Marital Biography and Health in Old Age: Insights from European Survey Data

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Index of Abbreviations: Country Codes

AT	Austria
BE	Belgium
CH	Switzerland
CZ	Czech Republic
DE	Germany
DK	Denmark
ES	Spain
EE	Estonia
FR	France
GR	Greece
IL	Israel
IT	Italy
IE	Ireland
LU	Luxembourg
NL	The Netherlands
PL	Poland
PT	Portugal
SE	Sweden
SI	Slovenia

INTRODUCTION

Life expectancy has risen enormously since the mid-19th century. For both women and men, it has more than doubled. In most developed countries, life expectancy has been increasing almost linearly, and there is no sign of rates ceasing. Especially the age group above 85 years represents the fastest growing population group over recent decades (Christensen *et al.* 2009; Oeppen and Vaupel 2002). European societies are composed of more old inhabitants than ever before, and these people spend more time in later life stages than ever before. This trend of demographic change has fuelled ageing research, where a broad spectrum of scientific disciplines analyse the causes and consequences of population ageing. A key aspect in the context of ageing research is health. It is still unclear whether there will be a compression or an expansion of morbidity, that is, whether more years of life mean more years spent in deteriorating health, or whether frailty is shifted to the very last years of life (Christensen *et al.* 2009). Hence, one aim of ageing research is the identification of patterns of health trajectories in later life and their causal roots.

From a sociological perspective, there is a puzzle which deserves greater attention: health and life expectancy are not only affected by biological factors[1] or epidemiological achievements, but they are also connected with personal relationships and family processes (Rapp and Klein 2015; also Carr and Springer 2010). One manifestation of these personal relationships is marriage. The reasons that people marry are of course manifold. Marriage can have its roots in economic security, social norms, shared responsibilities, or even in an abstract feeling of romantic love. And yet probably no one marries solely for reasons of health. Nevertheless, it is an established phenomenon that married people are healthier and live longer than the unmarried: "The greater longevity of married as compared with unmarried persons has been repeatedly demonstrated by studies dating back to the mid-1800s. […] married persons enjoy better health, make fewer demands on the health care system and experience lower death rates than single, widowed and divorced persons" (Goldman, Korenman and Weinstein 1995: 1717). Most studies in the domain of the marriage-health nexus have been conducted for the young or middle-aged life. The effects of marital status on health in the elderly are less analysed (Goldman, Korenman and Weinstein 1995). Whether the observed 'marriage benefit' continues, increases, or attenuates in old age is yet unclear. The limited number of existing studies show mixed results (Grundy and Tomassini 2010; Manzoli *et al.* 2007; Murphy, Grundy and Kalogirou 2007). The objective of this study is to gain more knowledge about health differentials by marital status in old and oldest age, using the broad spectrum of data provided by the Survey of Health, Ageing and Retirement in Europe (SHARE).

In recent decades, applying a life course perspective has become popular in the social sciences (Mayer 2009). The life course paradigm can help scholars to understand "how health differentials in older adults arise" (McFarland, Hayward and Brown 2013: 363). Marital status is one of the aspects of life,

[1] The recent advance in human longevity has its roots exclusively in non-genetic factors – the pace of the rise of life expectancy has occurred too fast to be caused by genetic changes (Westendorp and Kirkwood 2008).

which is has its roots in the past but has "important consequences in the present" (Festy and Rychtarikova 2008: 65). However, current marital status does not reflect the complexity of the life course of older individuals. Two persons who are married at the age of 70 can differ widely in their past marital biography: one might have been married once and continuously for 50 years, whereas the other might have experienced two divorces and is now remarried for one year. In other words, "within one marital status category, individuals differ with respect to their duration and pathway into that status" (Carr and Springer 2010: 748). The question is this: what has more impact on health in old age – current marital status or marital biography?

Adopting a life course perspective leads to another important part of the marriage-health connection: the role of health prior to marrying (or not marrying). One must therefore consider the theoretical explanations why differentials in health and mortality among the marital status groups are observed. On the one hand, there is the concept of social causation, the so-called marriage protection effect. This concept claims that marriage has a beneficial effect on health and longevity itself. On the other hand, there is the assumption that the observed marriage benefit is a product of reverse causality: the positive health outcomes for the married are a consequence of selection effects. Healthier people just have better chances to marry and to stay married (e.g. Manzoli *et al.* 2007). One's health *prior* to a potential marriage influences the selection into a marital status group. Which mechanisms are really at work is still an open question. Empirically, both selective effects and protective mechanisms of marriage and health have been found to date (McFarland, Hayward and Brown 2013).

In the present study I investigate the partnership biographies of Europeans aged 50 and older, and examine differences in health outcomes by marital status in later life by applying a life course perspective. Instead of merely considering current marital status, the study considers and compares marital biographies and the connection to health in old age. At the same time, there is the attempt to address selection effects by considering observed congenital health differences in early life, and by exploiting the longitudinal data structure to take care of unobserved heterogeneity.

Additionally, this study contributes to the literature by analysing objective health indicators. As mentioned above, the reasons that someone marries are manifold. Why some people experience different marital biographies than others has no simple or single-cause explanation. One can assume that a part of the observed marriage benefit is rooted in unobserved factors, which research to date has been and presumably is unable to reveal. Previous literature on the marriage-health benefit has often focused on self-rated health measures or all-cause mortality. Specific health conditions have often been examined using self-reports, within non-representative clinical samples or single country studies. The analysis of specific, more objective health measures can help avoid bias, which is caused by differences in reporting behaviour. Both marital status (Bardage *et al.* 2005) and country differences (Jürges 2007) may be factors which influence self-rated health scales**.** Hence, another research question of this project is whether the marriage benefit is observed when using objective tests of physical and cognitive functioning in later life, and whether results vary by marital biography.

Finally, this research may also have implications for future trends. Societal changes of family norms in Europe have brought about decreasing marriage rates and increasing divorce rates, non-marital living arrangements have become popular and accepted (Toulemon 2016). In combination with population ageing, this will most probably lead to new marital status compositions of the future elderly generation. Societies might consist of a greater number of never married or separated older people than ever before and gathering knowledge about the marriage-health relation in later life will become valuable.

The outline of this dissertation is as follows. *The first section (Chapter I)* sets the stage by summarising the established theories in the field of marital status and health. The following *section II* discusses empirical findings on marital status differences in health with a focus on later life, marital biography, objective health measures, and health in early life. *The third section (Chapter III)* investigates retrospective life history data on partnership biographies of the population aged 50 years and older in 14 European countries. It discusses national marital status compositions and patterns of marital as well as non-marital relationship biographies. The descriptive findings are referred to national marriage-related legislations. *Section IV* contains multivariate analyses between marital status and health outcomes of older Europeans, exploring the role of marital biography. *Chapter IV.1.* will analyse the connection between health in early life, past marital biography, current marital status and health in old age, using objective measures of physical and mental health. Different trajectories and timings of marital biographies are compared. *Chapter IV.2.* presents a longitudinal analysis of physical and cognitive health development after the most common marital transition in later life, widowhood. Different trajectories of the course of widowhood are compared. Both chapters conclude with a summary and discussion of the results. *The conclusion* summarises the main results of the dissertation, discusses possible implications, and provides ideas for future research.

I. THEORETICAL BACKGROUND

The following section sets the stage by giving an overview on theories in the field of marital status and health. First, sociological theories, including the marriage protection theory, stress/crisis theory, and marriage selection theory, are presented to explain the association between marital status and health. Second, psychological theories (socioemotional selectivity theory, interdependence theory), and bio-social perspectives (behavioural endocrinology, gene-environment interaction, disposable soma theory, cognitive reserve theory) are presented, focusing on marital status and health in old age. Additionally, concepts on gender differences of marriage-health benefits are discussed. Theoretical perspectives of the life course paradigm such as the cumulative (dis-)advantage theory are introduced to conceptualise the link between marital biography and health over the life course.

1. Marital Status and Health

1.1. Sociological Theories

1.1.1. Marriage Protection Theory

There are several theoretical explanations why the differentials in health and mortality among the marital status groups are observed. On the one hand, there is the concept of social causation, the so-called marriage protection theory that posits that marriage has an inherent beneficial effect (Manzoli *et al.* 2007). It is also referred to as marital resource model. The mechanisms of marital protection are manifold but operate mainly through economic resources, regulation of health behaviour, and social support (Williams and Umberson 2004).

First, married persons enjoy many economic advantages. They can realise a higher household income by combining two salaries, by the division and specialisation in household and wage labour, by using tax benefits, and by economies of scales. Thus, more money is available to be spent on health care and health resources, good nutrition, safer housing, or better health insurance. Moreover, mental and physical strains of low income can be prevented (Wilson and Oswald 2005; Becker 1998; Liu and Umberson 2008; Rendall *et al.* 2011). Second, lifestyle habits and health behaviour of married persons are monitored, influenced and controlled by the spouse (Rendall *et al.* 2011). Direct control of health behaviour can be exercised by making the other aware of symptoms, by reminding of or initiating appointments with a doctor, by telling the partner to engage in healthy habits (e.g., doing sports) and to stop unhealthy ones (e.g., drug consumption) (Umberson 1992; Wyke and Ford 1992; Wilson and Oswald 2005). Living with a spouse is also said to foster health by facilitating "an 'orderly lifestyle' which may include regular meals and sleep, and compliance with prescribed health regimes" (Wyke and Ford 1992: 524).

Third, the institution of marriage is a source of social control and social integration. It is assumed that social integration has a positive impact on health. Several authors draw on Durkheim's elaboration on suicide (Durkheim 1973 [1897]) to explain the mechanisms of a marital relation:

> "there is a dimension of social organization which enriches and lengthens life. Durkheim called this dimension 'social integration.' Through the configurations of roles, and through membership in groups and structures which promote interaction, social integration maintains the sense of personal identity and reciprocal obligations that make life worth living. In this argument, then, marriage can be taken as an indicator of social integration" (Kobrin and Hendershot 1977: 738; also Umberson 1992).

Additionally, it is argued that marriage is a commitment, as defined by Becker (1960). All following decisions and actions must be in line with the prior investment of marriage in order not to harm it. All this leads to indirect control mechanisms of health behaviours within a marriage. Spouses are aware of their obligations towards the partner and hence avoid risky and harmful actions (Umberson 1992). Similarly, Li, Liu and Guo (2015) state that marriage is, in general, a long-term contract, implying a sense of commitment and obligation to the partner. As a consequence, antisocial behaviour (e.g., delinquency, drugs, violence) is decreased because it might threaten the relationship (Li, Liu and Guo 2015).

Fourth, married persons may benefit from emotional support within their marriage. Emotional support, the intimate connection and the feeling of attachment is supposed „to reduce the incidence of depression and mental illness […] and may provide an important buffer against stress" (Wilson and Oswald 2005: 3). In case of depression, these mechanisms may help to reduce depressive symptoms (Wood, Goesling and Avellar 2007). Marriage prevents people from living alone, "while releasing people from any possible social stigma associated with being unmarried" (Wilson & Oswald 2005: 3). These beneficial effects on mental health may also be associated with physical well-being (Liu and Umberson 2008).

Especially in later life, when declining health and the handling of acute and chronic diseases play a more important role than at younger ages, aspects of social and instrumental support should be vital. Simeonova (2013), who analysed the relationship between marital status and health care utilisation, puts forward that a spouse's practical support with remembering doctor and pharmacy visits, the previous medical history, and with maintaining medication adherence, "prevents the development of new co-morbidities and exacerbation of current conditions" (34). In old age, severe conditions such as heart disease and comorbidities are more likely to arise. To recover from these conditions, complex medication and treatment is needed, which "are positively influenced by being married" (Schultz *et al.* 2017).

1.1.2. Stress Theory

Another model, which considers a causal relationship between marital status and health, is the stress model. It is also called strain model or crisis model. This concept assumes that there is no benefit of marriage per se but that the dissolution of a marriage causes stress and losses in health resources. So it is divorce and widowhood which has negative effects on health and mortality – and thus the health gap between married and unmarried persons is created (e.g. Couch, Tamborini and Reznik 2015; Williams and Umberson 2004; Liu and Umberson 2008). The theory points out that a separation or divorce –

whether desired or not – is an immediate source of stress that has negative health consequences. A marital separation can cause financial and logistical predicaments, negotiations, changes, or a decline in living standards, emotional challenges such as grief about the failed marriage and revision of one's identity, uncertainty, loss of social support, and changes or losses in one's social networks. All these challenges may not only cause acute stress but may lead to chronic stress, especially when there is ongoing conflict with the ex-spouse, and children and new parenting arrangements are involved. As a consequence, these stressors are responsible for an increase in negative emotional, behavioural, and health outcomes (Sbarra *et al.* 2014; Zhang and Hayward 2006; Waite 2009; Hughes and Waite 2009; Amato 2000).

Being widowed is another source of stress. "Death of a spouse is considered as one of the most stressful life events for older adults" (Sundström *et al.* 2014: 750). Losing one's spouse to death is assumed to have negative health consequences through the stress of bereavement. The surviving spouse loses their key social and emotional companion, as well as social and instrumental support (Hughes and Waite 2009; Waite 2009). The financial losses, changes in living arrangements and losses in social networks are assumed to be not as severe as for divorcees, or to be at least gender-specific (men suffering more from loss of social, emotional and practical support; women suffering rather from economic changes). Moreover, bereavement is less likely to be accompanied by prior marital conflict or violence as in the case of divorce. However, care work for a sick spouse prior to death may cause equal stress (Waite 2009; Hughes and Waite 2009). With regard to older adults, it could be theorised that the stress caused by losing a spouse is even more severe for persons in later life since "many older adults experience a pile-up of stressors" (Williams and Umberson 2004: 83) – they are confronted with deaths of others or diminishing economic resources regularly (ibd.).

The health differential between the married and the never married cannot be explained with stressful marital dissolutions since life-long singles neither experience divorce nor widowhood. However, it is argued that the status of being unmarried is a source of stress itself and is rooted in social expectations and norms to have a partner (Wyke and Ford 1992). All in all, the stress model assumes the health gap between married and never married persons to be smaller than between the married and the previously married (Liu and Umberson 2008).

How stress influences health via physiological reactions is summarised in Chapter I.1.3.

1.1.3. Marriage Selection Theory

The marriage selection theory assumes that any observation of a 'marriage benefit' is a product of reverse causality. In contrast to the hypotheses of the marriage protection theory and the stress/crisis model, health is not considered a cause of a marital status but a prerequisite. The marriage selection theory claims that positive health outcomes for the married are a consequence of selection effects – healthier people have better chances to marry and to stay married (e.g. Manzoli *et al.* 2007). In general, someone's health *prior* to a potential entry into or exit out of a marriage influences the selection to the marital status group (McFarland, Hayward and Brown 2013).

One explanation is that healthy people may have advantages on the marriage market and may have better chances to attract a partner and get married. First of all, bad health or disability impose mobility limitations and a stigma, which can lower chances of finding a partner (Wyke and Ford 1992). Evolutionary biology suggests "that several physical and personality traits that define a person as attractive for mating are associated with youth and health, and […] better health is a clear indication of reproductive success" (Guner, Kulikova and Llull 2014: 2; 9f.). To maximise reproductive outcomes, "individuals would mate assortatively in terms of innate permanent health, and innate health should be a good predictor of marriage probabilities" (ibd.: 3). This logic of the marriage market may not only apply to physical health but also to mental health: "those with fewer depressive symptoms may be more likely to get and stay married, because they may be viewed as more attractive marriage partners" (Wood, Goesling and Avellar 2007: 28). This paradigm of the selection theory would explain why better health outcomes are observed in married individuals compared with the never married. Moreover, the same argumentation can be employed to explain why health differentials between currently married and previously married people are observed. As Wilson and Oswald (2005) put it: "if assortative mating occurs, unhealthy people with unhealthy partners are more likely to be widowed" (2). That means that persons seek to mate with persons with similar health status to their own, resulting in stable marriages for the healthiest couples and in unstable marriages for the less healthy ones. Fu and Goldman (1996) draw on the model of assortative mating and evidence of marital homogamy (w.r.t. cultural resources such as family background, ethnicity, or physical traits such as body weight, height, personality, behaviour), and incorporate the dimension of health to the model of marriage selection. They argue that health (physical and mental illness), health-related features (e.g., weight, height), and health behaviours (e.g., smoking, alcohol habits) can affect a person's desire to marry and their desirability as a mate on the marriage market. We can take negative health selection into divorce as an example: "certain individuals possess problematic personal and social characteristics that not only predispose them to divorce, but also lead them to score low on indicators of well-being after the marriage ends" (Amato 2000: 1273).

Regarding the empirical evidence, it is still an open question which mechanisms are really at work – marriage protection or selection effects. Both selective effects and protective mechanisms of marriage and health have been found in analyses. Even the availability of longitudinal data and elaborate statistical techniques cannot provide an indisputable answer. The most popular view is that both protection and selection mechanisms create the health advantage of the married over the single, divorced, and widowed (McFarland, Hayward and Brown 2013; Rapp and Klein 2015).

Another, but less popular, concept within the selection theory is the concept of adverse health selection into marriage. This argumentation assumes that individuals with a bad health status deliberately seek to marry to benefit from the health advantages of a marriage (Lillard and Panis 1996; Cheung and Sloggett 1998).

1.1.4. Gender Differences

Within the research landscape of marital status and health, many studies stress the importance of gender differences in the health advantages of different-sex marriages. Both theoretically and empirically, it has been argued that women and men benefit differently from marriage and are affected differently by marital status transitions. Although the analysis of gender differences is not a main objective of this piece of work, it should not be neglected completely. In the following, I present a short summary of the theoretical argumentation.

First of all, the research field had been dominated by the general consensus that men benefit more from marriage. Recently however, scholars have argued that this difference might have diminished (Umberson and Kroeger 2016). The extent of gender differences in health benefits might have changed over historical time (Liu and Umberson 2008; Tumin 2017), and the contemporary findings of gender differences seem to be rather inconclusive (Carr and Springer 2010; Umberson and Kroeger 2016). The theoretical arguments why men should face greater health advantages when being married draw mainly on traditional gender roles, gender-specific socialisation, and gender-specific health behaviours. Traditional gender roles, as well as social and cultural norms are reiterated and cemented by socialisation processes, ascribing notions as the home and household, being nurturing, caring, and emotional supportive to the female sex; breadwinning on the labour market, being competitive, independent, and risk-taking to males (Umberson 1992; Umberson and Kroeger 2016). Moreover, women take over the role as mother and primary caretaker for babies and children, demanding them to be "in continual contact with the medical system" (Litwak *et al.* 1989: 61). These expectations and the incorporation of gender roles are assumed to make women not only feel responsible for their own health but also for the health of their family members. In a marriage, women are more likely to support their husbands with emotional support than vice versa. This may result in positive effects for mental and physical health for the male spouse (Umberson 1992; Umberson and Kroeger 2016). Furthermore, health threats that can arise through marital conflict, are supposed to affect men less. Since men historically enjoy a higher status in a marriage and society as a whole than women, they are supposed to experience less stress than women: humans "in subordinate positions are more adversely affected by stress than are their more dominate counterparts" (Umberson and Kroeger 2016: 193; Wanic and Kulik 2011). As argued earlier (Chapter I.1.1.1.), it is assumed that married persons benefit from enhanced social control over their health behaviours. However, "being married is much more likely to increase exposure to social control for men than women" (ibd.: 194). On the one hand, observed health benefits of marriage for men may be a result of unhealthy habits of single men such as drinking, smoking, or risky driving being controlled by a wife who does not share these habits. On the other hand, the provision of emotional support and social control may be burdensome and stressful for the wife, and "these marital dynamics may impose some costs for women's health while providing benefits for men's health" (ibd.: 195).

Regarding health differentials between married and previously married men and women, there is a debate whether the loss of a spouse has more influence on the health of men or women. Women are more likely to be socially integrated in general, entertaining social support networks of close friends and relatives, "whereas men typically name their wives as their main source of support and the only person in whom they confide personal problems" (Kiecolt-Glaser and Newton 2001: 472). Integration in social networks is related to positive health habits – consequently, entering a marriage should have more positive effects for men; (never having or) the termination of a marriage should also affect them more (Berkman and Breslow 1983; Litwak *et al.* 1989). The existence and extent of non-marital social contacts can also affect how someone copes with the stressful situation of spousal loss. Since men tend to rely more or solely on their wife as confidant, it is assumed that they lack resources of social support in stressful times of bereavement. Moreover, it has been argued that there are gender differences in coping strategies. For example, women confront and express their grief more than men. Consequently women's health should suffer less from spousal bereavement (Stroebe, Stroebe and Schut 2001). However, concerning physiological responses to marital loss, there is evidence that a divorce is more health damaging to women (Kiecolt-Glaser & Newton, 2001). Zhang and Hayward (2006) sum up a review of research by Kiecolt-Glaser and Newton (2001) as follows:

> "women spent more time ruminating about marital relations than men, and they felt more depressed after arguments with their spouses. Wives also had more vivid and detailed memories of marital conflict than did their husbands. As divorce may be a long and stressful process filled with bitter marital conflicts, 'women's stronger and more enduring memories of marital disagreement are likely to sustain maladaptive physiological changes such as heightened cardiovascular responses and elevated stress hormones'" (Zhang and Hayward 2006: 641; Kiecolt-Glaser and Newton 2001: 494).

In contrast, the end of a marriage could also be a healthy relief rather than a burden for women because it is also the end of psychosomatic stress, which women face within a marriage due to higher expectations and lower bargaining power, compared to husbands (Brockmann and Klein 2004).

Regarding gender differences in marital status and health in old age, theoretical modelling is based on arguments of social and material resources and support. Litwak *et al.* (1989) puts forward the argument that in very old age, which is accompanied by retirement and frailty, gender roles within a couple may dilute and it is now women who gain benefits from being married in very old age:

> "the oldest group of women, because of physical frailties, for the first time in their marriages may require help to manage the everyday health-related household activities. […] It may also be the case that the husband, upon retirement, undergoes a form of adult socialization in which sharing health-promoting household tasks become increasingly legitimated (e.g., becoming knowledgeable about cooking nutritious meals, learning basic first aid, keeping up with the news on health)" (Litwak *et al.* 1989: 62).

Finally, in later life, marital status is a reflection of life-long, unequal power relations between women and men (Arber 2004: 92). Experiencing divorce or widowhood at an advanced age may lead to more health disadvantages in women than men, via the unequal distribution of financial and material resources: "The implicit assumption has been that the financial position of older men is unaffected by

partnership breakdown, whether through widowhood or divorce […]. Widowed and divorced women are disadvantaged in later life, having often spent much of their life course subjugating their own occupational career to their role as wife and mother" (92f.; 106). Hence, widows suffer more from poverty or financial restrictions than widowers in old age (Martin-Matthews 2011). In contrast, never married older women should have access to more financial resources than previously married older women because they are more likely to have conducted wage labour and gained own pension rights (Arber 2004).

1.2. Psychological Theories: Marriage and Health in later Life

The aforementioned theories of marital status and health do not make explicit assumptions about particular stages of life or whether the association between marital status and health should vary across age groups. Theoretical concepts that deliver explanations for health differences between marital status groups in old age come from the field of psychology.

1.2.1. Socioemotional Selectivity Theory

Psychological theories claim that personal relationships have even more impact on one's well-being in later life because ageing adults are aware that their remaining life time is limited. Older adults focus more than younger persons on existing, emotionally meaningful social relationships. This may lead to a smaller social network, which then in turn, may have even more impact on the ageing adult (Bourassa *et al.* 2015; Carstensen 2006). The socioemotional selectivity theory suggests that this behaviour of more and more focusing on few, but meaningful relationships is not necessarily a consequence of biological ageing. Instead, the motivator is the awareness of one's own time horizon, the consciousness that one's life span is limited: "Goals, preferences, and even cognitive processes, such as attention and memory, change systematically as time horizons shrink" (Carstensen 2006: 1913). Empirical tests of this hypothesis have found evidence for its validity. For example, young people with a life threatening illness, who are aware of their shorter life expectancy, show the same preferences of choices of their social partners like very old people – they are more selective in choosing their social contacts, placing more value on emotionally close, familiar contacts (Carstensen 2006; Carstensen and Fredrickson 1998; Fredrickson and Carstensen 1990).

1.2.2. Interdependence Theory

Assuming that during the process of ageing, a marital relationship becomes a more and more important social contact for the spouses, what are the theoretical assumptions for their health status? The interdependence theory suggests that the health status of one spouse is dependent on the health status of the other spouse via spillover effects. Moreover, the mood convergence hypothesis and the emotional contagion hypothesis suppose that the well-being of one spouse provokes emotional and behavioural response in the partner qua emotional transmission. In line with these assumptions, a long-lasting marriage can both have positive and negative effects on health in old age (Kiecolt-Glaser and Wilson 2017; Bourassa *et al.* 2015). Positive implications for health arise when older couples benefit

from the fact that they have shared a profound time of their life spans, and have "an in-depth knowledge of other's strength and weaknesses" (Hoppmann, Gerstorf and Luszcz 2011: 144). Being part of a couple can lead to "a shift from self-focused to relationship-centered thinking" (Bourassa *et al.* 2015: 450), promoting positive health habits or the tackling of the health problem of one partner with shared forces (ibd.). On the other hand, these interdependent couple dynamics can have negative implications for the health of the spouses. Living with a partner who suffers from pain or illness can lead to stress reactions in the other partner, negatively affecting well-being and health. Given that health decline and chronic illnesses are not unusual in later life, these spillover mechanisms should especially play a role for older married persons (Bourassa *et al.* 2015).

1.3. Biosocial Perspectives: Physiological Pathways of Marital Status

Over a decade ago, in the Annual Review of Sociology, Freese, Li and Wade (2003) made a claim for the relevance of biology to social research. Although it may appear that "'biology' and the 'social' are locked in an explanatory zero-sum game" (234), they argue that "sociology should seek and support ways of understanding the interrelationship of biological and social influences that will allow our discipline to gain strength from these new developments rather than be diminished by them" (248).
Biosocial perspectives in family research try to find an answer to the question how one's marital status could go under the skin. This combination of biological and social science research analyses bodily pathways through which family relationships influence health. Very simply put, these concepts claim that relationships and relationship transitions affect people's health via genetic, hormonal or immune functions (Booth, Carver and Granger 2000; D'Onofrio and Lahey 2010).

1.3.1. Social Regulation of Emotional Responding

One mechanism in the relation of social relationships and health, is the "social regulation of emotional responding" (Coan, Schaefer and Davidson 2006: 1032). Theories of this area state that the way the body responds to negative emotional arousal can be influenced by social relationships. On the one hand, social interactions can result in positive physiological outcomes. Stress-related activities in the human body can be attenuated by supportive social behaviour via affecting the autonomic nervous system and the hypothalamic-pituitary-adrenal axis (Coan, Schaefer and Davidson 2006; DeVries, Glasper and Detillion 2003). One manifestation of supportive social behaviour is interpersonal touch. Touching is used to share emotions or enhance meaning of interpersonal communication (Field 2010). Although touch is a component of everyday life, regardless of marital status (e.g., handshaking, at the hair salon, etc.), people in a partnership or marriage receive, on average, more touching than single people: "romantic relationships usually feature more touching than casual platonic relationships […] forms of romantic touch have been noted including holding hands, hugging, kissing, cuddling, caressing and massaging" (Field 2010: 371). The neuroscientific, biological, and related literature has been pointing out the positive effects of interpersonal touch on health and well-being. Physiological, neurological, and biochemical reactions have been discussed as potential underlying mechanisms

(Field 2010; Gallace and Spence 2010). Touching is supposed to decrease blood pressure and heart-rate, and to affect hormone release. The release of stress hormones (e.g., cortisol) is attenuated, the beneficial, so-called 'love' hormone oxytocin increased. The pressure stimulation of an intensive form of touch – massage – is assumed to reduce pain via electrical and chemical changes in the process of pain signalling in the body; by positively affecting deep sleep and lowering the emittance of pain chemicals; by enhancing serotonin levels, the body's natural 'pain killer' hormone (Field 2010).

For instance, an experiment by Coan, Schaefer and Davidson (2006), using functional magnetic resonance imaging (fMRI), compared the brain activity of married women under the threat of an upcoming electric shock while being alone, while holding the hand of a male stranger, and while holding their husband's hand. Holding the hand of the stranger or the husband attenuated the neural response to the threat of pain compared with experiencing the experiment alone. Hand-holding with the husband showed the strongest attenuation effects. Only couples with high marital satisfaction were part of the sample, and even among them, "effects of spousal hand-holding on neural threat responses varied as a function of marital quality, with higher marital quality predicting less threat-related neural activation" (ibd.: 1032). (See D'Onofrio and Lahey (2010) for more on social neuroscience research on family-related topics.) Gallace and Spence (2010) and Field (2010) provide summaries of experimental designs studying the physiological responses of touch within couples. The studies showed that handholding, hugging, or massage with the partner before a stressful event lowered physiological stress-reactions (blood pressure, heart rate, cortisol level) in couples. Control groups were not allowed to touch or should just engage verbally. Despite the experimental settings of these studies, confounding factors may influence their findings. For example, such experimental designs cannot be kept completely blind. The participants could involuntarily influence the social interaction, and the role of touch could be over- or under-estimated (Gallace and Spence 2010).

1.3.2. Behavioural Endocrinology

On the other hand, social interactions can result in negative physiological outcomes. According to the assumptions of behavioural endocrinology**,** Shanahan, Hofer and Shanahan (2006) explain, that behaviour can evoke hormonal responses in the body, which can lead to an accumulation of adverse effects. In general, physical stress responses can easily be neutralised by the body: In a stressful situation, the hypothalamus in the brain is activated, and triggers the secretion of certain hormones, which then trigger the secretion of glucocorticoids like cortisol in the body. This reaction mobilises energy resources, which help the body neutralising the stress reaction. However, stress becomes harmful if it is experienced *over a long time* because the level of glucocorticoids remains high for a long period. In this case, "the chances of chronic disease greatly increase, including damage to the nervous system, suppression of the immune and reproductive systems, hypertension, and ulcers" (Shanahan, Hofer and Shanahan 2006: 616).

In line with the assumptions of the sociological stress model of being unmarried (see Chapter I.1.1.2.), being or becoming unmarried is a stressful experience of longer duration. The same applies to being

married in an unsatisfactory or troubled marriage. Thus, marital status transitions and marital interaction, as social relationships in general, can cause reiterated stress, which negatively influences health via endocrine, immunological, and cardiovascular body responses (Robles and Kiecolt-Glaser 2003). For example, research on stress reactivity showed that marital conflict leads to negative physiological and immunological body responses in spouses (Booth, Carver and Granger 2000; D'Onofrio and Lahey 2010; Robles and Kiecolt-Glaser 2003). Stress-related immunological changes can then be the pathway to health outcomes such as cancer, infectious diseases, or impaired wound healing (Booth, Carver and Granger 2000). Mazur and Michalek (1998) found for US air-force veterans that testosterone levels of men fall during the years around a marriage, and increase during the years around a divorce. Laboratory studies, which analyse the physiological responses during arguments between spouses in an experimental setting, have found that hostile behaviour and conflict discussion of young and old couples elevates their levels of catecholamines and glucocorticoids, which regulate metabolic, cardiovascular, stress responses, and immune function (Robles and Kiecolt-Glaser 2003). Thus, marital distress can, for example, be a path to obesity and related comorbidities: Elevated cortisol levels can foster an "increased intake of calorie-dense comfort foods, and insulin secretion rises as cortisol increases […] Persistent hypercortisolemia and higher insulin enhance visceral fat accumulation […]. Furthermore, marital distress can alter production of ghrelin, an appetite-stimulating hormone that promotes food intake" (Kiecolt-Glaser and Wilson 2017: 432). Regarding risk factors of cardiovascular diseases, "[m]arital interaction studies assessing blood pressure and heart rate suggest that couples show increased cardiovascular reactivity to marital conflict" (D'Onofrio and Lahey 2010: 772).

Vice versa, it is not only theorised that behaviour can change hormone levels in the body, but that hormone levels have an impact on behaviour and behavioural changes. From this model's point of view, it can be assumed that a person's hormones can affect their selection into a marital status. Although this sort of theorising is over-simplified, there has been behavioural endocrinological research worth mentioning (Shanahan, Hofer and Shanahan 2006). A study by Booth and Dabbs (1993) found in a sample of US men, that men who produce more testosterone, are less likely to marry. If they are married, they are more likely to get divorced, are more unsatisfied with their marriage, and more prone to cheating and violence. Due to the cross-sectional study design and the fact that testosterone is also associated with other negative behavioural outcomes, which may act as moderators, causality cannot be claimed (Shanahan, Hofer and Shanahan 2006).

1.3.3. Gene-Environment Interaction

Furthermore, there is the model of gene-environment interaction. This bio-social perspective claims that there is an interaction between genetical and environmental factors (D'Onofrio and Lahey 2010). Humans are equipped with an innate genetic disposition, but whether and how genes are expressed depends also on the environment someone is exposed to. Examples of social environments can be a supportive or a violent family or marriage. Very recent research on epigenetic processes has indicated

indeed that the environment someone lives in can alter the expression of genes at the molecular level (D'Onofrio and Lahey 2010). Using longitudinal US survey and DNA data, Li, Liu and Guo (2015) made an attempt to study the gene-marriage interaction. The authors tested whether being married moderates genes that are related to aggressive and antisocial behaviour. Genetic characteristics, they concluded, "explained much less variance in delinquency and violence among married individuals than unmarried individuals, implying that marriage may suppress the collective genetic influence" (ibd.: 1229). Using the same data set, Barnes and Beaver (2012) found evidence that the likelihood of getting married and the likelihood of desistance from criminal behaviour "share a genetic pathway" (29). As the sociological theory of marriage selection (cf. Chapter I.1.1.3.), research that addresses the link between environmental factors and brain changes also assumes processes of reverse causality: "the direct influence of environment and activities on the brain remains subject to discussion, and in particular the thorny problem of the 'causal relationship', ie, are activities predictive of cognitive functioning, or is it the reverse?" (Adam *et al.* 2013: 378).

1.3.4. Disposable Soma Theory

When studying health in later stages of life, it is important to point out biological theories and evidence of how ageing is caused in general, and how age-related diseases are caused. According to Westendorp and Kirkwood (2008), the disposable soma theory explains ageing as a life-long process of accumulation of damage in cells and organs. This gradual accumulation of cellular defects is accelerated in individuals who are exposed to factors such as stress and detrimental lifestyle. The manifestation of age-related frailty, disability, and diseases can either be accelerated by inflammation processes, or slowed down by anti-inflammatory processes. Additionally, genetic regulation determines how severe and fast the damages operate, via repair efforts. Healthy lifestyle habits can also slow down the molecular and cellular defects which cause ageing. Clinical empirical evidence has shown: "The majority of chronic, degenerative conditions, such as dementia, osteoporosis and osteoarthritis, involve the progressive accumulation of specific types of cellular and molecular lesions" (ibd.: 23).

1.3.5. Theories of Mental Health / Cognitive Function

After a focus on somatic outcomes, I will now turn to theories which explain the biological pathways between marital status and mental health, especially cognitive function.

Mental health issues can appear after a marital status transition, which involves the loss of the partner. In the case of widowhood, how severe someone reacts to the death of a spouse is influenced by the situational factors of the death, intrapersonal, and personal factors, but also by biological determinants. Pathological responses, e.g., complicated grief and depression after bereavement, are dependent on genetic factors, gene-environment interaction, epigenetic regulation, neuroendocrine factors, immunologic/inflammatory factors, brain neurotransmitters, and neurotrophic growth factors (Assareh *et al.* 2015). Again, divorce and widowhood can be a form of stress, and stress can not only provoke

physical health decline but also affect cognitive abilities such as memory: If a human being experiences a stressor, stress hormones – the glucocorticoid cortisol and the catecholamines adrenaline and noradrenaline – are secreted from the adrenal glands near the kidneys. These hormones "can easily cross the blood-brain barrier and access the brain, where they can influence learning and memory by binding to receptors localized in various brain regions known to be involved in learning and memory" (Lupien *et al.* 2007: 211). Especially phases of prolonged stress "can cause both cognitive impairments, and structural changes in the hippocampus, mainly through the actions of glucocorticoids" (ibd.: 212).

Both the theoretical and the empirical field of research on marital status and cognitive health in later life are very limited. Giorgi *et al.* (2016) conducted a literature research and review on scientific evidence on marital status and dementia/cognitive impairment. Considering only English language publications, they arrived at a 'mini review' of seven studies.

Cognition is composed of different domains of ability, such as orientation, memory, language, and executive function (i.e., planning, sequencing). Starting at around age 50, the human brain undergoes organic neuro-degenerative processes which lead to a decline in cognitive function. Memory function is affected first and foremost (Dewey and Prince 2008). Cognitive decline is related to the process of ageing and rooted in structural changes within the brain: These changes are a "loss of synapses, neurons, neurochemical inputs, and neuronal networks" (Adam *et al.* 2013: 377). However, the current state of research suggests that cognitive decline in old age is not completely unavoidable and fixed. There are observations of extremely old people who maintained their cognitive vitality (Adam *et al.* 2013; Mazzonna and Peracchi 2012).

One theory in the field of age-related cognitive decline is the **cognitive reserve theory**. This concept claims that different persons are equipped with different reserves to meet age-related changes and pathology of the brain. The differences may be both innate and alterable (Lifshitz-Vahav, Shrira and Bodner 2017). The assumption that cognitive reserve is alterable claims that "active stimulation throughout a person's life will alter neural tissues, enhance synapse development, and facilitate new neuronal pathways" (Sundström *et al.* 2014: 750; see also Scarmeas and Stern 2003). Assumptions of that kind imply that "the adult brain is adaptive at any age and has lifelong capacity for change" (Mahncke *et al.* 2006: 12524). This is the concept of neuroplasticity, i.e., the "ability of the nervous system to respond to intrinsic and extrinsic stimuli by reorganizing its structure, function and connections" (Cramer *et al.* 2011: 1592; see also Lifshitz-Vahav, Shrira and Bodner 2017). Lifestyle factors such as social engagement are among the factors under discussion that contribute to positive alterations of the cognitive brain reserve and thus delay cognitive decline (Fan *et al.* 2015). Marriage is supposed to have a protective influence on cognitive health because "mental and social stimulation that can come by living in a relationship is believed to increase a person's cognitive reserve" (Sundström *et al.* 2014: 750). Spouses could stimulate each other and thus help preserving their cognitive capacities, which in turn may delay or prevent dementia in old age. In comparison, "never-

married individuals could have less cognitive stimulation due to a small active social network and fewer leisure activities" (Helmer *et al.* 1999: 1957). The stress which comes along with the end of a marriage is assumed to have detrimental effects on hippocampal neurons and cognition, and may finally result in dementia among divorced and widowed persons (Sommerlad *et al.* 2018).

Furthermore, there is the theory of two dimensions of cognitive abilities: **fluid and crystallised abilities** (Arpino and Bordone 2014; Cattell 1943). Fluid abilities consist "of the basic mechanisms of processing information which are closely related to biological and physical factors" (Mazzonna and Peracchi 2012: 691). Fluid intelligence abilities such as working memory "tend to decline linearly from early adulthood […] [and] are much more difficult to be improved or altered in older adults" (Arpino and Bordone 2014: 338). Crystallised abilities "of cognition are more easily subject to changes and to be affected by daily activities" (ibd.: 338). This knowledge component "consists of the knowledge acquired during the life with education and other life experiences […] crystallized intelligence tends to be maintained at older ages and is subject to a lower rate of age-related decline" (Mazzonna and Peracchi 2012: 691). Arpino and Bordone (2014) hypothesise that social activity is one form of activity in later life which might positively affect crystallised cognition.[2] They argue that an engaged lifestyle is a form of stimulation for the brain. Although they study grandparenting as form of social engagement, being married in later life can also be considered a form of social activity.

2. Marital Biography and Health

Theoretical assumptions with regard to marital *status* differences have been thoroughly discussed already, assumptions regarding marital *biography* are harder to find in the marriage-health literature (Dupre and Meadows 2007). In the following, I will discuss theoretical assumptions that can be used to conceptualise the association of marital biographies and health.

2.1. Life Course Perspective

Life course perspective has become popular in the social sciences and neighbouring disciplines during the last decades. The availability of longitudinal and retrospective data allows to investigate human life courses, focussing on changes in the life and "the strong assumption that prior life history has strong impacts on later life outcomes" (Mayer 2009: 414). Health has been one of the emerging topics within life course research (Mayer 2009). The biographic perspective can help to understand "how health differentials in older adults arise" (McFarland, Hayward and Brown 2013: 363; see also McLeod and Almazan 2006; Mortimer and Shanahan 2006).

