UNIVERSITY OF SOUTHAMPTON

FACULTY OF SOCIAL, HUMAN AND MATHEMATICAL SCIENCES

Division of Social Statistics and Demography

Life events and changes in health-related behaviours: An investigation using the English Longitudinal Study of Ageing

by

Maria Herica La Valle

Thesis for the degree of Doctor of Philosophy

April 2019

ABSTRACT

The thesis uses data from the English Longitudinal Study of Ageing (ELSA) to investigate the topic of health behaviours change as associated with life events, with a particular attention on their timing. By reviewing the extensive literature on the health of the elderly people, the health inequalities and the health behaviours according to a life course approach, three research questions are addressed. Is there any relationship between the occurrence of certain life events and the change(s) in health related behaviours? Is there any association between the age when experiencing certain life events and the change(s) in health-related behaviours? Are there any differences by gender? In particular, three studies, presented in three separated chapters, and focusing on different behaviours and events, are conducted in order to explore this fascinating area of research. Each analysis concerns a particular stage of life, i.e. adult age, mid-life and adult/old age. Chapter 3 deals with smoking cessation as associated with two events usually happening in early adulthood, i.e. the birth of the first child and the first marriage, by a gender perspective. It uses Life History Interview, which provides retrospective information on several life domains and, in particular, on when people started and stopped smoking. Chapter 4 focuses on women and on the menopause as related to changes in frequency level of alcohol intake and physical activity engagement. A multilevel longitudinal analysis employing four couples of ELSA waves is conducted in order to examine changes in behaviours as associated with menopausal process stages. Chapter 5 investigates the transition into retirement as associated with changes in smoking, drinking and physical activity, and use waves 4-8. Overall, results suggest that selected life events and, in particular, specific phases of the transition to the event, as well as the age at experiencing them may play a role in the context of behaviours change. Further research is needed to assess whether the association between changes in health behaviours and timing of life events is verified in other settings, for other behaviours, and by using other analytic approaches.

FACULTY OF SOCIAL, HUMAN AND MATHEMATICAL SCIENCES

Social Statistics and Demography

Thesis for the degree of Doctor of Philosophy

LIFE EVENTS AND CHANGES IN HEALTH-RELATED BEHAVIOURS: AN INVESTIGATION USING THE ENGLISH LONGITUDINAL STUDY OF AGEING

Maria Herica La Valle

Table of Contents

List of Tables

List of Figures

Acknowledgements

This is the end. The end of a long academic and life journey.

When I started this PhD, I was as much excited as I was scared, and looked at studying in the UK as the fulfilment of a childhood dream. And it has really been that. I have loved British coasts, the countryside, the tea rooms, the libraries… I will always feel lucky to have spent time in such a beautiful and culturally significant country.

However, many obstacles have "suspended" my path and several times, I have imagined myself writing this page. I have always been sure I would have written about my health and family issues over the PhD. Instead, I will not do that. The only space for sadness is the big hug to my uncle, who left some months before the discussion…you would have been proud of me. I miss you so much.

Apart from this, I have realised that this amazing experience has changed my life approach, and I will focus on the lovely people who have really played a role in this.

I thank Elena Ambrosetti. She pushed me to apply for the PhD position at the University of Southampton and, to be honest, she always pushes me to do more, to believe in my skills and to simplify the daily difficulties relative to "doing research". She gives me time and suggestions and maybe she does not know how important in my academic development is.

I thank Jane Falkingham, who examined my application and decided to give me the opportunity to start a PhD. Also, she was one of my supervisors for more than a half of the PhD time and her presence was precious. She smartly and quickly deduced my research interests and gave me inestimable suggestions to define my research area and questions and she was always available to talk about my thesis. Despite her high academic level, she always approached me with humility and kindness. I will always look at her as a model to follow in my career.

I thank all my supervisors, for their joint human and academic commitment. They helped me in completing my thesis by sharing their knowledge and expertise. Many thanks because you have helped me as demographers by suggesting superlative research

perspectives and methods and as persons as you have always been patient. You know how difficult some moments were and each of you helped me in different ways.

I thank you, Heini Väisänen, for your precious technical advises and your rational and serene approach in problem solving.

I thank you, Agnese Vitali, for your pragmatism and optimism. You have positively reversed many of my days over the PhD by proposing brilliant alternatives to my ideas and you taught me how to do research despite the rest.

Heini and Agnese, I have been your first PhD student and this is one of the reasons I thank you twice. Thanks for your skills and for your natural attitude in supervising.

I thank my main supervisor, Amos Channon. Thanks Amos because you have always been there. Many thanks, Amos, above all for your time. Thanks because you have helped me with the academic language and shown how to write a thesis, for all the afternoons spent with STATA codes, for the books about statistics and methods, for your technical and theoretical solutions, and for (still) trying to improve my relationship with time.

I thank all my lifelong friends who are always with me although the geographical distance.

In particular, I thank my lovely Valentina. I cannot remember a life period when we were not together…thanks for your time, your love, your heart and your mind. You always give me the right advises and this is priceless in my life.

I thank Raffaele for his language suggestions at the time of the application. You were the only one knowing about this project and you have accompanied me in this entire journey. Thanks for being a very good friend.

I thank my new friends in Southampton, Elsie, Stephanie, and Vallia. Three completely different people who always give me amazing pieces of the world. Thanks for your lovely and international friendship.

I thank Rossella who, instead, has been my piece of Italy (although a northern one!) in the UK. You have been a great discovery in my life. Thanks because we are so different and so similar. Thanks because you are always available, kind, present and lovely. Day by day you have become very important in my life and you are the best gift of this PhD. We know how difficult some moments are but we also know that, despite the distance, we will

always support one each other, and this has helped me many times over this journey. You have read this thesis many times…I will never thank you enough for this too.

I thank Maria Elena, who has entered my life at the end of the PhD and has closed a "candy" circle from the past. She has shared her experience and helped me in coping with the last difficult moments. Thanks for your sweetness, your soul, your purity of heart and your smartness. We have met late in time but this will not impede to be friends forever.

I thank Mirko's parents who have sustained my last trips and have always enjoyed my results.

I thank my family who has always supported and encouraged my studies. I thank my mum's care and her thousands calls to make me feel less lonely. I thank my father's enthusiasm...I will never forget the first trip to Southampton with him. Neither the long ways to the nearest airport with my uncle. Many thanks for those days. I miss those cheerful times!

A particular thank to my little twins, Rosa and Carlotta. You have painted my life with bright colours and you are my piece of rainbow on the earth. I really love you and I am proud to be your aunt.

I thank Mirko, who is more than a husband for me. You are the love of my life, the reason, the aim. Thanks for being with me as you are. Thanks for the music, the poetry, the science. Thanks because since we met we have not left one each other for more than an hour. Thanks because you understand my times and always believe in my skills and projects. Thanks because we have our own project. Only for you I need to change the beginning of this page…this is not the end. This is the start.

Lastly, a little thank to me and to the thousands pages of literature I have read in the last years (Amos is laughing at this point!). Thanks to my positive attitude to life.

Chapter 1: Introduction

It has been well established that socioeconomic position in terms of education, occupation, income or wealth affects mortality and morbidity thus producing different health outcomes within the population of all countries (Mackenbach, 2012). Indeed, health inequalities in old age both across different socio-economic strata and between men and women have been identified by various studies (Arber, 2004; Arber and Ginn, 1993; Chandola, Ferrie, Sacker, and Marmot, 2007; Crimmins, Kim and Solé-Auró, 2010; Grundy and Holt, 2000; Grundy and Holt, 2001; Grundy and Sloggett, 2003; Knodel and Ofstedal, 2003; Lloyd-Sherlock, 2000). In particular, such inequalities have often been associated with the different distribution of behavioural factors by socioeconomic level (Lynch, Kaplan and Salonen, 1997). In fact, it has been found that the poorest and least educated individuals are more likely to smoke, to be overweight and to engage in less physical activity (Lantz *et al*., 1998). In this context, also gender plays an important role; for instance, it has been shown that women drink less alcohol (Holmila and Raitasalo, 2005) and are more likely to eat healthy and to be dieting (Wardle *et al.*, 2004) than men do.

In this work, the focus is on health behaviours adopted over the life course as one of the main sources of differences in health in adult and old age. In particular, the thesis looks at the *changes in* health behaviours and hypothesises that the chance to improving or deteriorating individual health-related behaviours is associated with the age when individuals experience certain life events. In other words, the thesis aims at verifying whether there is a relationship between the changes in health behaviours and the age at experiencing important life events, such as marriage and childbearing, which modify several life domains, among which health behaviours are involved. The rationale is that healthy and unhealthy behaviours do not depend on socio-economic status only, but also on life circumstances, which can act both as positive and as negative factors of influence (Alley and Crimmins, 2010).

Life circumstances can be represented by unexpected events – such as not planned pregnancies and death of the partner at young age – or by transitions from one stage of life to the next one – such as retirement and widowhood. Both may represent an opportunity to behave healthier or unhealthier. Elsewhere (George, 1993), it has already

been argued that transitions such as retirement are associated which changes in identity and behaviour, and this leads to consider the hypothesis that changes in health behaviours are more likely to happen in particular moments of life than in others. In this, age plays a key role. Indeed, considering Elder's analysis of the intersection of biography and social change (1999), Dannefer and Settersten (2010) argue that "the effect of events may turn out to be quite different, depending on the age at which an individual encounters them" (Dannefer and Settersten, 2010:7).

Hence, it is inevitable to consider the existence of a connection between the age at experiencing an event/transition and the chance to modify one or different health-related behaviours. In this context, Lynch and Davey Smith (2005) highlight how the stage of the life course when individuals get exposed to the risk factors of chronic diseases, is important in the process of development of their effects later in life, and this is true for health-related behaviours as well, as they may depend on the habits acquired during the earliest years of life.

Therefore, it may be hypothesised that changes in health behaviours may be linked to the age at experiencing some life events. To be clear, from an individual perspective, some events during life can promote or impede the decision to change one or more health related-behaviours just because they happen at one stage of life rather than at others. For example, childbearing should lead a woman to stop smoking, but the main expectation in this thesis is that age when a woman gets pregnant matters as much as or even more than the event itself, and that it can be positively or negatively linked with her decision to take a healthy behaviour. Moreover, it is supposed that such association may change depending on the respective birth cohort, since the social factors that influence the biological and the socio-educational development from childhood to adult age evolve over time, thus leading to different health inequalities in cohorts of different ages (Wadsworth, 1997). It seems necessary to comprehend *whether* and *how* the timing of particular life events is related to health behaviours and, indirectly, to health outcomes. In the light of this, the thesis addresses the following research questions:

1. Is there any relationship between the occurrence of certain life events and the change(s) in health related behaviours?

2. Is there any association between the age when experiencing certain life events and the change(s) in health related behaviours?
3. Are there any differences by gender?

It may be argued that considering the age when individuals experience specific life events can produce a selection effect that diverts the research from its main purpose, since such age is socio-economically graded. E.g., women's age at marriage is strictly linked to their socio-economic origins (Elder and Rockwell, 1976). However, as noted above, health behaviours are socio-economically graded as well. A study on Canada by Pomerleau *et al.* (1997), for instance, has showed that individuals with low socio-economic status are associated with a higher likelihood of adopting unhealthy behaviours. Class-based selection effects are inherently linked to the analysis of health behaviours: the individuals engaging in unhealthy behaviours tend to belong to the lowest socio-economic classes. In the light of this, it appears necessary to clarify that in this work, the expectation is that *within* the group of individuals who have adopted specific health-related behaviours, the age at experiencing an event is related to the risk of changing such behaviours regardless of the socio-economic level.

This thesis is constituted of an extensive literature review which deals with the health of the elderly population, the health inequalities, the health behaviours and the life course approach. This overview aims at highlighting the current gaps in the literature, i.e. the link between the age at experiencing selected life events and changes in health-related behaviours. This issue is particularly important in terms of promotion of health, since health behaviours are not fixed characteristics of individuals, rather they can change and such modification can be promoted by identifying the timing when individuals are more likely to change. For instance, a study on England (Lang *et al.*, 2007) has found that individuals who experienced transition into retirement were more likely to quit smoking than those who did not retire. More importantly, the authors suggest that such results may help to "targeting interventions to those planning their retirement and to ensuring that pre-retirement planning incorporates advice about positive health behaviour change" (Lang *et al.*, 2007: 642). By analysing the age at pregnancy, for instance, it may be found that women who experience such event later in life are more likely to behave healthier compared with those who get pregnant early in life, in order to reduce the age-

related biological complications that may emerge. Hence, health practitioners may target health promotion interventions to this age group of women.

The thesis is articulated into three distinctive papers which correspond to Chapter 3, Chapter 4 and Chapter 5 respectively.

The first paper focuses on the risk of stopping smoking as related to the age at first child birth and at first marriage. In particular, it is hypothesised that the age when such events happen is associated with the same probability of quitting, and that such association may be positive or negative depending on other factors, such as gender, birth cohort, education, and childhood origins. It uses data from the third wave of English Longitudinal Study of Ageing (ELSA), which provides information on individuals aged 50 and over. Moreover, it contains data collected through the Life History Interview. This dataset was collected in 2007, and contains retrospective information on individual health, employment, family and fertility histories.

The second paper centres on women, and aims at verifying whether there is a relationship between transition into menopause and changes in the frequency levels of alcohol intake and in physical activity engagement. The paper uses the English Longitudinal Study of Ageing (ELSA), from Wave 1, which dates back to 2002, to Wave 8, which dates back to 2016.

Finally, the third paper deals with retirement. In particular, it aims at examining changes in drinking, smoking and physical activity as related to the timing of retirement, both in terms of time since retired and in terms of age at retirement. The analysis is carried out by using data from waves 4-8 of the English Longitudinal Study of Ageing (ELSA).

This document is organised as follows. Chapter 2 describes the general literature from which the main research questions addressed in this thesis are drawn. The three papers, instead, focus on separated research questions, and deal with different life events. Hence, each paper contains its relevant background literature, a section explaining data and methods, the presentation of the analytic results, the discussion and main conclusions. Finally, Chapter 6 presents an overview of the thesis and discusses conclusions as a whole.

Chapter 2: Literature review

Nowadays, population ageing represents one of the major interests for public policy, given the several economic questions arising from the increasing costs of social services and medical and long-term care related to the elderly population (Parker and Thorslund, 2007). Indeed, the health issue plays a crucial role in this context, primarily due to the direct link between age and the risks of poor health: when age increases, risks of mortality, chronic disease and physical and cognitive impairment rise too (Alley and Crimmins, 2010).

However, from an individual perspective, the physical, psychological and social aspects of the process of ageing do not depend only on mere chronological age itself, but on a series of factors that cumulate over individuals' life course (Dannefer and Settersten, 2010). Several studies show that the health of the elderly people varies on the basis of socio-economic conditions and socio-demographic or socio-psychological factors, even if the disparity appears to be more pronounced among younger compared to older individuals (Grundy and Sloggett, 2003). The investigation of the causes of these inequalities requires to identifying not only the biological factors that produce different health outcomes in adulthood and in old age, especially by gender, but also the risk factors to which individuals are (not) voluntarily exposed over their life course. For instance, as noted in Kuh and Ben-Shlomo (2004), during the 20th century, when adult chronic disease became the core concern of public health in industrialised countries, the causes of such bad health condition were identified in *adult risk factors* and, more importantly, the studies conducted on post-war cohorts revealed two types of sources: bodily attributes on one hand, and personal behaviours on the other hand. Moreover, while in the past it was presumed that health problems, such as high blood pressure and chronic obstructive airways disease, arise from risk factors associated with middle adulthood, around the end of 1980s and over the 1990s, scholars started to consider poor health in middle and later life from a life course perspective (Wadsworth, 1997). Hence, from the research of 1980s and 1990s, which revealed that there is a positive association between the adverse circumstances early in life and the risk of adult chronic disease, life course epidemiology arose (Kuh and Ben-Shlomo, 2004) as "the study of long-term biological, behavioural, and psychosocial processes that link adult health and disease risk to physical or social

exposures acting during gestation, childhood, adolescence, earlier in adult life, or across generations" (Kuh and Ben-Shlomo , 2004: 3).

The aim of the present review is to explore the broad research area of *health and its determinants*, in order to show the gaps in the literature about health inequalities between adult men and adult women based on a life course approach, with particular attention to health behaviours as a fundamental set of health determinants.

Unlike bodily attributes, health behaviours are not fixed characteristics of individuals; rather are "modifiable" (Pomerleau, *et al.,* 1997:613) to the extent that they depend on people's choices and attitudes about healthy and unhealthy life styles. However, socio-economic conditions play a role in shaping behaviours as well. The promotion of positive changes in health behaviours requires to investigating whether they are associated also with factors that go beyond personal choices and socio-economic resources/constraints.

This involves a series of psychological, cultural, social and demographic issues, such as family events, fertility decisions and marital conditions. Furthermore, it requires taking into account the importance of gender on one hand, and on *time* on the other hand. Gender matters in terms of responsiveness to positive or negative life events that may be associated with the risk to start/stop adopting a health related behaviour thus leading to different health outcomes in late life. Time as well may make a difference both in terms of *birth cohort* and in terms of *age at experiencing an event*.

In the following, an overview of such issues is presented. In particular, it is organised along a topical sequence, as follows:

- the first section deals with the health of the elderly people;
- the second section focuses on health inequalities and the life course approach to their study;
- the third section describes the crucial area of this work, i.e. health-related behaviours and their change over the life course.

2.1 The health of the elderly people

The epidemiology of ageing investigates health patterns in the older population providing a theoretical tool aimed at reducing the risk of mortality and disease that increases with age (Alley and Crimmins, 2010). Nonetheless, considering different groups and different

time periods, this risk is not the same (Alley and Crimmins, 2010). Differences are detectable in the same ageing processes and within the older population, as tested by modern gerontology (Grundy, 2006). The attention needs to be focused not only on the health of the elderly, but also on the differences in health within the old population. Several scholars, indeed, have emphasised the issue of health inequalities in old age in terms of gender differences and/or socio-economic status imbalances. In particular, some concern comes from the fact that, on average, women live longer and spend a greater part of their life coping with worse living and health conditions than men do (De Santis, 2001; World Health Organisation, 2001; World Health Organisation, 2002). Since women's life length exceeds men's, elderly women outnumber elderly men; this phenomenon is known in some part of the literature as *feminization of ageing* (Calasanti, 2010; Davidson, DiGiacomo and McGrath, 2011; Mujahid, 2006; World Health Organisation, 2001; World Health Organisation, 2002). Women's greater life expectancy compared to men's has direct health consequences, since this implies that women, who tend to live to very old age, are more likely to suffer age-related disabilities than men do (Alley and Crimmins, 2010; World Health Organisation, 2001; World Health Organisation, 2002). However, the question of health inequalities in old age between women and men is not confined to the difference in life expectancy in itself. Research in this field has also focused on the analysis of health outcomes in old age in terms of gender differences in other life domains, like socio-economic position (Arber and Cooper, 1999; Arber and Ginn, 1993; Kasper et al., 2008), marital status (Arber, 2004; Arber and Cooper, 1999; Wilcox et al., 2003) and family stressors (Kasper et al., 2008).

The World Health Organisation (2001; 2002) reports that longer life expectancy of women leads to an imbalance between the number of widows and widowers. This affects health through the socio-economic implications of the widowhood for women. Widows, indeed, are usually poorer than widowers and never-married women (Arber and Ginn, 1993) and are more likely to suffer social isolation (World Health Organisation, 2001; World Health Organisation, 2002). Hence, the issue of the health in adulthood needs to be addressed not only in terms of the positive link between age and the risk of disability, disease and death; rather, the elderly population should be considered as a heterogeneous group of individuals who roughly share the same age but have different characteristics and backgrounds. The *biopsychosocial model of health and ageing* (Crimmins and Seeman,

2001; Seeman and Crimmins, 2001) shows a comprehensive picture of this heterogeneity, since it crosses the simple association between age and the onset of disability, and takes into account the whole set of factors influencing health in later life at the individual level. The simplified version of the model, provided by Alley and Crimmins (2010) gathers such factors as follows:

- *background* (age, sex, socioeconomic status, race/ethnicity, genetics);
- *health behaviours* (diet, exercise, smoking, drinking), *social psychosocial characteristic* (social support, control, stress), *life circumstances* (job characteristics, family environment, neighbourhood environment), and *health care* (availability and use of treatment and medications, preventive care use);
- *biological mechanisms* (hypertension, cholesterol, body weight, inflammation, stiffness of joints, shortness of breath, balance problems).

In other words, the model shows that socio-economic and genetic background affect health behaviours, social psychosocial characteristics, life circumstances, and health care, on one hand, and biological mechanisms, on the other hand; biological mechanisms are also influenced by the second group of factors and, in turn, determine health outcomes.

This model appears a useful starting point to address the present literature, since provides different research tracks to deepen in the context of health inequalities in adult age. In particular, in this thesis, the attention is oriented on health behaviours and life circumstances, which are included in the same category of factors of influence into the model discussed above. Since health behaviours affect health outcomes (in adult and old age), the investigation of their change over the life course is needed. The hypothesis is that individuals may be more motivated to changing health behaviours when they experience specific life events, such as childbearing and retirement, which are accompanied to modifications of their roles and responsibilities. More importantly, it is expected that the age at encountering such events matters so that the likelihood to change attitudes towards health and life style may vary by the age when people experience them. Hence, a life course perspective is required.

For this purpose, in the following, studies about health inequalities by a life course perspective are discussed.

2.2 Health inequalities and the life course approach

The analysis of the differences in health outcomes cannot disregard the source factors of such results, i.e. to investigate the topic of health inequalities in old age requires backing up a brief examination of the determinants of health.

2.2.1 Health determinants and differences in health

Omran's epidemiologic transition theory (1971) shows that "during the transition, a long-term shift occurs in mortality and disease patterns whereby pandemics of infection are gradually displaced by degenerative and man-made diseases as the chief form of morbidity and primary cause of death" (Omran, 2005: 736-737). The author identifies three categories of diseases determinants, i.e. three sets of factors that have produced the transition from infectious to degenerative diseases dominance:

1. "ecobiologic determinants of mortality, which indicate the complex balance between disease agents, the level of hostility in the environment and the resistance of the host" (Omran, 2005: 739);
2. "socioeconomic, political and cultural determinants, which include standards of living, health habits and hygiene and nutrition" (Omran, 2005: 741);
3. "medical and public health determinants, which include improved public sanitation, immunization and the development of decisive therapies" (Omran, 2005: 741).

According to "the pattern, the pace, the determinants and the consequences of population change" (Omran, 2005: 751), Omran identifies three models of the epidemiologic transition: the Classical (Western) Model of Epidemiologic Transition, the Accelerated Epidemiologic Transition Model and the Contemporary (or Delayed) Epidemiologic Transition Model.

Most of Europe and Western countries experienced the classical model; in particular, focusing on the determinants of mortality decline, in the XIX century, the triggering factors were the ecobiologic and socio-economic ones; while in the XX century, a decisive role was played by medical improvements (Omran, 2005). The issue of the evolution of diseases patterns is inevitably linked to that of health determinants and their variation over time and across countries. Graham and Kelly (2004) explain how the concept of

health determinants stems from the considerations developed in the 1970s about public health research and policy, which were accused of focusing on individuals rather than on populations, and were encouraged to take into account social policies and social determinants of health more than health services and disease outcomes. The authors assert that the expression "health determinants", nowadays, refers to "all the major non-genetic and non-biological influences on health" and comprises healthcare services, considering that the drop of the major disease-related mortality since the mid-20th century has been also due to "timely and effective interventions" (Graham and Kelly, 2004: 3).

One of the most important research tracks in this field is that of *health inequalities*. As noted in Marmot and Allen (2014), in the strength of British tradition, this expression means "differences in health between groups defined on the basis of socioeconomic conditions" (Marmot and Allen, 2014: S517). Indeed, considering any socio-economic indicator (such as income, class, housing tenure, deprivation or education), people who suffer the worst socio-economic conditions within a population, experience worse health, whichever dimension is taken into account, i.e. in terms of mortality, morbidity and self-reported health, and this can be observed all over Europe, both in richer and poorer countries (Shaw, Dorling and Smith, 2006). Marmot (2006) as well, argues that a *social gradient* in health has emerged from British statistics: health conditions tend to get worse as we consider people from the highest to the lowest social classes of a population. Why does this happen?

Mackenbach (2006) reports that initially, this issue has been investigated in terms of *direction* of the *relationship between health and socio-economic conditions*; in particular, two approaches have been proposed:

1. "social selection", i.e. health shapes socio-economic conditions;
2. "causation", i.e. socio-economic conditions shape health outcomes.

The author (Mackenbach, 2006) states not only that longitudinal studies have shown that the causality mechanism is more important than the selection one in terms of the link between socio-economic inequalities and health, but also that this kind of relationship is indirect, since it involves a set of *intermediate factors* that impact health and that can be gathered as follows (Figure 1):

- material factors, i.e. "exposure to low income and to health risk in the physical environment" (Mackenbach , 2006: 31);
- psychosocial factors, which arise from stressful life events and influence health negatively by passing through biological or behavioural ways;
- health-related behaviours, i.e. smoking, diet, alcohol consumption, physical exercise.

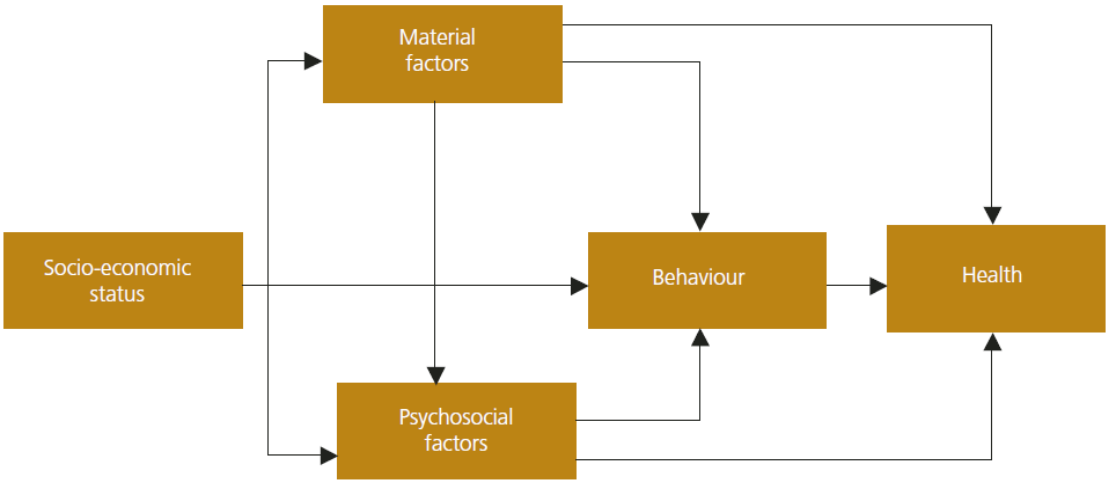

Figure 1 Simple explanatory diagram: factors which have been shown to 'mediate' between low socio-economic position and risk of ill-health (Mackenbach, 2006: 32).

However, this accounts for only one aspect of the issue. In the context of health determinants and health inequalities, indeed, Graham and Kelly (2004) emphasise the importance of studying the *unequal distribution of health determinants*, and argue that the same determinants of health are socially defined. What matters in this context is social position, i.e. the position occupied by an individual within the society, which is the driver through which the societal domain affects people's lives and individual health risk factors, thus determining health outcomes (Graham and Kelly, 2004). In particular, one dimension of individual's social position plays a decisive role in this research project, i.e. gender.

The existing literature about gender and health is quite notable (Bird and Rieker, 1999; Courtenay, 2000; Denton and Walters, 1999; Doyal, 2000; Kandrack, Grant and Segall,

1991; Luy, 2003; Luy and Wegner-Siegmundt, 2014; Macintyre, Hunt and Sweeting, 1996; Matthews, Manor and Power, 1999; McDonough and Walters, 2001; Moss, 2002).

In this context, since it is observed that industrialised countries exhibit higher life expectancy and higher morbidity for women than for men (Macintyre, Hunt & Sweeting, 1996), the issue of *sex/gender differences* in health can be addressed both in terms of male excess in mortality, and in terms of female excess in diseases. The first step to comprehend gender differences in health seems to be the same definition of the term *gender*, which is often used as synonym of *sex*. However, while the former refers more specifically to the social domain of individual's identity (Bird and Rieker, 1999; Kandrack, Grant and Segall, 1991), the second concerns the physiological characteristics of persons (Kandrack, Grant and Segall, 1991). As noted in Kandrack, Grant and Segall (1991), the boundary line between these two concepts is quite tenuous. Nonetheless, the need to specifying the distinction between them stems from the consideration that to look at health determinants either in terms of biology and physiology – i.e. sex differences – or in terms of social factors – i.e. gender differences – leads to depict an incomplete picture of men's and women's health status. Furthermore some biological attributes of people can change in the strength of the social and physical context in which they live (Bird and Rieker, 1999). This explains the importance of gender in the context of this thesis.

This issue, however, is strictly linked to the two different approaches used by scholars to explain the differences in health outcomes between women and men – i.e. the biological and the social– on one hand, and to the two hypotheses presented in examining such differences – the differential exposure hypothesis and the differential vulnerability hypothesis – on the other.

In regards to the first point, as noted in Kandrack, Grant and Segall (1991), the investigation of differences in health between men and women has been realised both from a biomedical perspective, which highlights the importance of the biological inheritance, and from a socio-medical perspective, which emphasises the roles of sociocultural and social-psychological factors. Some scholars suggest taking into account both the biological and the social components of health determinants (Bird and Rieker, 1999; Doyal, 2000) in order to involve both gender and sex implications in the study of health differences between men and women.

Focusing on male excess mortality, Luy (2003) points out the existence of two different approaches addressing this issue:

- the biological approach, which highlights the importance of genetic and biological factors, as such independent on human choice and action;
- the non-biological approach, which considers behaviours and environment as key factors, i.e. elements that people can directly or indirectly affect.

Moreover, Bird and Rieker (1999) argue that the interaction between social and biological factors can take place according two mechanisms, i.e. amplification and suppression. While the former implies that biological differences between men and women are intensified by the social environment in which they live, the second suggests that biological differences between men and women are attenuated by the social environment in which they live. In this context, reproduction is the very health dimension which can explain that differences matter, not only *among* groups, but also *within* them. Although women share the same biological characteristics, differences *among women* are observable by taking into account other factors, such as geopolitical context, class and race, which play an important role in terms of reproductive health outcomes: contraception, abortion and childbearing are not equally accessible by women all over the world (Doyal, 2000).

In regards to second point, as noted in McDonough and Walters (2001), responsiveness to stress is considered to play a decisive role in the research on the explanation of gender differences in health. In particular, two hypotheses have been proposed:

1. the *differential exposure hypothesis*, which states that women experience more illness compared to men because they are exposed to more stress in the strength of their obligations and social roles;
2. the *differential vulnerability hypothesis*, which points to the higher level of responsiveness of women compared to men in facing the same life events.

For instance, Denton, Prus, and Walters (2004) tested the different exposure and the different vulnerability of men and women to three types of health determinants – social structural, behavioural and psychosocial, and reported four main findings. Firstly, the study reveals the existence of gender differences in health: women report more chronic health problems, slightly lower levels of self-related health, functional health and higher

levels of distress than men do. Secondly, for both genders, while self-rated, functional and chronic health are primarily associated with the set of structural determinants of health, distress is particularly related to the set of psychosocial determinants. Thirdly,: when controlling for the structural, behavioural and psychosocial health determinants, inequalities in health by gender do not disappear, so that results do not confirm the differential exposure hypothesis. Fourth, the differential vulnerability hypothesis is verified.

Overall, the paper depicts an interesting picture of health determinants and gender differences in exposure and vulnerability to these determinants, showing a complex set of interrelated factors affecting all the health dimensions. Although to disentangling each single influence domain from the others is complicated, a main result emerges: among the three classes of health determinants, social structural factors appear to be the drivers through which psychosocial resources and behaviours influence health outcomes. In light of the present work, this paper is particularly important because highlights the need of a life course approach to the study of health-related behaviours and gender differences in health. Indeed, as Denton, Prus, and Walters (2004) suggest, a crucial aspect of the analysis needs to be deepened: which are the direct and indirect pathways of these dynamics? This research field requires a more complete dataset about men's and women's health conditions and socio-economic status, as well as more information about the experiences and events occurred over their entire life course. A retrospective approach may allow to evaluate the overall set of factors acting on health on one hand, and to trace the evolution of this complex influence system on the strength of other elements that have not been mentioned in the paper on the other hand.

The next paragraphs deal with the very life course approach to the study of health inequalities and to the central topic of this thesis, i.e. health behaviours by a life course perspective.

2.2.2 The life course approach

The role of individuals' life history in the analysis of health outcomes in later life is emphasised by several scholars (Alley and Crimmins, 2010; Kuh et al., 2003; Kuh and Hardy, 2002; Stone, Netuveli, and Blane, 2008; Stone, Netuveli, and Blane, 2014; Wadsworth, 1997; West, 1997). In regards to "gender inequalities in older age", for

instance, it has been showed that they "result from accumulated gendered disadvantages during the life course" (United Nations Economic Commission for Europe, 2009: 1).

In particular, life course research investigates human lives between birth and death by involving different disciplines, such as anthropology, demography, economics, sociology and developmental psychology (Mayer, 2009), "with sociology as an important disciplinary anchor" (2009:414). Within this broad research area, several issues have been addressed by scholars, who have adopted a life course perspective to investigate health inequalities (Graham, 2002; Stone, Netuveli and Blane, 2008; Wadsworth, 1997; West, 1997). These include the relationship between social class and health (Elo, 2009; Stone, Netuveli and Blane, 2014), health behaviours (Backett and Davison, 1995; Lawton, 2002; Umberson, Crosnoe, & Reczek, 2010), chronic diseases (Ben-Shlomo and Kuh, 2002; Lynch& Smith, 2005; Nicolau et al., 2007), and to explore the role of childhood experiences in adult health and morbidity (Angela and Hamil-Luker, 2005; Blackwell, Hayward and Crimmins, 2001; Forrest and Riley, 2004; Haas, 2007; Luo and Waite, 2005).

Since the life course approach can be seen as a tool to explore health, human development and ageing according to an interdisciplinary perspective (Kuh and Hardy, 2002; Kuh *et al*., 2003), it is particularly important in the study of health outcomes and health inequalities in adult age. Indeed, into the research area of life course sociology and health, most of the attention is focused on health outcomes trajectories, on the underlying factors of the "age-specific exposure to health risks", and on the differences in the age-specific impact of these risks (Mayer, 2009: 421).

The attitude to study some important diseases, which typically emerge in middle or later life, by taking into account not only these particular life stages but longer time periods, became more popular among scholars in the late 80s and 90s (Wadsworth, 1997). This does not mean that life course epidemiology focuses on the link between health outcomes and early life factors only; rather, it aims at studying the interaction of such factors with those appearing in later life (Kuh and Hardy, 2002; Kuh et al., 2003). Moreover, life course epidemiology is the research area that seeks to explain the development of disease risk as a result of the interaction of biological and social factors (Kuh et al., 2003). In particular, three models of life course disease development are commonly used in life course epidemiology, i.e. the *critical period model*, the *pathway model* and the *accumulation model* (Stone, Netuveli and Blane, 2008).

