ratios (OR) with 95% confidence intervals (95%CI).

We first modeled the effect of individual demographic variables (age and gender). In the second model, we added individual health variables (functional limitations and long-term illness and hearing disorders). In the third model, we incorporated individual sociodemographic variables (marital status, education, employment, and income). In the fourth model, we included the contextual variables (welfare models and violence against women). We did not add countries as fixed effects since welfare states were included as variables, and the model presented high collinearity between countries and welfare states.

The significance value was set at p < 0.05. Analyses were performed using the Statistical Package for Social Sciences (SPSS) software version 25.0 and STATA software version 13.1.
4. Results

4.1. Description of the sample

The study sample consisted of 302,613 participants over 50 years old, living in 16 European countries. The majority were women (56.1%), aged 65-79 (44.3%), married (71.5%) and retired (59.4%). About half had a long-term illness (52.5%) and functional limitations (46.6%). Also, half had a secondary education level (49.6%). With regard to the prevalence of depression, 27.71% of the participants scored above the cut-off point for depression (more than four items). The mean proportion of women subjected to violence in these countries amounted to 5.35% ± 2.07%.

Women, those aged 80 and above, those with no education, widowed, permanently sick, and having difficulty making ends meet presented the highest prevalence rates of depression. The complete data are shown in Table 1.

4.2 Associations between depression, individual and contextual factors

Table 2 shows the association between depression, individual endogenous and exogenous, and contextual factors.

In model 1, amid demographic variables (age and gender), we observed that older adults aged 65-79, and 80 and over have a greater probability of suffering from depression compared to those aged 50-64 (OR=1.019, p<0.001; OR=1.155, p<0.001 respectively). Likewise, females were significantly more likely to suffer from depression (OR=1.153, p<0.001).
Table 1: Sample characteristics and prevalence of depression in sample subgroups.

<table>
<thead>
<tr>
<th>Demographic characteristic</th>
<th>Total Sample</th>
<th>Prevalence of depression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample size</td>
<td>302613</td>
<td>27.7%</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>43.9%</td>
<td>19.6%</td>
</tr>
<tr>
<td>Female</td>
<td>56.1%</td>
<td>34.0%</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-64</td>
<td>42.0%</td>
<td>25.1%</td>
</tr>
<tr>
<td>65-79</td>
<td>44.3%</td>
<td>26.4%</td>
</tr>
<tr>
<td>&gt;=80</td>
<td>13.8%</td>
<td>39.6%</td>
</tr>
<tr>
<td>Hearing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fair/good/very good/excellent</td>
<td>98.0%</td>
<td>27.2%</td>
</tr>
<tr>
<td>Poor</td>
<td>2.0%</td>
<td>52.9%</td>
</tr>
<tr>
<td>Long term illness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>47.4%</td>
<td>17.9%</td>
</tr>
<tr>
<td>Yes</td>
<td>52.5%</td>
<td>36.5%</td>
</tr>
<tr>
<td>Limited in activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>53.4%</td>
<td>16.5%</td>
</tr>
<tr>
<td>Yes</td>
<td>46.6%</td>
<td>40.5%</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>71.5%</td>
<td>24.8%</td>
</tr>
<tr>
<td>Never Married</td>
<td>5.5%</td>
<td>27.9%</td>
</tr>
<tr>
<td>Divorced</td>
<td>8.2%</td>
<td>29.6%</td>
</tr>
<tr>
<td>Widowed</td>
<td>14.8%</td>
<td>40.1%</td>
</tr>
<tr>
<td>ISCED1997</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No education</td>
<td>6.9%</td>
<td>43.0%</td>
</tr>
<tr>
<td>Primary</td>
<td>17.6%</td>
<td>35.9%</td>
</tr>
<tr>
<td>Secondary</td>
<td>49.6%</td>
<td>26.1%</td>
</tr>
<tr>
<td>Tertiary</td>
<td>25.9%</td>
<td>21.0%</td>
</tr>
<tr>
<td>Current job situation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retired</td>
<td>59.4%</td>
<td>27.4%</td>
</tr>
<tr>
<td>Employed or self-employed</td>
<td>24.0%</td>
<td>19.7%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>2.9%</td>
<td>32.6%</td>
</tr>
<tr>
<td>Permanently sick</td>
<td>3.0%</td>
<td>52.8%</td>
</tr>
<tr>
<td>Homemaker</td>
<td>8.8%</td>
<td>38.4%</td>
</tr>
<tr>
<td>Other</td>
<td>1.9%</td>
<td>40.7%</td>
</tr>
<tr>
<td>Household able to make ends meet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>With difficulty</td>
<td>40.1%</td>
<td>37.0%</td>
</tr>
<tr>
<td>Without difficulty</td>
<td>59.9%</td>
<td>21.4%</td>
</tr>
<tr>
<td>Welfare Models</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scandinavian</td>
<td>12.1%</td>
<td>17.08%</td>
</tr>
<tr>
<td>Southern</td>
<td>28.1%</td>
<td>31.72%</td>
</tr>
<tr>
<td>Bismarckian</td>
<td>30.2%</td>
<td>27.24%</td>
</tr>
<tr>
<td>Former-USSR</td>
<td>8.6%</td>
<td>34.03%</td>
</tr>
<tr>
<td>Post-communist</td>
<td>21.0%</td>
<td>26.58%</td>
</tr>
<tr>
<td>Violence against women</td>
<td>[mean proportion ± SD]</td>
<td>5.33 ± 2.05</td>
</tr>
</tbody>
</table>