The concepts of life course research are relevant for the study of the marriage-health benefit of older individuals for several reasons. The current conjugal status of an older adult does not necessarily reflect the complexity of her or his marital life course. Two persons who are married at the age of 70 may share the same marital status but can differ widely in their past marital biography: one person

[2] Using SHARE data, Arpino and Bordone (2014) operationalise fluid cognition with the immediate and delayed recall test (and numeracy/orientation), crystallised cognition with the verbal fluency test.

might have been married once and continuously for 50 years, whereas the other person might have experienced two divorces and is now remarried for one year. Marital status is one aspect of life, which is "rooted in the past yet having important consequences in the present" (Festy and Rychtarikova 2008: 65; also Zaidi 2014). Moreover, "[o]lder adults today are more likely than previous generations to have experienced multiple transitions into and out of (non-)marital unions" (Hank and Brandt 2013: 308; also Brockmann and Klein 2004). So an important fact is that "within one marital status category, individuals differ with respect to their duration and pathway into that status" (Carr and Springer 2010: 748).

The sociology of the life course "lacks a coherent body of theory", as Mayer (2009: 423) points out. Despite gaps in theories within the life course approach, there is a considerable conceptual tool kit that includes the concept of age norms (and the consequences of being 'on' or 'off' time), as well as time dependency (of events, states, durations), and transitions and trajectories (Mayer 2009). Biographies can be studied with regard to "long-term patterns of stability and change in a particular status called *trajectories*" (Dupre and Meadows 2007: 624). The life course literature views trajectories "as pathways through particular domains over successive years" (Barrett 2000: 451). Marital trajectories can be one component of an individual's life course. Different marital biographies lead to the same current marital status categories. However, the marital life course has more components than current marital status. It is composed of marital transitions (e.g., divorce, widowhood, remarriage), duration in a marital status, and the timing of the transitions (e.g., in mid-life or later life) (ibd.).

Not only the number of but also the *type* of marital transition(s) a person experiences may also vary in its extent of being advantageous or disadvantageous for health. Concerning marriage, there are different assumptions whether remarriage is beneficial for health. On the one hand, remarriage could provide health benefits resulting in better health outcomes for the remarried than for the separated or widowed. On the other hand, since remarried individuals have undergone one or more marital losses, higher order marriages cannot be as beneficial as the first marriage. Concerning types of marital losses, divorce and widowhood might not be of equal disadvantage for someone's wellbeing (Barrett 2000): For some, their divorce "was a positive event that they initiated, while widowhood is presumed to be an undesirable, uncontrollable transition for nearly all who experience it" (ibd.: 453). Moreover, the type of marital loss that precedes a remarriage could also affect the level of benefit the new marriage provides. Hypothetically, a "divorce is more likely than widowhood to generate negative attitudes toward the institution of marriage, such as its permanence or longevity; therefore, one may expect remarriage after widowhood to be associated with higher levels of well-being compared with remarriage following divorce" (ibd.: 453).

Finally, considering the *timing*, the age at which a marital status is occupied or left, could be of importance (or the concept of age norms as Mayer (2009) referred to). Williams and Umberson (2004) put forward that the "[l]ife course theory suggests that occupying particular roles at non-normative stages of the life course may undermine well-being" (83). For example, being a bachelor or a spinster

may be outside the normative mainstream and hence a source of strain in old age, but not at younger ages (cf. ibd.). Becoming married at a very young age is argued to be "disruptive to normative developmental trajectories (e.g., schooling)" (Dupre, Beck and Meadows 2009: 552). Missed education, combined with uncommonly early parental responsibilities may lead to economic and psychological distress, and in turn to poor health (ibd.; Dupre and Meadows 2007).

2.2. Cumulative (Dis-)Advantage Theory

One theory, that already has been gaining popularity in this research area, deals with the accumulation of advantages or disadvantages over the life course (ibd.). According to a review by DiPrete and Eirich (2006), the concept of cumulative advantage (CA) is frequently invoked in the social sciences, especially in studies of social inequalities. The theory has its roots in the work of Robert K. Merton, who analysed the Matthew effect of scientific careers: in line with the famous Bible quote 'for whoever has will be given more', scientists who have been successful in the past will be cited more often and thus perpetuate their success (Merton 1968). The central idea of the CA theory is that an individual or a group has an advantage, which in turn increases over time – it accumulates. The concept can be employed to explain social stratification and inequality processes, assuming that "current levels of accumulation have a direct causal relationship on future levels of accumulation" (DiPrete and Eirich 2006: 272). In the same way, any given characteristic which is considered a disadvantage can also cumulate over time and thus cause divergence between individuals. Such advantages or disadvantages can be for example money, status, or health (Dannefer 2011). Dannefer (2011) emphasises the relevance of the CA theory for the study of the inequalities of older people: "Age and cumulative advantage/disadvantage theory have obvious logical, theoretical, and empirical connections, because both are inherently and irreducibly related to the passage of time" (327).

The CA theory can serve as a fruitful concept because "the timing and sequence of life events—like marriage and marital dissolution—may lead to different life outcomes in later life through cumulative advantages and disadvantages" (Zhang 2006: 266). In line with the cumulative disadvantage theory, experiencing a marital loss like separation or widowhood should have even greater negative effects if there were one or more preceding marital losses. By contrast, the counter hypothesis may be true: persons who experience a marital loss for the second time may not show as worse health outcomes as persons after the first spousal loss. There may be coping mechanisms derived from learning effects, e.g., social and psychological resources, which have been successful in buffering negative effects of the loss, that can be mobilised again (Barrett 2000; also O'Bryant and Straw 1991).

2.3. Health Capital Theory

Hughes and Waite (2009) propose to employ the theory of health capital to hypothesise about the impact of marital pathways on health.

The economics-based concept of health capital assumes that every individual is born with a certain, innate 'stock of health' that goes down in value with age. The value of the health capital can, however,

be increased by investments (Grossman 1972). Accordingly, Hughes and Waite (2009) argue that "experiences of marital gain and loss affect this stock of health. […] Over time, the health of a married person is protected, or even enhanced" (3) – people who lose a spouse should be confronted with long-lasting losses in their stock of health. A remarriage should then re-establish the beneficial effects but probably not to the same extent as a first marriage due to disadvantages through financial obligations to the former spouse or children or challenges with step children (Waite 2009).

II. LITERATURE REVIEW: Research on Marital Status Differences in Health

This section summarises relevant empirical findings on marital status differences in health, focussing on later life health outcomes, marital biography, and research on specific health measures. Some articles will appear in more than one of the sub-chapters because they cover more than one of the foci of interest.

The identification of the marriage advantage goes back to the 19th century. In 1853, British registrar William Farr examined the age-specific death rates for single, married, and widowed persons, and he "concluded from the figures that: Marriage is a healthy state. The single individual is more likely to be wrecked on his voyage than the lives joined together in matrimony" (Farr 1858: 507; cited in Wyke and Ford 1992: 523). Since then, researchers have been conducting a plethora of studies on the relation between marital status and health or longevity. A large research synthesis identified papers on marriage and health behaviour (alcohol, drug use, smoking, body weight), physical activity, health care use, insurance status, mental health, physical health, and mortality (Wood, Goesling and Avellar 2007, focusing on studies conducted with the US population since 1990). Manzoli *et al.* (2007) presented an international meta-analysis of marital status and mortality that identified, overall, a survival advantage for the married. An extensive review of the international, longitudinal data evidence concluded that there is ample evidence that people in a marriage live longer, are happier, and suffer less from psychological and physical illness, and that the quality of the marriage can influence the extent of these benefits. Nonetheless, all these findings could not finally reveal the causal mechanisms behind the marriage advantage – as the authors phrased it: "How marriage works its magic remains mysterious" (Wilson and Oswald 2005: 23).

Besides the literature making a case for marriage (e.g., Waite and Gallagher 2000), there is critical literature, stressing methodological fallacies and evidence against the existence of a marriage protection effect (Rendall *et al.* 2011; Zheng and Thomas 2013; Unger 2007).

1. Studies with Focus on the Older Population

The majority of studies in the domain of interest has been conducted for younger or mid-life. The effects of marital status on health in the elderly population is less analysed (Goldman, Korenman and Weinstein 1995). In view of the rising human life expectancy and the increasing duration people are now spending in later life stages, the question, whether the 'marriage health advantage' is the same or

not for older adults, warrants closer examination. The empirical evidence on health differentials by conjugal status of older adults is not conclusive to date.

On the one hand, there is research that concentrates on the survival rates of married and unmarried persons at different ages. An early study by Berkman and Syme (1979) analysed mortality rates in a Californian county, and found that the relative risk of mortality of unmarried men compared with married men, is much higher in the young- and middle-age groups than in later life. With official data of seven European countries, Murphy, Grundy and Kalogirou (2007) reported a steady increase of the survival advantage with increasing age for married people. A meta-analysis of 53 observational studies from all over the world, which analysed marital status and mortality of the elderly, came to the conclusion that elderly married people have a 5 to 15% reduction of all-cause mortality risk (Manzoli *et al.* 2007). Contrary, using the US Longitudinal Study of Aging, Goldman, Korenman and Weinstein (1995) found that the longevity advantage is greater for young and middle-aged than for elderly married people. The authors argued that health disadvantages among singles might weaken at old ages since singles do not experience stressful life events and changes in economic and social situation through divorce or widowhood.

On the other hand, there is some limited research that concentrates on the health status of (non-)married persons at different ages. Guner, Kulikova and Llull (2014), investigating self-reported health with US longitudinal data, showed that a marriage-health advantage seems to operate mainly after age 50. After adjusting for unobserved heterogeneity in innate health between the conjugal status groups, they found "that the effect of marriage on health disappears at younger (20–39) ages, while about 6 percentage points difference between married and unmarried individuals […] remains at older (55–59) age" (ibd.: 1). The authors assumed, "that association between marriage and health is mainly driven by selection into marriage at younger ages, while there might be a protective effect of marriage at older ages" (ibd.: 1). Mousavi-Nasab *et al.* (2012) studied cognitive health in a random sample of adults in Umeå, Sweden. The authors reported that married persons of both age classes (35–60 and 65–85) yield better results in memory tests of recognition and recall than the never married. Tests related to vocabulary and fluency memory seemed to be affected by interactions of age with marital status: Only married adults between 65 and 85 performed better than their widowed counterparts, there were no differences for adults aged 35 to 60. It is noteworthy that the authors excluded persons with dementia and stroke a priori.

An advantage of the investigation of samples of older adults could be the avoidance of the issue that many research designs cannot control for marital quality. One could argue "that the process of selection out of unsatisfactory marriages may have already taken place, and continuing marriages represent relatively stable and supportive relationships" (Idler, Boulifard and Contrada 2012: 45).

A major shortcoming of these survey-based publications is that most of them cannot include the older population in nursing homes and similar institutions. Admission to such institutions is related to marital status and poor health (see Murphy, Grundy and Kalogirou 2007 for a detailed discussion). A

study which was able to include residents of nursing homes and other institutional residencies, compared marital status and non-marital cohabitation history (Belgian register data), drawing the conclusion "that mortality is more closely associated with actual living arrangements than with marital status" (Herm, Anson and Poulain 2016: 1).

Moreover, it is unclear how survival selection or survey attrition affects or biases any of the observed developments of the 'marriage benefit' with age (Rendall *et al.* 2011; Gumà, Cámara and Treviño 2015). Alternatively, inconsistencies of results may come from actual variations and historical changes in mortality and health by period, country, and cohort (Murphy, Grundy and Kalogirou 2007). After all, some studies have been using cross-sectional designs, i.e., a comparison between different age/cohort groups at one point in time, while other studies have been using longitudinal data, i.e., comparing the same individuals over time/age.

In general, the wealth of literature on marital status and health differences of older people has been dealing mostly with very specific outcomes of age-related frailty and disease, such as cognitive decline or dementia. Hence, most research has not aimed at comparing younger and older age groups (Fan *et al.* 2015; Feng *et al.* 2014; Giorgi *et al.* 2016; Helmer *et al.* 1999; Sundström, Westerlund and Kotyrlo 2016; van Gelder *et al.* 2006); see also Chapter II.3.2. for a summary of this research.

2. Studies with Focus on Marital Biography

In this subsection, I will present empirical studies which analyse marital biographies and how they are related to health outcomes. Indeed, a "growing body of literature is now incorporating measures of marital trajectories to examine how marital status affects health and well-being from a life course perspective" (Dupre and Meadows 2007: 624).

It is important to recognise that "within one marital status category, individuals differ with respect to their duration and pathway into that status" (Carr and Springer 2010: 748). The question is how important current marital status is in comparison to past marital biography – with regard to health. For example, mental health may be more dependent on current relationship status, physical health more on the partnership biography (Rapp and Klein 2015). Why should we look into the details of marital biographies? Connidis (2010) puts it as simple as that:

> "Most research focuses on current marital status, but this masks major life course differences among older persons of the same status. Being married once or three times, or being divorced after one long marriage or after three short ones, constitute significantly different life course trajectories and consequent outcomes in later life" (58).

The landscape of this research does not provide or work with one definition of 'marital biography'. Also, operationalisation techniques are not uniform. Each study comes up with different ways of conceptualising and measuring marital life courses. Nevertheless, a useful and comprehensive definition can be found in Hughes and Waite (2009):

> "An individual's marital biography is composed of transitions into and out of marriage and durations in particular marital statuses. The occurrence of transitions, their type, and the ages at which they occur determine an individual's duration in each marital status (e.g., never married, married, divorced, widowed, or remarried). For people who have never married,

> current marital status and marital biography overlap completely. Among those who married once and remained married, marital biographies differ only due to differences in marital duration (i.e., age at marriage)“ (3).

Whether marital biography can be measured by all the described components, – i.e., number and type of marital transitions, age at marital status change, and duration in statuses – is not only dependent on the study design but also on the data available. The studies that I could identify draw on all the mentioned components to measure marital history but mostly cannot include *all* of them in their research design. As dependent variable, the existing literature has analysed mortality, self-rated health, reports of diseases, and – to a limited extent – biomarkers and mental health. Overall, significant effects have been found for all components of marital history but not for all domains of health equally. Both mortality and self-reported general health seems to be affected by the duration someone has spent in a certain marital status. This was elucidated in studies of US, German, and British adults: Lillard and Waite (1995), using US Panel Data of Income Dynamics, found that married persons have a substantial lower risk of mortality than the unmarried, and that this advantage accumulates the longer the marriage lasts. However, the authors mentioned that they do not explicitly address selection effects (cf. ibd.: 1136). Brockmann and Klein (2004) analysed the effects of marital biography on mortality using German panel data, and they revealed that timing, accumulation and attenuation effects of marital statuses influence mortality in certain ways. They found that both selection and protection effects play a role, and that “marital status influences mortality differently in the course of time” (579). For instance, the authors showed that positive effects of being married on longevity unfold only over time; negative effects resulting from divorce or widowhood attenuate over the life course. Drawing on longitudinal register-based data, Poulain and Herm (2016) looked at marital histories and living arrangement histories of Belgian centenarians, who can be considered “examples of successful aging” (1). They found that female centenarians had been living alone unmarried more than half of their lives. For men, to live until age 100, it seemed to be more beneficial to live with a spouse for a long time. Widowers who reached this very high age were remarried widowers. With British panel data of older persons, Grundy and Tomassini (2010) described a higher mortality risk for men being divorced between 10 and 20 years, and for men in long-term remarriages, compared with men in long first marriages, the never married, and widowers. The same was found for women in long-term remarriages. No significant differences were stated for widowed adults with different durations of widowhood. Pienta, Hayward and Jenkins (2000) showed with panel data of the US Health and Retirement Study (HRS) that, overall, married people had lower rates of chronic illness, functional limitations, and disability than the unmarried. However, the relationship between length of marriage and health was complex: Prevalence of conditions was less likely within marriages lasting from 20 to 29 years compared with shorter ones, but not within marriages longer than 30 years. Marriages of less than 10 years duration were not related to worse health conditions than longer marriages – what is interpreted as a sign of health selection effects in the (re-)marriage market. Analysing a broad range of

health outcomes with the same dataset as the latter study, Hughes and Waite (2009) found that among married older adults, those who had ever been divorced ended up with worse health. Currently divorced and widowed adults had worse health than the currently married. Chronic conditions and mobility limitations, which are assumed to develop slowly, were more common the longer someone had been divorced or widowed. The prevalence of symptoms of depression seemed to be more sensitive to current marital status.

Self-reports of general health seem not only to be affected by time spent in a marital status but also by the number of marital transitions, and age at the transition. Grundy and Holt (2000) found with a sample of British adults in early old age that the chances to report poor self-rated health and higher levels of disability were higher for women who had married more than once (compared with women married once), and for men who had married younger than 25. A study by Williams and Umberson (2004) presented evidence that getting a divorce has a positive effect on self-rated health of young men, and has a negative effect for older men, which even increases with age. Becoming widowed influenced only the self-assessed health of men and varied with the age of the men and the time since death. Men who entered a second or higher order marriage reported a stronger improved health than women – but this was only valid for young ages. In old age, remarriage decreased the chances to report very good health (a sample of the US-population above age 24 was interviewed three times between 1986–1994). Grundy and Tomassini (2010) showed with British panel data that old persons who had been remarried for more than two decades had a higher risk of long-term illness than other remarried adults (except for remarried old women after widowhood) and old adults in very long first marriages. A short or intermediate duration since a divorce had a stronger negative effect on long-term illness than long-term divorce. Compared to older women in long first marriages, never married older women reported less health limitations. Using fixed-effects regressions on data of the US Panel Study of Income Dynamics, Tumin (2017) came to the conclusion that improvements in self-rated health are only found in women who are married ten years or longer (compared to remaining unmarried), and who were born before 1975. However, older adults – born before 1955 – had been excluded from the analyses.

Moreover, there is evidence that also the prevalence of cardiovascular diseases, which are obtained via self-reports, is related to length, type, and order of marital status. Zhang (2006) investigated marital trajectories with retrospective survey data (HRS) and the prevalence of heart diseases and stroke between age 50 and 60. The least cardiovascular conditions were found among continuously married and never married adults. In comparison, persons with multiple marital losses had a higher likelihood of suffering from these conditions – independent from their current marital status. In a longitudinal design, Zhang and Hayward (2006) analysed five waves of the HRS (1992–2000) to inspect how the marital life course affects the outbreak of cardiovascular disease in later life. In contrast to the stably married, remarried women showed higher odds of reporting cardiovascular illness, remarried men had lower odds of suffering from these conditions. Being divorced or widowed showed no major,

significant effects. However, never married men reported these diseases less often than stably married men. The duration of a marriage, remarriage, widowhood, or a divorce showed no significant effects on the onset of cardiovascular issues. Dupre and Meadows (2007) used the same observational period of the HRS panel plus retrospective information on marital histories to examine marital trajectories and physical health in later life, measured as self-reports of diabetes, cancer, heart attack, and stroke. For females, a marriage before age 19, and one or more divorces increased the risk of developing a physical disease. For males, divorce duration and the accumulative number of widowhood transitions increased the risk of physical diseases. For both genders, beneficial health effects of being married seemed to increase over time (a longer marriage duration was associated with lower rates of disease), detrimental effects of divorce diminished over time.

Besides the measurements of self-reported diseases, I could identify two articles that examined risk factors with objective biomarkers. Some of the investigated parts of the body system seem to be affected by certain components of the marital biography, and this is also gender-specific: To assess cardiovascular, metabolic, and inflammation risk, McFarland, Hayward and Brown (2013) analysed blood pressure, heart rate, waist circumference, glycosylated haemoglobin, and C-reactive protein of the non-institutionalised US population aged 57 to 85. The authors' findings suggested "that marital biography gets under the skin through different mechanisms and into different bodily systems over different time scales" (ibd.: 376). For women, cardiovascular risk decreased with the duration of being married. The end of a marriage was related to a higher metabolic risk. For men, no positive accumulation effects of being married were found. It was found that the younger a man had been at first marriage, the higher the cardiovascular, metabolic, and inflammation risk in old age. Furthermore, Ploubidis *et al.* (2015) analysed hemostatic and inflammatory markers (C-reactive protein, fibrinogen, fibrin D-dimer, von Willebrand factor, tissue plasminogen activator antigen), metabolic syndrome, and lung capacity at around age 45 in all people born in Britain in March 1958. Adjusting for early-life health and socio-economic characteristics, they found that men "who never married or cohabited had significantly higher levels on 3 hemostatic function biomarkers and worse respiratory function than men who were married and remained married for the duration of the observation period" (1599). Never married women had only worse fibrinogen levels than married women. Women, "who married in their mid- to late 20s or early 30s and remained married for the whole observation period had the best health, with lower fibrinogen levels and better respiratory function than women who married in their early 20s" (1599).

One article could be identified that provides evidence on health behaviour. Reczek *et al.* (2016) analysed marital histories and heavy alcohol consumption among older US adults (HRS panel data), suggesting that the number of marriages and the duration of being married is more relevant than the duration of being divorced or widowed. Comparing current marital status, the authors found that never married elderly have higher rates of heavy alcohol use than the married. However, remarried women showed an increase in heavy drinking compared to stably married women. The inclusion of age

interaction effects revealed that the heavy drinking of the remarried women increases linearly with age. No significant differences in behaviour were found between long-term widowed, recently widowed, long-term divorced, recently divorced, or other marital trajectories.

Lastly, there is literature focusing on marital histories and mental health, mostly obtained from US data. On the one hand, there is evidence that mental well-being seems to be associated with number and length of marital status (transitions). A study by Barrett (2000) used data collected of adults in North Carolina, USA, in the 1980s (mean sample age=57), which included full marital histories, psychiatric histories (i.e., mental health prior to marriage), and measures of current depressive, anxiety symptoms, and substance abuse. The author concluded that being currently married protects from mental health issues compared to being unmarried; being in a higher order marriage was, however, not as beneficial, and a negative effect of multiple marital losses was found, independent of the type of losses and current marital status. Models including duration in current status suggested that being widowed "has a cumulative, negative effect on anxiety; however, a prior experience with marital loss, especially widowhood, appears to enhance individuals' resilience following a second dissolution" (461). Also Håkansson *et al.* (2009) showed that persons who had been widowed or divorced longer than 20 years had a much higher risk of Alzheimer's disease in old age than persons widowed or divorced less than 20 years (using two observations of an East Finnish population sample).

On the other hand, interviews with widows aged 60 and over from the Mid-West USA in the 1980s, revealed no differences in psychological well-being (symptoms of happiness or unhappiness/depression) between widows with previous experience with widowhood or divorce and widows without previous losses. However, interviews were conducted 1.5 years after the husband's death, not covering the acute phase of bereavement[3] (O'Bryant and Straw 1991). A study of remarriage after divorce proposed that a higher order marriage is not necessarily less beneficial for mental well-being. Drawing on cross-sectional US survey data, the authors concluded that, net of length of marriage, "the remarried appear similar to first-marrieds in most aspects of current well-being and marital and parental role adjustment" (Weingarten 1980: 533).

3. Studies with Focus on Objective Health Measures

The 'marriage benefit' with respect to health and mortality has been documented since the 19th century – this is notable, given the "change over time in the predominant causes of death, which were primarily acute infectious diseases in the nineteenth and early twentieth century and are largely chronic disease-related today" (Idler, Boulifard and Contrada 2012: 34). The measurement of health in studies on this topic has been very often being conducted via self-reports of health (Umberson and Kroeger 2016), or via all-cause mortality. However, this approach does "not capture specific biological pathways. […] certain systems may be more affected than others by marital biography"

[3] There is evidence of an elevated risk of excess mortality for the bereaved spouse immediately after the death of their spouse (compared to continuously married spouses). Over time, the negative effects of widowhood on excess mortality seems to attenuate. Especially men seem to be affected (Martikainen and Valkonen 1996; Moon *et al.* 2014; Thierry 2000).

(McFarland, Hayward and Brown 2013: 364). Also Carr and Springer (2010) "encourage researchers to move beyond broad measures of physical health (e.g., all-cause mortality, self-rated health) […] to instead focus on specific outcomes" (756).

An advantage of looking at specific health outcomes is that bias, which might be caused by self-rated health scales, is avoided. Although the subjective assessment of health has been proven to reliably mirror objective health, and to predict mortality, it has pitfalls. For instance, it is dependent on a frame of reference (Franz *et al.* 2017). Even more important, it has been shown that marital status itself can influence this health measure. Bardage *et al.* (2005) showed with data of Europeans over 65 years, that unmarried persons are more likely to report fair or poor health than married persons even when adjusting for objective health conditions such as cardiovascular disease, cancer, activities of daily living, diabetes, respiratory, musculoskeletal diseases (Bardage *et al.* 2005). Another paper, which used twenty years of US health survey data with mortality follow-up, found evidence that the married tend to overestimate their health when using self-rated health scales. Compared to the unmarried, the married must suffer from more severe problems until they start rating their health as poor (Zheng and Thomas 2013). Moreover, there is the possibility that habits in using self-rating scales of health might be subject of historical changes. With three decades of repeated cross-sectional US survey data, Liu and Umberson (2008) came to the conclusion that the self-rated health of the marital stats groups has changed over time: "self-rated health of never-married men became increasingly similar to that of the married men over time, […] the self-rated health of the widowed, divorced, and separated worsened over time, relative to the married" (251f.). However, the study is not able to clarify whether these changes are caused by actual advances in health care, adjustments of personal health knowledge, or selection effects (ibd.). Finally, there is evidence that the style of using self-rating scales of health varies between countries. This is especially important for the data source used in this thesis – SHARE is a multi-country survey. Using survey data of older people from six European countries, Bardage *et al.* (2005) emphasised that differences in self-reports of health between countries exist. Insights from vignettes data of the first wave of SHARE, covering eleven countries, also pointed to the existence of a cultural bias: Peracchi and Rossetti (2009) reported that regional differences in self-reported health can only partly be explained by the prevalence of health conditions – "a non-negligible part of these differences is due to other causes, which may include differences in reporting own health" (Peracchi and Rossetti 2009: n.p.) Also Pfarr, Schmid and Schneider (2012) and Vries, Blane and Netuveli (2014) discovered a country-specific variability of self-reported health and health conditions, using SHARE data.

3.1. Specific Health Measures

Over the last years, the research landscape of marital status and health has been showing a growing interest in the analyses of specific health conditions. Publications have been investigating cardiovascular disease (Zhang and Hayward 2006; Zhang 2006), cardiovascular disease and cancer (Dupre and Meadows 2007), chronic conditions and mobility limitations (Hughes and Waite 2009), a

health index including vision, hearing, speech, mobility, dexterity, cognition, emotion, pain (Wu and Hart 2002), activities of daily living ((I)ADL) (Liu and Zhang 2013), and long-term illness (Grundy and Tomassini 2010). These studies are national studies covering the US older population, the young and middle-aged Canadian population, and elderly inhabitants of England and Wales. Additionally, there is also clinical research with patient samples evaluating the connection between marital status and concrete health endpoints (e.g., cardiac event rates after percutaneous coronary interventions (Barbash *et al.* 2013)).

However, not only self-rated health measures but also these self-reported diseases can be mis- or under-reported. Sources of bias can be individual doctoral check-up behaviour, which in turn may be biased by someone's marital status: There are studies showing that the married "are more likely to see the doctor for checkups, screening, and other early detection than the nonmarried with the same symptoms, functioning, and general level of health" (Ross, Mirowsky and Goldsteen 1990: 1064; Berkman and Breslow 1983; also Guner, Kulikova and Llull 2014).

3.2. Health Tests

Besides specific health conditions, there is a body of literature on the association between marital status or biography and 'even more objective' measures of health. These measures include biomarkers as well as physical performance and cognitive performance tests.

Publications of marital status and health using **biomarkers** have been including analyses of blood pressure, heart rate, waist circumference, glycosylated hemoglobin, C-reactive protein (to identify cardiovascular, metabolic, and inflammation risk) (McFarland, Hayward and Brown 2013), blood pressure and blood glucose level (Schwandt, Coresh and Hindin 2010), hemostatic and inflammatory markers (C-reactive protein, fibrinogen, fibrin D-dimer, von Willebrand factor, tissue plasminogen activator antigen) (Ploubidis *et al.* 2015), blood levels of C-reactive protein (marker of systemic inflammation) (Sbarra 2009), inflammation-sensitive proteins (fibrinogen, ceruloplasmin, haptoglobin, α1-antitrypsin, orosomucoid) (Engström *et al.* 2006), and urinary cortisol levels (as indicator of stress-related neuroendocrine reactions) (Richardson *et al.* 2013). These studies have been conducted with US data of older adults (single-city, regional and population representative), and a British and Swedish birth cohort study.

Regarding tests of **physical functioning**, only a very limited scope of studies exists. Recently, two studies have been carried out analysing how marital status is related to the performance of hand grip strength and lung function: Clouston, Lawlor and Verdery (2014) found that never married, widowed, and divorced older persons show lower scores in both grip and lung strength testing – especially the men. Schneider *et al.* (2014) reported that never married older men and women have lower grip strength than the continuously married; remarried and previously married women have less hand grip strength than continuously married women. Both studies used SHARE data of the European older population. An article by Ploubidis *et al.* (2015) with the British National Child Development Study, discovered that never married men with and without cohabitation experience had lower respiratory

functioning than men continuously married since their 20s/early 30s. Continuously married women who had married in their late 20s or early 30s had higher respiratory capacity than married women who had married in their early 20s.

Regarding tests of **cognitive functioning**, a review of „available scientific evidence on the association between marital status and cognitive impairment and dementia“ (Giorgi *et al.* 2016: 510) elucidated that evidence in this field is still very scarce.[4] Studies on marital status and dementia using a full clinical assessment and/or psychological examination of dementia have been carried out for the Swedish population of 50 years and older (Sundström, Westerlund and Kotyrlo 2016), Eastern Finland (Håkansson *et al.* 2009), the southwestern French population above age 65 (Helmer *et al.* 1999), and the Taiwanese population above age 65 (Fan *et al.* 2015) – to name a few. A very recent review could identify 15 studies on marital status and risk of clinically assessed dementia in older adults from Europe, USA, and Asia. The authors' meta-analyses identified a greater risk of dementia for the widowed and life-long singles, compared to the married. However, the difference remained only significant for singles when studies had adjusted for age, sex, and education. All studies relied on current marital status in old age, no information on marital status duration or other components of the marital life course was available (Sommerlad *et al.* 2018).

On the other hand, and in line with the focus of my thesis, there have been some noteworthy studies analysing items of cognition tests similar to the cognition measures provided in the SHARE dataset (see chapter IV.1.2. for details on the testing procedures used in SHARE). Mousavi-Nasab *et al.* (2012) studied two waves of a survey among a random sample of adults in Umeå, Sweden. The outcome variables were derived from tests of episodic memory (recognition & recall tests), and tests of semantic memory (vocabulary & fluency tests). The authors found that married persons yield better results in the memory tests than the never married, but this does not apply to semantic memory. As far as development over time is concerned, never married and widowed persons showed a faster decline in the memory tests than the married**.** Furthermore, only the vocabulary and fluency tests seemed to be affected by interactions of age with marital status: Only married adults between 65 and 85 performed better than their widowed counterparts, there were no differences for adults aged 35 to 60. It is noteworthy that the authors excluded persons with dementia and stroke. Finally, van Gelder *et al.* (2006) and Feng *et al.* (2014) assessed scores of the Mini-Mental State Examination (MMSE) test battery as a measure of cognitive health in the older population. (MMSE consists of questions on orientation, registration, attention, calculation, recall, language, and visual construction. Originally created for clinical use, the MMSE "is now used extensively in epidemiologic studies" (van Gelder *et al.* 2006: 214)). The examination of longitudinal survey data of men over age 70 from Finland, Italy, and the Netherlands revealed that decline in cognition of never and unmarried men is twice as strong than among the married (van Gelder *et al.* 2006). In the investigation of Chinese adults over 55,

[4] See Wilson and Oswald (2005) for a critical overview of studies on marital status and broader measures of mental health (e.g., depressive symptoms, subjective well-being, happiness).

sampled for the Singapore Longitudinal Aging Study, Feng *et al.* (2014) discovered that single (i.e., never married) and widowed elderly are more likely to be cognitively impaired compared to the married – the results only being significant for men, not women. It must be noted that the study excluded institutionalised as well as extremely cognitively impaired men at baseline. A cross-sectional exploration of HRS data by Vable *et al.* (2015) found no significant difference in a memory test with a word list between continuously married and recently (0–2 years) widowed older US Americans. Using cross-sectional data of a sample of the Indian population above age 60, Perkins *et al.* (2016) explored the impact of duration of widowhood on memory function (recall test of 10 words). They stated negative effects for widows who had been widowed either 0–4 years, or longer than 10 years; for widowers, a significant negative effect was found for a duration of 5–9 years (compared to stably married).

4. Studies with Focus on Childhood Health Selection Effects

Another aim of this work is the integration of older people's health status in early life into the research design. With the increasing availability of longitudinal and retrospective datasets, which cover longer time spans of life histories, empirical research is able to address the marriage selection hypothesis (cf. Chapter I.1.3.). Publications have been covering European countries as well as the USA, and have been dealing with the question whether someone's individual health status influences their probability to marry, or more generally, the chances to enter or exit a marital union.

Regarding a beneficial effect of marriage on mortality, evidence has been found that this may be mainly a result from health selection into marriage (Kohler, Kohler and Skytthe 2011 with Danish twin register data), or a partly and time-dependent selection result, especially for men (Brockmann and Klein 2004 with German SOEP data). Regarding a beneficial effect of marriage on health, Guner, Kulikova and Llull (2014) demonstrated that this protective mechanism may only operate at older ages. At younger ages, it seemed to be a result from selection effects (US longitudinal data). Unger (2007) claimed that the marriage-health association goes completely back to health selection into marriage (using German SOEP data). Sbarra *et al.* (2014) showed with two waves of nationally representative US data, that only formerly depressed people suffer from major depressive disorder after a separation. Investigations on health selection out of marriage showed that married persons with health problems are more likely to get divorced than do healthy spouses (Joung *et al.* 1998 with Dutch regional data; Rapp 2012 with German SOEP data). Karraker and Latham (2015) identified only the onset of illness in the wife as a risk factor of divorce, whereas the onset of either spouse's illness can be a risk factor for widowhood in older US-adults.

The cited studies did not use measures of health status during childhood. To date, most datasets do not allow analysing both childhood health and old age health, and marital life course of the same individuals within one single research design. One study that included measurements of health in early life in a research design on partnership/marital status and health was conducted by Gumà, Cámara and Treviño (2015). They used the retrospective SHARELIFE data of elderly Europeans to examine the

relationship between partnership history and self-reported health at age 30 to 64. The included control variable on self-reported poor health during childhood showed a significant positive effect on hazards of poor health in mid-life, whereas there seemed to be no meaningful health advantage of having a partner in mid-life.

Other studies have been incorporating various other characteristics of childhood but not health. A paper on the association of partnership/marriage with mental well-being used data from 1970, 1980, 1986, and 2012 of the British Cohort Study, and included the following childhood characteristics: age mother at first birth, parent's marital status and social class at birth, timing of birth, age mother finished education, smoking of mother during pregnancy, respondent's birth order, parent's place of birth, living with parents and housing tenure (age 10), math test score (age 10), vocabulary test score (age 16). The authors concluded that a propensity score matching procedure "on childhood characteristics does not eliminate advantages to living with a partner; however, matching eliminates differences between marriage and cohabitation for men and women more likely to marry" (Perelli-Harris and Styrc 2017: 1; Perelli-Harris and Styrc 2016). The same authors and colleagues combined international datasets (British Cohort Study 1970, National Longitudinal Survey of Youth 1979 (U.S.), Household, Income and Labour Dynamics in Australia, Generations and Gender Survey for Norway, Socio-Economic Panel (DE)), and compared the impact of marriage and cohabitation on self-rated health (Perelli-Harris *et al.* 2017). As variables of childhood, the authors included: family structure (living with parents, no. of siblings, age mother at birth), and parental socio-economic status. The inclusion of these controls reduced differences in health effects between marriage and cohabitation for the UK, US, and Australian men, but the differences remained significant. Finally, Zhang and Hayward (2006) considered the survival status of the parents of US adults aged 50 to 60 "as a partial control for familial and genetic influences stemming from early life" (642). In models controlling for parental survival status, elderly women who ever had experienced a marital loss had an elevated risk of cardiovascular disease as compared with the stably married women; there were no significant differences between the other marital status groups.

All in all, the review of literature reveals that the state of research is still too limited to yield a consistent result on the marriage-health relation in old age. The same applies to the relationship between marital history and health. What has been shown is that different domains and measurements of health are sensitive to both marital status and different components of marital biography in different ways. Research designs which adjusted for childhood conditions seemed not to delete all health gaps between marital status groups. However, a major problem is that, to date, there is no study documenting marital status and health of the same persons from birth to death. Moreover, evidence for gender differences has been found in many of the articles within the discussed topics. However, these disparities were not trivial and not consistent across marital status and health dimensions. Concerning all the discussed areas of research, studies from the USA have been dominating, and studies with European samples have been mostly single-country studies.

III. MARITAL BIOGRAPHIES OF OLDER EUROPEANS: Overview of Measures, Descriptive Findings, and Country Differences

This chapter investigates retrospective life history data on partnership biographies of the population aged 50 years and older in 14 European countries. As a data source, I use the third wave of the SHARE survey (SHARELIFE) as well as self-compiled macro-indicators related to marriage-related national legal settings.

To set the stage for the multivariate analyses in Chapter IV, the following chapter presents the dataset, sample preparations, and marital biography measures. The aim is to exploit the unique data source of marital biographies of large, representative population samples of several European countries. Different national marital status compositions as well as characteristics of marital and non-marital relationship biographies are shown. The descriptive statistical findings are discussed with reference to country contexts and national marriage-related legislations.

1. Dataset: Survey of Health, Ageing and Retirement in Europe (SHARE)

This piece of work uses the Survey of Health, Ageing and Retirement in Europe (SHARE) (Börsch-Supan *et al.* 2013), datasets wave 1, 2, 3 (SHARELIFE), 4, 5, 6, release version 6-0-0 (Börsch-Supan 2017a; Börsch-Supan 2017b; Börsch-Supan 2017c; Börsch-Supan 2017d; Börsch-Supan 2017e; Börsch-Supan 2017f). All analyses were conducted with Stata Version 13.

SHARE is a multi-disciplinary panel survey that collects micro-level data from the European population aged 50 years and older. One of the project's core aims is to provide longitudinal data on the economic, social, psychological, and health conditions of older Europeans, enabling analyses of the consequences of increasing human life expectancy and ageing populations. The first survey wave was conducted in 11 European countries and Israel in 2004/2005. The following survey waves were conducted biennially between 2006 and 2015. The composition and number of participating countries has been changing between the six waves, resulting in a varying coverage of 20 countries (Austria, Belgium, Croatia, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Netherlands, Poland, Portugal, Sweden, Slovenia, Spain, Switzerland). Eligible for participation are persons aged 50 or above at the time of the interview (i.e., for wave 1: persons born in 1954 or earlier). Partners of the selected respondents are also interviewed, irrespective of their age[5]. Persons who are imprisoned, hospitalised, out of the country or not able to speak the country's language are not eligible. All age-eligible persons who have taken part in any wave of the SHARE survey are part of the longitudinal sample and followed for re-interviews (if possible, also after admission to a nursing home). The respondents are interviewed in their homes by trained local interviewers via CAPI (Computer Assisted Personal Interview) method. The questionnaire contains between 20 (wave 1) and 25 modules (wave 6), including physical performance tests.

[5] Own calculations show that not all sampled couple-households deliver interviews of both partners. The following shares of couple-households have interviews of both partners in the dataset: 69% in wave 1; 73% in wave 2; 81% in wave 3; 76% in wave 4; 75% in wave 5; 78% in wave 6.

Methodologically, probability sampling with a maximum of population coverage is the foundation of the SHARE survey design. This sampling approach allows for drawing inferences about the national populations of 50 years and older. The specific methods of the survey sampling design are dependent on the country-specific conditions – the most frequent design in the SHARE countries is the multi-stage stratified sampling design[6]. The types of sampling frames include population or civil registers, registers for specific use, and telephone directories. Each survey wave sample – except for wave 1 and 3 – consists of a longitudinal and a refreshment sample unit. The purpose of drawing a refreshment sample is to allow for a sufficient coverage of 'younger' respondents in the longitudinal sample. Additionally, refreshment sampling can compensate for the loss of observations due to panel attrition (Börsch-Supan *et al.* 2013; Munich Center for the Economics of Aging (MEA) 2017b; Börsch-Supan and Jürges 2005; Bergmann *et al.* 2017). To date, nearly 300,000 interviews with over 120,000 respondents have been administered (Bergmann *et al.* 2017), between 30,000 interviews (wave 1) and 68,000 interviews (wave 6) have been released to the scientific community.

In panel surveys, and especially in panel surveys of populations of the elderly, such as SHARE, issues of panel attrition and panel mortality play an important role with respect to data quality and statistical inference. The multiple countries design of SHARE additionally harbours national differences in response rates (to the initial survey request) and retention rates (response at follow-up waves). Causes are, among others, different cultures of survey acceptance, national sampling frames and/or national legal restrictions (Blom and Schröder 2011). The main risk is that "panel attrition not only harms the power of longitudinal analyses by decreasing sample size over time, but it can also affect the representativeness of the sample if specific sub-groups of panel members drop out more than others" (Kneip, Malter and Sand 2015: 135). Methodological research indicates that there are indeed national differences in response and retention rates in the SHARE survey. However, with regard to demographic characteristics of the respective respondents, across all countries, there is no particular evidence that attrition is related to gender. The evidence for age is less clear. Whereas no consistent patterns for age-related attrition is found for the participation in wave 3 (SHARELIFE), there is evidence that the oldest respondents (>74 years) are more likely to drop out in the transition to wave 2 and to wave 5. However, this might be rather an issue of actual mortality instead of panel mortality (Blom and Schröder 2011; Kneip, Malter and Sand 2015; Schröder 2008; Bergmann *et al.* 2017).