The first shows the case when disease emerging later in life arises from an exposure occurred during a critical period of development without any intervention of later experiences (Kuh *et al.,* 2003), where the expression "critical period" can be defined as *"*a limited time window in which an exposure can have adverse or protective effects on development and subsequent disease outcome" (Kuh *et al.*, 2003:780). Stone, Netuveli and Blane (2008; 2014) state that the model focuses on the idea that the risk exposure has different influences on health depending on the age when it occurs and that it stems from Barker's "foetal origin hypothesis" (Barker et al., 1989; Barker et al., 1990), as confirmed by Graham (2002) as well. This means that early life adaptations, differently from those occurring in adult life, are likely to permanently affect the body's structure and function (Barker, 2001). Furthermore, as noted in Kuh *et al*. (2003), there is a version of such model, i.e. the "critical period with later effects modifiers", where later physiological and psychological stress factors impact the influence of an exposure occurred during a critical period on later disease risk.

The second model, instead, centres on health outcomes in later life as a result of the way in which the risk exposure in early life affects the successive risk exposures (Stone, Netuveli and Blane, 2008). Adult health is thought to have its roots in childhood circumstances, but the effect is considered indirect, *"*with poor childhood conditions influencing social trajectories into and through adulthood" (Graham, 2002: 2008). According to Kuh et al. (2003), this is similar to the chain of risk model, which is based on the idea that a series of linked exposures increases disease risk. The authors state that such chains of risk can be social, biological and psychological and interact with *mediating* and *modifying factors*. Moreover, they recognise two types of chains on the basis of the effect of the exposure, which can be *additive* (Figure 2, Model c) – each exposure raises both the following exposure and the disease risk in itself – or trigger (Figure 2, Model d) – only the final link in the chain directly affects the disease risk.

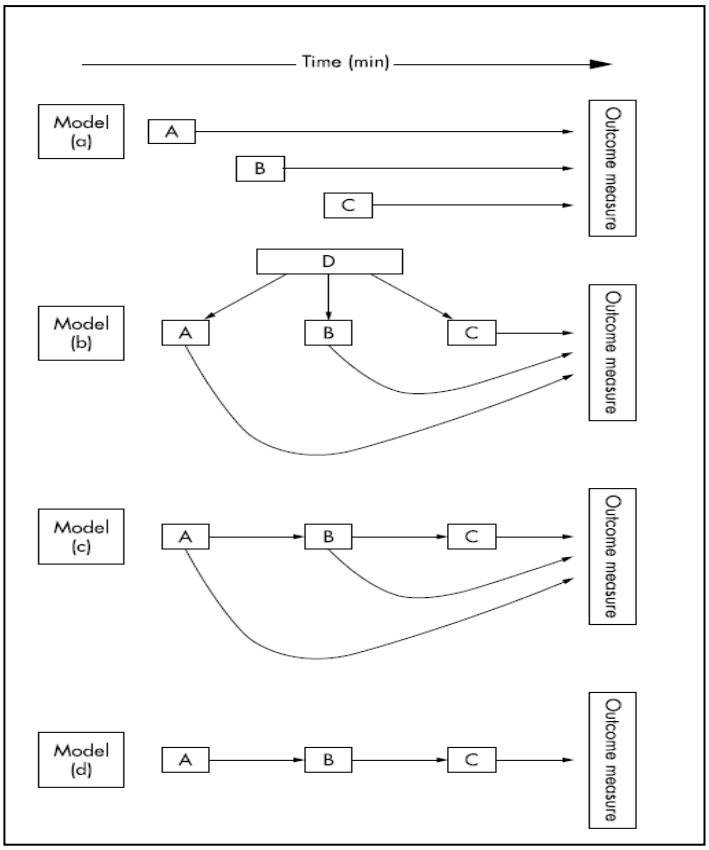

Figure 2 Life course casual models (Kuh *et al.*, 2003: 779)

Specifically, the former is a particular version of the *accumulation model* (Kuh *et al.*, 2003), where there is a cumulative dose/response effect of negative circumstances at different life stages on health (Graham, 2002). Such model can exhibit independent (Figure 2, Model a) or clustered (Figure 2, Model b) risk exposures (Kuh *et al.,* 2003).

In the context of this thesis, the pathway model seems to be the theoretical model that better explains the hypothesis to investigate. Indeed, health related behaviours, which are risk factors for individuals' health, start developing early in life as dependent on childhood conditions, such as educational and socio-economic circumstances of parents. Then, mediating and modifiers factors can intervene and contribute to positive or negative changes in behaviours, i.e. to a risk attenuation or exacerbation. One of such factors, in this thesis, is identified in life events, i.e. in particular moments of life when individuals may be more or less likely to change health behaviours, maybe depending on the age at which people experience them.

Directly linked to this is the role of time, both conceived as life time, i.e. chronological age of individuals, and as historical time, i.e. birth cohort (Kuh *et al*., 2003). Indeed, "the social factors that affect both biological programming and the social and educational pathways

from childhood to adult socio-economic circumstances, vary with historical time and so the extent of health inequality in actuality and in potential in a cohort of a given age is likely to be different from that of a cohort of another age" (Wadsworth, 1997: 867). As a result, the cohort study seems to be the best perspective from which investigating causal life-course hypothesis (Nicolau *et al.,* 2007). The social hypothesis does not recognise the existence of a particular period in which its impact is displayed, in comparison to the biological programming mechanism that locates its effects into specific critical periods of development (Wadsworth, 1997).

In the literature, some emphasis is put on childhood (Angela and Hamil-Luker, 2005; Forrest and Riley, 2004; Haas, 2007; Luo and Waite, 2005; Poulton *et al*., 2002). For instance, Forrest and Riley (2004) report how several studies on mental and chronic diseases of older Americans reveal that the causes have to be sought out into childhood; and Angela and Hamil-Luker (2005) indicate that three main springs of childhood adversity exist, i.e. "childhood poor health, economic hardship and family instability*"* (Angela and Hamil-Luker , 2005: 118). However, social inequalities in health have been investigated above all in terms of socio-economic status in adulthood (Poulton *et al.,* 2002).

Since in this thesis, it is hypothesised that the age when *life events* happen is related to changes in health behaviours and thus to different health outcomes in adult age, the focus is on the role of *time* as linked to the concept of *vulnerability*, which Kuh *et al.* (2003: 781) explain as "a dynamic process of negative adaptation in the face of adversity".

It seems necessary to clarify, however, that in this work, the concept of vulnerability is considered from a broader perspective. To be clear, the life events supposed to be related to health behaviours change on the basis of the age when they happen, include also positive episodes of the life course. The idea is that both positive and negative experiences may produce a change in individuals' beliefs and awareness on health risks on one hand, and modify their life plans and priorities on the other hand, thus leading to improve or worsen the behaviours related to health.

For instance, Wadsworth (1997) addresses this issue in terms of *age related vulnerability*, by considering both *biological factors* and *age related social factors* influencing health. In the light of this work, the latter is particularly relevant, since it concerns the wide set of

socio-economic circumstances – i.e. occupational status and security, educational level, housing environment and tenure and family context – which is thought to have a different impact on health on the basis of the different life stage of the individuals (Wadsworth, 1997). The next paragraph concerns this topic.

2.2.3 The effect of socio-economic conditions on health over the life course

The study of health inequalities, i.e. "differences, variations, and disparities in the health achievements of individuals and groups" (Kawachi, Subramanian and Almeida-Filho, 2002: 647), stems from social epidemiology, which is the research field focussed on the "individual factors that might explain the socio-economic gradient in health" (Graham, 2002: 2006). The highest social gradients in health concern two steps of the life course: early childhood and midlife, although the measure of this social variation depends on the socio-economic status indicator, i.e. income, employment, occupation or education (Siegrist and Marmot, 2004).

The role of time is particularly important also in this research field, since not only the developmental trajectories of individuals depend on the historical period when they live (Krieger, 2001), but also on the timing of life events, given that the different life stages when individuals come into contact with the socio-environmental health determinants differently affect the development of chronic diseases (Lynch and Davey Smith, 2005). Hence, the tool to explore the "emergence of health inequality across the dimension of time" (Kawachi, Subramanian and Almeida-Filho, 2002: 650) seems to be the very life course perspective.

Power, Manor and Matthews (1999) explain how this study area has been explored by focusing on the interaction and the accumulation of circumstances experienced in early and later life and on the relative contribution of these different life stages; in particular, one of the research tracks followed by scholars has been oriented towards the socio-economic conditions that individuals live during those phases as factors impacting on adult diseases. As noted in Graham (2002), for example, British longitudinal studies show how the effect of the class structure, in terms of negative influence, extendes both across generations and between generations, with disadvantage going from parents to children and from childhood to adulthood. This is the reason why the first paper (Chapter 3) looks

also at socio-economic origin at childhood as associated with quitting smoking in adult age.

Although it is one of the most popular topics in social science field, the relationship between health and socio-economic status as expressed by education is more difficult to explain than the relationship between health and socio-economic status as measured by income or occupation, which concerns living, working condition, the ability to affording medical and preventive care expenses (Lynch, 2003). However, as noted in Ross and Wo (1996), to focusing on education rather than on income or occupation as measure of socio-economic status presents some advantages, since education is *"*causally prior to occupation and income, universal to all adults and it is stable throughout life after young adulthood" (Ross and Wo, 1996: 105).

More broadly, three theories about the correlation between education and health have emerged (Eide & Showalter, 2011): the first and the second respectively state that higher the education level better the health status, and poorer the health conditions lower the educational attainment; the third, instead, assumes the existence of *omitted factors* influencing both education and health.

However, in the context of a life course approach on health inequalities, some attention has been put on the relationship health-education as *varying over time* (Herd, 2006; Lynch, 2003, 2006; Ross & Wo, 1996), and two hypotheses have been formulated: the *cumulative-advantage hypothesis*, which states that differences in health by education accumulate over the life course and get larger at older ages than at younger, and the *age-as-leveller hypothesis*, which maintains the opposite, i.e. the relationship is stronger at younger ages than at older (Herd, 2006; Lynch, 2003, 2006).

Ross and Wu (1996) have tested the cumulative-advantage hypothesis by studying two samples of U.S. households. The former, consisting of individuals aged 18-90 interviewed in 1990, was a cross-sectional sample. The second sample, instead, was examined over time: the respondents, aged 20-64, were interviewed in 1979 and 1980. The authors found support to the cumulative-advantage hypothesis: differences in health status, expressed by self-reported health, physical functioning and physical well-being, by education get larger with age and the health advantage of people with higher education levels is greater at older ages than at younger. Other support to the cumulative-

advantage hypothesis has been confirmed by Lynch (2003), who used two national datasets by considering respondents aged 30 and over. The author examined the effect of education on health and found that it increases across age and across successive birth cohorts. However, the work finds support to the age-as-leveller hypothesis as well, since the life course effect changes across cohorts. Indeed, it can be depicted as a U-shape pattern where the cumulative-advantage hypothesis is experienced up to some age for each cohort (respectively the effect of education on health decreases after the age 30 for people born in 1873, from midlife for people born in 1918, after the age 50 for people born in 1963) an then the age-leveller hypothesis occurs (Lynch, 2003).

Considering the literature about education, all statistical models in this thesis control for educational level. Indeed, it seems to affect not only the risk to adopt specific health behaviours, but also the risk to change such behaviours. However, this is discussed further later; apart from education and, more broadly, from socio-economic conditions, another source of differences in health is represented by stressful events. The next paragraph deals with this.

2.2.4 The relationship stressors-health and the timing of life events

The study of stress is fundamental in the investigation of differences in health and of the varying risks and protective factors that account for these differences (Turner & Avison, 2003). What needs to be considered in this context is that different health outcomes stressors related seem to be connected to the different stress distribution within the population. Indeed, it has been argued (Lantz *et al*., 2005) that individuals from lower socio-economic classes are more exposed to stress. Pearlin *et al*. (2005: 213) state that "the relationship between health inequalities and status stratification is mediated by variations in exposure to health related stressors". Turner, Wheaton and Lloyd (1995), for example, have investigated sociodemographic differences in mental health as explained by stress exposure and found that there is a direct correspondence between the distribution of exposure to stress and depressive symptoms across sex, age, marital status and occupational status. More importantly, also in this field, age matters. Indeed, as noted in Pearlin and Skaff (1996), even if the pure exposure to stressors does not increase, the stressors nature and quality may vary by individuals' age. The authors (Pearlin and Skaff, 1996) emphasize the importance of a life course perspective on social

stress, by expressing stress as a process extending through time and, as such, representing a change in individual's lives that affects their well-being. They (Pearlin and Skaff, 1996) indicate three kinds of stressors: eventful, chronic and quotidian stressors. Focusing on the first category, however, they (Pearlin and Skaff, 1996) explain that since life events inventories usually list events that tend to happen at early adulthood – such as being married, being divorced, having children, changing or losing jobs – it cannot be argued that older people are less likely to be exposed to stressful life events than youngers. Rather, there are two types of stressors that particularly happen at old age, i.e. the onset of illness and/or impairments and the death of dear people (Pearlin and Skaff, 1996).

These two events are particularly important in this thesis, since illness and widowhood can be considered two moments in life when changes in health behaviours may be more likely to occur. For example, Wilcox *et al*.(2003) have found not only that physical and mental health and health-related behaviours of married women were better than widowed women's, but also that while serious impairments were registered for recent widows, stability or small improvement were observed for longer term widows. This leads to ask whether the link between bad health results and the status of widow is mediated by a deterioration of health behaviours as linked to the death of the partner, as well as whether such potential changes in behaviours are the same for men and women who experience the event. Indeed, different stress sources may impact female and male health (behaviours) differently. A study by Turner and Avison (2003), which focuses on life events inventories, indeed, shows that the measure chosen to indicate stress plays a fundamental role in the analysis of status differences in exposure to stress. By examining a sample of 493 non-Hispanic white and 406 African American individuals of both genders, interviewed between 1997 and 2000, and by employing recent life events, chronic stressors, lifetime major events and discrimination stress as measures of stress, they present three main findings. About gender, the results reveal more major events and discrimination stress for men than for women, and show that women are more exposed to recent life events than men (Turner and Avison, 2003). About race, the authors show how the differences in exposure to stress between the two groups of individuals tend to be underestimated when life events are employed as measure of stress (Turner and Avison, 2003). Finally, about socio-economic status, when the measure of stress is more

inclusive, the exposure grade has a serious influence on differences in depressive symptomatology by ethnicity, even if it explains far more the difference by socio-economic status than the gender difference in distress (Turner and Avison, 2003).

Another feature of the relationship between stress and health concerns the fact that severe stressors do not tend to occur singly, rather they are likely to proliferate, since all the individuals' life spheres are related and a negative event in one domain leads to others happening in other domains (Pearlin, 1989). Pearlin *et al.* (2005) suppose this stress proliferation process be the way through which earlier circumstances have an effect on health and well-being later in life, and indicate three circumstances explaining this long term effect on health, that is *traumas*, *timing* and *sequencing of early transitions* and *life course disruptions*. In this context, the concepts of primary and secondary stressors need to be introduced. According to Pearlin (1989), primary stressors tend to occur firstly in individuals' life, while secondary stressors can be considered as a consequence of the former, although their effect in terms of stress can be greater compared to primary stressors'. Traumas are an ideal example of this stress process. Pearlin et al. (2005), indeed, explain how their impact on health might be due not only to the trauma in itself, but also to the secondary stressors that come from it.

Transitions, instead, are defined as "movements into and out of roles and statuses" (Pearlin *et al*., 2005: 211). Although transitions are likely to occur at all stages of the life course and are reversible, two of them are particularly complex and concern the early period of life, i.e. the transition from formal education to labour force and the transition from teenage to parenthood (Pearlin *et al*., 2005).

However, in this thesis, the attention is paid on transitions occurring at later stages of life, i.e. early adulthood (marriage and childbearing) and adulthood (menopause, retirement). This comes from the idea that health behaviours in adult age may depend on habits and beliefs developed in childhood and adolescence, but changes in health behaviours, which represent a broken point with such habits, may be related to events occurring later in life. In this discourse, the timing occupies a relevant position. Indeed, Pearlin (2010) suggests that the notions of timing and sequencing are directly linked to the concept of transition, since "among those making a transition, not everyone makes it at the same age or point of the life course, and variations in the timing of transitions may be relevant to the directions they impose on the life course. The same is true of the sequencing of the

transition, which refers to whether it precedes or follows other transitions" (Pearlin, 2010: 208).

Elder (1998), for instance, talks about the transition to motherhood and refers to it as a *multiphasic process* (Elder, 1998: 6) where all the stages represent choice points. The author emphasises the issue of "cumulation of disadvantages" (Elder, 1998: 6) that arises from its occurrence at an early phase of life. This recalls the discourse of pregnancy presented above on the potential higher probability to engaging in healthier behaviours associated with higher ages at having a child. The rationale was that, because of the biological complications that women can encounter when get pregnant later in life, they may be more motivated to behave healthy in order to preserve the duration of pregnancy. On the other side, to get pregnant earlier in life can be problematic as well – maybe because the pregnancy was not planed and economic and working issues may arise – and can affect behaviours in adulthood. Elder, indeed, explains how early transitions by affecting behaviours can determine a process of "cumulating advantages and disadvantages" (Elder, 1998: 7) that shape the subsequent transitions thus producing lasting effects on individuals' lives.

Differently from early transitions, life course disruptions – such as divorce and involuntary job loss – i.e. the change in some established roles and in their related behaviours, tend to happen at later life stages, but are also likely to produce secondary stressors (Pearlin et al., 2005). Williams and Umberson (2004), for instance, have gone beyond the simple link between marital status and health – that is supposed to be stronger for men than for women – and have analysed the relationship between the transition into or out of marriage and self-assessed health. By adopting a life course perspective and by using data from three waves (1986, 1989 and 1994) of the Americans' Changing Lives survey, the authors (Williams and Umberson, 2004) have achieved three main results. Firstly, differences in health by marital status reproduce the negative consequences of marital dissolution more than the positive effects of marriage (Williams and Umberson, 2004). Secondly, from a gender perspective, the detrimental influence of marital dissolution has a negative impact of self-assessed health of men but not women (Williams and Umberson, 2004). Thirdly, the differences in health depending on marital status are not related to gender only, instead a key factor is the very age of individuals. Indeed, their findings show that for men, the negative effect of the transition out of marriage because

of divorce or widowhood in terms of physical health increases with age (Williams and Umberson, 2004).

This leads to ask whether this happen for health behaviours as well. This thesis aims just at investigating this area, and addresses the issue of the age at marriage and childbearing as related to smoking cessation in the first paper.

However, what is intended to emphasise is that the study of transitions is important above all when accompanied by the study of their timing, because the age at experiencing an event may be more important than or, at least, as important as, the event itself in terms of changes in attitudes and behaviours, especially when taking into account environmental and historical factors that filter the way people experience transitions. Pearlin, (2010: 208), indeed, states that "transitions, together with their timing and sequencing, shape life course trajectories, the patterns of change and continuity of people's lives within the multiple, social, and economic institutions of the society". Elder (1998) as well argues that historical circumstances affect social trajectories of education, family and work, thus influencing behaviours and development of individuals.

Therefore, the very behaviours seem to be the vehicle through which the environment, in social, cultural and historical terms, affects life course trajectories. A particular kind of behaviours, i.e. health related-behaviours, is the focus of the next section, which deals about their determinants and their change over the life course, with a stress on gender attitudes.

At this stage of the review, however, it seems necessary to clarify that the importance of stress in this thesis comes from the consideration that negative events can deteriorate health outcomes in adult health by increasing the probability to adopting negative health behaviours. On the other hand, positive events can be stressful as well because lead to changes in roles and responsibilities that can be associated with negative/positive changes in health behaviours. Hence, the aim of this work is to investigating the association between changes in health behaviours and life events which are important just because represent extraordinary modifications of people's life. Furthermore, the importance of such events is considered in terms of age at experiencing them, and it is hypothesised that events may be related to higher risk of behaving healthier/unhealthier depending on the age when individuals encounter them. An example is represented by

cancer screening, which is considered by scholars (Demark-Wahnefried, 2005; Ganz, 2005; McBride and Ostroff, 2003; McBride *et al.*, 2008; Taylor et al., 2007) as a teachable moment for behaviour change. As argued by McBride, Emmons and Lipkus (2003: 15), teachable moments are "naturally occurring life transitions or health events thought to motivate individuals to spontaneously adopt risk-reducing health behaviours". A question spontaneously arises: is such potential motivation the same at any age at experiencing those transitions and those health events?

At this point of the literature, to look at health related behaviours id needed; the next paragraph deals with this and with the life course perspective.

2.3 Health-related behaviours and the life course perspective

Health behaviours can be defined as *personal actions that influence health, disability and mortality* by producing positive effects – such as those of *exercise, eating well, and adherence to medical regimens* – or negative effects – such as those of *smoking, excessive weight gain, and substance abuse* – on health (Umberson, Crosnoe & Reczek, 2010: 140).

In the discourse of health inequalities, they play an important role, not only as determinants of health, i.e. as a source of the social distribution of risks and benefits that determine health outcomes of individuals, but also as a result of the action of the same social differences influencing health. Research in epidemiology has really demonstrated that several disease risk factors in psychosocial, behavioural and biological terms are not equally distributed by social class (Borg and Kristensen, 2000).

Lynch, Kaplan and Salonen (1997), indeed, state that health-related behaviours are "differentially distributed by socio-economic levels" (Lynch, Kaplan and Salonen, 1997: 809), and Ross and Wu (1995) argue that the behaviours in themselves are socially defined and that smoking, drinking and exercising are related to educational differences in health. In this context, Kawachi, Subramanian and Almeida-Filho (2002) talk about the *social gradient in health behaviours* and state that the empirical findings confirm the beliefs of social determinists. This strand considers the choice of individuals to have a healthy or unhealthy attitudes as depending on "constrained and unfair circumstances, to the extent that there are early life course influences on adult health and that one's life

chances depend upon contextual factors" (Kawachi, Subramanian and Almeida-Filho , 2002: 648).

Several scholars, indeed, have both emphasised the importance of a life course approach to the study of health behaviours (Backett & Davison, 1995; Elo, 2009; Forrest & Riley, 2004; Graham, 2002; Jackson, Knight & Rafferty, 2010; Umberson, Crosnoe & Reczek, 2010) and dealt with education (Cavelaars *et al.*, 2000; Cutler & Lleras-Muney, 2010; De Walque, 2007; Huisman, Kunst & Mackenbach, 2005; Ross & Mirowsky, 1999; Ross & Wo, 1995, 1996;) and more broadly with socio-economic circumstances (Graham, 1994; Huisman, Kunst & Mackenbach, 2005; Lynch, 2006; Lynch, Kaplan & Salonen, 1997; Pomerleau *et al.*, 1997) as factors that influence them.

In the following, these research areas are discussed together, since to disentangle them is difficult given the interrelations between the determinants of health-behaviours and their varying contribution over the different stages of individuals' life courses.

According to Lynch, Kaplan and Salonen (1997), the models of behavioural and psychological change used in public health have tended to emphasise the role of individual free choices in the adoption of healthy or unhealthy behaviours, or to consider these choices as the result of the economic, historical, family, cultural and political context in which people live. For instance, by reporting results of two qualitative studies on health and illness in the social and cultural context conducted in the U.K. in the late 1980s, Backett and Davison (1995) have found that respondents related their reasoning about behaviours to their cultural appropriateness at the different life stages considered.

Therefore, not only the habits acquired in childhood influence behaviours in later life, but also the socio-cultural perspective of individuals on attitudes that can be defined healthy or unhealthy have a certain importance. As noted in Lynch, Kaplan and Salonen (1997), this happens because the context affects the choice process about health behaviours on one hand, and the types of accessible and appropriate behavioural options on the other hand; the authors, indeed, state that evidence about health related-behaviours shows that they are inversely related to socio-economic conditions.

Pomerleau *et al.* (1997), for instance, analysed four measures of socio-economic status, i.e. education, household income, source of household income and occupational prestige, in order to investigate the link between socio-economic status and health behaviours. In

particular, they used data from Ontario Health Survey (1990) and focused on selected health behaviours: smoking, fat intake, alcohol consumption and physical activity. Their findings reveal that socio-economic status and unhealthy behaviours are inversely related, with the only exception of alcohol consumption, which has been observed to be positively associated with income.

Education plays a key role in this context, so that Cutler and Lleras-Muney (2010) talk about *education gradient* in health behaviours. The importance of education is confirmed also elsewhere. In their analysis of the positive relationship between education and health, Ross and Wu (1995) indicate three sets of factors on which their theoretical framework is based, i.e. work and economic conditions, social-psychological resources and health lifestyle. As stated by the authors (Ross and Wu, 1995), the third category represents the health-related behaviours, such as smoking, exercise, drinking and health check-ups, which are considered to be positively associated with the education level of individuals.

Other factors that need to be investigated in the context of health-related behaviours are *time*, both in terms of chronological age and in terms of historical setting, and *timing*. Considering chronic diseases, Lynch and Davey Smith (2005) underscore the fact that time and timing can help to understand the causative relation between exposures and outcomes over the life course and that health-related behaviours, such as smoking, diet and physical activity, which are among adult risk factors for this kind of diseases, may have their origin in early life. This recalls the pathway model discussed above.

Furthermore, Forrest and Riley (2004) include health behaviours into the set of sources of chronic diseases and mental disorders – together with childhood environmental exposures, risk states and fully developed disorders – and argue that they are shaped in childhood and adolescence. More generally, this is also sustained by Elo (2009), while Graham (2002), by explaining the prescriptions of pathways models, indicates how the early life conditions affect health outcomes in adulthood through their effect on social trajectories: the disadvantage emerging in childhood, by reducing educational resources, influences adulthood circumstances in terms of socio-economic conditions and health-related behaviours.

The role of time is important also in the light of the fact that health behaviours are not constant over time, rather they change (Prochaska and Velicer, 1997; Umberson, Crosnoe and Reczek, 2010), and they can be modified according to the age and gender of individuals. For instance, Pomerleau *et al.* (1997) have found that unhealthy behaviours are adopted more by younger and male persons than by older and female ones. Also, "childhood, adolescence and adulthood are all potentially important stages for attempts to alter the health-related behavioural and psychosocial profiles of adults" (Lynch, Kaplan and Salonen, 1997: 818).

This is strictly related to the topics of Chapter 4 and Chapter 5, i.e. the investigation of the link between the risk to change health behaviours and the age at experiencing two life events that happen over adulthood, i.e. menopause and retirement.

In Chapter 3, instead, childbearing and marriage are considered as potential events related to behaviours change. In particular, the hypothesis that the age at marriage can be associated with changes in behaviours comes from the literature about social relationships and behaviours. Umberson, Crosnoe and Reczek (2010), for instance, focus on social relationships as a determinant of health behaviours and include this influence among the sources of demographic disparities in health. The authors (Umberson, Crosnoe and Reczek, 2010) explain how social ties, both in terms of structure (social integration and social networks) and in terms of content (social support and stress), by changing over the life course, have varying effects on health behaviours. The mechanism considered as relevant in this interaction is the double effect that they can have on health by displaying social support or stress (Umberson, Crosnoe and Reczek, 2010).

Social support, indeed, tends to help the adoption of health protecting behaviours (Ross and Wu, 1995) and this is particularly true in the context of marital relations. Umberson (1992) has found, for instance, that marital status has an effect on health behaviours and, moreover, that this influential relationship shows differences by gender. For these reasons, in the analyses conducted in Chapter 4 and Chapter 5, all models control for the relationship status of respondents.

A change in health behaviours is positive when emerges from the transition from the condition of unmarried to the condition of married, instead it is negative in the opposite transition, and women are more likely than men to control the health of others.

Therefore, in the first paper, it is hypothesised that marriage is related with positive changes in health behaviours, in particular with higher risk of smoking cessation. The effect of social ties on health behaviours, however, needs to be investigated by considering the particular life stage of individuals, since during each of them, some relationships result more important than others in the explanation of this influence and of its evolution over the life course. Indeed, "this is an intrinsically life course process in that social ties, psychosocial mechanisms, and health behaviours unfold relative to one another within and across life stages" (Umberson, Crosnoe and Reczek, 2010: 149). For this reason, in Chapter 3, the age at marriage is considered to filter the association between health behaviour changes and the event of marriage itself.

The issue of the life stages is emphasised also in the context of socio-economic status and health behaviours. Lynch, Kaplan and Salonen (1997), by analysing data from a population-based study of middle-aged men carried out in Finland in 1980, examined the association between socio-economic status in selected stages of the life course and health behaviours in adulthood. They (Lynch, Kaplan and Salonen, 1997) found that several unhealthy behaviours adopted in adulthood depended on poor childhood conditions, low education levels and blue-collar employments and that these detrimental behaviours for health were more prevalent for men whose parents were poor.

Therefore, the discourse on the pathway model as reference conceptual framework of Chapter 3 emerges again, since evidence suggests that health behaviours are shaped in childhood, but their change can happen over the life course of individuals, as related to the age when they encounter new socio-economic circumstances and/or major life events, such as childbirth and marriage.

"Perhaps, the most striking aspect of these findings is that adult behaviours and psychosocial orientations are patterned by childhood socio-economic status, and so do not provide support for the "free choice" conception of adult behaviour, because in this view adult health behaviour would be unrelated to childhood conditions" (Lynch, Kaplan and Salonen, 1997: 817).

Hence, beyond psychological and socio-economic factors, health-related behaviours need to be investigated as related to life events and to the age of individuals at their occurrence, by taking into account the factors that directly depend on the context in

which people spend their lives. In particular, apart from the social, political, cultural, economic and educational environment, that obviously affects individual possibilities and constraints, the attention needs to be focused on the temporal dimension of such context, both in terms of historical period and in terms of age when events happen over the life course.

The present review has demonstrated that stressful circumstances – intended as both positive and negative events that produce important changes in several individuals' life domains – shape health outcomes via health-related behaviours. On the other hand, life circumstances and transitions – such as passage from the condition of unmarried to the condition of married – have been found to be more important in some life stages than in other ones, thus affecting health behaviours differently on the basis of the period of life considered. By considering life events as related to changes in behaviours, this leads to formulate the following questions:

1. Is there any relationship between the occurrence of certain life events and the change(s) in health related behaviours?

2. Is there any association between the age when experiencing certain life events and the change(s) in health related behaviours?

3. Are there any differences by gender?

In particular, three life events/transitions have been selected for this thesis.

In Chapter 3, child bearing and marriage are investigated as related to the risk of quitting smoking. Both generally occur at early adulthood, but the age at experiencing them varies across individuals, and the paper asks whether such age is associated with a greater risk of stopping smoking and whether there any differences by gender.

In Chapter 4, menopause transition is analysed as associated with the risk of changing frequency of alcohol intake and physical activity engagement.

Finally, in Chapter 5, timing of retirement is examined as associated with the risk to change smoking, drinking and physical activity habits.

Chapter 3: The age at experiencing life events and quitting smoking: How do English men and women behave?

Abstract

The chapter examines the risk of quitting smoking as associated with the age at experiencing the birth of the first child and the first marriage, for a sample of male and female smokers drawn from the Life History Interview of the English Longitudinal Study of Ageing. Moreover, it investigates whether in the year when each event occurs the risk of quitting is higher compared with the other years. Event history techniques are employed. Results show that a one-year increase in the age at the birth of the first child increases the odds of quitting for both males and females, while no association has been found between the age at the first marriage and the risk of stopping smoking. However, for both genders, the odds of quitting are higher in the year of birth of the first child as well as in the year of the first marriage compared with the other years. In order to time health promotion intervention, future research should consider the whole history of partnership and childbearing of respondents, and should carry out a contextual analysis of smoking initiation.

3.1 Introduction

Smoking is one of the most serious threats to health, as it contributes to the emergence of different types of cancer (Doll *et al.*, 2005), cardiovascular diseases (Erhardt, 2009), and stroke (Peters, Huxley & Woodward, 2013).

Studies on the relationship between smoking and health outcomes report various results in terms of sex differences. For instance, it has been found that among smokers, the risk of myocardial infarction is higher for females than for males (Prescott *et al.*, 1998). On the other hand, no differences by sex have been reported neither in the risk of stroke associated with smoking, nor in the benefits in terms of stroke risk reducing deriving from quitting compared with people who have never smoked (Peters, Huxley and Woodward, 2013). In general, indeed, it has been demonstrated that stopping smoking allows people

to greatly reduce the consequent risk of lung cancer, also when quitting into middle age (Peto *et al.*, 2000).

From a public health perspective, to asking which factors shape men's and women's chances to starting and quitting smoking is needed. With regard to *starting*, it is well known that people with the lowest education and income grade are most likely to smoke (as well as to be overweight and to engage in least physical activity) (Lantz *et al*., 1998). More broadly, Marmot and Allen (2014) talk about "causes of the causes", i.e. the drivers of health behaviours and, in particular for smoking, report the existence of a social gradient detectable in several industrialised countries. With regard to *quitting*, scholars suggest that both sex and socio-economic characteristics matter: women tend to be less successful than men in stopping smoking (Perkins, 2001; Scharf and Shiffman, 2004; Sorensen and Pechacek, 1987), as well as people from lower socio-economic groups compared with those from wealthier classes (Hiscock, Judge, and Bauld, 2010; Kotz and West, 2009). Furthermore, from a psychological viewpoint, another highly discussed factor is stress, which has been found to be associated with the smoking behaviour of both adolescents (Booker *et al.,* 2004; Byrne, Byrne and Reinhart, 1995; Byrne and Mazanov, 2001) and adults (Ng and Jeffery, 2003).

The present chapter focuses on quitting smoking, and investigates factors that cross both psychological and socio-economic individual circumstances. Specifically, it examines the age at experiencing two life events, i.e. the birth of the first child and the first marriage, as associated with the risk of giving up smoking. It has been hypothesised that such events, by affecting different life domains, may force individuals to cope with new (un)expected roles and may be related to their attitude towards health and life style, thus facing the issue of keeping/stopping smoking. In particular, the expectation is that the age when people experience the birth of the first child and the first marriage is associated with a change into the risk of quitting and, also, that such association varies by gender and across birth cohorts.

3.2 Empirical and theoretical background and aim of the study

The models of health behaviours that have been used in public health differ according to the idea that the choice to adopting healthy or unhealthy behaviours is free or depends

on the economic, historical, family, cultural and political context in which people live (Lynch, Kaplan and Salonen, 1997). As noted in Schooling and Kuh (2002), while health psychologists focus on "individual characteristics (such as personal attitudes, feelings, knowledge, and beliefs)", sociologists, anthropologists and social epidemiologists focus on the influence of "social context" by emphasising the importance of "socioeconomic differences in adult lifestyle as measured by social class, educational level or income". (Schooling and Kuh, 2002: 281).

About thirty years ago, in their review of studies about the Health Belief Model – which stems from psychosocial disciplines and links health-related behaviours of individuals to their attitudes and beliefs – Janz and Becker (1984) observed that, although there was significant empirical support for the model, other factors needed to be taken into account:

1. behaviours such as smoking imply the presence of habit as an element going beyond the classical psychosocial decision-making process;
2. some health behaviours depend on "nonhealth" reasons, e.g. "stopping smoking or jogging to attain social approval" (Janz and Becker, 1984: 44)*;*
3. the environment as well as the economic conditions may limit individuals' comportments.

