Family trajectories and health. A life course perspective

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Abstract

In this paper, I investigate the role of family trajectory, i.e. the whole sequence of family events, during the life course of early adults in shaping their health outcomes. I jointly consider union formation and childbearing, since the two life domains are highly connected and their intersections may have an effect on health outcomes. Data come from Wave I and Wave IV of the National Longitudinal Study of Adolescent Health (Add Health). The paper is divided in two parts. First, I focus on transitions and investigate if changes in timing (when events happen), quantum (what and how many transitions) and sequencing (in what order), have an effect on the health of young women. In the second part, I classify life course trajectories into six groups representing different ideal-types of family trajectories and I explore the association of these trajectories with health outcomes. Results suggest that family trajectories play an important role on different health outcomes. Controlling for selection and background characteristics, precocious and "non-normative" transitions are associated with lower self-reported health and higher propensity of smoking and drinking.

1 Introduction

During the last decade, there has been an increasing interest in the relationship between marital status and health, (see e.g. Schoenborn, 2004; Waite and Bachrach, 2000; Wood et al., 2007; Koball et al., 2010). This is partially motivated by the recent changes in family behavior that have occurred in the United States and many other Western countries, i.e. increase in cohabitation, delay in marriage and rise of non marital childbearing (Cherlin, 2005; Schoen et al., 2007). Studies on the United States highlight the positive association between marriage and a various range of health outcomes for both men and women. Married adults are less likely to die in any given period than the unmarried (Lillard and Waite, 1993; Dupre et al., 2009), they also appear to have better mental

health than their counterparts (Lamb et al., 2003; Horwitz and White, 1998; Soons and Kalmijn, 2009; Meadows, 2009) and they are less likely to engage in unhealthy behaviors (Duncan et al., 2006).

Most studies examine health differences by marital status in order to identify the causal effect of marriage. Generally, they compare health outcomes of married men and women versus unmarried (or cohabiting) people or they examine the effect of changes in marital status across life course (Nock, 1981). Only a limited number of studies adopts a complete life course perspective. The life course paradigm assumes that individuals, as human agents, build their future on the basis of the constraints and opportunities experienced in the past (Elder, 1994). The process is iterative and cumulative, since initial advantages or disadvantages often are amplified with time (Giele and Elder, 1998). Life courses are embedded in different time and location and are affected by the social context in which individuals live. In addition, different life domains are strongly interdependent.

Elder (1985) observes that a trajectory can also be envisioned as a sequence of transitions that are enacted over time. A transition is a discrete life change or event within a trajectory (e.g., from single to married), whereas a trajectory is a sequence of linked states within a conceptually defined range of behavior or experience. Transitions are often accompanied by socially shared ceremonies and rituals, such as a graduation or a wedding ceremony, whereas a trajectory is a long-term pathway, with age-graded patterns of development in major social institutions such as education or family. In this way, the life course perspective emphasizes the ways in which transitions, pathways, and trajectories are socially organized. Moreover, transitions typically result in a change in status, social identity, and role involvement. Trajectories, however, are long-term patterns of stability and change and can include multiple transitions. Using longitudinal or retrospective data, family trajectories can be described by the complete sequence over time of union status, childbearing and eventually work status. Life course scholars stress the importance of the long term effects of trajectories (Soons et al., 2009), together with other characteristics of life history. Rather than investigating the contemporaneous association between marital status and wellbeing, life course analysis looks at the entire development of family history, i.e. the whole trajectory. Under this perspective, characteristics such as type, number and duration of unions, or the order of events may have an effect on later health outcomes (Peters and Liefbroer, 1997).

In this paper, I investigate the role of family trajectory, i.e. the whole sequence of family events, during the life course of early adults in shaping their health outcomes. I jointly consider union formation and childbearing, since the two life domains are highly connected and their intersections may have an effect on health outcomes. This paper is divided in two parts. First, I focus on transitions and investigate if changes in *timing*

(when events happen), *quantum* (what and how many transitions) and *sequencing* (in what order) (Billari et al., 2006; Billari, 2005), have an effect on the health of young women. In the second part, I classify life course trajectories into six groups representing different ideal-types of family trajectories and I explore the association of these trajectories with health outcomes.

2 Theoretical and empirical background

According to the life course health development (LCHD) model, health is the result of a continuous process that develops over an individual's lifetime (Halfon and Hochstein, 2002). In the LCHD model, health is a consequence of multiple factors operating in nested genetic, biological, behavioral, social, and economic contexts. These contexts change as a person develops. Therefore, health is seen as an adaptive process, composed by multiple transactions between the contexts mentioned above (e.g., genetic, social) and the biobehavioral regulatory systems (e.g., neurological, endocrine) that define human functions (Halfon and Hochstein, 2002). In other words, health is not a static phenomenon. It develops over time and changes as a function of experience. The LCHD model suggests that a person's health takes on a trajectory that results from the cumulative influence of multiple risk and protective factors during life course. Health, in turn, is a multidimensional concept that encompasses a large array of measures, including behavioral, physical, and emotional outcomes.

The association between family transitions and health is well documented. Changes in the family structure may affect health in several ways. In particular, Wood et al. (2007) distinguish five different health dimensions: health behaviors, mental health, physical health and longevity, health care access and use, intergenerational health effects. In this paper, I will only consider the first three dimensions. Using a sample of young women in the United States, I study the consequences of family trajectories on self-reported health, depression, drinking and smoking behaviors.

A large number of works demonstrates that married people are healthier, happier and less likely to engage in health threatening behaviors (for a review see Wood et al., 2007; Schoenborn, 2004). These potential benefits of marriage have influenced, at least in part, several US governmental initiatives in recent years that encourage and support marriage (Lichter et al., 2003; Acs, 2007). Consequently, this led to a debate on the effectiveness of pro-marriage policies among the scientific community, (McLanahan, 2007; Amato, 2007; Nock, 2005).

In the literature, the benefits associated with marriage are generally called the "protection effects" of marriage (Waldron et al., 1996). In their review, Musick and Bumpass (2006) suggest four possible explanations: institutionalization, social roles, social support

and commitment. Marriage is an institution where spouses have defined social roles both inside and outside the household (Gove, 1972; Ferree, 1990). Moreover, marriage is a source of social support. Spouses provide intimacy, companionship and daily interaction. At the same time, married people are connected to a larger network (e.g. friends, kin). This enlarges the social capital from which spouses can draw on in case of need. Last, the public nature of marriage strengthens commitment and facilitates joint long-term investments, including financial, role specialization and time spent in the care of young children. Commitment strengthens bonds between partners and serves as a barrier to exit. It is not clear, however, if these benefits are unique to marriage or whether they can be extended to other intimate relationship, particularly cohabitation. Evidences are mixed: Wu and Hart (2002) find no health effects of entering into marriage or cohabitation in Canada. Horwitz and White (1998) find differences in happiness, but no disadvantages in terms of depression. Musick and Bumpass (2006) examine several dimensions of wellbeing including psychological health, social ties and relationship quality and they do not find significative differences between married and cohabiters. In a comparative research using data from 30 european countries, Soons and Kalmijn (2009) find that the cohabitation gap (with respect to marriage) in wellbeing is associated with the degree of acceptance of non-marital unions in the society.

Although there is an extensive literature on the association between marital status and health outcomes, a number of issues motivates a life course perspective. First, the association between marriage and wellbeing may reflect preexisting conditions. Healthy individuals may be more likely to possess certain characteristics, such as higher earnings, emotional health, and physical attractiveness, that make them more desirable marriage partners than those in poor health. In contrast, those with poor mental or physical health may lack the energy and well-being necessary to find a spouse or a partner. Most of the studies take into account selection issues using longitudinal data and controlling for the "individual effect". This is done generally using "fixed effect models" or "lagged dependent variable" regression, where the researcher can take in consideration selection controlling for previous outcomes. Although these statistical models take into account selection, they generally do not solve the problem of reverse causation. In some situations, health status may be the cause, rather than the effect of family transitions. For instance, once married, those who are less healthy may be less able to communicate and to participate in activities with their partner, or may have difficulties to contribute financially to the household, all of which may increase the likelihood of divorce.
Second, when data on marital status are collected in a longitudinal survey, we often ignore what happens between the time periods that are taken in consideration. Cohabitation and marriage are not mutually exclusive. In the United States, about half of

young adults live with a partner before marrying. For some people, cohabitation is a prelude to marriage or a trial marriage. For others, a series of cohabiting relationships may be a long-term substitute for marriage (Cherlin, 2005). Although cohabitation has become common in the United States, it rarely lasts long. About half of cohabitation relationships end through marriage or a breakup within a year (Seltzer, 2004; Bumpass and Lu, 2000). If we consider only the change in marital status between the two waves of a longitudinal survey, we may ignore possible variations occurring in between. This may lead to considerable bias if the time between two data collection is sufficiently large. For instance, we may not distinguish between an individual married for the first time and another one who remarried after a separation. Also, since many married people experience cohabitation, it may be difficult to separate the causal effect of marriage. Does marriage have a different effect if it is preceded by cohabitation? In this case, does the time of exposure to premarital cohabitation matter?