SHARELIFE

The third wave of the SHARE survey, called SHARELIFE, is not a regular panel wave, but a collection of data on life histories. In 2008 and 2009[7], about 30,000 SHARE respondents from 14 European countries (Austria, Belgium, Czech Republic, Denmark, France, Germany, Greece, Ireland, Italy, Netherlands, Poland, Sweden, Switzerland, Spain; see Figure 1 for a map) participated in the

[6] Types of sampling design include: (Stratified) simple random sampling from national population registers (e.g., DK, SE), multi-stage sampling using regional/local population registers (e.g., DE, IT), and single or multi-stage sampling using telephone directories followed by screening in the field (e.g., AT, CH) (Klevmarken, Hesselius and Swensson 2005).

[7] In Ireland, field time was 2009–2011.

survey. The approach was to gather multidisciplinary data by collecting life course information on children, partners, accommodations, employment, health, finances, and further important life events (Börsch-Supan, Brandt and Schröder 2013; Börsch-Supan *et al.* 2013). SHARELIFE interviews were conducted via CAPI (Computer Assisted Personal Interview) method, supplemented by the EHC (Event History Calendar) method. The EHC CAPI software contained years of country-specific social, political, sports, or natural events, facilitating respondents' recall of their life histories (Das, Martens and Wijnant 2011).

Figure 1: Participating countries SHARELIFE (in orange)

Source: Own compilation based on map provided by SHARE-ERIC

In the scope of this study, the questionnaire module on partnership histories is essential. Respondents gave retrospective reports of the time spans of marital and non-marital partnerships. The questionnaire on *marital partnership biography* asked if someone was ever married, and if so, for each marriage the following information was collected: the year of the beginning of the relationship, the year of marriage, the year of the beginning of cohabitation. For each marriage, the interviewer asked: *"Are you still living with [{name of partner}]?*".[8] If the answer was no, the year was documented and the reason: "relationship breakdown including divorce", "widowed/partner died", "partner moved into nursing or care home", "other reason". In the case of relationship breakdown, respondents were asked if it was a divorce, and then the year of divorce (Schröder 2011). Since the main motivation of this research is to compare official marital status categories, the answer options are aggregated accordingly. Reports of "other reason" are treated as missing values, since this category is too vague to add it to any of the other reasons for a marriage's ceasing to be, or to analyse it as a subgroup

[8] All cited SHARE questionnaire passages within this piece of work have been retrieved from http://www.share-project.org/data-documentation/questionnaires.html [last access on 4/12/2017].

(N=122). What 'other reasons' for quitting marital cohabitation may be is very speculative. One reason could be that a marriage with shared household transformed to a long-distance relationship with separate households. Respondents could have also chosen this category as a proxy for refusal or a memory gap. The reason "partner moved to nursing home" (N=38) is not treated as a proper cessation of a marriage since it only marks the end of marital cohabitation due to health and organisational reasons but not a dissolution of the marriage.

The questionnaire on *non-marital partnership biographies* gathered information on both non-marital cohabitation relationships and non-marital relationships without shared household ('living apart together' (LAT)). First, respondents were asked if they had ever had an unmarried partner, not considering their marriages *("[Have/Not considering your marriage, have/Not considering your marriages, have] you ever lived unmarried together with someone as a couple?"*). If the answer was Yes, for each relationship information on the year of the start of the relationship and of cohabitation was collected. In the case of relationship cessation, the year was documented and the reason: "relationship breakdown including divorce", "widowed/partner died", "partner moved into nursing or care home", or "other reason". As with marriages, the reason "partner moved to nursing or care home" (N=3) is not treated as the cessation of a relationship. Due to the limited numbers of observations and since official marital status categories do not apply to non-marital relationships, the categories "relationship breakdown including divorce" and "other reason" are combined. Finally, respondents were asked if they had ever been in a long-term relationship that had been important to them and during which they had lived at a different address than the partner for most of the time. The year of the beginning and end (if applicable) of these partnerships were collected but no reasons for relationship breakups.

Marital history, the central explanatory variable of this study, may be a source of distortion which is caused by recall errors of respondents. Reliability and quality of retrospectively collected SHARELIFE data about early life circumstances has been tested by Havari and Mazzonna. They concluded that their results "should mitigate doubts on retrospective data collection and promote their use for research purposes" (Havari and Mazzonna 2011; Havari and Mazzonna 2015). Garrouste and Paccagnella (2011) linked marital status information from regular SHARE waves and SHARELIFE to test consistency. They found that men remember relationships slightly better than women, and recall accuracy increases with age; however, they report very low rates for recall bias of marital status. But what about the data quality of decades of marital biographies? In fact, people with more complex partnership histories have more events to remember, and the "more events there are to remember, the harder it may be to remember all of them accurately" (Garrouste and Paccagnella 2011: 62).[9]

[9] See Hill (2005) for a report on methodological problems such as non-response, interviewer effects, or validity of survey data about family and partnership themes. See Breitenbach (2013) and Brüderl and Engelhardt (1997) on reporting bias of dates of separation and divorce in population surveys. See Klein and Fischer-Kerli (2000) for reliability of partnership biographies of retrospectively collected life history data.

Plausibility Checks of Retrospective Partnership History Data

The data structure and questionnaire design of the SHARELIFE survey is complex and comprises almost 30,000 observations across 14 countries. The following plausibility checks and data cleaning efforts have been conducted for the retrospective partnership history data.

Marriages: Some respondents reported implausible dates on marriages, such as marriage before birth, year of marriage after termination of marriage, beginning of the second marriage before the end of the first marriage (N=128). These data are treated as missing values and are excluded from analysis. Similarly, respondents who reported implausible dates on 'living-apart-together' partnerships are excluded. N=19 were dropped due to implausible information, e.g., two parallel relationships or missing data on the start or end year.[10]

Age at marriage: The minimum age at which persons are legally allowed to marry varies between European countries and has been often modified during the 20th century. For example, in Spain, between 1943 and 1978, the marriageable age was 21, and in extraordinary cases even 14. From 1978 onwards, it has been reduced to 18, although in special cases marriage at 16 is now possible. In many countries the marriageable age is lower for females. For example, in the Netherlands, between 1918 and 1991, men were allowed to marry at 20, women at 18, and with parental consent even at 12. Since 1991, both spouses must be 18, and with parental consent it is possible to marry at 16. In Germany, women could marry at age 16 (in special cases at 14), and males at 21 (in special cases at 18) from 1938 to 1974. Since 1974, both partners must be 18 (16 if one spouse is 18) (for references see Table 4 in section "Marriage-related legislation in SHARELIFE countries" of this chapter). I compared the reported age at marriage in the SHARELIFE dataset with the country-specific legal situation in the given year. Since the date of marriage is only identified by the year and not the month, a margin of one year should be accepted when comparing age at marriage of respondents to the legal marriage age. In the end, I excluded N=6 which seemed to be reporting or recalling errors[11].

Same-sex marriage: In the scope of the following analyses, only different-sex marriages will be included in the sample. It was only in the new millennium that European jurisdiction began to legalise same-sex marriages.[12] Pioneered by the Netherlands and Belgium (legalisation in 2001 and 2003), to date, in only eight of the 14 SHARELIFE countries homosexual couples can marry. The other countries introduced the option to register different-sex partnerships. In Poland neither option exists for same-sex couples until today. The questionnaire of SHARELIFE does not distinguish between

[10] E.g., Brockmann and Klein (2004), who conducted a study of German marital biographies, pointed out that respondents with reporting gaps of marital biographies "are unlikely to have had an average marriage" (570).

[11] Greece: N=2, females married under 12; Czechia: N=1, female married at 14 in 1965; Poland: N=2, female married at age 6, male married at 13 in 1954; Germany: N=2, males married at 16 in 1967/1972 (for references cf. Table 4). Respective respondents did not immigrate from different countries, marriage under different law regimes is unlikely.

[12] Since same-sex marriage is a relatively recent phenomenon in Europe and the USA, research in the field of marriage and health has been restricted to heterosexual couples. Whether the health status of persons in different- or same-sex marriages is similar are not will be a promising research area which is slowly evolving (Cherlin 2013).

hetero- and homosexual marriages. Theoretically, it is possible that in some countries respondents reported same-sex marriages. For countries that introduced same-sex marriage before or during the survey years (2007/2008/2009)[13], the gender of respondent and his/her partner was compared and identified as different-sex marriages. N=21 remained and were dropped where no partner interview was available, and the gender could not be checked. An overview of national variations in the legalisation of gay marriage can be found in Table 5, Chapter III.4.3.

2. Marital Status and Marital Biography Measures

To take into account the various components of marital life course, the following variables are constructed. First of all, there is the distinction between current marital status and marital biography. *Current marital status* is the marital status at the time of the interview. That is: married, separated, widowed, and never married. The status 'separated' includes divorced and separated persons. Divorce legislation has undergone many changes and is not identical in the different European countries. Using the category 'divorced' may distort results due to different time frames of divorce legislation: e.g., one year of separation is compulsory before judicial divorce in Germany, whereas in Ireland it is four; divorce law of the Netherlands or Poland permits immediate divorce.[14] Moreover, divorce became legal at different time points in the European countries, e.g., in 1875 in Germany and in 1996 in Ireland. Accordingly, separation was surely a proxy for divorce in countries where divorce became possible rather late (cf. Table 3 for a compilation on national divorce legislation).

The variables reflecting the marital life course of respondents are constructed from the retrospective partnership interviews. "By definition, marital trajectories comprise several interrelated components that develop over time, including marital sequencing, timing, transitions, and durations" (Dupre and Meadows 2007: 624). Following this definition, a variable of *marital status biography* represents the number and types of marital status transitions. There are nine categories used in the following: never married, married once, separated once, separated after two or more marital losses, widowed once, widowed after two or more marital losses, remarried after separation, remarried after widowhood, remarried after two or more marital losses. 'Marital loss' refers to separation and/or widowhood. The subcategories follow the classification with similar data of retrospective marital histories by Zhang (2006), and reflect the data structure adequately. Due to the limited number of observations in the categories of multiple marriages and multiple marital transitions, more detailed subcategories were not possible. In terms of *marital timing and duration* biography, variables of age at first marriage, age at first separation, and age at first widowhood were generated for the ever-married population. Moreover,

[13] The Netherlands introduced gay marriage in 2001, Belgium in 2003, Spain in 2005, Sweden in 2009 (for references cf. Table 5).

[14] Taking into account the compulsory (one-year) period of separation before judicial divorce, like in the case of Germany, it has become custom in the German field of divorce research to use the date of separation instead of divorce as variable of interest to take (Rapp 2008). However, a study by Brüderl and Engelhardt (1997) comes to the conclusion that there are no substantial differences when using separation or divorce date for large samples.

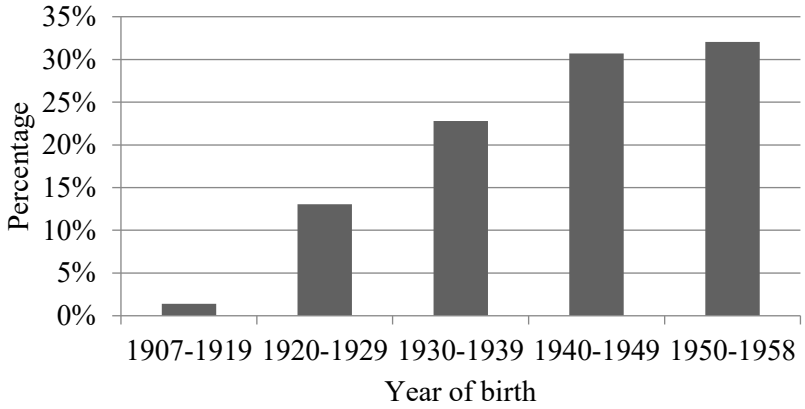
the duration spent in a marital status (in years) was calculated.[15] For the never married population, a variable is used distinguishing between different partnership biographies (no relationship ever/previously in a relationship/currently in a relationship).Table 1 shows selected descriptive statistics of SHARELIFE respondents who reported complete marital biographies and are 50 years or older at the time of the interview (N(weighted)=27,793). Note that all descriptive statistics of this study use calibrated cross-sectional weights at the individual level, which are provided in the SHARE dataset. These weights have been calculated using country- and wave-specific calibration margins, which reflect the size of the target population with respect to age, gender, and region. This procedure of statistical weighting "may help reduce the potential selection bias generated by unit nonresponse and panel attrition" (Munich Center for the Economics of Aging (MEA) 2017b: 36) – under the assumption that any missing data is missing-at-random (ibd.).

To limit the sample to the older European population, respondents under age 50 were excluded (N=511 younger partners). The resulting age range of the sample is between 50 and 101, with a mean age of circa 66 years. Distribution of respondents across birth cohorts is displayed in Figure 2. Only about 1% of the sample has been born in the first two decades of the 20th century. 13% have been born in the 1920s, almost 23% in the 1930s, and over 30% each in the 1940s and 50s. The average number of marriages in this sample is one. The average number of unmarried cohabitation unions in this sample is very low (0.09); for LAT unions, the average number for all countries taken together is 0.1. From a today's perspective, these numbers may appear extremely low. Indeed, the last decades have been characterised by a rise in non-marital cohabitation unions, "challenging the institution of marriage" (Perelli-Harris and Bernardi 2015: 702). Although in most European countries, cohabitation is today an accepted form of family behaviour, often serving as a pre-stage before marriage or alternative to marriage, it has to be noted that cohabitation has been a marginal phenomenon before (ibd.). For example, the German legal system has been historically forming obstacles for persons cohabitating out of wedlock, and even today this living arrangement is hardly recognised. The German Criminal Code included a prohibition of procuring until 1973, which had made landlords guilty of an offence when providing accommodation to an unmarried couple (Adamietz 2017). In almost all Cantons of Switzerland, repressive legislation prohibited unmarried cohabitation until the 20th century – abolishment of these prohibitions was enforced between the 1970s and the late 1990s (Head-König 2007). Bearing in mind these restrictions, during the main phase of mate selection in the young adulthood of the SHARELIFE respondents – who were born no later than 1958 – cohabitation may just have not been an option (see also Table 6 for country-specific acceptance of cohabitation nowadays).

[15] Similar approaches of operationalisations to test the effects of the marital life course on health can be found in the literature (Brockmann and Klein 2004; Dupre, Beck and Meadows 2009; Dupre and Meadows 2007; Grundy and Tomassini 2010; Hughes and Waite 2009; McFarland, Hayward and Brown 2013; Zhang and Hayward 2006; Zhang 2006).

Regarding marital status, 7% of the respondents have been never married at the time of the interview. The majority, 66%, is married. Around 9% are separated or divorced, and 18% live in widowhood. A gender-separated calculation of current marital status reveals the well-known differential in the male-female-ratio of widowhood: While only 7% of older men are widowed, more than 27% of the older women are widowed. The underlying mechanisms are manifold. First of all, there is a sex-differential in longevity – women live longer than men (Peace *et al.* 2008). (An exceptional case is Ireland, where until recently, men outlived women (Coleman 1992). This demographic exception can be observed in the SHARE dataset, the highest share of male widowers is found in Ireland (ca. 10%)). Second, women often marry men that are older than themselves, and vice versa (Cheung 2000; Martin-Matthews 2011). Third, there is evidence of an elevated risk of excess mortality for widowers immediately after the death of their wife (e.g., Martikainen and Valkonen 1996; Thierry 2000). At the same time, it has been found that there may be a positive effect on longevity of widows after the death of the husband (Pizzetti and Manfredini 2008). Finally, it has been shown that men remarry more frequently after widowhood than women, leaving more women in the marital status group of the widowed (Martin-Matthews 2011).

Figure 2: Distribution of birth cohorts of the SHARELIFE sample



Source: SHARE w3 rel6-0-0. N=27793. Own calculation using weights.

Table 1: Summary statistics of analysis sample

	Mean	S.D.	Min.	Max.
Year of birth	1942.33	(10.35)	1907	1958
Age	65.90	(10.35)	50	101
No. of marriages	1.01	(0.43)	0	5
No. of cohabitation unions	0.09	(0.36)	0	8
No. of LAT unions	0.10	(0.36)	0	5
		Percent		
Marital Status	All		Men	Women
never married	6.96		8.07	6.04
married	66.48		77.38	57.41
separated/divorced	8.57		7.54	9.42
widowed	17.99		7.01	27.12
$N_{(weighted)}$	27793		12416	15377

Source: SHARE w3 rel6-0-0. Own calculations using weights.

3. Country Differences

Although decisions on partnership and marriage take place within people's private living spheres, the country context shapes how and by whom these decisions are made. The role of country context has "been found to be one of the most enduring factors shaping family formation. Numerous studies have found that countries, or states defined by national borders, have been important for defining demographic processes across space […]. By developing standard policies, education, communication, and media, the modern state has organized and structured populations, resulting in greater homogenization of behaviors within countries" (Perelli-Harris and Lyons-Amos 2016: 5). The European welfare states differ in their intentions of national family policy and how legal, economic, and educational state interventions are combined. Different family policies create different incentives or barriers to realise private family formations such as marriage, cohabitation, or child bearing. At the same time, these national policy profiles shape societal norms of what is considered the 'right and normal' family biography. However, despite the differences in national policy profiles, long-term demographic processes in Europe show great similarities, for instance, trends in birth rates, non-marital childbearing, or age at first marriage (Strohmeier 2008).

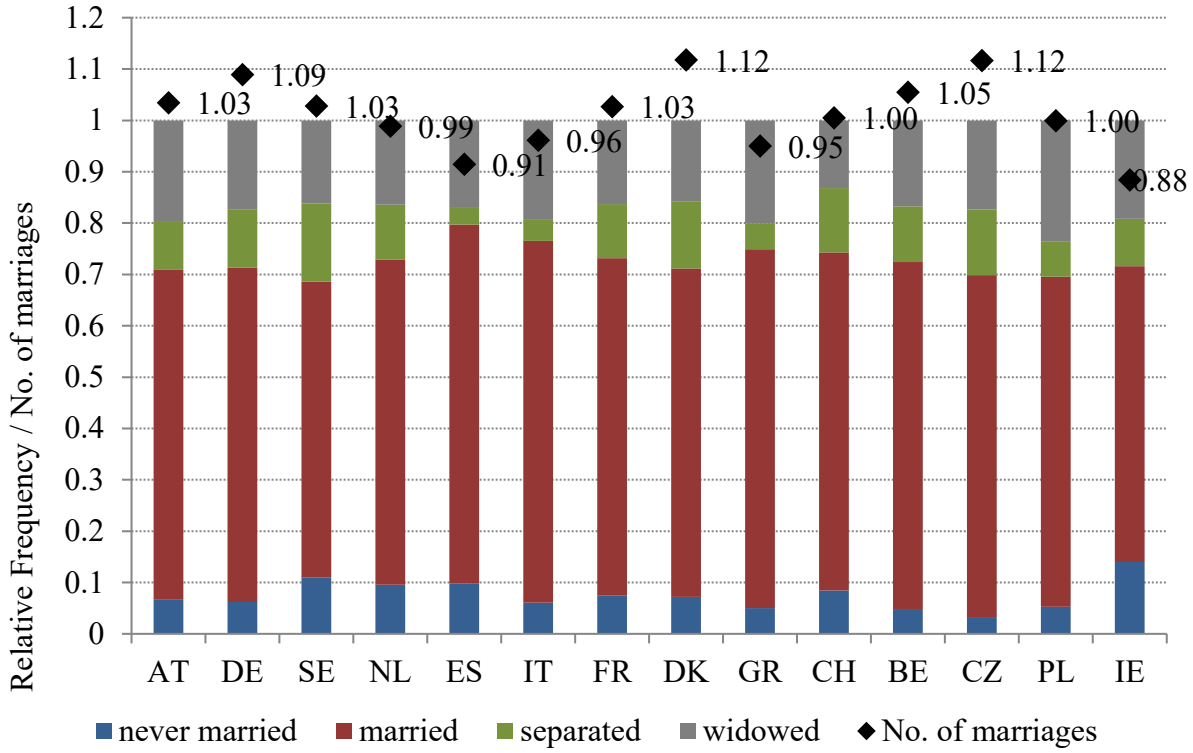
3.1.Marital History Characteristics

The following figures provide country-wise descriptive statistics on various aspects of marital life courses of the SHARELIFE sample.

3.1.1. Current Marital Status

Figure 3 shows the national proportions of marital status in the survey year (2007/2008/2009).

Figure 3: Marital status proportions & Average no. of marriages at time of interview, by country



Source: SHARE w3 rel6-0-0. N=27793. Own calculation using weights.

In all countries, the major share of the population of 50 years and older is married. The biggest share of currently married people is found in Italy (70%), the smallest share is found in Ireland and Sweden (58%). In all other countries, more than 60% of respondents are currently married. The percentage of never married adults ranges between 3% in the Czech Republic, ranges between 5 and 10% in the other countries, and reaches a maximum of 14% in Ireland. The large number of never married older people in Ireland reflects country-specific circumstances of the culture of marriage at the time when the SHARE respondents were younger. Indeed, Ireland seems to be an exceptional case in Europe in terms of marriage, fertility, emigration, and mortality rates. As Coleman (1992) states, the unique demography of Ireland has been standing out across Europe since the 19th century (53). Strassmann and Clarke (1998), who conducted a study using 19th and 20th century Irish census data on marriage and reproduction, pointed out that: "Since the mid-1800s, Ireland has had one of the highest percentages of individuals who postpone marriage or who never marry of any country in the world" (33). The authors argue that ecological and economic constraints lowered the chances of getting married, in a country with poor economic prospects and a predominantly agricultural economy. Low marriage rates were driven by the necessity of economic success – especially land ownership – and social success (e.g., high status) for marriage (Strassmann and Clarke 1998). In addition, unusually high rates of emigration and mortality of females, had made Ireland to "'a nation of elderly bachelors'" (Coleman 1992: 57). Overall, the observed share of never married people aged 50 or above reflects the past marriage behaviour of the birth cohorts of the SHARELIFE sample. Official

European aggregated statistics confirm that of European women born in the 1940s, more than 90% have at least married once by the age of 50 (Toulemon 2016).[16]

Variation between countries is similar for separated persons. As stated earlier, separated and divorced persons are clustered to one category because divorce legislation has undergone many changes and is not identical in the different European countries. Using the category 'divorced' may distort results due to different time frames of divorce legislation (e.g., one year of separation is compulsory before divorce in Germany, whereas in Ireland it is four). Moreover, divorce became legal at different time points in the European countries, e.g. in 1875 in Germany, and in 1996 in Ireland. Accordingly, separation was surely a proxy for divorce in countries where divorce became possible rather late (cf. Table 3 for a compilation and references on national divorce legislation). Less than or maximally 5% of the older population lives separated in Spain (3%), Italy (4%), and Greece (5%), at the time of observation. Shares of around ten percent divorced or separated older adults are found in Austria (9%), Ireland (9%), Germany (11%), the Netherlands (11%), France (11%), and Belgium (11%). The highest shares of separated older people live in Denmark (13%), Switzerland (12.5%), Czechia (12.8%), and up to 15% in Sweden. These numbers presumably reflect historic developments of national divorce law and cultural context. Unless nowadays, "divorce was highly stigmatized, forbidden or difficult to obtain, and very rare in Europe" around the mid-20th century (Toulemon 2016: 31). However, in the 1960s and 70s, there was a rapid increase of divorce rates in Northern, Eastern and Western Europe. Southern Europe experienced also increasing divorce rates but much later, between the 1990s and 2000s (ibd.). Reasons for this social phenomenon are for sure complex but they are, among others, rooted in country-specific legislation and religious beliefs. Spain, Italy, and Greece introduced or re-introduced legal divorce during the 1970s and 80s, Ireland as late as 1996. In the other ten countries, divorce had been an option already since the 16th century (DK), 18/19th century (AT, BE, F, DE, NL) or early (CZ, SE, CH) to mid-20th century (PL). Moreover, strong family ties and Catholicism have slowed the diffusion of divorce in Southern Europe and parts of Eastern Europe. In Nordic countries, Protestantism, the early orientation towards gender equality, and female labour force participation may have promoted liberal values, which led to the increase in divorce (Perelli-Harris and Lyons-Amos 2016). In the case of Ireland, with a share of almost 10% of separated elderly, the SHARELIFE data clearly reveal that the married population found ways to leave their spouse, despite the ban of divorce until 1996. As validated by Coleman (1992), the Irish substituted the absence of domestic divorce with separation, annulment, and desertion of marriages, or divorce abroad. In the 1980s, the Irish had a higher proportion of separated persons than England (ibd.).

[16] An exemplary cross-check of the marital status proportions that are obtained with the weighted SHARELIFE survey data was conducted for Germany, using register-based census data of 2011 (restricted to adults age >= 50, registered same-sex partnerships and missing answers excluded). There is almost complete consistency: married: 65% (SHARE) vs. 65% (Census), separated/divorced: 11% (SHARE) vs. 10% (Census (=divorced only)), widowed: 17% (SHARE) vs. (Census: 17%), never married: 6% (SHARE) vs. 7% (Census) (Statistische Ämter des Bundes und der Länder 2014, own calculations).

The second largest marital status group in each country is the widowed. This is clearly a result of the age structure of the sample. Across all countries, 18% of respondents are currently widowed. The percentage of widows and widowers is highest in Poland (24%) and lowest in Switzerland (13%). The figure also illustrates the average number of marriages in each country (this datum is marked by the diamond shaped data points). The average number of marriages is below one in Ireland (0.88), Spain (0.91), Italy, and Greece (0.96/0.95). In all other countries, the average is 1 or up to 1.12 marriages (DK and CZ). Although there is some variation in the absolute number of marriages, most respondents have not entered higher-order marriages.

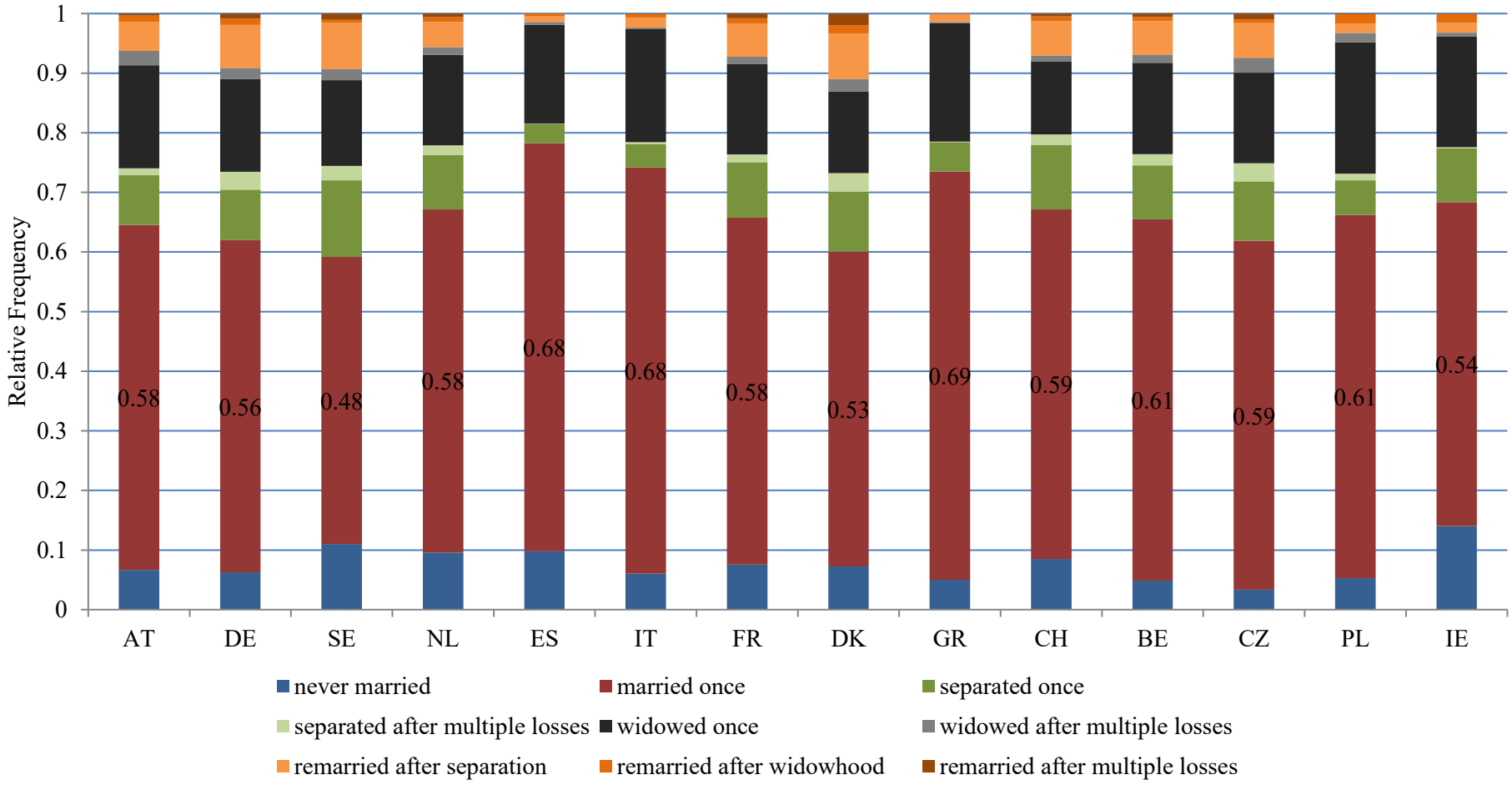
3.1.2. Marital Status Biography

Figure 4 illustrates more detailed marital status biographies in the European countries. The marital biography of the never married is identical to their marital status category used in Figure 3. As seen in the figure before, the largest share of people of the older population is currently married, and most of them are so continuously in their first marriage. Italy, Greece, and Spain have the highest percentage of continuously married persons aged 50 or older (almost 70%). These numbers are most likely a result of the 'golden age of marriage', which took place after World War II in most European countries. It was characterised by early and universal marriage behaviour and lasted until the 1970s (Toulemon 2016).

Additionally, the graph shows the percentage of remarried people per country. Remarriage in later life is most common in Germany, Sweden, and Denmark (about 10% of the older population). Less than 1% of the population is remarried in Spain, Italy, and Greece. Among others, this may be rather a legacy of national divorce legislation than of personal decisions. Spain, Italy, and Greece legalised divorce much later than Germany, Sweden, or Denmark, rendering also remarriage impossible. So, most of the members of the analysed cohorts never had the option to officially divorce and marry again for most of their lives. In almost all countries remarriage occurred mostly after a separation, not after bereavement. Exceptions are Poland and Ireland, where we find approximately as many remarriages after separation as we do after widowhood.

If we turn to look at separations, the data allow us to distinguish between separations after one marriage and separations after two or more marriages. In each country, more than half of the currently separated people are separated for the first time. Up to 3% of the older adults are separated or divorced again in Denmark, the Czech Republic, and Germany, whereas there are almost no higher-order separations in Spain, Italy, Greece, and Ireland. Concerning the widowed population, the data show that in every country more than half of the current widows and widowers are widowed after the first marriage. About 2% are widowed after two or more marital losses in Austria, German, Sweden, France, Denmark, and the Czech Republic. All other countries show even smaller figures. Although there is some variation in conjugal status sequences, it becomes clear that the sample represents an older, relatively conservative cohort, with respondents on average having been born in 1942. The dominating biography is one continuous marriage.

Figure 4: Marital sequencing biography, by country



Source: SHARE w3 rel6-0-0. N= 27696. Own calculation using weights.

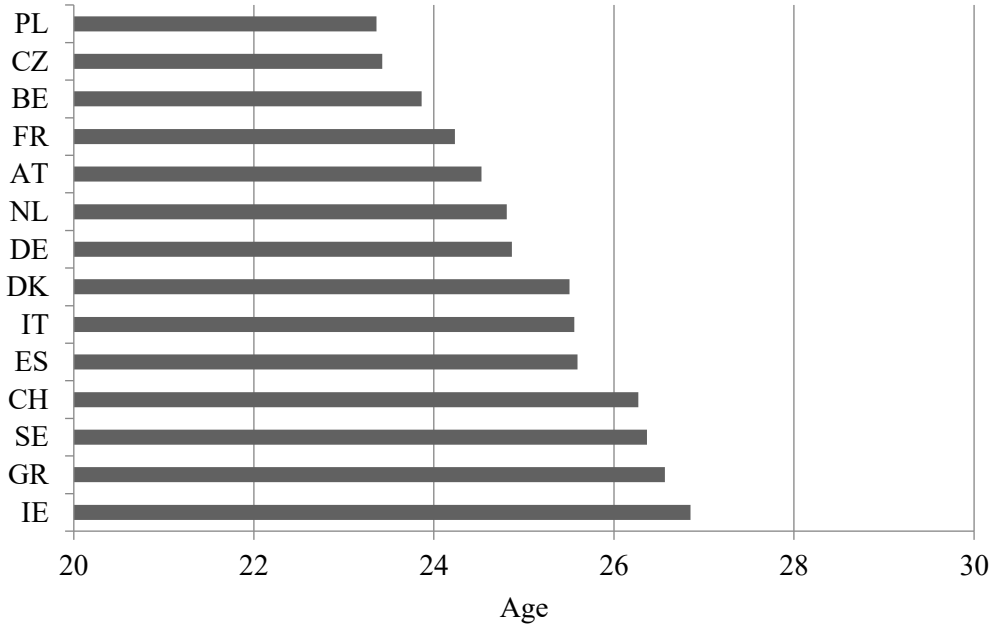
3.1.3. Marital Timing and Duration

Looking at persons who have been married at least once, it is possible to describe marital biographies regarding age at marriage, duration of marriage(s) and, if given, separation(s) and widowhood(s).[17] Figure 5 illustrates the mean age at first marriage in each of the 14 countries. Again, the past unique marriage conditions of Ireland are visible: a mean age at first marriage of almost 27 years is the highest being observed across all the European countries. However, similarly high values can be found for Switzerland, Greece, and Sweden (around 26 years). All other countries show an average age at marriage between 23 and 25. Official European aggregated data support these findings. The mean age at marriage was circa 23 in the 1960s in Europe. Afterwards, mean age at marriage began to increase – in the 1970s in Western Europe, in the 1980s in Southern Europe, and in the 1990s in Eastern Europe – reaching a peak in Sweden where women's age at first marriage is above 30 nowadays (Toulemon 2016).

The gender-specific variation of the average age at first marriage of the respondents can be seen in Figure 6. Across countries, female respondents had been younger than male respondents at their first wedding. The age gap varies between two to almost five years. The lowest average age is found for Polish females (21.9 years), the highest for Greek males (29.2 years). Again, national legislation is supposed to have influenced this picture. The age limit for civil marriage has been varying between the 14 European countries. Legal marriageable age had been lower for women than for men in Austria (until 2001), Belgium (until 1990), France (until 2006), Germany (until 1974), the Netherlands (until 1992), and Switzerland (until 1996). Nowadays, the conventional age limit for marriage is 18 years in all the countries for both men and women, except for Poland where marriageable age for women is 16. Table 4 in Chapter III.4. compiles the historic changes of marriageable age legislation, age limits nowadays, and the possibilities of exceptions.

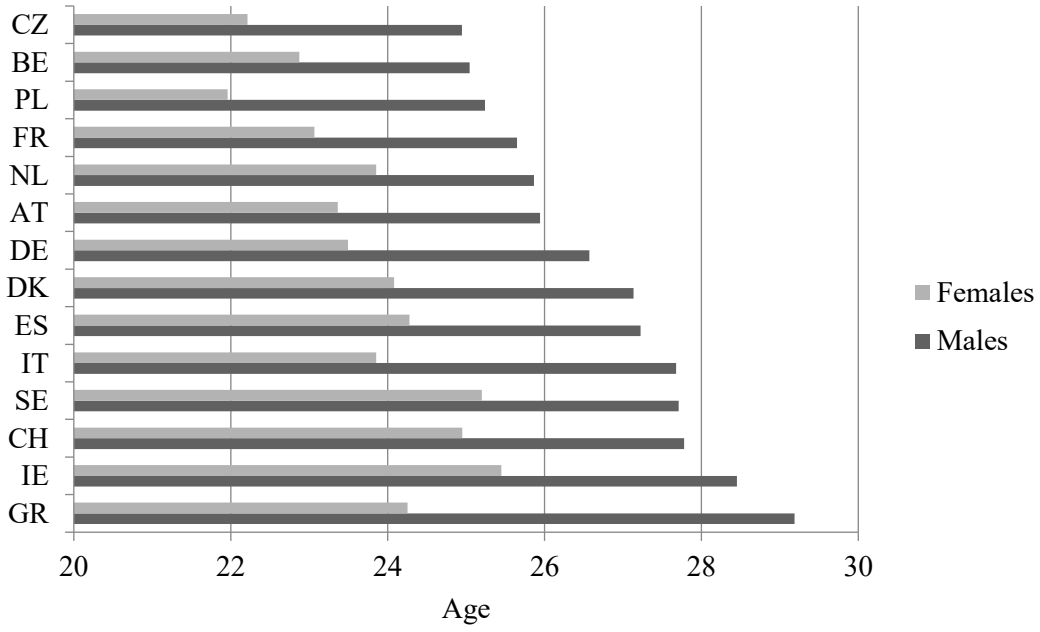
[17] In this subsample, N=102 was dropped because of data collection error and/or partial non-response. For example, excluded cases reported to still live in first marriage but also having an ongoing second or third marriage. Another exclusion criterion was a missing reason for the end of first marriage.

Figure 5: Mean age at first marriage, by country



Source: SHARE w3 rel6-0-0. N=26040. Own calculation using weights.

Figure 6: Mean age at first marriage, gender-specific, by country

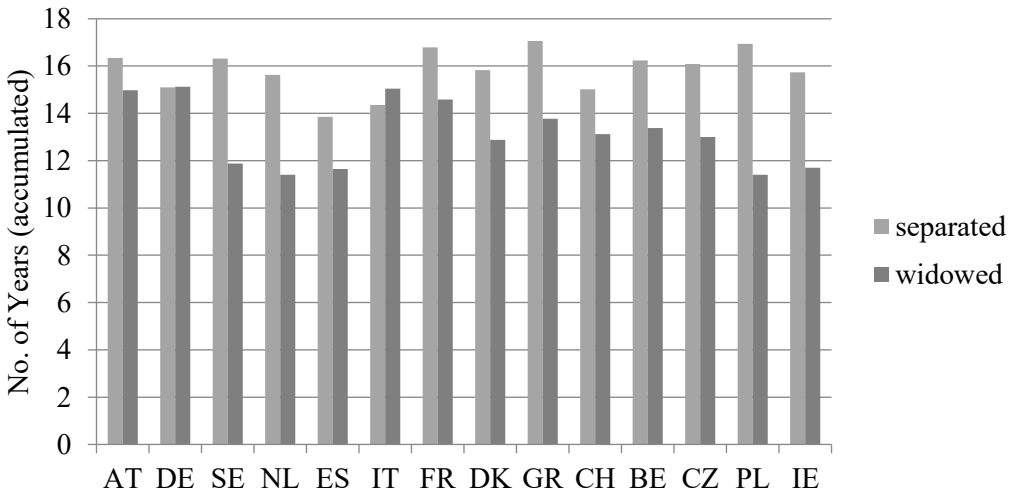


Source: SHARE w3 rel6-0-0. N=26040. Own calculation using weights

For persons who ever experienced a marriage cessation, there are national differences with regard to the durations of separations and widowhoods. The light grey bars in Figure 7 show the average number of years people spent living separated or divorced (accumulated). Across countries, the average length of time that persons have spent living separated is rather homogenous. On average, the European respondents have been living separated for 14 to 17 years of their current life times. Respondents from Italy and Spain show the shortest mean duration, whereas Greek and Polish elderly show the longest accumulated duration of being separated/divorced. The dark grey bars show the average number of years the Europeans have spent living widowed (accumulated). The years of life in widowhood are lower than the years in separation, across all countries. The exceptional case is Italy, where the average duration of separation(s) is very similar to that of widowhood(s), the latter exceeding the former. Around 15 years of their current life time, respondents from Austria, Germany, France, and Italy have been spending in widowhood. In the remaining countries, average durations of widowed life spans are between 11 and 14 years.