3.2.1 The importance of social context

In the literature, scholars drew attention to the importance of the social context by emphasising the indirect relationship between health-related behaviours and socio-economic status (Lantz *et al.*, 1998; Lantz *et al.,* 2001; Lynch, Kaplan and Salonen, 1997; Pomerleau *et al.*, 1997; Power *et al.*, 2005), the role of education in shaping behaviours (Cutler and LLeras-Muney, 2010; Lynch, 2006; Ross and Wu, 1996), and the differences by gender (Lundborg and Andersson, 2008; Waldron, 1991). For instance, Lundborg and Andersson (2008) have tested the perception of both the mortality risk associated with smoking and the addictiveness of such behaviour in a sample of individuals aged 15-18 by a gender perspective, and have found that, among females, while mortality perception was higher, addictiveness was lower.

The positive link between lower socio-economic status and higher smoking rates was not demonstrated up to the 1960s (Link and Phelan, 1995) and was confirmed by various studies (Stronks *et al.*, 1997; Wardle and Steptoe, 2003). Factors such as education, however, account not only for smoking rates; rather, they seem to affect smoking behaviour on two sides. De Walque (2007), for instance, has found that the higher the educational level, the lower the risk of smoking and, among smokers, those who have higher education are more likely to give up. This may be explained in terms of awareness of the health risks faced with consuming tobacco, as individuals with a higher educational level and income have been found to be more aware of such risks (Siahpush *et al*., 2006). Nonetheless, other studies (Cavelaars *et al*., 2000; Huisman, Kunst and Mackenbach, 2005) have shown that the positive association between smoking and education is not always confirmed and seems to reflect differences by country, age and gender.

If we consider that the most part of smokers belong to the lowest socio-economic and educational classes and that those being more likely to give up are the richest and the most educated, we may ask whether there are any differences into the chances of quitting *within the cluster of smokers*, beyond their socio-economic and educational level, i.e. whether the link between smoking behaviour and socio-economic level is driven by other factors. Some scholars, for instance, have suggested that such a link depends on factors like minor social support (Hiscock et al., 2012).

3.2.2 The role of gender

Also gender differences in quitting smoking can be read in these terms. In a study on smoking cessation, Bjornson *et al.* (1995), for example, have found that women faced more difficulties than men when it came to quitting. This result was explained by taking into account other variables beyond gender, such as demographic factors and smoking histories. In particular, for both genders, the individuals who were more educated, older, married, and who had tried longer stopping smoking in the past, were more likely to be sustained non-smokers. The authors (Bjornson *et al.*, 1995) suggest that since women in the sample were less educated, received a lower social support (as represented by a lower probability to be married and a higher likelihood to live with smoking partners) and had not tried for as long to quit in comparison to men, were less likely to quit. However, among individuals with less than a high school education, women were less likely to stop

smoking compared to men (Bjornson *et al.*, 1995). Similar results were found by Osler *et al.* (1999), who confirmed the lower probability of quitting for women than for men, and the positive relationship between education and stopping smoking in the female group. Hence, in some cases, gender may be a filter of the different educational level attained as affecting the risk of stopping smoking, and this matters above all when age is considered as well. For instance, in a study on adult smokers in Great Britain (Jarvis, 1994), it was found that gender differences in quitting smoking were associated with age, i.e. among the young, females presented higher cessation rates than males, while in the group of middle-aged individuals, the opposite was observed. This may lead to ask whether events that usually happen over the young or early adult stages of life, such as marriage and childbearing, are related to the chances of quitting smoking more for women than for men as women are more responsive to them than men are.

Elsewhere (Pirie, Murray & Luepker, 1991), the gender pattern of smoking cessation has been contradicted by showing that both the attempts to stopping smoking and successful stopping are equally common among male and female young adults. Furthermore, other factors that may be related to the risk of stopping have been investigated. Van Loon *et al.* (2005), for example, have found that for both sexes, individuals with a higher probability of quitting were married, older and smoked more cigarettes per day. The importance of socio-demographic factors, such as social class, social support and marital status for smoking cessation has been demonstrated also elsewhere (Chandola, Head and Bartley, 2004). In particular, a study on a Finnish prospective twin dataset (Broms *et al.*, 2004) has showed that quitting smoking was predicted by high education for both sexes and by high social class for females, and that in the male group, marriage was associated with an increased likelihood of stopping. The association between marriage and stopping smoking has been revealed also excluding other sociodemographic factors and with no particular differences by gender (Franks, Pienta and Wray, 2002). Monden, de Graaf and Kraaykamp (2003) have demonstrated that for individuals living with a partner who smoked in the past, the probability of quitting smoking is five times that of individuals who are single and two times that of individuals who live with a never-smoker partner. Indeed, the presence of other people who smoke in the same household has been found to affect individual smoking behaviour (Jones, 1994).

The importance of being married – or at least of having a partner – in this context, leads to ask whether the age when individuals get married matters in terms of risk of stopping smoking as associated with such an event, and whether it varies by gender and across birth cohorts.More broadly, gender differences in smoking cessation have been found also in the analysis of other factors considered to affect smoking behaviour, i.e. stressful life events. In a study by McKee *et al.* (2003), women have been found to be more likely than men to keeping smoking when experiencing negative financial events, less likely than men to stopping when experiencing a negative health event, and overall the negative effect of such events on the probability of quitting smoking has been found to be greater for women than for men.

3.2.3 Life events and age

Apart from gender differences, smoking rates are higher among people who have experienced a traumatic event (Feldner, Babson and Zvolensky, 2007). Montgomery *et al.* (1998), for instance, have found that men who have had experience of unemployment have a higher likelihood to smoke, and that those who have spent more time in unemployment are less likely to quitting.

However, life circumstances in general have been investigated as influencing health behaviours. For instance, pregnancy has been indicated as a good opportunity for quitting smoking, given the favourable effects of stopping on the health of both the mother and the child (Fingerhut, Kleinman and Kendrick, 1990). It has been also found that divorced and separated people tend to have lower stopping smoking rates compared to married, single or widowed people, and this has been suggested to depend on the shortage of social support or on other factors associated to the probability of getting divorced (Kabat and Wynder, 1987).

To considering life events – having the first child and getting married, in particular – as associated with the probability of quitting/keeping smoking, raises questions about the existence of other mediating factors related to such events. Specifically, to experience an event at an earlier/later age may play a role in this context. A longitudinal study on smoking by McGee and Williams (2006) has shown that becoming mother at an age lower than 21 is positively associated with the likelihood of daily smoking at baseline. Moreover, a younger age at the first child birth is associated with persistent smoking at

follow-up (McGee and Williams, 2006). Graham, Hawkins and Law (2010), have investigated the influence of life course on smoking behaviour before pregnancy and on quitting in pregnancy in the Millennium Cohort Study (MCS), and found that younger age at the first child birth and an experience of lone-motherhood are associated with higher risk of being a smoker before pregnancy. However, early motherhood has been found to increase the odds of quitting smoking in pregnancy (Graham, Hawkins and Law, 2010).

As noted in McGee and Williams (2006), the topic of becoming mother at a young age as associated with smoking behaviour is not very popular among scholars. However, the authors (McGee and Williams, 2006) suggest explaining such relation in terms of experiencing motherhood without a partner. Indeed, it has been shown that lone mothers have higher odds of smoking compared to mothers who have a partner (Siahpush, 2004). A study on Australian women by Bell and Lee (2006) has found that among mothers, those reporting to be current smokers had become mothers at younger ages compared with ex-smokers. The same work, however, has not shown an association between age at first marriage and smoking behaviour (Bell and Lee, 2006). A study by Weden and Kimbro (2007), instead, has found that the association between the timing of family formation and changes in health-related behaviours is shaped by factors such as race and ethnicity. Indeed, results show that white people getting married at younger age exhibit a lower likelihood of quitting smoking, while Whites marrying on time as well as Blacks and Hispanics marrying at all ages are more likely to quit (Weden and Kimbro, 2007).

Therefore, broadly speaking, literature suggests that the timing of events such as pregnancy and marriage is related to smoking behaviour and acts as a mediating factor that, in turn, mediates other factors as well, such as the experience of poor socio-economic conditions – e.g. lone-motherhood – or racial and cultural backgrounds. This leads to deepen the topic of smoking as related to life events and to take into account the age at experiencing such events in order to detect potential associations with quitting. Hence, the present chapter aims at analysing not just the effect of the occurrence of specific life events, such as pregnancy, childbearing, marriage, divorce, partner's death, on smoking behaviour, but the association between the risk of quitting and the age at experiencing such events. Some studies, for instance, show that the age when individuals start smoking matters: the likelihood of stopping is lower for individuals who have started

in early life compared to those who have started later (Breslau and Peterson, 1996;.Khuder, Dayal & Mutgi, 1999). Further, it has been found that heavier smokers are more likely to quitting among older individuals than among younger (Coambs, Li and Kozlowski, 1992).This leads to ask whether the probability of stopping smoking may be related not only to socio-demographic factors – such as gender, birth cohort, education, economic circumstances and childhood origins – and to positive and negative life events, but also to the age at experiencing such events, and, if this is the case, whether this relationship is positive or negative.

In particular, the chapter considers two life events, i.e. birth of the first child and first marriage. Given the existing literature, both are supposed to be positively associated to the risk of stopping smoking. The paper adds to this literature by verifying whether such expectations vary depending on the age when individuals experience the events.

3.2.4 Aim of the study and hypotheses

The following research questions are addressed:

1. Is there any association between the age when individuals experience the birth of the first child and the first marriage and their risk of quitting smoking? If yes, is it positive or negative?

2. Is the risk of quitting lower or higher in the year when these events happen?

3. Are there any differences by gender?

Moreover, the following hypotheses are tested:

1. Age at birth of the first child is expected to be associated with the risk of stopping smoking in particular for women, i.e. an older age at becoming mother may increase the risk of quitting – given a higher potential awareness of smoking-related risks and lower stress levels due to the lower likelihood of lone-motherhood.
2. As for the first marriage, it is hypothesised that the age at this event is not related to the probability of quitting and that other factors, such as the presence of a smoking partner in the household, may matter.
3. However, a higher lower risk of quitting is expected in the year of the first marriage since the union formation may act a stimulus to quit, maybe because both partners

smoke, or as a deterrent to keep smoking (maybe because the non-smoking partner pushes for quitting).

4. Compared to the other years, women are expected to be more likely to quit smoking in the year of birth of the first child, given the experience of pregnancy, which should lead them to behave healthier. No differences by gender are expected in relation to the year of the first marriage.

3.3 Data and Methods

The paper uses data from the third wave of English Longitudinal Study of Ageing (ELSA). This wave contains the Life History Interview, which is needed to reconstruct the smoking history along with other personal histories of respondents.

ELSA[1] provides information on people aged 50 and over. Such respondents were extracted from the households of the sample who took part to the Health Survey for England (HSE) between 1998 and 2004. ELSA started in 2002 and eight waves have been collected so far. As for the Life History Interview[2], it was conducted in 2007 and was designed to gather information on the retrospective histories of the eligible members about topics such as employment, individual health, family and fertility histories. In order to help respondents to remember the events happened over their life, the so called Life History Calendar was used; it allowed seeing together both personal and external events and facilitated the reminiscence of their timing.

The Life History Interview, not only provides information on several life domains, such as fertility, health and partnership, but also reports the exact year when particular life events happened over the respondent's life course. This is particularly useful in the context of this chapter, since to know the timing of the selected life events allows calculating respondents' age at experiencing them as related to the probability to stopping smoking

[1] https://www.elsa-project.ac.uk/

[2] Information on ELSA and Life History Interview can be found in Ward *et al*. (2009).

It needs to be noted that, in this chapter, the dataset provided by the Life History Interview has been merged with the main dataset of ELSA-Wave 3 and with another dataset containing derived variables of the same wave.

Considering that the Life History Interview took place in 2007, only people born in 1957 and before are considered, in order to focus on individuals aged 50 and over. Since in the original dataset, the year of birth is collapsed for 65 respondents aged 91 or more, in the chapter, these individuals are assumed to be born in 1915. At this step, the sample numbers 6,766 respondents: 3,119 males and 3,647 females.

In order to investigate the association between the timing of life events and the probability of quitting smoking, event history analysis is used. In the Life history Interview, smoking initiation, cessation and duration, and the occurrence of the events are all measured in years, rather than in months or weeks or days. As a result, a discrete-time hazard model is employed to evaluate the probability of stopping smoking.

In such a method, two concepts are of extreme importance, i.e. the "*risk set*, which is the set of individuals who are at risk of event occurrence at each point in time*"*, and the "*hazard rate"*, which is "the conditional probability that an event will occur at a particular time to a particular individual, given that the individual is at risk at that time" (Allison, 2014: 8).

Specifically, the *discrete-time hazard is the conditional probability that the event occurs at time t, given that it has not yet occurred* (Rabe-Hesketh & Skrondal, 2012: 750):

$$h_t \equiv \Pr(T = t | T > t - 1) = \Pr(T = t | T \geq t) \quad (1)$$

In the present analysis, the risk set is represented by the individuals who are at risk of stopping smoking. Hence, only those reporting they have ever smoked cigarettes are included in the sample. Further selections concern:

- the individuals reporting the *year when they started smoking daily* among the group of those who have ever smoked – this information is needed to reconstruct the smoking history of respondents, by recording *when* they started smoking, i.e. when smoking became an habit;
- the individuals reporting the *year when smoked the last cigarette*, among those who stopped smoking.

As a result, the sample numbers 3,865 individuals (2,036 males and 1,829 females). At the interview date, 2,926 respondents (1,606 males and 1,320 females) had stopped smoking and 939 (430 males and 509 females) still smoked. In the sample, smoking duration ranges from a minimum of 1 year to a maximum of 76 years.

Dependent variable

The hazard rate is the probability of quitting smoking, given that the respondent has not stopped already at any given point in time. As specified in Allison (2014), the hazard is the dependent variable in the model. In the present analysis, such a variable is constructed as a dummy that takes the values of 1 in the year when the individual stops smoking and the value of 0 in each year of observation when stopping does not happen.

In particular[3], by denoting the hazard by P(t) and by considering only two explanatory variables, i.e. x_1, which is a time-constant variable, and $x_2(t)$, which is a time-varying variable, P(t) could be written as a linear function of x_1 and $x_2(t)$:

$$P(t) = b_0 + b_1 x_1 + b_2 x_2(t) \quad (2)$$

for $t = 1, \dots, 10$.

By applying a logit transformation of P(t), we obtain:

$$log\left(\frac{P(t)}{1-P(t)}\right) = b_0 + b_1 x_1 + b_2 x_2(t) \quad (3)$$

The equation in (3) is a logistic regression model, where b_0 is the intercept and *the coefficients* b_1 *and* b_2 *express the change in the logit (log-odds) for each one-unit increase in* x_1 *and* x_2 *respectively* (Allison, 2014: 10).

Covariates

Time constant variables are sex, birth cohort, socio-economic class at childhood, education, and individuals' age at the occurrence of each selected event.

Since the minimum legal age of smoking tobacco in the UK was 16 up to the 2007 and respondents into the sample were born between 1915 and 1957, in order to consider people who were aged 16 respectively before the Second World War, over and after the

[3] The specification of the model is drawn from Allison (2014).

Second World War, before the 1960s, and over and the 1960s, four birth cohorts have been created, i.e.:

- 1915-1923 (respondents of this cohort were 16 between 1931 and 1939);
- 1924-1935 (respondents of this cohort were 16 between 1940 and 1951);
- 1936-1944 (respondents of this cohort were 16 between 1952 and 1960);
- 1945-1957 (respondents of this cohort were 16 between 1961 and 1973).

Socio-economic class of origin has been constructed by considering the variable about the occupation of the parent/main carer when the respondent was 14. By following the guide lines of Rose, Pevalin and O'Reilly (2005), the 16 occupational categories provided by the main questionnaire have been grouped into 5 broader classes, i.e. Managerial and professional, Intermediate, Routine and manual, Other, and Non-employed.

As for educational groups[4], the classes provided by the main questionnaire are gathered into 4 broad levels, i.e. “No Qualification”, “Low Education” (that contains nvq1/cse, nvq2/gce and nvq3/gce), “Medium-High Education” (that includes higher education and below) and Higher Education (that comprises nvq4/nvq5/degree). Moreover, 406 individuals who have achieved an education attainment abroad are excluded from the analysis, since the level is not specified and this does not allow including them in one of the education classes constructed.

Time-varying variables are the year of birth of the first child and the year of the first marriage. These variables are constructed as dichotomous responses that are coded 1 if the event occurred in that year and 0 if it did not occur. Another variable, which represents the time since the individual started smoking, is “t”. It takes the value 1 in the year when the individual starts smoking daily, 2 in the second year, 3 in the third and so on up to the last year of observation, i.e. when cessation occurs.

Models

In order to emphasise the importance of each single event and to avoid the presence of collinearity between the age at birth of the first child and the age at first marriage, two

[4] Information about education levels in the UK can be found at https://www.gov.uk/what-different-qualification-levels-mean/list-of-qualification-levels

different models are estimated, one for the event “birth of the first child” and one for the event “first marriage”. Both models are constructed for males and females separately and control for:

- demographics, i.e. education , birth cohort, socio-economic class of origin;
- the time-constant variable that indicates the age of the respondents at the occurrence of the events, i.e. age at the birth of the first child and age at the first marriage;
- the dummy variable that indicates when the events happened, i.e. year of birth of the first child and year of first marriage. In particular, these variables are coded 1 in the year of the event and 0 in the other years;
- the time-varying variable t, which is the time since the individuals started smoking up to when they stopped, i.e. it takes the value “1” during the year when the respondent says he/she started smoking, the value “2” in the following year, and so on by increasing up to the last year of observation, which is when the respondent says he/she quitted.

Stata SE-13 is used to conduct the analysis.

Observations on the analysis

At this point of the chapter, some observations on the analysis and on the rational relative to the sample selection are needed.

As a first step, only individuals reporting to have ever smoked have been chosen (since the risk of quitting smoking can be calculated for smoking people only) regardless they quitted or did not quit at some point in their life, i.e. regardless they had already quitted at the time of the interview.

In the chapter, the time of data collection does not coincide with the start of the observation period. Respondents were interviewed in 2007 and gave information about their life, events, behaviours relative to their present and their past. Therefore, by selecting current and ex-smokers, the year when they started smoking has been set as the beginning of the observation period. This means that such period has a different duration for respondents depending on whether and when they quitted. For instance, as noted above, smoking duration ranges from a minimum of 1 year to a maximum of 76 years, i.e.

one of more respondents smoked for one year only and one or more respondents smoked for 76 years, i.e. did not stop smoking up to the end of the observation period (but we cannot say that for them quitting will never happen in the future).

Further, since the interest is in the age at experiencing the first child birth and the first marriage, only respondents who have at least one child and who have ever been married at the time of the interview are selected for the analysis.

3.4 Results

Characteristics of the sample

Table I and Table II provide descriptive data about the sample of respondents who have ever smoked and the sample of individuals who quitted respectively. Characteristics of the sample as a whole are presented in the Appendix A (Table XX).

After data cleaning, there are 3,865 respondents aged 50-92 who reported they started smoking at any time in their life. The female percentage (47.32) is lower than the male one (52.68). Most respondents have low education (34.2%), although, among females, the most participated class of education is “No Education” (40.35%).

The highest percentages of the overall population are included in the birth cohort “1945-1957” (42.46%) and into the “Routine and manual occupations” socio-economic class at childhood (40.91%).

Respondents who stopped smoking and reported the year when they smoked the last cigarette are 2,926 (that is about the 75.7% of the sample), of whom 54.89% are males and 45.11% are females (Table II).

Table I - Sample's characteristics – respondents who have ever smoked

Respondents who have ever smoked: 3,865 individuals (2,036 males and 1,829 females)			
	Overall	**Males**	**Females**
Education (%)			
No Education	33.12	26.62	40.35
Low Education	34.20	34.33	34.06
Medium Education	16.04	19.25	12.47
High Education	16.64	19.79	13.12
Birth cohort (%)			
1915-1923	6.99	6.63	7.38
1924-1935	25.55	26.52	22.36
1936-1944	26.00	27.90	23.89
1945-1957	42.46	38.95	46.36
Socio-economic class of origin (%)			
Managerial and professional occupations	7.30	6.43	8.26
Intermediate occupations	26.13	25.39	26.95
Routine and manual occupations	40.91	41.60	40.13
Other	22.20	23.43	20.83
Non-employed	3.47	3.14	3.83

Table II - Sample's characteristics – respondents who stopped smoking

Respondents who stopped smoking: 2,926 individuals (1,606 males and 1,320 females)			
	Overall	**Males**	**Females**
Education (%)			
No Education	30.83	24.72	38.26
Low Education	33.56	33.62	33.48
Medium Education	17.02	19.99	13.41
High Education	18.59	21.67	14.85
Birth cohort (%)			
1915-1923	8.68	7.91	9.62
1924-1935	26.76	29.27	23.71
1936-1944	26.38	27.21	25.38
1945-1957	38.17	35.62	41.29
Socio-economic class of origin (%)			
Managerial and professional occupations	7.93	6.85	9.24
Intermediate occupations	27.85	27.02	28.86
Routine and manual occupations	39.71	40.47	38.79
Other	21.36	22.91	19.47
Non-employed	3.14	2.74	3.64

Table III and Table IV show the median age at selected life events of respondents who have ever smoked and of respondents who stopped smoking, respectively (in the Appendix A - Table XXI - data on the sample as a whole are presented).

The median age at starting smoking is 17 in both samples. The median age at quitting for those who quitted, instead, is 41.

Overall, the median age at first marriage (23) is lower than the median age at first child birth (25) for both men (24 versus 27) and women (22 versus 24). However, the median age of females at both the events is lower than the male one. This is seen into the sub sample of individuals who stopped smoking as well.

Table III - Median age at selected life events by sex – respondents who have ever smoked

Respondents who have ever smoked: 3,865 individuals (2,036 males and 1,829 females)			
	Overall	Males	Females
Median age at first child birth	25	27	24
Median age at first marriage	23	24	22
Median age at started smoking	17	16	17

Table IV - Median age at selected life events by sex – respondents who stopped smoking

Respondents who stopped smoking: 2,926 individuals (1,606 males and 1,320 females)			
	Overall	Males	Females
Median age at first child birth	26	27	25
Median age at first marriage	23	24	22
Median age at started smoking	17	17	18
Median age at stopped smoking	41	41	41

Table V shows the median age at which individuals stopped smoking by demographic characteristics. In the overall population and for both sexes, the higher the educational level, the lower the median age at stopping smoking. Further, the median age at quitting is higher for the least recent birth cohorts in all the three groups of respondents, i.e. overall, males and females. As for socio-economic class at childhood, the lowest median age at giving up smoking is seen for "Intermediate occupations" and the highest for "Non-employed" (into the overall population and into the male group) and for "Other" (into the female group).

Table V - Median age at stopping smoking by demographic characteristics

Respondents who stopped smoking: 2,926 individuals (1,606 males and 1,320 females)			
	Overall	Males	females
Median age at quitting smoking by:			
Education			
No Education	46	46	47
Low Education	40	41	40
Medium Education	38	38	38
High Education	36	37	34.5
Birth cohort			
1915-1923	50	49	50
1924-1935	47	46	48
1936-1944	42	40	44
1945-1957	35	36	33
Socio-economic class of origin			
Managerial and professional occupations	41	43	40
Intermediate occupations	38	39	36
Routine and manual occupations	41	40	42
Other	44	43	47
Non-employed	45	47	44.5

Probability of keeping smoking

Figure 3 shows the probability of survival S(t)=Pr(T>t)., i.e. to keeping smoking, past a specified time (Kleinbaum and Klein, 2012) for the sample of individuals who stopped smoking. In this case, since the maximum duration of smoking is 76 years, the time ranges from 0 to 76, and the survival function is a decreasing step function, which begins at S(t)=1, at t=0 and heads downward toward zero as t increases toward 76. The probability of keeping smoking for males is higher than females up to roughly "past 18-20 years". From this point, the probability of failing (i.e. of quitting smoking) is higher for men than for women.

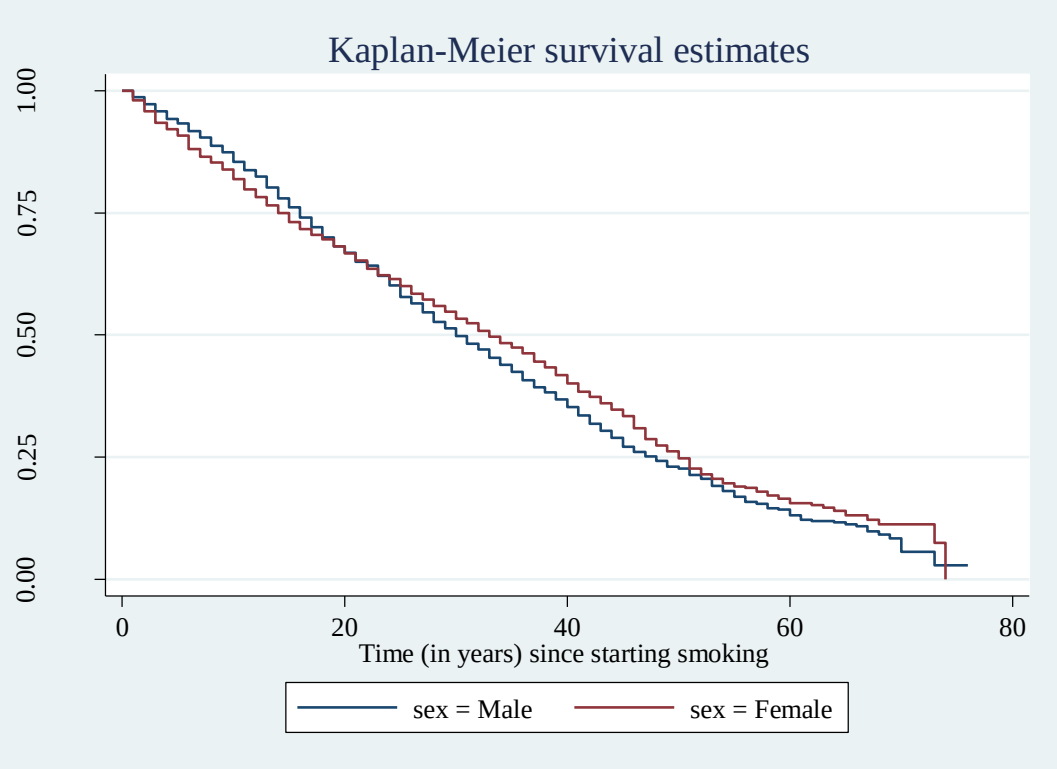

Figure 3 Kaplan-Meier survival estimates by sex

Results from the discrete-time hazard model

In Table VI and Table VII, results from the discrete time hazard models studying the hazard of quitting smoking as associated with the birth of the first child and the first marriage respectively (as well as with other covariates) are reported. The reference sample includes men and women who have reported to have ever smoked, since the interest is in respondents who are at risk of quitting.

Table VI - Quitting smoking hazard – Males and Females (also controlling for age at and year of the birth of the first child)

Independent variable	Hazard of quitting			
	Males*		Females**	
	Odds Ratio	p-value	Odds Ratio	p-value
Education				
No Education (ref.)				
Low Education	1.29	0.00	1.23	0.00
Medium Education	1.54	0.00	1.27	0.02
High Education	1.98	0.00	1.59	0.00
Birth cohort				
1915-1923	0.95	0.61	0.98	0.86
1924-1935	0.87	0.04	0.76	0.00
1936-1944	0.92	0.23	0.93	0.31
1945-1957 (ref.)				
Socio-economic class of origin				
Managerial and professional occupations	1.10	0.37	1.26	0.05
Intermediate occupations	1.16	0.03	1.23	0.01
Routine and manual occup. (ref.)				
Other	1.04	0.62	0.88	0.11
Non-employed	0.82	0.23	1.00	0.99
Age at the birth of the first child	1.02	0.00	1.03	0.00
Year of birth of the first child (ref. 0)	1.52	0.01	1.75	0.00
t	1.03	0.00	1.02	0.00

*N. of observations=54071; ** N. of observations=49000

Table VII - Quitting smoking hazard – Males and Females (also controlling for age at and year of the first marriage)

Independent variable	Hazard of quitting			
	Males*		Females**	
	Odds Ratio	p-value	Odds Ratio	p-value
Education				
No Education (ref.)				
Low Education	1.28	0.00	1.23	0.00
Medium Education	1.60	0.00	1.39	0.00
High Education	1.98	0.00	1.82	0.00
Birth cohort				
1915-1923	0.95	0.64	1.12	0.30
1924-1935	0.88	0.05	0.78	0.00
1936-1944	0.92	0.22	0.93	0.31
1945-1957 (ref.)				
Socio-economic class of origin				
Managerial and professional occupations	1.13	0.22	1.29	0.02
Intermediate occupations	1.17	0.03	1.25	0.00
Routine and manual occup. (ref.)				
Other	1.02	0.72	0.88	0.09
Non-employed	0.78	0.16	0.94	0.70
Age at first marriage	1.01	0.15	1.01	0.15
Year of first marriage (ref. 0)	1.51	0.01	2.05	0.00
t	1.03	0.00	1.02	0.00

* N. of observations=57229; ** N. of observations=51763

For both males and females, results confirm the findings of most of the literature about the positive link between education and smoking cessation, i.e. the likelihood of stopping smoking increases with the education attainment. Indeed, into both models, the variable measuring education is significant with odd ratios>1; moreover, the highest odd ratios are observable for the highest educational levels. Birth cohort does not seem to be related to the risk of quitting smoking of either sex. Only the cohort born in 1924-1935 appears to be less likely to quitting compared to the reference category (1945-1957). In particular, for females, this is observed both into the model on birth of the first child (Table VI) and into the model on first marriage (Table VII), while for males, into the first one only.

For both males and females, the difference by socio-economic class of origin is detectable for “Intermediate occupations”, i.e. individuals from this class seem to be more likely to stop smoking compared to those from the reference category (“Routine and manual occupations”). This may be related to the existence of a social gradient in smoking cessation, on the basis of which, wealthier people, as above, have more consciousness of the health risks depending on smoking and transfer this knowledge to their children so conditioning their health behaviours as adults. Moreover, this is also linked to the expectation that socio-economic conditions at childhood affect health behaviours later in life.

Further, for both men and women, the higher the number of years since starting smoking the higher the chance to stop compared to keep; in particular, for one year-increase in t, the odds of quitting increase by a factor of 1.03 for males and 1.02 for females.

By looking at the first model (Table VI), results show that the hypothesis about a potential relationship between quitting smoking and the age at birth of the first child is confirmed. Indeed, for both sexes, a one year-increase in the age at birth of the first child increases the odds of stopping smoking than keeping by a factor of 1.02 for males and 1.03 for females. Also, results show the odds of quitting are higher in the year of birth of the first child compared with the other years (OR= 1.52 for males, OR=1.75 for females).

The hypothesis about a link between the probability of stopping smoking and the age at and the year of the first marriage, instead, is not completely verified. While the age at first marriage is not significant for either sex, the year of the first marriage is significant

for both (Table VII). In particular, in this year, the odds of stopping are higher than in the other years (1.51 for males and 2.05 for females).

3.5 Discussion

The current study has addressed the following three main research questions:

1. Is there any association between the age when individuals experience the birth of the first child and the first marriage and their risk of quitting smoking? If yes, is it positive or negative?

2. Is the risk of quitting lower or higher in the year when these events happen?

3. Are there any differences by gender?

Two models have been estimated to study the two single events and both have been carried out separately for men and women. As for the birth of the first child, results suggest that higher the age at this event higher the odds of quitting than keeping smoking for both males and females. Moreover, the odds of quitting compared to keeping in the year of birth of the first child are higher compared with the other years for both genders.

Childbearing is a "female fact" and, as such, it should be an experience more important for women than for men in terms of changes into several life domains, above in the context of health related behaviours, which through the mother directly affect the child's safety. Indeed, this issue in the literature tends to be investigated by focusing on women and pregnancy (DiClemente, Dolan-Mullen and Windsor, 2000; Ebrahim *et al.*, 2000; Stotts *et al.*, 1996). However, results in this paper suggest that childbirth is also important for men. Their chances to quitting smoking, indeed, just like women's, seem to be associated with the birth of the first child, both in terms of age when experiencing the birth of the child and in terms of year when such an event happens.

Though, more broadly, it is important to note that in this chapter, the event taken into account is the birth of the first child, which is different from pregnancy. Unfortunately, data does not allow to calculate the exact month when pregnancies started so it is not possible to identify whether the year of birth of the child and the year of the pregnancy are the same. It may be that pregnancy covers two consecutive years so that the year of birth coincides with the second one. With more precise information about dates, it may

be possible to find that for women, the period of pregnancy and the period before – if the pregnancy itself is a "plan" rather than un unexpected event – are more important in terms of relationship with the probability of quitting smoking than the year of birth of the child.

Furthermore, scholars emphasise the fact that women who smoke before pregnancy and quit during it, tend to resume shortly after the birth of their children (Colman and Joyce, 2003; Fingerhut, Kleinman and Kendrick, 1990; McBride and Pirie, 1990). This cannot be confirmed nor contradicted by this analysis since the dependent variable indicating quitting smoking denotes permanent cessation. Therefore, the sample does not include people who report the exact periods of their life when stopped smoking and then restarted. This retrospective dataset does not provide the full smoking history of respondents and it does not allow comparing women who enduringly stopped smoking with those who stopped and restarted in the following years.

As for the first marriage, for both males and females, the age at experiencing such event is not associated with the risk of quitting smoking. Nonetheless, in the year when the first marriage occurs, for both men and women, the odds of quitting than keeping smoking are higher than in the other years.

In the literature about marriage, different results on partners' influence on smoking behaviours have been shown. On one hand, it has been found that the partner's smoking status affects smoking behaviour of married couples, above all in terms of relapse and especially women tend to be influenced by their husbands (Homish and Leonard, 2005). On the other hand, an association between being married/cohabiting and successful smoking cessation has been found for males (Tillgren *et al.*, 1996).

Apart from gender differences, however, it has been identified a link between smoking quitting of married individuals of both genders, and this has been suggested to depend on different factors, such as the support for changing behaviour (Franks, Pienta, and Wray, 2002). Elsewhere (Osler and Prescott, 1998), instead, successful quitting has been found to be associated with the presence of a non-smoking partner (spouse or cohabitant).

The present study only tells that the year when the first marriage happens is positively associated with the risk of stopping smoking. But it does not allow formulating hypotheses about the reasons why men and women tend to be more likely to quitting

smoking than to keeping in the year of their first marriage compared with the other years. Indeed, the individual analysis does not give any information on partner's smoking behaviour, thus not allowing assuming potential interactions about smoking cessation within the couple.

Moreover, it may be suggested that the whole partnership histories of both males and females would help to disentangle the events over the life course and test whether subsequent union formations or dissolution matter. It may be found that the age at the second cohabitation or marriage is more important in terms of smoking cessation than the age at the first one, as well as the age at union dissolution, i.e. divorce or partner's death. In the year of divorce, for instance, other union formations may happen; this is possible, given that the divorce happens sometime later the real union dissolution, and in the meantime, other romantic relationships may start as well as other children may be born.