Third, the majority of studies focus on union status without taking into consideration the link with other life domains. Union status is clearly connected with other events that happen during the life course. Having a child, leaving parental home, finishing school, starting to work are strictly connected with the probability to enter (or exit) a union. For example, a couple may decide to marry because of an unplanned pregnancy, or they can decide to postpone marriage until she/he reaches economic independence. Since different domains are strictly interlaced, it may be difficult to identify the effect of a single event, such as marriage or entering a cohabitation. Other variables may confound the effect of family transitions. There may be, in fact, interactions between family events and background characteristics such as race, socio-economic status or social context. For instance, Harris et al. (2010) observed that early marriage by young adults does not have a protective effect for African Americans as observed for whites. Moreover, numerous studies show that individuals who marry at young age have higher risk of marital dissolution (Martin and Bumpass, 1989; Bumpass et al., 1991; Lehrer, 1988; Teachman, 2002).

Numerous studies try to investigate the causal link between divorce and premarital unions. Marital dissolution is higher among couple who experienced cohabitation. This negative effect is partially explained by self-selection (Lillard et al., 1995) and it is associated with the degree of acceptance of non-marital unions in the society (Liefbroer and Dourleijn, 2006). Moreover, Mazzuco (2009) found that the cohabitation length effect on duration of marriage is time varying, being close to zero for the first 2-3 years of cohabitation and rising considerably in the following years. Also low socioeconomic status may constitute a barrier to enter marriage (Edin and Reed, 2005; Schoen et al., 2009) and lead to other family transitions.

Last, standard analyses do not consider variations in timing, quantum and sequenc-

ing of life course trajectories. It is not clear, in fact, how changes in the structure of trajectories affect health outcomes later in life. Most researches, in fact, do not take into account when transitions occurs (timing), how many (quantum) and in what order they happen (sequencing). Transitions that occur in different periods of life may have a different effect on wellbeing. For instance, age at first union may be associated to health outcomes. Marriages at age 18 and 30 are qualitatively very different, indeed. At the same time, the sequence of events is relevant on the study of family life course. Does marriage have the same effect on health if it is preceded by the birth of a child? Evidence shows that unmarried mothers fare worse in the marriage market, because they have greater chances of partnering with poorly educated and unemployed men (Ermisch and Pevalin, 2005). However, it is not clear if this increases the risk of having worse health outcomes. Last, trajectories may be very different in terms of complexity. Some individuals may experience a large number of transitions while others may not. Does stability in family trajectories affect health outcomes? Does the number of transitions matter? Some scholars argued that the overall structure of the life course has changed in profound ways, becoming "de-standardized," "de-institutionalized," and increasingly "individualized" (Macmillan, 2005; Shanahan, 2000; Elzinga and Liefbroer, 2007). It is not clear, however, what are the consequences of a de-standardization of family life course.

From a life course perspective, health outcomes are the result of the cumulative influence of multiple risks and protective factors experienced during the life course. For this reason the association between health and family formation should be expressed as an iterative process where health and family trajectories are mutually influenced. Under this perspective, it is necessary to take into account the whole trajectory in order to study the effects on health outcomes. The discussion above shows how difficult it may be to assess precise causal effects of family transition, unless the researcher relies on very strong assumptions. On the other hand, taking the whole trajectory as an input in statistical analysis is not straightforward (George, 2009). In this study, I use sequence analysis techniques to capture characteristics of the family trajectory such as complexity, sequencing and timing. Then, using Optimal Matching (Abbott and Tsay, 2000), I derived from data typical pathways of family formation using clustering techniques. Rather than identifying a causal effect of single family transitions, the aim of this paper is to explore associations between health outcomes and typologies of family trajectories. It may be possible, in fact, that certain typologies of family formation are associated with low health outcomes. This is relevant from a policy point of view. The study of family trajectories may highlight disadvantaged situations and it may permit to design appropriate interventions.

3 Contribution of the current study

The aim of this study is to explore the association between wellbeing and family trajectories from a life course perspective. In particular, I am interested in analyzing if there exists particular family trajectories associated with reduction in health status. To evaluate wellbeing I focus on the analysis of four different health outcomes: Self reported health, depression and risky behaviors (heavy drinking and smoking). I restrict the analysis to young women in age 30-33. I focused on young women for two reasons. First, the timing of family formation events tends to be earlier for women than for men. For example, the median age at first marriage in US is about 25 for women compared to 27 for men (Cherlin, 2004). Given the relatively young age of the sample I use, more women than men would have experienced family formation transitions. Second, becoming a parent is a central variable in this analysis, and men's reports of childbearing are less reliable than those of women. Indeed, one third to one half of men misreport non-marital births and births within previous marriages (Amato et al., 2008; Rendall et al., 1999).

A trajectory is defined as the monthly sequence of family states. The state-space is defined as follows. For every woman in the sample, I collect information about marriage and cohabiting relations. Moreover, I gather information about the age (in months) at first birth. The combination of union status with parenthood gives these six states: Single; Single Parent; Cohabiting; Cohabiting Parent; Married and Married Parent. Union states are reversible since from cohabitation it is possible to go into marriage or to return to single after a family disruption. Parenthood instead, is not reversible, i.e. from Single Parent a woman can only go to Cohabiting Parent or Married parent. The six states configuration follows the work by Schoen et al. (2007), where the authors examined early family transitions using a multi-state life table framework. The monthly detail permits to address in a precise way the order of transitions and to reduce the bias due to time interval. Differently from Amato et al. (2008), I take into consideration only family events (i.e. unions and childbearing) to focus on the relationship between health and family trajectories.

Following a life course perspective, I intend to analyze the association between different types of family trajectories and self-reported health, depression symptoms and risky behaviors. In the first part of the empirical analysis, I focus separately on variations in timing, quantum and sequencing of family transitions. In the second part, I classify family trajectories in homogeneous groups sharing similar characteristics. The effect of selection and confounding variables is considered using appropriate statistical models. In reference to variation of timing quantum and sequences, I specify three different research hypotheses.

H1: Women who have earlier transitions have lower health outcomes. (Timing hypothe-

sis)
I hypothesize that women who postpone family formation are more likely to invest in education and accumulate human capital. Young mothers or young women that enter an union have, in fact, less time to accumulate resources that contribute avoiding poor health and depression (Miech and Shanahan, 2000). Higher education also prevent women from engaging in behaviors that can damage their health. Furthermore, low educated women are more likely to match low educated men with higher probability of being unemployed and with lower income. Last, early marriage and early motherhood are associated with a higher probability of marital disruption that, in turn, is associated with major stress (Ermisch and Pevalin, 2005; O'Connell and Rogers, 1984).

H2: Women with "disordered" trajectories have lower health outcomes. (Quantum hypothesis)
Women who experience a large number of transitions are more likely to have less stable unions and may experience more traumas that can be dangerous for health development. The concept of "disorder" has been introduced for the first time by Rindfuss et al. (1987) in the study of transition to adulthood and parenthood. Individuals have expectations in terms of the role they assume in the society. A "disordered" life course may reflect difficulties to achieve the desired social role and fulfill the expectations. Also the lack of stability in family roles may be associated with more stress and less support from others. The "disorder" of life course is evaluated with a series of measures indicating the stability of the trajectory.

H3: Women who have more non-normative transitions experience lower health outcomes. (Order hypothesis)
Family transitions are not qualitatively equivalent. I expect that family transitions that are recognized by the society as "normative" do not have negative effect on health. On the contrary, I expect that "non-normative" transitions are associated with lower outcomes. Individuals have expectations about the order of life-course events, even if sanctions are not applied. In fact, many sociological theories build in an expected sequencing of events in the transition to family. For example, first marriage is still sometimes equated with the beginning of exposure to the risk of parenthood. The variable ordering of events in the life course is a contingency of some importance in the life cycle (Hogan, 1978).

In the second part of the empirical analysis, I focus on family pathways. Since the possible combinations of family trajectories are enormous, I derive from data homogeneous clusters of trajectories. The resulting typologies of family pathways describe simultaneously different combination of timing, quantum, and sequencing. In analogy with Amato

et al. (2008), I describe family formation using typical patterns of formation derived by empirical observations. The advantage of using classes is to reduce the (almost) unlimited number of combinations to a manageable number of groups that can be easily described. Differently form other studies (e.g. Amato et al., 2008), I am not interested in the precursors of different family pathways, but rather the consequences. Studying the health outcome of family typologies may help highlighting eventual disadvantages by subgroups of population.

4 Data and methods

4.1 Sample

The data I use come from Waves I and IV of the National Longitudinal Study of Adolescent Health (Add Health). Add Health is a longitudinal sample, nationally representative of US adolescents who were in grades 7 through 12 in 1994-5. In the first wave, data were collected through in-home interviews with the adolescent participants and one of their parents. Typically, the parent interview was completed by the biological mother. Adolescents were interviewed again in a second wave one year later in 1996, again in a third wave collected in 2001-2002 and finally in a forth wave in 2008-2009. At the time of Wave IV, respondents ranged in age from 26 to 33 years. Since the goal of this study is to explore the implications of early life course trajectories, the sample is restricted to women who are 30 or older at Wave IV. Of this sample (n = 2,358), Wave IV weights are missing for 101 women. After dropping these cases, the final sample size is 2,259. At the time of the Wave IV data collection, 27% of women in the sample were 30 years of age, 54% were 31 years of age, and 19% were 32 years of age. Using retrospective questions from wave IV, I reconstructed the family biographies of women from age 15 to their age at wave IV.