Note: SD, standard deviation
We included health variables into model 2. The older adults experiencing poor hearing, long-term illness, functional limitations are more likely to suffer from depression than their counterparts (OR=1.166, p<0.001; OR=1.075, p<0.001; OR=1.199, p<0.001, respectively). These results remained relatively unchanged except for the association with age, which became reversed in the 65-79 age group, becoming slightly protective of depression (OR=0.987, p<0.001).

The inclusion of socio-economic variables (marital status, education, employment status, and income) in model 3 removed the statistical significance of the 65-79 age group (OR=0.997, P=0.123). The risk of depression was higher in those never married, divorced, and widowed than in their married counterparts (OR=1.017, p<0.001, OR=1.023, p<0.001, OR=1.046, p<0.001, respectively). When looking at the educational level, having primary, secondary, and tertiary education had a protective effect against depression compared to those with no education (OR=0.964, p<0.001; OR=0.920, p<0.001; OR=0.909, p<0.001, respectively). Regarding employment status, those who were employed or self-employed, unemployed, permanently sick, homemaker and other were significantly more likely to suffer from depression than their retired counterparts (OR=1.007, p<0.001; OR=1.059, p<0.001; OR=1.151, p<0.001, OR=1.041, p<0.001, OR=1.064, p<0.001, respectively). About the household’s financial situation, those making ends meet without difficulty are less likely to suffer from depression than those making ends meet with difficulty (OR=0.901, p<0.001).

After adjusting for contextual variables (violence against women and welfare models) in model 4, each 1% increase in violence against women increased the odds of depression by 0.7% (OR=1.007, P < 0.001). As for welfare models, we observed a significant relationship between living in the Southern, Bismarckian, Former-USSR, and Post-communist models and depression compared to the Scandinavian model (OR=1.082, p<0.001; OR=1.074, p<0.001; OR=1.089, p<0.001; OR=1.039, p<0.001 respectively). The results mentioned above remained relatively unaltered after adjustment for these contextual factors, except for the effect of being employed/self-employed comparing to being retired, which lost its significance (OR=1.004, P=0.072).
Table 2: Association between depression and age and gender (model 1), and hearing, long term illness and functional limitations (model 2), and marital status, education, employment status and financial distress (model 3), and welfare regimes and violence against women (model 4).