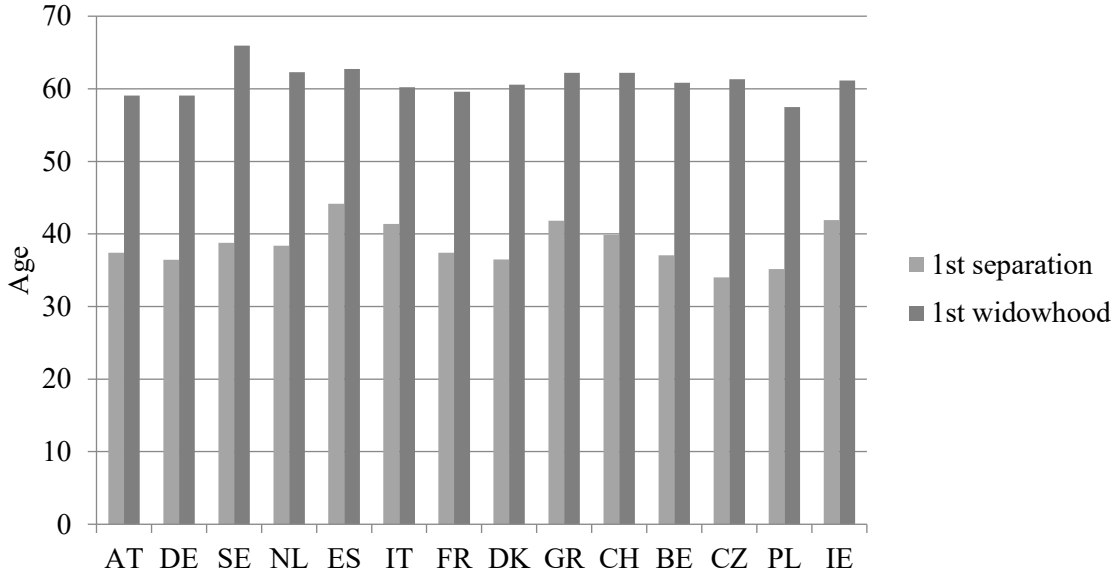
As far as timing of the disruptions of marriages is concerned, the patterns across countries are also very homogenous (Figure 8). The mean age at which people experienced the death of a spouse for the first time is around 60 years in each of the countries. Polish respondents have experienced widowhood on average slightly earlier (at age 57). The other exception is Sweden, where respondents became widowed for the first time later, at around age 66. The average age for the first experience of a marriage breakdown is in the mid- and late 30s. Irish, Italian, Greek, and Spanish members of the sample had been already over 40 when their first separation occurred (mean age: 41–44).

Figure 7: No. of years the ever-disrupted have been living separated/widowed (accumulated), by country



Source: SHARE w3 rel6-0-0. N=4582 (widowed); N=3555 (separated). Own calculation using weights.

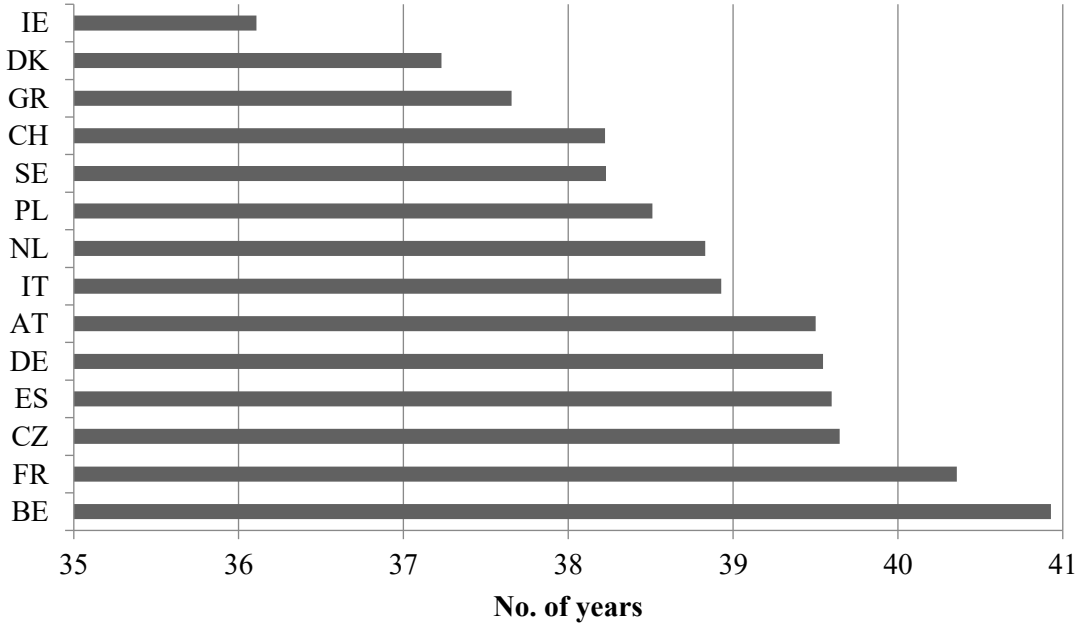
Figure 8: Mean age at 1st separation/widowhood of the ever-disrupted, by country



Source: SHARE w3 rel6-0-0. N=4333 (widowed); N=3522 (separated). Own calculation using weights.

Regarding the large subgroup of persons who have been continuously married, differences in average length of marriage can be observed. Overall, across all 14 European countries, stably married persons have been married for more than 35 years. The longest marriages are found in Belgium and France (>40 years). In Ireland and Denmark, on average, the shortest lengths of marriage duration are found (36 and 37 years, respectively) (cf. Figure 9).

Figure 9: Average length of marriage, continuously married population, by country

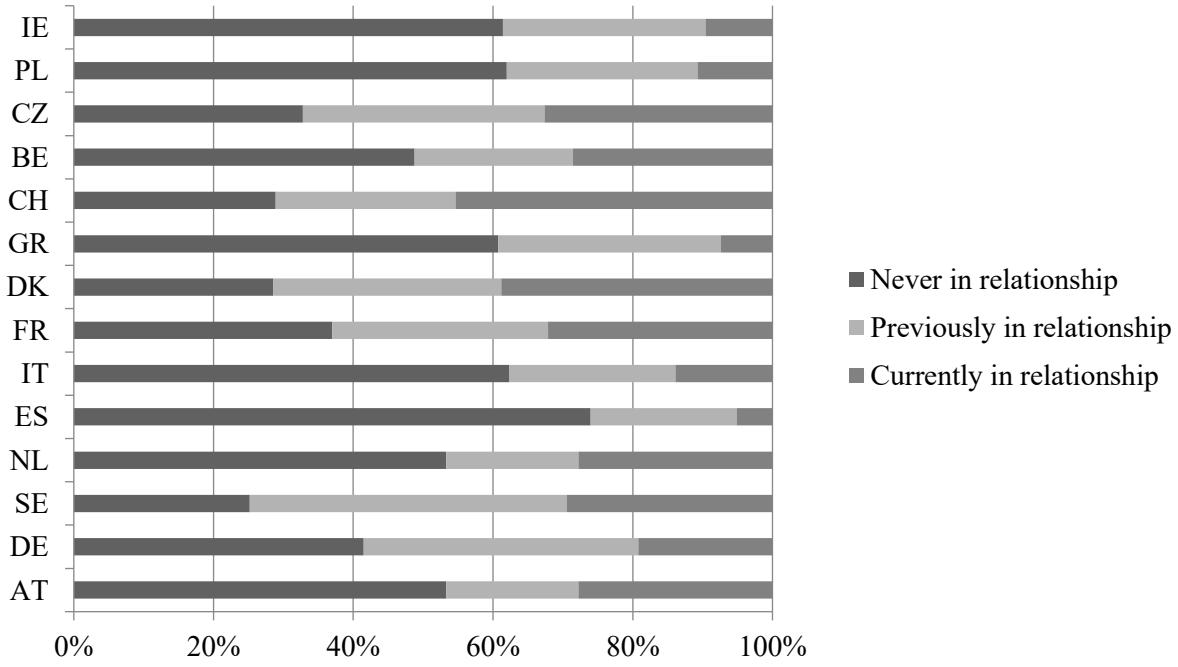


Source: SHARE w3 rel6-0-0. N=17984. Own calculation using weights.

3.2. Non-marital Partnership Biographies

Finally, we turn to the non-marital partnerships biographies of the European population above age 50. Regarding the status quo, the data show that there are national differences in the prevalence of having a non-marital relationship in later life among the never married Europeans (cf. Figure 10). In Belgium, Czechia, Switzerland, Denmark, France, the Netherlands, Sweden, and Austria more than 25% of the older, unwed population lives in some form of partnership at the time of the interview. Switzerland and Denmark lead the field with 45% and 39% of respondents in a partnership, respectively. Such living arrangements out of wedlock are less popular in Spain, Ireland and Italy, where fewer than 10% of the never married are living in a partnership in later life. In each country, the majority of respondents never has had any partnership or has had a partnership which broke down. Among the Irish, Polish, Greek, Italian, Spanish, Dutch, and Austrian respondents, a share of over 50% never experienced a partnership. The group of Spanish never married elderly takes the front rank, with 74%. However, the number of observations per country is very small in some countries and ranges from N=54 (CZ) to N=191 (F).

Figure 10: Percentage of never married population with, without, and with previous partnership, by country

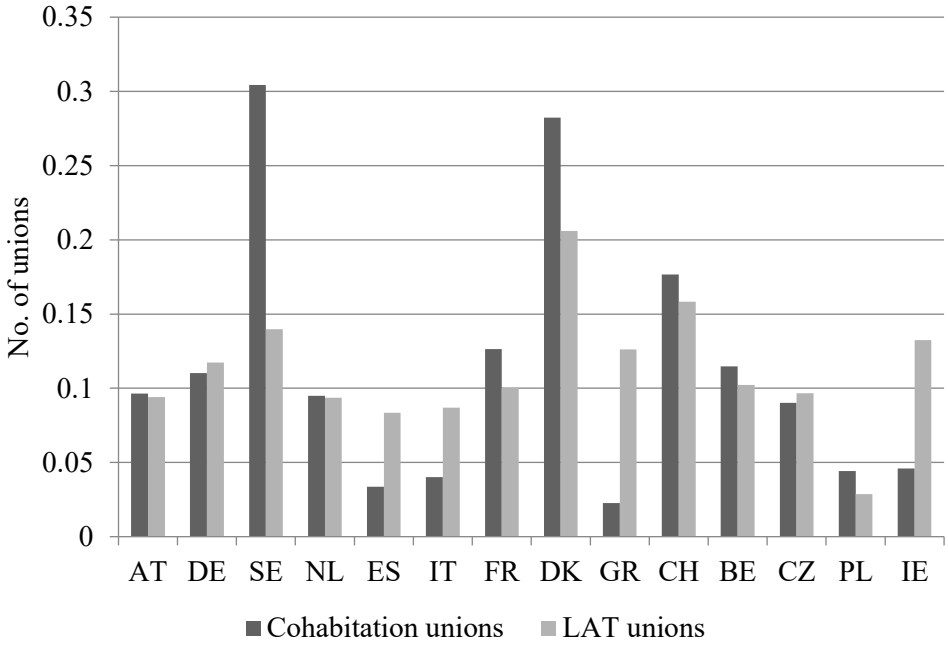


Source: SHARE w3 rel6-0-0. N=1624. Own calculation using weights.

Figure 11 gives an overview of non-marital partnership biographies of the older Europeans, distinguishing between living forms with and without a shared household. The bars indicate the average number of living-apart-together (LAT) relationships and cohabitating relationships for each country. Overall, the prevalence of partnerships out of wedlock is very low for the studied population.

In all countries, the average number of a non-marital union is below one. The countries with the highest share of non-marital relationships over the life course are Switzerland, Denmark, and Sweden. In Poland, these living arrangements are least common. Relationships without a shared household seem to be more popular than cohabitation in Czechia and Germany, and especially in Ireland, Greece, Italy, and Spain. Living together as non-married couple is more common in Belgium, Switzerland, Denmark, France, and Sweden.

Figure 11: Average number of non-marital relationships, by country



Source: SHARE w3 rel6-0-0. N=27793. Own calculation using weights.

As noted earlier, the birth cohorts who constitute the SHARELIFE sample grew up in times when cohabitation was a marginal phenomenon. Although the Western world has experienced a rise in cohabitation, even nowadays, the prevalence of non-marital unions shows a great diversity across European countries. For example, cohabitation among young and middle-aged couples is very common in Norway today and less common in Poland. These European variations are a product of differences in legislation, cultural context, religious values, social norms, and family values (Perelli-Harris and Bernardi 2015). Compared with the institution of marriage, the social and legal status of non-marital unions is even more diverse across European countries. There are countries where cohabitation is legally ignored or distinctions between marriage and cohabitation remain large, for example in tax law (e.g., DE, CH, LIT), or these living forms are associated with socio-economic disadvantage (e.g., UK), making cohabitators a selective group. On the other hand, in Scandinavian countries with social-democratic welfare states and a focus on gender equality, living arrangements and childbearing out of wedlock have a longer tradition of societal and political recognition. For example, Norway and the Netherlands have equal laws for married and cohabitating couples. In the

case of Germany, varieties can be observed even within the country. While Eastern Germany has a tradition of non-marital fertility and high cohabitation rates, Western Germany's legal and political framework has been supporting the male breadwinner model, encouraging marriage by taxation and insurance benefits, and making cohabitation less attractive. Additionally, religious settings shaped the options for partnership arrangements. In Catholic countries like Italy, Poland, and Lithuania the diffusion of non-marital cohabitation was slow. Protestant areas like the Nordic countries, which also had an earlier orientation towards female labour market participation, experienced an earlier and more intense growth in cohabitation (Perelli-Harris and Lyons-Amos 2016; Perelli-Harris *et al.* 2017). Finally, it is important to note that the legal situation for parents, especially fathers, towards their children might affect the decision to marry or not to marry. In some European countries, the legal status of a couple – i.e., married or unmarried – determines the legal relation to joint children. The proportion of extramarital births has been a marginal phenomenon in the middle of the 20th century. It was only in the last decades of the 20th century that unmarried fertility has been increasing all over Europe. After 2010, in many European countries, more than 50 percent of births occur to unmarried women (Toulemon 2016; Lesthaeghe 2011). Being born between 1907 and 1958, the phase of mate selection and procreation of SHARELIFE respondents took place in times when childbearing was very closely linked to marriage. In fact, over 95% of the SHARELIFE respondents who are currently married have at least one (living) child (including natural and adopted/foster children, also of the spouse). Of the never married population, about 26% state to have children. Among the divorced/separated it is about 90%, over 92% among the widowed.

Table 6 (Chapter III.4.4.) contains a condensed overview of the legal recognition of non-marital cohabitation in the countries of the SHARELIFE survey. Derived from the available sources, the table specifies whether by law, unmarried cohabitation is similar to married cohabitation or not. This comparative overview proves the diversity of rights of unmarried couples across European countries nowadays – which could also serve as a rough proxy for the level of legal recognition in the past. This overview suggests that today, the legal similarity of unmarried and married cohabitation is rather high or very high in Austria, Belgium, Denmark, France, Ireland, the Netherlands, Poland, Spain, and Sweden. In the Czech Republic, Germany, Greece, Italy, and Switzerland the legal recognition of cohabitation is relatively low to non-existent.

Furthermore, it has to be noted that the low numbers of non-marital unions which are observed in the sample could also depend on the specific wording of the SHARELIFE questionnaire. For example, the numbers do not include any cohabitating relationship arrangements of respondents who had a relationship and then married this partner. (The question reads: "[Have/Not considering your marriage, have/Not considering your marriages, have] you ever lived unmarried together with someone as a couple?"). Concerning LAT relationships, the interviewer asks*: "Have you ever been in a long term relationship that was important to you, where your partner lived at a different address from you for most of the time?"*. As always in survey research, the interpretation of a question by the respondent is

crucial. Which relationships are considered 'long-term' and 'important' is a subjective criterion and may also vary across cultures.

Furthermore, Table 2 shows characteristics in timing and duration of the two types of non-marital relationships. Taken all countries together, the mean age the European respondents entered their first LAT relationship is about 30 years. However, the standard deviation is large (14.03), indicating the great variability of the time in life when respondents started their first LAT partnership. Median age of the first LAT relationship is 24, so the majority of these partnerships were started at young ages. Persons spent on average six to seven years in such couple arrangements (SD: 7.85 years). The picture for cohabitating relationships is a different one. The mean age when respondents started these relationships for the first time is higher, about 36 years. Standard deviation is again quite high (13.48 years). Median age at the first establishment of such a union is 35, making cohabitation unions a phenomenon of all ages. Duration spent in these living arrangements is longer (mean: 13.55 years). But again, variability is also great (SD: 11.14 years). Overall, partnerships out of wedlock are not a common feature of the older European population. For the minority of about 2000 persons, who has actually lived or is living in such a relationship, there is no clear pattern of timing or duration. What can be observed is that the establishment of non-marital relationships seems to be a living form chosen at all ages, with LAT arrangements being more prevalent in the respondents' twenties and thirties, cohabitation unions being rather chosen at their mid-life ages. Average age for the first establishment of both types of partnerships is higher (30 and 36 years) than the average age at first marriage, which was under 27 years in all countries (cf. Figure 5).

Table 2: Characteristics of non-marital partnerships (countries pooled)

	Mean	S.D.	Median	$N_{(weighted)}$
LAT Relationships				
Age at 1st relationship	30.06	14.03	24	**2278**
Years spent in relationships (accumulated)	6.63	7.85	4	**2269**
Cohabitation Relationships				
Age at 1st relationship	35.83	13.48	35	**2091**
Years spent in relationships (accumulated)	13.55	11.14	10	**2084**

Source: SHARE w3 rel6-0-0. Own calculation using weights.

These findings on the timing of non-marital unions are supported by historical changes in the perception and diffusion of unmarried cohabitation. Most likely, the observed patterns are as much a consequence of personal decisions and opportunity structures as of cultural differences and national legal frameworks.

For young adults, living together unmarried has started to become an option since the 1960s (Northern Europe) or the 1970s (Western Europe). In countries of these areas, "the decline in marriage probabilities at young ages was almost entirely compensated for by an increase in unmarried cohabitation" (Toulemon 2016: 32). In Southern Europe, however, cohabitation remained rare among young adults; in Central and Eastern Europe, marriage remained a common and early-age

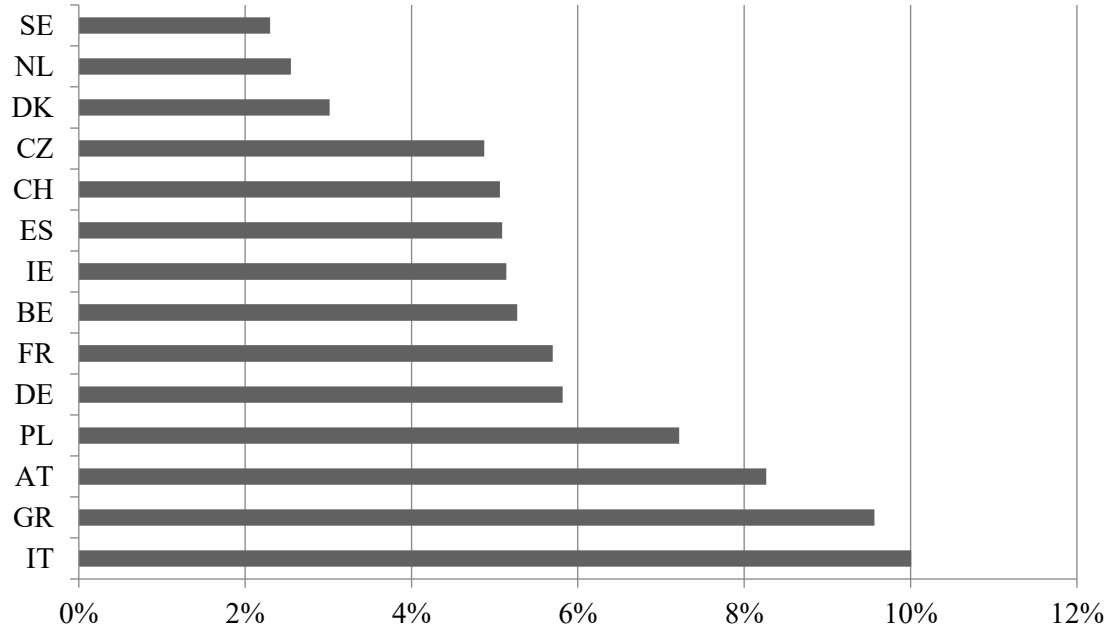
phenomenon until the 1990s (ibd. (also Klein, Lengerer and Uzelac 2002; Klein 2016)). For the birth cohorts of the SHARELIFE sample, who were born between 1907 and 1958, these societal developments have not yet been a reality of life, especially not in Southern or Eastern Europe.

3.3. Marriage and Partnership Quality

Quantitatively, in all surveyed countries, marriage is the dominating living arrangement. But what do we know about relationship quality? There is no information on partnership quality in the SHARELIFE data. However, in previous SHARE waves, some information on this topic has been collected. Respondents who participated in one of the first two waves of SHARE received an additional, 'drop-off' questionnaire at the end of the main interview (Börsch-Supan and Jürges 2005). That is, "a self-administered paper and pencil questionnaire used in SHARE to ask questions that may be particularly sensitive for the respondent" (Luca and Peracchi 2005: 99). Response rates ranged between approximately 70% in Sweden and 93% in Greece (Luca and Peracchi 2005). The questionnaire contained a question on marital conflict: *"There are sometimes important questions about which we have a disagreement with persons close to us, and which therefore may lead to conflicts. Please tell us how often, if at all, you experience conflict with each of the following persons".* Respondents should choose between "often/sometimes/rarely/never" for: parents, parents-in-law, partner/spouse, children, other family members, or friends/coworkers/acquaintances. This methodological procedure provides information on conflict rates in partnerships at only one point in time (sample members who participated in wave 1 *and* 2 filled in this questionnaire only once (Schaan 2008)). Due to the cross-sectional nature of this questionnaire item within the SHARE dataset, the analysis of partnership quality is limited to this singular time of observation. Additionally, the obtained results have to be interpreted with caution due to the 'voluntary' nature of the return of the drop off questionnaire. The decision of respondents to fill in and return might not have operated at random and might be biased by socio-demographic factors and other personal characteristics.

Across the 14 countries, 5.75% of respondents in partnerships or marriages stated that they experience conflict with their partner or spouse often. 32.8% claimed to have conflict with their partner sometimes (N=18,376). Figure 12 shows the average percentage of people who reported to have often conflicts with their partner or spouse by country. The greatest share of conflictual relationships can be observed in Greece, Italy, and Austria (around 9%). The most harmonic partnerships are reported by Danes (only ca. 3% reporting frequent conflict), Dutch, and Swedes (around 2%). In all other countries, 5 to 7% of respondents with a partner report frequent conflicts.

Figure 12: Percentage of persons reporting to have conflicts with partner/spouse often, by country



Source: SHARE w1,w2 rel6-0-0. N=17493. Own calculations, unweighted.[18]

In comparison, 3.87% of respondents above age 50 claim that they experience conflict often with their parents (N= 9,735), 3.64% with the parents-in-law (N=8,730). 4.09% report to have conflict often with their children (N=19,324). Only 2.03% report frequent conflicts with other family members (N=18,308). Frequent conflict with contacts outside the family (friends/coworkers/acquaintances) are even less common, with an average share of 1.28% (N=19,765). Among all social contacts, frequently occurring conflict is most prevalent in partnerships and marriages, even if the percentage per se is rather small (5.75%). The country which shows the highest share of frequent arguments among partners and spouses, Italy, also takes the front rank in conflicts with parents, parents-in-law, children, further family members, and contacts outside the family: Across countries, Italian elderly report on average the highest frequencies of conflicts with all their social contacts. Possible country-specific reporting styles or cultural differences of cultures of conflict may be at work. However, Poland, Greece, and Austria, which show the second highest share of frequent partnership conflict, do not show identically high values for conflicts with all the other social contacts.

Idler, Boulifard and Contrada (2012) assume that marital quality does not too much confound results of the marriage-health connection within samples of older couples. They argue, "that the process of selection out of unsatisfactory marriages may have already taken place, and continuing marriages represent relatively stable and supportive relationships" (45). As we have seen, most of the marriages observed in the SHARE survey are indeed long-term marriages. Nevertheless, not all of them seem to be equally harmonic.

[18] No weights are used for variables from the drop-off questionnaire because "the calibrated weights do not compensate for any additional nonresponse in the drop-offs" (Klevmarken, Hesselius and Swensson 2005: 35).

4. Marriage-related Legislation in SHARELIFE Countries

The following tables provide background information on policies related to marriage and partnerships in the 14 studied countries. Table 3 compiles data on the legalisation of divorce and the compulsory duration of living separated prior to the divorce act. Table 4 lists legal marriageable age across countries including historical changes, which apply to the cohorts of SHARELFIFE respondents. Table 5 gives an overview of the institutionalisation of same-sex partnerships in the countries. Table 6 contains the level of legal recognition of cohabitation unions per country (The compiled lists are not intended to be exhaustive and may not completely satisfy the complex geographical and legal history of European shifting borders).

4.1. Divorce

Table 3: Divorce legislation in SHARELIFE countries

Country	Divorce legal since	Compulsory duration of separation	Source
Austria	1812 (1783 for non-Catholics)	3 years / none if mutual consent (6 months)	The European e-Justice Portal 2016; Joseph des Zweiten Gesetze und Verfassungen im Justiz-Fache (1780–1784) 1817
Belgium	1804	6 months	Parlement fédéral belge 2007
Czech Republic	1919 (Czechoslovakia)	6 months	Humphrey 2006; Národní shromáždění Československé socialistické republiky 1963
Denmark	1582 (for Protestants)	2 years of living separately, 6 months of legal separation / none if mutual consent	Johansen 2017; Statsforvaltningen 2017
France	1804	2 years / none if mutual consent	Corps législatif 2004; Premier Consul de la République Française 1804
Germany	1875/1900 (1783 for non-Catholics)	1 year	Deutscher Bundestag 1980 (n. F. v. 2.1.2002); Fahrner 2011
Greece	1974	2 years / none if mutual consent	The European e-Justice Portal 2015a
Ireland	1996	4 out of the previous 5 years	Citizens Information Board 2017
Italy	1970	3 years of legal separation	The European e-Justice Portal 2015b
Netherlands	1811	None	Staten-Generaal van het Koninkrijk der Nederlanden 2016
Poland	1946	None	Sejm Polskiej Rzeczypospolitej Ludowej 1964
Spain	1981 (re-introduction)	None	Cortes Generales 1889
Sweden	1915	2 years, but also possible to divorce immediately	Humphrey 2006; Sveriges riksdag 1987
Switzerland	1907	2 years / none if mutual consent	Die Bundesversammlung der Schweizerischen Eidgenossenschaft 1907

4.2. Marriageable Age

Table 4: Legal marriageable age and historical changes in SHARELIFE countries

Country	Marriageable age (before last legal changes)	Exceptions (individual cases with court approval)	Marriageable age today	Exceptions (individual cases with court approval)	Source
Austria	1939–2001: females 16, males 19	Until 2001: 18 males, 15 females	Since 2001: 18	16 if spouse is of age	Parlament - Republik Österreich 1973; 2001
Belgium	1804–1990: females 15, males 18	Extraordinary marriage possible, but no strict minimum age specified in the law	Since 1990: 18	Extraordinary marriage possible, but no strict minimum age specified in the law	Parlement fédéral belge 1990
Czech Republic	1949–2014: both 18	Both 16	Both 18	Both 16	Národní shromáždění Československé socialistické republiky 1949; 1963
Denmark	Both 18	Both 15			Børne- og Socialministeriet 2016 (n.F.v. 24/01/2017)
France	1804–2006: females 15, males 18	No strict minimum age specified in the law, (age of consent: 13, since 1863)	Since 2006: 18	Extraordinary marriage possible, but no strict minimum age specified in the law	Corps législatif 1803; Corps législatif 2006
Germany	1938–1974: females 16, males 21	1938–1974: females – age not specified (age of consent 14), males 18	Since 1974: 18	Since 1974: if spouse is of age	Reichsregierung des Deutschen Reichs 6.07.1938; Grau 2003
Greece	Since 1946: 18	No strict minimum age specified in the law (age of consent: 15)			Ελληνικό Κοινοβούλιο 23.02.1946; 31.05.1985
Ireland	1870: 21 without parental consent; Since 1972: 16	Since 1870: possible under 21 with parental consent (no strict minimum age)	Since 1995: 18	Since 1995: under 18, no strict minimum age	Parliament of the United Kingdom of Great Britain and Ireland 1870; Lawyer.ie 2016
Italy	Since 1942: both 18	1865–1942: males 14, females 12; since 1942: both 16			Governo Italiano 1865; Parlamento Italiano 1942
Netherlands	1838–1992: males 18, females 16	No minimum age specified, with consent of the king at any age	Since 1992: both 18	1992 - 2016: both 16, since 2016: 18	Staten-Generaal van het Koninkrijk der Nederlanden 1837; 1991
Poland	Before 1950: no minimum age specified (age of consent: 15);	1950–1964: both 16; since 1964: females 16, males 18	Both 18	Females 16, males 18	Sejm Polskiej Rzeczypospolitej 27.06.1950; 1964

	Since 1950: both 18				
Spain	Since 1943: both 21	Both 14	Since 1978: 18	Both 16	INFORMAJOVEN 2006
Sweden	Before 1987: n.a.		Since 1987: 18	1987–2014: 16	Sveriges riksdag 1987
Switzerland	Before 1996: females 18, males 20	Before 1996: females 17, males 18	Since 1996: 18		Die Bundesversammlung der Schweizerischen Eidgenossenschaft 1907

4.3. Same-Sex Marriage

Table 5: Introduction of same-sex-marriage or registered partnership in SHARELIFE countries

Country	Same-sex marriage/ Registered partnership legal since	Source
Austria	Registered partnership since 2010	Graupner 2017
Belgium	Same-sex marriage since 2003	Borghs 2017
Czech Republic	Registered partnership since 2016	Otáhal 2017
Denmark	Same-sex marriage since 2012	Tølbøll 2014
France	Same-sex marriage since 2013	Kouzmine 2017
Germany	Same-sex marriage since 2017	Adamietz 2017; Deutscher Bundestag 2002 (n. F. v. 20.07.2017)
Greece	Registered partnership since 2015	Papadopoulou 2017
Ireland	Same-sex marriage since 2015	Tobin 2017
Italy	Registered partnership since 2016	Winkler 2017
Netherlands	Same-sex marriage since 2001	Government of the Netherlands 2016
Poland	-	Smiszek 2017
Spain	Same-sex marriage since 2005	Miret-Gamundi, Treviño and Zueras 2014
Sweden	Same-sex marriage since 2009	Ytterberg 2017
Switzerland	Registered partnership since 2007	Zufferey and Widmer 2014

4.4. Cohabitation

Table 6: Legal recognition of non-marital cohabitation unions in SHARELIFE countries

Country	Legal similarity between marriage and cohabitation nowadays	Source
Austria	Very high	Graupner 2017
Belgium	High	Borghs 2017
Czech Republic	Low	Otáhal 2017
Denmark	(Very) high	Tølbøll 2014
France	High	Kouzmine 2017
Germany	Very low	Adamietz 2017
Greece	Low	Constandinidou and Stavropoulou 2016; Papadopoulou 2017
Ireland	High	Tobin 2017
Italy	Low	Winkler 2017
Netherlands	Very high	Sumner 2017
Poland	High	Smiszek 2017
Spain	Very high	Miret-Gamundi, Treviño and Zueras 2014
Sweden	(Very) high	Ytterberg 2017
Switzerland	Low	ch.ch 2013; Head-König 2007; Zufferey and Widmer 2014

IV. MARITAL STATUS AND PHYSICAL AND COGNITIVE HEALTH OF OLDER EUROPEANS: Investigating the Role of Marital Biography

1. Early Life Health, the Marital Life Course and Health Outcomes in Old Age

This chapter aims at examining the relation between marital status, marital life course, and health outcomes of the older European population. I analyse the connection between health in early life, past marital biography, current marital status, and health in old age. To draw conclusions on health status in old age, outcomes of objective test measures of physical and cognitive functioning are used. Moving beyond the static measure of marital status, different timings and trajectories of marital biographies are related to four different domains of physical and mental health (hand grip strength, expiratory peak flow, memory function, verbal fluency function).

1.1. Research Questions

Derived from the theoretical framework and the literature review provided in Chapter I and II, the research questions of the subsequent analyses are as follows.

1) Can a marriage-health benefit be observed in later life? Given the central role of morbidity and mortality in later life, and following the argumentation of marriage protection theory, stress theory, biosocial pathways of partnership relations, and psychological theory of couple relationships regarding health, it is assumed that married persons show a better health status in old age. Being unmarried or never married is expected to be related to poorer health. According to stress-related theories, the previously married should be more disadvantaged. Based on the bio-social literature on physical pathways of marital status (transitions), I expect that both physical and cognitive health domains are affected. Drawing on the theoretical arguments of gender disparities, and with regard to the 'conservative' birth cohorts of the study sample, men are expected to benefit more from being married or remarried than women. Likewise, the end of marriage, either through divorce or widowhood, is supposed to result in greater health disadvantages for men.

2) Furthermore, the aim is to answer the question whether health in old age depends on both current marital status and on marital biography. Adults who share the same marital status in later life differ widely from each other in number, sequencing, timing, and duration of marital status. This approach will reveal whether the different components of marital biography have different effects on health and which component might be more important than others (Dupre and Meadows 2007). Different numbers, types, and durations of marital statuses should be associated differently with physical and cognitive health in old age. In accordance with cumulative dis-/advantage theory, health capital theory, and disposable soma theory, it is assumed that a higher number of marital losses and a longer time spent unmarried results in an enhanced disadvantage for health. A longer duration of being married should result in an accumulated advantage for health. Marital status groups are compared with respect to their marital histories, assuming that not all currently married people and not all currently divorced or widowed people will show the same health outcomes. The marriage protection theory does not

distinguish between first or higher order marriages, theoretically any marriage should have positive effects on health. That is, there should be no difference between married and remarried individuals (Waite 2009). On the other hand, remarried persons have undergone at least one phase of being unmarried – consequently, sociological and biological stress theories and health capital theory lead to the assumption that remarriage will not be as beneficial for health as one, stable marriage (Barrett 2000). With respect to effects of type of a prior marital loss (i.e., divorce or widowhood), no specific prediction can be made for health in old age. Divorce and widowhood might not be of equal disadvantage for someone's wellbeing (Barrett 2000): For some, their divorce "was a positive event that they initiated, while widowhood is presumed to be an undesirable, uncontrollable transition for nearly all who experience it" (ibd.: 453). Moreover, the type of marital loss that precedes a remarriage could also affect the level of benefit the new marriage provides. Hypothetically, a "divorce is more likely than widowhood to generate negative attitudes toward the institution of marriage, such as its permanence or longevity; therefore, one may expect remarriage after widowhood to be associated with higher levels of well-being compared with remarriage following divorce" (ibd.: 453). In line with the cumulative disadvantage theory, experiencing a marital loss like separation or widowhood should have even greater negative effects if there were one or more preceding marital losses. By contrast, the counter hypothesis may be true: persons who experience a marital loss for the second time may not show less health deficits than persons after the first spousal loss. There may be coping mechanisms derived from learning effects, e.g., social and psychological resources, which have been successful in buffering negative effects of the loss, and can be mobilised again (Barrett 2000; also O'Bryant and Straw 1991). Non-normative timing of marital transitions should lead to disadvantages for health. Derived from the literature discussed in Chapter II, it is assumed that very early marriages should result in negative health outcomes. There is less theoretical and empirical foundation for health effects of a first marriage late in the life course. However, since this is a deviance from the normative life course, there might be an association with health deficits for both very early and very late marriage.

3) Finally, it is tested whether the consideration of health in early life affects the marital status-health relationship. According to the marriage selection theory, a person's health condition in early life should have a profound influence on their chance to marry and stay married. Possible health selection effects should be controlled for by the inclusion of childhood health and cognitive status. With regard to the existing evidence, it is expected that childhood health status will decrease the health gap between marital status groups but will not neutralise it.

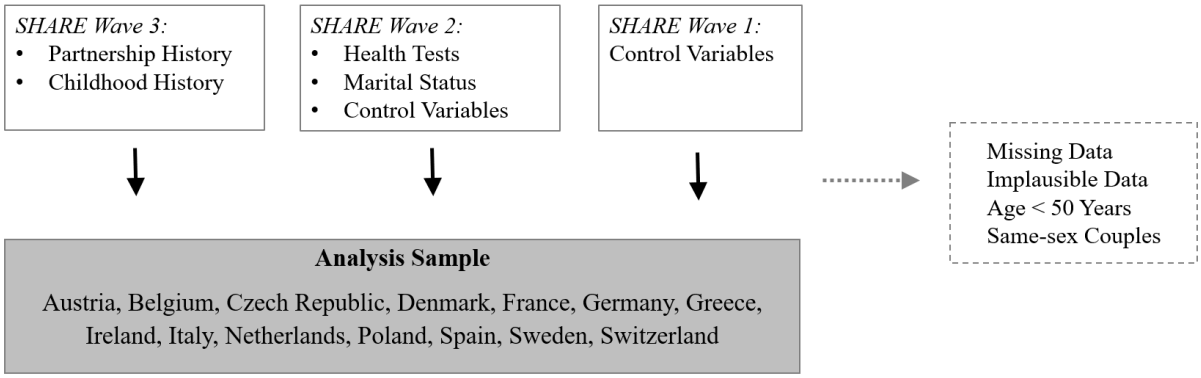
1.2. Measures and Methods

1.2.1. Data Source and Study Variables

The data source for this part of the study is SHARE wave 1, wave 2, and wave 3 (SHARELIFE). All details concerning dataset description, collection methods, and references can be found in Chapter III.1. Since the SHARELIFE survey wave focused on the collection of life history data, the data on the physical and cognitive functions have to be extracted from the previous wave (SHARE wave 2).

Consequently, all information provided on marital and partnership biographies have been adjusted to the time of the interview at wave 2. Years of all kinds of marital status transition were checked to identify whether the transition occurred *between* the wave 3 and wave 2 interview; marital status biography is corrected accordingly. Similarly, duration of a marital status was reduced to the time of the survey of wave 2 (year 2006/2007). Figure 13 gives a graphical illustration of the procedure of the generation of the analytical samples.

Figure 13: Generation and data sources of analytical samples. Source: Own illustration



Key Independent Variables: Marital Status and Marital History

To take into account the components of marital life course, I build the following variables. First of all, there is the distinction between current marital status and marital biography. Current marital status is derived from the regular panel wave question in wave 1 and 2 ("*What is your marital status?"- Married and living together with spouse / Registered partnership / Married, living separated from spouse*[19] */ Never married / Divorced / Widowed)*. The variables reflecting the marital life course of respondents are constructed from the retrospective partnership interviews of wave 3. Cases with inconsistent and contradicting information on current marital status in wave 2 and marital information reported in wave 3 are excluded (N=237)[20]. Current marital status is the marital status at the time of the interview. That is: *married, separated, widowed, never married*. The status 'separated' includes divorced and separated persons. Divorce legislation has undergone many changes and is not identical in the different European countries. Using the category 'divorced' may distort results due to different time frames of divorce legislation (e.g., one year of separation is compulsory before divorce in

[19] It is not entirely clear whether this category applies also to long-distance marriages. Only in wave 6 (used in Chapter IV.2.), there is an interviewer instruction in the questionnaire: "*If marriage persists but partner does not live in household for any reason, such as being in a nursing home, hospital, prison etc., then code 3*". So, this category may include separated couples as well as spatially divided couples. This is not unproblematic for the interpretation of marital status group analyses.

[20] N=156 reported to be married in the w2 interview, however, in the SHARELIFE interview, they answered the question whether they have been ever married with No. Vice versa, N=19 never married respondents (according to w2) state marriage(s) during the SHARELIFE survey. N=42 of marital status widowed (w2) and N=20 divorced negate marriage(s) in SHARELIFE.

Germany, whereas this in not the case in the Netherlands, Spain, or Poland). Moreover, divorce became legal at different time points in the European countries, e.g., in 1875 in Germany, in Ireland in 1996. Accordingly, separation was surely a proxy for divorce in countries where divorce became possible rather late (cf. Table 3 (Chapter III.4.) for details on national divorce laws). Indicators of marital status biography represent the number and types of marital transitions. A variable of number and types of marital trajectories encompasses nine categories: *never married, married once, separated once, separated after two or more marital losses, widowed once, widowed after two or more marital losses, remarried after separation, remarried after widowhood, remarried after two or more marital losses.* 'Marital loss' refers to separation and/or widowhood. The subcategories follow the classification with similar data of retrospective marital histories by Zhang (2006), and reflect the data structure adequately. Due to the limited number of observations in the categories of multiple marriages and multiple marital transitions, a singling out of even more sub-categories was discarded. In terms of marital timing and duration biography, a variable of age at first marriage is generated for the ever-married population. A categorical variable distinguishes between early marriage (<age 20), mid-life marriage (age 20–39), and late marriage (>age 39)[21]. Moreover, the duration spent in a marital status is calculated (in years).[22] For the never married population, a variable is used distinguishing between different partnership biographies: *no relationship ever / previously in a relationship / currently in a relationship*. Current partnership status can also be constructed from the regular SHARE waves. Non-marital cohabitation is indicated by the 'partner in the household' variable provided in the SHARE dataset. Living-apart-together partnerships can be identified by the question *"Do you have a partner who lives outside this household?"*. This question was answered by all marital status groups in waves 1 and 2.