Health outcomes

I created the following indicators to analyze different aspects of health status, with measures available both at Wave I and at Wave IV. Measures are expressed in a continuous scale, and indicate physical, mental health, drinking and smoking behaviors.

Self-reported Health

Status of current health was assessed with one question, "In general, how is your health?" (1= excellent, 2= very good, 3= good, 4= fair, 5=poor). Health status is therefore expressed in reverse order. Greater values indicate poor health status. I also report in the descriptive analysis the proportion of women reporting poor or fair health status (11% of the sample, Table 4).

Depression. A measure of depression has been constructed using questions from the CESD (Center for Epidemiologic Studies Depression) Scale (Radloff, 1977). In particular, nine questions out of this scale were asked (each based on the frequency of the event during the past seven days): bothered by things that usually dont bother you, couldnt shake off the blues, felt just as good as other people, had trouble keeping your mind on what you were doing, felt depressed, felt too tired to do things, enjoyed life, felt sad, and felt that people disliked you (0 = never or rarely, 1 = sometimes, 2 = a lot of the time, and 3 = most of the time or all of the time). When appropriate, the coding was reversed so that high scores reflected high levels of depression. This indicator ranges from 0 to 21. I define as individuals with depression symptoms those who have a level of 9 or above (i.e. the ones who responded in average to have experience sometimes each of these symptoms, 18% - Table 4)

Smoking The number of cigarettes smoked in the last 30 days is used as a measure of smoking behavior. The percentage of women who report to have smoked at least an entire cigarette at wave IV is 27% (Table 4).

Heavy drinking. A scale of the frequency and severity of alcohol consumption has been created using this question: Within the last 12 months, on how many days did you drink five or more drinks in a row? Response options were 0 = never, 1 = one or two days, 2 = once per month or less, 3= two or three days per month, 4 = one or two days per week, 5= three to five days per week, and 6 = every day or almost every day. The resulting indicator is used as a continuous variable. Table 4 reports the proportion of respondents who had at least an episode of heavy drinking in the last 12 months (35% at wave IV).

Background characteristics

To control for compositional characteristics, I include in the models some indicators of demographic and socioeconomic status. Race/ethnicity is included: Hispanics, Black, Asian and White as a reference group. Parents' education is taken into account with a dummy variable indicating if at least one of the parent has college education. Also family composition at wave I is included. A dummy variable indicates if the respondent used to live with both biological parents during the first interview. Last, continuous values of age and age squared (measured in at Wave I) are included in the regression models.

4.2 Methods

In sequence analysis, life course trajectories are represented by monthly combination of union and childbearing states from age 15 to age 30. I define the state space to take six possible values: Single (S); Single Parent (SP); Cohabiting (C); Cohabiting Parent (CP); Married (M) and Married Parent (MP). In sequence analysis, each life-course or

trajectory is represented as a string of characters (also numerical), similar to the one used to code DNA molecules in the biological sciences. Thus, every trajectory is composed by a string of $(12) * 15 = 180$ values. The number of possible combinations is extremely large (6^{180}) and it is impossible to treat it with any statistical techniques. From a statistical point of view, sequences can be thought as the realization of a stochastic processes or alternatively as categorical time series. Life course sequences can be represented in several ways. A common approach is to describe the sequence with the state and its duration in time. For instance, an individual that stays single for 24 months, after that he has a cohabitation of 12 months and then she/he marries and stays married for 24 months can represented in this way:

(S, 24)-(C,12)-(M-24)

The sequence in the example describes the union status of a person for a period of five years.

Sequences differ in three dimensions: *timing*, *quantum*, and *ordering*. In this paper, I attempt to define some basic indicators to measure variations in those three dimensions. The proposed indicators are then used in regression analysis to evaluate the association with health outcomes.

Timing

Timing refers to the duration of events, and specifically to the age at which different transitions happen in the life course. I propose three indicators for timing:

- Age at first transition (i.e., the earliest between first union and first child).
- Age at first union.
- Age at first child.

The three indicators are refereed to the period from age 15 to age 30. I only consider individuals who experienced the event by age 30. In Add-Health data, at age 30 the 94.4% of women exited singlehood, 93.6% experienced a union and 64.6% became mothers.

Quantum

Quantum indicates the number of events in a trajectory. I propose two indicators to evaluate the *quantum* of a sequence:

- Number of events from age 15 to 30.
- Sequences Turbulence.

The first is the number of transitions experienced from age 15 to 30 without distinguishing the type of transitions. The second is an indicator proposed by Elzinga and Liefbroer (2007) that measures the dynamics of a categorical time series. Turbulence takes into account, besides the number of transitions, the duration in different states. The turbulence index is, in fact, a composite measure of two aspects: variability in the time spent in different states and the number of distinct subsequences that can be extracted from the sequence. It gives an overall measure of the grade of disorder of a life trajectory (see e.g. Elzinga et al., 2008; Elzinga and Liefbroer, 2007; Widmer and Ritschard, 2009)

Sequencing

Sequencing indicates the order in which events happen in life sequence. I propose two indicators to evaluate the *order* in a family sequence:

- Number of normative transitions from age 15 to 30.
- Number of non-normative transitions from age 15 to 30.

I divide transitions in two groups: normative and non-normative transitions. Normative transitions are events in life course that are commonly accepted in the society (Rindfuss et al., 1987). In this study, I consider "normative" the sequence of events with this order: Single-Married-Married Parent. Each variation to this pattern is classified as "non-normative". It follows that: premarital childbearing, cohabitation, and any union disruptions are considered non-normative. The concept of normative is certainly arbitrary and relative to the society in which the study takes place. Since long-term cohabitation in United States is not very common and marriage is still the primary form of union, I chose to include cohabitation on the list of non-normative transitions. Table 1 illustrates the classification of transitions.

Table 1: Normative and non-normative transitions. Classification Table. 1="Normative"; 0="Non-normative"

	S_t	SP_t	M_t	MP_t	C_t	CP_t
S_{t-1}	[1]	0	1	0	0	0
SP_{t-1}	- [2]		-	1	-	0
M_{t-1}	0	0		1	0	0
MP_{t-1}	-	0	-		-	0
C_{t-1}	0	0	1	0		0
CP_{t-1}	-	0	-	1	1	

[1] The empty diagonal indicates a permanence in the same state from time t to time $t+1$.

[2] The symbol $-$ indicates that the transition is not possible (i.e. from parenthood to singlehood).

4.2.1 Regression Models

To examine the relation between the indicators above and health outcomes, I use regression models that take into account the effect of selection and confounding variables. The aim is to analyze if the change in the four outcomes between Wave I and Wave IV is imputable to some characteristics of family transitions. The time span between the two wave in consideration is around 15 years. In Wave I, the respondents are teenagers (age 13-16), while in the last wave they are 30-33 years old. This means that the two time periods considered represent two periods in life qualitatively very different. Health is a continuous process that develops across time. Health in early adulthood is very likely to be influenced by the level of health experienced in adolescence, childhood, infancy and during mother's pregnancy. Previous health levels, in turn, influence the family transitions. To account for this selection issues, I include in the model the previous level of health indicator as a regressor. To examine the impact of these indicators on health, I use a change (or lagged dependent variable) model that sets health at Wave IV as a function of the initial level of adolescent health at Wave I (Allison, 1990; Johnston, 1995). I then include the characteristics of the trajectory, a set of time-invariant SES and control variables measured at Wave I. Such models can correctly be estimated as long as exogenous predictors are well controlled (Johnston, 2005).

The simple model is depicted in Equation (1)

$$Y_{i2} = \gamma D_i + \rho Y_{i1} + \beta X_{i1} + \epsilon_{i2} \tag{1}$$

Here, Y_{i2} represents a vector of health indicators measured at Wave IV (Time 2) for person i and Y_{i1} represents a vector of identical health measures at Wave I (Time 1). X_{i1} a vector of demographic controls and SES background at Wave I. The vector D_i represents the characteristics of the sequence from Wave I to Wave IV.

Alternatively we could assume that there is an individual effect such that $\epsilon_{i2} = \alpha_i + u_{i2}$ where α_i is the individual fixed effect and u_{it} a random shock. In this case we could use a fixed effect estimation, where the outcome is differentiated in order to drop the individual's time-invariant characteristics a_i (Angrist and Pischke, 2009). However, the fixed effect model is based on the presumption of time-invariant omitted variables. This assumption does not seem plausible since health is theorized as a development process that depends on many time-variant inputs that are not captured by the variables in the model. Also the time lag is sufficiently large (around 15 years). This avoids the risk that the time correlation explains all the variability in the outcomes.

Fixed effect (FE) appears to be particularly effective when we have information in small interval of time and we know changes in status. Using FE models, a change in status (i.e. marital status) can be associated with a change in the outcome. On the other hand, with a lagged dependent variable (LDV) strategy, we can include in the estimating

equation time-invariant variables. While FE models control for time-invariant omitted variables, LDV model does not. In particular, this can lead to bias in the estimates if we attempt in identifying a causal effect of a treatment variable. However, in this case, the proposed estimation strategy seems to be a good compromise to give a portrait of the statistical association between trajectories and health outcomes.