It needs to be noted that the original idea for this chapter was to including "cohabitation", "first divorce" and "first partner's death" as events related with the hazard of quitting smoking on the basis of the age when respondents experienced them. Unfortunately, the dataset provides a very low number of cases to be analysed. In particular, roughly the 80% of respondents cohabited and got married during the same year, hence, marriage has been preferred as event compared to cohabitation. In regards to divorce, there are too many missing values for the variable about the age at this event as well as about the year when it happened. The same is observed for the age at and the year of first partner's death. This depends above all on the fact that the dataset from the Life History Interview is used instead of the general ELSA dataset; therefore, no other participants at follow-up can be added to the study.

Since it has not been possible to investigate other life events as associated with the risk of stopping smoking, some research tracks appear fascinating for future studies. For instance, it has been found that while living with others is one of the predictors of stopping smoking, to having experienced health problems in the past is one of the predictors of the intention of giving up (Abdullah et al., 2006). This might lead to ask whether also the health problems of the partner may induce individuals to improve their health behaviours, and thus to quitting smoking if they do smoke. This may suggest that a tremendous event such as partner's death may be the occasion to think about own

health. McBride, Emmons and Lipkus (2003), for instance, have proposed a heuristic model on teachable moments – i.e. health or life vents supposed to affect positively changes in health behaviours – and have suggested three circumstances for which a cue event may be defined as a teachable moment for smoking cessation: it increases the perception of the risk, causes an emotional response and redefines the individual social role. By this perspective, the death of own partner may be considered a sort of teachable moment, i.e. an overwhelm event that leads to stopping smoking instead of a stressful event that increases the risk of keeping. Such rationale directly leads to the question about the age at experiencing the partner's death. Does it matter? However, this has not been tested in this paper, since a small part of the sample has experienced the death of the own partner, and no information on the reasons of such death (e.g. health issues, accidents…) is provided, neither on other factors that may interact with the probability of stopping smoking for women and for men who experience such an event.

3.6 Conclusion

The purpose of this chapter was to investigate the link between the risk of stopping smoking and the age at experiencing first child birth and first marriage and the year when such events happen.

The choice of these two events depends on the following rationale. The birth of a child and marriage are well studied in the literature as positively affecting health behaviours change. The former thanks to the awareness of the benefits in terms of child's health, while the latter because of social support. The aim of the analysis was to verify whether such positive relationship is always confirmed or whether the *timing* in terms of *age at experiencing them* and *year of occurrence* matters as well.

Results suggest that for both sexes, the age at birth of the first child is positively associated with the risk of stopping smoking, while the age at first marriage is not. Hence, the first hypothesis about the relation between the age at and the year of the birth of the first child for women is partially confirmed, since such relation exists for men as well.

Also the second hypothesis is confirmed, since a relation between the age at first marriage and quitting smoking does not exist for men nor for women.

Moreover, the analysis has showed that in the year when the events happen, the likelihood of stopping is higher for both males and females, thus confirming part of the third and the fourth hypothesis. However, these results should be examined in the light of other life events that may happen in the same years and that may interact, thus contributing to the change smoking habits. As for the birth of the first child, information on pregnancies would help to calculate the exact year when they started and whether also the timing of such starting plays a role in smoking cessation, above all by examining potential gender differences. This is important also considering that pregnancies may be desirable, and as such planned, or unexpected; hence, the age at this event may be related to changes in smoking behaviour especially for women, and may follow opposite directions depending on the feelings and the attitudes towards the event as a whole. As for marriage, the complete retrospective history of union formation and dissolution would allow to test whether the age at experiencing some relationships is important in the context of smoking cessation.

In this thesis, this chapter is the first attempt to analysing the field of heath behaviour change as related to the timing of life events, and from these preliminary results other research tracks can emerge.

On one hand, the whole history of partnership and childbearing should be evaluated in order to compare e.g. the timing of divorce or partner's death, or of pregnancy and abortion, and identify potential overlapping periods, so that the effect of the different events might be disentangled.

On the other hand, a contextual analysis of smoking initiation should be conducted, in order to investigate the link between the age at some events such as partner's death or abortion and the chance to (re)starting smoking instead of the likelihood of quitting. This was not allowed by the data, since the variable indicating smoking cessation was about the "last cigarette smoked", thus representing a definitive smoking cessation, without any information on the years when individuals stopped smoking and relapsed.

A more comprehensive history and analysis of life transitions and smoking behaviours of individuals may allow to *timing health promotion interventions* with particular *gender oriented procedures.*

Chapter 4: Health that shapes health: the menopause and changes in health behaviours

Abstract

The chapter uses all eight waves of the English Longitudinal Study of Ageing to investigate whether menopause can be defined as a teachable moment for health behaviours change. In particular, the chapter examines the association between menopausal stages and changes in the frequency of alcohol intake and physical activity engagement, with a particular attention on age. Overall, results show a link between transition into menopause and increasing frequency of drinking on one hand, and decreasing physical activity level on the other hand. Moreover, a relation between change in drinking and age at baseline is reported. However, some limitations of the study lead to consider these findings with caution, and call for the need to conduct further research with more detailed data on both behaviours and menopausal process. In order to detect changes in behaviours that may happen with menopause, information on transition, such as commencement and duration, is needed.

4.1 Introduction

Health behaviour improvement is an important individual instrument to shape our own health. Also, the relationship between health behaviour change and health condition is not unidirectional, i.e. also health conditions can affect health behaviours. As seen in Chapter 2, this is a key message of the theory of "teachable moments", which emerged from the field of health care research and practice, in the context of the approaches encouraging healthy behaviours and discouraging unhealthy attitudes (Lawson and Flocke, 2009). As stated in McBride, Emmons and Lipkus (2003: 15), teachable moments are defined as "naturally occurring life transitions or health events thought to motivate individuals to spontaneously adopt risk-reducing health behaviours".

In this chapter, the focus is on women and on the physiological stage of menopause as a potential teachable moment that may induce changes in health-related behaviours. Since life transitions are often associated with changes in behaviours (Lang *et al.*, 2007), the

rationale followed in the present study is that menopause, a natural health event (i.e. nor positive nor negative), by impacting women's life, may shape their attitudes and life style.

In particular, the chapter examines the potential changes of women experiencing different stages of menopausal process in two kinds of behaviours: the frequency level of alcohol consumption and physical activity engagement. Also, it aims at assessing whether there is an association between age and such changes.

4.2 Background literature and aim of the study

Health behaviours are identified in those individual actions that can positively (such as exercise or eating well) or negatively (such as smoking or substance abuse) affect health, disability and mortality (Umberson, Crosnoe & Reczek, 2010). Since health-related behaviours shape health, their change over the life course acquires particular importance in the discourse of health outcomes in old age. However, the issue of positive changes in health behaviours can be addressed by the opposite perspective, i.e. by considering such changes not just as contributing to health improvement but, to some extent, encouraged by health deterioration. In other words, if it is true that healthier behaviours help to reduce the risk of the emergence of several diseases, is it also true that the onset of an illness or of a negative health period helps individuals to behave healthier? Also, do natural health transitions such as menopause play a role as well? Can they stimulate positive and/or negative health changes in behaviours?

The next paragraphs offer some examples from the literature on both health behaviour change and menopause in order to provide a theoretical frame to these questions.

4.2.1 Changes in health behaviours as related to health events

The theory of the teachable moments seeks to promote the idea that some events over people's life can be recognised as opportunities to engage in positive changes in health behaviours. In particular, for smoking cessation, McBride, Emmons and Lipkus (2003) identify three characteristics that an event should exhibit in order to be classified as a teachable moment: it should intensify "perceptions of personal risk and outcome expectancies", it should produce "strong affective or emotional responses", and it should change "self-concept or social role" (McBride, Emmons and Lipkus, 2003:162). Moreover,

the authors on the basis of the event taken into account, recognise five groups of published works dealing with teachable moments (in the context of smoking cessation): “office visits, notification of abnormal test results, pregnancy, hospitalization and disease diagnosis ((McBride, Emmons and Lipkus, 2003:157).

The literature provides many examples of teachable moments. One of the most popular is cancer screening (Demark-Wahnefried, 2005; Ganz, 2005; McBride and Ostroff, 2003; McBride et al., 2008; Taylor et al., 2007). Since cancer treatment may be menaced by smoking and patients are more motivated to quit, this can be an opportunity for healthcare providers to help patients to quit (Gritz et al., 2006). Another case is surgery, which has been found to increase the likelihood of stopping smoking (Shi and Warner, 2010). Pregnancy as well has been proposed as a teachable moment for encouraging women to improve their health behaviours. For example, healthy eating and engaging in physical activity in order to reduce the weight gain that can be experienced over gravidity may increase with pregnancy (Phelan, 2010).

This suggests that teachable moments can be positive or negative health events; hence, it is crucial to identify both the factors that sharpen and those that weaken the positive influence of teachable moments on the decision to behave healthier, in order to help healthcare providers to make targeted interventions on patients.

4.2.2 Age at natural menopause and factors of influence

Menopause represents an interesting research track to investigating the changes in health behaviours as related to life events and age. In various studies, indeed, menopause has been shown to generate negative effects in both physical and psychiatric domains (Fallahzadeh, 2010). This sensitive phase of women’s life is important not only in terms of reproductive health but also in terms of psychological wellbeing. Indeed, in such a process, biological, psychological and social alterations interact, thus leading women to experience the end of reproductive life as a step of deep change (O’Neill and Eden, 2012; O’Neill and Eden, 2014; O’Neill and Eden, 2017).

Menopause naturally occurs in adulthood. In general, age at natural menopause varies between 40 to 60 years (De Bruin *et al.*, 2001), and mean age at menopause is 51 (Morabia, Costanza, and World Health Organization Collaborative Study of Neoplasia and

Steroid Contraceptives, 1998; Shuster *et al.*, 2010). In the UK, the average age at menopause is also 51 (O'Neill and Eden, 2014; O'Neill and Eden, 2017). Moreover, when menopause occurs between 40 to 45 years of age, it is defined as "early menopause", while when happening before 40, it is recognised as "premature" (Demakakos *et al.*, 2019; Shuster *et al.*, 2010).

However, different factors seem to influence the onset of menopause. For instance, a study on the timing of natural menopause of Polish women has demonstrated that both biological and socio-demographic characteristics matter (Kaczmarek, 2007). In particular, younger age at menopause has been found to be linked with early age at menarche, low education, negative health perception, short length of the period (Kaczmarek, 2007) and smoking (Chmara-Pawlińska and Szwed, 2004; Cooper, Sandler and Bohlig, 1999; Hayatbakhsh *et al.*, 2012; Jick Porter and Morrison, 1977; Kaczmarek, 2007; Kaufman et al., 1980; Luoto, Kaprio and Uutela, 1994; Meschia *et al.,* 2000; Midgette and Baron, 1990; Parazzini, Negri and La Vecchia, 1992; Parente *et al.*, 2008; Sonja, Nancy and John, 1985).

Research on this topic has also put the attention on the quantity of cigarettes smoked rather than simply by considering the smoker/non-smoker dichotomy. For instance, a study on Australian women by Adena and Gallagher (1982) has showed that the average age at menopause for women who smoked ten or more cigarettes per day was 1.3 years lower than for those who smoked less, who did not smoke anymore and never smoked. Parente *et al.* (2008) however indicated that, by reviewing publications on the link smoking-age at menopause, the association between the age at menopause and the amount of smoked cigarettes is not unequivocal.

The issue of smoking as associated with the age at menopause is particularly important for the purposes of this thesis, and leads to the need to take into account other health behaviours that may be related to menopause as well. For example, a study on 494 women aged 44-60 (Kinney, Klyne and Levin, 2006), has revealed that the median age at menopause was higher for women who drank alcohol 5/7 days a week compared with those who did not drink at all. Also elsewhere (Torgerson et al, 1997), it has been found that moderate alcohol consumption is linked to a delayed menopause process.

More broadly, a US longitudinal study on five different racial/ethnic groups (Gold *et al.*, 2001) has shown a link between younger age at menopause and current smoking, lower education, separation/widowhood/divorce, non-employment, and heart disease history. Conversely, older age at natural menopause is associated with parity, prior use of oral contraceptives, and Japanese race/ethnicity. Similar results have been found by Gold *et al.* (2013), who has revealed a link between later age at the final menstrual period and higher education, prior oral contraceptive use, and higher weight at baseline, on one hand, and with the condition of employed, of non-smoker, of using alcohol, of being engaged in less physical activity, and of exhibiting better self-rated health over follow-up, on the other hand.

4.2.3 Menopausal terms

As seen so far, overall, literature suggests that health behaviours are closely related to menopause and the age that it occurs. This chapter, however, aims at analysing the topic by using the opposite perspective, i.e. by focusing on the link between the menopause and the likelihood of changing behaviours.

A first step is to briefly examine the terminology concerning the menopause, which has often been confusing (O'Neill and Eden, 2012; O'Neill and Eden, 2014; O'Neill and Eden, 2017; Utian, 2004). This has lead researchers to use the same criteria to select the analytic samples and made the comparison of results difficult, thus also affecting the activity care offered to women (Utian, 2004). Since menopause is a complex phenomenon which happens through different biological and hormonal phases, a unique approach to delimit the boundaries between each stage and the consecutive one as well as to chronologically identify such stages is needed. As for this paper – which is not a medical study – it seems important to outline at least the difference between the onset of menopause itself and the menopausal transition.

Natural menopause is defined as the permanent interruption of menstruation; in particular, it takes place when no menstrual periods occurs for 12 consecutive months and this cannot be imputed to other causes (Fallahzadeh, 2010; Kaufert *et al*, 1986; O'Neill and Eden, 2012; O'Neill and Eden, 2014; O'Neill and Eden, 2017; Sherman, 2005). To be clear, to establish that a menstrual cycle is the last one, 12 months are needed to

pass: this means that the onset of natural menopause, which coincides with the last menstruation, is retrospectively calculated (Greendale, Lee and Arriola, 1999).

To define the period of menopausal transition, instead, is more complicated. Scholars have long associated this phase with that of perimenopause, which "should include the period immediately prior to the menopause (when endocrinological, biological and clinical features of approaching menopause commence) and the first year after menopause" (WHO, 1996: 13). In particular, transition into menopause has been considered to coincide with the time section of perimenopause that ends when menopause occurs, i.e. with the last menstrual period (Burger *et al.*, 2002; Landgren *et al.*, 2004; Mckinlay, Brambilla and Posner, 1992).

Attempts to offer a well-defined terminology of menopause and its phases have been given by the World Health Organisation (O'Neill and Eden, 2012; O'Neill and Eden, 2014; O'Neill and Eden, 2017) in 1981 (Mckinlay, 1996; Sherman, 2005; Utian, 2004) and 1996 (Burger et al., 2002; Sherman, 2005; Utian, 2004), by the Council of Affiliated Menopause Societies (O'Neill and Eden, 2012; O'Neill and Eden, 2014; O'Neill and Eden, 2017) in 1999 (Utian, 2004) and by other expert pulls in different settings[5]. However, some definitions such as those of pre-menopause, perimenopause, menopausal transition and climacteric partly covered one each other thus generating confusion (O'Neill and Eden, 2012; O'Neill and Eden, 2014; O'Neill and Eden, 2017).

In 2001, the Stages of Reproductive Aging (STRAW) Workshop suggested a universal categorisation of reproductive ageing (O'Neill and Eden, 2012; O'Neill and Eden, 2014; O'Neill and Eden, 2017; Utian, 2004) aimed at putting together all the preceding attempts in the field (Utian, 2004) in order to provide an instrument to categorise menopausal status for both scientific research and clinical purposes (Sherman, 2005). The result was a seven steps process scheme where the last menstruation was the point 0, and there were five preceding and two following stages (O'Neill and Eden, 2012; O'Neill and Eden, 2014; O'Neill and Eden, 2017; Utian, 2004). Specifically, as seen in Sherman (2005: 5S) and in O'Neill and Eden (2012: 64):

- the reproductive period comprised stages -5, -4, and -3 (and its duration was not

[5] More detailed overviews are provided by Sherman (2005), and Utian (2004).

fixed);

- the menopausal transition covered stages -2 and -1 (with a variable time lenght);
- post-menopause started at point 0 and included stage +1 (i.e. the 12 months of no periods plus 4 years), and stage +2 (which lasted up to death).

Moreover, the STRAW Workshop discouraged the use of the term perimenopause in the context of scientific publications (O'Neill and Eden, 2012; Sherman, 2005).
Afterwards, in 2011, the Workshop STRAW + 10 amended this classification so that, nowadays, some phases contain sub-categories (O'Neill and Eden, 2014: 350; O'Neill and Eden, 2007: 304):

- the reproductive period comprises stages -5, -4, -3b, and -3a (with a still variable duration);
- the menopausal transition covers stages -2 (whose time length is variable), -1 (which lasts 1-3 years), and +1a (which covers the 12 months after the last menstruation and coincides with early post-menopause);
- post-menopause includes stages:
    - +1a (early);
    - +1b, which lasts one year;
    - +1c, with a time length of 3-6 years;
    - +2 (late), which lasts up to death.

The most important feature of this new classification is represented by the period of transition to menopause, which starts at least one year before the last period and does not finishes with the last menstruation but 12 months after that. Therefore, by excluding the variability of the stage -2, the transition is defined as a period whose length is at least two years. However, if the phase -1 lasts 3 years, the total duration is four years.

4.2.4 Menopausal symptoms and health behaviours

The menopausal phenomenon fully considered, i.e. by taking into account both the transition and the postmenopausal period, is a delicate phase for women, and numerous studies have shown that produces adverse modifications in abdominal fat deposition, body constitution and general health (Davis *et al.*, 2012). Van Dijk *et al.* (2015) identify multiple health conditions affecting women during and after menopause, such as musculoskeletal disturbs, cognitive decline, depression, vasomotor symptoms, sleep

disorders and migraine, many of which are related to menopause itself. Mishra and Kuh (2012) have identified four stable symptoms categories for women over menopausal transition, i.e. psychological, somatic, vasomotor, and sexual issues.

In the literature, the most investigated health consequences associated with menopause are vasomotor symptoms, i.e. hot flushes and/or night sweats (Avis *et al.*, 2015; Freeman and Sherif, 2007; Obermeyer, Reher and Saliba, 2007). As noted by Brinton *et al.* (2015), this can be the only effect of menopause on women's health or it can be accompanied by cognitive functions deterioration (Maki, 2012; Weber, Rubin and Maki, 2013), insomnia, pain and depression (Cray *et al.*, 2012). Indeed, the hormonal alterations occurring over the transition have critical effects on body and health, and one of these is the higher risk of experiencing depression mood (Jaspers *et al.*, 2015).

The relationship between menopause and depression has been widely investigated by scholars, although they have not shown unanimous results (Bromberger *et al.*, 2003; Bromberger *et al.*, 2007; Cohen *et al.,* 2006; O'Neill and Eden, 2012; O'Neill and Eden, 2014; O'Neill and Eden, 2017). However, as argued by O'Neill and Eden (2017), beyond hormonal changes, other factors may be related to depressive mood throughout the menopausal transition, such as interpersonal stress, marital status and lifestyle. This is also suggested by Woods *et al.* (2008), who carried out a longitudinal study on menopausal transition and found that depression mood was positively associated with factors such as life stress, high body mass index and family history of depression. A study by Bromberger *et al.* (2007), after confirming the relationship between depression and menopausal transition, and demonstrating the link between depression symptoms and five risk factors – with stressful events resulting the major predictor – argue that a depressive mood over the menopausal transition cannot depend on one factor only, but on the interaction of different circumstances. Factors such as ethnicity, psychological, social and cultural characteristics affect the menopause transition thus leading women to report different symptoms (O'Neill and Eden, 2017).

More broadly, a study on depression affecting women over mid-life (Woods and Mitchell, 1997) has demonstrated that beyond the menopausal transition, what matters is the entire milieu of women's life, such as their attitudes towards menopause and ageing. This has been suggested also by Ayers, Forshaw and Hunter (2010), who have reviewed

studies on this topic and concluded that negative attitudes towards menopause are associated with a higher reporting of symptoms during the menopausal transition. This requires going beyond the biological and physiological process of menopause, and taking into account factors that can be modified in order to attenuate the health issues accompanying menopause, i.e. behaviours and attitudes. The literature provides many examples of this. For instance, Dennerstein (1996) underscores the link between menopausal symptoms and other conditions, such as socio-demographic characteristics, stress and health behaviours, and fosters the reduction of stress and the improvement of life style and of attitudes towards menopause and ageing. In general, a healthy life style has been suggested also elsewhere (Anderson *et al.*, 2015; Van Dijk *et al.*, 2015). More specifically, among health behaviours, a well investigated topic by scholars is physical activity, which has been found to reduce menopausal symptoms (Daley *et al.*, 2007; Elavsky and McAuley, 2005; Stojanovska et al., 2014). For instance, it has been proposed as a solution to reduce both the risk of weight gain (Mastorakos *et al.,* 2010; Sternfeld *et al.*, 2005) and the reporting of all symptoms (McAndrew *et al.*, 2009; Stojanovska *et al.*, 2014) related to menopause.

4.2.5 The importance of menopausal stages and age

Although menopause is a natural phenomenon in women's life, scholars have demonstrated that symptoms reporting is not universal, rather it differs by various factors, such as race (Avis *et al.*, 2015), culture and environment (Freeman and Sherif, 2007; Melby, Lock and Kaufert, 2005). In the context of this work, two major variables need to be taken into account, i.e. menopausal stages and age when experiencing menopause. To be clear, scholars show that not only symptoms are differently reported by women e.g. with different cultural background, but also vary by phase of menopause and age.

For instance, a multiracial US study by Avis *et al.* (2015) using data from the Study of Women's Health Across the Nation (SWAN) has found that median total vasomotor symptoms duration is 7.4 years, while after the final menstrual period, the persistence is 4.5 years. However, a difference by menopausal status is observed: for women whose onset of frequent vasomotor symptoms is before menopause or over perimenopause, duration is the longest (the median is over 11.8 years), whereas women reporting such

symptoms after menopause for the first time exhibit the shortest duration (the median is 3.4 years) (Avis *et al.*, 2015). Also, the authors (Avis *et al.*, 2015) show a positive association between younger age at first symptoms reporting and longer duration of both total and post-menopausal persistence.

Another multi-ethnic longitudinal study using data from SWAN by Gold *et al.* (2006) shows an increase in vasomotor symptoms reporting as women pass from the pre-menopause period to early perimenopause and, more strongly, to late perimenopause; also, older age has been found to be independently associated with increasing symptoms reporting (except for Hispanics). Mishra and Kuh (2012), instead, have carried out a longitudinal study on British women aged 47-54 experiencing natural menopause and whose symptoms are grouped into psychological, somatic, vasomotor, and sexual, each one with four profiles, i.e. mild, moderate, severe, and very severe. Results show that all groups apart from the second are associated with the timing of menopause (Mishra and Kuh, 2012). In particular, 10% of women exhibits a severe psychological issues profile with a peak in the year after menopause; as for vasomotor symptoms, instead, 14% of women shows an early severe profile with a peak at early post-menopause and a sharp reduction after that, while 11% has a late severe profile with an increase in the stage of perimenopause and remaining stable up to four or more years after menopause; for the 14% of women with late severe profile of sexual symptoms, these increase up to menopause and keep on after that (Mishra and Kuh, 2012) .

Also depression has been found to be associated with menopausal status. For instance, Tangen and Mykletun (2008) have analysed anxiety and depressive symptoms for a sample of Norwegian women aged 35-60 by using the Hospital Anxiety and Depression Scale (HADS), and shown that scores are higher in the perimenopause and post-menopause period than before menopause, with a peak in the phase of perimenopause and a decrease after that. In this context, Freeman *et al.* (2004), have found that the risk of depression increases during the transition and decreases after that. Bromberger *et al.* (2011), instead, have shown that the risk of depression is higher during the transition and the early post-transition period than over the period before the transition. Another study (Cohen *et al.* ,2006) has focused on women who had not experienced depressive episodes over their life, and shown that those who moved into the menopausal transition earlier faced a higher risk of developing depressive symptoms. Further, a longitudinal study by Woods *et al.* (2008) has shown not only a significant and positive relationship between

the late phase of the transition and the depressive mood, but also a negative association between age and CES-D (Center for Epidemiologic Studies Depression scale) scores.

4.2.6 Aim of the study and hypotheses

In summary, what the literature suggests is that menopause is not just an event, rather represents a pathway, from reproductive to non-reproductive life, which needs a multidisciplinary approach to be dealt with. Three observations must be stressed in the light of the investigation conducted in this thesis and, in particular, in this chapter.

Firstly, menopause and, especially, the transition into menopause (sometimes referred to as perimenopause) is a period of modification and, as such, it is often indicated with the term “the change” (Brinton *et al.*, 2015; van Keep and Kellerhals, 1975). This primarily depends on the body and psychological alterations that happen through the transition, but leads to ask whether it is a favourable life phase for health-related behaviours change as well. This is the major aim of this work and is strictly related to the second observation.

As shown above, the menopausal process is associated with health behaviours: on one hand, because behaviours affect the timing of menopause and its stages, on the second hand, because symptoms can be mitigated by healthier life styles. Following from this, the chapter goes beyond the existing literature by investigating menopause as an opportunity to positively change health behaviours. Although menopause is not a negative health event, but a natural progression in a woman’s life, it may be hypothesised that improvements in health related-behaviours are more likely to occur in this period, given their potential benefits in terms of symptoms reduction.

Thirdly, even if menopause occurs to all women, not only symptoms differ by type, number and duration, but also reporting can vary. Indeed, attitudes toward menopause, symptoms recognition and reactions as well as medical treatment decisions are influenced by several factors such as culture, region, or race (Freeman and sheriff, 2007). As seen above, very popular among scholars, is the topic of differences in menopausal symptoms by transition state and age (both chronological and menopausal). The chapter examines such factors as playing a role also in the changes in behaviours that are expected to happen over the menopausal transition. Therefore, the attention is focused on the menopausal process in order to identify the time window when potential changes

in behaviours are more likely to occur. The event menopause is taken into account as a "cut-point" in women's life, that may lead to change life style in order to react both to the body alterations produced by and to the social and cultural feelings towards the new state of menopause. Such changes may happen over the same transition into menopause or after that. Indeed, changes in attitudes such as modifications in health-related behaviours are the result of adjustment processes that need time to take place, and may be better assessed after the transition process. In particular, the chapter aims at studying the potential association between menopause and change in health behaviours, and at examining the role of age as well.

As for age, the chapter excludes age at menopause as a covariate and focuses on age at baseline, i.e. the age at the first point of observation. Specifically, through a longitudinal analysis, changes in behaviours between (couples of) waves are investigated as associated with the menopausal stage of respondent women, i.e. pre-menopause, transition, and post-menopause. By including age at the first wave as a covariate, this study aims to consider the age of women at the commencement of their own menopausal stage. This choice arises from the idea that not just age at the last period matters, but age when symptoms begin. As seen in the previous paragraph, the age when first symptoms are reported matters for their duration (Avis *et al.*, 2015). Further, the rationale of the chapter is that changes in behaviours are encouraged by the physical and psychological alterations associated with the menopausal phenomenon that tend to occur over the transition stage.

Therefore, in the context of this chapter, it is the age at the start of the transition, not the age at the last period, which is expected to play a role. As noted in O'Neill and Eden (2012; 2014; 2017), during the transition into menopause, changes in the menstrual cycle and on the endocrine level happen. However, data used in this chapter do not allow identifying the exact time when the first signs of such changes occur. For instance, the beginning of menstrual cycle irregularity would be needed Therefore, by considering the STRAW +10 definition of menopausal stages, a portion of time of 3/5 years around menopause (i.e. at least one year before and one year after the last period), has been chosen to identify the stage of transition, so that the age at the start of this stage – i.e. age at baseline – is an approximation of the age at the first symptoms.

By focusing on alcohol consumption and physical activity, the following research questions are addressed:

1. Is menopause associated with changes in the frequency and of alcohol intake and in physical activity engagement?
2. Does this potential relation vary by type of behaviour?
3. Does age matter as well?

The following three hypotheses are tested:

1. changes in health-related behaviours are more likely to happen over the transition into menopause than in the pre-menopausal period;

2. however, results can vary by behaviour, i.e. changes in specific behaviours can be associated with specific menopause states;

3. also, if considering different behaviours, the association with menopausal state can result into positive changes in some behaviours and negative changes in others;

4. age plays a role: positive changes in behaviours are expected at earlier ages, but this may depend on the type of behaviour as well.

4.3 Data and methods

Data are drawn from the English Longitudinal Study of Ageing (ELSA), which provides information on several life domains, such as employment, health, and family of individuals aged 50 and over. Respondents were extracted from the households of the sample who took part to the Health Survey for England (HSE) between 1998 and 2004. The first wave of ELSA dates back to 2002 and up to 2017, eight waves have been collected.

This chapter uses data from Wave 1 to Wave 8. However, it is worth noting that information on menopause is not included in all ELSA waves. In particular, the first time ELSA respondents were asked about this event was the Life History interview, which was conducted in 2007 for selected sample members of Wave 3. This aimed at collecting data on the retrospective histories of respondents. Thereafter, only at Wave 4, Wave 6, Wave

7 and Wave 8, data on menopause was gathered. This means that Wave1, Wave 2, Wave 3, and Wave 5 do not contain such records. With regard to health behaviours, all waves provide data on smoking, drinking and physical activity.

Although using all ELSA waves in order to reconstruct menopausal histories of respondents, the analysis is focused on four pairs of waves, i.e. waves 1-3 (2002/2003-2006/2007), 2-4 (2004/2005-2008/2009), 3-5 (2006/2007-2010/2011), and 4-6 (2008/2009-2012/2013) and investigates changes in frequency levels of alcohol use and in physical activity for three categories of women:

1. pre-menopausal, i.e. those reporting to have a period at both baseline and follow-up;
2. transitioning, i.e. those reporting to have a period at baseline and whose last period occurs between baseline and follow-up (for instance, for waves 2-4, women still have a period at Wave 2, experience their last period at Wave 3, and are in early post-menopause in Wave 4);
3. post-menopausal, i.e. those who do not have any period at both baseline and follow-up, and whose last period was 1 to 3 years before baseline.

Observations on the analytic sample

Some observations about the sample are needed. Firstly, in order to reconstruct the menopausal history of women interviewed in waves 1, 2, 3, and 5, (where information on menopause is not provided), all 8 ELSA waves have been merged so that responses on menopause collected at the successive waves can be used to calculate the year of menopause. Therefore, women of the analytic sample are those who were interviewed at baseline (e.g. Wave 1), at follow-up (e.g. Wave 3) and at least at one of the waves reporting information on menopause (waves 4, 6, 7, and 8).

Secondly, as seen in the previous paragraph, it is still difficult to define the exact boundaries of menopausal stages in the medical field, above all because the duration and the timing of menopause differ by woman. However, by considering the STRAW +10 definitions, transition into menopause comprises an early variable phase, a late stage that lasts 1-3- years up to menopause, and the 12 months after menopause that overlap with post menopause. Post-menopausal period, instead, starts with the last period and includes an early stage of (a 2 years period plus a phase of 3-6- years) and a late stage

(that lasts up to death). In this chapter, which does not show a medical research, phases of menopause are not calculated with rigid constraints, and the couples of waves selected for the analysis allow analysing time periods of 3-6 years.

Thirdly, the couple of waves 5-7 and 6-8 are not included into the analysis because descriptive statistics of all 8 ELSA waves show that most women experienced menopause before their interview(s), so that the group of premenopausal women for these waves includes a very small number of respondents.

A fourth observation concerns age. As seen, age at menopause varies between 40 and 60. Therefore, women aged 40 to 60 at baseline have been selected for the analysis. This requires particular attention because ELSA is a survey on people aged 50 and over and their younger partners, who are, as the technical report on Wave 1 states, the spouses or partners of sample members living in the same household when the HSE interview took place, and born after 29 February 1952. Since the sample of interest is that of respondents aged 50 and over, those younger than 50 are not considered core sample members and are assigned a sampling weight equal to 0[6]. Given the importance of age in this study, women younger than 50 are included into the analysis and, as a result, sample unweighted regression models are carried out.

Method

To address the aim of the study, a multilevel analysis is conducted. In particular, since the outcome variables, i.e. changes in behaviours, are constructed as nominal variables (the categories are *no change*, *decrease* and *increase*), a multilevel multinomial logistic regression analysis is performed using Stata-13 command gsem. Specifically, it is a two-level analysis, where level-1 is the wave and level-2 is the single woman. Indeed, multiple measurements of the same woman are observed. Two separated models are estimated, the first on the change in alcohol use frequency and the second on the change in physical activity engagement level.

[6] This is fully explained into the technical reports and extensive materials accompanying ELSA data.

4.3.1 Analysis

Changes in behaviours for three categories of women, i.e. premenopausal, transitioning and post-menopausal, are investigated. As noted above, information on menopause is not provided by all ELSA waves, but only by Life History, Wave 4, Wave 6, Wave 7, and Wave 8. Therefore, the menopause histories of respondents (such as year of last period and age at menopause) have been reconstructed by combining data from multiple waves.

As a first step, the year of the last period of each woman reporting not to have had any period in the 12 months preceding the interview(s) has been calculated. In particular, in the questionnaires of waves 4, 6, 7, and 8, women are asked whether in the last 12 months they have had a period or menstrual bleeding. If they reply “No”, they are asked two other questions: in what year they had their last period and the reason for which they did not have any period in the last 12 months. By combining responses, the information on the year of the last period allows calculating the year of menopause. Moreover, only women experiencing natural menopause are selected for the analysis.

Secondly, of women who were interviewed at both baseline (waves 1, 2, 3, 4) and follow-up (waves 3, 4, 5, 6), only those who responded to questions on health behaviours have been kept for the analysis in order to construct the outcome variable(s), change(s) in behaviours.

Outcome variables

The dependent variables are changes in the frequency of alcohol use (decrease, no change, increase) and change in physical activity engagement (decrease, no change, increase) between baseline and follow-up. It needs to be noted that the original idea was to investigate alcohol units intake as well, but unfortunately response rate was too low to permit statistical analyses and only frequency of alcohol use has been considered.

At all waves, respondents are asked about the frequency levels of alcohol intake during the 12 months preceding the interview(s). However, while in Wave 1, there are six response options, the remaining waves show eight possible choices. In order to compare responses, four broad categories of frequency levels have been constructed, i.e. “Less than monthly”, “One/two times a month”, “One/two to three/four days a week”, and

"Five/six day a week and daily" and women who did not drink at all have been excluded. By considering the changes between baseline and follow-up, three categories are constructed, i.e. "no change", "increase", and "decrease".

All waves report information on physical activity as well. In particular, respondents are asked about the frequency of involvement in three kinds of physical activities, which are explained into a card accompanying the questionnaire, i.e.:

- vigorous, such as running or jogging, swimming, cycling, aerobics or gym workout, tennis, digging with a spade or shovel;
- moderate, like gardening, cleaning the car, walking at a moderate pace, dancing, floor or stretching exercises;
- mild, e.g. vacuuming, laundry, home repairs.

For each type of activity, four response options are presented: "more than once a week", "once a week", "one to three times a month", and "hardly never or never".