<table>
<thead>
<tr>
<th></th>
<th>Model 1 OR (95% CI)</th>
<th>Model 2 OR (95% CI)</th>
<th>Model 3 OR (95% CI)</th>
<th>Model 4 OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong> (Ref.: 50-64)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-79</td>
<td>1.019*** (1.016-1.022)</td>
<td>0.987*** (0.983-0.990)</td>
<td>0.997 (0.992-1.001)</td>
<td>0.997 (0.993-1.002)</td>
</tr>
<tr>
<td>&gt;=80</td>
<td>1.155** (1.149-1.161)</td>
<td>1.059*** (1.053-1.064)</td>
<td>1.047*** (1.041-1.053)</td>
<td>1.048*** (1.041-1.054)</td>
</tr>
<tr>
<td><strong>Gender</strong> (Ref.: male)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1.153*** (1.149-1.157)</td>
<td>1.140*** (1.114-1.121)</td>
<td>1.118*** (1.114-1.121)</td>
<td>1.121*** (1.117-1.124)</td>
</tr>
<tr>
<td><strong>Hearing</strong> (Ref.: fair/good/very good/excellent)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>1.166*** (1.153-1.179)</td>
<td>1.106*** (1.094-1.118)</td>
<td>1.107*** (1.095-1.119)</td>
<td></td>
</tr>
<tr>
<td><strong>Long-term illness</strong> (Ref.: No)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.075*** (1.071-1.079)</td>
<td>1.073*** (1.069-1.077)</td>
<td>1.078*** (1.074-1.082)</td>
<td></td>
</tr>
<tr>
<td><strong>Functional limitations</strong> (Ref.: No)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.199*** (1.194-1.203)</td>
<td>1.172*** (1.168-1.176)</td>
<td>1.172*** (1.168-1.176)</td>
<td></td>
</tr>
<tr>
<td><strong>Marital status</strong> (Ref.: Married)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>1.017*** (1.010-1.023)</td>
<td>1.014*** (1.007-1.021)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Divorced</td>
<td>1.023*** (1.017-1.029)</td>
<td>1.022*** (1.016-1.028)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
<td>1.046*** (1.041-1.051)</td>
<td>1.046*** (1.041-1.051)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Education level
(Ref.: No education)

<table>
<thead>
<tr>
<th>Level</th>
<th>Odds Ratio</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>0.964***</td>
<td>(0.958-0.971)</td>
</tr>
<tr>
<td>Secondary</td>
<td>0.920***</td>
<td>(0.914-0.925)</td>
</tr>
<tr>
<td>Tertiary</td>
<td>0.909***</td>
<td>(0.903-0.915)</td>
</tr>
</tbody>
</table>

### Employment status
(Ref.: Retired)

<table>
<thead>
<tr>
<th>Status</th>
<th>Odds Ratio</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed or self-employed</td>
<td>1.007**</td>
<td>(1.002-1.011)</td>
</tr>
<tr>
<td>Unemployed</td>
<td>1.059***</td>
<td>(1.048-1.069)</td>
</tr>
<tr>
<td>Permanently sick</td>
<td>1.151***</td>
<td>(1.140-1.162)</td>
</tr>
<tr>
<td>Homemaker</td>
<td>1.041***</td>
<td>(1.035-1.047)</td>
</tr>
<tr>
<td>Other</td>
<td>1.064***</td>
<td>(1.053-1.076)</td>
</tr>
</tbody>
</table>

### Financial distress
(Ref.: With difficulty)

<table>
<thead>
<tr>
<th>Status</th>
<th>Odds Ratio</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without difficulty</td>
<td>0.901***</td>
<td>(0.898-0.904)</td>
</tr>
</tbody>
</table>

### Welfare model
(Ref.: Scandinavian)

<table>
<thead>
<tr>
<th>Model</th>
<th>Odds Ratio</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern</td>
<td>1.082***</td>
<td>(1.076-1.089)</td>
</tr>
<tr>
<td>Bismarckian</td>
<td>1.074***</td>
<td>(1.069-1.080)</td>
</tr>
<tr>
<td>Former-USSR</td>
<td>1.089***</td>
<td>(1.082-1.097)</td>
</tr>
<tr>
<td>Post-communist</td>
<td>1.039***</td>
<td>(1.033-1.046)</td>
</tr>
</tbody>
</table>

### Violence against women

<table>
<thead>
<tr>
<th></th>
<th>Odds Ratio</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violence against women</td>
<td>1.007***</td>
<td>(1.007-1.008)</td>
</tr>
</tbody>
</table>

Note: P-values: *p value < 0.05; **p value < 0.01; ***p value < 0.001; OR, odds ratio; CI, confidence interval.
5. Discussion

5.1. Main findings of this study

Women, older and least educated persons, those suffering from chronic diseases, functional limitations, or poor hearing capacity, have a higher risk of depression. Having a low education, being single, divorced or widowed, employed, unemployed, permanently sick or homemaker, and facing financial distress were also risk factors for depression. Finally, living in countries where women were more subjected to violence, and in Southern, Bismarckian, Former-USSR, Post-communist countries were associated with higher odds of depression. These risks of depression remained significant after the simultaneous adjustment for all these endogenous, exogenous, and contextual variables.

5.2. Analysis and comparison with the literature

Overall, our results are aligned with previous studies that analyzed each individual variables' association with depression (independently and/or adjusted by age and gender) and with findings that support the pathway between contextual variables and depression among older European adults.