4.2.2 Extracting typologies of life trajectories

The indicators proposed in the previous paragraph are useful to describe some characteristics of the life trajectory. However, they do not give any indication on the "type" of sequence. To describe completely family trajectories we need to study simultaneously *timing*, *quantum*, and *sequencing* in life course sequences (Billari, 2005). The complexity of life course suggests to adopt an holistic approach, where all the different components of the life course are taken into account. Abbott (1995) was the first to introduce sequence analysis in the social sciences using Optimal Matching algorithm (OM) as a method to compare different life sequences. This method has been used for the alignment of biosequences. The basic idea behind optimal matching is to measure the dissimilarity of two sequences by considering how much effort is required to transform one sequence into the other one. Transforming sequences entails three basic operations in this very elementary method:

- insertion
- deletion
- substitution

A specific cost can be assigned to each operation, and the total cost of applying a series of elementary operations can be computed as the sum of the costs of single operations. Thus, the distance between two sequences can be defined as the minimum cost of transforming one sequence into the other one. Hence, the resulting output is a symmetric matrix of pairwise distances that can be used for further statistical analysis, mainly multivariate analysis. Optimal Matching is a family of dissimilarity measures between sequences derived from the distance originally proposed in the field of information theory and computer science by Vladimir Levenshtein (Levenshtein, 1965), with the difference that in OM the three operations have different costs, (Lesnard, 2006). The choice of the operations' costs determines the matching procedure and influences the results obtained. This is a major concern about the use of this technique in social sciences (Wu, 2000). A common solution for assessing the substitution costs is to use the inverse of the transition probability, in order to assign higher costs to the less common transitions (Piccarreta and Billari, 2007). I adopt this strategy in the empirical analysis.

Sequence analysis have been adopted in demography to study complex phenomenon in order to simultaneously study multiple demographic transitions (see e.g. Billari, 2001). Once obtained the dissimilarity matrix, we can apply standard reduction techniques to classify trajectories into homogeneous groups. The resulting groups are then used to describe "typical" patterns of transitions. Following the approach of McVicar and Anyadike-Danes (2002), I conduct a cluster analysis using Ward algorithm to identify six clusters of life sequences. Clusters can be described by choosing a representative sequence. Aassve et al. (2007) suggest to identify groups by using the medoid sequence, that is the sequence with the minimum distance from all of the other sequences in that cluster.

This group characterization of life sequences can be used as an input for further analysis, in particular regression analysis in order to explore the consequences of different life trajectories. For instance, Mouw (2005) uses the output of a clustering procedure as an input for a regression analysis under the heading "Does the sequence matter?" Regression analyses show important differences in the risk of experiencing outcomes such as poverty at age 35. Sequences are also found to influence subsequent happiness and depression status.

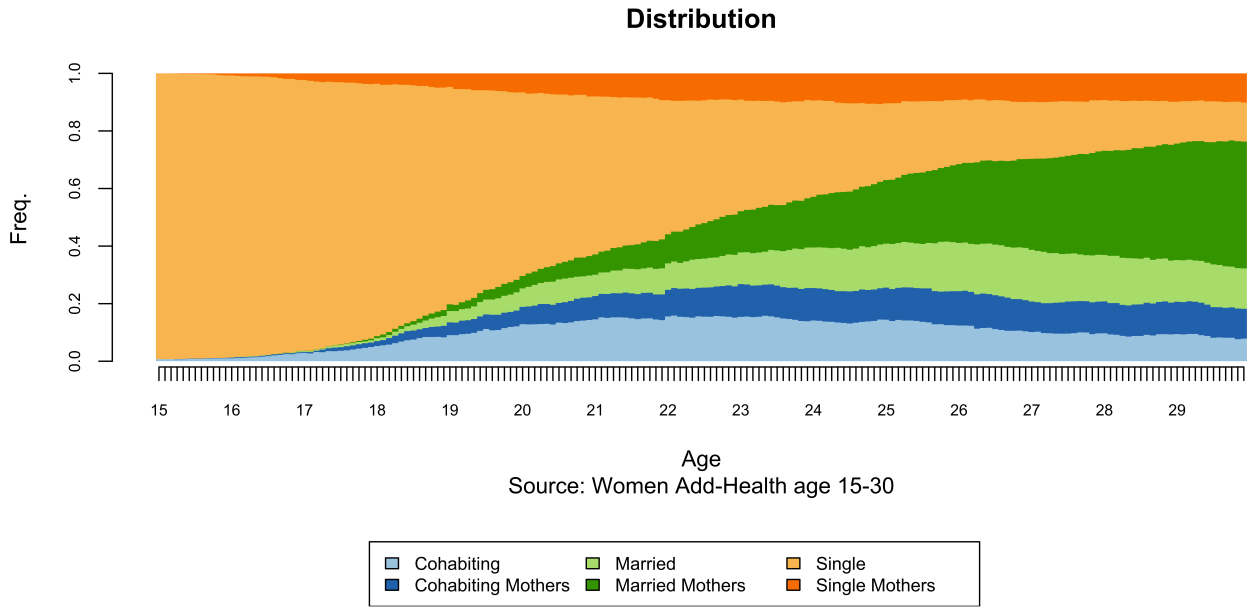
In this study, I analyze the consequences of family trajectories on health outcomes. I detect typical trajectories using cluster analysis on family sequences from age 15 to age 30. I only consider sequences from age 15-30 in order to have sequences of the same length for all the individuals. The resulting groups are then used as a categorical variable in a regression analysis. Using different "typologies" of trajectory allows to analyze the change in health status among different groups of individuals. This clustering procedure, for instance, allows to isolate the groups of single mothers who experience the birth of the first child outside a union, and do not experience stable union after childbearing. It is important, from a policy point of view to understand if any particular trajectory is associated with a decrease in health status. However, health status is measured at different ages for different individuals. This creates an asynchrony between the outcome and the time used to describe the covariate. The ideal situation, would be to have individuals interviewed at the same age. To control for age effects I introduce age and age-squared in the estimation.

5 Analysis of trajectories

It is important to examine events in the initial years of early adulthood because the large-scale changes in cohabitation, marriage, and non marital fertility have particularly affected women in age 20-30. In terms of family transitions,those years are very "dense" (Rindfuss, 1991), with more demographic events occurring than during any other part

of the life course. Figure 1 shows the distribution of "family states" from age 15 to 30. At age 30 very few women are single (because they did not enter an union, or because a disruption), the 55% are married and 18% are cohabiting (Table 2). Cohabitation is more frequent than marriage until age 23, then it slightly decreases at later ages. Motherhood increases with time, but it is predominant within marriage. The 44% of 30-years-old women are married and have at least a child (MP), while 11% are cohabiting mothers (CP) and the 11% are Single Mothers (SP). Only the 35% are childless and most of them are single.

Figure 1: Distribution of family states. Women age 15-30, weighted frequencies.



The distribution of family states gives a picture of family states by age, but gives no indication about the dynamic of trajectories. Table 3 shows the most frequent trajectories observed among women 15-30. The representation in table 3 does not take into account the length of permanence in a state, but only the order of events. The first occurring pattern (11% of the sequences) includes cohabitation before marriage. The normative pattern of transitions is the second most common. Women that follow this pattern do not experience cohabitation. Only the fifth pattern contains individuals who do not experience any transition, while the sixth and the seventh indicates the presence of an union disruption. The first ten patterns cover 52% of all cases.

In table 4 I cross-classify health outcomes with some features of the sequences. Women who experienced marriage have better health outcomes. They are, in fact, less likely to

Table 2: Weighted age percentage of women for marital status, cohabitation and motherhood from age 16 to age 30.

Age	Prop. married	Prop. cohabiting	Prop. with children
16	0.00	0.01	0.01
17	0.00	0.03	0.03
18	0.02	0.07	0.06
19	0.06	0.14	0.11
20	0.11	0.19	0.17
21	0.14	0.23	0.23
22	0.19	0.25	0.29
23	0.25	0.27	0.35
24	0.32	0.25	0.38
25	0.37	0.26	0.44
26	0.44	0.24	0.49
27	0.50	0.21	0.52
28	0.52	0.21	0.57
29	0.55	0.21	0.62
30	0.55	0.18	0.62

Table 3: First 10 sequence pattern of transitions in Women 15-30. Weighted frequencies.

		Freq
1	S-C-M-MP	11.46
2	S-M-MP	10.46
3	S-C-M	5.93
4	S-C-CP-MP	4.41
5	S	4.37
6	S-C-S	3.46
7	S-C-S-C-M-MP	3.37
8	S-M	3.15
9	S-C	3.07
10	S-SP-CP-MP	2.77

Pattern representation indicates the sequence of events with durations ≥ 1

report poor health, to suffer depression and adopt more healthy behaviors. On the contrary, women that have at least a cohabitation experience are more likely to have poor health. Furthermore, the proportion of smokers and heavy drinkers is greater among cohabiting and unmarried people. We do not observe great differences between mothers and non-mothers on self-reported health and depression. We observe, instead, differences

in behaviors. In fact, mothers are less likely to be smokers or to drink than women who never had a child.

Table 4: Proportion of women in poor health, with depression symptoms, smoking and heavy drinking in the last 30 days. Frequencies by union status and motherhood.