Following previous literature (Hamer, Lavoie and Bacon, 2014), these three types of activity have been combined and a single variable on physical activity frequency has been constructed. Firstly, vigorous, moderate and mild activities have been dichotomised by assigning the value 0 for frequencies equal to and lower than one to three times a month, and the value 1 for frequencies from once a week and more. Therefore, the single variable "Physical activity" has been constructed with the following categories:

- inactive: no activity at all or mild activity at least once a week, with no moderate nor vigorous activity;
- moderate activity: moderate activity at least once a week, with no vigorous activity;
- vigorous activity: vigorous activity at least once a week.

By examining the differences between baseline and follow-up, as done for alcohol frequency change, three categories are considered, i.e. "no change", "increase" (from inactive to moderate/vigorous, and from moderate to vigorous), and "decrease" (from vigorous to moderate/inactive, and from moderate to inactive).

Covariates

In addition to menopausal state (premenopausal, transitioning, and post-menopausal), both models control for those variables presented in the literature as associated with the menopausal phenomenon:

- age at baseline (40-60);
- education at baseline (highest educational level attained: *no qualification, intermediate* and *high education*);
- relationship status at baseline (*partner*, i.e. married/cohabiting, versus *no partner*, i.e. neither);
- smoking status at baseline (*current smoker* versus *not a current smoker*);
- working status at baseline *(in work* versus *not in work*);
- self-reported health at baseline (*better than good, good, worse than good*) – for waves 1, 2, and 4, the HRS (US Health and Retirement Study) version has been used (excellent, very good, good, fair, poor); at Wave 3, instead, the question about self-reported health has been asked by using the HSE (Health Survey for England) version (very good, good, fair, bad, very bad); in this chapter, the categories have been combined in order to measure health status at baseline for all couples of waves;
- socio-economic status at baseline (National Statistics-Socio-Economic Classification – NS-SEC – three-class version, that is *managerial and professional occupations*, *intermediate occupations*, and *routine and manual occupations*);
- depressive status at baseline (yes, no).

As for this last variable, the eight-item Centre of Epidemiological Studies Depression (CES-D) scale has been used, and a score of ≥4 to define cases of elevated depressive symptoms has been chosen, so that 0-3 means there are not depressive symptoms, while 4-8 indicates a depressive status. As noted by some scholars (Gallagher *et al.*, 2017; Hamer *et al.*, 2009; Hamer, Lavoie and Bacon, 2014), this measure has been used and valeted in the US Health and Retirement Study (Steffick *et al.*, 2000).

Also body mass index is presented as a relevant factor in this context, but unfortunately in ELSA, it is provided by nurse interviews, which were conducted only at waves 2, 4, 6 and 8, thus not allowing including it as a control variable at baseline for all couples of waves.

4.4 Results

For both behaviours, only women who were interviewed at both baseline and follow-up, whose menopause history has been reconstructed and aged 40-60 at baseline have been selected. As shown in Table VIII, for all couples of waves, the highest percentage of women are post-menopausal, while the least are transitioning.

Table VIII - Interviewed women at baseline and follow-up by menopausal state aged 40-60

	Wave 1-3		**Wave 2-4**		**Wave 3-5**		**Wave 4-6**	
N	381		316		266		361	
Menopausal state	n	%	n	%	n	%	n	%
Pre-menopause	109	28.61	102	32.28	87	32.71	115	31.86
Transitioning	106	27.82	70	22.15	29	10.9	55	15.24
Post-menopause	166	43.57	144	45.57	150	56.39	191	52.91

However, when considering frequency of alcohol use and physical activity engagement separately, the analytic samples are smaller because of missing data.

Alcohol consumption frequency change

Most of the women in the sample drink on a weekly basis from 1/2 to 3/4 days a week (Table IX) at baseline and about the 67% of them do not change drinking frequency levels between baseline and follow-up (Table X).

Table IX - Frequency of alcohol use at baseline (women aged 40-60, N=1,121)

Frequency of alcohol use at baseline	n	%
Less than monthly	178	15.88
1/2 times a month	159	14.18
1/2 to 3/4 days a week	514	45.85
Daily	270	24.09

Table X - Change in alcohol use frequency between baseline and follow-up (women aged 40-60, N=980)

Change in alcohol use frequency	n	%
No change	655	66.84
Decrease	209	21.33
Increase	116	11.84

Table XI shows results from multilevel multinomial logistic regression model on the change in frequency level of alcohol use between baseline and follow-up. For women transitioning into-menopause, the risk of increasing frequency level of alcohol use is 2.03 times that of not changing at all, compared with pre-menopausal women. Also, for each additional year of age at baseline, the odds of increasing compared to not changing the frequency of drinking reduce by a factor of 0.91; while having a partner relative to being single reduces the risk of increasing compared to not changing by a factor of 0.46. As for decreasing drinking frequency, instead, other factors seem to play a role. For women with intermediate and high educational level, the risk to decrease relative to not change frequency level of alcohol use declines by a factor of 0.52 and 0.34 respectively, compared with women with no qualification. The same is observed for women with a partner compared with those who are single, and for women of intermediate occupation relative to those in managerial and professional occupation. Instead, being in work increase the risk to decrease compared to not change by a factor of 1.64 compared relative to women who are not in work. Also, for women reporting a worse than good general health at baseline, the risk of decrease than not change increases by a factor of 1.86, compared with women with better than good health conditions reported at baseline.

Table XI - Multilevel multinomial logistic regression – Change in frequency level of alcohol use between baseline and follow-up (ref. No change; N=958)

	Decrease	Increase
	exp(b)	exp(b)
Menopausal state		
Pre-menopause (ref.)		
Transition	1.32	2.03*
Post-menopause	0.67	1.37
Age at baseline	1.01	0.91**
Educational level at baseline		
No qualification (ref.)		
Intermediate	0.52**	0.76
High education	0.34***	0.61
Relationship status		
No partner (ref.)		
Partner	0.58*	0.46**
Socio-economic status at baseline		
Managerial and professional (ref.)		
Intermediate	0.58**	0.85
Routine and manual	0.65	0.87
Working status at baseline		
Not in work (ref.)		
In work	1.64*	0.90
Smoking status at baseline		
Not a current smoker (ref.)		
Current smoker	1.13	1.52
Self-reported health at baseline		
Better than good (ref.)		
Good	1.09	1.36
Worse than good	1.86**	1.72
Depressive status at baseline		
No (ref.)		
Yes	0.99	1.11

*p<0.1; **p<0.05; ***p<0.01; ****p<0.001

Physical activity engagement change

As shown in Table XII, the highest percentage of women in the sample reports to be engaged in moderate activity at least once a week. Moreover, about the 60% of women does not change the level of physical activity between baseline and follow-up (Table XIII).

Table XII - Level of physical activity engagement at baseline (women aged 40-60, N=1,319)

Frequency of physical activity engagement at baseline	n	%
Light	175	13.27
Moderate	635	48.14
Vigorous	509	38.59

Table XIII - Change in physical activity engagement between baseline and follow-up (women aged 40-60, N=1,319)

Change in physical activity engagement frequency	n	%
No change	794	60.2
Decrease	282	21.38
Increase	243	18.42

Table XIV shows results from multilevel multinomial regression model about the change in physical activity between baseline and follow-up. To be into the transition state to menopause increases the odds of decreasing physical activity level compared to no change at all by a factor of 1.78 compared with being in pre-menopause. No association between change in this behaviour and age is observed.

As for increase, education matters. For women with intermediate and high educational level, the risk to increase relative to not change level of physical activity engagement declines by a factor of 0.49 and 0.52 respectively, compared with women with no qualification. The same is observed for women in work compared with those who are not in work.

Table XIV - Multilevel multinomial logistic regression – Change in level of physical activity engagement between baseline and follow-up (ref. No change; N=1,269)

	Decrease	Increase
	exp(b)	exp(b)
Menopausal state		
Pre-menopause (ref.)		
Transition	1.78**	1.06
Post-menopause	1.52	0.85
Age at baseline	0.97	1.02
Educational level at baseline		
No qualification (ref.)		
Intermediate	0.96	0.49**
High education	0.73	0.52**
Relationship status		
No partner (ref.)		
Partner	1.14	1.29
Socio-economic status at baseline		
Managerial and professional (ref.)		
Intermediate	1.04	1.19
Routine and manual	1.51	1.20
Working status at baseline		
Not in work (ref.)		
In work	0.68	0.63*
Smoking status at baseline		
Not a current smoker (ref.)		
Current smoker	0.73	0.78
Self-reported health at baseline		
Better than good (ref.)		
Good	1.38	1.38
Worse than good	1.60	1.30
Depressive status at baseline		
No (ref.)		
Yes	0.68	1.01

*p<0.1; **p<0.05; ***p<0.01; ****p<0.001

4.5 Discussion

The chapter investigates the association between stages of menopause and changes in two health-related behaviours, i.e. drinking and physical activity. In particular, multilevel multinomial models are estimated to examine the change in the frequency level of drinking and in physical activity engagement for women in three different phases of the menopausal process, i.e. pre-menopause, transition into menopause and post-menopause. Also, the models control for age at baseline and other variables that are presented in the literature as associated with the menopausal phenomenon. Both models show an association between changes in behaviours and menopausal state. In particular, results confirm the first hypothesis of this chapter, which suggests that changes in health-related behaviours are more likely to happen over the transition into menopause than in the pre-menopausal period. Women transitioning into menopause have larger odds of increasing than not changing alcohol frequency level, compared with those in pre-menopause. For physical activity, instead, the odds of decreasing than not changing level are larger for transitioning women than for pre-menopausal. These findings contradict the second hypothesis but confirm the third. Specifically, two different behaviours seem to be associated with the same stage of the menopausal process, i.e. transition, but transitioning women have a higher risk to increase frequency level of drinking and a higher risk to decrease physical activity engagement. In the first case, it is not possible to talk about unhealthier behaviour since an increase in drinking frequency does not necessarily mean "heavier drinking". As noted by Holdsworth *et al.* (2017), cross-sectional investigations have shown that older people drink less but more frequently than younger adults. To depict a real picture of change in drinking, the inclusion of a variable about consumed units is needed. Unfortunately, data do not allow the construction of a combined variable, because of low response rates to the questions about weekly units consumed (this information was also not collected at Wave 1.

As for physical activity, instead, the potential reduction over the transition into menopause is undoubtedly an unhealthier behaviour. It may depend, for example, on the deterioration of body energy accompanying the physiological change associated with menopause.

The fourth hypothesis related to the role played by age finds partial support as an association is observed between age at menopause and alcohol frequency only. Specifically, and additional year of age means lower odds of increasing than not changing drinking frequency.

Educational level and working status are associated with both behaviours, while relationship status, socio-economic status and self-reported health at baseline seem to be associated with drinking only.

Overall, results suggest an association between transition into menopause and change in health-related behaviours. However, results need to be discussed by taking into account some limitations of the study.

Firstly, the models omit some relevant baseline characteristics presented in the literature as affecting the onset of and the age at menopause, such as prior use of oral contraceptive (Gold *et al.*, 2001; Gold *et al.*, 2013), weight at baseline (Gold *et al.*, 2013), and amount of smoked cigarettes per day (Adena and Gallagher, 1982). Unfortunately, information on contraception use is not provided by ELSA surveys, while selected data on health such as body mass index is not collected at all waves. As for the number of cigarettes smoked per day, to include such a measure, only smoking women at baseline should be selected and this not only would noticeably reduce the sample size, but also would not allow studying the association between menopause and change in behaviours of women who no longer smoked or who never smoked.

Secondly, in both pairs of waves, the highest percentage of women interviewed has not either increased or decreased the frequency level of alcohol intake and physical activity engagement. In particular, less than 20% of women in both sample changed their involvement in mild energetic activities, regardless their menopause state.

Thirdly, in addition to the lack of information about alcohol units, the variable measuring alcohol consumption frequency presents many missing values and this reduces the analytic sample size and may underestimate the real changes occurred in drinking habits.

Therefore, by considering the analysis as a whole, results do not allow to affirm that a robust association between menopause and changes in health behaviours exists. On one hand, this study investigates two behaviours only. On the other, the lack of information

on the duration of each single phase, on the commencement of symptoms (such as cycle length and irregularity) makes difficult the exact estimation of the boundaries of each single menopausal phase, thus leading to overlapping periods of analysis. For instance, in this chapter, women included in the transition category may have started their transition processes at different times so that their changes in behaviours may have already been occurred. Also, the duration of transition may be different so that the time period in which changes in attitude may happen are narrower for some women compared to others. Further, earlier/later transition starts, i.e. earlier/later age at transition commencement, may be associated with such changes as well.

The same definition of teachable moments suggests approaching this research area from this perspective. Teachable moments are "naturally occurring life transitions or health events thought to motivate individuals to spontaneously adopt risk-reducing health behaviours" (McBride, Emmons and Lipkus, 2003: 156). Above all because of data availability, the chapter has carried out the analysis on the basis of a cut-point event, i.e. year of the last menstruation. However, transitions more than events tend to influence individuals' attitudes thus leading them to change their health behaviours (Umberson, Liu and Powers, 2009). This leads to hypothesise that a positive change in health habits is more likely to happen over the transition into menopause than at the end of the transition and this requires collecting all the available information characterising the transition. On the other hand, an aspect which needs to be taken into account is the risk of facing depression mood over the transition to menopause. As noted in the paragraph 4.2, several scholars have investigated the link between menopause and depression (Bromberger *et al.*, 2003; Bromberger *et al.*, 2007; Cohen *et al.,* 2006; O'Neill and Eden, 2012; O'Neill and Eden, 2014; O'Neill and Eden, 2017). In particular, it has been found that the risk of suffering depression increases during the transition and decreases after that (Freeman *et al.,* 2004). Such a factor may affect women's attitudes towards life in general and towards health behaviours in particular, thus preventing positive changes in life style and, rather, encouraging the adoption of unhealthier behaviours. Moreover, as observed in the paragraph 4.2, while it has been suggested that a family history of depression is positively associated with suffering depressive symptoms over the menopause transition (Woods *et al.*, 2008), elsewhere (Cohen *et al.,* 2006), it has been found that among women who have never faced depression in their life, the risk of coping

with depression is higher for those entering the transition into menopause earlier. This suggests not only that age at transition start may be associated with the risk of suffering depression over the transition, but also that a younger age at transition may intensify the negative effects of depression on attitudes towards life and health, thus leading to unhealthier behaviours. Indeed, age and cultural factors influence the emotional response of individuals experiencing an event/transition classifiable as teachable moment (McBride, Emmons and Lipkus, 2003).

4.6 Conclusion

The association between menopause and changes in health-related behaviours has been studied above all in terms of positive effects of healthier behaviours on menopausal symptoms. This chapter contributes to the literature by investigating the opposite relationship, i.e. the link between menopausal stages and behaving healthier.

Overall, results report an association between transition into menopause and both change in drinking and physical activity, but some limitations of the study suggest taking these conclusions carefully. Further research is needed and more detailed information on the transition may help detecting the positive changes in attitudes that are hypothesised in this thesis. This may lead to identify menopause as a teachable moment and help women to keep on with healthier behaviours. On the other hand, if results show that negative attitude toward health are developed over the transition, health promoting programs could be realised and directed to women transitioning into menopause.

Chapter 5: Transition into retirement and changes in health behaviours

Abstract

The chapter investigates the transition into retirement as associated with changes in smoking, drinking and physical activity engagement, and stresses the importance of age at retirement as well. By using data from the English Longitudinal Study of Ageing (waves 4-8), individuals employed at baseline and retired at follow-up are selected, in order to examine the transition into retirement of people who got retired at different time points between baseline and follow-up. The length of the observation period allows including people who got retired 0/1 years before the interview and people who got retired 6/7 years before responding the questionnaire. Overall, results do not show any association between the different categories of retirees and changes in the three behaviours above. However, age at retirement has been found to be associated with change in physical activity: one year increase in age at retirement increases the odds of decreasing and reduces the odds of increasing compared to not changing. Further research is needed to assess whether such a relation exists also for drinking and smoking, when the investigation includes the analysis of behaviours change by considering not only baseline and follow-up but multiple stages of the retirement transition.

5.1 Introduction

Retirement has been widely studied as a life event/transition characterised by changes in lifestyles and/or health-related behaviours (Celidoni and Rebba, 2017; Eibich, 2015; Nooyens *et al.*, 2005; Zantinge *et al.*, 2013). Since the likelihood and the direction of such changes affect health outcomes in old age, the promotion of lifestyle changes towards healthier behaviours upon retirement might help to reduce health inequalities within the elderly population.

Indeed, health behaviours are not fixed characteristics of individuals (such as gender and/or genetics), rather they can be modified, and researching the factors inducing

individuals to behave healthier or unhealthier is the first step to improve health outcomes in old age.

In the literature, changes in health behaviours have been associated with certain life events and/or transitions like unemployment (Montgomery et al., 1998), widowhood (Shahar *et al.*, 2001) and retirement (Lang *et al.*, 2007; Nooyens *et al.*, 2005). In particular, this chapter focuses on changes in behaviours experienced by people who are transitioning into retirement.

5.2 Background and aim of the study

Empirical evidence shows that both positive and negative lifestyle changes occur with retirement (Eibich, 2015; Henkens, van Solinge and Gallo, 2008; Zantinge *et al.*, 2013). Obviously, to be retired means to have more free time. However, this activates two potential mechanisms that may influence health. On the one hand, such time may favour taking on healthier behaviours, e.g. more physical activity and more possibilities to try quitting smoking (Insler, 2014). On the other hand, retired individuals may increase their alcohol consumption, given the higher involvement in social activities and the more opportunities to enjoy leisure time, as suggested by Zins *et al.* (2011) about the increase in heavy drinking upon retirement.

Eibich (2015) shows an association between retirement and both health behaviour improvements (i.e. a lower likelihood to smoke and a higher probability to be engaged in physical activity) and health behaviour deteriorations (i.e. a lower risk of not drinking alcohol).

This leads to reflect on the whole set of factors playing a role in health behaviour change upon retirement and call for the analysis of more than one health behaviour to better understand the effects of retirement on health. However, results on the association between retirement and changes in single health behaviours are inconsistent as well. In the following, I present an overview of the existing literature about changes in single health behaviours upon retirement.

5.2.1 Alcohol use

Kuerbis and Sacco (2012) identify three theories explaining the link between retirement and alcohol use:

The *social network theory* suggests two opposite kinds of influence of social environment on drinking. On the one hand, alcohol intake may increase because of the "greater leisure time and/or a lessened demand for workplace functioning" (Kosberg and Garcia, 1985)" (Kuerbis and Sacco, 2012: 588). On the other hand, a reduction in alcohol use may occur because "one is cut off from social networks that encourage consumption (i.e., co-workers who drink), which may be compounded by loss of friends or family or caring for an ill family member (Wood, 2006)" (Kuerbis and Sacco, 2012: 588).

The *stress and coping theory*, instead, suggests an increase in alcohol use as an instrument to face retirement, which is presented as a stressful event producing, for instance, a reduction in income and social networks (Kuerbis and Sacco, 2012).

Finally, the *role theory* focuses on the transition from the employment role to the post-retirement one, and contemplates the cases of both increasing and decreasing alcohol consumption depending on "whether alcohol use is associated with work-oriented social roles or whether alcohol is used to cope with role loss" (Kuerbis and Sacco, 2012: 589).

As we can see, in theoretical terms, the relation between retirement and alcohol consumption is not univocal since it is thought to depend on several factors and to follow different mechanisms. Empirical evidence shows mixed results as well.

First of all, while some studies do not report any association between retirement and changes in drinking habits at all (Ding *et al.*, 2016; Platt, Sloan and Costanzo, 2010), others find a link between retirement and alcohol use. For instance, Ekdert *et al.* (1989) analysed a sample of men for a 2 years period by distinguishing those who were still employed at follow-up from those who retired over the observation time. Their study reported no association between retirement and changes in drinking behaviour but those who retired showed more variability in consumption than non-retired. Further, the authors (Ekdert *et al.*, 1989) found that retired individuals had a higher risk of encountering drinking problems and experiencing periodic heavier drinking compared to those who did not retire.

Another study by Bacharach *et al.* (2007) on men employed in blue-collar jobs and eligible for retirement, suggests paying attention to the history of drinking problems of individuals when examining the effect of retirement on the severity of problem drinking behaviour. Indeed, the authors (Bacharach *et al.*, 2007), by conducting a longitudinal analysis, found that, while there was no association between retirement and problem drinking behaviour of those who did not have a history of drinking problems, males with a problem drinking history experienced a significant reduction in the severity of such problems. A study of both men and women (Midanik *et al.*, 1995), instead, found no association between retirement and changing drinking problems, but showed that retired women had a higher probability to report no drinking problems than those who did not retire at follow-up.

Also the specific retirement stage has been considered as affecting drinking. Bacharach *et al.* (2004) examined a sample of blue-collar workers, whose drinking behaviours and problems were observed 6 months before retirement-eligibility and one year later, when individuals were divided into three categories, i.e. not yet retired, retired but bridge employed, and fully retired. The authors (Bacharach *et al.*, 2004) concluded that during the phase of becoming eligible to retire, individuals did not change their alcohol behaviour nor their drinking problems. However, by controlling for other factors, compared to those who were still working, those fully retired had double the likelihood of periodic heavy drinking, and those who were bridge employed showed a higher quantity of alcohol consumption on drinking occasions (Bacharach *et al.*, 2004).

Some contributions report an increase in alcohol consumption upon retirement (Perreira and Sloan, 2001; Zins *et al.*, 2011) and others show a positive or a negative impact of retirement on drinking behaviour by selected conditions of retirees categories. For instance, a US study on a sample of university employees by Richman *et al.* (2006) focused on workplace stress and found that over retirement, for those who had higher levels of stress in their previous workplace, alcohol consumption was higher than for those with lower earlier stress levels. Similarly, Wang, Steier and Gallo (2014) conducted a longitudinal analysis by using seven waves of the US Health and Retirement Study and reported gender differences in weekly drinking use. In particular, the authors (Wang, Steier and Gallo, 2014) considered two samples, one including individuals reporting alcohol use at follow-up and one comprising those reporting alcohol use at both baseline

and follow-up. Results show a positive association between retirement and weekly alcohol consumption for retired men in the second sample, but not for women.

As for the association between retirement and decrease in alcohol use, a Dutch study by Neve, Lemmens and Drop (2000) has analysed the link between role transitions at different life course points and changes in alcohol use and drinking problems. Their findings suggest that retirement is associated with a reduction in drinking problems especially for men, even if statistical significance has not been presented. Also Rodriguez and Chandra (2006), have found gender differences by examining the prediction of alcohol use by employment status of a sample of American individuals interviewed for the National Survey of Families and Households (NSFH). In particular, the authors (Rodriguez and Chandra, 2006) have shown that retirement is associated with a reduction in drinking for males.

Brennan, Schutte and Moos (2010) suggest taking into account other variables that may be more important than retirement in shaping alcohol consumption, such as baseline health, income and history of problem-drinking. Indeed, the authors (Brennan, Schutte and Moos, 2010) show that an association between retirement and reduction in drinking frequency exists, but it disappears when controlling for the above variables.

Another aspect arising from research is the voluntariness of retirement. Indeed, through a study on retirement in the Netherlands, Henkens, van Solinge and Gallo (2008) found that, while there was no association between voluntary retirement and change in alcohol use, those who involuntarily retired reported a lower risk of decreased alcohol consumption compared to non-retired individuals. Also Bacharach *et al.* (2008) have considered voluntariness of retirement as a factor of influence. The authors (Bacharach *et al.*, 2008), by controlling for drinking behaviour before retirement, found that people experiencing retirement as a voluntary process decreased their alcohol use and were less likely to face problematic drinking, whereas feeling of involuntary retirement were associated with higher alcohol use.

5.2.2 Physical activity

One of the main issues of reviewing works about retirement and changes in physical activity is the concept of physical activity itself. Zantinge *et al.* (2013), for instance,

distinguish works dealing with physical activity intended as "leisure time activity" only from those examining "overall physical activity", which includes leisure time and work-related physical activity. The review by Barnett, van Sluijs and Ogilvie (2012) identifies three domains, i.e. exercise, leisure time and total physical activity. Both analyses (Barnett, van Sluijs and Ogilvie, 2012; Zantinge *et al.* 2013) suggest an overall positive association between retirement and change in physical activity as leisure time, and this has been confirmed also elsewhere (Engberg *et al.*, 2012). Exercise as well seems to increase after retirement (Barnett, van Sluijs and Ogilvie, 2012), while results about total physical activity are mixed.

Regardless the type of activity and the measure used to assess its intensity, most of the literature finds a positive association between retirement and physical activity (Berger *et al.*, 2005; Brown, Heesch and Miller, 2009; Evenson et al., 2002; Feng *et al.*, 2016; Lathi *et al.*, 2011; Mein *et al.*, 2005; Menai *et al.*, 2014; Midanik *et al.*, 1995; Sjösten *et al.*, 2012; Touvier *et al.*, 2010; Wister, 1996). However, some clarifications about this relationship are needed.

Firstly, the study by Berger *et al.* (2005) on 699 Scottish individuals (followed up for 5/6 years) has shown a small increase in leisure time physical activity upon retirement that does not counterbalance the decrease into the work-related activity, thus resulting into a decline in overall physical activity. Secondly, some works (Evenson *et al.*, 2002; Menai *et al.*, 2014; Touvier *et al.*, 2010) reporting an increase in leisure time physical activity upon retirement find an increase in sedentary behaviour as well. In particular, Evenson *et al.* (2002) have analysed a sample of Americans aged 45-64 at baseline and have found that retired individuals had a higher risk to increase both leisure time physical activity and television watching compared to those who kept working. Moreover, the authors (Evenson *et al.*, 2002) show that, among the more active people at baseline, who retired over the observation period had a higher probability to continue being involved in sport and exercise than those who did not retire, while, among the sedentary individuals at baseline, retired at follow-up had a higher probability to do physical activity compared with non-retired. Menai *et al.* (2014), instead, have carried out a study on French individuals who were followed for 6 years and divided into three categories according to their retirement status at baseline and follow-up. The work revealed that those experiencing retirement transition over the considered period increased both sedentary

behaviour and time spent in leisure time physical activity, but also that the mean rise in overall sedentary behaviour was three times higher than the average rise in leisure time physical activity (Menai *et al.*, 2014).

Moreover, in this context, gender differences are reported. For instance, a French study by Touvier *et al.* (2010) has shown that mean leisure time physical activity increased for both men and women who retired over the observation period whilst no change was observed for those remaining into employment. However, for men, the increase in time spent on television watching was higher for retirees compared with those who continued working. For female retirees, the high increase in time for walking was related to a reduction in time for television watching.

Thirdly, some scholars have suggested paying attention to the transition *out of* work rather than *to* retirement. A British study by Mein *et al.* (2005), for instance, has found a positive association between retirement and physical activity, but only for individuals who do not work after retirement. Feng *et al.* (2016), instead, have highlighted the differences in physical activity change over the transition from full time employment of a US sample of individuals aged 50-75: results show a decline for people exiting because of disability, and an increase for those who become unemployed and pass to semi or full retirement.

Finally, differences by type of physical activity have been highlighted. Lathi *et al.* (2011) have investigated the association between retirement and leisure time physical activity, both vigorous and moderate. While they found a positive association between retirement and leisure time moderate physical activity (which increased 31 minutes per week for women and 42 minutes a week for men) no association was found between retirement and vigorous physical activity. A Dutch study by Koeneman *et al.* (2012), has found a positive link between retirement and moderate to vigorous physical activity and no association with sports engagement. Similarly, another Dutch work by Slingerland *et al.* (2007) reports that retirement is not associated with either an increase or decrease in sports or non-sports leisure time physical activity. Therefore, given the decrease in physical activity related to work transportation, the authors (Slingerland *et al.*, 2007) conclude that retirement turns out into a decline in physical activity levels.

As seen above, and as noted for changes in alcohol consumption, the literature on changes in physical activity after retirement also present mixed results that do not allow

clear conclusions to be taken. However, an important aspect of retirement and physical activity change emerging from empirical evidence is retirement status, i.e. the specific stage of retirement when the analysis is conducted. Van Dyck, Cardon and De Bourdeaudhuij (2016), for instance, have examined a sample of 446 adults from Belgium for a follow-up period of 2 years and have shown that individuals who were already retired at baseline reduced their leisure time cycling activity, while those retiring over the observation period increased such time. Moreover, the authors (Van Dyck, Cardon and De Bourdeaudhuij, 2016) found that the rise in sedentary time was higher for the second group of people compared with the former, thus suggesting that the effect of the transition from employment to retirement may lessen over the following years. Similar results are reported by other scholars (e.g. Holstila *et al.*, 2017; Stenholm *et al.*, 2016).

Lastly, works dealing with selected categories of retired, such as occupation type and voluntariness of retirement, need to be taken into account. A US study by Chung *et al.* (2009) has shown a positive association between physical activity and retirement from a sedentary job and the opposite relation with retirement from physically demanding jobs. The authors (Chung *et al.*, 2009) have reported the existence of an interaction between occupation and wealth: the negative effect of retirement on physical activity was intensified by the lack of wealth, while the positive relation was reinforced by wealth.

Henkens, van Solinge and Gallo (2008), instead, have analysed the effect on voluntary and involuntary retirement on changes in smoking, alcohol use and physical activity. They (Henkens, van Solinge and Gallo, 2008) have found that voluntary retirement is not associated with either smoking or drinking; for physical activity, instead, they report both a higher probability to increase and a lower probability to reduce physical activity for voluntary retired individuals compared with non-retired. Moreover, the same changes in physical activity result to be related with involuntary retirement, even if the extent of such modifications is less marked (Henkens, van Solinge and Gallo, 2008).

5.2.3 Smoking

The literature on the association between retirement and smoking is much more scarce compared with the literature on drinking and physical activity. A Canadian study on the influence of socioeconomic status on exercise and smoking by age groups by Wister (1996) shows that to be retired is associated with a lower likelihood of being a smoker

compared with individuals who remain into the working category. Similar results were found by Lang *et al.* (2007), who examined, for a period of 5-6 years, a sample of English smokers aged 50 and over and showed that those experiencing the transition into retirement were more likely to quit smoking than those who kept working or were already retired at baseline. This would lead to look at retirement as an opportunity for people to behave healthier, at least in terms of smoking cessation. Although this has been confirmed by other scholars (Eibich, 2015; Insler, 2014), elsewhere no impact of retirement on smoking behaviour has been found (Midanik *et al.*, 1995), and some works suggest the existence of additional factors shaping the association between retirement and change in smoking habits.

Ding *et al.* (2016), for instance, have studied a large sample of Australian people aged 45 and over and have found a relation between retirement and decrease in smoking for women but not for men. Gender differences in change in smoking habits have been confirmed by a study on the effect of stressful life events on smoking behaviour of French adults by Tamers *et al.* (2015). In particular, while before and around retirement, a reduction in smoking happened for both genders, the analysis for the periods "1 year after retirement" vs "5 years after retirement" showed a considerable decline in the odds of smoking for women but not for men (Tamers *et al.*, 2015).

Apart from gender, another aspect arising from research is, again, the voluntariness of retirement. A Dutch study by Henkens, van Solinge and Gallo (2008) on individuals aged 50-64 followed for a period of 6 years has shown that, while a higher likelihood of increasing smoking and a lower risk of reducing smoking were associated with involuntary retired individuals compared with non-retired people, no association resulted for voluntary retired individuals and changes in smoking quantity.

5.2.4 The importance of time from retirement and age at retirement

A well-defined relationship between retirement and changes in behaviours does not emerge from the referring literature, since empirical evidence shows mixed results. This suggests investigating the topic by another perspective, i.e. rather than comparing people who keep working with people who get retired, it may be looked at the second group only, i.e. at people transitioning into retirement. The idea is that retiring people are an heterogeneous group of individuals who share the experience of exiting the labour

market but live this transition with different cultural background, educational level, socio-economic position, gender and so on. It may be found that that not just retirement plays a role in health-related behaviours change but the factors differentiating each retiree from the others.

For instance, as seen in the previous paragraphs, many scholars have shown the importance of the retirement stage, i.e. on the time portion spent since retirement. This directly leads to take into account the age when people retire and its association with potential changes in behaviours. The idea that is put forward in this chapter is that the relationship between retirement and changes in health behaviour depends on *when* individuals retire, i.e. modifications in lifestyle may occur as soon as the transition is completed or some years later because people may need more time to adjust to the new status. This is why, in the following analysis, the group of individuals who got retired 6/8 years before follow-up – the other three groups got retired 4/5, 3/2, 0/1 years before the second interview respectively – has been chosen as reference category of the analysis: it is expected that changes in behaviours associated with transitions into retirement tend to happen around the event of retirement and not "too late".

Moreover, this may depend on the age when individuals retire, because different ages at retirement may accelerate or slowdown such adjustments. As seen in Chapter 2, it is hypothesised that the timing of life events as well as the age at experiencing the events does play a major role in shaping behaviours. Indeed, as noted by Pearlin (2010), "among those making a transition, not everyone makes it at the same age or point of the life course, and variations in the timing of transitions may be relevant to the directions they impose on the life course" (Pearlin, 2010: 208).

In this context, age at retirement may play a decisive role in shaping behaviours since to get retired earlier/later may affect the approach towards the event itself, thus encouraging or preventing healthier behaviours. In other words, as seen above, retirement means "more free time" and this free time can be spent by doing more exercise or by intensifying leisure time activity thus drinking more and/or more frequently. Which factors mediate such potential relationship between retirement and positive/negative changes in behaviours?

In this chapter, the main expectation is that the timing of retirement, in terms of *years since retirement* and the *age at retirement*, shape the association between retirement and changing heath behaviours. On one hand, potential changes are more likely to happen in the years "around" retirement than many years later; on the other hand, younger ages at retirement may induce improvement of some behaviours and deterioration of others.

5.2.5 Aim of the study and hypotheses

The chapter investigates the relation between different stages of the retirement transition and changes in three types of behaviours, i.e. alcohol use, physical activity and smoking.

In particular, it addresses the following research questions:

1. Is there any association between time from retirement and changes in drinking, physical activity and smoking habits?
2. Does age at retirement matter as well?
3. Are there any differences by gender?

The following related hypotheses are tested:

1. The specific stage of retirement plays a role in shaping behaviours and, in particular, the first year just after retirement may be associated with higher risks of changing. However the direction of the change may depend on the particular behaviour taken into account.

2. Age at retirement is associated with such changes as well with earlier age at retirement leading to healthier behaviours and later ages at retirement implying unhealthier behaviours.

3. Differences by gender may be detected as well.

5.3 Data and Methods

The chapter uses the English Longitudinal Study of Ageing (ELSA), which provides information on individuals aged 50 and over. Respondents were extracted from the

households of the sample who took part in the Health Survey for England (HSE) between 1998 and 2004. ELSA started in 2002 and covers several life domains, such as health, family and employment. Eight waves have been collected so far and in this paper, waves from the fourth to the eighth are used.