Considering gender, our results indicate that it is an important factor of depression in older adults. This is in line with the literature regarding the high prevalence of depression among women (Calvó-Perxas et al., 2016; Mazzonna & Peracchi, 2012; Ylli et al., 2016; Zunzunegui et al., 2009), and the higher prescription rates of antidepressant drugs (Rotermann et al., 2014). This may be related to biological and psychological factors, as stressed by Parker and Brotchie (2010). However, various gender-specific social risk factors are described in the literature addressing the gender gap in depression across Europe: female roles seem more likely to be constrained by a lack of choice and opportunities (Van de Velde et al., 2010), heavy workload as women are usually the primary caregivers for their families; children, parents, and spouses (Pinquart & Sörensen, 2006), and a propensity for females to be underestimated (Piccinelli & Wilkinson, 2000). As well, women from older generations tend to have lower social and economic autonomy. Chonody & Siebert (2008) argued that a lower socioeconomic status might be the main factor for increased depression levels in women. It was also suggested that
men have difficulties reaching out for help and have other problems than depression due to societal proscribed gender expectations (Addis, 2008), but as we used a scale to measure depression, this must not be the explanation for our findings. Helvik et al. (2011) and Stordal et al. (2001) showed that depression was more prevalent in older men than in older women, which is inconsistent with our study. One possible explanation may be due to the scale (Hospital Anxiety and Depression Scale) used by the authors, which does not include somatic disease symptoms and may overrate the prevalence of depression in men and/or underrate in women shown by Nortvedt et al. (2016).

A significant variation in depression prevalence between age groups was observed in our sample, with the highest risk among the elderly aged 80 years and over. This result is in line with previous findings, which showed an increase in the prevalence of depression with age and a higher prevalence in individuals aged 65 and 75 (Roberts et al., 1997; Gostynski et al., 2002). Other studies demonstrated that the increase in the prevalence of depression with age might be attributed to age-related determinants, as poor physical health and disability, rather than age itself (Steffens et al., 2000). A Scandinavian study where the highest prevalence of depression was observed among older people (80 and above) with dementia; this may be explained by the neurochemical and structural changes in demented individuals' brains (Palsson et al., 2001). The significant association of age group 65-79 with depression disappeared after adjustment for long-term illness, functional limitations, and socioeconomic factors. This is consistent with the studies that showed that healthy elderly might not be at greater risk of depression than younger individuals, as the observed effect of age on depression is mostly due to physical and functional health issues (Stordal et al., 2003).

It has been widely reported that chronic diseases and functional limitations are consistently associated with a higher prevalence of depression among older adults and that this association may be bidirectional. Depression can occur due to particular biological effects of a chronic illness (Anderson et al., 2001) and due to the fact that functional limitations and chronic illnesses impact the persons' autonomy, identity, and wellbeing, as well as its ability to maintain its social connection, becoming socially isolated. Cole & Dendukuri (2003) and Schillerstrom and colleagues (2008) demonstrated that older adults with poor hearing are more likely to suffer from disabilities and limitations in their daily activities; both were confirmed risk factors for depression in older individuals (Gopinath et al., 2012). A well-documented mechanism concerns the communication problems resulting from poor hearing, by which social and interpersonal functioning may be challenged (Kiely et al., 2013). Penninx and collaborators (1999) suggested that communication barriers, such as social isolation and lack of social support, which may arise from poor hearing and functional limitations, have been reported to
lead to depression. According to Blazer and Tucci (2019), this may be partially due to the struggle following a conversation, which increases isolation feelings. It was also argued that poor hearing might then evolve into a chronic stressor, contributing to depressive symptoms with a lack of social support (West, 2017), and individuals with hearing disorders may have low levels of assistance-seeking, which may further lead to or worsen the symptoms of depression (Sheppard, 2008).

As in our study, several others found that marital status was a significant predictor of depression in older groups. Bromet et al. (2011) and Vable et al. (2015) demonstrated that divorced, separated, and widowed reported a higher level of depression than married people, as well as Carr (2004) and Lee et al. (2001). This may be explained by social support, which is believed to affect the relationship between marital status and depression in different older age groups, e.g., married or widowed (Pinquart, 2003). Empirical research findings indicate that social support can mitigate the effects of risk factors on depression in the elderly (Bozo et al., 2009). Sonnenberg and collaborators (2013) emphasized the importance of spousal support and its protective role against depression in the elderly. Also, having no spouse or partner in the household is positively associated with depressive symptoms in older adults (Vable et al., 2015).