	Prop. with poor health	Prop. with depression symptoms	Prop. smoking	Prop. drinking
Never Married	0.11	0.20	0.39	0.45
Ever Married	0.09	0.15	0.27	0.32
Never Cohabitation	0.07	0.17	0.16	0.20
Ever Cohabitation	0.10	0.17	0.36	0.42
Non-mothers	0.10	0.17	0.29	0.45
Mothers	0.10	0.17	0.32	0.32
Total	0.11	0.18	0.27	0.35

Although these descriptive tables show a relation between health and family status, the true impact can be masked by selection issues and by the effect of confounding variables. In table 5 I report the mean value of indicators of *timing*, *quantum*, and sequences for women conditional to their health status. Individuals with poor health status and depression symptoms have their first family transitions earlier than others. They usually experience more transitions, in particular the "non-normative" ones. Analogously, smoking and drinking behavior is associated with early exit from singlehood, younger age at first union and first child and greater number of non-normative transitions.

Table 5: Indicators of *timing*, *quantum* and *sequencing* and health status.

	Poor Health		Depression		Smoking		Drinking		Total
	no	*yes*	*no*	*yes*	*no*	*yes*	*no*	*yes*	
Timing indicators									
Age at first transition	22.12	21.17	22.12	21.17	22.47	20.83	22.06	21.83	21.97
Age at first union	22.24	21.02	22.23	21.02	22.55	20.96	21.91	22.03	21.96
Age at first child	23.44	21.99	23.51	21.99	23.80	22.01	23.54	23.18	23.43
Quantum indicators									
Number of transition	3.09	3.40	3.11	3.41	2.9	3.69	3.08	3.36	3.18
Turbulence	6.43	6.48	6.45	6.48	6.27	6.89	6.42	6.68	6.52
Sequencing indicators									
Number of normative transition	1.08	0.97	1.10	0.97	1.12	0.93	1.19	0.96	1.10
Number of non-normative transition	2.02	2.43	2.01	2.44	1.80	2.80	1.897	2.40	2.08

5.1 Multivariate results

Early transitions have a negative effect on self-reported health and smoking behavior. Table 6 (and tables 12,13 in the appendix) reports the results of the regression analysis. These results indicate that, controlling for previous health and compositional characteristics, transitions under age 18 are associated with poor self-reported health and increase in smoking. If we consider only union transitions or the age at first child, also transitions before age 20 are significantly different from transitions that happen later in life. Moreover, depression symptoms are associated with early childbearing. The dynamic of family trajectories has a similar effect. The number of transitions is associated with negative effect on self-reported health and smoking behavior. The more transition a woman experience between wave I and wave IV, the more she is likely to smoke and report poor health (see table 7). Other indicators of sequence dynamics, instead, do not show notable effect on health outcomes (see table 14 in the appendix).

It is interesting to notice, however, what happens if we decompose the number of transitions into normative and non-normative (the distinction between normative transitions and non-normative is defined in table 1). Results in table 8 show that the two types of sequences have an opposite effect. While non-normative transitions have a negative effect on health outcomes, normative transitions are associated with less unhealthy behavior. Non-normative transitions are associated with a decrease in self-reported health and an increase in depression symptoms. Concerning smoking and drinking behaviors, we observe a protection effect given by normative transitions. Traditional family formation is therefore associated with reduction of risky behaviors. Controlling for other variables, non-normative transitions are associated with increase in the number of cigarette smoked and drinking occasions. Possible explanations are that non-normative transitions constitute major sources of stress. People who follow a normative path, instead, receive bigger support from friends and family.

The estimate results in tables 6,7,8 show similar levels of correlation between health outcomes in Wave I and Wave IV. The inclusion of lagged dependent variable allows to take into account selection issues. I also included in the models' background variables indicating race composition, socio-economic status and the family composition at the beginning of the transition. Although previous health outcomes control for health selection, I assume that background characteristics can affect the level of health at Wave IV net of previous health outcomes. Estimates show that women with college educated parents have lower health outcomes and minor propensity to smoke. The propensity to engage in risky behavior changes with race. Black and Hispanic girls tend to smoke and drink less than their white counterpart. Moreover, African American women have a general tendency to report minor levels of health. Overall, these results show that women that

move away from a traditional pattern have bigger risk to report poor health and above all to engage in risky behaviors. Therefore, these results show that *timing*, *quantum* and *sequencing* are important factors in the study of family formation.

6 Typologies of family trajectories

The analyses presented in the previous section show that women who move away from a "normative" model (especially in terms of age at first transition and order of events) are the ones who experienced greater decline on health status. Poor health outcomes are associated with early transitions, high numbers of changes in family status, and "non-normative" order of events. Traditional transitions seem to have instead a protective effect, especially on behavior.
Any how, previous analysis do not permit to identify what type of family patterns are associated with changes in health status. From a policy point of view, we are interested in detecting what subgroups of population risk more to experience poor health, for example, single motherhood (Furstenberg, 2005, 1998, 1976). Previous studies show lower levels of health among single mothers, in particular mental health (Cairney et al., 2003), propensity to smoke (Francesconi et al., 2010), and also higher level of mortality, (Mirowsky, 2005). Therefore, it is relevant to study the consequences of different patterns in family formation.

The number of possible combinations of sequences in family formation is almost unlimited. It follows that a convenient empirical strategy aims to reduce all the possible trajectories to a more manageable number. I used a cluster analysis to specify six groups of trajectories as representative of the entire set of sequences. The details of the analysis are presented in the Appendix. Below, I present a description of the sequences in each group, additional details can be found in table 9 and figures 2 and 3. Clusters can also be described using their medoid sequences (Aassve et al., 2007). A medoid is the observation with the minimum distance from other individuals in a cluster. The advantage of using medoid sequences is to define the cluster using a real sequence that best represents the groups.

1. **Married mothers** *(S,73)(C,11)(M,12)(MP,84); n=693.* This is the largest group in the sample (29%). It is composed by women that follow a more traditional pattern, i.e. Single-Married-Married Mothers. Almost all of them experience both marriage and motherhood. Cohabitation is not rare, but generally short. Women in this class start family transition earlier than women in other groups (with the exception of single and cohabiting mothers). Although the number of transitions is comparable with the other groups, the number of "non-normative" transitions is

Table 6: Regression estimates. Effects of timing indicators on health outcomes: age at first transition

	(1) Poor Health	(2) Depression	(3) Smoking	(4) Drinking
Age at first transition > 25 (ref.)				
Age at first transition < 18	0.270**	0.295	3.278***	0.0697
	(0.102)	(0.496)	(0.871)	(0.102)
Age at first transition 18-20	0.128	0.0691	1.771	0.0525
	(0.107)	(0.524)	(0.916)	(0.107)
Age at first transition 20-25	−0.0214	−0.0373	0.761	0.100
	(0.104)	(0.503)	(0.841)	(0.104)
Age at wave I	0.683	−4.167	−12.23	0.866
	(0.904)	(5.361)	(11.98)	(0.666)
Age squared at wave I	−0.0199	0.112	0.310	−0.0268
	(0.0251)	(0.147)	(0.329)	(0.0180)
Living with bio-parents at wave I	−0.0383	−0.185	−1.082	−0.00895
	(0.0533)	(0.250)	(0.640)	(0.0738)
College educated parents	−0.230***	−0.717**	−3.151***	0.0685
	(0.0636)	(0.273)	(0.771)	(0.0949)
Hispanic	0.184*	−0.112	−3.544***	−0.150
	(0.0905)	(0.437)	(0.755)	(0.0943)
Black	0.176**	0.567	−1.002	−0.278***
	(0.0618)	(0.342)	(0.770)	(0.0795)
Asian	0.208	0.0783	−1.643	−0.0998
	(0.120)	(0.389)	(1.242)	(0.155)
Self-reported health at wave I	0.270***			
	(0.0289)			
Depression WI		0.277***		
		(0.0259)		
Smoking WI			0.509***	
			(0.0318)	
Drinking WI				0.177***
				(0.0275)
Constant	−4.230	42.61	123.8	−6.337
	(8.132)	(48.88)	(109.3)	(6.181)
Observations	2255	2237	2237	2248
Adjusted R^2	0.141	0.108	0.310	0.060

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7: Regression estimates. Effects of quantum indicators on health outcomes: number of transitions

	(1) Poor Health	(2) Depression	(3) Smoking	(4) Drinking
Number of transitions	0.0457**	0.122	0.674***	0.0151
	(0.0149)	(0.0748)	(0.183)	(0.0192)
Age at wave I	0.325	−12.63*	−30.34*	0.529
	(1.475)	(5.981)	(14.84)	(1.113)
Age squared at wave I	−0.0102	0.343*	0.805*	−0.0175
	(0.0406)	(0.164)	(0.405)	(0.0299)
Living with bio-parents at wave I	−0.0622	−0.184	−1.215	−0.00217
	(0.0537)	(0.253)	(0.654)	(0.0736)
College educated parents	−0.266***	−0.739**	−3.410***	0.0735
	(0.0642)	(0.267)	(0.758)	(0.0920)
Hispanic	0.182*	−0.0408	−3.426***	−0.144
	(0.0917)	(0.435)	(0.747)	(0.0953)
Black	0.175**	0.579	−0.963	−0.274***
	(0.0619)	(0.341)	(0.783)	(0.0813)
Asian	0.198	0.0574	−1.785	−0.102
	(0.117)	(0.377)	(1.252)	(0.156)
Self-reported health at wave I	0.277***			
	(0.0292)			
Depression WI		0.273***		
		(0.0255)		
Smoking WI			0.508***	
			(0.0321)	
Drinking WI				0.176***
				(0.0273)
Constant	−0.915	119.5*	289.0*	−3.257
	(13.40)	(54.53)	(135.9)	(10.36)
Observations	2254	2236	2236	2247
Adjusted R^2	0.133	0.113	0.312	0.061