Wave 8 has been chosen as the follow-up wave because it is the most recent interview of ELSA and, as such, provides the most recent data (interviews took place in 2016-2017). To take Wave 4 as the baseline wave, instead, concerns the intention to conduct a longitudinal analysis. In ELSA, only respondents who have been interviewed at all waves are assigned a longitudinal weight. This means that, at each wave, only individuals who have taken part to all waves up to the present are given a longitudinal weight. For instance, at Wave 3, longitudinal weight has been given to all core members interviewed at Wave 1, 2 and 3 and keeping living in private households, while those who have missed a wave do not have any longitudinal weight. At Wave 8, there are two longitudinal weights, i.e. one for respondents interviewed from Wave 1 to Wave 8 (3,470 core members) and the other for individuals who took part in Wave 4, 5, 6, 7, and 8 (5,623 core members). Wave 4 instead of wave 1 has been chosen as the baseline in this chapter because it provides a larger sample. Moreover, between Wave 1 and wave 8, a longer period elapses, and this may affect results, since changes in behaviours may not depend on an event happened many years before.

Therefore, the analysis investigates changes in behaviours that happened over a 9-year follow-up (interviews for Wave 4 were conducted in 2008-2009). Information collected at Wave 4 and at Wave 8 is used to construct variables about smoking, alcohol and physical activity as well as retirement. Waves 5, 6, and 7 are used to calculate the year of retirement of individuals who experience retirement between baseline and follow-up.

In the following, a description of the variables which will be used in the analyses is presented.

5.3.1 Main variables

Variables measuring changes in health behaviours

In all waves, respondents are asked about their smoking, alcohol use and physical activity, so that changes in behaviours are reconstructed by comparing the responses at baseline (Wave 4) and at follow-up (Wave 8).

As for alcohol consumption, at each wave, respondents are asked about both the frequency of drinking over the 12 months preceding the interview and the consumed units during the previous week. Therefore, two measures of drinking are considered in this paper.

As for the frequency levels of alcohol intake, the eight response options provided by the questionnaire have been grouped in four broad categories, i.e. “Less than monthly”, “One/two times a month”, “One/two to three/four days a week”, and “Five/six day a week and daily” and women who did not drink at all have been excluded.

As for the weekly alcohol units consumed, respondents are asked questions about three types of drinks: beer (including lager and cider), wine (including sherry, port and vermouth), and spirits. In order to construct a single variable indicating the total amount of alcohol weekly consumed, as done previously (Britton *et al.*, 2015), the following rationale has been applied: a beer half pint is equal to 1 UK unit, one glass of wine/spirits is equal to 1 UK unit. Afterwards, a variable including the units of all types of alcohol considered has been constructed and people reporting 0 units have been omitted from the analysis, in order to focus on drinkers only.

For both frequency and units of drinking, by calculating the differences in individual responses at Wave 4 and Wave 8, three categories of changes in alcohol use are constructed, i.e. *decrease* (if respondents report a lower level at follow-up than at baseline), *no change* (if respondents report the same level at the two waves), and *increase* (if respondents report a higher level at follow-up than at baseline).

In all waves, respondents are also asked the frequency of their involvement in physical activities with different grades of involvement, i.e.:

- vigorous, such as running or jogging, swimming, cycling, aerobics or gym workout, tennis, digging with a spade or shovel;
- moderate, like gardening, cleaning the car, walking at a moderate pace, dancing, floor or stretching exercises;
- mild, e.g. vacuuming, laundry, home repairs.

Four response options from "more than once a week" to "never" are proposed. As for alcohol use, a further categorisation of physical activity frequency levels is realised in this chapter. Following previous literature (Hamer, Lavoie and Bacon, 2014), these three types of activity have been combined and a single variable on physical activity frequency has been constructed. Firstly, vigorous, moderate and mild activities have been dichotomised by assigning the value 0 for frequencies equal to and lower than one to three times a month, and the value 1 for frequencies from once a week and more. Therefore, the single variable "Physical activity" has been constructed with the following categories:

- inactive: no activity at all or mild activity at least once a week, with no moderate nor vigorous activity;
- moderate activity: moderate activity at least once a week, with no vigorous activity;
- vigorous activity: vigorous activity at least once a week.

Again, by examining the differences at responses at Wave 4 and Wave 8, three kinds of variations in physical activity are created, i.e. *no change*, *increase* and *decrease*.

As for smoking, at each wave, respondents are classified as "smokers" or "non-smokers". In this paper, only smokers at baseline are selected (i.e. respondents who define themselves as "smoker" in Wave 4) and, based on their smoking status at Wave 8, respondents are classified as s*till smoking* or *quitters* at follow-up.

Variables measuring changes in employment status

At each wave, individuals are asked about their work situation with eight response options, i.e. "Retired", "Employed", "Self-employed", "Unemployed", "Permanently sick or disabled", "Looking after home or family", "Other", "Semi-retired". Respondents who at wave 4 reported to be retired, unemployed, permanently sick or disabled, looking after home/family, semi-retired and other are excluded from the analysis, while employed and

self-employed are considered as the same category, i.e. “Employed”. This sample selection allows considering all those respondents who experience the transition into retirement between Wave 4 and Wave 8, i.e. those who are employed at baseline and retired at follow-up.

Also, only people reporting to be continuously retired at each wave after their retirement year up to follow-up are kept for the analysis, while those retired at one wave and not retired at the following one(s) are omitted. Specifically, by considering respondents who report to be employed at Wave 4 and retired at Wave 8 and whose retirement wave is, for instance, Wave 5, responses at Wave 6 and at Wave 7 are examined in order to verify that they do not report to be employed after retirement. This means that at waves 6 and 7, if they state to be employed, they will be excluded from the analysis; otherwise, if their work status is still “retired” at both waves, they will be kept. Such a choice arises from the idea that changes in behaviours need to be examined as associated with a permanent shift from employment into retirement. Furthermore, it allows making a further selection of respondents who experience the transition into retirement, by considering the year when they retired. Individuals who are employed at baseline and retired at follow-up are divided into different categories based on the year when they retired. In particular, by considering the difference between the year when they were interviewed for Wave 8 (i.e. 2016 or 2017) and the interview year when they reported to be retired (from 2010 to 2017), four groups of retirees have been created: *6-8 years retired*, *4-5 years retired*, *3-2 years retired* and *up to 1 year retired*.

5.3.2 Analysis

Changes in health behaviours between Wave 4 and Wave 8 are examined for respondents who experience the transition to retirement between baseline and follow-up in order to examine the relationship with age at retirement as well.

Moreover, models control for time since retirement by considering individuals who have experienced the transition into retirement at different time points before the interview. Age at baseline is not included because of collinearity with the age at retirement.

Stata SE-13 is used for the analysis, and a longitudinal weight is applied. As noted in the User guide provided by ELSA, such weight is “calculated for the set of 5,623 core

members who have responded to all five waves since Wave 4, and remain living in private households".

5.3.3 Methods

Different regression models aimed at evaluating the association between retirement and changes in health behaviours are estimated, one for each behaviour. In the first model, the dependent variable is alcohol consumption frequency change, in the second model, the dependent variable is the change in the number of weekly alcohol units consumed, while in the third the outcome is the change in physical activity engagement. All of them are categorical variables with three potential outcomes, i.e. *Decrease*, *No change*, and *Increase*.

Hence, multinomial logistic regression is employed.

In the fourth model, instead, the dependent variable is smoking status change, which is constructed as a dummy variable that is equal to 0 when respondents still smoke at follow-up (*Still smoking*) and to 1(*Quitted*) when respondents do not smoke anymore at Wave 8.

A logistic model is run to analyse the association between smoking status change and retirement transition.

Covariates

In addition to the main explanatory variable (transition into retirement between Wave 4 and Wave 8), all models control for factors that have been studied as affecting health-related behaviours, i.e. gender (Courtenay, McCreary and Merighi, 2002; Wardle and Steptoe, 1991), age at baseline (Pomerleau *et al.*, 1997), marital status (Umberson, 1992), education and wealth (Lantz *et al*., 1998; Pomerleau *et al.*, 1997), and health conditions at baseline (as used by Bobo and Greek, 2011; Chung, Domino, Stearns and Popkin, 2009; Lang *et al.*, 2007; Molander, Yonker and Krahn, 2010; Platt, Sloan and Costanzo, 2010). Moreover, the model on physical activity also controls for the type of occupation in terms of physical effort (as done by Chung, Domino, Stearns and Popkin, 2009). The selected variables are constructed as follows:

- age at age at retirement;

- education at baseline (highest educational level attained: no qualification, intermediate and high education);
- relationship status at baseline (partner, i.e. married/cohabiting, versus no partner, i.e. single/widowed/divorced/separated);
- wealth quintiles at baseline (poorest, second quintile, middle, fourth quintile, richest)[7];
- self-reported health at baseline (excellent/very good, good, fair/poor);
- limiting longstanding illness at baseline (no longstanding illness, no limiting longstanding illness, limiting longstanding illness);
- body mass index (underweight/normal, overweight, obese);
- level of physical activity in main job (sedentary occupation, standing occupation, physical work, heavy manual work).

As for age at retirement measure, it is important to note that the dataset provides the age when respondents retired but this information is included in the wave when they report to be retired for the first time only. To be clear, if an individual reports to be employed at Wave 4 and at Wave 5 and to be retired at Wave 6 (as well as at Wave 7 and 8), the age at retirement is provided by the dataset of Wave 6 only. This information has been used to calculate the year when respondents retired as the sum of the year of birth and the age at retirement[8].

It is worth noting that voluntariness of retirement has not been controlled for. This depends on considerations about the questionnaire itself: individuals who state to be retired are asked about the reasons for retiring and a set of 13 answer options are presented. Each option is a different variable so that respondents can choose more than one reason. Preliminary data examination has shown that, not only several missing values

[7] Economic status of respondents at baseline is considered by taking into account the derived variable which indicates "the sum of savings, investments, physical wealth and housing wealth after financial debt and mortgage debt has been subtracted" (as it is explained into the "Financial derived variables user guide of ELSA"**)**. In particular, the variable indicating the quintiles of net total wealth, i.e. total wealth excluding pension, is included into the analysis.

[8] By checking data, conflicting information has been observed for some respondents. Specifically, for one person, the year of retirement is consecutive in respect to the year of the interview when they report to be retired for the first time (so that this individual has been dropped). For 89 respondents, instead, the year of retirement is more than two years prior to the year of the interview reporting the status of retired. Since ELSA interviews were conducted every two years, this means that this information is wrong. Therefore, these individuals have been dropped as well.

are present – this leads to a reduction the analytic sample size – but also that some respondents have indicated multiple retirement reasons. This makes difficult disentangling voluntary retirement processes from involuntary ones and the exclusion of this variable has been preferred.

5.4 Results

After data cleaning, the sample includes 979 individuals (502 males and 477 females) aged 50-77. Characteristics of the sample at baseline by time from retirement are reported in Table XV, where *p* is the p-value of the chi2 test, which has been used to test whether there is a relationship between each variable at baseline and retiree categories. Since the analysis is carried out separately for e behaviour, the sample and its characteristics are not the same across models. For instance, for smoking change, only respondents who report being current smokers at baseline are selected, i.e. 121 individuals.

For respondents who experienced the transition into retirement over waves 4-8, mean age at retirement is 63.2 (63.8 for males and 62.5 for females), and it ranges from 53 to 82 (Figure 4 shows the classes of age at retirement by gender).

Figure 4 Age at retirement by gender

Table XV - Baseline characteristics of the sample by time since retirement (n=979)

	6/7 years retired (n=222)	**4 /5 years retired** (n=295)	**2/3 years retired** (n=202)	**0/1 years retired** (n=222)	***p*** (n=260)
Gender	**%**	**%**	**%**	**%**	**0.099**
Males	24.70	30.88	21.12	23.31	
Females	20.55	29.35	20.13	29.98	
Educational level	**%**	**%**	**%**	**%**	**0.928**
No qualification	18.8	30.77	23.08	27.35	
Intermediate	23.46	30.33	20.85	25.36	
High	22.76	29.43	20	27.82	
Missing	40	60	0	0	
Relationship status	**%**	**%**	**%**	**%**	**0.803**
No partner	24.07	30.86	21.6	23.46	
Partner	22.4	29.99	20.44	27.17	
Wealth quintiles	**%**	**%**	**%**	**%**	**0.045**
Poorest	16.44	31.51	23.29	28.77	
Second	16.31	31.21	22.7	29.79	
Middle	19.1	35.39	21.91	23.6	
Fourth	28.07	28.51	23.25	20.18	
Richest	30.38	29.96	16.88	22.78	
Missing	13.93	23.77	17.21	45.08	
Self-reported health	**%**	**%**	**%**	**%**	**0.014**
Excellent/very good	20.36	33.04	22.14	24.46	
Good	27.33	23.47	18.65	30.55	
Fair/poor	22.22	35.56	20	22.22	
Missing	16.67	27.78	11.11	44.44	
Limiting longstanding illness	**%**	**%**	**%**	**%**	**0.029**
No longstanding illness	20.1	28.35	21.48	30.07	
No limiting longstanding illness	24.67	33.04	20.7	21.59	
Limiting longstanding illness	28.82	32.35	17.65	21.18	
Body mass index	**%**	**%**	**%**	**%**	**0.123**
Underweight/Normal	21.54	34.55	17.48	26.42	
Overweight	24.43	29.26	25	21.31	
Obese	21.93	29.82	19.3	28.95	
Missing	21.57	25.49	17.65	35.29	
Level of physical activity in main job	**%**	**%**	**%**	**%**	**0.121**
Sedentary occupation	22.6	31.99	17.9	27.52	
Standing occupation	23.08	31.47	20.28	25.17	
Physical work	23.6	23.6	28.65	24.16	
Heavy manual work	26.09	17.39	17.39	39.13	
Missing	15.56	35.56	20	28.89	

Note: rows total 100%

Alcohol consumption frequency change

The sample used for assessing alcohol use change is the original one, i.e. there are 979 individuals aged 50-77. At baseline, alcohol consumption information is reported for 832 individuals, while at follow-up, 853 respondents report their alcohol use (Table XVI). Between Wave 4 and Wave 8, 175 respondents reduced the frequency of alcohol consumption, while 95 increased such frequency, and 497 did not change at all.

Table XVI - Frequency level of drinking at baseline and follow-up

	Baseline n=832	**Follow-up** n=853
Frequency level of drinking	**%**	**%**
Less than monthly	9.7	13.36
1/2 times a month	11.8	14.19
1/2 to 3/4 days a week	51.3	46.54
Daily	27.2	25.91

If we look at results of multinomial logistic regression (Appendix A Table XXII), no association between retirees' categories and change in alcohol use frequency is recorded. The same is observed as for the age at retirement.

However, two other factors seem to matter for increasing: wealth and BMI (body mass index) at baseline. In particular, to be in the fourth quintile increases the odds of increasing than not changing frequency of drinking by a factor of 3.75, relative to those in the poorest quintile. Similar results are observed for being obese versus normal (RRR=2.06)

Change in alcohol units consumption

At baseline, information on alcohol units intake is reported for 684 individuals, while at follow-up for 654 respondents. (Table XVII shows data by gender). As noted in Frisher *et al.* (2015), the UK government has defined lower-risk drinking as "up to 14 units per week", while 15-35 units per week is an increasing-risk drinking profile, and more than 35 units a week represents a higher-risk drinking; for males, the respective values are "up to 21", 22-50, over 50 units per week.

Between Wave 4 and Wave 8, 258 respondents reduced, while 222 increased, and 64 did not change alcohol units intake.

Table XVII - Weekly consumed alcohol units at baseline (n=684) and follow-up (n=654) by gender

	Males		Females	
	Baseline n=372	**Follow-up** n=360	**Baseline** n=312	**Follow-up** n=294
Consumed alcohol units	**%**	**%**	**%**	**%**
Lower-risk drinking	86.7	86.85	74.3	75.08
Increasing-risk drinking	12.4	12.39	21.5	20.34
Higher-risk drinking	0.9	0.76	4.2	4.59

Also results from the multinomial logistic regression about change in alcohol units (Appendix A Table XXIII) do not show any association between such change and retirees categories, neither with the age at retirement. Only reporting a good health status relative to reporting an excellent health status at baseline seems to play a role for decrease alcohol units intake (RRR=2.39).

Change in physical activity engagement

As well as for drinking, the sample used for physical activity change is the original one (979 respondents aged 50-77). Information on the level of activity engagement at baseline and at follow-up is reported in Table XVIII. At both baseline and follow-up, most of respondents are engaged in moderate and vigorous activity.

Table XVIII - Physical activity level engagement at baseline and follow-up by gender

	Baseline n=979	**Follow-up** n=978
Physical activity engagement	**%**	**%**
Light	9.1	12.58
Moderate	49.1	48.88
Vigorous	41.8	38.55

Table XIX - Multinomial logistic model outcomes – RRR for *Decreasing* and *Increasing* physical activity engagement versus *No change* (n=729)

	Decrease		Increase	
	RRR	**p-value**	**RRR**	**p-value**
Retirees categories				
Employed -6 to 7 years retired (ref.)				
Employed -4 to 5 years retired	0.91	0.73	0.90	0.71
Employed-2 to 3 years retired	0.79	0.42	1.36	0.33
Employed-0 to 1 years retired	0.63	0.12	1.06	0.85
Gender				
Males (ref.)				
Females	1.01	0.95	1.09	0.72
Age at retirement	1.07	0.01	0.95	0.07
Education				
No qualification (ref.)				
Intermediate	0.86	0.61	0.85	0.66
High	0.69	0.23	0.69	0.35
Marital status				
No partner (ref.)				
Partner	1.07	0.79	1.14	0.67
Wealth quintiles				
Poorest (ref.)				
Second	0.93	0.85	2.06	0.20
Middle	0.70	0.35	2.83	0.07
Fourth	0.45	0.04	1.23	0.71
Richest	0.73	0.42	1.91	0.27
Self-reported health				
Excellent/very good (ref.)				
Good	1.22	0.37	1.18	0.53
Fair/poor	1.90	0.06	1.63	0.26
Limiting longstanding illness				
No longstanding illness (ref.)				
No limiting longstanding illness	1.30	0.27	0.97	0.90
Limiting longstanding illness	1.24	0.42	1.25	0.48
Body mass index				
Underweight/Normal (ref.)				
Overweight	0.85	0.51	0.68	0.14
Obese	1.36	0.25	1.14	0.66
Level of physical activity in main job				
Sedentary occupation (ref.)				
Standing occupation	1.23	0.37	1.00	0.99
Physical work	1.37	0.24	0.91	0.78
Heavy manual work	1.82	0.33	0.42	0.27

Between baseline and follow-up, most of respondents (about 54%) did not change their exercise habits, while roughly the 26% and the 19% decreased and increased respectively the level of physical activity involvement.

Table XIX shows results from the multinomial logistic regression on the change in physical activity level between baseline and follow-up. No association between such change and categories of retirees is reported.

However, age at retirement is associated with both decreasing and increasing physical activity involvement. In particular, compared with not changing, for each additional year of age at retirement, the odds of reducing activity engagement increase by a factor of 1.07, while the odds of increasing decline by a factor of 0.95.

Wealth at baseline seems to matter as well. For respondents in the fourth quintile at baseline, the odds of decreasing reducing relative to not changing physical activity level involvement decline by a factor of 0.45 compared with those in the poorest quintile at baseline.

Instead, reporting a fair versus an excellent health status at baseline increases the odds of decreasing exercise level compared with not changing. As for increasing the engagement in activity, instead, to be in the middle quintile compared with being in the poorest, increases the odds of increasing relative to not changing by a factor of 2.83.

Smoking status change

The investigation of quitting smoking as associated with age at retirement, focuses on respondents experiencing retirement between wave 4 and Wave 8. The sample of smokers who are employed at baseline and retired at follow-up numbers 121 individuals (56 males and 65 females) aged 50-74. Age at retirement varies between 56 and 78, and mean age at retirement is 63.8 (64.7 for males and about 63 for females). Results from logistic regression are reported in Appendix A Table XXIV.

No association between age at retirement and quitting smoking is found, while there is a link with gender (OR=0.36, p=0.081), and wealth quintiles at baseline. In particular, for retired respondents in the richest quintile (p=0.034), the odds of quitting are 8.12 times larger than keeping smoking compared with those in the poorest quintile. Similar results

are observed for the second (OR=5.03, p=0.096) and the fourth (OR=8.21, p=0.057) quintiles (Appendix A Table XXIV).

5.5 Discussion and conclusions

The chapter investigates the association between change in health-related behaviours and retirement. Specifically, drinking, physical activity and smoking have been analysed in relation to the transition into retirement.

Health behaviours change of respondents who were employed at Wave 4 and retired at Wave 8 of ELSA have been selected in order to study whether time since retirement and age at retirement play a role in health behaviours change upon retirement.

Results about each of the behaviours are discussed in the following.

Change in drinking

About the 65% of respondents did not change their drinking habits between baseline and follow-up in terms of frequency, while roughly the 47% and the 41% decreased and increased respectively the weekly consumption of alcohol units.

In a similar way to some previous studies (Ding *et al.*, 2016; Platt, Sloan and Costanzo, 2010), no association between retirement and change in alcohol habits has been found. Also the model shows no relationship between years since retirement and alcohol intake frequency change. It has to be noted that the model has been run also by excluding measures of health conditions (self-reported health, limiting long-standing illness, body mass index) and wealth (wealth quintiles) at baseline, in order to verify whether an association may exist and disappear when controlling for such variables, as suggested by Brennan, Schutte and Moos (2010). But also results from this model[9] show no link between alcohol use and retirement.

[9] Available upon request.

The focus of this chapter was on the timing of retirement in terms of both age at retirement and time since retirement. As suggested by Kuerbis and Sacco (2012), a limitation of many studies dealing with retirement and drinking is that age is not included as a control variable in the analysis, thus not allowing for the examination of retirement in the context of the ageing process. In general, longitudinal studies show that drinking declines with age (Molander, Yonker and Krahn, 2010). Nevertheless, in England, as suggested by Holdsworth *et al.* (2016), over the last years, while alcohol use has decreased among younger groups, it has been constant for older adults.

As for the present analysis, the model reveals that neither age at retirement or time since retirement play a role in the change in alcohol frequency level and weekly units consumed upon retirement. Further, although gender differences are reported by some scholars (Neve, Lemmens and Drop, 2000; Rodriguez and Chandra, 2006; Wang, Steier and Gallo, 2014), in this chapter, results do not show such differences.

However, some limitations of this study need to be taken into account. First of all, the history of drinking problems of respondents, which has been emphasised by some scholars (Bacharach *et al.*, 2007; Brennan, Schutte and Moos, 2010), has not been included as a control in the models due to data restriction. This does not exclude that retirement may be associated with any positive or negative change in drinking habits of respondents who had a history of heavy drinking.

Although, as found by Molander, Yonker and Krahn (2010), frequency and quantity of alcohol use do not follow the same trend over time, a single measure of drinking, including quantity intake would strengthen results of this study. Unfortunately, such an analysis cannot be carried out because the measure of frequency refers to the 12 months preceding the interview, while that of units concerns the last week before responding the questionnaire. Moreover, the variable on weekly units of alcohol consumed presents a high number of missing responses so that, by combining it with the variable about frequency, the analytic sample would reduce further.

Moreover, in this chapter, frequency levels of alcohol intake have been grouped in broad categories. It can be hypothesised that minor changes, such as from “three/four days a week” to “five/six days a week”, have not been caught by the analysis.

Change in physical activity engagement

Most studies report a positive association between retirement and physical activity (Berger *et al.*, 2005; Brown, Heesch and Miller, 2009; Evenson et al., 2002; Feng *et al.*, 2016; Lathi *et al.*, 2011; Mein *et al.*, 2005; Menai *et al.*, 2014; Midanik *et al.*, 1995; Sjösten *et al.*, 2012; Touvier *et al.*, 2010; Wister, 1996). In this chapter, the change in physical activity engagement level (light, moderate, and vigorous) is not associated with retiree category, i.e. with a particular stage of the transition into retirement of respondents.

However, the analysis shows that an association between age at retirement and change in physical activity involvement exists: one year increase in the age at retirement increases the odds of decreasing and reduces the odds of increasing compared to not changing.

A study by Stenholm *et al.* (2016) has shown an increase in moderate-to-vigorous activity over the transition into statutory retirement, which was higher for older retiring, and a reduction over the following years. This may be read as the effect of ageing, i.e. as age increases, because of body energy deterioration, the likelihood of increasing the engagement in activity is lower, while the probability of reducing is higher.

Moreover, previous results (Chun *et al.*, 2009) about the importance of the type of job in this context are not confirmed by this work.

Change in smoking status

Results in this chapter do not show any association between stopping smoking and time since retirement or age at retirement, and the factor that seems to play a role in this context is wealth at baseline.

A very important limitation of this analysis is the sample size. Indeed, the small number of smokers at baseline has led to a deep reduction of the original analytic sample, so that results cannot be generalised and a lot of statistical power was lost.

A final and general observation is noteworthy. Although some studies have emphasised the role of voluntariness of retirement for alcohol consumption (Bacharach *et al.*, 2008; Henkens, van Solinge and Gallo, 2008), or physical activity (Henkens, van Solinge and Gallo, 2008), or smoking (Henkens, van Solinge and Gallo, 2008), the analysis carried out

in this chapter does not control for reason for retiring. This represents a limitation of the study concerning all the three behaviours taken into account, since it does not allow comparing people who decide to retire with people who are forced to retire. It may happen that different feelings towards retirement differently shape attitudes to all or some life styles when leaving employment.

Overall, the only hypothesis that has been partly confirmed by the analysis is that age at retirement plays a role in the context of health behaviours change over the transition into retirement. However, this is observed for physical activity only, while no association has been found with drinking and smoking.

Nonetheless, the idea that changes in one or more behaviours may be associated with the specific stage of the retirement process cannot be abandoned, since results may depend on the type of the analysis that has been conducted so far. A shorter observation period, for instance, may help to detect changes that tend to occur in the recent years after retirement and to decrease later. With regards to statutory retirement, this has been suggested by previous studies (Holstila *et al.*, 2017; Stenholm *et al.*, 2016). Furthermore, similar results were found by Menai *et al*. (2014), who showed that leisure-time physical activity increased for respondents retiring over the observation period of their study, and decreased for those who were already retired at baseline, i.e. for those retired for a longer time period.

Indeed, in this chapter, changes in behaviours are measured at baseline and at follow-up, i.e. over a 7 to 9 years period, thus not allowing identifying the exact *time* when behaviours effectively change. As noted by Evenson *et al.* (2002), it may be useful to assess physical activity level not only at baseline but also at different time periods up to follow-up, in order to investigate each step of the change process. Also, a longer time period, such as from before retirement up to 5 or more years after (Van Dyck, Cardon and Bourdeaudhuij, 2016) should be considered to conduct the analyses. This is applicable to all other behaviours considered. To be clear, a sample of people should be observed before, during and after retirement by considering a long time span and by measuring changes also at different time points between baseline and follow-up. Unfortunately, this kind of analysis has not been carried out in this chapter because the number of people between consecutive waves is very small and results would have been less reliable.

The main conclusion that may be taken is that the relationship between timing of retirement and changes in health behaviours primarily depends on the health behaviour taken into account. Whilst age at retirement is associated with changes in physical activity engagement, no relationship is observed for drinking frequency, alcohol units consumed and smoking. However, further research is needed to assess whether the relation between retirement and physical activity exists for alcohol consumption and smoking habits when the investigation includes multiple stages of the retirement transition.

Chapter 6: Conclusions

6.1 Overview

The thesis deals with health-related behaviours as one of the main sources of differences in health in adult and old age. In particular, it aims at investigating whether there is an association between the occurrence of significant life events and changes in three kinds of heath behaviours, i.e. smoking, alcohol consumption and physical activity.

However, the main contribution of this work is the investigation of the age at selected life events as linked to the changes in behaviours mentioned above.

The work starts with an extensive literature review (Chapter 2) which embraces the topics of the health of the elderly, of the life course approach to the study of health inequalities and of health-related behaviours by a life course perspective. From this, the main research questions of the thesis arise:

1. Is there any relationship between the occurrence of certain life events and the change(s) in health related behaviours?

2. Is there any association between the age when experiencing certain life events and the change(s) in health-related behaviours?

3. Are there any differences by gender?

These research questions are generally investigated over the thesis, although the rest of the work is articulated into three different chapters which address separate research questions and consider different life events and behaviours. In particular, each chapter focuses on events usually happening at a particular stage of life: i.e. marriage and childbearing (early adulthood), menopause (mid-life), and retirement (adult/old age). Indeed, the work is articulated as follows:

- Chapter 3 deals with the risk of stopping smoking as related to the age at first child birth and at first marriage and investigates whether such risk is higher in the year when each event happens compared with the others;

- Chapter 4 focuses on mid-life women and on the menopause to examining the association between menopausal transition and changes in drinking frequency and physical activity engagement;
- Chapter 5 investigates the transition into retirement as related to changes in drinking, physical activity and smoking.

In the entire thesis, data source is the English Longitudinal Study of Ageing (ELSA), which provides information on people aged 50 and over. However, different waves are used depending on the chapter considered.

Chapter 3 uses the Life History Interview, which is a dataset collected in 2007, when Wave 3 took place. By providing retrospective information on individual health, employment, family and fertility histories up to the year of the interview, it allows calculating the age at the events and, in particular, the age at starting and stopping smoking of respondents.

All ELSA waves, instead, are used in Chapter 4 to study the menopausal transition. Since information on menopause is not provided by all waves and, in particular no data on menstrual periods and menopause are available for waves 1, 2, 3, and 5, to merge all ELSA waves has helped to reconstruct the menopausal history of interviewed women.

Chapter 5, instead, uses waves 4-8 and analyses the changes in behaviours of respondents followed-up for a 9-years period.

Moreover, Chapter 3 employs event history analysis techniques, Chapter 4 uses multilevel multinomial logistic regression, Chapter 5 conducts multinomial logistic regression analyses

Finally, Stata SE-13 has been employed to conduct all the analyses.

6.2 Main results

Chapter 3 shows that, for both men and women, a one-year increase in the age at the birth of the first child increases the odds of quitting than keeping smoking. Also, in the year when this event occurs, the odds of keeping are higher for both men and women.

As for the first marriage, instead, no association has been found between age at getting married for the first time and quitting smoking. However, in the year of the first marriage, the odds of quitting than keeping are higher for both.

Chapter 4 finds an association between the transition into menopause and changes in both drinking and exercise. In particular, compared with women in pre-menopause, those transitioning into menopause have larger odds of increasing alcohol frequency level, and larger odds of decreasing physical activity engagement. Also a 1-year increase in the age at baseline reduced the odds of increasing frequency of alcohol intake, while no associations between age at baseline and changes in physical activity involvement is reported.

Chapter 5 studies transition into retirement as associated with changes in the frequency of alcohol intake and physical activity and with stopping smoking. Results show that a 1-year increase in age at retirement increases the odds of decreasing and reduces the odds of increasing compared to not changing.

The thesis as a whole shows that in the context of behaviours change, life events, their timing and, in particular the age when experiencing them, play a role.

However, differences by type of behaviour and type of event have emerged. E.g., age at the first child

Results, for instance, suggest that for quitting smoking, the birth of the first child matters. It has already been shown that pregnancy may be a good opportunity for giving up in the light of the positive effects on both mother's and child's health (Fingerhut, Kleinman and Kendrick, 1990). The study in this thesis shows that also for men, the birth of the first child can help quitting smoking and, above all, not only the event itself is important, but also *when* the event occurs matters.

Age at marriage, instead seems to be not important for quitting smoking. Although it has been suggested that social support helps behaving healthy (Ross and Wu, 1995), we may look at marital relationships by the opposite perspective. Overall, among scholars, a popular topic is marital dissolution, which has been found to be associated with health behaviour change both for men and women. In particular, for the former, Eng *et al.* (2005) have shown a link between the increase in alcohol consumption and widowhood,

decrease in physical activity and increase in vegetable consumption and remarrying, and decrease in vegetable consumption and divorce/widowhood. As for women, instead, a study on the US by Lee *et al.* (2004) on those middle-aged to elderly, has demonstrated that while remarrying is linked to positive health behaviours change, divorce and widowhood are associated with physical activity increase on one hand, with smoking relapse, alcohol consumption increase, and worse diet on the other hand. Therefore, the topic of smoking may be analysed in terms of starting and relapsing as associated with union dissolution such as divorce and partner's death.

Further research is needed also to explore the menopausal transition as a time period when changes in behaviours are more likely to occur. Overall, it seems that physical activity positively affects the health of mid-life and old women, for instance by preventing bone loss (Berard, Bravo and Gauthier, 1997) and cognitive and physical decline (Anderson, Seib and Rasmussen, 2014). This should encourage an increase in exercise involvement. The thesis, however, shows that over the transition into menopause, the odds of reducing physical activity engagement increase. However, in the light of this thesis, it needs to underscore the interaction among health behaviours. A study by Evenson *et al.* (2002) on physical activity change over life for a sample of multi-ethnic women aged 55-79, has not only shown that there was a decrease in vigorous activity by age – with the major decline after the age of 50 – but also that current vigorous activity was positively associated with factors that went beyond race and ethnicity, such as higher socio-economic status, not smoking, lower body mass index and, reporting excellent health. Another study (Boynton et al., 2008) has demonstrated that among obese and postmenopausal women, predictors of diet quality were education and smoking history, thus leading the authors to conclude that "the timing of smoking cessation is a possible teachable moment for food and nutrition professionals" (Boynton et al., 2008: 129).

This suggests that a positive change of a health-related behaviour may contribute to improve one or more behaviours as well. Furthermore, as found by Anderson, Anderson and Hurst (2010), for women, midlife represents an important stage of life to engage in behaviour change. This leads to hypothesise that other settings and analytic approaches may lead to different results, above all by collecting the information about the beginning of the transition.

Retirement as well should be studied by considering other types of behaviours.

In this context, previous studies have reported different results by type of activity taken into account, i.e. vigorous vs. moderate (Lathi *et al.*, 2011), and moderate and vigorous vs. sport (Koeneman *et al.*, 2012).

In particular, Van, Cardon and Bourdeaudhuij (2016) have found differences in physical activity change upon retirement both by type of activity and by time since retirement. The authors (Van Dyck, Cardon and Bourdeaudhuij, 2016), have analysed leisure-time cycling and moderate-to-vigorous physical activity, and shown that the former increased for people who retired between baseline and follow-up (i.e. over a 2 years period) and declined for those who were already retired at baseline (i.e., retired for a period comprised between 6 months and 5 years), while the second dropped seriously for the first group and increased slightly for the second.

Different interpretations of increasing leisure-time activity with retirement can be made, such as more free time available and higher awareness of age-related risks call for better life styles (Menai *et al.,* 2014; Van Dyck, Cardon and Bourdeaudhuij, 2016). However, as time passes and people adjust to the new life condition, they may switch to the old habits again (Van Dyck, Cardon and Bourdeaudhuij, 2016).

This suggests considering an extended observation period in order to catch changes in behaviours that can be positive at one stage of the transition and negative at other stages.

6.3 Policy implications

Overall, the main finding of this thesis is that the timing matters.
Timing as *when* life events and life transitions occur, at which stage of the life course.
Timing as at *what age* individuals experience life events.
Timing as *which stage* of the transitions is more likely to encourage changes in behaviours.
And, above all, at this point of the work, timing as *reference period* for data collection.
Indeed, both results and limitations of the studies in this thesis, suggest there is a lack of data about issues which are very important for individuals' life. The longitudinal analyses conducted in two of the chapters (4, and 5) has focused on two time points – both for

theoretical implications and for data availability – baseline and follow-up, in order to investigate the changes in behaviours over the years in between.