Dependent Variables: Physical and Cognitive Health

Both physical and mental health is analysed. Hand grip strength and lung function serve as measures of physical health, memory and verbal fluency performance serve as measures of cognitive health. **Grip Strength:** For the measurement of hand grip strength, SHARE respondents squeeze a handheld device with their maximum ability (Smedley, S Dynamometer, TTM, Tokyo, range: 0–100 kg). For each hand, two measurements are taken (Mehrbrodt, Gruber and Wagner 2017). The hand grip strength test is a popular and simple measure of objective health in ageing surveys; it is not only a measure of isometric strength in the upper extremity, but it also correlates with a person's strength in other muscle groups. Large population-representative studies have proven that grip strength declines with age (from 45 onwards), and "is associated with current and future physical functioning, morbidity, and mortality" (Frederiksen *et al.* 2006: 561; Andersen-Ranberg *et al.* 2009). The

[21] The categories aim at covering the life course. The empirical distribution of age at marriage within the sample has a median age of 24. 75% of the sample had been married at age 27. The lowest quintile is at age 19.

[22] Similar approaches of operationalisations to test the effects of the marital life course on health can be found in the literature (Brockmann and Klein 2004; Dupre, Beck and Meadows 2009; Dupre and Meadows 2007; Grundy and Tomassini 2010; Hughes and Waite 2009; McFarland, Hayward and Brown 2013; Zhang and Hayward 2006; Zhang 2006).

predictive power of grip strength trajectories with respect to mortality is assumed to be comparable across nations with different health and life expectancy levels (Oksuzyan *et al.* 2017). The underlying reasons for grip strength predicting disability, morbidity, and mortality are not yet clear. Possible explanations suspect a mixture of ageing-related decline in muscle mass and quality, chronic low-level inflammations, environmental, and genetic factors (Andersen-Ranberg *et al.* 2009). For analysing grip strength as a dependent variable, I use the maximum performance value a respondent was able to squeeze the dynamometer. Observations without two valid measurements for right and left hand are excluded, as well as implausible values such as persons with differences over 20 kg for the same hand (Mehrbrodt, Gruber and Wagner 2017). **Lung Function:** Lung function is measured via a breathing test of a person's maximum expiratory air flow. Respondents blow into a handheld device (mini-Wright peak-flow meter), having two trials to exhale with as much strength as possible (ibd.). It is a practical physiologic measurement for large surveys of the older population, and it has been proven valid to indicate the health status and physical functioning in older persons. Low peak expiratory flow has been identified as an independent predictor of hospitalisation in US-adults (Roberts and Mapel 2012). Further studies have shown that peak expiratory flow is related to mortality, cognitive, and physical decline (Cook *et al.* 1991; Albert *et al.* 1995; Seeman *et al.* 1994). The mini-Wright peak-flow meter has a scale, which is marked in litres per minute (range: 60–800 l/min) (Wright 1978). Observations with performance values outside of this range are excluded (N=786). As dependent variable in the regression analyses on lung function, I use the maximum value of the two measurements.

Cognition is composed of different domains of ability, such as orientation, memory, language, and executive function (i.e., planning, sequencing). Starting at around age 50, the human brain undergoes organic neuro-degenerative processes which lead to a decline in cognitive function. Memory function is affected first and foremost. The SHARE dataset provides several separate tests of the domains of cognition (Dewey and Prince 2008). In this study, I analyse memory and executive function via the following tests. **Memory Test:** During the SHARE survey, the interviewer reads out a list of ten words to the participants (short and rather simple words as butter, queen, book, etc.). To test immediate recall ability, participants are asked to repeat as many words as possible in any order. To test delayed recall ability, they are asked to repeat the task a few minutes later. This test format is based on the 'Telephone Interview of Cognitive Status-Modified' (TICS-M), which is modelled after the Mini-Mental State Examination (MMSE) (Mehrbrodt, Gruber and Wagner 2017; Brandt, Spencer and Folstein 1988). The TICS-M test battery is a very common "assessment instrument with good reliability and validity to screen for dementia" (Knopman *et al.* 2010: 35). The relatively long list of ten words to be recalled twice by the participants should allow the "separation between persons with preserved learning ability and patients with cognitive disorders that impair learning" (ibd.: 41). For analysis, the results of both trials are summed up to one metric variable (range 0 to 20).

Verbal Fluency Test: For the verbal fluency test, SHARE respondents are asked to name as many different animals as they can think of in 60 seconds. The SHARE questionnaire defines that *"[t]he score is the sum of acceptable animals. Any member of the animal kingdom, real or mythical is scored correct, except repetitions and proper nouns. Specifically each of the following gets credit: a species name and any accompanying breeds within the species; male, female and infant names within the species"*. Semantic verbal fluency is considered a test of executive function, which "taps lexical knowledge and semantic memory organization" (Ardila, Ostrosky-Solís and Bernal 2006: 324). Using animals as the semantic category has proven to be advantageous: it is a relatively easy and clear category "with only minor differences among people living in different countries, different educational systems, or belonging to different generations" (ibd.: 324). Neuroscientific examinations show that frontal lobe damage (usually left and bilateral frontal lesions) is related to difficulties in test performance. The following brain-related health conditions have been identified to affect the performance in this test: focal brain damage (especially frontal lobe pathology)[23], Parkinson's disease, schizophrenia, subcortical dementia, traumatic brain injury, Huntington's disease, depression, vascular and degenerative dementias, and amyotrophic lateral sclerosis (ibd.). The analysis variable is a count variable ranging from zero to the maximum number of words named.

Figure 14: Overview of health measures

PHYSICAL HEALTH		**COGNITIVE HEALTH**	
Grip Strength	Maximum hand grip strength Scale: 0–100 kg	**Memory**	List of 10 words to be recalled (two times, immediate + delayed) Score: 0–20 words
Lung Function	Peak expiratory air flow Scale: 60–800 l/min	**Verbal Fluency**	Number of animals named Time: 60 sec. Score: No. of words

Control Variables

I adjust for several variables that are assumed to confound the association between family status and health. These include childhood health as the main confounder of interest, as well as age, gender, economic situation, education, body height, disturbing factors, and country. Except for childhood health status, that is obtained from the SHARELIFE wave, control variables must be extracted from wave 1 or 2.

It is still unclear if the marriage benefit is a result of unique benefits of marriage or if it is just healthier people who marry and stay married. Therefore, it is desirable to control for possible health selection into marriage. To minimise bias by positive health selection, I aim at controlling for very good innate health. In the scope of the retrospective SHARELIFE survey, respondents answered questions on their past health and health care history (Schröder 2011). These data allow controlling for health status in

[23] Persons with frontal lobe damage "have a number of deficiencies in how they use memory. They do poorly on tests of free (unaided) recall where healthy individuals can use strategic search" (Squire 2009: 12714).

childhood, that is before mate selection and marriage. Respondents answer detailed questions on their health circumstances during childhood, which is defined as the period of life between birth and, including, age 15. First, they give a self-assessment of their childhood health (*"Would you say that your health during your childhood was in general excellent, very good, good, fair, or poor?").* There is an optional sixth category *"Health varied a great deal"* for spontaneous answers, which applies to 0.42% of all respondents. Second, respondents answer more objective questions regarding early life health. They are shown two lists of health problems and must report all illnesses they had suffered from: "*Did you have any of the diseases / illnesses or health conditions on this card during your childhood (that is, from when you were born up to and including age 15)?"*

> *- Infectious disease (e.g. measles, rubella, chickenpox, mumps, tuberculosis, diphtheria, scarlet fever) / Polio / Asthma / Respiratory problems other than asthma / Allergies (other than asthma) / Severe diarrhoea / Meningitis/encephalitis / Chronic ear problems / Speech impairment / Difficulty seeing even with eyeglasses;*
>
> *- Severe headaches or migraines / Epilepsy, fits or seizures / Emotional, nervous, or psychiatric problem / Broken bones, fractures / Appendicitis / Childhood diabetes or high blood sugar / Heart trouble / Leukaemia or lymphoma / Cancer or malignant tumour (excluding minor skin cancers) / None of these / Other serious health condition (please specify).*

An advantage of this measurement is that it reflects both physical and mental health. The majority of the respondents reported a rather disease-free childhood: More than half (57.42%) remembered to have suffered from only one condition. About 20% named two conditions, and 15% claimed to have had none of the mentioned nor any other serious health conditions. By far the most frequent early life health deficit was infectious disease (selected by almost 80%). All other deficits were reported well under ten percent (between 0.03% for any form of cancer and 8.5% for appendicitis). For the analysis, an indicator variable of a **very healthy childhood** is constructed. Persons reporting no disease or only an infectious disease are defined as respondents with a very healthy childhood. It is common knowledge that most infants experience infectious diseases such as measles or chickenpox, a fact which is also shown from the data. Overall, the presented list of illnesses contains rather serious and severe health problems (the 'other'-option asks specifically for *serious* health conditions). Indeed, methodological research on internal consistency between reported childhood diseases on self-rated childhood health of SHARELIFE data shows that the more severe diseases are reported, the lower the probability that the respondent reported a good overall childhood health condition – short-term conditions (infections, fractures) showed no significant effects (Havari and Mazzonna 2011). Especially for older adults and adults who grew up in times of war, or unstable circumstances with limited access to health care, a report of specific diagnoses during infancy may be incomplete. In fact, between 0.44 and 1.12% chose the answer category 'Don't know' when shown the lists of illnesses, whereas only 0.12% were not able to answer the general assessment question of their childhood health. Accordingly, all respondents who could not report on the specific illnesses are defined as 'very healthy children' if they rated their early health as excellent/very good. Havari and Mazzonna (2011)

found that SHARELIFE respondents from economically less developed European countries (reference period is 1926–1956) had lower response rates for most of the diseases. The authors conclude that this is a consequence of limited access to medical services and not a recall bias. Overall, methodological research on SHARELIFE data quality by Havari and Mazzonna (2011) showed evidence of some colouring for childhood self-rated health, but good internal and external consistency for all other self-reported childhood health items.[24] Indeed, the indicator of a very healthy childhood corresponds with the self-assessment of childhood health: nearly 70% of respondents fall into the category of a very healthy childhood, and nearly 70% of respondents rated their early health as excellent or very good themselves. Additionally, I adjust for cognitive skills in childhood, that is, before marriage or before mate selection. This is not only to control for innate traits of cognitive abilities but also to control for health-selection into marriage with respect to cognitive health. It can be argued that "people with difficulties in flexibility of thought or communication and consequent smaller lifelong cognitive reserve" (Sommerlad *et al.* 2018: 237) may have been less likely to marry and are more likely to develop cognitive pathologies such as dementia in old age. For this purpose, indicators of **very good language or mathematical skills at age 10** are used. These were obtained from the question: *"Now I would like you to think back to your time in school when you were 10 years old. How did you perform in Maths / in {Country's Language} compared to other children in your class? Did you perform much better, better, about the same, worse or much worse than the average?"*. Very good skills are defined as a much better performance than the rest of the class in maths or language. People who did not go to school at that age are assigned to the subgroup who did not perform much better (N=793)[25].

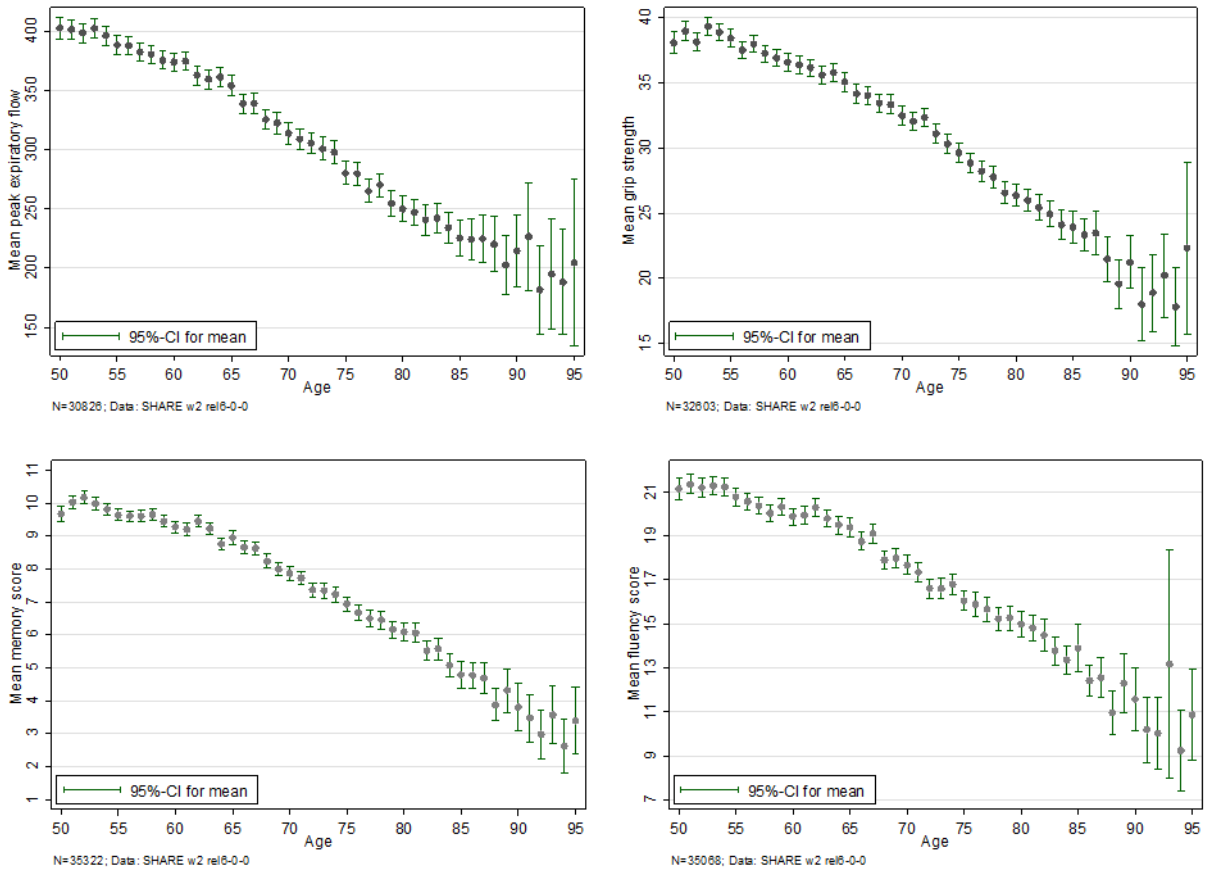
Moreover, **age** at the time of the interview is controlled via a continuous variable. There is a 'natural' decline of hand grip strength, lung function, and cognitive function with age, even in healthy humans (Andersen-Ranberg *et al.* 2009; Cotes, Chinn and Miller 2006; Dewey and Prince 2008; Hank *et al.* 2006). Besides, the probability of widowhood rises with age. The age-related deterioration of physical and cognitive abilities can indeed be observed within the SHARE sample. Figure 15 displays that mean hand grip strength, lung function, memory score, and verbal fluency score decline almost linearly with age in the sample of older Europeans (w.r.t. cross-sectional variability). **Gender** enters analyses as binary variable (male/female). There is a male-female imbalance in mortality and health in old age. Women have a higher life expectancy, worldwide (Peace *et al.* 2008), consequently more women are widowed than men. Regarding anatomical differences, more muscle mass is on average

[24] Further discussions of quality of retrospective data on childhood health can be found in Avendano and Croda (2015); Smith (2009).

[25] Of course, persons who did not attend a school during childhood are not equal w.r.t. cognitive abilities to persons with average or below-average cognitive performance; reasons are rather structural and country-specific: half of respondents without schooling at age ten live in Spain, the other half mostly in Greece and Italy. Their mean and median year of birth is 1935/1934. During the 20th century, not only World War II shattered educational careers, Greece and Spain suffered additionally from the military dictatorships and civil wars. In Greece, the military dictatorship interrupted educational reforms during the 1960s/70s. Italy introduced compulsory schooling only in 1970. Nowadays, Italy and Spain show the lowest levels of educational attainment within Europe (Kesidou and Xochellis 2017; Tombeil 1999). Noise in the data which might be caused by that assignment should be controlled for by the educational level variable ('no education').

found in the male body (Janssen *et al.* 2000), what should give the male sex a performance advantage in the physical tasks. Moreover, there are male-female differences in thorax and body composition, influencing for instance, lung elasticity (Cotes, Chinn and Miller 2006). Gender differences have been empirically detected for lung function (ibd.) and grip strength (Hank *et al.* 2006). Regarding socially constructed gender-differences, entering and leaving a marriage has different costs and benefits for men and women. For instance, with respect to gender roles or the traditional distribution of wage and care work (cf. the sociological theories on gender differences in Chapter I.1.1.4.).

Figure 15: Average performance in physical and cognitive health tests by age



The level of **education** is represented by aggregated categories of the International Standard Classification of Education (ISCED-1997). The variable has three categories: no or primary education – secondary education – tertiary education. There is theoretical foundation and empirical evidence that the level of education influences health behaviour (Hurrelmann 2006). Similarly, education affects selection in marital statuses, for instance, the risk of divorce is assumed to be affected by the education level of the wife (Becker 1998; Perelli-Harris and Lyons-Amos 2016).

Due to the different currencies and purchasing powers of the 14 countries, **economic status** is represented by a subjective assessment of the household's financial situation. Participants are asked: "*Thinking of your household's total monthly income, would you say that your household is able to*

make ends meet...With great difficulty / With some difficulty / Fairly easily / Easily". This question is only answered by one member of the household (the financial respondent) and the answer must be copied to the other household members. For the analyses, economic well-being is treated as an ordered categorical variable. A study showed that despite the self-assessment, this is a reliable measure for financial situation (Litwin and Sapir 2009). Economic status is assumed to both affect health and marital transitions. According to marital protection theory, the health advantage for the married is, among others, a consequence of higher financial resources of the married. Economic resources have been proven to be positively associated with health (Hurrelmann 2006). The impact of marital status on mortality has been found to be mediated by income (Rogers 1995). Besides, economically successful, independent women might be more likely to initiate divorce (Becker 1998; Perelli-Harris and Lyons-Amos 2016). For the physical performance tests only, respondent's **body height** is controlled (in centimetres). Body height, which is associated with muscle mass, is a possible confounder of a person's grip strength ability. A positive relation between height and grip strength has been identified (Hank *et al.* 2006)[26]. Moreover, body height is considered an indicator of childhood health conditions and marital selection. The body height of adults is related to their health, hygiene, and nutrition status during childhood. Evidence has been found that height can be useful in predicting mortality (Cheung 2000; Tanner 1992). Since body height is also associated with chances on the marriage market, it can serve as "a useful indicator of marital selection" (Cheung 2000: 94). Studies have shown that Western women tend to prefer taller men, and that tall men are more likely than shorter men to have more relationships, to get married and to remarry (Weeden and Sabini 2005). SHARE respondents report their height in centimetres once during their first interview *("How tall are you?").* Implausible values have been excluded (height < 30 cm; N=6).

All models of cognitive performance control additionally for **test-retest effects** by the inclusion of an indicator whether respondents have taken part in the tests in the previous SHARE wave. This is to rule out learning and anticipation effects, which could lead to better test performance, especially for the delayed recall test (Ferrer *et al.* 2004; Rabbitt 2001). Test situations can induce stress reactions in the human body and reduce cognitive performance, however, routine and learning effects reduce this stress reactivity (Fox 2010). Additionally, a dummy variable is included whether the interviewer reported that there were **contextual factors** that may have impaired the respondent's performance during the tests. Finally, a dummy variable for each country is included in the models to control for **country effects**. Analysing cross-national data, it is important to rule out bias that may be driven by

[26] I do not control for body weight for several reasons. Weight is a time-varying factor, but is only measured prospectively in SHARE, not retrospectively. Moreover, the relationship between weight/body mass index and body fat/muscle mass is not linear, and consequently too complex to be operationalised by weight in kg (Rothman 2008; Janssen *et al.* 2000). Empirically, it has often been shown that being married is related to modest gains in body weight, and that married people (especially husbands) engage less in physical activity (Rapp and Klein 2015; Wood, Goesling and Avellar 2007). Overweight and obesity are risk factors of chronic diseases such as arthritis, hypertension, or diabetes (Must 1999). Hence, weight per se can be interpreted as a health outcome of marital status, and the inclusion in the regression models is not desirable (e.g., due to multicollinearity).

any country-specific macro effects, such as cultural variation, religion, family legislation, culture of marriage and divorce, or health care systems. The selection into a marital status or marital biography may also be dependent on national family legislation (the relevance has also been discussed in Chapter III.3.). Furthermore, for cross-country studies of grip strength, it is recommended to control for nationality in order to take care of possible gene-environment interactions (Andersen-Ranberg *et al.* 2009). For German respondents, an additional indicator is included whether they grew up in the former German Democratic Republic or not. Even 20 years after German reunification, marriage behaviour in West and East Germany shows clear differences (Mühling and Schreyer 2012). Divorce rates have been and are higher in East Germany, even before the foundation of the GDR (Böttcher 2006).

1.2.2. Analytical Sample

For each regression of each health outcome, participants without the respective test participation were excluded. Overall, participants were excluded if they had any missing or faulty information of marital status, marital status transitions, or duration, or on any of the covariates. Persons under 50 years (i.e., younger partners of respondents) and same-sex couples were also not part of the analyses (for detailed data cleaning, exclusion criteria of the sample and reasoning see Chapter III.1. & 2.). For the physical function analyses, N=894 observations were dropped due to missing data on marital status or marital biography, or any of the control variables; for the cognition tests, N=909 were dropped. Table 7 shows the summary statistics for the analytical samples. The main sample consists of more than 22,000 respondents and represents the older population of 14 European countries. Hereof, 73% are married, 8% separated or divorced, 14% widowed, and 5% are never married. On average, the sample is 64 years old and contains 45% men. The mean maximum grip strength is 35 kg, the mean maximum peak expiratory flow is 350 l/min. The average number of words that were recalled in the memory test is approximately 9 (of 20). Respondents named on average 19 animal names in 60 seconds. Over 68% of the respondents had a very healthy childhood. 10% reported very good mathematical and language skills during childhood, respectively. Overall, the characteristics of the two samples for physical and cognitive health are very similar, a slightly higher share (ca. 0.5 percentage points) of widowed persons is present in the cognitive health sample.

The subsample of the currently married (N=16,094/16,614) indicates that most married respondents married between age 20 and 39, and have been married for more than 37 years, on average. The subsample of persons with at least one marital loss (N=5,950/6,253) shows a mean duration of living separated of 30 years, and a mean duration of 12 years in widowhood (this group of respondents is referred to as the ‘ever-disrupted’ (cf. also Hughes and Waite 2009)). Of them, over 9% experienced more than one marital loss. The subsample of the never married (N=1,064/1,108) consists of more than 50% life-long singles and of 30% singles, who had at least one previous partner.

Table 7: Summary statistics of the full and sub samples

	Physical Health Sample				*Cognitive Health Sample*			
	Mean / Percent	Std. Dev.	Min.	Max.	Mean / Percent	Std. Dev.	Min.	Max.
Marital Biography: Full Sample	***N*=22122**				***N*=22979**			
Current marital status								
never married	5.03				5.06			
married	72.95				72.51			
separated	8.06				7.92			
widowed	13.97				14.52			
Marital status biography								
never married	4.79				4.81			
married continuously	68.19				67.85			
separated once	6.47				6.37			
separated after >=2 losses	1.12				1.08			
widowed once	12.72				13.24			
widowed after >=2 losses	0.93				0.94			
remarried after separation	4.37				4.31			
remarried after widowhood	0.92				0.93			
remarried after >=2 losses	0.50				0.49			
Marital Biography: Currently married	***N*=16094**				***N*=16614**			
Age at 1st marriage								
early marriage (<age 20)	7.64				7.71			
mainstream marriage (age 20-39)	89.88				89.80			
late marriage (>age 39)	2.48				2.49			
Years married (accumulated)	37.86	(10.02)	0	74	37.99	(10.09)	0	74
Remarried (=yes)	7.67				7.59			
Marital Biography: Ever disrupted	***N*=5950**				***N*=6253**			
Years married (accumulated)	29.85	(13.99)	0	81	30.21	(14.11)	0	81
Years separated (accumulated)	14.69	(10.91)	0	64	14.72	(10.96)	0	64
Years widowed (accumulated)	12.18	(10.19)	0	63	12.29	(10.21)	0	63

Multiple disruptions (=yes)		9.39				9.15			
Marital Biography: Never married	***N*=1064**					***N*=1108**			
Relationship status biography									
never in relationship		50.75				52.26			
previously in relationship		30.36				30.87			
currently in relationship		18.89				16.88			
Health and Covariates: Full Sample	***N*=22122**					***N*=22979**			
Grip strength test: Maximum grip strength (in kg)		34.65	(11.90)	1	84				
Peak expiratory flow test: Maximum lung function (in l/min)		349.15	(141.04)	60	800				
Memory test: Maximum number words recalled						8.68	(3.48)	0	20
Verbal fluency test: Maximum number words mentioned						19.01	(7.32)	0	100
Very healthy childhood (=yes)		68.21				68.47			
Very good language skills childhood [b]						10.10			
Very good math skills childhood [b]						10.17			
Age		64.23	(9.38)	50	97	64.46	(9.51)	50	99
Gender (=Male)		45.07				44.67			
Education									
no/primary education		30.16				31.19			
secondary education		50.07				49.37			
tertiary education		19.77				19.44			
Make ends meet									
with great difficulty		11.26				11.66			
with some difficulty		27.98				28.18			
fairly easily		33.38				33.17			
easily		27.38				27.00			
Height (in cm) [a]		167.84	(8.99)	109	210				
Disturbing factors during test (=yes) [b]						6.52			
Panel respondent (=yes) [b]						62.08			

Note: N encompasses all cases with at least valid information for grip strength or lung function / memory or fluency and therefore slightly differs from the number of cases in analyses. In the following analyses, the total number of observations is reduced due to missing values of the further variables.
Unweighted data.

[a] For physical health regressions only.
[b] For cognitive health regressions only.

1.2.3. Analytical Strategy / Method

For the analyses of all health tests outcomes, multivariate ordinary least squares (OLS) regressions are used since the dependent variables are continuous measures. The formula for multivariate linear regression reads:

$$y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \cdots + \beta_{K-1} x_{K-1,i} + \varepsilon_i$$

i=1, …, n

Where y_i is the outcome of interest of an individual i (i.e., the dependent variable, health). β_0 represents the regression constant or intercept; the further regression coefficients β_j denote the slope at the respective points of the regression line. The independent variable x_{1i} with (j=1, …, k-1) is the categorical variable of marital status, indicating whether someone is married, widowed, etc., or any other variable of marital biography. The further independent variables x_{ji} with (j=2, …, k-1) are vectors of individual characteristics such as age, gender, childhood health, etc., which serve as control variables; ε_i denotes the residuum, the error term (cf. e.g., Kohler and Kreuter 2012; Wolf and Best 2010a):

$$Health = \beta_0 + \beta_1 marital\ status + \beta_2 gender + \beta_3 age + \cdots + error\ term$$

To examine gender differences, i.e., whether the gender of a person systematically moderates the effect between the outcome (health) and the independent variables, all models are additionally run with the inclusion of gender interaction terms. Therefor, the binary gender variable (male/female) is multiplied with every explanatory variable of the model. The products of $\beta_j \times (x_{ji} \times gender_i)$ with (j=1, …, k-1) enter the linear regression models, additionally. This method is preferred over separated subgroup analyses of men and women to ensure sufficient numbers of observations (especially in the less common subgroups of marital biography), and statistical power.

The model analysing the inability of physical test performance is conducted with a logistic regression because the outcome of interest is a dichotomous variable. This technique draws on the maximum-likelihood principle to estimate the regression coefficients, which depict the effect of the independent variables on Pr(y=1) (i.e., the probability that the outcome y is 1, with y indicating whether an individual was able to perform a health test or not) (cf. e.g., Wolf and Best 2010b).

For all regression models, robust standard errors were chosen. Specifying robust standard errors uses Huber-White-corrected standard errors, which are robust to some kinds of misspecification, especially to the violation of the assumption of heteroscedasticity (e.g., Brüderl 2010).

1.3. Results

1.3.1. Current Marital Status and Health

The first step is to compare how the current marital status of older Europeans is related with their performance in physical and cognitive health tests. The estimation results of the regressions are presented in Table 8. In all four test domains – grip strength, lung function, memory function, and verbal fluency function – never married persons show significantly worse test results than married persons. The group of never married elderly has on average 1.4 kg less hand grip strength, and about 17 l/min less lung function than the married. Never married people remember on average 0.4 words less in the memory test, and name 0.7 words less in the test of verbal fluency[27]. For the groups of previously married persons, results are mixed: Separated persons show significant performance differences compared to the married in peak flow and memory scores: with a 7.2 l/min lower lung function and 0.3 words less recalled than the married, the negative effects for separation are smaller than for the never married. Widowed elderly persons show lower test scores than married people in both cognition tests, 0.5 words less in the memory test, 0.7 words less in the fluency test. Grip strength performance of the widowed is slightly better than that of the married, about half a kilo. This positive effect for the widowed may appear counter-intuitive at the first sight. However, this is not necessarily an uncommon finding. For instance, Pizzetti and Manfredini (2008) found a longevity advantage for widowed Italian females, compared to continuously married women. In-depth interviews with UK widowers and widows over 65 revealed that widows tend to describe the loss of their spouse as a newly found freedom (Davidson 2001). Nevertheless, another explanation for a positive health effect for the widowed, found here and in other studies, may be panel attrition and selective participation. As widows and widowers tend to be older, they are more likely to drop out of a panel survey due to death or health-related reasons. The remaining widowed participants are likely to be healthier – at least healthy enough to voluntarily participate in a time and energy demanding survey.

[27] A robustness test revealed that pet owners have no advantage for the task of naming of animal names over respondents without pets. The information of pet ownership was extracted from the SHARE w1 and w2 'drop-off' questionnaires. On average, 43% of respondents had a pet at the time of the interview. The share of pet owners across the marital status groups is quite equally distributed.

Table 8: OLS regressions of health on marital status

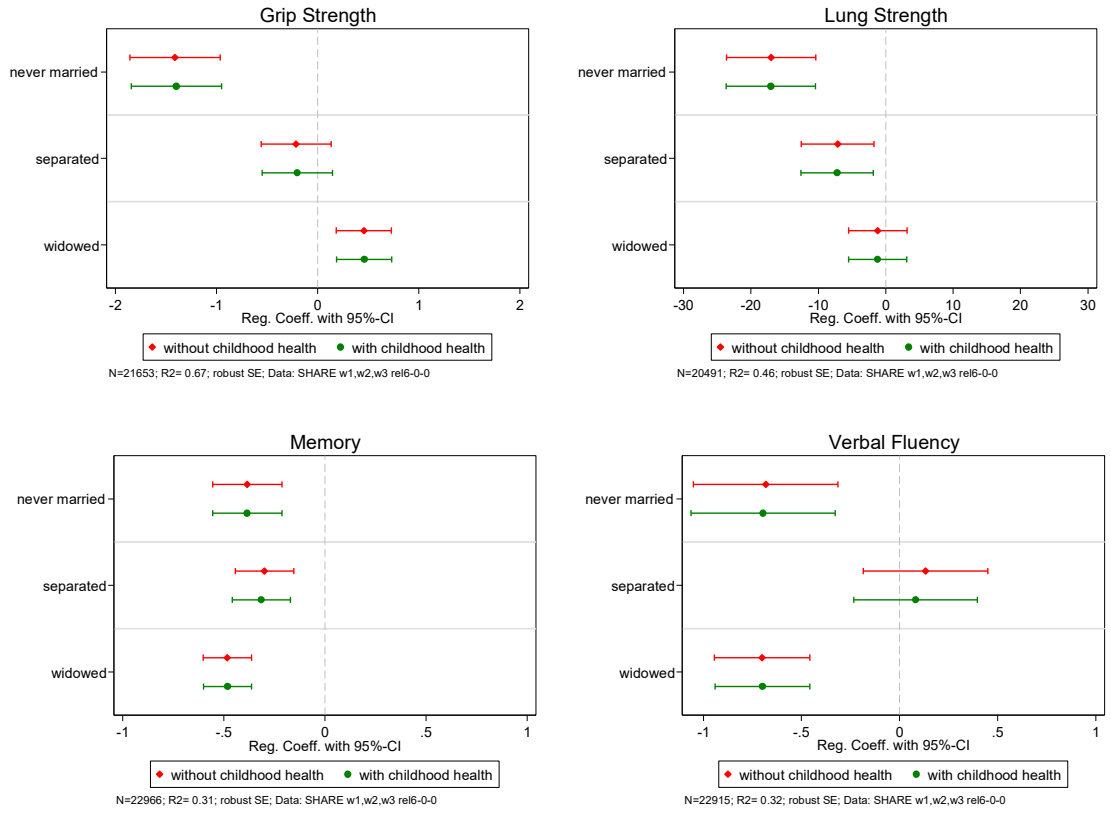
	Grip Strength	Lung Function	Memory	Verbal Fluency
Marital status (Ref.=married)				
never married	-1.40***	-17.07***	-0.39***	-0.70***
	(0.23)	(3.38)	(0.09)	(0.19)
separated	-0.20	-7.21**	-0.30***	0.08
	(0.18)	(2.74)	(0.07)	(0.16)
widowed	0.46***	-1.19	-0.48***	-0.70***
	(0.14)	(2.21)	(0.06)	(0.12)
Male	14.25***	102.90***	-0.82***	0.04
	(0.13)	(2.05)	(0.04)	(0.08)
Age	-0.41***	-4.86***	-0.11***	-0.17***
	(0.01)	(0.09)	(0.00)	(0.00)
Body height	0.25***	2.42***		
	(0.01)	(0.12)		
Education (Ref.=no/primary education)				
secondary education	0.46***	17.56***	1.27***	1.94***
	(0.12)	(1.90)	(0.05)	(0.10)
tertiary education	0.26	34.27***	2.30***	4.02***
	(0.15)	(2.42)	(0.06)	(0.14)
Make ends meet (Ref.=with great difficulty)				
with some difficulty	0.98***	2.09	0.20**	0.54***
	(0.18)	(2.70)	(0.07)	(0.13)
fairly easily	2.06***	17.45***	0.45***	1.22***
	(0.18)	(2.78)	(0.07)	(0.14)
easily	2.15***	30.16***	0.58***	1.93***
	(0.20)	(3.04)	(0.08)	(0.15)
Very healthy childhood	0.24*	-1.31	-0.08	-0.40***
	(0.10)	(1.58)	(0.04)	(0.09)
Very good maths skills childhood			0.35***	0.80***
			(0.07)	(0.16)
Very good language skills childhood			0.44***	1.21***
			(0.07)	(0.16)
Disturbing factors			-0.73***	-0.83***
			(0.09)	(0.18)
Panel respondent			0.20***	0.29**
			(0.05)	(0.11)
Constant	12.04***	198.84***	15.29***	28.53***
	(1.40)	(21.35)	(0.22)	(0.42)
R^2	0.671	0.459	0.309	0.323
Observations (N)	**21653**	**20491**	**22966**	**22915**

Note: Regression coefficients. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for country fixed-effects (not shown)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Moreover, it is tested how controlling for physical and mental condition in early life affects the results. Figure 16 displays plotted regression coefficients (with 95% confidence intervals) of all four health outcomes for the marital status groups. The red coefficients represent the models without control for childhood conditions. The green coefficients represent the models controlling for health status, mathematical, and language skills in childhood (the two latter indicators are only included in the

models for memory and fluency). The dichotomous variable of a very healthy childhood has a significant effect on the grip test outcome (b=0.24; p<0.05), and fluency (b=-0.40; p<0.001). Respondents who were extraordinary healthy before age 15 show slightly better results for hand grip strength in old age, but worse results for the naming of animal names than other respondents. Cognitive abilities at age ten significantly affect the outcome of both cognition tasks in old age (p<0.001). Both very good mathematical and language skills increase the respondent's score in the cognition tests. The size of the effects is larger for the verbal fluency task: especially an excellent verbal performance at school enhances respondents' performance in verbal fluency in old age (b=1.21). The difference in size between the estimated coefficients of the models with and without childhood health/cognition status are extremely small. Controlling for the available childhood characteristics does not seem to profoundly influence the marital status differences in health. Again, these outcomes could be a result of a biased sample through mechanisms of selection effects and panel attrition. Persons with exceptionally severe health conditions in early life may just not have survived, or not survived until old age. A survival bias of healthier individuals, who are more likely to take part in the survey, may be at work here.

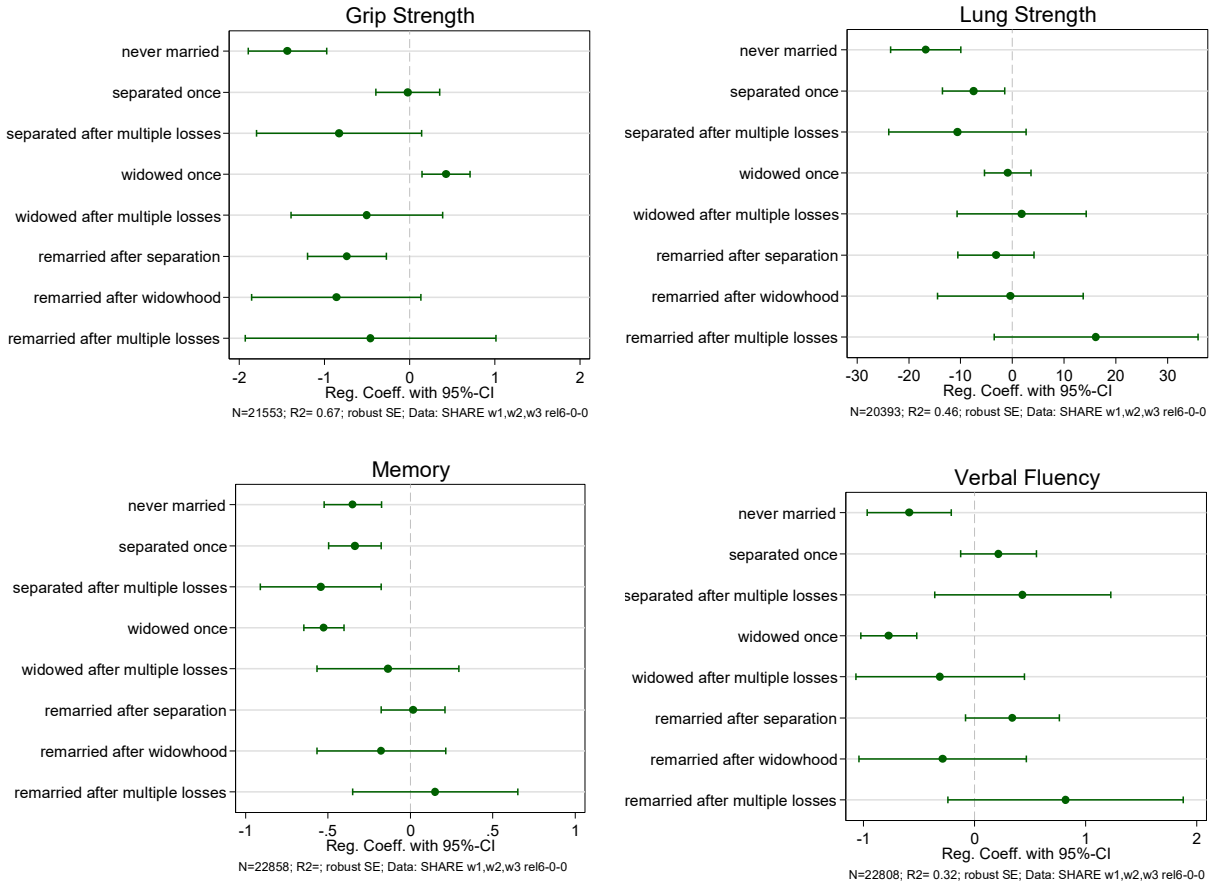
Figure 16: OLS regression coefficients of health on marital status. Comparison of models with and without control for childhood health (Reference=married)



1.3.2. Marital Transitions and Health

In a second step, the effect of the number and types of marital transitions on health in old age is examined. Except for the never married, all marital status groups are decomposed into smaller sub groups, which reflect the number and nature of marital status transitions over the life course. Regression results are shown as plotted coefficients in Figure 17 (complete regression tables in Table 22, Appendix).