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: Regression estimates. Effects of sequencing indicators on health outcomes: number of normative and non-normative transitions

	(1) Poor Health	(2) Depression	(3) Smoking	(4) Drinking
Number of normative transitions	−0.0180	−0.133	−1.122**	−0.216***
	(0.0315)	(0.144)	(0.354)	(0.0430)
Number non-normative transitions	0.0556***	0.160*	0.961***	0.0513*
	(0.0153)	(0.0769)	(0.205)	(0.0203)
Age at wave I	0.432	−12.21*	−26.79*	0.988
	(1.460)	(5.933)	(13.40)	(1.105)
Age squared at wave I	−0.0131	0.332*	0.710	−0.0298
	(0.0401)	(0.162)	(0.364)	(0.0297)
Living with bio-parents at wave I	−0.0459	−0.115	−0.796	0.0575
	(0.0540)	(0.253)	(0.657)	(0.0740)
College educated parents	−0.266***	−0.739**	−3.440***	0.0731
	(0.0638)	(0.266)	(0.745)	(0.0883)
Hispanic	0.163	−0.121	−4.121***	−0.216*
	(0.0912)	(0.435)	(0.752)	(0.0994)
Black	0.136*	0.425	−2.251**	−0.425***
	(0.0640)	(0.346)	(0.815)	(0.0862)
Asian	0.195	0.0529	−1.984	−0.124
	(0.117)	(0.384)	(1.207)	(0.144)
Self-reported health at wave I	0.273***			
	(0.0290)			
Depression WI		0.272***		
		(0.0256)		
Smoking WI			0.486***	
			(0.0327)	
Drinking WI				0.158***
				(0.0271)
Constant	−1.861	115.8*	257.3*	−7.337
	(13.27)	(54.10)	(123.1)	(10.26)
Observations	2254	2236	2236	2247
Adjusted R^2	0.136	0.116	0.329	0.090

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

limited.

2. **Late transitions** *(S,168)(C,12); n=648.* This group represents women that start family transition very late or the ones who have not experienced any transition by age 30. They stay single for the majority of the sequence and they eventually experience a transition to cohabitation. Very few of them are married or have a child by age 30.

3. **Married women without children** *(S,97)(C,12)(M,71); n=315.* This group differs from group 1 essentially for two reasons. Women in this group begin the family transition later and they remain longer married without a child. The average time in which they stay married without children (M) is 2 years and half, compared to 1 year in group 1. The result is that the majority of women in this group postpones childbearing after age 30. The majority of transitions is traditional and cohabitation is generally short. Above all, this group is characterized by a postponement of traditional pattern.

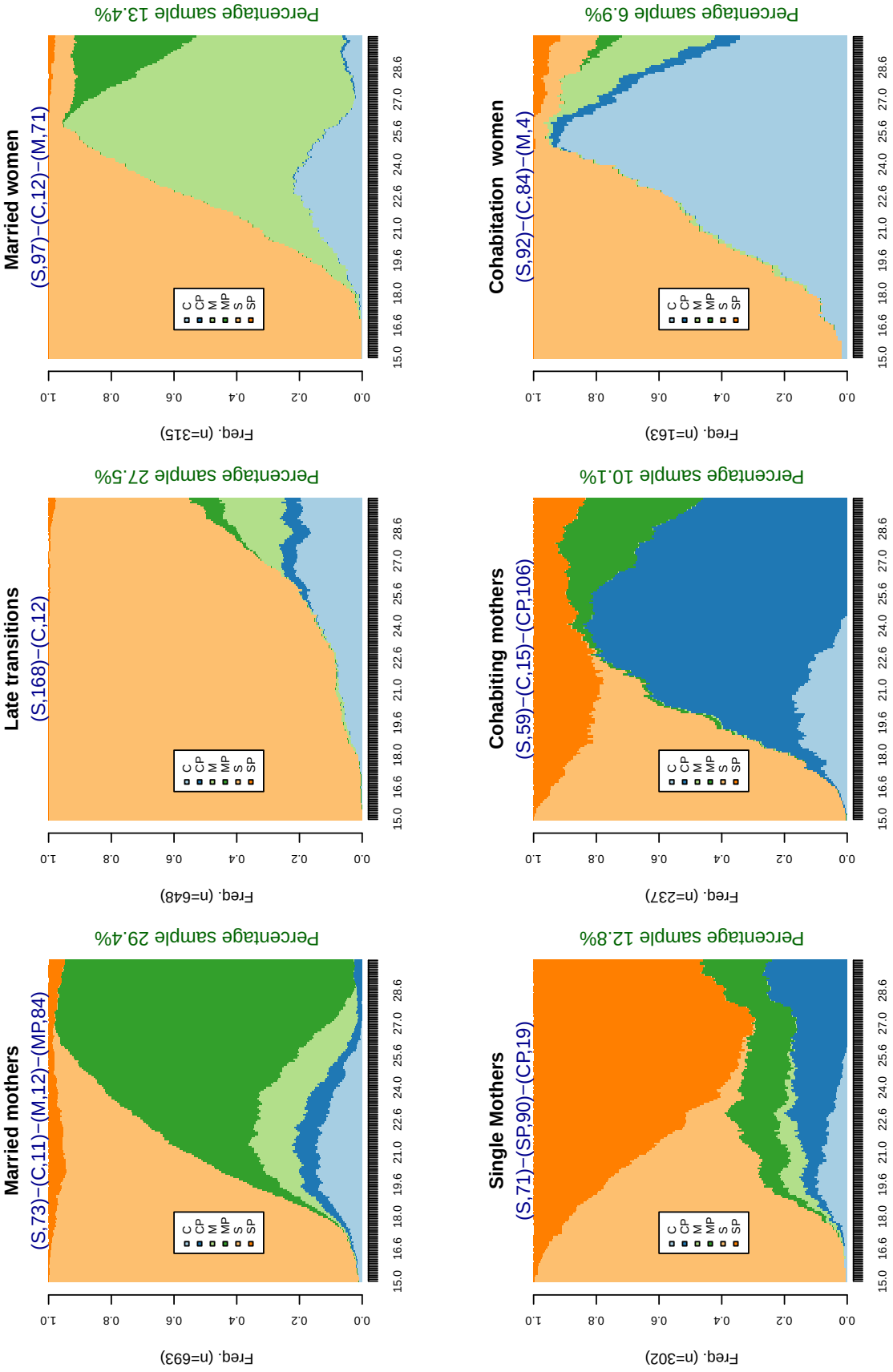
4. **Single Mothers** *(S,71)(SP,90)(CP,19); n=302.* This group identifies women who became mothers without being in an partnership. The group is characterized by very early transition to motherhood. Although there are some experiences of cohabitation, most of the time is spent outside a union. Women in this group experience in average more transitions than women in other groups. The majority of transitions are non-traditional. Single mothers are more likely to experience more than one cohabitation union.

5. **Cohabiting mothers** *(S,59)(C,15)(CP,106); n=237.* Women in this group differ from single mothers mainly for the fact that childbearing occurs during a cohabitation. This group is characterized by early transitions both to union and to motherhood. Similarly to single mothers, they experience a large number of transitions, most of them "non-normative" transitions.

6. **Cohabitating women** *(S,92)(C,84)(M,4); n=163.* The last group is characterized by cohabitation. It accounts for roughly 7% of women in the sample. Trajectories in this class are similar to group 2 (late transitions), with the difference that women in this group anticipate union to enter a cohabitation. The number of transitions is relatively low. Childbearing is postponed to later age.

Groups differ for compositional characteristics, in particular race composition and socioeconomic status (see table 9). Groups 4 and 5 have a higher proportion of African

Figure 2: Distribution of states



American women. These two groups seem to be the more disadvantaged in terms of family resources. Their families' income is noticeably inferior and a great proportion of them was not living with two biological parents at Wave I. On the contrary, women in the groups 2 and 3 seem to be more advantaged in terms of family income, education and family composition.

Single mothers, cohabiting mothers and cohabiting women (groups 3,4 and 6) report inferior level of health at Wave IV (table 6). The same groups also have higher probability to incur depression symptoms. This is partially explained by selection, since the same groups also have lower levels of health during wave I. Single and cohabiting mothers have a greater propensity to smoke at Wave IV. Drinking behavior, instead, is more frequent among cohabiting women and women who experience late transitions. Although we observe a general reduction in smoking from adolescent to adulthood, women who postpone family transitions (group 2) are the ones who have the biggest decrease.