However, this has not permitted telling the full story of those behaviours. On one hand, the detected changes may be overestimated since they may merely represent brief episodes of change that would need external support to be kept. On the other hand, the undetected behaviours changes may be hidden in those years between baseline and follow-up when data are not collected.

ELSA (English Longitudinal Study of Ageing) – as well as SHARE (Survey of Health, Ageing and retirement in Europe) – is a precious data source allowing the analysis of different aspect of people's life. However, as for menopause for instance, most of respondents have experienced menopause before the interview, since it is a survey on people aged 50 and over. In chapter 3, for example, the observation period to investigate quitting smoking is quite long, but the question about the last cigarette smoked does not allow including into the study all those people who have tried giving up and then have started again. Similarly, the 9-year follow-up of people transitioning into retirement would allow study the phenomenon of behaviours change in depth, but a few respondents experienced the transition between the internal waves thus not allowing further analysis.

Not only more observations are needed in order to analyse larger sample and, as a consequence, to acquiring more statistical power. Also, multiple information on individuals' behaviours and life events, possibly collected at repeated appointments, would help to reconstruct the real changes in such behaviours and the potential risks to relapse.

Since we are talking about medical data and health information, two factors are needed to be noted. Firstly, medical data – such as the start of menstrual irregularity – are difficult to be gathered in the context of socio-demographic studies given the issues of privacy, thus narrowing the analysis perspectives of researchers. Secondly, factors such as shame, may be overwhelmed in different data collection settings. Embarrassment may be the reason why in the papers of this thesis, above all in regards to alcohol, a high number of missing responses has been observed. If individuals are asked personal and sensitive questions by health professional, they will feel more confident in giving responses.

Health practitioners may help to collect data from patients by considering all the messages coming from part of the empirical evidence, i.e. to identify the target population on the basis of the age when usually individuals experience some events – such as pregnancy, menopause, and retirement – and gather information on both physical and psychological attitudes in relation to such events and their intentions or difficulties, to experience them as potential time windows for health behaviours change. Health professionals and social scientists should work together in order to predispose more rigorous and sophisticated data collection.

Results would help both health practitioners to target health interventions, and researchers to understand *when, at what stage of the life and health transitions*, at *what age* of individuals experiencing such transitions, collecting data. In other words, a research teaching how to do research.

Appendix A

Appendix A Table XX - Whole sample's characteristics

All respondents: 6,766 individuals (3,119 males and 3,647 females)			
	Overall	**Males**	**Females**
Education (%)			
No Education	30.12	23.05	36.17
Low Education	33.90	33.02	34.66
Medium Education	16.26	19.62	13.38
High Education	19.72	24.30	15.79
Birth cohort (%)			
1915-1923	6.59	5.71	7.35
1924-1935	23.81	24.33	23.36
1936-1944	25.48	26.93	24.24
1945-1957	44.12	43.03	45.05
Socio-economic class of origin (%)			
Managerial and professional occupations	7.67	6.76	8.45
Intermediate occupations	28.08	27.16	28.87
Routine and manual occupations	39.79	41.26	38.52
Other	21.21	21.80	20.70
Non-employed	3.25	3.01	3.45

Appendix A Table XXI - Median age at selected life events – whole sample

All respondents: 6,766 individuals (3,119 males and 3,647 females)			
	Overall	Males	females
Median age at first child birth	26	27	25
Median age at first marriage	23	24	22

Appendix A Table XXII - Multinomial logistic model outcomes – RRR for *Decreasing* and *Increasing* alcohol consumption frequency level versus *No change* (n=606)

	Decrease		Increase	
	RRR	**p-value**	**RRR**	**p-value**
Retirees categories				
Employed-6 to 7 years retired (ref.)				
Employed-4 to 5 years retired	0.84	0.55	0.64	0.25
Employed-2 to 3 years retired	1.10	0.76	1.37	0.39
Employed-0 to 1 years retired	1.05	0.87	1.28	0.54
Gender				
Males (ref.)				
Females	0.81	0.34	0.64	0.13
Age at retirement	1.04	0.15	1.01	0.83
Education				
No qualification (ref.)				
Intermediate	1.31	0.47	1.37	0.53
High	0.91	0.82	1.36	0.58
Marital status				
No partner (ref.)				
Partner	1.05	0.86	1.07	0.86
Wealth quintiles				
Poorest (ref.)				
Second	1.74	0.24	2.32	0.28
Middle	0.77	0.59	2.14	0.33
Fourth	1.31	0.55	3.75	0.08
Richest	0.86	0.74	2.07	0.35
Self-reported health				
Excellent/very good (ref.)				
Good	0.89	0.64	1.20	0.58
Fair/poor	1.28	0.55	1.65	0.35
Limiting longstanding illness				
No longstanding illness (ref.)				
No limiting longstanding illness	1.17	0.56	0.51	0.10
Limiting longstanding illness	0.94	0.86	1.31	0.47
Body mass index				
Underweight/Normal (ref.)				
Overweight	1.41	0.19	1.28	0.48
Obese	1.42	0.24	2.06	0.05

Appendix A Table XXIII - Multinomial logistic model outcomes – RRR for *Decreasing* and *Increasing* alcohol units consumption versus *No change* (n=425)

	Decrease		Increase	
	RRR	**p-value**	**RRR**	**p-value**
Retirees categories				
Employed -6 to 7 years retired (ref.)				
Employed -4 to 5 years retired	0.76	0.54	1.06	0.90
Employed-2 to 3 years retired	1.28	0.67	2.59	0.10
Employed-0 to 1 years retired	0.68	0.44	0.92	0.87
Gender				
Males (ref.)				
Females	0.63	0.21	0.55	0.11
Age at retirement	1.03	0.59	0.98	0.66
Education				
No qualification (ref.)				
Intermediate	0.64	0.53	0.63	0.52
High	0.82	0.79	0.90	0.89
Marital status				
No partner (ref.)				
Partner	0.33	0.07	0.37	0.11
Wealth quintiles				
Poorest (ref.)				
Second	0.89	0.89	1.33	0.76
Middle	2.89	0.22	2.00	0.45
Fourth	1.38	0.70	1.59	0.60
Richest	2.54	0.28	3.01	0.23
Self-reported health				
Excellent/very good (ref.)				
Good	2.39	0.06	1.91	0.16
Fair/poor	1.78	0.45	2.19	0.29
Limiting longstanding illness				
No longstanding illness (ref.)				
No limiting longstanding illness	1.39	0.47	1.12	0.82
Limiting longstanding illness	0.54	0.22	0.58	0.25
Body mass index				
Underweight/Normal (ref.)				
Overweight	1.78	0.21	1.43	0.44
Obese	0.64	0.33	0.74	0.52

Appendix A Table XXIV - Logit model outcomes – OR quitting smoking at follow-up (n=91)

	Quit smoking	
	OR	**p-value**
Time since retirement		
6 to 7 years retired (ref.)		
4 to5 years retired	2.69	0.174
2 to 3 years retired	0.69	0.699
0 to 1 years retired	0.50	0.428
Age at retirement	1.09	0.341
Gender		
Males (ref.)		
Females	0.36	0.081
Education		
No qualification (ref.)		
Intermediate	0.75	0.707
High	1.40	0.640
Marital status		
No partner (ref.)		
Partner	0.81	0.693
Wealth quintiles		
Poorest (ref.)		
Second	5.03	0.096
Middle	2.21	0.452
Fourth	8.21	0.057
Richest	8.12	0.034
Self-reported health		
Excellent/very good (ref.)		
Good	1.37	0.646
Fair/poor	0.85	0.846
Limiting longstanding illness		
No longstanding illness (ref.)		
No limiting longstanding illness	0.77	0.763
Limiting longstanding illness	3.04	0.243
Body mass index		
Underweight/Normal (ref.)		
Overweight	0.96	0.959
Obese	0.92	0.915

List of References

Abdullah, A. S. M., Ho, L. M., Kwan, Y. H., Cheung, W. L., McGhee, S. M., & Chan, W. H. (2006). Promoting smoking cessation among the elderly: what are the predictors of intention to quit and successful quitting?. *Journal of Aging and Health*, *18*(4), 552-564.

Adena, M. A., & Gallagher, H. G. (1982). Cigarette smoking and the age at menopause. *Annals of Human Biology*, *9*(2), 121-130.

Allender, S., Hutchinson, L., & Foster, C. (2008). Life-change events and participation in physical activity: a systematic review. *Health promotion international*, *23*(2), 160-172.

Alley, D. & Crimmins, E. (2010). "Epidemiology of Ageing", in Dannefer, D., & Phillipson, C. (Eds.). (2010). The SAGE handbook of social gerontology. Sage. Section 1, Chapter 6, pp.75-95.

Allison, P. D. (2014). *Event history and survival analysis* (Vol. 46). Sage.

Anderson, D., Seib, C., & Rasmussen, L. (2014). Can physical activity prevent physical and cognitive decline in postmenopausal women?: A systematic review of the literature. *Maturitas*, *79*(1), 14-33.

Anderson, D., Seib, C., McGuire, A., & Porter-Steele, J. (2015). Decreasing menopausal symptoms in women undertaking a web-based multi-modal lifestyle intervention: The Women's Wellness Program. *Maturitas*, *81*(1), 69-75.

Anderson, R., Anderson, D., & Hurst, C. (2010). Modeling factors that influence exercise and dietary change among midlife Australian women: results from the Healthy Aging of Women Study. *Maturitas*, *67*(2), 151-158.

Angela, M. O., & Hamil-Luker, J. (2005). Processes of cumulative adversity: Childhood disadvantage and increased risk of heart attack across the life course. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *60*(Special Issue 2), S117-S124.

Arber, S. (2004). Gender, marital status, and ageing: Linking material, health, and social resources. *Journal of Aging Studies*, *18*(1), 91-108.

Arber, S., & Cooper, H. (1999). Gender differences in health in later life: the new paradox?. *Social science & medicine*, *48*(1), 61-76.

Arber, S., & Ginn, J. (1993). Gender and inequalities in health in later life. *Social science & medicine*, *36*(1), 33-46.

Avis, N. E., Crawford, S. L., Greendale, G., Bromberger, J. T., Everson-Rose, S. A., Gold, E. B., ... & Thurston, R. C. (2015). Duration of menopausal vasomotor symptoms over the menopause transition. *JAMA internal medicine*, *175*(4), 531-539.

Ayers, B., Forshaw, M., & Hunter, M. S. (2010). The impact of attitudes towards the menopause on women's symptom experience: a systematic review. *Maturitas*, *65*(1), 28-36.

Bacharach, S., Bamberger, P., Biron, M., & Horowitz-Rozen, M. (2008). Perceived agency in retirement and retiree drinking behavior: Job satisfaction as a moderator. *Journal of Vocational Behavior*, *73*(3), 376-386.

Bacharach, S. B., Bamberger, P. A., Cohen, A., & Doveh, E. (2007). Retirement, social support, and drinking behavior: a cohort analysis of males with a baseline history of problem drinking. *Journal of Drug Issues*, *37*(3), 525-548.

Bacharach, S. B., Bamberger, P. A., Sonnenstuhl, W. J., & Vashdi, D. (2004). Retirement, risky alcohol consumption and drinking problems among blue-collar workers. *Journal of Studies on Alcohol*, *65*(4), 537-545.

Backett, K. C., & Davison, C. (1995). Lifecourse and lifestyle: the social and cultural location of health behaviours. *Social Science & Medicine*, *40*(5), 629-638.

Barker, D. J. (2001). Fetal and infant origins of adult disease. *Monatsschrift Kinderheilkunde*, *149*(1), S2-S6.

Barker, D. J., Bull, A. R., Osmond, C., & Simmonds, S. J. (1990). Fetal and placental size and risk of hypertension in adult life. *Bmj*, *301*(6746), 259-262.

Barnett, I., van Sluijs, E. M., & Ogilvie, D. (2012). Physical activity and transitioning to retirement: a systematic review. *American journal of preventive medicine*, *43*(3), 329-336.

Bell, S., & Lee, C. (2006). Does timing and sequencing of transitions to adulthood make a difference? Stress, smoking, and physical activity among young Australian women. *International journal of behavioral medicine*, *13*(3), 265-274.

Ben-Shlomo, Y., & Kuh, D. (2002). A life course approach to chronic disease epidemiology: conceptual models, empirical challenges and interdisciplinary perspectives.

Berard, A., Bravo, G., & Gauthier, P. (1997). Meta-analysis of the effectiveness of physical activity for the prevention of bone loss in postmenopausal women. *Osteoporosis international*, *7*(4), 331-337.

Berger, U., Der, G., Mutrie, N., & Hannah, M. K. (2005). The impact of retirement on physical activity. *Ageing & Society*, *25*(2), 181-195.

Bird, C. E., & Rieker, P. P. (1999). Gender matters: an integrated model for understanding men's and women's health. *Social science & medicine*, *48*(6), 745-755.

Bjornson, W., Rand, C., Connett, J. E., Lindgren, P., Nides, M., Pope, F., ... & O'hara, P. (1995). Gender differences in smoking cessation after 3 years in the Lung Health Study. *American Journal of Public Health*, *85*(2), 223-230

Blackwell, D. L., Hayward, M. D., & Crimmins, E. M. (2001). Does childhood health affect chronic morbidity in later life?. *Social science & medicine*, *52*(8), 1269-1284.

Bobo, J. K., & Greek, A. A. (2011). Increasing and decreasing alcohol use trajectories among older women in the US across a 10-year interval. *International journal of environmental research and public health*, *8*(8), 3263-3276.

Booker, C., Gallaher, P., Unger, J., Ritt-Olson, A., & Johnson, A. (2004). Stressful life events, smoking behavior, and intentions to smoke among a multiethnic sample of sixth graders. *Ethnicity and Health*, *9*(4), 369-397.

Borg, V., & Kristensen, T. S. (2000). Social class and self-rated health: can the gradient be explained by differences in life style or work environment?. *Social science & medicine*, *51*(7), 1019-1030.

Bouchard, D. R., Langlois, M. F., Domingue, M. È., Brown, C., LeBrun, V., & Baillargeon, J. P. (2012). Age differences in expectations and readiness regarding lifestyle modifications in individuals at high risk of diabetes. *Archives of physical medicine and rehabilitation*, *93*(6), 1059-1064.

Boynton, A., Neuhouser, M. L., Sorensen, B., McTiernan, A., & Ulrich, C. M. (2008). Predictors of diet quality among overweight and obese postmenopausal women. *Journal of the American Dietetic Association*, *108*(1), 125-130.

Brennan, P. L., Schutte, K. K., & Moos, R. H. (1999). Reciprocal relations between stressors and drinking behavior: a three-wave panel study of late middle-aged and older women and men. *Addiction*, *94*(5), 737-749.

Brennan, P. L., Schutte, K. K., & Moos, R. H. (2010). Retired status and older adults' 10-year drinking trajectories. *Journal of Studies on Alcohol and Drugs*, *71*(2), 165-168.

Breslau, N., & Peterson, E. L. (1996). Smoking cessation in young adults: age at initiation of cigarette smoking and other suspected influences. *American journal of public health*, *86*(2), 214-220.

Brinton, R. D., Yao, J., Yin, F., Mack, W. J., & Cadenas, E. (2015). Perimenopause as a neurological transition state. Nature reviews endocrinology, 11(7), 393.

Britton, A., Ben-Shlomo, Y., Benzeval, M., Kuh, D., & Bell, S. (2015). Life course trajectories of alcohol consumption in the United Kingdom using longitudinal data from nine cohort studies. BMC medicine, 13(1), 47.

Bromberger, J. T., Assmann, S. F., Avis, N. E., Schocken, M., Kravitz, H. M., & Cordal, A. (2003). Persistent mood symptoms in a multiethnic community cohort of pre-and perimenopausal women. *American Journal of Epidemiology*, *158*(4), 347-356.

Bromberger, J. T., Kravitz, H. M., Chang, Y. F., Cyranowski, J. M., Brown, C., & Matthews, K. A. (2011). Major depression during and after the menopausal transition: Study of Women's Health Across the Nation (SWAN). *Psychological medicine*, *41*(9), 1879-1888.

Bromberger, J. T., Matthews, K. A., Kuller, L. H., Wing, R. R., Meilahn, E. N., & Plantinga, P. (1997). Prospective study of the determinants of age at menopause. *American journal of epidemiology*, *145*(2), 124-133.

Bromberger, J. T., Matthews, K. A., Schott, L. L., Brockwell, S., Avis, N. E., Kravitz, H. M., ... & Randolph, J. F. (2007). Depressive symptoms during the menopausal transition: the Study of Women's Health Across the Nation (SWAN). *Journal of affective disorders*, *103*(1), 267-272.

Broms, U., Silventoinen, K., Lahelma, E., Koskenvuo, M., & Kaprio, J. (2004). Smoking cessation by socioeconomic status and marital status: the contribution of smoking behavior and family background. *Nicotine & Tobacco Research*, *6*(3), 447-455.

Brown, W. J., Heesch, K. C., & Miller, Y. D. (2009). Life events and changing physical activity patterns in women at different life stages. *Annals of Behavioral Medicine*, *37*(3), 294-305.

Burger, H. G., Dudley, E. C., Robertson, D. M., & Dennerstein, L. O. R. R. A. I. N. E. (2002). Hormonal changes in the menopause transition. *Recent progress in hormone research*, *57*, 257-276.

Byrne, D. G., Byrne, A. E., & Reinhart, M. I. (1995). Personality, stress and the decision to commence cigarette smoking in adolescence. *Journal of psychosomatic research*, *39*(1), 53-62.

Byrne, D. G., & Mazanov, J. (2001). Self-esteem, stress and cigarette smoking in adolescents. *Stress and Health*, *17*(2), 105-110.

Calasanti, T. (2010). "Gender and Ageing in the Context of Globalization", in Dannefer, D., & Phillipson, C. (Eds.). (2010). The SAGE handbook of social gerontology. Sage. Section 2, Chapter 10, pp.137-149

Cavelaars, A. E., Kunst, A. E., Geurts, J. J., Crialesi, R., Grötvedt, L., Helmert, U., ... & Rasmussen, N. K. (2000). Educational differences in smoking: international comparison. *Bmj*, *320*(7242), 1102-1107.

Celidoni, M., & Rebba, V. (2017). Healthier lifestyles after retirement in Europe? Evidence from SHARE. *The European Journal of Health Economics*, *18*(7), 805-830.

Chandola, T., Ferrie, J., Sacker, A., & Marmot, M. (2007). Social inequalities in self reported health in early old age: follow-up of prospective cohort study. *Bmj*, *334*(7601), 990.

Chandola, T., Head, J., & Bartley, M. (2004). Socio-demographic predictors of quitting smoking: how important are household factors?. *Addiction*, *99*(6), 770-777.

Chmara-Pawlińska, R., & Szwed, A. (2004). Cigarette smoking and the age of natural menopause in women in Poland. *Przeglad lekarski*, *61*(10), 1003-1005.

Chung, S., Domino, M. E., Stearns, S. C., & Popkin, B. M. (2009). Retirement and physical activity: analyses by occupation and wealth. *American journal of preventive medicine*, *36*(5), 422-428.

Coambs, R. B., Li, S., & Kozlowski, L. T. (1992). Age interacts with heaviness of smoking in predicting success in cessation of smoking. *American Journal of Epidemiology*, *135*(3), 240-246.

Cohen, L. S., Soares, C. N., Vitonis, A. F., Otto, M. W., & Harlow, B. L. (2006). Risk for new onset of depression during the menopausal transition: the Harvard study of moods and cycles. *Archives of general psychiatry*, *63*(4), 385-390.

Colman, G. J., & Joyce, T. (2003). Trends in smoking before, during, and after pregnancy in ten states. *American journal of preventive medicine*, *24*(1), 29-35.

Cooper, G. S., Sandler, D. P., & Bohlig, M. (1999). Active and passive smoking and the occurrence of natural menopause. *Epidemiology*, 771-773.

Cutler, D. M., & Lleras-Muney, A. (2010). Understanding differences in health behaviors by education. *Journal of health economics*, *29*(1), 1-28.

Courtenay, W. H. (2000). Constructions of masculinity and their influence on men's well-being: a theory of gender and health. *Social science & medicine*, *50*(10), 1385-1401.

Cray, L. A., Woods, N. F., Herting, J. R., & Mitchell, E. S. (2012). Symptom clusters during the late reproductive stage through the early postmenopause: observations from the Seattle Midlife Women's Health Study. *Menopause (New York, NY)*, *19*(8), 864.

Crimmins, E. M., Kim, J. K., & Solé-Auró, A. (2010). Gender differences in health: results from SHARE, ELSA and HRS. *The European Journal of Public Health*, ckq022.

Crimmins, E. M., & Seeman, T. (2001). Integrating biology into demographic research on health and aging (with a focus on the MacArthur Study of Successful Aging). *Cells and surveys: Should biological measures be included in social science research*, 9-41.

Cutler, D. M., & Lleras-Muney, A. (2010). Understanding differences in health behaviors by education. *Journal of health economics*, *29*(1), 1-28.

Daley, A., MacArthur, C., Stokes-Lampard, H., McManus, R., Wilson, S., & Mutrie, N. (2007). Exercise participation, body mass index, and health-related quality of life in women of menopausal age. *Br J Gen Pract*, *57*(535), 130-135.

Dannefer, D. & Settersen, R.A., Jr. (2010). "The Study of the Life Course: Implications for Social Gerontology" in Dannefer, D. & Phillipson, C. (2010) edited by, The SAGE Handbook of Social Gerontology, Section 1, Chapter 1, pp. 3-19, London: SAGE Publications Ltd.

Davidson, P. M., DiGiacomo, M., & McGrath, S. J. (2011). The feminization of aging: how will this impact on health outcomes and services?. *Health care for women international*, *32*(12), 1031-1045.

Davis, S. R., Castelo-Branco, C., Chedraui, P., Lumsden, M. A., Nappi, R. E., Shah, D., ... & Writing Group of the International Menopause Society for World Menopause Day 2012. (2012). Understanding weight gain at menopause. *Climacteric*, *15*(5), 419-429.

De Bruin, J. P., Bovenhuis, H., Van Noord, P. A. H., Pearson, P. L., Van Arendonk, J. A. M., Te Velde, E. R., ... & Dorland, M. (2001). The role of genetic factors in age at natural menopause. *Human Reproduction*, *16*(9), 2014-2018.

De Walque, D. (2007). Does education affect smoking behaviors?: Evidence using the Vietnam draft as an instrument for college education. *Journal of health economics*, *26*(5), 877-895.

De Santis, G. (2001). Population Ageing in Industrialised Countries: Challenges and Issues, *IUSSP Policy and Research Paper, 19.*

Dean, K. (1989). Self-care components of lifestyles: the importance of gender, attitudes and the social situation. *Social Science & Medicine*, *29*(2), 137-152.

Demakakos, P., Pashayan, N., Chrousos, G., Linara-Demakakou, E., & Mishra, G. D. (2019). Childhood experiences of parenting and age at menarche, age at menopause and duration of reproductive lifespan: Evidence from the English Longitudinal Study of Ageing. *Maturitas*.

Demark-Wahnefried, W., Aziz, N. M., Rowland, J. H., & Pinto, B. M. (2005). Riding the crest of the teachable moment: promoting long-term health after the diagnosis of cancer. *Journal of Clinical Oncology*, *23*(24), 5814-5830.

Dennerstein, L. (1996). Well-being, symptoms and the menopausal transition. *Maturitas*, *23*(2), 147-157.

Denton, M., Prus, S., & Walters, V. (2004). Gender differences in health: a Canadian study of the psychosocial, structural and behavioural determinants of health. *Social science & medicine*, *58*(12), 2585-2600.

Denton, M., & Walters, V. (1999). Gender differences in structural and behavioral determinants of health: an analysis of the social production of health. *Social science & medicine*, *48*(9), 1221-1235.

Devine, C. M. (2005). A life course perspective: understanding food choices in time, social location, and history. *Journal of nutrition education and behavior*, *37*(3), 121-128.

Devine, C. M., Connors, M., Bisogni, C. A., & Sobal, J. (1998). Life-course influences on fruit and vegetable trajectories: qualitative analysis of food choices. *Journal of Nutrition Education*, *30*(6), 361-370.

DiClemente, C. C., Dolan-Mullen, P., & Windsor, R. A. (2000). The process of pregnancy smoking cessation: implications for interventions. *Tobacco control*, *9*(suppl 3), iii16-iii21.

Ding, D., Grunseit, A. C., Chau, J. Y., Vo, K., Byles, J., & Bauman, A. E. (2016). Retirement—a transition to a healthier lifestyle?: evidence from a large Australian study. *American journal of preventive medicine*, *51*(2), 170-178.

Doll, R., Peto, R., Boreham, J., & Sutherland, I. (2005). Mortality from cancer in relation to smoking: 50 years observations on British doctors. *British journal of cancer*, *92*(3), 426-429.

Dorjgochoo, T., Kallianpur, A., Gao, Y. T., Cai, H., Yang, G., Li, H., ... & Shu, X. O. (2008). Dietary and lifestyle predictors of age at natural menopause and reproductive span in the Shanghai Women's Health Study. *Menopause (New York, NY)*, *15*(5), 924.

Doyal, L. (2000). Gender equity in health: debates and dilemmas. *Social science & medicine*, *51*(6), 931-939.

Ebrahim, S. H., Floyd, R. L., Merritt II, R. K., Decoufle, P., & Holtzman, D. (2000). Trends in pregnancy-related smoking rates in the United States, 1987-1996. *Jama*, *283*(3), 361-366.

Eibich, P. (2015). Understanding the effect of retirement on health: Mechanisms and heterogeneity. *Journal of health economics*, *43*, 1-12.

Eide, E. R., & Showalter, M. H. (2011). Estimating the relation between health and education: What do we know and what do we need to know?. *Economics of Education Review*, *30*(5), 778-791.

Ekerdt, D. J., De Labry, L. O., Glynn, R. J., & Davis, R. W. (1989). Change in drinking behaviors with retirement: findings from the normative aging study. *Journal of studies on alcohol*, *50*(4), 347-353.

Elavsky, S., & McAuley, E. (2005). Physical activity, symptoms, esteem, and life satisfaction during menopause. *Maturitas*, *52*(3), 374-385.

Elder, G. H. (1998). The life course as developmental theory. *Child development*, *69*(1), 1-12.

Elder Jr, G. H., & Rockwell, R. C. (1976). Marital timing in women's life patterns. *Journal of Family History*, *1*(1), 34-53.

Elo, I. T. (2009). Social class differentials in health and mortality: Patterns and explanations in comparative perspective. *Annual Review of Sociology*, *35*, 553-572.

Eng, P. M., Kawachi, I., Fitzmaurice, G., & Rimm, E. B. (2005). Effects of marital transitions on changes in dietary and other health behaviours in US male health professionals. *Journal of Epidemiology & Community Health*, *59*(1), 56-62.

Engberg, E., Alen, M., Kukkonen-Harjula, K., Peltonen, J. E., Tikkanen, H. O., & Pekkarinen, H. (2012). Life events and change in leisure time physical activity. *Sports medicine*, *42*(5), 433-447.

Erhardt, L. (2009). Cigarette smoking: an undertreated risk factor for cardiovascular disease. *Atherosclerosis*, *205*(1), 23-32.

Evenson, K. R., Rosamond, W. D., Cai, J., Diez-Roux, A. V., & Brancati for the Atherosclerosis Risk in Communities Study Investigators, F. L. (2002). Influence of retirement on leisure-time physical activity: the atherosclerosis risk in communities study. *American Journal of Epidemiology*, *155*(8), 692-699.

Evenson, K. R., Wilcox, S., Pettinger, M., Brunner, R., King, A. C., & McTiernan, A. (2002). Vigorous leisure activity through women's adult life: the Women's Health Initiative Observational Cohort Study. *American Journal of Epidemiology*, *156*(10), 945-953.

Fallahzadeh, H. (2010). Quality of life after the menopause in Iran: a population study. *Quality of Life Research*, *19*(6), 813-819.

Feldner, M. T., Babson, K. A., & Zvolensky, M. J. (2007). Smoking, traumatic event exposure, and post-traumatic stress: A critical review of the empirical literature. *Clinical psychology review*, *27*(1), 14-45.

Feng, X., Croteau, K., Kolt, G. S., & Astell-Burt, T. (2016). Does retirement mean more physical activity? A longitudinal study. *BMC public health*, *16*(1), 605.

Fingerhut, L. A., Kleinman, J. C., & Kendrick, J. S. (1990). Smoking before, during, and after pregnancy. *American Journal of Public Health*, *80*(5), 541-544.

Forrest, C. B., & Riley, A. W. (2004). Childhood origins of adult health: a basis for life-course health policy. *Health Affairs*, *23*(5), 155-164.

Franks, M. M., Pienta, A. M., & Wray, L. A. (2002). It takes two: marriage and smoking cessation in the middle years. *Journal of Aging and Health*, *14*(3), 336-354.

Freeman, E. W., Sammel, M. D., Liu, L., Gracia, C. R., Nelson, D. B., & Hollander, L. (2004). Hormones and menopausal status as predictors of depression in womenin transition to menopause. *Archives of general psychiatry*, *61*(1), 62-70.

Freeman, E., & Sherif, K. (2007). Prevalence of hot flushes and night sweats around the world: a systematic review. *Climacteric*, *10*(3), 197-214.

Gallagher, D., Kiss, A., Lanctot, K., & Herrmann, N. (2017). Depression with inflammation: longitudinal analysis of a proposed depressive subtype in community dwelling older adults. *International journal of geriatric psychiatry*, *32*(12), e18-e24.

Ganz, P. A. (2005). A teachable moment for oncologists: cancer survivors, 10 million strong and growing!.

George, L. K. (1993). Sociological perspectives on life transitions. *Annual review of sociology*, *19*(1), 353-373.

Gold, E. B., Bromberger, J., Crawford, S., Samuels, S., Greendale, G. A., Harlow, S. D., & Skurnick, J. (2001). Factors associated with age at natural menopause in a multiethnic sample of midlife women. *American journal of epidemiology*, *153*(9), 865-874.

Gold, E. B., Crawford, S. L., Avis, N. E., Crandall, C. J., Matthews, K. A., Waetjen, L. E., ... & Harlow, S. D. (2013). Factors related to age at natural menopause: longitudinal analyses from SWAN. *American journal of epidemiology*, *178*(1), 70-83.

Graham, H. (2002). Building an inter-disciplinary science of health inequalities: the example of lifecourse research. *Social science & medicine*, *55*(11), 2005-2016.

Graham, H., Hawkins, S. S., & Law, C. (2010). Lifecourse influences on women's smoking before, during and after pregnancy. *Social science & medicine*, *70*(4), 582-587.

Graham, H., & Kelly, M. P. (2004). *Health inequalities: concepts, frameworks and policy*. London: Health Development Agency.

Greendale, G. A., Lee, N. P., & Arriola, E. R. (1999). The menopause. *The Lancet*, *353*(9152), 571-580.

Gritz, E. R., Fingeret, M. C., Vidrine, D. J., Lazev, A. B., Mehta, N. V., & Reece, G. P. (2006). Successes and failures of the teachable moment. *Cancer*, *106*(1), 17-27.

Grundy, E. (2006). Ageing and vulnerable elderly people: European perspectives. *Ageing and Society*, *26*(01), 105-134.

Grundy, E., & Holt, G. (2000). Adult life experiences and health in early old age in Great Britain. *Social science & medicine*, *51*(7), 1061-1074.

Grundy, E., & Holt, G. (2001). The socioeconomic status of older adults: How should we measure it in studies of health inequalities?. *Journal of Epidemiology and Community health*, *55*(12), 895-904.

Grundy, E., & Sloggett, A. (2003). Health inequalities in the older population: the role of personal capital, social resources and socio-economic circumstances. *Social science & medicine*, *56*(5), 935-947.

Haas, S. A. (2007). The long-term effects of poor childhood health: an assessment and application of retrospective reports. *Demography*, *44*(1), 113-135.

Hamer, M., Lavoie, K. L., & Bacon, S. L. (2014). Taking up physical activity in later life and healthy ageing: the English longitudinal study of ageing. *Br J Sports Med*, *48*(3), 239-243.

Hamer, M., Molloy, G. J., de Oliveira, C., & Demakakos, P. (2009). Leisure time physical activity, risk of depressive symptoms, and inflammatory mediators: the English Longitudinal Study of Ageing. *Psychoneuroendocrinology*, *34*(7), 1050-1055.

Hayatbakhsh, M. R., Clavarino, A., Williams, G. M., Sina, M., & Najman, J. M. (2012). Cigarette smoking and age of menopause: a large prospective study. *Maturitas*, *72*(4), 346-352.

Hayward, M. D., & Zhang, Z. (2001). Demography of aging. *Handbook of aging and the social sciences*, *5*, 69-85.

Henkens, K., van Solinge, H., & Gallo, W. T. (2008). Effects of retirement voluntariness on changes in smoking, drinking and physical activity among Dutch older workers. *The European Journal of Public Health*, *18*(6), 644-649.

Herd, P. (2006). Do functional health inequalities decrease in old age? Educational status and functional decline among the 1931-1941 birth cohort. *Research on Aging*, *28*(3), 375-392.

Hirano, K., Imbens, G. W., & Ridder, G. (2003). Efficient estimation of average treatment effects using the estimated propensity score. *Econometrica*, *71*(4), 1161-1189.

Hiscock, R., Bauld, L., Amos, A., Fidler, J. A., & Munafò, M. (2012). Socioeconomic status and smoking: a review. *Annals of the New York Academy of Sciences*, *1248*(1), 107-123.

Hiscock, R., Judge, K., & Bauld, L. (2010). Social inequalities in quitting smoking: what factors mediate the relationship between socioeconomic position and smoking cessation?. *Journal of Public Health*, fdq097.

Holdsworth, C., Frisher, M., Mendonca, M., De Oliveiria, C., Pikhart, H., & Shelton, N. (2017). Lifecourse transitions, gender and drinking in later life. *Ageing & Society*, *37*(3), 462-494.

Holdsworth, C., Mendonça, M., Pikhart, H., Frisher, M., de Oliveira, C., & Shelton, N. (2016). Is regular drinking in later life an indicator of good health? Evidence from the English Longitudinal Study of Ageing. *J Epidemiol Community Health*, *70*(8), 764-770.

Holmila, M., & Raitasalo, K. (2005). Gender differences in drinking: why do they still exist?. *Addiction*, *100*(12), 1763-1769.

Holstila, A., Mänty, M., Rahkonen, O., Lahelma, E., & Lahti, J. (2017). Statutory retirement and changes in self-reported leisure-time physical activity: a follow-up study with three time-points. *BMC public health*, *17*(1), 528.

Homish, G. G., & Leonard, K. E. (2005). Spousal influence on smoking behaviors in a US community sample of newly married couples. *Social science & medicine*, *61*(12), 2557-2567.

Huisman, M., Kunst, A. E., & Mackenbach, J. P. (2005). Educational inequalities in smoking among men and women aged 16 years and older in 11 European countries. *Tobacco control*, *14*(2), 106-113.