Figure 17: OLS regression coefficients of health on marital transition biography (Reference=continuously married)



Because of the rather conservative marriage histories of the sample, number of observations in the marital biography groups with multiple marital transitions is low, leading to large confidence intervals. As before, being never married has a significant negative effect on performance ability in both the physical and cognitive health tests. The effects for persons being separated and widowed once are in line with the effects of the current marital status 'separated' and 'widowed', as shown in the analyses of current marital status: a significant negative effect on peak expiratory flow and memory is found for the onetime separated persons. Onetime widowed persons show significantly lower test scores in both cognition tests, and higher scores in the grip test. Most of the marital biographies with higher order marriages and disruptions have no significant effects on health. There are two exceptions: remarried

persons, who experienced one divorce, do not perform as well as stably married persons in the grip test (b=-0.74; p<0.01). The coefficients for the other subgroups of the remarried (after one widowhood/after multiple marital losses) show the same direction, however no statistical significance. Finally, for memory performance, a significant effect is found for persons who are separated after two or more marital losses: they perform worse than stably married persons in recalling the word list twice (b=-0.54; p<0.01).

In order to test for gender differences, additional regression models including interactive terms of each independent variable with gender were performed. For the interpretation of the results of the physical tests, the gender differences in physical ability *per se* must be acknowledged (cf. also Cotes, Chinn and Miller 2006; Hank *et al.* 2006). Table 9 indicates an average grip strength performance of 43.83 kg among men, 26.99 kg among women. For the breathing test, the mean value for males is 420.32 l/min, for females 288.61. The sizes of regression coefficients must be interpreted accordingly.

The results of the regression models adding the interaction between the explanatory variables and gender reveal that there is indeed some variation between men and women. Figure 18 and Figure 19 show plotted average marginal effects (AME), which were post-estimated from the OLS regressions, for females and males separately (for regression tables, see Appendix Table 23 and Table 24).[28]

Table 9: Gender differences in physical performance tests

	Mean (S.D.)		Mean (S.D.)
Grip Strength (kg)		**Lung Function (l/min)**	
Men	43.83 (9.85)	*Men*	420.32 (148.40)
Women	26.99 (7.00)	*Women*	288.61 (102.90)

[28] Following the regressions interacting each independent variable with the factor gender, marginal effects were calculated. Since the marginal effects are dependent on the value of the covariates, the covariate gender was fixed at value 0/1 (female/male), respectively, indicating the slopes for each of the two covariate patterns.

Figure 18: Average Marginal Effects (AME) of marital status biography on physical health for men/women (Reference=continuously married)

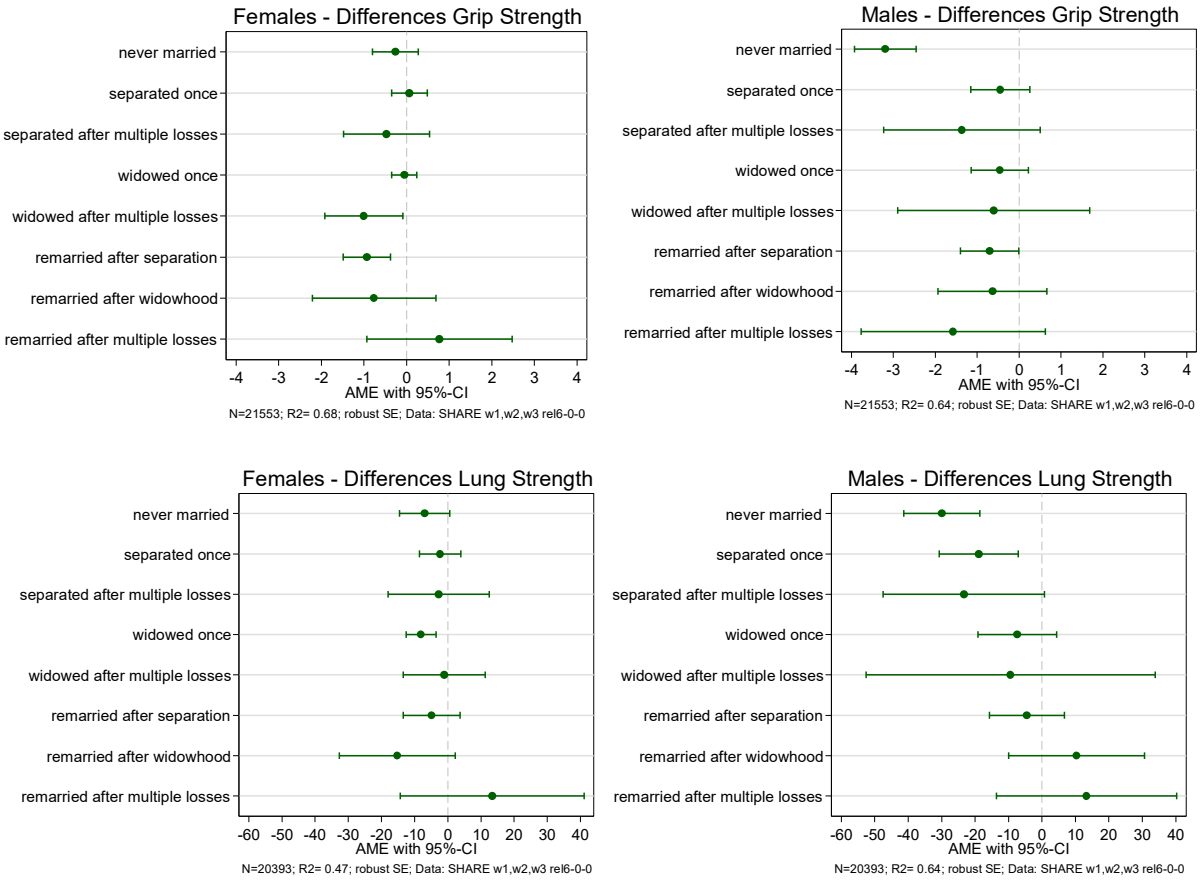
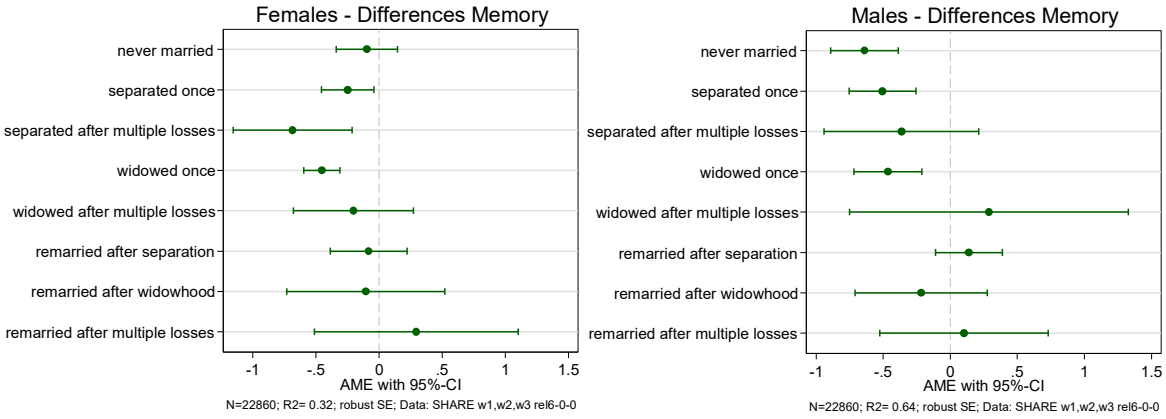
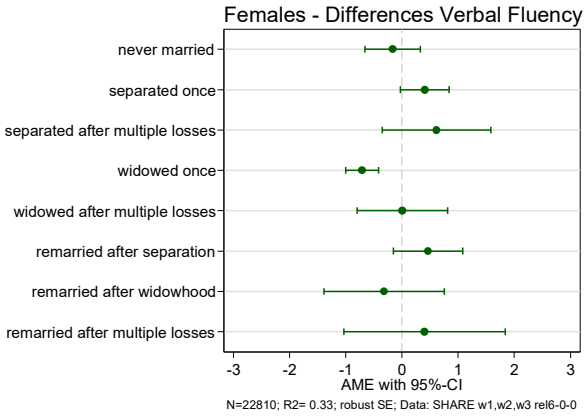
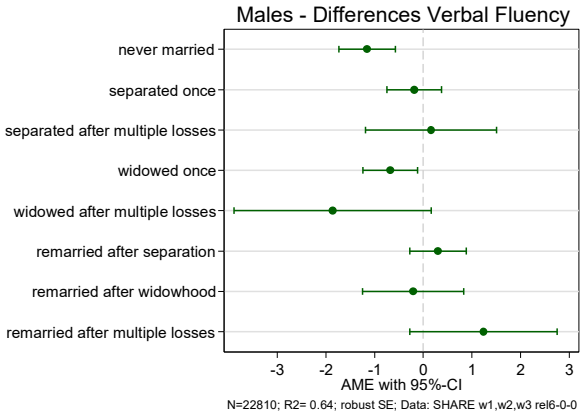


Figure 19: Average Marginal Effects (AME) of marital status biography on cognitive health for men/women (Reference=continuously married)







Turning to physical health, the negative effect for the never married older Europeans disappears for female respondents, there are no significant differences in grip and lung strength between never married and stably married women. Most likely, the negative coefficient of being never married seems to be driven by the subgroup of males. Never married men show significantly lower physical health test results than stably married men. Similarly, in the peak flow test, onetime separated men and men separated after multiple disruptions fare worse than stably married men. Again, the negative impact of being separated or divorced on lung function, seems to be driven by males. For women, a significant negative effect for lung function is observed for the first-time widows. Being widowed after two or more marital losses has a negative impact on older women's grip strength. The negative effect of being remarried (after one divorce), compared to first marriages, is significant for both genders.

Regarding cognitive abilities in later life, again, differences between never married respondents and the continuously married are only significant within males. For memory capacity, the negative impact of being separated or widowed after one marriage can be observed within both genders. Being separated after multiple marital losses shows to be only a disadvantage for females, in comparison with their stably married counterparts. The negative effect of being widowed (once) on the abilities of semantic fluency holds for both men and women.

1.3.3. Marital Timing, Durations and Health

The next step is to compare whether differences in the timing and durations of marital statuses affects health differently.

The Currently Married

First, for the group of currently married persons, the influence of the timing of the first marriage on health in old age is analysed. Simultaneously, an indicator for remarriage is included in the models to test whether the order of marriage plays a role. Results from M1, shown in Table 10 and Table 11, indicate for all the health measures that persons with an early marriage (i.e., first marriage before the age of 20) have worse health than persons with a marriage age between 20 and 39. The effects are statistically significant for grip strength (b=-0.55), and the two cognition tests (b=-0.25 for memory; b=-0.45 for semantic fluency). A rather late first marriage (after age 39) shows no significant differences compared to a marriage between 20 and 39. Whether respondents are married in their first or a higher order marriage, makes only a significant difference for grip strength. Remarried persons have a 0.74 kg lower hand grip performance score than the persons married for the first time ($p<0.001$).

In an alternative model, the category 'early marriage' has been specified as marriage before age 18. Marriage under age 18 was or is not allowed in all the European countries and more often applied to female spouses (exceptions possible via court rule, cf. Table 4 (Chapter III.4.)). The findings were in line with the previous specification of the variable, however, the negative effect sizes for grip strength and the cognition tests were considerably greater.

Moreover, models were run examining the duration which a person has been married, instead of analysing age at marriage (M2 in Table 10 and Table 11). Small positive effects for the number of years married is obtained for physical health outcomes, very small negative effects for the mental health measures. However, this measure of marital history did not reach statistical significance.

Table 10: OLS regressions of physical health on marital timing/duration. Currently married only

	Grip Strength		Lung Function	
	M1 (Timing)	***M2 (Duration)***	***M1 (Timing)***	***M2 (Duration)***
Age at 1st marriage				
(Ref.=mainstream marriage (age 20-39))				
early marriage (<age 20)	-0.55**		-3.90	
	(0.21)		(3.01)	
late marriage (>age 39)	-0.33		-7.38	
	(0.36)		(5.70)	
Remarried	-0.74***	-0.78***	-1.66	-0.50
	(0.22)	(0.22)	(3.34)	(3.41)
Years married (accumulated)		0.01		0.26
		(0.01)		(0.16)
Male	14.59***	14.65***	107.05***	107.65***
	(0.15)	(0.15)	(2.37)	(2.39)
Age	-0.44***	-0.44***	-5.09***	-5.30***
	(0.01)	(0.01)	(0.11)	(0.18)
Body height	0.26***	0.26***	2.40***	2.41***
	(0.01)	(0.01)	(0.14)	(0.14)
Education (Ref.=no/primary education)				
secondary education	0.39**	0.44**	16.70***	17.27***
	(0.15)	(0.15)	(2.31)	(2.32)
tertiary education	0.21	0.27	32.39***	33.13***
	(0.18)	(0.18)	(2.89)	(2.92)
Make ends meet (Ref.=with great difficulty)				
with some difficulty	0.99***	1.01***	1.07	1.17
	(0.23)	(0.23)	(3.36)	(3.37)
fairly easily	2.13***	2.17***	18.77***	18.68***
	(0.23)	(0.23)	(3.44)	(3.45)
easily	2.24***	2.28***	30.99***	31.18***
	(0.24)	(0.24)	(3.71)	(3.73)
Very healthy childhood	0.24*	0.23	0.48	0.43
	(0.12)	(0.12)	(1.89)	(1.89)
Constant	12.99***	12.85***	215.44***	214.59***
	(1.67)	(1.68)	(25.68)	(25.69)
R^2	0.658	0.658	0.442	0.441
Observations (N)	**15807**	**15729**	**14986**	**14907**

Note: Regression coefficients. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for country fixed-effects (not shown)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 11: OLS regressions of cognitive health on marital timing/duration. Currently married only

	Memory		Verbal Fluency	
	M1 (Timing)	***M2 (Duration)***	***M1 (Timing)***	***M2 (Duration)***
Age at 1st marriage				
(Ref.= mainstream marriage (age 20-39))				
early marriage (<age 20)	-0.25**		-0.45*	
	(0.09)		(0.19)	
late marriage (>age 39)	0.05		0.11	
	(0.14)		(0.28)	
Remarried	0.03	-0.01	0.35	0.18
	(0.09)	(0.09)	(0.19)	(0.19)
Years married (accumulated)		-0.00		-0.01
		(0.00)		(0.01)
Male	-0.80***	-0.78***	0.14	0.14
	(0.05)	(0.05)	(0.10)	(0.10)
Age	-0.10***	-0.10***	-0.17***	-0.15***
	(0.00)	(0.00)	(0.01)	(0.01)
Education (Ref.=no/primary education)				
secondary education	1.20***	1.21***	1.90***	1.91***
	(0.06)	(0.06)	(0.12)	(0.12)
tertiary education	2.09***	2.11***	3.87***	3.85***
	(0.08)	(0.08)	(0.16)	(0.16)
Make ends meet (Ref.=with great difficulty)				
with some difficulty	0.22**	0.22**	0.53***	0.53***
	(0.09)	(0.09)	(0.16)	(0.16)
fairly easily	0.49***	0.50***	1.37***	1.38***
	(0.09)	(0.09)	(0.17)	(0.17)
easily	0.57***	0.58***	2.17***	2.17***
	(0.10)	(0.10)	(0.18)	(0.18)
Very healthy childhood	-0.07	-0.07	-0.29**	-0.30**
	(0.05)	(0.05)	(0.10)	(0.10)
Very good maths skills childhood	0.33***	0.32***	0.87***	0.90***
	(0.09)	(0.09)	(0.19)	(0.19)
Very good language skills childhood	0.35***	0.36***	1.01***	1.02***
	(0.09)	(0.09)	(0.19)	(0.19)
Constant	14.92***	14.79***	28.09***	27.72***
	(0.27)	(0.28)	(0.53)	(0.54)
R^2	0.287	0.288	0.318	0.319
Observations (N)	**16604**	**16521**	**16576**	**16494**

Note: Regression coefficients. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for disturbing factors, panel respondent, country fixed-effects (not shown)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

As far as gender differences in marital timing of the currently married are concerned, the following results are obtained (see also Appendix Table 25, Table 26, Table 27, and Table 28). The negative impact of a young age at marriage is only significant within women for two of the four health outcomes. Women who married before age 20 have less hand grip strength and lower semantic fluency scores than women who married between age 20 and 39. As discussed earlier, a marriage of a young person, especially a young woman, can reflect a time of poor family circumstances in childhood. The group of respondents who got married before their twentieth birthday was born between 1908 and 1957, with a mean birth year of 1943, and the distribution is skewed to the left. Becoming married at a very young age is argued to be "disruptive to normative developmental trajectories (e.g., schooling)" (Dupre, Beck and Meadows 2009: 552). It has also been argued that an early marriage leads to missed education, combined with uncommonly early parental responsibilities, which then leads to economic and psychological distress, and in turn to poor health (ibd.; Dupre and Meadows 2007). However, any confounding effects of missed education should be controlled for by the variable of education level. Additionally, I tested whether a variable indicating a period of financial stress in childhood (from birth to age 15) moderates the negative effect of early marriage – no significant effects were detected.

The Ever-Disrupted

Second, the subsample of 'ever-disrupted' persons is examined. This refers to persons who were or are separated, divorced, or widowed – regardless of their current marital status. The impact of the duration spent in disrupted marital statuses is tested for the sample of persons who have ever experienced one or more marital losses. Length of time (years) spent in each marital status is accumulated and included in the models as continuous variables. People who spent time either only widowed or separated, are assigned a value of zero to the other duration variable, respectively. To distinguish these values of zero from persons with a marital transition in the year of the survey, durations are lagged by one year. Additionally, models contain an indicator variable if respondents had been confronted with more than one marital loss.

Overall, the durations spent in the marital statuses seem to have only minor effects on health in old age (Table 12). Whereas the coefficients for the number of years spent separated or divorced are insignificant, there are significant but very small effects for the years spent widowed. The longer someone has been widowed over the life course, the better their average result of the hand grip measurement (increase of 0.03 kg per additional year). On the contrary, one additional year widowed is associated with a memory capacity of 0.01 words less ($b=-0.01$, $p<0.05$). For the verbal fluency test, each year spent in widowhood is associated with a 0.03 decrease in words mentioned ($p<0.01$). A coefficient greater in size is found for multiple marital disruptions. Older Europeans who have experienced more than one loss of a spouse showed on average 1.5 kg less grip power than persons with only one marital disruption. Since others have found evidence for detrimental effects directly after a marital loss – for example that a marital separation is more traumatic in the short run, with initially very high stress levels (Gardner and Oswald 2006), or the risk of excess mortality

immediately after the death of a spouse (Martikainen and Valkonen 1996; Moon *et al.* 2014; Thierry 2000) – I ran a model testing, additionally, the impact of a very recent marital loss (<=3 years ago). No significant effects were obtained for the relation between a recent marital loss and the four health measures.

Table 12: OLS regressions of health on marital status durations. Ever disrupted persons only

	Grip Strength	**Lung Function**	**Memory**	**Verbal Fluency**
Years separated (accumulated)	0.02	-0.20	-0.01	0.02
	(0.01)	(0.15)	(0.00)	(0.01)
Years widowed (accumulated)	0.03*	-0.26	-0.01*	-0.03**
	(0.01)	(0.16)	(0.00)	(0.01)
Multiple disruptions (=yes)	-1.53**	0.50	0.25	0.56
	(0.50)	(6.94)	(0.23)	(0.42)
Male	14.10***	100.15***	-0.84***	0.04
	(0.28)	(4.52)	(0.09)	(0.19)
Age	-0.38***	-4.46***	-0.12***	-0.18***
	(0.01)	(0.16)	(0.00)	(0.01)
Body height	0.22***	2.46***		
	(0.01)	(0.23)		
Education (Ref.=no/primary education)				
secondary education	0.35	13.89***	1.27***	1.88***
	(0.22)	(3.59)	(0.10)	(0.19)
tertiary education	0.18	36.12***	2.13***	4.00***
	(0.29)	(4.80)	(0.13)	(0.28)
Make ends meet (Ref.=with great difficulty)				
with some difficulty	1.26***	2.16	0.18	0.78**
	(0.31)	(4.81)	(0.12)	(0.27)
fairly easily	1.72***	13.14**	0.32*	1.01***
	(0.32)	(5.06)	(0.13)	(0.28)
easily	1.98***	29.86***	0.47**	1.44***
	(0.35)	(5.62)	(0.15)	(0.30)
Very healthy childhood	0.09	-3.59	-0.06	-0.56**
	(0.19)	(3.01)	(0.08)	(0.17)
Very good maths skills childhood			0.43**	0.93**
			(0.14)	(0.30)
Very good language skills childhood			0.46**	1.32***
			(0.14)	(0.30)
Disturbing factors			-0.68***	-0.76*
			(0.18)	(0.32)
Panel respondent			0.49***	0.29
			(0.10)	(0.21)
Constant	14.81***	172.39***	16.13***	29.90***
	(2.62)	(41.18)	(0.40)	(0.78)
R^2	0.689	0.489	0.358	0.348
Observations (N)	**5363**	**5079**	**5817**	**5800**

Note: Regression coefficients. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for country fixed-effects (not shown)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Again, also among the different marital history subgroups of the ever-disrupted older adults, gender differences can be observed (see Appendix Table 29, Table 30). The marginal effects for the interactive effects of marital status durations/number of disruptions and gender explore whether marital histories affect health differently among men and women. Regarding physical health, a significant negative effect is observed for men with more than one marital disruption, compared to men with only one disruption experience (grip strength; AME=-4.07; $p<0.001$). The accumulation of negative health consequences by the time spent in widowhood seems to be only significant within women (lung function; AME=-0.35; $p<0.05$). The same can be observed for one measure of cognitive health: only women's performance in semantic fluency decreases by every additional year widowed (AME=-0.02; $p<0.05$).

1.3.4. Marriage Quality and Health

As already mentioned, data limitations do not allow taking into account any trajectories of the quality of a marriage. No information was collected on marital satisfaction in the retrospective SHARELIFE survey. Without an indicator of marital quality, all marriages compared in this study are treated the same with respect to quality – even though there may be substantial differences in the frequency of conflict and level of satisfaction within the relationship. Put the case that the marital resource theory proves to be true and marriage has a beneficial effect on health, it nevertheless denies the fact that "the simple presence of a spouse is not necessarily protective" (Kiecolt-Glaser and Wilson 2017: 422). Being in an unhappy or troubled marriage can be a major source of stress itself (ibd.). In Chapter I.1.3., I provided theoretical explanations for the relevance of marital quality for health, which is mainly derived from bio-social research on the physiological pathways of marital interaction (for extensive reviews see also Kiecolt-Glaser and Newton 2001; Robles and Kiecolt-Glaser 2003; Robles *et al.* 2014). The limited amount of studies investigating the association between marital quality and health of older spouses has found that elderly persons in harmonious marriage have less health care costs, physician visits, chronic and physical health problems, disability, and sleep problems, compared to elderly persons in unhappy marriages – especially the wives (Bookwala 2005; Farrell and Markides 1985; Levenson, Carstensen and Gottman 1993; Prigerson, Maciejewski and Rosenheck 1999; Prigerson, Maciejewski and Rosenheck 2000; Roth-Roemer and Kurpius 1996).[29]

Even if very limited, the SHARE survey allows considering marital quality to a certain extent. For the currently married, a question on conflict behaviour – in a voluntary, additional paper-and-pencil 'drop-off-questionnaire' complementing wave 1 and 2 – can be exploited to operationalise a variable on marital quality (see Chapter III.3.3, section "Marriage and Partnership Quality" for details of data collection). A categorical variable is generated to indicate whether a person reported to have conflicts with their spouse often, sometimes, or never. The answer option 'rarely' was added to the intermediate

[29] See Robles and Kiecolt-Glaser (2003) for a general review of marital interaction studies on physiological reaction; see also a review by Kiecolt-Glaser and Newton (2001) that "is devoted to evaluating studies of physiological responses to marital interaction, including a discussion of the potential significance of these physiological changes for subsequent morbidity and mortality" (474).

category ‘sometimes’. Limiting the sample to only currently married persons, I arrive at a subsample of 10,425 observations, whereof 5% claim to have arguments with their spouse often, 78% sometimes, and around 17% never (Table 13).

Table 13: Distribution of the measure of marital conflict. Currently married persons only

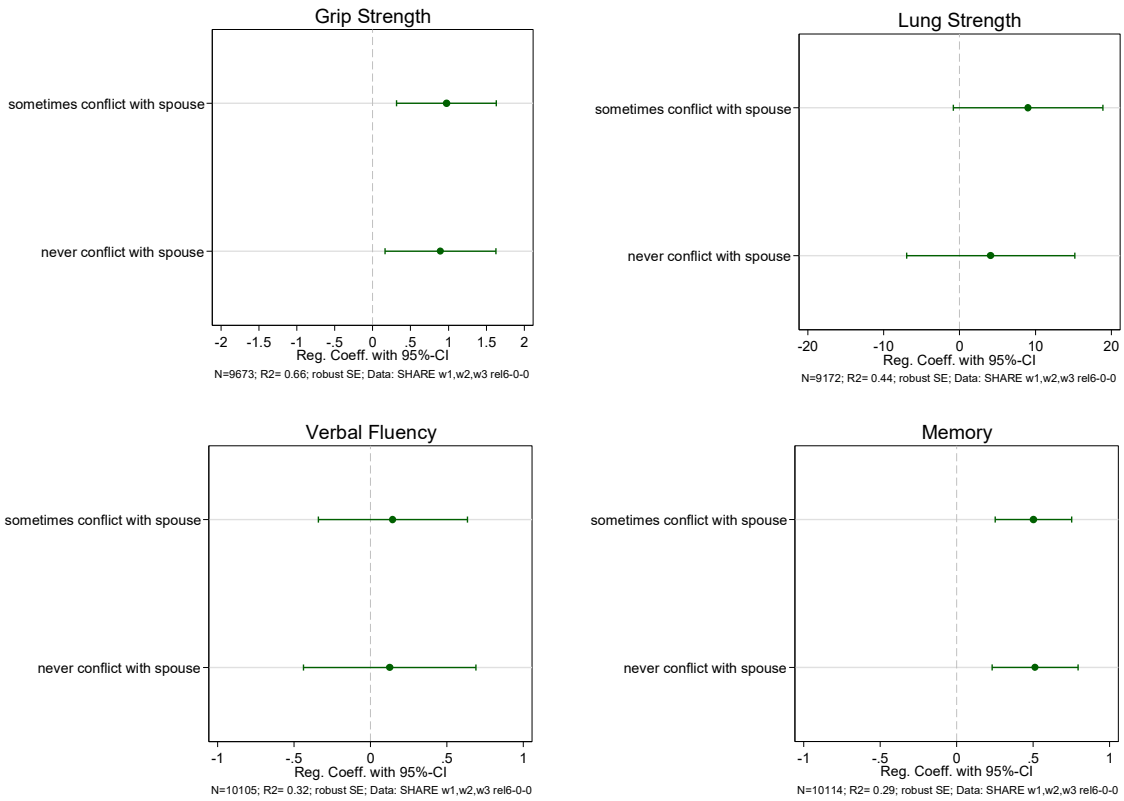
Frequency of conflict with spouse	**Percent**
Often	5.02
Sometimes	78.20
Never	16.79
N=10,425	

Data: SHARE w1,w2 rel6-0-0. Unweighted data.

In general, the frequency of arguments within a couple relationship “is a reliable predictor of marital satisfaction” (Noller, Feeney and Peterson 2001: 144). Nevertheless, it should be also noted that the absence of marital conflict does not necessarily stand for a high level of marital satisfaction. An avoidance or suppression of conflict might as well be a mean of handling relationship problems – especially older couples in long-term marriages might “take the view that differences that have not been resolved by this late stage of their relationship are best accepted or ignored” (ibd.: 144).

It goes without saying that the measure of marital quality reflects frequency of marital conflict only for the time the survey had been conducted. Nevertheless, it can be used as a proxy of subjective marital satisfaction. Figure 20 shows the plotted coefficients of the focal predictors of the regressions on health with respect to conflict frequency (see also regression Table 31 in Appendix). Older Europeans in marriages with intermediate frequency of conflict and in conflict-free marriages seem to reach better results for both physical and mental health – compared to the reference group of conflictual marriages. These differences are significant for the grip strength task and the memory task. Spouses who argue sometimes or never have about 1kg more hand grip power and 0.5 words higher memory capacity than spouses in high-conflict marriages.

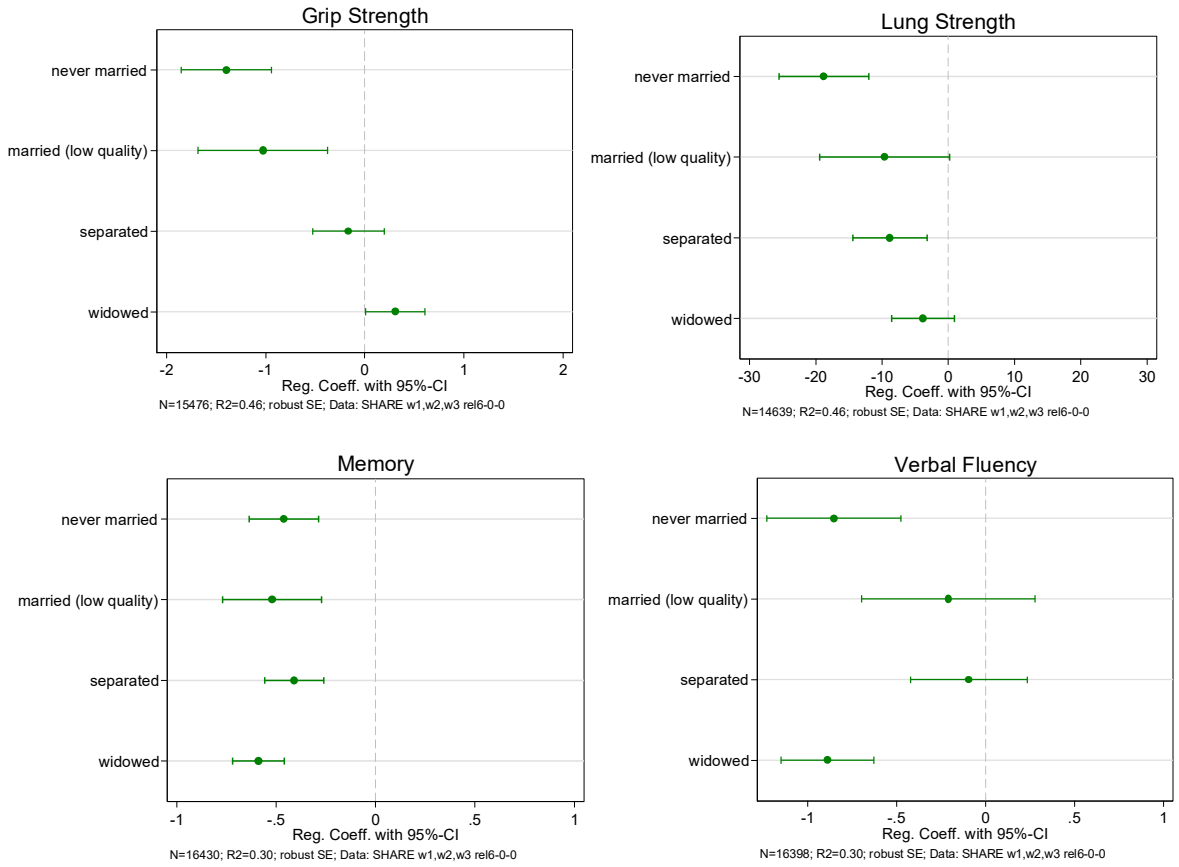
Figure 20: OLS regression coefficients of health on marital quality (Reference=often conflict). Currently married persons only



Using this information on marital quality, the models regressing health on current marital status are run again. The group of married persons is divided into two subcategories: married with low marital quality (i.e., married with frequent spousal conflict) and married with high/average marital quality (i.e., sometimes/never conflict). Figure 21 displays that there are significant differences between the two subgroups of married adults for both physical and cognitive health. Compared to married persons in marriages with intermediate frequency or a lack of conflict, married persons in high-conflict marriages have a negative coefficient for grip and lung strength as well as memory function. For the memory test, the negative effect for the troubled marriages (b=-0.52) is even greater in size than for the group of separated adults (b=-0.41) (see Appendix Table 32 for complete regression tables).

However, the findings of these analyses must be treated with caution. Since the information on marital quality was extracted from the optional paper-and-pencil questionnaire, the total number of observations for valid current marital status is reduced from about 23,000 to 17,000. Especially the share of married persons is reduced considerably. Whereas the share of married persons is over 70% in the regular sample, the sample considering marital quality contains less than 60% married persons, due to missing values and refusal on the conflict question. This considerably influences the original distribution of marital status groups in favour of the never married, separated, and widowed.

Figure 21: OLS regression coefficients of health on marital quality (Reference=married, high/average quality)



1.3.5. The Never Married: Non-marital Partnership Biography and Health

Even though the main interest of this study is official conjugal status, the evidence on health deficits of the never married older population, compared to the married, motivates an additional exploration of the subgroup of elderly singles. In comparison with the impact of the marital life course on health, the effects of different histories of non-marital unions have been less studied. Schneider *et al.* (2014) stress that "[s]tudies that analyse the association between relationship status and health usually disregard non-marital relationships" (1). That there are "various types of unmarrieds or singles" (Bryant 2016: 218) is seldom acknowledged in the field of research. The question whether there is a difference between legal marital status and partnership status for health status is increasingly examined because family formations are becoming more diverse and less traditional (see Rapp and Klein 2015 for a summary on research on partnership and health). Regarding the older population, there is limited evidence for partnership biographies and health outcomes to date (Wright and Brown 2017: 833). It can be argued that formal marital status is a proxy for a living arrangement and a structure of life style, which shares many features with non-marital romantic relationships. Nevertheless, an official marriage is not merely a 'piece of paper', but a central social relationship

linked to certain binding commitments, substantial legal rights and obligations – which is different from a partnership.

Using retrospective information on LAT unions and cohabitation unions, collected in the SHARELIFE dataset, as well as partnership status at the time of the interview, it is possible to generate a sample of N=1,067 (physical health) / N=1,113 (cognitive health) of never married older adults with complete reports on their relationship history and current partnership status. In the following, LAT partnerships and non-marital cohabitation partnerships are subsumed as non-marital relationship. Within the sample of the never married, slightly over 50% report to never have been in any form of serious partnership. Around 30% have experienced at least one partnership but are without partner at the time of the interview. The minority, about 19% of the never married, is living in a non-marital union at the time of observation.

Table 14 shows the results of the regressions of health on the different trajectories of relationship history. Significant differences between the unmarried without a partnership and the unmarried elderly with partnership are found for physical health. Never married persons who have had at least one partnership before, but who are now single, show significantly lower results in hand grip power than partnered older adults ($b=-1.59$; $p<0.05$). This piece of evidence could imply that unmarried persons may compensate their exposition to stress, strain and lack of resources by the benefits of a partnership, even if it is out of wedlock. Unmarried persons with a previous relationship break-down would then resemble divorced persons in terms of a cumulation of health disadvantages and loss of resources.

In contrast, however, elderly Europeans who have never been living in a relationship at all, show a positive coefficient for lung function – compared with individuals with a partner ($b=22.78$, $p<0.05$). In this case, it could be argued that for the life-long singles, an optimal adjustment to living alone is rather valid than a cumulation of disadvantage and strain. This is also supported by the results which are obtained by the regressions including interactive effects of gender (see Appendix Table 33). Never married men without any partnership experience have a significant positive effect for the breathing test, compared to men in a partnership ($AME=54.20$; $p<0.001$). On the other hand, adverse selection into a relationship may be at work. Older adults who are in a partnership at the time of the interview may be sicker or frailer and may have directly or indirectly searched for companionship and support. This may especially apply to older men. Elderly single women, however, who experienced at least one past partnership that came to an end, are physically weaker in terms of grip strength than women who have a partner ($AME=-1.66$; $p<0.05$). For mental health outcomes, no difference between groups of never married older adults is evident. No gender differences are observed for mental performance (cf. Appendix Table 34).

Table 14: OLS regressions of health on non-marital relationship history. Never married persons only

	Grip Strength	Lung Function	Memory	Verbal Fluency
Non-marital relationship biography (Ref.=currently in relationship)				
never in relationship	-0.56	22.78*	-0.24	0.05
	(0.63)	(9.74)	(0.26)	(0.58)
previously in relationship	-1.59*	11.19	0.39	0.71
	(0.66)	(9.59)	(0.26)	(0.60)
Male	11.11***	77.86***	-1.23***	-0.62
	(0.62)	(8.32)	(0.18)	(0.39)
Age	-0.34***	-5.35***	-0.10***	-0.12***
	(0.03)	(0.39)	(0.01)	(0.02)
Body height	0.31***	2.96***		
	(0.03)	(0.46)		
Education (Ref.=no/primary education)				
secondary education	0.23	21.80*	1.25***	2.46***
	(0.62)	(9.17)	(0.23)	(0.47)
tertiary education	0.05	36.90***	2.48***	5.46***
	(0.75)	(10.94)	(0.28)	(0.59)
Make ends meet (Ref.=with great difficulty)				
with some difficulty	0.51	7.43	-0.12	0.92
	(0.86)	(12.69)	(0.30)	(0.65)
fairly easily	2.11*	19.70	0.37	1.17
	(0.82)	(12.83)	(0.29)	(0.63)
easily	1.93*	28.47*	0.40	1.36
	(0.94)	(13.85)	(0.31)	(0.70)
Very healthy childhood	0.69	-7.71	-0.23	-0.81*
	(0.47)	(6.95)	(0.18)	(0.40)
Very good maths skills childhood			0.62*	1.36
			(0.31)	(0.72)
Very good language skills childhood			0.77*	0.03
			(0.35)	(0.80)
Disturbing factors			-0.48	-0.39
			(0.34)	(0.81)
Panel respondent			0.07	0.07
			(0.23)	(0.48)
Constant	-3.87	118.55	15.52***	25.17***
	(6.52)	(86.00)	(0.86)	(1.85)
R^2	0.626	0.457	0.363	0.316
Observations (N)	**1033**	**968**	**1108**	**1106**

Note: Regression coefficients. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for country fixed-effects (not shown)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

1.3.6. Robustness Checks for Test Performance Inability

A short-coming of the physical health measures in this study is that the test participation requires a minimum amount of physical ability. There are no test results for exceptionally frail or certain disabled respondents. To examine whether the ability to take part in the hand grip and breathing test is non-random across marital status groups, I test whether the probability of being unable to perform the tests varies by marital status.[30]

In the following, respondents are categorised as being unable to perform if the respondent and/or interviewer felt that it would not be safe, or if the respondent tried but was unable to complete the test. For the grip strength test, inability was additionally identified if the respondent could not participate due to a surgery, injury, or swelling on both hands. For the peak flow test, inability was additionally defined if the test result was coded as invalid because the exhalation performance had been worse than the minimum value on the peak flow meter scale (<60 l/min). This results in a share of 5.9% (peak flow) and 3.6% (grip strength) of eligible respondents with non-missing information on marital status who were unable to take part in the test (N=1,344 of 22,473 for breathing test; N=824 of 22,755 for grip test). No such data is available for the cognition tests. However, non-participation seems to be considerably lower for those tasks. Only 0.3% refused to participate in the animal naming test or selected the 'Don't Know' category. However, the reasons for respondents' refusal are unknown. No information on refusal at all has been released for the memory task.

Table 15 shows the results of a logistic regression analysis for the association between participation inability and marital status, adjusting for all covariates used in the previous analyses. The association between the probability of being unable to conduct the physical test and marital status is presented by exponentiated logit coefficients (Odds Ratios). A value of 1 indicates that there is no relationship between marital status and test inability, a value <1 indicates a negative relationship, a value >1 a positive relationship. Never married persons had significantly higher chances of being not able to perform both physical tests than the married: 51% higher odds for peak expiratory flow test inability ($p<0.01$); 71% for grip strength test inability ($p<0.001$). Widowed persons showed also an increased probability of inability compared with married persons for the peak flow test (OR=1.236; $p<0.01$). It can be assumed that there is a higher proportion of frail people among never married, and – to a certain extent – widowed individuals a priori. Therefore, the negative health effects obtained for the never married and widowed, in the previous analyses of grip and lung strength, might even be underestimated. Results may have been obtained from a rather selective, healthier group of never married and widowed persons.

As a robustness check, I ran all main models including the respondents who had been not able to participate in the physical health tests. These cases were assigned the value zero for grip strength and peak expiratory flow. Additionally, a binary indicator of test participation (yes/no) was added as a control variable. Interestingly, results were robust to this specification of the health measures.

[30] A similar approach regarding test inability of SHARE respondents is presented in Weinstein (2016).