To investigate the relation between health and family trajectories, I applied the same estimation strategy used in the previous section. Since family trajectories are subject to selection issues and confounding variables, I control for previous health outcomes (Wave I) and compositional characteristics in the regression models. The choice of the family pattern is very likely to be influenced by variables that are omitted in the regression model. Also the effect of reverse causation may not be negligible. On the other hand, the dependent variable is only a representation of a variety of trajectories and it cannot be thought as a treatment that is randomly assigned to the population. For this reason, the estimation results presented in table 11 only indicate a statistical association and they not have a causal significance. Nevertheless, results show some interesting aspects of the relation between health and family formation.

First, both women who have a child in early age and the ones who cohabit without children have lower self-reported health. On the other hand, women with a traditional pattern do not differ significantly to women who postpone family transitions. Second, cohabiting mothers are more likely to experience depression symptoms compared to other groups. Although single mothers are similar in many aspects, they do not differ from the reference group. A possible explanation is that depression is associated with the cohabiting experience, or in other terms with union instability. Last, smoking and drinking behaviors appear to be strongly influenced by family patterns. Trajectories with marriage seem to have a protective effect on the risky behaviors of women. Controlling for other variables, women of group 1 and 2 have lower probability to engage in heavy drinking behavior, while women of group 2 experience a sensible reduction on the average number of cigarette smoked. This is consistent with other studies that show how marriage has

a strong incentive on reducing risky behaviors (Duncan et al., 2006). However, it would be interesting to understand if this protective effect remains constant in time or if it has only a temporary effect. Overall, parents education has a positive effect on health - both physical and mental - and a reduction on cigarette smoking. Race has a mixed effect. Black women report less perceived health levels, but at the same time are less likely to engage in drinking behavior.

7 Discussion

Health is the result of a continuous process that develops over an individual's lifetime. Health trajectories are the consequence of a multitude of factors coming from genetic, biological, behavioral, social and economic contexts. Previous studies indicate that health is certainly connected with family events occurring during life course. Following the approach of Giele and Elder (1998), I distinguish between transitions (changes in family status) and trajectories (the whole sequence of transitions) in order to study jointly union formations and childbearing. Although the study of the dynamic inter-relationship between health and the life course has recently been an emerging topic, there is no general agreement on how trajectories should be conceptualized and analyzed. In this paper, I use sequence analysis to describe life course trajectories. Describing family biographies as sequences of family states allows to analyze different dimensions of life course. In particular, I am interested in examining if there is a direct effect of *timing*, *quantum* and *sequencing* on health outcomes for young women. It emerges that, controlling for selection and background characteristics, changes in these dimensions affect health status. Early transitions have negative repercussions on self-reported health and smoking behavior (*hypothesis 1*). Although the experience of a large number of transitions is associated with negative effects (*hypothesis 2*), some particular transitions have a protective effect. Normative transitions (i.e. traditional unions, childbearing after marriage) have protective effects on behaviors (*hypothesis 3*). Women with numerous normative transitions, in fact, smoke less cigarettes and have less occasions of heavy drinking. Above all, the indicators proposed indicate that sequence characteristics matters. In particular, it seems that moving away from normative family patterns (in terms of age-roles and order of events) is associated with a decrease in wellbeing.

In the second part of the paper, I examine the consequences of different typology of trajectories. I individuate six classes representing typical patterns of family formation. Differences in terms of wellbeing and propensity to risky behaviors are substantial. Once controlled for selection and background characteristics, these differences are attenuated but still significant. Empirical results show that women with short experiences of cohabitation and women with a traditional pattern do not differ significantly to women who

postpone family transitions. On the other hand, early childbearing and long cohabitation are associated with poor health status. Moreover, married women are less likely to smoke and to drink. These analyses partially confirm previous studies, in particular regarding the "protection effect" of marriage. Although selection and social background play most of the role, we still observe negative outcomes for women who experience early childbearing. We do not find much differences, instead, between single mothers and young mothers that have a child during a cohabitation.

Results show that early childbearing is associated with worse health outcomes. It is possible that women who anticipate motherhood have less resources (in terms of human and social capital) to tackle the stress of raising a child (especially if without a stable partner). Another complementary explanation is that early mothers are disadvantaged in the marriage market and they have difficulties to match with good men. Our results also show that married women are less likely to smoke and drink, confirming a "protection effect" of marriage. Cohabitation seems to have no negative effect if short and followed by a marriage. On the other hand, it is associated to poor outcomes (especially propensity to smoking and drinking) when it is persistent and accompanied by motherhood. It is possible, in fact, that short cohabitation, when followed by marriage, are becoming more and more accepted in the society. The aim of this paper is mainly descriptive. The mechanism of these relations, in fact, is beyond the scope of this work. Nevertheless, these results, give evidences that family trajectories matter.

It would be interesting in the future, to investigate if these differences persist during the life course to see if the more disadvantaged groups are able to catch up with the others. Another open issue is the interaction between family transitions and social class. It may be, in fact, that family trajectories have different effects according to the socio-economic status of the family of origin. For example, the risk associated with non-normative transitions may not affect women coming from higher social class. Last, this study only deals with young women and ignores men. Comparing the trajectories of partners might help to understand the effect of previous family transitions in the marriage market. Any how, this study represents one of the first tentative to study the association between health and family formation using a life course perspective.

Table 9: Descriptive statistics of typical group of sequences

	Married mothers	Late transitions	Married women	Single Mothers	Cohabiting mothers	Cohabiting women
			Union status and parenthood			
Ever married	1.00	0.37	1.00	0.51	0.44	0.44
Ever cohabited	0.70	0.71	0.72	0.83	1.00	1.00
Children	1.00	0.19	0.40	1.00	1.00	0.21
			Age at first transitions			
Age at first transition <18	0.58	0.12	0.32	0.63	0.79	0.46
Age at first transition 19-22	0.21	0.09	0.26	0.26	0.19	0.19
Age at first transition 23-25	0.21	0.38	0.42	0.11	0.02	0.36
Age at first transition >25	0.00	0.41	0.00	0.00	0.00	0.00
			Quantum and sequencing indicators			
Number of transitions Weave I-IV	3.37	2.41	3.14	3.89	3.79	3.32
Normative transitions	1.78	0.53	1.60	0.74	0.54	0.65
Non-normative transitions	1.59	1.88	1.54	3.15	3.25	2.67
			Compositional characteristics			
Proportion Black	0.1	0.18	0.06	0.34	0.31	0.14
Parents with college degree	0.19	0.27	0.38	0.15	0.07	0.22
Living with parents	0.49	0.56	0.63	0.29	0.26	0.52
Income family W1 (thousands of dollars)	41.54	51.92	53.52	33.38	34.59	41.73
Sex before 16	0.38	0.23	0.22	0.43	0.56	0.31

Table 10: Descriptive statistics of typical group of sequences. Health outcomes.

	Married mothers	Late transitions	Married women	Single Mothers	Cohabiting mothers	Cohabiting women
			Health status at Weave I			
Prop. in poor health at WI	0.10	0.08	0.07	0.16	0.10	0.14
Prop. with depression symptoms at WI	0.25	0.23	0.22	0.28	0.29	0.35
Smoking at WI	0.39	0.42	0.35	0.42	0.50	0.46
Heavy drinking at Weave I	0.34	0.39	0.34	0.31	0.32	0.47
			Health status at Weave IV			
Prop. in poor health at WIV	0.09	0.08	0.10	0.13	0.12	0.14
Prop. with depression symptoms at WIV	0.16	0.15	0.13	0.17	0.26	0.23
Smoking at WIV	0.30	0.29	0.20	0.39	0.43	0.37
Heavy drinking at WIV	0.29	0.43	0.38	0.33	0.35	0.52

Table 11: Regression estimates. Effects of family trajectories on health outcomes

	(1) Poor Health	(2) Depression	(3) Smoking	(4) Drinking
Late transitions (ref. category)				
Married mother	0.105	0.0705	−0.151	−0.311***
	(0.0694)	(0.301)	(0.768)	(0.0880)
Married women	0.0824	0.168	−1.906*	−0.225*
	(0.0784)	(0.389)	(0.913)	(0.109)
Single mothers	0.245**	−0.196	1.858	−0.162
	(0.0883)	(0.442)	(1.095)	(0.113)
Cohabiting mothers	0.211*	0.995*	2.243	−0.154
	(0.0919)	(0.498)	(1.153)	(0.123)
Cohabitation women	0.252*	0.887	0.327	0.330
	(0.118)	(0.481)	(1.824)	(0.230)
Age at wave I	0.650	−4.052	−12.08	1.173
	(0.876)	(5.366)	(11.90)	(0.645)
Age squared at wave I	−0.0193	0.108	0.301	−0.0354*
	(0.0244)	(0.147)	(0.326)	(0.0174)
Living with bio-parents at wave I	−0.0624	−0.210	−1.206	−0.0269
	(0.0536)	(0.248)	(0.645)	(0.0720)
College educated parents	−0.258***	−0.722**	−3.261***	0.0533
	(0.0643)	(0.274)	(0.772)	(0.0898)
Hispanic	0.152	−0.114	−4.162***	−0.182
	(0.0916)	(0.448)	(0.775)	(0.0980)
Black	0.126*	0.530	−1.945*	−0.324***
	(0.0630)	(0.350)	(0.815)	(0.0814)
Asian	0.198	−0.00107	−1.813	−0.134
	(0.121)	(0.394)	(1.185)	(0.149)
Self-reported health at wave I	0.277***			
	(0.0294)			
Depression WI		0.278***		
		(0.0261)		
Smoking WI			0.509***	
			(0.0318)	
Drinking WI				0.166***
				(0.0270)
Constant	−3.769	41.85	126.0	−8.809
	(7.889)	(48.93)	(108.6)	(5.973)
Observations	2255	2237	2237	2248
Adjusted R^2	0.132	0.113	0.308	0.077

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

References

Aassve, A., F. C. Billari, and R. Piccarreta, 2007. Strings of Adulthood: A Sequence Analysis of Young British Women's Work-Family Trajectories. *European Journal of Population*, 23(3-4):369–388.