In terms of education level, our findings show that higher education is a protective factor against depression in older adults, which is in line with the results from a large-scale prospective study that showed that lower educational attainment is associated with a greater risk of depression (Eikemo et al., 2008; Kok et al., 2012). Likewise, a Norwegian cross-sectional study found a significant association between low levels of education and depression (Bjelland et al., 2008). Indeed, education attainment may help prevent depression by contributing to cognitive skills, attitudes, and beliefs that form health-related behaviors. For example, education attainment might help protect against depressive disorders by enhancing cognitive abilities, attitudes, and perceptions influencing health-related behaviors (Laheima et al., 2006; Patel & Kleinman 2003). Furthermore, education may provide a higher income and better living conditions, reducing the population's exposition to stress or social isolation. Education can be seen as human resource capital, allowing individuals to pursue and achieve basic goals involving emotional wellbeing (Bjelland et al., 2008).

Our findings suggest that employment status is a risk factor for depressive symptoms in older adults: those unemployed, employed or self-employed, and permanently sick had a higher risk of being depressed than those who were retired. Previous research indicates that unemployment among older individuals is related to poorer health (Sullivan & Von Watcher,
2009) and a higher prevalence of depression (Gallo et al., 2000). Nevertheless, those permanently sick and socially vulnerable may be excluded from the labor market (Salm, 2009). Riumallo-Herl & collaborators (2014) found that unemployment was significantly associated with depression in Europe and the U.S.; this implies that social protection schemes may not be enough to alleviate unemployment’s negative impact, contributing to depression. Surprisingly, in our study and after adjusting for contextual factors, we observed no statistically significant association between being employed and depression, comparing to being retired. This contrasts with Bartley (1994) and Matour & Prout (2007) results, which emphasized that having a job may enhance people’s cognitive skills, autonomy, motivation, interpersonal interaction, self-esteem, and social identity, nor with a Finnish study that demonstrated that depression is correlated with retirement, as retired elderly may be economically and socially inactive (Lamberg et al., 2010). Our results are in line with Westerlund et al. (2010), who concluded that retirement reduced depressive symptoms among people. Indeed, as we adjusted our model to the capacity of making ends meet and to the different welfare models where people lived, the effect of being employed vs. retired was mitigated. The loss of employment effect may be explained by the fact that more protective welfares may be protecting socially and economically the older adults who were retired, allowing them to have the risk for depression as the employed. Indeed, some authors have even defended that retirement can free individuals from stress, and work-related obligations may help them have a better perception of their health and mental wellbeing even in the event of an illness (Segel-Karpas, 2015).

As previously stated, loss of income or financial distress was associated with higher depression odds in older people (Zimmerman & Katon, 2005; McCall et al. 2002; Kahn & Fazio, 2005; Dunlop et al. 2003). People with higher income and wealth are less likely to suffer from depression than those who live in poverty. This is in line with our findings; being able to make ends meet is a protective factor against depression, which may explain that having an income may provide a standard of living conditions and access to health care services (Araya et al., 2003), which will reduce stress, anxiety and the risk of depression (Lorant et al., 2003).

European welfare models have been correlated with depressive symptoms in older adults (Whelan & Maître, 2010). Levecque and colleagues (2011) found that the mean value for depression was higher in eastern and southern European countries, emphasizing the welfare system’s role in alleviating, or reversing, the impacts of economic distress, and aging on health. A comparative analysis of seven welfare models concluded that individuals from the Southern European countries had higher odds to suffer from depression in the past 12 months (Chung et al., 2013). In this regard, Eastern and southern countries are characterized by restricted
social protection, higher socioeconomic disparities, and lower quality of life than in Nordic and central European countries (Conde-Sala et al., 2017). According to our results, the elderly with a Bismarckian, southern, former-USSR, and post-communist welfare model have higher odds of being depressed than their Nordic neighbors. The Scandinavian welfare model's characteristics may explain this variation; strong universalism, excellent social protection, active labor market policies, gender equality, and high social inclusion (Whelan & Maître, 2010).