Table 15: Logistic regressions of inability to perform physical function tests on marital status

	Test Inability Grip Strength	Test Inability Lung Function
Marital status (Reference=married)		
never married	1.709***	1.510**
	(0.27)	(0.19)
separated	0.762	1.031
	(0.14)	(0.14)
widowed	1.116	1.236**
	(0.11)	(0.10)
Male	0.566***	0.843*
	(0.06)	(0.07)
Age	1.074***	1.065***
	(0.00)	(0.00)
Body height	1.002	0.993
	(0.01)	(0.00)
Education (Ref.=no/primary education)		
secondary education	0.837	0.880
	(0.08)	(0.06)
tertiary education	0.639**	0.728**
	(0.10)	(0.09)
Make ends meet (Ref.=with great difficulty)		
with some difficulty	0.607***	0.703***
	(0.06)	(0.06)
fairly easily	0.525***	0.490***
	(0.06)	(0.05)
easily	0.476***	0.461***
	(0.07)	(0.05)
Very healthy childhood	0.980	0.908
	(0.08)	(0.06)
Constant	0.000449***	0.00776***
	(0.00)	(0.01)
R^2	0.109	0.123
Observations (N)	**22050**	**21705**

Note: Odds Ratio. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for country fixed-effects (not shown)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

1.4. Summary of Results and Discussion

The results detected that married individuals are healthier than the never married in old age. The never married elderly have lower scores than the married in four different physical and cognitive health tests – grip strength, peak expiratory flow, memory, and verbal fluency performance. Additionally, never married respondents have a greater risk to be unable to conduct the physical performance tests at all. The health advantage of the married over the never married is in line with other studies measuring health via objective tests, e.g., grip strength (Clouston, Lawlor and Verdery 2014; Schneider *et al.* 2014), respiratory functioning (Ploubidis *et al.* 2015), and recall testing (Mousavi-Nasab *et al.* 2012).

When the previously married were compared with the married, results were more heterogeneous. Separated older Europeans show both a decreased lung and memory function. However, the negative effects for the separated are smaller than for the never married. The widowed perform worse than married people in the cognition tests. In contrast, the grip strength performance of the widowed is slightly better than that of the married. One underlying reason for the reduced cognitive function of the widowed could be – among others – a consequence of depression after the death of the spouse. Death of a spouse is considered to be one of the most devastating life events, which is accompanied by a rise of depressive symptoms (e.g., Schaan 2013; Sasson and Umberson 2014). It has been observed that two thirds of depressed patients suffer from cognition impairment (Rock *et al.* 2014); depression has been found to impair executive cognitive function such as semantic fluency performance, and depressed persons had difficulties with memory tasks (Ardila, Ostrosky-Solís and Bernal 2006; Marazziti *et al.* 2010). The finding of increased grip strength of widowed Europeans may be counter-intuitive and contradicts the hypothesis that the unmarried are less healthy than the married. Nevertheless, it concurs well with other study results, which have reported positive consequences of widowhood. Pizzetti and Manfredini (2008) found a longevity advantage for Italian widows, compared to continuously married women. In-depth interviews with British widowers and widows over 65 revealed that widows tend to describe the loss of their spouse as a newly found freedom (Davidson 2001). Another explanation for a positive health effect for the widowed may be panel attrition and selective participation. As widows and widowers tend to be older, they are more likely to drop out of a panel survey due to death or health-related reasons. The remaining widowed participants are likely to be healthier – at least healthy enough to voluntarily participate in a time and energy demanding survey. However, widowed adults did not show a better performance in lung function and had worse cognitive health than the married. The widowed were more likely to be unable to complete the breathing test as compared with the married. Hence, it is disputable whether the positive effect of grip strength is a mere result of a survival and selection bias of healthier widow(er)s.

The examination of the past marital life course of the older Europeans revealed that neither all currently married, currently separated, and currently widowed persons have had the same marital history, nor that they are 'equally' healthy. The various components of marital biographies seem to be relevant for different health areas, and to different extents. One of the findings was that remarried

persons, who experienced one divorce, have lower grip strength than stably married persons. This supports evidence by Williams and Umberson (2004), who observed that remarriage decreases the chances of reporting good health in old age. One reason may be the fact that divorce is a stressful life event, which cannot be fully compensated by the positive effects of remarriage, making a higher order marriage less beneficial for health than a first marriage. That remarriage is not as protective as a first marriage, especially after divorce, is also supported by a study stating that a quick remarriage does not buffer against the long stressful experience of a divorce, with regard to well-being (Gardner and Oswald 2006). Another underlying mechanism could be adverse health selection into (re-)marriage among old adults. Divorced or widowed elderly who found a new partner may be more prone to formally get married, if one of the partners needs care or is likely to be hospitalised. For instance, Vespa (2013) found that unmarried older US men are more likely to marry their cohabitating partner when they are unhealthy and very wealthy; older women are at higher risk to marry their partner if they are poor but very healthy. Adverse mechanisms of health selection are also supported by another finding of my analyses: compared with the first-time married, the remarried have less hand grip power – regardless of type of previous loss.

Another finding was that Europeans who are separated after two or more marital losses have a decreased memory performance, compared to the stably married; the negative effect is larger for them than for people who are separated only once. This finding offers some clues that there is an accumulation of health disadvantages over the life course, and that multiple marital disruptions are more detrimental for health than a single marital loss.

A non-normative, early timing of entering a marriage seems to be related to health deficits. The analyses of marital timing suggested that elderly Europeans with an early marriage (i.e., first marriage before age 20) are less healthy than persons who married later (between age 20 and 39). The effects are statistically significant for grip strength and the two cognition tests. In contrast, a relatively late first wedding (after age 39) showed no significant effects.

The durations spent in the marital statuses seem to have only minor effects on health in old age. Whereas there are no significant effects of the number of years of being separated or divorced, there are significant effects for the years spent in widowhood. The longer someone has been widowed over the life course, the better the average hand grip strength. This contradicts research with US data, reporting that chronic conditions and mobility limitations are more common the longer someone had been divorced or widowed (Hughes and Waite 2009). However, others have found that neither the duration of widowhood nor of divorce affects physical health (e.g., cardiovascular diseases (Zhang and Hayward 2006)). Regarding cognitive health, a longer duration of being widowed was associated with a decrease in memory and verbal fluency capacity. This lends support to previous research that found widowhood to be more stressful than divorce, as far as mental well-being and re-adjustment is concerned (Gardner and Oswald 2006; Holmes and Rahe 1967). Among the currently married older Europeans, the duration of being married was not associated with health. This result shares similarities

with the work by Zhang and Hayward (2006), who could not identify effects of the duration married or remarried on cardiovascular health.

Concerning the number of marital losses among older Europeans with at least one marital loss, individuals who have experienced more than one loss of a spouse showed less grip power than respondents with only one marital disruption. Similarly, Zhang (2006) found evidence that persons with multiple marital losses have a higher likelihood of suffering from physical health deficits. Overall, the hypothesis that there is an accumulation of health deficits, the longer someone has been living divorced or widowed, can partly be supported by the findings for cognitive health, but only for being widowed. The negative effect of multiple marriage disruptions seems to support the assumption of cumulative disadvantage, at least for grip strength. However, there seems to be a recovery or adjustment effect over time for the grip strength of the widowed.

A major advantage of the present analysis was the availability of reports of mental and physical health, and cognitive abilities during childhood. Additionally, body height, which serves as a proxy of childhood circumstances, was controlled. As has been emphasised in the literature review (cf. Chapter II.4.), most datasets do not allow analysing childhood health and old age health, as well as the marital life course of the same individuals. The available publications to date mostly refer to proxy measures of early life health, for example socio-economic or mortality characteristics of the parents (Perelli-Harris *et al.* 2017; Zhang and Hayward 2006). Even though I applied cross-sectional regression methods, which can only describe differences in health at one point in time, a 'time' component entered the analyses, via the use of the retrospective life history data (Victor, Westerhof and Bond 2008). I observed that the health differentials between the marital status groups in old age are robust to the adjustment for health in early life. The advantages of the married in the different domains of health remained, even after controlling for physical and mental health as well as cognitive abilities of childhood. The variables of childhood cognitive abilities had a significant effect on cognitive function in all models of marital status and biography. The indicator of a healthy childhood showed to have a significant effect on grip strength and fluency, in most of the models of marital status and biography. However, these outcomes could also be a result of a biased sample through mechanisms of selection effects and panel attrition. Persons with exceptionally severe health conditions in early life may just not have survived their childhood, or may not have become very old. A survival bias of healthier individuals, who are more likely to take part in the survey, may be at work here. Besides, the measurement of childhood health as binary variable might not perfectly represent true past health status. For example, persons who suffered 'only' from one disease other than infection might not necessarily have been sicker than the reference group. As a sensitivity check, the variable indicating a healthy childhood was exchanged by a linear measure of the number of diseases mentioned (range 0–20). Although this operationalisation may underestimate the effect for persons with only one but a very severe illness as a child, results of the models of this study were not affected. Furthermore, all

main models predicting cognitive health were alternatively run controlling for childhood health but not for verbal and mathematical school performance – leading to the same results.

An additional aspect of my findings was the gender-specific nature of the association between marital status, marital biography and health. Never married men show significantly lower grip strength, lung function, and cognitive abilities in old age than stably married men. No difference between married and never married women is detected. This is similar to evidence by Clouston, Lawlor and Verdery (2014), who found that especially never married older men show lower results in grip and lung strength; Feng *et al.* (2014) discovered cognitive impairment also only within never married elderly men, not women. On the one hand, this could be a support for the hypothesis that men benefit more from being married than women, and this seems to hold true also in old age. On the other hand, one could argue that this finding is a result of selective mechanisms which took place in the marriage market – and which were not covered by the variable of childhood health. With regard to the evidence on grip strength, men with more muscle mass might have been more attractive mates for women compared to less muscular men, who are physically weaker (cf. Weeden and Sabini 2005 for a review on physical attractiveness in Western societies).

Regarding marital status biography, onetime separated men and men separated after multiple disruptions fare worse in the lung function test than stably married men. Again, this is not observed in women. For women, I discover a negative association between lung function and being a first-time widow. Being widowed after two or more marital losses has a negative impact on older women's grip strength. Regarding memory function, being separated after multiple marital losses is a disadvantage for older females. With respect to the timing of marriage, the present study found that the negative impact of a young age at marriage is only significant within women for two of the four health outcomes. Women who married before age 20 have lower outcomes in grip strength and semantic fluency than women who married between age 20 and 39. This matches with evidence by Ploubidis *et al.* (2015) who also reported gender-differences in the detrimental effects of early marriage on health, measured via biomarkers. Further, Dupre and Meadows (2007) confirmed that marrying before age 19 increases the risk of physical disease in older women; McFarland, Hayward and Brown (2013) found that the younger a man had been at marriage, the higher his biological risk factors in old age (cf. also Grundy and Tomassini 2010). Finally, I found evidence that women experience an accumulation of physical and cognitive health disadvantages through a longer time spent in widowhood (lung function, fluency). Overall, the finding that the gender disparities show a high degree of variability across health and marital history measures is in accordance with prior evidence (presented in the literature review (Chapter II.)).

The present study also shed light on the importance of marital quality in the exploration of marital status and health. Older Europeans in marriages with few or no conflicts have better physical and mental health than spouses in troubled marriages. These differences are significant for the grip strength and the memory task. Besides, there are significant health differences between married adults

with intermediate frequency or a lack of spousal conflict and married persons in high-conflict marriages. The latter show deficits in grip and lung strength as well as memory function. That low levels of marital quality are detrimental for the health status of the spouses has been pointed out elsewhere (e.g., Kiecolt-Glaser and Wilson 2017). Since it was not possible to include measures of marital quality of the *whole* marital life course, it is desirable that the collection of data on marital quality will be acknowledged as an important component of social scientific survey data.

In the light of the identified health disadvantages of never married older Europeans, the role of non-marital partnership biography was explored. Results offer some clues that the previous partnership history is related to physical health in later life, but not to cognitive function. Never married Europeans who have never lived in a relationship at all show greater lung power than individuals with a partner, especially men. In contrast, never married persons who have had at least one partnership before, but who are now single, show less hand grip strength than partnered older adults, especially women. Research by Schneider *et al.* (2014), that compared marital, cohabitation, and partnership status and their association with grip strength performance, found similar effects of cohabitation biography: older Europeans who had either previously or never lived with a partner had less grip strength than those living with a partner continuously (see Chapter IV.1.3.5. for a further discussion of partnership biography results).

Overall, the goodness of fit measure of the OLS-regressions, R^2, indicated that about 30% of the variance in cognitive health can be explained by the independent variables, whereas 50–70% of the variance in physical health can be explained by the independent variables.

The presented analyses have limitations. One major limitation is their cross-sectional nature. Cross-sectional regressions are likely to be biased, for example, due to unobserved omitted variables that confound the relationship between marital status and health (e.g., personality traits, stressful life events). Causal conclusions about the association of marital history and health in old age are not reasonable, and selection processes into marital biographies could not be ruled out completely. Although an adjustment for childhood health was conducted, the used measures can test only one small piece of the puzzle of the health selection hypothesis. Furthermore, the data allowed examining detailed marital biographies, but health status was collected at two points only in time: in early life and in later life. No causal interpretation is possible because the exact temporal ordering of health status and marital trajectories is not measured. It is unclear at which point in time of a marital biography a certain health status began to unfold. For example, with regard to the negative effects for the divorced in the peak flow and memory performance test, nothing is known about the ordering of events. The results do not disentangle what came first: the separation or the health decline. Has the health decline been the cause for a relationship breakdown or the consequence? (cf. also Gumà, Cámara and Treviño 2015).

Moreover, reporting errors of the marital life histories may have reduced the quality of the results. As presented in detail in Chapter III.2. and IV.1.2., inconsistencies were discovered between marital

status reports in regular SHARE panel waves and marital history reports in the retrospective SHARELIFE data. It is not clear whether this is a result of erroneous interviewer behaviour, or faulty reports or cognitive impairment of the respondents. Further, it is possible that the variety and impact of marital biographies with multiple transitions might be underestimated in the presented analyses. In fact, people with more complex partnership histories have more events to remember, and the "more events there are to remember, the harder it may be to remember all of them accurately" (Garrouste and Paccagnella 2011: 62). Missing values in the partnership histories are problematic if the underlying reasons for their absence are non-random. For example, never married respondents have per se a higher likelihood of reporting 'complete' partnership histories because there *is* nothing to forget. Respondents with many marital transitions, over decades of their lives, may have a higher likelihood of reporting gaps or recall errors – just because there *is* a lot to forget.

Furthermore, there was only limited variability in marital status sequences. For example, most of the currently married respondents are in one long-term marriage. The small sample sizes of the subgroups of marital biographies may have limited statistical power to detect all differences between groups. It has been pointed out that the partnership patterns of persons who are in their later life stage today are rather coined by the circumstances of the two world wars than by the processes of individualisation and pluralisation of (family) lifestyles, which started in the 1970s. Recent trends – such as the postponement of marriage, elevated divorce risk, or the preference of cohabitation over formal marriage – affect the partnership patterns of older cohorts only remotely. It is rather the generation of persons born after 1950/1960 who has undergone profound changes in marital and partnership behaviour (Lengerer 2016). Especially the generation born after 1960 is not represented in the analysed sample. It will be the task of upcoming research to analyse whether future older Europeans will still show health gaps along official marital status groups, or whether the rise of non-marital cohabitation will blur the boundaries.

2. Marital Status Transition in Later Life and Health: Exploring Trajectories of Widowhood

In the previous section, the examination of the health status of older Europeans has captured health status at two points in time: in early life and in later life. An even more complex life course approach has been applied to analyse the impact of marital biographies. However, it is important to recognise how health develops over time and not only how healthy or unhealthy a person is at *one point* in old age. To date, prospective data do not yet allow following health *and* marital pathways of Europeans from birth to death. With the SHARE dataset it is, however, possible to track changes in health of Europeans after the main marital transition in later life: widowhood. Whereas the analyses in the previous chapter employed a cross-sectional design – comparing existing health differences of different groups of people at one point in later life – the following analyses will look at changes in

health in later life. Theoretically, longitudinal research designs are most appropriate for studying ageing (see also Victor, Westerhof and Bond 2008).

The analytical strategy of the previous analyses was to include relevant individual characteristics of childhood age to adjust for possible self-selection mechanisms within the marriage-health nexus. Analytically, there are different strategies to gain control of such confounding factors. Relying on observable or self-reported information can never take into account all confounding mechanisms. Panel data are a tool to overcome the omitted variable bias and to handle unobserved time-constant heterogeneity. With cross-sectional analyses it is difficult to rule out the original differences in background characteristics between the marital status groups (cf. Wood, Goesling and Avellar 2007). In the case of widowhood, it has been hypothesised that there are selection effects at work as well – that it is non-random who experiences widowhood. For instance, assortative mating on the marriage market could lead to marriages between persons with equal health status, and "unhealthy people with unhealthy partners are more likely to be widowed" (Wilson and Oswald : 2). Similarly, "assortative mating and the environment and lifestyle shared by spouses may confound the relation between widowhood and mortality. The death of a spouse is postulated to be indicative of some poor lifestyle factor or socioeconomic background, which may affect the survival chance of widow(er)s" (Cheung 2000: 93). On the other hand, there has been evidence that there could be indeed a causal effect of widowhood, for example on mortality, and "that the widowhood effect is not due to homogamy bias" (Elwert and Christakis 2008: 851).

In the following section, I aim at exploring the development of physical and mental health after marital bereavement. The availability of longitudinal data covering this marital transition will shed further light on my cross-sectional findings of the health of widowed persons in contrast to the married. This approach will clarify whether the identified physical and cognitive health differences for widowed elderly are mainly driven by unobserved background characteristics of the respondents, or if health differentials between the married and the widowed could be – to a certain degree – causal.

2.1. Research Questions

The research questions for the following analyses affiliate to the main research questions, which were raised in Chapter IV.1., and are only minorly adjusted in the following.

1) Derived from the theoretical assumptions and the literature review provided in Chapter I and II, the first question is whether a marriage-health benefit can be observed in later life. Given the central role of morbidity and mortality in later life, and following the argumentation of marriage protection theory, stress theory, biosocial pathways of partnership relations, and psychological theory of couple relationships regarding health, it is assumed that married persons show a better health status in old age than the unmarried. According to stress-related theories, being unmarried – here: widowed – is expected to be related to poorer health. I expect that both physical and cognitive health domains are affected.

The financial losses, changes in living arrangements, and losses in social networks after the death of a spouse are assumed to be gender-specific: e.g., men should suffer more from loss of social, emotional and practical support; women rather from economic changes (Waite 2009; Hughes and Waite 2009; Sasson and Umberson 2014). Drawing on the theoretical arguments of gender disparities within the marriage-health association, and in view of the 'conservative' birth cohorts of the study sample, men are expected to benefit more from being married than women. Likewise, the end of marriage through widowhood is supposed to result in greater health disadvantages for men than for women.

2) Second, the aim is to answer the question whether health in old age depends on both current marital status and on marital biography. Different trajectories and components of the marital life course should be associated differently with physical and cognitive health in old age. Widows and widowers are compared with respect to features of their marital history, assuming that not all currently widowed people will have the same health status. In accordance with cumulative dis-/advantage theory, health capital theory, and disposable soma theory, it is assumed that a longer time spent widowed results in a cumulative disadvantage for physical and cognitive health. I assume that becoming widowed has an immediate impact on cognitive health. Death of a spouse is considered to be one of the most devastating life events, which is accompanied by grief and depressive symptoms (e.g., Schaan 2013; Sasson and Umberson 2014). Evidence exists that depression can impair executive and memory-related cognitive function (Ardila, Ostrosky-Solís and Bernal 2006; Marazziti *et al.* 2010), and that two thirds of depressed patients suffer from cognition impairment (Rock *et al.* 2014). A longer duration of being married should result in an accumulated advantage for health.

Furthermore, it is explored whether the entering of a new partnership affects the relationship between widowhood and health. The marriage protection theory does not distinguish between first or higher order marriages, theoretically any marriage should have positive effects on health, meaning that there should be no health difference between married and remarried individuals (Waite 2009). On the other hand, widowed persons who repartner have undergone a phase of marital disruption. So, sociological and biological stress theories lead to the assumption that remarriage cannot be as beneficial for health as stable marriages (Barrett 2000).

3) Finally, the longitudinal research design allows exploring the question whether unobserved, time-constant traits of individuals markedly affect the relationship between marital status and health. According to the marriage selection theory, a person's health condition in early life should have a profound influence on their chance to marry and stay married. Concerning widowhood, also the assumptions of assortative mating propose that, "unhealthy people with unhealthy partners are more likely to be widowed" (Wilson and Oswald : 2). In view of the existing evidence, it is expected that a health gap between married and widowed persons will be found, even if time-constant unobserved heterogeneity is kept under control.

2.2. Measures and Methods

2.1.1. Analytical Strategy / Method

For the analyses of health trajectories after the change of marital status from married to widowed, fixed-effects (FE) panel regressions are conducted. This technique exploits the availability of multiple observations per person over time and 'rules out' person-specific error terms. For this, we first assume an error component model:

$$y_{it} = \beta_1 x_{it} + a_i + \varepsilon_{it}$$

i=1, …, n

Where y_{it} denotes the dependent variable (health) of an individual *i* at measurement time point *t*. a_i is a person-specific, time-constant, unobserved error term (e.g., a person's intelligence or personality traits). ε_{it} is the idiosyncratic error term that varies across persons and time, and that represents unobserved characteristics of a person (e.g., variables not measured in the SHARE survey). β_1 denotes the regression coefficient that is to be estimated for x_{it}, an independent variable such as marital status of a person at measurement time point *t*. Then, a 'between-transformation' is conducted that calculates means of the data for each person over time ('between' refers to the variation of means between persons):

$$\overline{y}_i = \beta_1 \overline{x}_i + a_i + \overline{\varepsilon}_i$$

with $\overline{y}_i = T^{-1} \sum_{t=1}^{T} y_{\text{it}}$, $\overline{x}_i = T^{-1} \sum_{t=1}^{T} x_{\text{it}}$, and $\overline{\varepsilon}_i = T^{-1} \sum_{t=1}^{T} \varepsilon_{\text{it}}$ being the person-specific means (*T* being number of measurement time points). Subtracting the second equation from the first equation conducts a 'within-transformation' that eliminates the person-specific, time-constant, unobserved error term a_i (it is identical to its mean). Any bias that might come from the association between the unobserved error term a_i with the regressors is eliminated:

$$y_{it} - \overline{y}_i = \beta_1 (x_{it} - \overline{x}_i) + (\varepsilon_{it} - \overline{\varepsilon}_i)$$

What remains is the 'within' variation, meaning the variation of means within a person (Brüderl 2010; Brüderl and Ludwig 2015; Giesselmann and Windzio 2013). Thus, it is possible to compare the same individuals with 'themselves' before and after widowhood.

However, FE models do not allow testing the effect of specific time-constant independent variables. To test whether time-constant variables such as sex moderate the association between the time-variant variable of marital status and health, interaction terms are calculated (e.g., multiplication of marital status and sex). For all regression estimations, panel robust standard errors are specified, clustered at the person-level. That allows relaxing the assumption of independence within groups (autocorrelation of error terms within a person due to multiple observations of the same person), and of

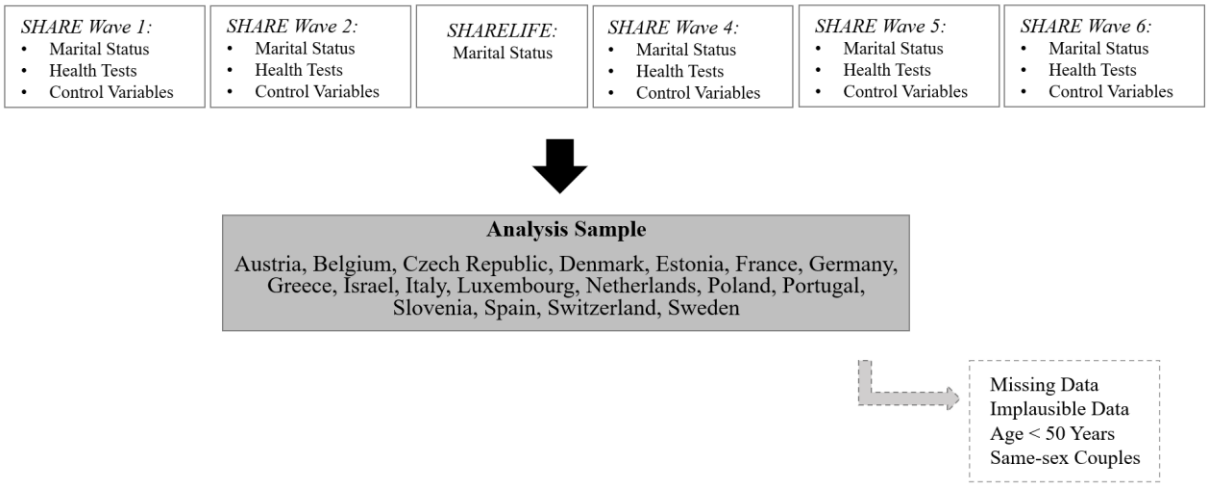
heteroscedasticity. Conventional standard errors could lead to an overestimate of significant effects (cf. e.g., Brüderl 2010). A Hausman specification test was performed to test the appropriateness of the fixed-effects estimator (in comparison with a random-effects estimator). The null-hypothesis, that the difference in the coefficients is not systematic, could be rejected (Prob>chi^2=0.000), indicating the FE estimator as consistent.

2.1.2. Data Source and Study Variables

The longitudinal sample is constructed of SHARE waves 1, 2, 4, 5, and 6. Data was collected every two years between 2004 and 2015 in 20 European countries and Israel. However, not each country participated in each wave (cf. Munich Center for the Economics of Aging (MEA) 2017b). Retrospective information collected in wave 3 (SHARELIFE) is used as auxiliary dataset to make adjustments to marital status for individuals whose marital status changed between wave 2 and wave 4 (cf. Munich Center for the Economics of Aging (MEA) 2017a on correction issues of information transfer of marital status changes reported by SHARELIFE respondents).

Figure 22 gives a graphical illustration of the procedure of the generation of the analytical sample.

Figure 22: Generation and data sources of analytical samples. Source: Own illustration



To estimate the FE regression models, only time-varying covariates enter the models:

Dependent Variables: Physical and Cognitive Health

As before, the maximum of hand grip strength serves as the measure for physical health (the peak expiratory flow test is not measured in every wave and hence not available for longitudinal analyses). The verbal fluency test and the memory test serve as measures for cognitive health.

Key Independent Variables: Becoming Widowed and Marital Biography

The focal independent variable is a change in current marital status from married to widowed. A change in marital status from married to widowed is derived from the question on current marital status and the question "*Since our last interview, has your marital status changed?"*. In case a

respondent took part in the SHARELIFE survey and stated a loss of the spouse, the marital status transition is reconstructed from the partnership history module. As further characteristic of marital biography, duration of widowhood is analysed. The length of widowhood is calculated with information obtained from the question *"In which year did you become a [widow/widower]?"*. Furthermore, I analyse a variable which indicates re-partnering after widowhood. The presence of a cohabitating partner is indicated by the 'partner in the household' variable provided in the SHARE dataset. Living-apart-together partnerships can be identified by the question *"Do you have a partner who lives outside this household?"*. This question was answered by all marital status groups in waves 1, 2, 4, and 6. In wave 5, however, only married persons who lived separated from their partner received the question.

Control Variables

The following time-variant control variables enter the models: age at the time of the interview (in years, linear) as well as current financial situation (measured by the self-assessment of how easily one's household is able to make ends meet with its income). Considering the age-period-cohort issue ('APC problem'), dummy variables for each survey wave are included to account for confounding effects of period, i.e., the chronological time (which is not a linear specification and not specified for each single year since survey measurement is only biennial). Birth cohort of respondents is indirectly controlled by the FE regression approach, that implicitly eliminates potential bias caused by any time-constant variables.[31] For regressions of cognitive health, I control for the presence of disturbing factors during the cognition tests, and whether respondents are baseline or panel respondents (test-retest effects) (cf. Chapter IV.1.2. for detailed presentation of the study variables).

2.1.3. Analytical Sample

For each analysis of each of the three health outcomes, participants without the respective test participation were excluded – that is $N_{person\text{-}years}$=12,010 for grip test, $N_{person\text{-}years}$=4,809 for memory, and $N_{person\text{-}years}$=5,010 for semantic fluency. Overall, participants were excluded if they had any missing or faulty information of marital status, marital status transition, status duration, or on any of the covariates. Persons under 50 years (i.e., younger partners of respondents) and same-sex couples were also not part of the analyses (cf. also Chapter III.1.). Only respondents who are married at the time of the first observation and who remain married or become widowed during the observational period are part of the initial sample. Person-years of persons who remarry after widowhood would be excluded, i.e., censored at the last time point of widowhood. A minimum of two observations per person is required to analyse changes in health. Accordingly, I dropped $N_{person\text{-}years}$=839 due to being widowed before entering the sample, $N_{person\text{-}years}$=81,372 due to other marital status than married/widowed, $N_{person\text{-}years}$=651 due to implausible marital status reports, and $N_{person\text{-}years}$=29,450 due to a lack of more than one observation. The final sample consists of $N_{persons}$=54,494 (for physical health) and

[31] More on the APC issue, that is relevant for the analyses of longitudinal data, can be found, e.g., in Klein (2016); Victor, Westerhof and Bond (2008).

$N_{persons}$=55,502 (for cognitive health), who are married at baseline. The respondents are from Austria, Belgium, Czechia, Denmark, Estonia, France, Germany, Greece, Italy, Luxembourg, the Netherlands, Poland, Portugal, Slovenia, Spain, Switzerland, Sweden, and Israel. The average number of observations per respondent is 2.31. At baseline, the sample's average age is 63, the share of male respondents is 50%. The mean hand grip strength is approximately 36 kg, at the beginning of the observational period. The average number of words that were recalled in the memory test is approximately 9 (of 20). Respondents named on average 20 animal names in 60 seconds. Within the observational period, 3,007 persons (physical health sample) / 3,220 persons (cognitive health sample) experience the death of their spouse. This is a share of about 6% of the sample. Within the group of widowed adults, less than 3% begin a new partnership after the death of the spouse. All other marriages in the sample are right-censored, i.e., they last within the period of observation. Summary statistics of the samples can be found in Table 16.

The group of respondents who remains married during the complete observational period, has on average 7 kg more grip strength, recalls around one word more, names about two animals more, is on average six years younger, and has less financial difficulties at baseline – compared to those who become widowed later on. Among respondents who remain married, there is a balanced gender-ratio at baseline; the group of persons who will become widowed consists of 72% women. This corresponds with official population statistics, which show that there are more widowed women than men in old age, and with increasing age, the share of widowed women increases as compared to men (Statistisches Bundesamt 2016).

Table 16: Summary statistics of the samples

	Physical Health Sample				*Cognitive Health Sample*			
	Mean / Percent	Std. Dev.	Min.	Max.	Mean / Percent	Std. Dev.	Min.	Max.
Widowhood								
Becoming widowed [b]	6.04				6.14			
Duration widowed (years) [b]	2.38	(1.97)	0	11	2.38	(1.98)	0	11
New partnership in widowhood [b]	2.86				2.70			
Health and Covariates								
Grip Strength Test: Maximum grip strength (in kg) [a]	35.81	(12.04)	2	92				
Memory Test: Maximum number words recalled [a]					8.94	(3.56)	0	20
Verbal Fluency Test: Maximum number words mentioned [a]					20.13	(7.57)	0	100
Age [a]	62.94	(8.88)	50	95	63.10	(8.97)	50	97
Gender (=Male) [a]	50.56				50.17			
Make ends meet [a]								
with great difficulty	9.04				9.46			
with some difficulty	26.18				26.46			
fairly easily	33.59				33.52			
easily	31.18				30.57			
Disturbing factors during test (=yes) [a c]					6.22			
Panel respondent (=yes) [a c]					4.02			
No. of observations per person	2.31	(1.37)			2.31	(1.37)		
N (person years)	**140431**				**148140**			
N (persons)	**54494**				**55502**			

Note: N encompasses all cases with at least valid information for grip strength / memory or fluency and therefore slightly differs from the number of cases in analyses. In the following analyses, the total number of observations is reduced due to missing values of the further variables. Unweighted data.

[a] At baseline.
[b] At the end of the observational period.
[c] For cognitive health regressions only.

2.3. Results

2.3.1. Physical and Cognitive Functioning after Death of a Spouse

Table 17 shows the results of the fixed-effects regressions on physical health. Model M1 contains widowhood as main explanatory variable. The death of a spouse is associated with a negative effect on hand grip strength in the surviving spouse. However, the effect is not statistically significant.

To explore whether the experience of widowhood affects physical health of men and women differently, Model M2 adds an interactive term of widowhood and gender. Significant gender differences are found. The effect of becoming widowed on average grip strength is negative within men ($b=-1.32$; $p<0.001$). For women, widowhood increases the effect by 1.69 units, resulting in a small positive effect for them ($b=0.37$; $p<0.01$).

The results for cognitive health can be found in Table 18 and Table 19. Table 18 displays the panel regression results for memory function. Model M1 obtains a negative, significant effect of becoming widowed on memory performance ($b=-0.25$; $p<0.001$). Older Europeans who have lost their spouse recall on average 0.25 words less during the memory test than before the loss. The results of Model M2 indicate that there are no differences in the development of memory function after bereavement between men and women.

The relationship between widowhood and semantic fluency performance can be found in Table 19. Like memory performance, also verbal fluency is negatively affected by the death of a spouse. After becoming widowed the average number of animals named in the test declines by 0.35 ($p<0.01$). Also as in the case of memory performance, there are no significant gender differences in the effect of widowhood on the fluency test.

Table 17: Fixed-effects regressions for grip strength

	M1	M2	M3
Reference=continuously married			
Widowhood	-0.13	-1.32***	-0.08
	(0.12)	(0.25)	(0.16)
Duration widowed (linear)			-0.02
			(0.05)
Widowhood X Female		1.69***	
		(0.27)	
Age	-0.20***	-0.20***	-0.20***
	(0.04)	(0.04)	(0.04)
Make ends meet			
(Ref.=with great difficulty)			
with some difficulty	0.16	0.16	0.16
	(0.08)	(0.08)	(0.08)
fairly easily	0.21*	0.21*	0.21*
	(0.09)	(0.09)	(0.09)
easily	0.13	0.14	0.13
	(0.10)	(0.10)	(0.10)
Constant	49.16***	49.20***	49.16***
	(2.15)	(2.15)	(2.15)
$R^{2\ (within)}$	0.089	0.089	0.089
N persons	**54357**	**54357**	**54352**
N person-years	**138128**	**138128**	**138102**

Note: Regression coefficients. Robust standard errors in parentheses. All models control for survey wave (not shown).
Data: SHARE w1,w2,w3,w4,w5,w6 rel6-0-0
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 18: Fixed-effects regressions for memory performance

	M1	M2	M3
Reference=continuously married			
Widowhood	-0.25***	-0.19	-0.25**
	(0.07)	(0.12)	(0.09)
Duration widowed (linear)			-0.01
			(0.03)
Widowhood X Female		-0.09	
		(0.14)	
Age	-0.14***	-0.14***	-0.14***
	(0.02)	(0.02)	(0.02)
Make ends meet			
(Ref.=with great difficulty)			
with some difficulty	0.10**	0.10*	0.10*
	(0.04)	(0.04)	(0.04)
fairly easily	0.14**	0.14**	0.14**
	(0.04)	(0.04)	(0.04)
easily	0.14**	0.14**	0.14**
	(0.05)	(0.05)	(0.05)
Disturbing factors	0.17***	0.17***	0.17***
	(0.01)	(0.01)	(0.01)
Panel respondent	0.28***	0.28***	0.28***
	(0.02)	(0.02)	(0.02)
Constant	16.75***	16.75***	16.72***
	(1.08)	(1.08)	(1.08)
$R^{2\ (within)}$	0.007	0.007	0.007
N persons	**55298**	**55298**	**55294**
N person-years	**144789**	**144789**	**144756**

Note: Regression coefficients. Robust standard errors in parentheses. All models control for survey wave (not shown).
Data: SHARE w1,w2,w3,w4,w5,w6 rel6-0-0
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 19: Fixed-effects regressions for verbal fluency performance

	M1	M2	M3
Reference=continuously married			
Widowhood	-0.35**	-0.70**	-0.56***
	(0.12)	(0.24)	(0.17)
Duration widowed (linear)			0.09
			(0.06)
Widowhood X Female		0.49	
		(0.27)	
Age	-0.07	-0.07	-0.07
	(0.04)	(0.04)	(0.04)
Make ends meet			
(Ref.=with great difficulty)			
with some difficulty	0.25**	0.25**	0.25**
	(0.08)	(0.08)	(0.08)
fairly easily	0.39***	0.39***	0.39***
	(0.09)	(0.09)	(0.09)
easily	0.65***	0.65***	0.65***
	(0.09)	(0.09)	(0.09)
Disturbing factors	0.17***	0.17***	0.17***
	(0.02)	(0.02)	(0.02)
Panel respondent	0.32***	0.32***	0.33***
	(0.05)	(0.05)	(0.05)
Constant	23.88***	23.89***	23.79***
	(2.16)	(2.16)	(2.16)
$R^{2\ (within)}$	0.008	0.008	0.008
N persons	**55232**	**55232**	**55228**
N person-years	**144678**	**144678**	**144647**

Note: Regression coefficients. Robust standard errors in parentheses. All models control for survey wave (not shown).
Data: SHARE w1,w2,w3,w4,w5,w6 rel6-0-0
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

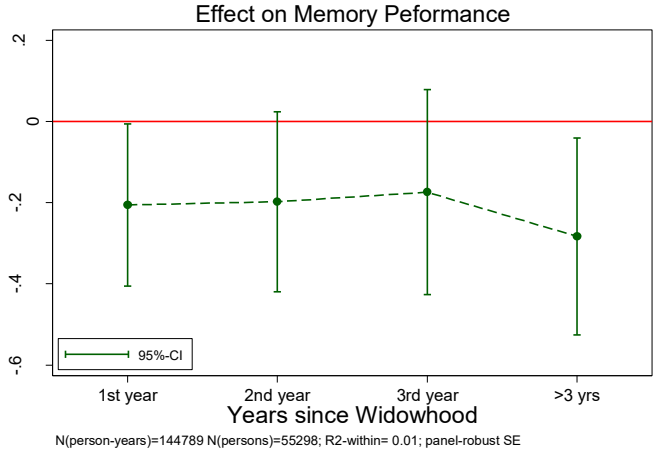
2.3.2. The Role of Marital Biography

In order to assess whether different marital pathways affect the health consequences of widowhood differently, the duration of being widowed and the presence of a new partner is analysed.

Duration Widowed

The results obtained by Model M3 in Table 17, Table 18, and Table 19 show that the number of years a person spent widowed – during the observational period – seems neither to have an impact on physical nor mental health. The linear specification of time in widowhood showed no significant effect for each health outcome. However, it could be the case that there is a non-linear effect of the duration a person is widowed on health. A quadratic specification of the number of years widowed was tested and lead to no significant effect for each health outcome. As SHARE surveys its respondents (ideally) biennial and not once a year, a non-parametric specification – a yearly impact function – of the time since widowhood was tested. The number of years after the loss of the spouse is split in dummy variables of 1 / 2 / 3 / >3 year(s). As can be seen in Figure 23, an older adult's memory capacity is significantly decreased in the first year of widowhood ($b=-0.21$; $p<0.05$). The negative effect is slightly smaller in the second and third year, however not significant. Being widowed more than three years is associated with a greater decline in memory than in the first year ($b=-0.28$; $p<0.05$) (cf. Appendix Table 35). No significant effects of the non-parametric specification of years since bereavement can be found for the other health measures (cf. Appendix Figure 24 and Figure 25).

Figure 23: Effects of widowhood duration on memory performance (yearly impact function)



Repartnering after Widowhood

Another component of the marital pathways after the death of a spouse is repartnering. The health of widowed persons who have a new partner might differ from the health of widowed persons without new relationship. To assess the effects of entering a new union after widowhood, a categorical variable is included in the regression models, distinguishing between widowed persons without new partnership and widowed persons with new partnership. Table 20 contains the respective fixed-effects regression results for all three health outcomes. The physical health of older adults is not affected by widowhood, irrespective of their partnership status after bereavement. Neither is there a significant difference in grip capacity before compared to after bereavement for adults who have a new partner – nor for those without new partner.

The cognitive health status decreases significantly in widowed respondents who have no new partner. This can be observed both for the memory score ($b=-0.26$; $p<0.001$) and fluency score ($b=-0.35$; $p<0.01$). In both areas of cognitive functioning, there is no significant difference before and after widowhood among adults who have a new partner. This finding could be a subtle support for the assumption that a partnership is equally protective as a marriage in old age and that a partnership buffers the negative effects of widowhood on mental health.

Effects of re*marriage* cannot be analysed with the present sample since there are no remarriages after widowhood observed in the data. One underlying reason might be the relatively short period of the panel survey. On the other hand, remarriage after widowhood is less common than after divorce – due to advanced age and the excess of (widowed) women in older populations (Klein 2016). Schimmele and Wu (2016) showed with data of the Canadian population above age 45 that repartnering after widowhood takes longer than after divorce, and that more men than women repartner and remarry after union dissolution in later life (5% of women finally re-married after widowhood, 24% of the widowers). Brown, Bulanda and Lee (2012) found that among older US Americans, cohabitation unions are quite stable but are unlikely to lead to marriage. Non-marital cohabitation seems to serve as a long-term alternative to marriage in later life (based on HRS data).