Insler, M. (2014). The health consequences of retirement. *Journal of Human Resources*, *49*(1), 195-233.

Jackson, J. S., Knight, K. M., & Rafferty, J. A. (2010). Race and unhealthy behaviors: chronic stress, the HPA axis, and physical and mental health disparities over the life course. *American journal of public health*, *100*(5), 933-939.

Janz, N. K., & Becker, M. H. (1984). The health belief model: A decade later. *Health education quarterly*, *11*(1), 1-47.

Jarvis, M. J. (1994). Gender differences in smoking cessation: real or myth?. *Tobacco control*, *3*(4), 324.

Jaspers, L., Daan, N. M., Van Dijk, G. M., Gazibara, T., Muka, T., Wen, K. X., ... & Laan, E. (2015). Health in middle-aged and elderly women: a conceptual framework for healthy menopause. *Maturitas*, *81*(1), 93-98.

Jefferis, B. J., Power, C., Graham, H., & Manor, O. (2004). Effects of childhood socioeconomic circumstances on persistent smoking. *American Journal of Public Health*, *94*(2), 279-285.

Jick, H., Porter, J., & Morrison, A. (1977). Relation between smoking and age of natural menopause: report from the Boston Collaborative Drug Surveillance Program, Boston University Medical Center. *The Lancet*, *309*(8026), 1354-1355.

Jones, A. M. (1994). Health, addiction, social interaction and the decision to quit smoking. *Journal of health economics*, *13*(1), 93-110.

Jose, B. S., Van Oers, H. A., Van De Mheen, H. D., Garretsen, H. F., & Mackenbach, J. P. (2000). Stressors and alcohol consumption. *Alcohol and Alcoholism*, *35*(3), 307-312.

Kabat, G. C., & Wynder, E. L. (1987). Determinants of quitting smoking. *American Journal of Public Health*, *77*(10), 1301-1305.

Kaczmarek, M. (2007). The timing of natural menopause in Poland and associated factors. *Maturitas*, *57*(2), 139-153.

Kandrack, M. A., Grant, K. R., & Segall, A. (1991). Gender differences in health related behaviour: some unanswered questions. *Social Science & Medicine*, *32*(5), 579-590.

Kasper, J. D., Ensminger, M. E., Green, K. M., Fothergill, K. E., Juon, H. S., Robertson, J., & Thorpe, R. J. (2008). Effects of poverty and family stress over three decades on the

functional status of older African American women. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *63*(4), S201-S210.

Kaufert, P., Lock, M., McKinlay, S., Beyenne, Y., Coope, J., Davis, D., Eliasson, M., Gognalons-Nicolet, M., Goodman, M. and Holte, A., 1986. Menopause research: the Korpilampi workshop. *Social Science & Medicine*, *22*(11), pp.1285-1289.

Kaufman, D. W., Slone, D., Rosenberg, L., Miettinen, O. S., & Shapiro, S. (1980). Cigarette smoking and age at natural menopause. *American Journal of Public Health*, *70*(4), 420-422.

Kawachi, I., Subramanian, S. V., & Almeida-Filho, N. (2002). A glossary for health inequalities. *Journal of epidemiology and community health*, *56*(9), 647-652.

Kim, J. S., & Steiner, P. M. (2015). Multilevel propensity score methods for estimating causal effects: A latent class modeling strategy. In Quantitative Psychology Research (pp. 293-306). Springer, Cham.

Kinney, A., Kline, J., & Levin, B. (2006). Alcohol, caffeine and smoking in relation to age at menopause. *Maturitas*, *54*(1), 27-38.

Kleinbaum, D. G., & Klein, M. (2012). Kaplan-Meier survival curves and the log-rank test. In *Survival analysis* (pp. 55-96). Springer New York.

Knodel, J., & Ofstedal, M. B. (2003). Gender and aging in the developing world: Where are the men?. *Population and Development Review*, *29*(4), 677-698.

Koeneman, M. A., Chinapaw, M. J., Verheijden, M. W., van Tilburg, T. G., Visser, M., Deeg, D. J., & Hopman-Rock, M. (2012). Do major life events influence physical activity among older adults: the Longitudinal Aging Study Amsterdam. *International journal of behavioral nutrition and physical activity*, *9*(1), 147.

Kosberg, J. I., & Garcia, J. L. (1985). Issues in assessing community resources for the leisure-time needs of the elderly. *J. Soc. & Soc. Welfare*, *12*, 777.

Kotz, D., & West, R. (2009). Explaining the social gradient in smoking cessation: it's not in the trying, but in the succeeding. *Tobacco control*, *18*(1), 43-46.

Krieger, N. (2001). A glossary for social epidemiology. *Journal of epidemiology and community health*, *55*(10), 693-700.

Kuerbis, A., & Sacco, P. (2012). The impact of retirement on the drinking patterns of older adults: a review. *Addictive Behaviors*, *37*(5), 587-595.

Kuh, D., Ben-Shlomo, Y., Lynch, J., Hallqvist, J., & Power, C. (2003). Life course epidemiology. *Journal of epidemiology and community health*, *57*(10), 778.

Kuh, D. & Ben-Shlomo, Y. (2004), "Introduction", in Kuh, D. & Shlomo, Y. B. (Eds.). (2004). *A life course approach to chronic disease epidemiology* (Second edition). Oxford University Press, Part I, Chapter 1, pp. 3-14

Kuh, D., & Hardy, R. (2002). *A life course approach to women's health: does the past predict the present?* in Kuh, D., & Hardy, R. (2002). *A life course approach to women's health*. Oxford University Press, Chapter 1, 3-20.

Khuder, S. A., Dayal, H. H., & Mutgi, A. B. (1999). Age at smoking onset and its effect on smoking cessation. *Addictive behaviors*, *24*(5), 673-677.

Lahti, J., Laaksonen, M., Lahelma, E., & Rahkonen, O. (2011). Changes in leisure-time physical activity after transition to retirement: a follow-up study. *International Journal of Behavioral Nutrition and Physical Activity*, *8*(1), 36.

Landgren, B. M., Collins, A., Csemiczky, G., Burger, H. G., Baksheev, L., & Robertson, D. M. (2004). Menopause transition: annual changes in serum hormonal patterns over the menstrual cycle in women during a nine-year period prior to menopause. *The Journal of Clinical Endocrinology & Metabolism*, *89*(6), 2763-2769.

Lang, I. A., Rice, N. E., Wallace, R. B., Guralnik, J. M., & Melzer, D. (2007). Smoking cessation and transition into retirement: analyses from the English Longitudinal Study of Ageing. *Age and ageing*, *36*(6), 638-643.

Lantz, P. M., House, J. S., Lepkowski, J. M., Williams, D. R., Mero, R. P., & Chen, J. (1998). Socioeconomic factors, health behaviors, and mortality: results from a nationally representative prospective study of US adults. *Jama*, *279*(21), 1703-1708.

Lantz, P. M., Lynch, J. W., House, J. S., Lepkowski, J. M., Mero, R. P., Musick, M. A., & Williams, D. R. (2001). Socioeconomic disparities in health change in a longitudinal study of US adults: the role of health-risk behaviors. *Social science & medicine*, *53*(1), 29-40.

Lawson, P. J., & Flocke, S. A. (2009). Teachable moments for health behavior change: a concept analysis. *Patient education and counseling*, *76*(1), 25-30.

Lawton, J. (2002). Colonising the future: temporal perceptions and health-relevant behaviours across the adult lifecourse. *Sociology of Health & Illness*, *24*(6), 714-733.

Lee, S., Cho, E., Grodstein, F., Kawachi, I., Hu, F. B., & Colditz, G. A. (2004). Effects of marital transitions on changes in dietary and other health behaviours in US women. *International Journal of Epidemiology*, *34*(1), 69-78.

Link, B. G., & Phelan, J. (1995). Social conditions as fundamental causes of disease. *Journal of health and social behavior*, 80-94.

Lloyd-Sherlock, P. (2000). Population ageing in developed and developing regions: implications for health policy. *Social science & medicine*, *51*(6), 887-895.

Lundborg, P., & Andersson, H. (2008). Gender, risk perceptions, and smoking behavior. *Journal of health economics*, *27*(5), 1299-1311.

Luo, Y., & Waite, L. J. (2005). The impact of childhood and adult SES on physical, mental, and cognitive well-being in later life. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *60*(2), S93-S101.

Luoto, R., Kaprio, J., & Uutela, A. (1994). Age at natural menopause and sociodemographic status in Finland. *American journal of epidemiology*, *139*(1), 64-76.

Luy, M. (2003). Causes of male excess mortality: insights from cloistered populations. *Population and Development Review*, *29*(4), 647-676.

Luy, M., & Wegner-Siegmundt, C. (2014). The impact of smoking on gender differences in life expectancy: more heterogeneous than often stated. *The European Journal of Public Health*, cku211.

Lynch, J.L. & Davey Smith, G. (2005). "A life course approach to chronic disease epidemiology", Annual Review of Public Health, 26: 1-35.

Lynch, J. W., Kaplan, G. A., & Salonen, J. T. (1997). Why do poor people behave poorly? Variation in adult health behaviours and psychosocial characteristics by stages of the socioeconomic lifecourse. *Social science & medicine*, *44*(6), 809-819.

Lynch, S. M. (2003). Cohort and life-course patterns in the relationship between education and health: A hierarchical approach. *Demography*, *40*(2), 309-331.

Lynch, S. M. (2006). Explaining life course and cohort variation in the relationship between education and health: The role of income. *Journal of Health and Social Behavior*, *47*(4), 324-338.

Macintyre, S., Hunt, K., & Sweeting, H. (1996). Gender differences in health: are things really as simple as they seem?. *Social science & medicine*, *42*(4), 617-624.

Mackenbach, J. P. (2006). *Health inequalities: Europe in profile*. Produced by COI for the Department of Health.

Mackenbach, J. P. (2012). The persistence of health inequalities in modern welfare states: the explanation of a paradox. *Social science & medicine*, *75*(4), 761-769.

Maki, P. M. (2012). Minireview: effects of different HT formulations on cognition. *Endocrinology*, *153*(8), 3564-3570.

Marmot, M. (2006). *Inroduction*, in Marmot, M. & Wilkinson, R. (Eds.). (2006). *Social determinants of health*. Oxford University Press, Chapter 1, 1-5.

Marmot, M., & Allen, J. J. (2014). Social determinants of health equity. *American journal of public health*, *104*(S4), S517-S519.

Mastorakos, G., Valsamakis, G., Paltoglou, G., & Creatsas, G. (2010). Management of obesity in menopause: diet, exercise, pharmacotherapy and bariatric surgery. *Maturitas*, *65*(3), 219-224.

Matthews, S., Manor, O., & Power, C. (1999). Social inequalities in health: are there gender differences?. *Social science & medicine*, *48*(1), 49-60.

Mayer, K. U. (2009). New directions in life course research. *Annual review of sociology*, *35*, 413-433.

McAndrew, L. M., Napolitano, M. A., Albrecht, A., Farrell, N. C., Marcus, B. H., & Whiteley, J. A. (2009). When, why and for whom there is a relationship between physical activity and menopause symptoms. *Maturitas*, *64*(2), 119-125.

McBride, C. M., Emmons, K. M., & Lipkus, I. M. (2003). Understanding the potential of teachable moments: the case of smoking cessation. *Health education research*, *18*(2), 156-170.

McBride, C. M., & Ostroff, J. S. (2003). Teachable moments for promoting smoking cessation: the context of cancer care and survivorship. *Cancer control*, *10*(4), 325-333.

McBride, C. M., & Pirie, P. L. (1990). Postpartum smoking relapse. *Addictive behaviors*, *15*(2), 165-168.

McBride, C. M., Puleo, E., Pollak, K. I., Clipp, E. C., Woolford, S., & Emmons, K. M. (2008). Understanding the role of cancer worry in creating a "teachable moment" for multiple risk factor reduction. *Social science & medicine*, *66*(3), 790-800.

McDonough, P., & Walters, V. (2001). Gender and health: reassessing patterns and explanations. *Social science & medicine*, *52*(4), 547-559.

McGee, R., & Williams, S. (2006). Predictors of persistent smoking and quitting among women smokers. *Addictive behaviors*, *31*(9), 1711-1715.

McKee, S. A., Maciejewski, P. K., Falba, T., & Mazure, C. M. (2003). Sex differences in the effects of stressful life events on changes in smoking status. *Addiction*, *98*(6), 847-855.

Mckinlay, S. M. (1996). The normal menopause transition: an overview. *Maturitas*, *23*(2), 137-145.

Mckinlay, S. M., Brambilla, D.J., & Posner, J.G. (1992). The normal menopause transition. *Mauritas, 14(2)*, 103-115.

Mein, G. K., Shipley, M. J., Hillsdon, M., Ellison, G. T., & Marmot, M. G. (2005). Work, retirement and physical activity: cross-sectional analyses from the Whitehall II study. *The European Journal of Public Health*, *15*(3), 317-322.

Melby, M. K., Lock, M., & Kaufert, P. (2005). Culture and symptom reporting at menopause. *Human reproduction update*, *11*(5), 495-512.

Menai, M., Fezeu, L., Charreire, H., Kesse-Guyot, E., Touvier, M., Simon, C., ... & Oppert, J. M. (2014). Changes in sedentary behaviours and associations with physical activity through retirement: a 6-year longitudinal study. *PLoS One*, *9*(9), e106850.

Meschia, M., Pansini, F., Modena, A. B., de Aloysio, D., Gambacciani, M., Parazzini, F., ... & Peruzzi, E. (2000). Determinants of age at menopause in Italy: results from a large cross-sectional study. *Maturitas*, *34*(2), 119-125.

Midanik, L. T., Soghikian, K., Ransom, L. J., & Tekawa, I. S. (1995). The effect of retirement on mental health and health behaviors: The Kaiser Permanente Retirement Study. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *50*(1), S59-S61.

Midgette, A. S., & Baron, J. A. (1990). Cigarette smoking and the risk of natural menopause. *Epidemiology*, 474-480.

Mishra, G. D., & Kuh, D. (2012). Health symptoms during midlife in relation to menopausal transition: British prospective cohort study. *Bmj*, *344*, e402.

Molander, R. C., Yonker, J. A., & Krahn, D. D. (2010). Age-related changes in drinking patterns from mid-to older age: results from the Wisconsin longitudinal study. *Alcoholism: Clinical and Experimental Research*, *34*(7), 1182-1192.

Monden, C. W., de Graaf, N. D., & Kraaykamp, G. (2003). How important are parents and partners for smoking cessation in adulthood? An event history analysis. *Preventive medicine*, *36*(2), 197-203.

Montgomery, S. M., COOK, D. G., Bartley, M. J., & WADSWORTH, M. E. (1998). Unemployment, cigarette smoking, alcohol consumption and body weight in young British men. *The European Journal of Public Health*, *8*(1), 21-27.

Morabia, A., Costanza, M. C., & World Health Organization Collaborative Study of Neoplasia and Steroid Contraceptives. (1998). International variability in ages at menarche, first livebirth, and menopause. *American Journal of Epidemiology*, *148*(12), 1195-1205.

Moss, N. E. (2002). Gender equity and socioeconomic inequality: a framework for the patterning of women's health. *Social science & medicine*, *54*(5), 649-661.

Mujahid, G. (2006). Population Ageing in East and South-East Asia, 1950-2050: Implications for Elderly Care. *Asia-Pacific Population Journal*, *21*(2), 25.

Nagata, C., Takatsuka, N., Kawakami, N., & Shimizu, H. (2000). Association of diet with the onset of menopause in Japanese women. *American journal of epidemiology*, *152*(9), 863-867.

Neve, R. J., Lemmens, P. H., & Drop, M. J. (2000). Changes in alcohol use and drinking problems in relation to role transitions in different stages of the life course. *Substance Abuse*, *21*(3), 163-178.

Ng, D. M., & Jeffery, R. W. (2003). Relationships between perceived stress and health behaviors in a sample of working adults. *Health Psychology*, *22*(6), 638.

Nicolau, B., Thomson, W. M., Steele, J. G., & Allison, P. J. (2007). Life-course epidemiology: concepts and theoretical models and its relevance to chronic oral conditions. *Community dentistry and oral epidemiology*, *35*(4), 241-249.

Nooyens, A. C., Visscher, T. L., Schuit, A. J., van Rossum, C. T., Verschuren, W. M., van Mechelen, W., & Seidell, J. C. (2005). Effects of retirement on lifestyle in relation to changes in weight and waist circumference in Dutch men: a prospective study. *Public health nutrition*, *8*(8), 1266-1274.

Nystedt, P. (2006). Marital life course events and smoking behaviour in Sweden 1980–2000. *Social Science & Medicine*, *62*(6), 1427-1442.

Obermeyer, C. M., Reher, D., & Saliba, M. (2007). Symptoms, menopause status, and country differences: a comparative analysis from DAMES. *Menopause*, *14*(4), 788-797.

Omran, A. R. (2005). The epidemiologic transition: a theory of the epidemiology of population change. *Milbank Quarterly*, *83*(4), 731-757.

O'Neill, S., & Eden, J. (2012). The pathophysiology of menopausal symptoms. *Obstetrics, Gynaecology and Reproductive Medicine*, *22*(3), 63-69.

O'Neill, S., & Eden, J. (2014). The pathophysiology of menopausal symptoms. *Obstetrics, Gynaecology and Reproductive Medicine*, *24*(12), 349-356.

O'Neill, S., & Eden, J. (2017). The pathophysiology of menopausal symptoms. *Obstetrics, Gynaecology and Reproductive Medicine*, *27*(10), 303-310.

Osler, M., & Prescott, E. (1998). Psychosocial, behavioural, and health determinants of successful smoking cessation: a longitudinal study of Danish adults. *Tobacco control*, *7*(3), 262-267.

Osler, M., Prescott, E., Godtfredsen, N., Hein, H. O., & Schnohr, P. (1999). Gender and determinants of smoking cessation: a longitudinal study. *Preventive medicine*, *29*(1), 57-62.

Parazzini, F., Negri, E., & La Vecchia, C. (1992). Reproductive and general lifestyle determinants of age at menopause. *Maturitas*, *15*(2), 141-149.

Parente, R. C., Faerstein, E., Celeste, R. K., & Werneck, G. L. (2008). The relationship between smoking and age at the menopause: a systematic review. *Maturitas*, *61*(4), 287-298.

Parker, M. G., & Thorslund, M. (2007). Health trends in the elderly population: getting better and getting worse. *The Gerontologist*, *47*(2), 150-158.

Pearlin, L. I. (1989). The sociological study of stress. *Journal of health and social behavior*, 241-256.

Pearlin, L. I. (2010). The life course and the stress process: Some conceptual comparisons. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *65*(2), 207-215.

Pearlin, L. I., Schieman, S., Fazio, E. M., & Meersman, S. C. (2005). Stress, health, and the life course: Some conceptual perspectives. *Journal of Health and Social Behavior*, *46*(2), 205-219.

Pearlin, L. I., & Skaff, M. M. (1996). Stress and the life course: A paradigmatic alliance. *The Gerontologist*, *36*(2), 239-247.

Perkins, K. A. (2001). Smoking cessation in women. *CNS drugs*, *15*(5), 391-411.

Perreira, K. M., & Sloan, F. A. (2001). Life events and alcohol consumption among mature adults: a longitudinal analysis. *Journal of studies on alcohol*, *62*(4), 501-508.

Peters, S. A., Huxley, R. R., & Woodward, M. (2013). Smoking as a risk factor for stroke in women compared with men. *Stroke*, *44*(10), 2821-2828.

Peto, R., Darby, S., Deo, H., Silcocks, P., Whitley, E., & Doll, R. (2000). Smoking, smoking cessation, and lung cancer in the UK since 1950: combination of national statistics with two case-control studies. *Bmj*, *321*(7257), 323-329.

Phelan, S. (2010). Pregnancy: a "teachable moment" for weight control and obesity prevention. *American journal of obstetrics and gynecology*, *202*(2), 135-e1.

Pirie, P. L., Murray, D. M., & Luepker, R. V. (1991). Gender differences in cigarette smoking and quitting in a cohort of young adults. *American Journal of Public Health*, *81*(3), 324-327.

Platt, A., Sloan, F. A., & Costanzo, P. (2010). Alcohol-consumption trajectories and associated characteristics among adults older than age 50. *Journal of Studies on Alcohol and Drugs*, *71*(2), 169-179.

Pomerleau, J., Pederson, L. L., Østbye, T., Speechley, M., & Speechley, K. N. (1997). Health behaviours and socio-economic status in Ontario, Canada. *European journal of epidemiology*, *13*(6), 613-622.

Poulton, R., Caspi, A., Milne, B. J., Thomson, W. M., Taylor, A., Sears, M. R., & Moffitt, T. E. (2002). Association between children's experience of socioeconomic disadvantage and adult health: a life-course study. *The lancet*, *360*(9346), 1640-1645.

Power, C., Graham, H., Due, P., Hallqvist, J., Joung, I., Kuh, D., & Lynch, J. (2005). The contribution of childhood and adult socioeconomic position to adult obesity and smoking behaviour: an international comparison. *International Journal of Epidemiology*, *34*(2), 335-344.

Prescott, E., Hippe, M., Schnohr, P., Hein, H. O., & Vestbo, J. (1998). Smoking and risk of myocardial infarction in women and men: longitudinal population study. *Bmj*, *316*(7137), 1043.

Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American journal of health promotion*, *12*(1), 38-48.

Rabe-Hesketh, S., & Skrondal, A. (2012). Multilevel and Longitudinal Modeling Using Stata. *Stata Press books*.

Richman, J. A., Zlatoper, K. W., Ehmke, J. L. Z., & Rospenda, K. M. (2006). Retirement and drinking outcomes: Lingering effects of workplace stress?. *Addictive Behaviors*, *31*(5), 767-776.

Rodriguez, E., & Chandra, P. (2006). Alcohol, employment status, and social benefits: One more piece of the puzzle. *The American journal of drug and alcohol abuse*, *32*(2), 237-259.

Rose, D., Pevalin, D. J., & O'Reilly, K. (2005). *The National Statistics Socio-economic Classification: origins, development and use*. Basingstoke: Palgrave Macmillan.

Rosenbloom, C. A., & Whittington, F. J. (1993). The effects of bereavement on eating behaviors and nutrient intakes in elderly widowed persons. *Journal of Gerontology*, *48*(4), S223-S229.

Ross, C. E., & Wu, C. L. (1995). The links between education and health. *American sociological review*, 719-745.

Ross, C. E., & Wu, C. L. (1996). Education, age, and the cumulative advantage in health. *Journal of health and social behavior*, 104-120.

Scharf, D., & Shiffman, S. (2004). Are there gender differences in smoking cessation, with and without bupropion? Pooled-and meta-analyses of clinical trials of Bupropion SR. *Addiction*, *99*(11), 1462-1469.

Schooling M., & Kuh, D. (2002). "A life course perspective on women's health behaviours", in Kuh, D., & Hardy, R. (2002). *A life course approach to women's health*. Oxford University Press, Part III, Chapter 13, pp 279-303.

Seeman, T. E., & Crimmins, E. (2001). Social environment effects on health and aging. *Annals of the New York Academy of Sciences*, *954*(1), 88-117.

Shahar, D. R., Schultz, R., Shahar, A., & Wing, R. R. (2001). The effect of widowhood on weight change, dietary intake, and eating behavior in the elderly population. *Journal of Aging and Health*, *13*(2), 186-199.

Sherman, S. (2005). Defining the menopausal transition. *The American journal of medicine*, *118*(12), 3-7.

Shi, Y., & Warner, D. O. (2010). Surgery as a teachable moment for smoking cessation. *Anesthesiology: The Journal of the American Society of Anesthesiologists*, *112*(1), 102-10

Siahpush, M. (2004). Why is lone-motherhood so strongly associated with smoking?. *Australian and New Zealand Journal of Public Health*, *28*(1), 37-42.

Show, M., Dorling, D., & Smith, G.D. (2006), "Poverty, social exclusion, and minorities", in Marmot, M. & Wilkinson, R. (Eds.). (2006). *Social determinants of health*. Oxford University Press, Chapter 10, 196-223.

Shuster, L. T., Rhodes, D. J., Gostout, B. S., Grossardt, B. R., & Rocca, W. A. (2010). Premature menopause or early menopause: long-term health consequences. *Maturitas*, *65*(2), 161-166.

Siahpush, M., McNeill, A., Hammond, D., & Fong, G. T. (2006). Socioeconomic and country variations in knowledge of health risks of tobacco smoking and toxic constituents of smoke: results from the 2002 International Tobacco Control (ITC) Four Country Survey. *Tobacco control*, *15*(suppl 3), iii65-iii70.

Siegrist, J., & Marmot, M. (2004). Health inequalities and the psychosocial environment—two scientific challenges. *Social science & medicine*, *58*(8), 1463-1473.

Sjösten, N., Kivimäki, M., Singh-Manoux, A., Ferrie, J. E., Goldberg, M., Zins, M., ... & Vahtera, J. (2012). Change in physical activity and weight in relation to retirement: the French GAZEL Cohort Study. *BMJ open*, *2*(1), e000522.

Slingerland, A. S., van Lenthe, F. J., Jukema, J. W., Kamphuis, C. B., Looman, C., Giskes, K., ... & Brug, J. (2007). Aging, retirement, and changes in physical activity: prospective cohort findings from the GLOBE study. *American Journal of Epidemiology*, *165*(12), 1356-1363.

Sonja, M. M., Nancy, L. B., & John, B. M. (1985). Smoking and age at menopause in women. *Annals of Internal Medicine*, *103*, 350-356.

Sorensen, G., & Pechacek, T. F. (1987). Attitudes toward smoking cessation among men and women. *Journal of Behavioral Medicine*, *10*(2), 129-137.

Steffick, D. E., Wallace, R. B., Herzog, A. R., Ofstedal, M. B., Steffick, D., Fonda, S., & Langa, K. M. (2000). Documentation of affective functioning measures in the Health and Retirement Study.

Stenholm, S., Pulakka, A., Kawachi, I., Oksanen, T., Halonen, J. I., Aalto, V., ... & Vahtera, J. (2016). Changes in physical activity during transition to retirement: a cohort study. *International Journal of Behavioral Nutrition and Physical Activity*, *13*(1), 51.

Sternfeld, B., Bhat, A. K., Wang, H., Sharp, T., & CHARLES P QUESENBERRY, J. R. (2005). Menopause, physical activity, and body composition/fat distribution in midlife women. *Medicine & Science in Sports & Exercise*, *37*(7), 1195-1202.

Stojanovska, L., Apostolopoulos, V., Polman, R., & Borkoles, E. (2014). To exercise, or, not to exercise, during menopause and beyond. *Maturitas*, *77*(4), 318-323.

Stone, J., Netuveli, G., & Blane, D. (2008). Modelling socioeconomic trajectories: an optimal matching approach. *International Journal of Sociology and Social Policy*, *28*(5/6), 217-230.

Stone, J., Netuveli, G., & Blane, D. (2014). Life-course occupational social class and health in later life: the importance of frequency and timing of measures. *European Journal of Ageing*, *11*(3), 273-284.

Stotts, A. L., Diclemente, C. C., Carbonari, J. P., & Mullen, P. D. (1996). Pregnancy smoking cessation: a case of mistaken identity. *Addictive behaviors*, *21*(4), 459-471.

Stronks, K., van de Mheen, H. D., Looman, C. W., & Mackenbach, J. P. (1997). Cultural, material, and psychosocial correlates of the socioeconomic gradient in smoking behavior among adults. *Preventive medicine*, *26*(5), 754-766.

Tamers, S. L., Okechukwu, C., Marino, M., Guéguen, A., Goldberg, M., & Zins, M. (2015). Effect of stressful life events on changes in smoking among the French: longitudinal findings from GAZEL. *The European Journal of Public Health*, *25*(4), 711-715.

Tangen, T., & Mykletun, A. (2008). Depression and anxiety through the climacteric period: an epidemiological study (HUNT-II). *Journal of Psychosomatic Obstetrics & Gynecology*, *29*(2), 125-131.

Taylor, K. L., Cox, L. S., Zincke, N., Mehta, L., McGuire, C., & Gelmann, E. (2007). Lung cancer screening as a teachable moment for smoking cessation. *Lung cancer*, *56*(1), 125-134.

Thoemmes, F., & Ong, A. D. (2016). A primer on inverse probability of treatment weighting and marginal structural models. *Emerging Adulthood*, *4*(1), 40-59.

Tillgren, P., Haglund, B. J., Lundberg, M., & Romelsjö, A. (1996). The sociodemographic pattern of tobacco cessation in the 1980s: results from a panel study of living condition surveys in Sweden. *Journal of epidemiology and community health*, *50*(6), 625-630.

Torgerson, D. J., Thomas, R. E., Campbell, M. K., & Reid, D. M. (1997). Alcohol consumption and age of maternal menopause are associated with menopause onset. *Maturitas*, *26*(1), 21-25.

Touvier, M., Bertrais, S., Charreire, H., Vergnaud, A. C., Hercberg, S., & Oppert, J. M. (2010). Changes in leisure-time physical activity and sedentary behaviour at retirement: a prospective study in middle-aged French subjects. *International Journal of Behavioral Nutrition and Physical Activity*, *7*(1), 14.

Turner, R. J., & Avison, W. R. (2003). Status variations in stress exposure: Implications for the interpretation of research on race, socioeconomic status, and gender. *Journal of Health and Social Behavior*, 488-505.

Turner, R. J., Wheaton, B., & Lloyd, D. A. (1995). The epidemiology of social stress. *American Sociological Review*, 104-125.

Umberson, D. (1992). Gender, marital status and the social control of health behavior. *Social science & medicine*, *34*(8), 907-917.

Umberson, D., Crosnoe, R., & Reczek, C. (2010). Social relationships and health behavior across the life course. *Annual review of sociology*, *36*, 139-157.

United Nations Economic Commission for Europe. (2009). Gender equality, work and old age. *Policy brief on Ageing 2*, November 2009.

Utian, W. H. (2004, April). Menopause-related definitions. In *International Congress Series* (Vol. 1266, pp. 133-138). Elsevier.

Van Dyck, D., Cardon, G., & De Bourdeaudhuij, I. (2016). Longitudinal changes in physical activity and sedentary time in adults around retirement age: what is the moderating role of retirement status, gender and educational level?. *BMC public health*, *16*(1), 1125.

Van Dijk, G. M., Kavousi, M., Troup, J., & Franco, O. H. (2015). Health issues for menopausal women: the top 11 conditions have common solutions. *Maturitas*, *80*(1), 24-30.

Van de Mheen, H., Stronks, K., Looman, C. W. N., & Mackenbach, J. P. (1998). Does childhood socioeconomic status influence adult health through behavioural factors?. *International Journal of Epidemiology*, *27*(3), 431-437.

van Keep, P. A., & Kellerhals, J. M. (1975). The ageing woman: about the influence of some social and cultural factors on the changes in attitude and behaviour that occur during and after the menopause. *Acta Obstetricia et Gynecologica Scandinavica*, *54*(sup51), 18-27.

Van Loon, A. J. M., Tijhuis, M., Surtees, P. G., & Ormel, J. (2005). Determinants of smoking status: cross-sectional data on smoking initiation and cessation. *The European Journal of Public Health*, *15*(3), 256-261.

Veenstra, M. Y., Lemmens, P. H., Friesema, I. H., Garretsen, H. F., Knottnerus, J. A., & Zwietering, P. J. (2006). A literature overview of the relationship between life-events and alcohol use in the general population. *Alcohol and Alcoholism*, *41*(4), 455-463.

Victor, C. (2010). "The Demography of Ageing", in Dannefer, D., & Phillipson, C. (Eds.). (2010). The SAGE handbook of social gerontology. Sage. Section 1, Chapter 5, pp.61-74.

Wadsworth, M. E. J. (1997). Health inequalities in the life course perspective. *Social science & medicine*, *44*(6), 859-869.

Waldron, I. (1991). Patterns and causes of gender differences in smoking. *Social science & medicine*, *32*(9), 989-1005.

Wang, X., Steier, J. B., & Gallo, W. T. (2014). The effect of retirement on alcohol consumption: results from the US Health and Retirement Study. *The European Journal of Public Health*, *24*(3), 485-489.

Wardle, J., & Steptoe, A. (2003). Socioeconomic differences in attitudes and beliefs about healthy lifestyles. *Journal of epidemiology and community health*, *57*(6), 440-443.

Wardle, J., Haase, A. M., Steptoe, A., Nillapun, M., Jonwutiwes, K., & Bellisie, F. (2004). Gender differences in food choice: the contribution of health beliefs and dieting. *Annals of Behavioral Medicine*, *27*(2), 107-116.

Weber, M. T., Rubin, L. H., & Maki, P. M. (2013). Cognition in perimenopause: the effect of transition stage. *Menopause (New York, NY)*, *20*(5).

Weden, M., & Kimbro, R. T. (2007). Racial and ethnic differences in the timing of first marriage and smoking cessation. *Journal of Marriage and Family*, *69*(3), 878-887.

West, P. (1997). Health inequalities in the early years: is there equalisation in youth?. *Social science & medicine*, *44*(6), 833-858.

Wilcox, S., Evenson, K. R., Aragaki, A., Wassertheil-Smoller, S., Mouton, C. P., & Loevinger, B. L. (2003). The effects of widowhood on physical and mental health, health behaviors, and health outcomes: The Women's Health Initiative. *Health Psychology*, *22*(5), 513.

Williams, S., McGee, R., Olaman, S., & Knight, R. (1997). Level of education, age of bearing children and mental health of women. *Social Science & Medicine*, *45*(6), 827-836.

Williams, K., & Umberson, D. (2004). Marital status, marital transitions, and health: A gendered life course perspective. *Journal of Health and Social Behavior*, *45*(1), 81-98.

Wister, A. V. (1996). The effects of socioeconomic status on exercise and smoking: age-related differences. *Journal of Aging and Health*, *8*(4), 467-488.

Wood, S. A. (2007). Developmental issues in older drinkers' decisions: To drink or not to drink. *Alcoholism Treatment Quarterly*, *24*(4), 99-118.

Woods, N. F., & Mitchell, E. S. (1997). Pathways to depressed mood for midlife women: observations from the Seattle Midlife Women's Health Study. *Research in Nursing & Health*, *20*(2), 119-129.

Woods, N. F., Smith-DiJulio, K., Percival, D. B., Tao, E. Y., Mariella, A., & Mitchell, E. S. (2008). Depressed mood during the menopausal transition and early postmenopause: observations from the Seattle Midlife Women's Health Study. *Menopause*, *15*(2), 223-232.

World Health Organization. (1996). Research on the menopause in the 1990s: report of a WHO scientific group.

World Health Organization. (2001). Health and ageing: A discussion paper.

World Health Organization. (2002). Active ageing: A policy framework.

Zantinge, E. M., van den Berg, M., Smit, H. A., & Picavet, H. S. J. (2013). Retirement and a healthy lifestyle: opportunity or pitfall? A narrative review of the literature. *The European Journal of Public Health*, *24*(3), 433-439.

Zins, M., Guéguen, A., Kivimaki, M., Singh-Manoux, A., Leclerc, A., Vahtera, J., ... & Goldberg, M. (2011). Effect of retirement on alcohol consumption: longitudinal evidence from the French Gazel cohort study. *PLoS One*, *6*(10), e26531.