Violence against women may reflect gender power disparities and this unbalance tends to be linked to the culture of women's abuse (Oram et al., 2017). Some researchers have long argued that the higher rates of violence against women result from laws, policies, social structure, and traditional patriarchal institutions that consistently consider women subordinate to men in many countries. Women are more often abused in countries where men have economic power and the ability to exert control and decision-making within the household, where it is difficult for women to divorce, and where adults regularly use violence to resolve their disputes (Heise, 2012). Furthermore, several studies have explored the relationship between violence against women levels and other economic and societal power indicators, such as the proportion of seats held by women in National Parliament, secondary school level attainment, women's rights, and whether or not a country has signed a Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) (Heise, 2012). In a cross-sectional study, researchers suggested that in "collectivist" societies, where women should sacrifice their wellbeing for the wellbeing of their families, the violence is higher than in "individualist" societies (Archer, 2006). As a result, in countries where women are victims of physical/sexual violence may therefore perceive their situation as hopeless, generating feelings of fear, mistrust, shame, guilt, stigma, lack of social support, social isolation, victimization, loss of self-esteem, leaving them to feel vulnerable and raising their feelings of depression (Torres & Han, 2000; Jordan et al., 2010).
6. Limitations of the study

Our study has methodological strengths and limitations that need to be addressed. First, we used cross-sectional data. Although the literature and knowledge of biological pathways support our belief that these risk factors contribute to depression in older adults, reverse causality cannot be excluded, as we cannot observe the variables and their health effects in a chronological sequence. However, this limitation is considerable for individual variables, but it is unlikely to occur regarding contextual variables as welfare states: it is unlikely that the depression status influences the welfare state individuals to live in.

Second, depression was assessed by a questionnaire, not using a previous diagnose. Though, the Euro-D scale has demonstrated strong validity, and internal consistency to identify depression in participants has already been validated using clinical assessment in various European contexts (Castro-Costa et al., 2008; Guerra et al., 2015). We also believe that using a validated questionnaire incorporated in a face-to-face interview must have better captured those older adults who were depressed but not diagnosed due to a lack of access to healthcare services.

Similarly, chronic illnesses and functional limitations were identified using self-report scales, which may be subject to bias, and people from different countries may likely interpret and respond differently to these questions, and thus measurement biases in estimates of the prevalence of depression and its determinants may not be excluded (Andrade et al., 2000). However, these scales are commonly used and depend on the presence or absence of particular symptoms or medical conditions; its implementation followed similar methods across SHARE countries. As such, the likelihood of different reporting bias across countries is minor.

Third, the collection of accurate violence data poses certain challenges as the definition of violence may differ from one culture to another and, thus, from one country to another. Women from progressive countries may report violence more accurately than conservative countries, while these may underreport it. The differences between these countries must be more expansive in the real world, which may have underestimated the association between violence against women and depression symptoms in the population.
Fourth, to have a comprehensive perspective on the prevalence of depression in these 16 European countries, we divided them into five welfare models. Typology grouping provides a theory-based analysis of the impact of these countries' cultural and socio-political determinants on health outcomes but does not consider the variations within the welfare state or country (Aidukaite, 2011). We have adjusted our analysis for education and income, allowing us to observe the variations in the risk of depression according to their socioeconomic status.
7. Conclusion

The experience of depression can result in emotional distress and impairment and constitute a significant barrier to healthy aging. As in the rest of the world, in Europe, depression is a frequent disorder among older adults and constitutes a public health concern that must be taken seriously. Therefore, there is an urgent call to focus on depression in older adults and its risk factors.

This study enlightens the importance of the individual (endogenous, exogenous) and contextual factors as the main drivers of depression in European older adults. Our study shows that women, older and least educated individuals, those suffering from chronic disease, functional limitations, or poor hearing capacity had a higher risk of depression. Having a low education, being single, divorced or widowed, employed, unemployed, permanently sick or homemaker, and facing financial distress were also risk factors for depression. Finally, living in countries where women were more subjected to violence and in Southern, Bismarckian, Former-USSR, Post-communist countries were associated with higher odds of depression.

As such, depression should be addressed through social policies and strategies that should strive to provide adequate living conditions for healthy aging and tackle social and economic hardship. Welfare models with consistent social support may play a decisive role in cushioning the effect of deprived socioeconomic status on depression in older age groups. More specifically, retirement benefits, housing support, and strong community cohesion can contribute to better living conditions, as well as measures preventing violence against women, as through the promotion of gender equity. Raising awareness about depression among the older adults and implementing mental health services are fundamental to reduce the burden of depression and its consequences in this group. Mental health services should not only be made available to all the population but specifically target the higher-risk groups: those with chronic diseases and functional limitations, socioeconomically deprived and socially isolated.
8. References


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