Table 20: Fixed-effects regressions for physical and cognitive health outcomes

	Grip Strength	Memory	Verbal Fluency
Reference=continuously married			
widowed with new partner	-0.42	0.07	-0.56
	(0.59)	(0.36)	(0.57)
widowed without new partner	-0.13	-0.26***	-0.35**
	(0.12)	(0.07)	(0.12)
Age	-0.20***	-0.14***	-0.07
	(0.04)	(0.02)	(0.04)
Make ends meet			
(Ref.=with great difficulty)			
with some difficulty	0.16	0.10*	0.25**
	(0.08)	(0.04)	(0.08)
fairly easily	0.21*	0.14**	0.39***
	(0.09)	(0.04)	(0.09)
easily	0.13	0.14**	0.65***
	(0.10)	(0.05)	(0.09)
Disturbing factors		0.17***	0.17***
		(0.01)	(0.02)
Panel respondent		0.28***	0.32***
		(0.02)	(0.05)
Constant	49.17***	16.75***	23.88***
	(2.15)	(1.08)	(2.16)
$R^{2\ (within)}$	0.089	0.007	0.008
N persons	**54357**	**55298**	**55232**
N person-years	**138128**	**144789**	**144678**

Note: Regression coefficients. Robust standard errors in parentheses. All models control for survey wave (not shown).
Data: SHARE w1,w2,w3,w4,w5,w6 rel6-0-0
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Further Analyses of Marital Biography

Additionally, I analysed the effect of the length of the marriage before widowhood. Since the sample consists mainly of very long marriages (mean/median duration of marriage at baseline is 39 years), the effect of being married a relatively short period of time before spousal death was tested.[32] The group of widowed older Europeans was split into two subgroups, indicating whether someone had been married shorter than ten years before widowhood or not (alternative analysis with marriage duration <=5 years). Neither of the tested variants showed any significant differences in health outcomes.

It has to be noted that there is only a very small number of older adults who are married not longer than ten years at baseline. The share within the continuously married subgroup is 3.71%, within the widowed it is only 0.89% ($N_{persons}$=28). Furthermore, there is no information in regular SHARE waves whether the respondent is married in her or his first marriage or in a higher order marriage.

[32] Duration of the marriage is calculated with information obtained from the question *"In which year did you get married?"*. In case both spouses take part in the interview (what is the usual manner), only the spouse who answers the questionnaire first is asked the question on the year of marriage. The reported year must be assigned to the other spouse and cannot be checked against.

2.3.3. Robustness Checks for Grip Strength Test Performance Inability

As already discussed in Chapter IV.1.3.6., a short-coming of the physical health measures used in this study is that the test participation requires a minimum amount of physical ability. There are no grip strength scores for exceptionally frail or certain disabled respondents. The minimum ability to take part in the hand grip test could be distributed non-randomly across marital status groups. The cross-sectional results of Chapter IV.1. showed that widowed respondents are more likely to be unable to conduct the lung function test than married respondents. Furthermore, the exclusion of persons who were too frail to complete the test procedure could lead to an upward bias of the findings on health after widowhood.

In the following, respondents are identified as being unable to perform the measurement if the respondent and/or interviewer felt that it would not be safe, if the respondent tried but was unable to complete the test, or if the respondent could not participate due to a surgery, injury, or swelling on both hands. This results in a share of 7.20% of eligible respondents with valid information who were unable to take part in the test ($N_{persons}$=3,972 of 54,494). No such data is available for the cognition tests. A cross-tabulation of marital status and inability to complete the grip test shows that, at baseline, 2.79% of the continuously married respondents are not able to perform the test, whereas 4.11% of future widowed persons are unable. As an additional check, I ran all fixed-effect regression models including the respondents who had not been able to participate in the physical health tests. These cases were assigned the value zero for grip strength. As depicted in model M1a in Table 21, the death of a spouse has a significant, negative effect on hand grip strength – if persons who were unable to perform the measurement are assigned a test outcome of 0 kg (b=-0.40; $p<0.05$). However, if a variable which controls for test participation is added to the model, the effect of widowhood becomes insignificant (model M2a). This corresponds with the previous finding, where unable respondents had been excluded from the analysis sample. Also the results of the further regressions of grip strength, which were conducted, stay robust to the inclusion of unable respondents into the outcome while controlling for test participation.

Table 21: Fixed-effects regressions for grip strength (including unable persons)

	M1a	M2a
Reference=continuously married		
Widowhood	-0.40*	0.02
	(0.16)	(0.12)
Grip test inability (=yes)		-27.17***
		(0.20)
Age	-0.23***	-0.22***
	(0.05)	(0.04)
Make ends meet		
(Ref.=with great difficulty)		
with some difficulty	0.45***	0.15
	(0.12)	(0.09)
fairly easily	0.65***	0.21*
	(0.13)	(0.09)
easily	0.64***	0.17
	(0.13)	(0.10)
Constant	50.02***	50.08***
	(3.02)	(2.21)
$R^{2\ (within)}$	0.056	0.457
N persons	**55058**	**55058**
N person-years	**142538**	**142538**

Note: Regression coefficients. Robust standard errors in parentheses. All models control for survey wave (not shown).
Data: SHARE w1,w2,w3,w4,w5,w6 rel6-0-0
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

2.4. Summary of Results and Discussion

The longitudinal analyses of health after the death of a spouse in old age found that both physical and cognitive health is affected by this marital transition. Europeans who become widowed in later life show a reduction in memory and verbal fluency performance after the bereavement. Similar findings of international studies which have examined cognitive function tests support this result. A longitudinal analysis by Mousavi-Nasab *et al.* (2012) found that widowed Swedes show a faster decline in memory test scores than the married**.** An examination of longitudinal survey data of men from Finland, Italy, and the Netherlands, revealed that widowed men show a twice as strong decline in cognition than the married (van Gelder *et al.* 2006). In contrast, a cross-sectional study by Vable *et al.* (2015) could not identify any significant difference in a memory test between continuously married and recently (0–2 years) widowed older US Americans.

Furthermore, no gender differences were obtained for the relationship between widowhood and the cognitive health measures. Similarly, an analysis of the risk of developing dementia within the Swedish older population by Sundström, Westerlund and Kotyrlo (2016) concluded that there is an increased risk of dementia for widowed men *and* women. However, an investigation of Chinese adults by Feng *et al.* (2014) discovered that only widowed men are more likely to be cognitively impaired, compared to the married.

Becoming widowed was not related to a decline in physical health. This result is in line with that reported by Vable *et al.* (2015), who found no significant differences in hand grip strength between continuously married and recently widowed US Americans.

However, I identified clues that there is a gender-specific effect of widowhood on physical health. Whereas European men showed a decrease in hand grip strength after becoming widowed, women showed an increase of grip strength after becoming widowed. Various underlying causes are possible for this observation. Indeed, the loss of the husband could be at the same time the end of a burdensome phase of caregiving and mental and physical stress, what could lead to an improvement in health (Waite 2009; Hughes and Waite 2009). Due to their higher life expectancy, women are more frequently in the position of caring for a dying husband than vice versa. For example, in-depth interviews with British widowers and widows revealed that only widows, not widowers describe the loss of their spouse as a newly found freedom (Davidson 2001). Also van den Hoonaard (2001) and Lopata (1996) discovered in American and Canadian samples, "that widows reported positive aspects in their status, among which were freedom and relief from caring" (Davidson 2001: 298). Pizzetti and Manfredini (2008) even found a longevity advantage for widowed Italian women, compared to continuously married women. Moreover, widowhood can be considered an anticipated life course event among women because of the female longevity advantage. This could lead "to a mental rehearsal" (Martin-Matthews 2011: 346) in anticipation of the new living circumstances in later life. However, it remains debatable whether the observed positive effect of widowhood on strength can be a causal process. Whereas the human body reduces muscle mass very fast in case of non-use, the restoration or build-up of muscles affords a long-term, active training. For instance, an experiment by Vigelsø *et al.* (2015) showed that already a two-week immobilisation of the leg leads to a marked reduction of strength and work capacity of the leg – both in young and old men. Six weeks of training increased muscle strength, but showed not to be sufficient to fully rehabilitate. Eventually, the positive effect of widowhood on women's grip strength might also be driven by a survivor bias. Given the elevated mortality risk after the death of one's spouse (Martikainen and Valkonen 1996; Moon *et al.* 2014; Thierry 2000), it could be the case that only the surviving, healthier widows remain as respondents in the longitudinal sample.

The analyses of the duration of widowhood showed mixed results. The findings for memory performance indicate that there is a non-linear effect of the duration of widowhood. Memory functioning decreases in persons who are in the first year of widowhood or who have been living widowed for more than three years. No such effects were observed in the other area of cognitive health, semantic fluency. Concerning physical health, no significant impact of the time someone has spent widowed were found. The non-linear effect of the widowhood duration on memory is similar to findings of Perkins *et al.* (2016): Using cross-sectional data of a sample of the Indian population, the authors stated a decreased memory performance for widows who had been widowed either 0–4 years,

or longer than 10 years. Also Mousavi-Nasab *et al.* (2012) detected a faster decline in memory function among the widowed than among the married, in the long-run.

Moreover, repartnering after bereavement seems to absorb negative consequences of widowhood on mental health. Cognitive functioning decreases significantly after bereavement in widowed respondents who have no new partner, but not in widowed adults who have a new partner. This finding could be a subtle support for the assumption that a partnership is equally protective as a marriage in old age and that a partnership buffers the negative effects of widowhood on mental health. However, I found no effects of repartnering on grip strength performance.

The presented analyses have several limitations. Although it was possible to compare the health status of the same individuals before and after the marital status transition, the measurement of health status 'before' takes place after age 50. Hence, large parts of a person's development of health are not observed with this sample. In this sample of older adults, there are decades of unobserved health and marital pathways, which may have influenced the baseline measurement of health. In contrast to the retrospective SHARELIFE data, no further information on marital history is collected in the regular SHARE waves. It is not known whether the death of the spouse was the first marital loss or whether it was a higher order marriage. Nothing is known about prior marital status transitions or durations. Moreover, it is unknown what proportion of the married persons who enter the analysis sample is *re*married. As was pointed out in the beginning, the sample of persons with an experience of widowhood and the group of respondents who do not lose their spouse during the observational period varies considerably in terms of health at baseline. Respondents who became widowed during the observational period had lower scores in grip strength and the cognitive tests, already at baseline. This could be a result of health and marital selection processes which had taken place earlier in the life course. Furthermore, a considerable number of respondents had to be excluded from analysis because they were only observed once during the observational period. This applies, on the one hand, to respondents who had their first interview in the last wave of the SHARE survey. On the other hand, this applies to respondents who deceased or who refused to participate. If the latter group of respondents varies non-randomly with respect to marital status or confounding factors, the sample composition can be biased.

Overall, the goodness of fit measure of the FE-regressions (R^2-within) is much lower for the models regressing cognitive health, compared to the models on grip strength. The variation over time of the independent variables explains approximately 0.08% of the variation in cognitive health within a person (in contrast to 0.9% in physical health) (cf. also Brüderl 2010).

The evidence on the impact of repartnering after spousal loss on health has not only limitations due to the small number of respondents who repartner, but also due to a lack of data. In wave 5, there is only information on cohabitating partners, no information was collected whether widowed adults have a non-cohabitating partner. This might decrease the quality and generalisability of this analysis because there are more widowhood events observed in waves 5 and 6 than in the earlier waves. Finally, the

number of years after the death of a spouse which are observed within the SHARE panel is rather short: 2.4 years, on average. To assess the development of physical and mental health after bereavement more thoroughly, a re-analysis of the research question would be promising, as soon as more panel waves are available. Some areas of health may be affected only after a longer period. Severe health conditions which impair cognitive functioning, such as dementia, develop over a longer time. The limited number of years observed in the SHARE panel could be in many cases too short to observe a full development of dementia within the sample (cf. Sundström, Westerlund and Kotyrlo 2016). For instance, Håkansson *et al.* (2009) showed that persons who had been widowed longer than twenty years had a much higher risk of suffering from Alzheimer's disease than persons who had been widowed less than twenty years. Similarly, also chronic conditions, which affect the physical constitution, develop over time. Following the European older population over a longer time span after bereavement might lead to further insights how severely cognitive health is impaired in the long run, and whether physical health will decline as well.

CONCLUSION

In the face of the rising human life expectancy, later life stages are an important subject of social scientific research. As many people as never before will spend a considerable number of years in later life stages. Recognising all facets of the consequences, challenges, and opportunities of population ageing is the endeavour of ageing research. The present study was motivated by the well-documented health and longevity advantage of married persons over the unmarried. The demographic change and the societal changes of marital and partnership behaviour give relevance to the exploration of the marriage-health nexus in the older population. The objective of the study was to gain more knowledge about health differentials by marital status in old age, using the broad spectrum of data provided by the Survey of Health, Ageing and Retirement in Europe (SHARE). Applying a life course perspective, differences in health outcomes in later life were not only examined by current marital status but by marital biography. Additionally, this study contributed to the literature by analysing objective health indicators of physical and cognitive functioning (i.e., tests of grip strength, expiratory air flow, memory, verbal fluency). Possible self-selection effects of healthier individuals into a (stable) marriage were addressed by considering physical and mental health conditions in early life. The longitudinal dimension of five waves of the SHARE panel was exploited to investigate the development of physical and cognitive health after the central marital transition in later life, widowhood. Additionally, cross-country differences of marital and partnership biographies of older Europeans from 14 countries were presented.

The descriptive findings showed that the analytical sample consists of many Europeans who were part of the 'golden age of marriage'. This era took place after World War II in most European countries, lasted until the 1970s, and was characterised by early and universal marriage behaviour (Toulemon 2016). I observed and discussed national differences in the components of marital biography (current marital status, number of marriages, sequencing and timing of marital transitions, duration of marital status, and number, type and timing of partnerships). The overall patterns of marital biographies were quite homogenous across Europe.

Results obtained by cross-sectional linear regressions showed an association between current marital status and health in old age. Married Europeans had both physical and cognitive health advantages, compared to the never married and the separated. Widowed older Europeans were disadvantaged in terms of cognitive health, but not physical health. Adjusting for health and cognitive status in childhood did not eliminate the health differences. The comparison of currently married persons identified the following components of marital biography to be related to health deficits: Marriage before age 20, frequent marital conflict, and for physical health: remarriage. The length of a marriage had no impact on health in old age. The comparison of persons who experienced at least one marital loss (divorce/widowhood) showed that multiple marital losses seemed to negatively affect physical health (grip strength). A longer period of widowhood was related to a decrease in cognitive health, but to an increase in grip strength. There were neither signs of an accumulation of health disadvantages by

the duration of living separated/divorced – nor signs of a positive accumulation of health advantages through a long duration of being married.

Moreover, I found evidence for gender differences. For example, the health advantage of the married over the never married was only significant among men, not among women. Whereas the different components of marital biography seemed to affect mental and physical health of men and women quite differently (cf. summary Chapter IV.1.4.).

Furthermore, the quality of a marriage was identified to be important: higher levels of marital conflict were associated with health deficits.

Additionally, it was shown that different partnership statuses and histories are related to differences in physical health of the never married population in later life (cf. Chapter IV.1.3.5.).

The longitudinal analyses, employing fixed-effects regression, revealed that the death of a spouse is associated with a decline in cognitive health. The duration of widowhood was found to have a non-linear influence on memory performance: an immediate negative effect in the first year of bereavement and more than three years of widowhood seemed to aggravate the detrimental consequences on memory ability. Physical health consequences of becoming widowed seem to be moderated by gender. For grip strength, a positive health development was found for women after losing their husband, whereas men's grip power deteriorates after becoming widowed. Finally, the results offered some clues that having a new partnership after the death of the spouse seems to diminish the negative effects of widowhood on cognition.

The study has limitations and motivates ideas for future research. A short-coming of the cross-sectional analyses is that I could not control for all possible differences in background characteristics between those who marry and those who do not. The results rely on interview data and not on experimental data, and it is very likely that important confounders were omitted. Although, I controlled for health in early life and other possible confounders, it is very likely that the relation between marital biography and health is also affected by further, unobserved covariates (e.g., personality characteristics or further life events). Besides, retrospective reports on physical and mental childhood diseases and cognitive abilities cannot disentangle selection and causal effects of marital status and health. Moreover, the composition of the sample may affect the generalisability of the results. For instance, persons who suffered from extreme health conditions in early life may not have survived until old age. Consequently, there may be a survival bias of healthier individuals, who are more likely to take part in the survey.

The first part of the study presented theoretical explanations for the marriage-health benefit and the relation between marital biography and health in old age. Theories were derived from sociology, psychology, biology, and neuroscience. It was outside of the scope of the present study to identify the specific underlying mechanisms of the health differentials between married und unmarried older adults that have been found. I did not examine whether married and unmarried adults show differences in their health care behaviour, how much they spend for health care, whom they ask for support, or how

they have coped with illnesses over the life course. Besides, the dataset did not allow to discover what physiological processes are at work 'under the skin' of single, married, divorced, and widowed persons. The analyses could be extended by targeting further components of the life course such as health-related habits, or health care behaviour before and after a marital transition, or the development of social support networks of unmarried and married people. Further data collection and examination is required to identify causal mechanisms with reference to biological pathways of marital status and health. For instance, also European survey data could be enriched by the collection of biomarkers: blood or saliva analyses could further clarify which bodily systems and processes are affected across marital status or biography groups. To elucidate "[h]ow marriage works its magic" (Wilson and Oswald 2005: 23), researchers will have to wait for longitudinal data sources that follow detailed health and marital pathways of the same individuals from early to late life.

Still, the study provides novel insights into the relationship of marital history and health. A major contribution of the paper lies in the use of a large, population representative data set covering many European countries. As has been pointed out by the conducted literature review, publications which focus on the marriage-health benefit in old age, explore the marital life course, or analyse objective health measures, have frequently used US population samples, or – in case of European samples – are often single-country studies.

Another contribution was the fact that many components of the marital biography could be analysed. These components included the number and ordering of marital transitions, the duration and timing of a marital status, as well as the partnership history. The panel structure of the dataset allowed observing trajectories of health before and after widowhood.

A further advantage was the possibility to control for childhood health. The majority of cross-sectional studies in the field have been conducted without information on health in early life. Especially for the analysis of older cohorts it is important to adjust for early life health. Since members of older birth cohorts grew up in times when marriage was the social norm, it could be the case that only the most disadvantaged people remained single. Major health disadvantages could have prevented them from successfully finding a partner (e.g., Sommerlad *et al.* 2018).

Furthermore, the presented work contributed to the literature by relying on objective measures of health. Existing research on the marriage-health benefit that is based on objective health tests is still limited, but on the rise (cf. Chapter II.3.). An objective way of measuring health avoids bias which can be caused by differences in reporting behaviour between the marital status groups. The use of health test measures is also favourable in the view of multi-country data. For example, Vries, Blane and Netuveli (2014) showed with SHARE data, that the relationship between grip strength and peak expiratory flow measurement and self-reported information on activity limitations is not consistent across European countries. Interestingly, an analysis regressing self-rated health status on current marital status revealed no significant differences between the marital status groups at all (own analyses).

Although the availability of objective health tests is a major advantage of the study, also this kind of health measurement may not be without flaw. Both the physical and cognitive health tasks are dependent on the respondent's fitness on the day of the test. For example, on a bad or inattentive day, the motivation and performance in the cognitive tests may suffer – even if the general health level of the person is good. The same applies for the physical tests: being tired or feeling weak at the day of the interview could lead to lower scores in grip and lung strength, independent of the true overall health status.

Returning to the main research questions (cf. Chapter IV.1.1. & 2.1.), I conclude the following. The first question was whether a marriage-health benefit can be observed in later life. Despite the mentioned limitations, the results suggest that being married is associated with health benefits in old age. My findings support prior evidence of a health advantage of the married in later life (Guner, Kulikova and Llull 2014; Mousavi-Nasab *et al.* 2012). However, some findings for widowed older Europeans contradict the marriage-health advantage: their grip strength was better than among the married, in the cross-sectional analyses. The longitudinal evidence supported this finding for widowed women.

Furthermore, the question was whether health in old age depends both on current marital status and on marital biography. I found that both current marital status and past marital life course is related to health within the sample of the European older population. In line with other studies (cf. Chapter II.2.), significant effects were identified for many components of marital history, but not for all domains of health equally. Different domains of health were sensitive to both marital status and different components of marital biography, to a different extent. Some aspects of the marital history were more important than others. Taken together, the results underline that a focus on current marital status is too narrow, especially for analyses of older adults' health. Finally, it was tested whether the consideration of health in early life affects the marital status-health relationship. The question was whether the association between marital status and health reflects a selection of healthier individuals into (a stable) marriage. The analyses identified significant health differentials between marital status and biography groups – even after controlling for early health status in the cross-sectional design, and even though time-constant unobserved heterogeneity could be controlled for in the longitudinal results. This leads to the cautious conclusion that health differences between the marital status groups cannot be explained by the selection theory alone.

Some of the findings from the present study could lead to practical implications for the health care of older adults. High levels of physical and cognitive functioning until the last years in life can be crucial for the independence of older adults. Geriatric practitioners could use an older person's marital status as one factor to identify vulnerable target groups. For example, after hospitalisation, the follow-up health status and compliance of never married, male patients could be monitored more carefully than that of the married. Another implication could consist of preventive measures aiming at marital status groups who are at higher risk of developing physical and cognitive deficits in old age. For instance,

single older adults could be a target group of campaigns for the maintaining and check-up of cognitive health. Sommerlad *et al.* (2018) pointed out that it is more difficult to diagnose dementia in singles who attend examinations alone because they may complain less about memory deficits – since they do not have a steady person of reference. The absence of a spouse can lead to a "lack of collateral information" (7) about an older patient's behaviour and health. It goes without saying that these implications cannot be generalised with respect to future cohorts of older persons, but the presented evidence might improve the understanding and tackling of health inequalities among the respective European cohorts.

Appendix

Lists of Figures and Tables

Regression Tables

Table 22: OLS regressions of health on marital transition biography

	Grip Strength	Lung Function	Memory	Verbal Fluency
Marital Transitions (Ref.=continuously married)				
never married	-1.43***	-16.74***	-0.35***	-0.59**
	(0.24)	(3.46)	(0.09)	(0.19)
separated once	-0.02	-7.49*	-0.34***	0.22
	(0.19)	(3.06)	(0.08)	(0.18)
separated after >=2 losses	-0.83	-10.63	-0.54**	0.43
	(0.49)	(6.78)	(0.19)	(0.40)
widowed once	0.43**	-0.89	-0.52***	-0.77***
	(0.14)	(2.29)	(0.06)	(0.13)
widowed after >=2 losses	-0.50	1.82	-0.13	-0.31
	(0.45)	(6.37)	(0.22)	(0.39)
remarried after separation	-0.74**	-3.17	0.02	0.34
	(0.24)	(3.76)	(0.10)	(0.22)
remarried after widowhood	-0.86	-0.39	-0.18	-0.29
	(0.51)	(7.17)	(0.20)	(0.38)
Remarried after >=2 losses	-0.46	16.18	0.15	0.82
	(0.75)	(10.05)	(0.26)	(0.54)
Male	14.25***	102.70***	-0.81***	0.03
	(0.13)	(2.05)	(0.04)	(0.08)
Age	-0.41***	-4.87***	-0.11***	-0.17***
	(0.01)	(0.09)	(0.00)	(0.00)
Body height	0.25***	2.44***		
	(0.01)	(0.12)		
Education (Ref.=no/primary education)				
secondary education	0.47***	17.64***	1.23***	1.93***
	(0.12)	(1.91)	(0.05)	(0.10)
tertiary education	0.27	34.20***	2.16***	3.99***
	(0.15)	(2.43)	(0.07)	(0.14)
Make ends meet (Ref.=with great difficulty)				
with some difficulty	0.97***	2.07	0.19**	0.55***
	(0.18)	(2.70)	(0.07)	(0.13)
fairly easily	2.04***	17.38***	0.44***	1.24***
	(0.18)	(2.78)	(0.07)	(0.14)
easily	2.14***	30.19***	0.54***	1.94***
	(0.20)	(3.05)	(0.08)	(0.15)
Very healthy childhood	0.22*	-1.49	-0.07	-0.38***
	(0.10)	(1.58)	(0.04)	(0.09)
Very good maths skills childhood			0.34***	0.82***
			(0.07)	(0.16)
Very good language skills childhood			0.44***	1.22***
			(0.07)	(0.16)
Disturbing factors			-0.73***	-0.85***
			(0.09)	(0.18)
Panel respondent			0.21***	0.29**
			(0.05)	(0.11)
Constant	12.08***	196.61***	15.32***	28.40***
	(1.41)	(21.38)	(0.22)	(0.43)
R^2	0.671	0.459	0.313	0.324
Observations (N)	**21553**	**20393**	**22858**	**22808**

Note: Regression coefficients. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for country fixed-effects (not shown)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 23: Average marginal effects (AME) of marital status biography on physical health for men/women

	Grip Strength		Lung Function	
	Females	*Males*	*Females*	*Males*
Marital Transitions (Ref.=continuously married)				
never married	-0.26	-3.19***	-6.98	-29.94***
	(0.28)	(0.38)	(3.86)	(5.79)
separated once	0.07	-0.45	-2.28	-18.93**
	(0.21)	(0.36)	(3.17)	(6.03)
separated after >=2 losses	-0.47	-1.36	-2.74	-23.35
	(0.52)	(0.95)	(7.77)	(12.32)
widowed once	-0.05	-0.46	-8.07***	-7.40
	(0.15)	(0.35)	(2.31)	(6.01)
widowed after >=2 losses	-1.00*	-0.61	-1.06	-9.36
	(0.47)	(1.17)	(6.29)	(22.04)
remarried after separation	-0.93***	-0.70*	-4.87	-4.52
	(0.28)	(0.36)	(4.38)	(5.72)
remarried after widowhood	-0.76	-0.64	-15.20	10.36
	(0.74)	(0.66)	(8.92)	(10.38)
remarried >=2 losses	0.77	-1.57	13.38	13.29
	(0.87)	(1.12)	(14.13)	(13.74)
Observations (N)	**21553**	**21553**	**20393**	**20393**

Note: AME. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for interaction terms of gender with: age, healthy childhood, financial situation, education, height, country
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 24: Average marginal effects (AME) of marital status biography on cognitive health for men/women

	Memory		Verbal Fluency	
	Females	*Males*	*Females*	*Males*
Marital Transitions (Ref.=continuously married)				
never married	-0.10	-0.64***	-0.16	-1.15***
	(0.12)	(0.13)	(0.25)	(0.30)
separated once	-0.25*	-0.51***	0.41	-0.18
	(0.11)	(0.13)	(0.22)	(0.29)
separated after >=2 losses	-0.69**	-0.36	0.62	0.16
	(0.24)	(0.29)	(0.49)	(0.69)
widowed once	-0.45***	-0.47***	-0.71***	-0.68*
	(0.07)	(0.13)	(0.15)	(0.29)
widowed after >=2 losses	-0.20	0.29	0.01	-1.87
	(0.24)	(0.53)	(0.41)	(1.03)
remarried after separation	-0.08	0.14	0.46	0.30
	(0.16)	(0.13)	(0.32)	(0.30)
remarried after widowhood	-0.11	-0.22	-0.32	-0.21
	(0.32)	(0.25)	(0.55)	(0.53)
remarried >=2 losses	0.30	0.10	0.40	1.24
	(0.41)	(0.32)	(0.73)	(0.77)
Observations (N)	**22860**	**22860**	**22810**	**22810**

Note: AME. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for interaction terms of gender with: age, healthy childhood, maths & language skills childhood, financial situation, education, panel respondent, disturbing factors, country
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 25: Average marginal effects (AME) of marital timing on physical health for men/women. Currently married only

	Grip Strength		Lung Function	
	Females	*Males*	*Females*	*Males*
Age at 1st marriage				
(Ref.=mainstream marriage (age 20-39))				
early marriage (<age 20)	-0.56**	0.35	-5.74	-1.57
	(0.21)	(0.67)	(2.96)	(11.18)
late marriage (>age 39)	-0.13	-0.46	-5.32	-5.54
	(0.41)	(0.51)	(6.75)	(8.10)
Remarried	-0.64*	-0.79*	-3.60	-0.70
	(0.27)	(0.32)	(4.00)	(5.01)
Observations (N)	**15807**	**15807**	**14986**	**14986**

Note: AME. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for interaction terms of gender with: age, healthy childhood, financial situation, education, height, country
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 26: Average marginal effects (AME) of marriage duration on physical health for men/women. Currently married only

	Grip Strength		Lung Function	
	Females	*Males*	*Females*	*Males*
Remarried	-0.88**	-0.66*	-5.40	0.57
	(0.28)	(0.33)	(4.14)	(5.08)
Years married (accumulated)	-0.02	0.03	-0.16	0.25
	(0.01)	(0.02)	(0.19)	(0.25)
Observations (N)	**15729**	**15729**	**14907**	**14907**

Note: AME. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for interaction terms of gender with: age, healthy childhood, financial situation, education, height, country
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 27: Average marginal effects (AME) of marital timing on cognitive health for men/women. Currently married only

	Memory		Verbal Fluency	
	Females	*Males*	*Females*	*Males*
Age at 1st marriage				
(Ref.=mainstream marriage (age 20-39))				
early marriage (<age 20)	-0.19	-0.41	-0.40*	-0.09
	(0.10)	(0.23)	(0.20)	(0.60)
late marriage (>age 39)	0.16	-0.05	0.40	-0.09
	(0.26)	(0.17)	(0.52)	(0.32)
Remarried	-0.04	0.10	0.62	0.16
	(0.14)	(0.11)	(0.49)	(0.69)
Observations (N)	**16604**	**16604**	**16576**	**16576**

Note: AME. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for interaction terms of gender with: age, healthy childhood, maths & language skills childhood, financial situation, education, panel respondent, disturbing factors, country
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 28: Average marginal effects (AME) of marriage duration on cognitive health for men/women. Currently married only

	Memory		Verbal Fluency	
	Females	*Males*	*Females*	*Males*
Remarried	-0.07	0.09	0.26	0.24
	(0.14)	(0.12)	(0.28)	(0.26)
Years married (accumulated)	0.00	0.00	-0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Observations (N)	**16521**	**16521**	**16494**	**16494**

Note: AME. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for interaction terms of gender with: age, healthy childhood, maths & language skills childhood, financial situation, education, panel respondent, disturbing factors, country
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 29: Average marginal effects (AME) of status duration on physical health for men/women. Ever disrupted persons only

	Grip Strength		Lung Function	
	Females	*Males*	*Females*	*Males*
Years separated (accumulated)	0.01	0.03	0.02	-0.68
	(0.01)	(0.02)	(0.15)	(0.35)
Years widowed (accumulated)	0.01	0.00	-0.35*	-0.45
	(0.01)	(0.04)	(0.16)	(0.51)
Multiple disruptions (=yes)	-0.88	-4.07***	2.52	-8.16
	(0.51)	(1.23)	(7.54)	(16.94)
Observations (N)	**5363**	**5363**	**5079**	**5079**

Note: AME. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for interaction terms of gender with: age, healthy childhood, financial situation, education, height, country
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 30: Average marginal effects (AME) of status duration on cognitive health for men/women. Ever disrupted persons only

	Memory		Verbal Fluency	
	Females	*Males*	*Females*	*Males*
Years separated (accumulated)	-0.00	0.00	0.02	0.00
	(0.01)	(0.02)	(0.01)	(0.02)
Years widowed (accumulated)	-0.01	-0.04	-0.02*	-0.04
	(0.01)	(0.03)	(0.01)	(0.03)
Multiple disruptions (=yes)	0.11	0.35	0.55	0.35
	(0.27)	(1.11)	(0.45)	(1.11)
Observations (N)	**5817**	**5817**	**5800**	**5800**

Note: AME. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for interaction terms of gender with: age, healthy childhood, maths & language skills childhood, financial situation, education, panel respondent, disturbing factors, country
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 31: OLS regressions of health on frequency of marital conflict. Only currently married persons

	Grip Strength	Lung Function	Memory	Verbal Fluency
Conflict with spouse (Ref.=often)				
sometimes	0.97**	9.04	0.50***	0.15
	(0.34)	(5.04)	(0.13)	(0.25)
never	0.89*	4.11	0.51***	0.13
	(0.37)	(5.66)	(0.14)	(0.29)
Male	14.89***	106.87***	-0.82***	0.18
	(0.20)	(3.08)	(0.06)	(0.12)
Age	-0.43***	-5.05***	-0.10***	-0.17***
	(0.01)	(0.14)	(0.00)	(0.01)
Body height	0.24***	2.41***		
	(0.01)	(0.18)		
Education (Ref.=no/primary education)				
secondary education	0.32	16.59***	1.08***	1.89***
	(0.20)	(3.01)	(0.08)	(0.15)
tertiary education	0.06	32.22***	2.01***	3.80***
	(0.24)	(3.73)	(0.10)	(0.21)
Make ends meet (Ref.=with great difficulty)				
with some difficulty	1.14***	7.38	0.33**	0.38
	(0.31)	(4.49)	(0.11)	(0.21)
fairly easily	2.19***	21.90***	0.51***	1.13***
	(0.31)	(4.52)	(0.11)	(0.22)
easily	2.38***	33.93***	0.73***	2.00***
	(0.32)	(4.82)	(0.12)	(0.24)
Very healthy childhood	0.28	0.45	-0.04	-0.22
	(0.15)	(2.39)	(0.06)	(0.13)
Very good maths skills childhood			0.38***	0.86***
			(0.10)	(0.23)
Very good language skills childhood			0.44***	1.04***
			(0.11)	(0.25)
Disturbing factors			-0.70***	-0.70*
			(0.13)	(0.28)
Panel respondent			0.30***	0.65***
			(0.09)	(0.19)
Constant	12.08***	196.61***	14.10***	27.66***
	(1.41)	(21.38)	(0.35)	(0.68)
R^2	0.656	0.439	0.287	0.319
Observations (N)	**9673**	**9172**	**10114**	**10105**

Note: Regression coefficients. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for country fixed-effects (not shown)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 32: OLS regression coefficients of health on marital quality

	Grip Strength	Lung Function	Memory	Verbal Fluency
Marital status				
(Ref.=married, high/average quality)				
never married	-1.39***	-18.79***	-0.46***	-0.85***
	(0.23)	(3.46)	(0.09)	(0.19)
married (low quality)	-1.03**	-9.60	-0.52***	-0.21
	(0.33)	(5.00)	(0.13)	(0.25)
separated	-0.16	-8.80**	-0.41***	-0.09
	(0.18)	(2.86)	(0.08)	(0.17)
widowed	0.31*	-3.81	-0.59***	-0.89***
	(0.15)	(2.42)	(0.07)	(0.13)
Male	14.28***	101.08***	-0.85***	-0.01
	(0.16)	(2.47)	(0.05)	(0.10)
Age	-0.40***	-4.80***	-0.11***	-0.17***
	(0.01)	(0.10)	(0.00)	(0.01)
Body height	-1.39***	-18.79***		
	(0.23)	(3.46)		
Education (Ref.=no/primary education)				
secondary education	0.41**	17.57***	1.18***	1.93***
	(0.15)	(2.25)	(0.06)	(0.12)
tertiary education	0.15	34.71***	2.15***	3.98***
	(0.18)	(2.87)	(0.08)	(0.16)
Make ends meet (Ref.=with great difficulty)				
with some difficulty	1.01***	5.47	0.23**	0.47**
	(0.21)	(3.19)	(0.08)	(0.16)
fairly easily	1.99***	17.93***	0.42***	1.03***
	(0.21)	(3.28)	(0.08)	(0.17)
easily	2.13***	30.92***	0.62***	1.75***
	(0.23)	(3.57)	(0.09)	(0.18)
Very healthy childhood	0.25*	-2.14	-0.05	-0.37***
	(0.12)	(1.84)	(0.05)	(0.10)
Very good maths skills childhood			0.38***	0.77***
			(0.08)	(0.18)
Very good language skills childhood			0.51***	1.27***
			(0.09)	(0.19)
Disturbing factors			-0.65***	-0.71***
			(0.11)	(0.21)
Panel respondent			0.36***	0.41**
			(0.07)	(0.14)
Constant	13.46***	195.36***	15.32***	28.73***
	(1.67)	(25.35)	(0.24)	(0.48)
R^2	0.673	0.464	0.324	0.328
Observations (N)	**15476**	**14639**	**16430**	**16398**

Note: Regression coefficients. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for country fixed-effects (not shown)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 33: Average marginal effects (AME) of relationship biography on physical health for men/women. Never married only

	Grip Strength		Lung Function	
	Females	*Males*	*Females*	*Males*
Non-marital relationship biography				
(Ref.=currently in relationship)				
never in relationship	-1.48	0.25	-11.60	54.20***
	(0.85)	(0.91)	(11.15)	(15.00)
previously in relationship	-1.66*	-1.94	-0.59	20.98
	(0.84)	(1.04)	(10.74)	(15.58)
Observations (N)	**1033**	**1033**	**968**	**968**

Note: AME. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for interaction terms of gender with: age, healthy childhood, financial situation, education, height, country
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 34: Average marginal effects (AME) of relationship biography on cognitive health for men/women. Never married only

	Memory		Verbal Fluency	
	Females	*Males*	*Females*	*Males*
Non-marital relationship biography				
(Ref.=currently in relationship)				
never in relationship	-0.34	-0.20	-0.10	0.03
	(0.37)	(0.39)	(0.82)	(0.85)
previously in relationship	0.37	0.39	1.24	-0.28
	(0.36)	(0.39)	(0.85)	(0.86)
Observations (N)	**1108**	**1108**	**1106**	**1106**

Note: AME. Robust standard errors in parentheses
Data: SHARE w1,w2,w3 rel6-0-0. Adjusted for interaction terms of gender with: age, healthy childhood, maths & language skills childhood, financial situation, education, panel respondent, disturbing factors, country
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 35: Fixed-effects regressions of memory performance on widowhood duration (as yearly impact function)

	Memory
Reference=continuously married	
1st year widowed	-0.21*
	(0.10)
2nd year widowed	-0.20
	(0.11)
3rd year widowed	-0.17
	(0.13)
>3 years widowed	-0.28*
	(0.12)
Age	0.14***
	(0.02)
Make ends meet	
(Ref.=with great difficulty)	
with some difficulty	0.10**
	(0.04)
fairly easily	0.14**
	(0.04)
easily	0.14**
	(0.05)
Constant	0.17***
	(0.01)
$R^{2\ (within)}$	0.007
N persons	**55298**
N person-years	**144789**

Note: Regression coefficients. Robust standard errors in parentheses. All models control for survey wave (not shown).
Data: SHARE w1,w2,w3,w4,w5,w6 rel6-0-0
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figures

Figure 24: Effects of widowhood duration on grip strength performance (yearly impact function)

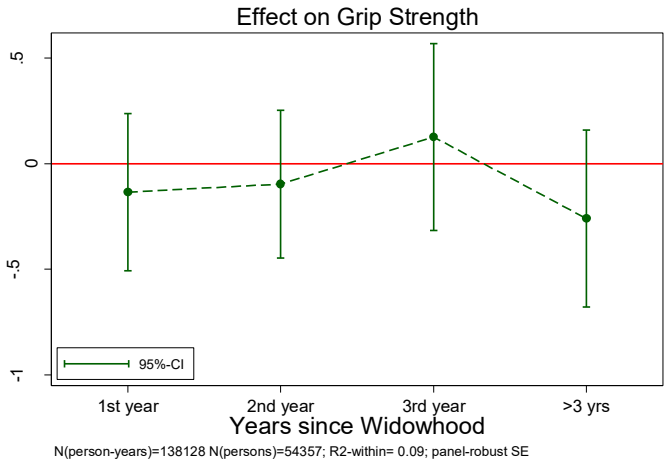
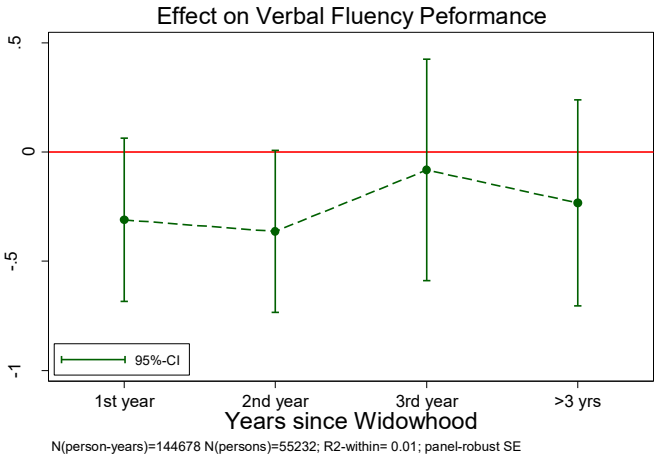


Figure 25: Effects of widowhood duration on verbal fluency performance (yearly impact function)



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