Abbott, A., 1995. Sequence analysis: new methods for old ideas. *Annual Review of Sociology*, 21(1):93–113.

Abbott, A. and A. Tsay, 2000. Sequence analysis and optimal matching methods in sociology: Review and prospect. *Sociological Methods & Research*, 29(1):3.

Acs, G., 2007. Can We Promote Child Well-Being by Promoting Marriage? *Journal of Marriage and Family*, 69(5):1326–1344.

Allison, P., 1990. Change Scores as Dependent Variables in Regression Analysis. *Sociological Methodology*, 20:93–114.

Amato, P., 2007. Strengthening marriage is an appropriate social policy goal. *Journal of Policy Analysis and Management*, 26(4):952–955.

Amato, P., N. Landale, and T. Havasevich-Brooks, 2008. Precursors of Young Women's Family Formation Pathways. *Journal of Marriage and Family*, 70:1271–1286.

Angrist, J. and J. Pischke, 2009. *Mostly harmless econometrics: an empiricist's companion*. Princeton NJ:Princeton University Press.

Billari, F. C., 2001. The analysis of early life courses: complex descriptions of the transition to adulthood. *Journal of Population Research*, 18(2):119–142.

Billari, F. C., 2005. Life course analysis: two (complementary) cultures? Some reflections with examples from the analysis of the transition to adulthood. *Advances in Life Course Research*, 10:261–281.

Billari, F. C., J. Fürnkranz, and A. Prskawetz, 2006. Timing, Sequencing, and Quantum of Life Course Events: A Machine Learning Approach. *European Journal of Population*, 22(1):37–65.

Bumpass, L. and H.-H. Lu, 2000. Trends in Cohabitation and Implications for Children's Family Contexts in the United States. *Population Studies*, 54(1):29–41.

Bumpass, L., T. Martin, and J. Sweet, 1991. The impact of family background and early marital factors on marital disruption. *Journal of Family Issues*, 12(1):22–42.

Cairney, J., M. Boyle, D. Offord, and Y. Racine, 2003. Stress, social support and depression in single and married mothers. *Social Psychiatry and Psychiatric Epidemiology*, 38:442 – 449.

Cherlin, A., 2004. The Deinstitutionalization of American Marriage. *Journal of Marriage and Family*, 66(4):848–861.

Cherlin, A., 2005. American Marriage in the Early Twenty-First Century. *The Future of Children*, 15(2):33–55.

Duncan, G., W. Bessie, and E. Paula, 2006. Cleaning Up Their Act: The Effects of Marriage and Cohabitation on Licit and Illicit Drug Use. *Demography*, 43(4):691–710.

Dupre, M. E., A. N. Beck, and S. O. Meadows, 2009. Marital trajectories and mortality among US adults. *American Journal of Epidemiology*, 170(5):546–55.

Edin, K. and J. Reed, 2005. Why Don't They Just Get Married? Barriers to Marriage among the Disadvantaged. *The Future of Children*, 15(2):117–137.

Elder, G., 1994. Time, Human Agency, and Social Change: Perspectives on the Life Course. *Social Psychology Quarterly*, 57(1):4–15.

Elder, G. H., 1985. *Life course dynamics: trajectories and transitions, 1968-1980*. Ithaca, NY: Cornell Univ Press.

Elzinga, C. and A. Liefbroer, 2007. De-standardization of family-life trajectories of young adults: A cross-national comparison using sequence analysis. *European Journal of Population*, 23(3):225–250.

Elzinga, C., S. Rahmann, and H. Wang, 2008. Algorithms for subsequence combinatorics. *Theoretical Computer Science*, 409(3):394–404. doi:10.1016/j.tcs.2008.08.035.

Ermisch, J. and D. Pevalin, 2005. Early Motherhood and Later Partnerships. *Journal of Population Economics*, 18(3):469–489.

Ferree, M., 1990. Beyond Separate Spheres: Feminism and Family Research. *Journal of Marriage and Family*, 52(4):866–884.

Francesconi, M., S. P. Jenkins, and T. Siedler, 2010. The effect of lone motherhood on the smoking behavior of young adults. *Health Economics*, in press.

Furstenberg, F. F., 1976. *Unplanned parenthood: the social consequences of teenage childbearing*. New York: Free Press.

Furstenberg, F. F., 1998. When Will Teenage Childbearing Become a Problem? The Implications of Western Experience for Developing Countries. *Studies in Family Planning*, 29(2):246–253.

Furstenberg, F. F., 2005. Non-normative life course transitions: reflections on the significance of demographic events on lives. *Advances in Life Course Research*, 10:155–172.

George, L. K., 2009. Conceptualizing Life course trajectories. In G. H. Elder and J. Z. Giele, editors, *The Craft of Life Course Research*. New York, NY: Guilford Press.

Giele, J. Z. and G. H. Elder, 1998. *Methods of life course research: qualitative and quantitative approaches*. Los Angeles, CA: SAGE Publications.

Gove, W., 1972. The Relationship between Sex Roles, Marital Status, and Mental Illness. *Social Forces*, 51(1):34–44.

Halfon, N. and M. Hochstein, 2002. Life Course Health Development: An Integrated Framework for Developing Health, Policy, and Research. *The Milbank Quarterly*, 80(3):433–479.

Harris, K. M., H. Lee, and F. Deleone, 2010. Marriage and Health in the Transition to Adulthood: Evidence for African Americans in the Add Health Study. *Journal of Family Issues*, forthcoming.

Hogan, D., 1978. The Variable Order of Events in the Life Course. *American Sociological Review*, 43(4):573–586.

Horwitz, A. and H. White, 1998. The Relationship of Cohabitation and Mental Health: A Study of a Young Adult Cohort. *Journal of Marriage and Family*, 60(2):505–514.

Johnston, D., 1995. Alternative Methods for the Quantitative Analysis of Panel Data in Family Research: Pooled Time-Series Models. *Journal of Marriage and Family*, 57(4):1065–1077.

Johnston, D., 2005. Two-wave panel analysis: Comparing statistical methods for studying the effects of transitions. *Journal of Marriage and Family*, 67(4):1061–1075.

Koball, H., E. Moiduddin, and J. Henderson, 2010. What Do We Know About the Link Between Marriage and Health? *Journal of Family Family*, forthcoming.

Lamb, K., G. Lee, and A. DeMaris, 2003. Union Formation and Depression: Selection and Relationship Effects. *Journal of Marriage and Family*, 65(4):953–962.

Lehrer, E., 1988. Determinants of marital instability: A Cox-regression model. *Applied Economics*, 20(2):195 – 210.

Lesnard, L., 2006. Optimal matching and social sciences. *Manuscript, Observatoire Sociologique du Changement (Sciences Po and CNRS), Paris.(http://laurent. lesnard. free. fr/)*.

Levenshtein, V. I., 1965. Binary codes capable of correcting deletions, insertions, and reversals. *Soviet Physics Dokl.*, 10:707–710.

Lichter, D., D. Graefe, and J. Brown, 2003. Is Marriage a Panacea? Union Formation among Economically Disadvantaged Unwed Mothers. *Social Problems*, 50(1):60–86.

Liefbroer, A. and E. Dourleijn, 2006. Unmarried cohabitation and union stability: testing the role of diffusion using data from 16 European countries. *Demography*, 43(2):203–221.

Lillard, L., M. Brien, and L. Waite, 1995. Premarital Cohabitation and Subsequent Marital Dissolution: A Matter of Self-Selection? *Demography*, 32(3):437–457.

Lillard, L. and L. Waite, 1993. A Joint Model of Marital Childbearing and Marital Disruption. *Demography*, 30(4):653–681.

Macmillan, R., 2005. The structure of the life course: classic issues and current controversies. *Advances in Life Course Research*, 9:3–24.

Martin, T. and L. Bumpass, 1989. Recent Trends in Marital Disruption. *Demography*, 26(1):37–51.

Mazzuco, S., 2009. Another look into the effect of premarital cohabitation on duration of marriage: an approach based on matching. *Journal of the Royal Statistical Society Series A*, 172(1):255–273.

McLanahan, S., 2007. Should government promote marriage? *Journal of Policy Analysis and Management*, 26(4):951–964.

McVicar, D. and M. Anyadike-Danes, 2002. Predicting Successful and Unsuccessful Transitions from School to Work by Using Sequence Methods. *Journal of the Royal Statistical Society. Series A*, 165(2):317–334.

Meadows, S., 2009. Family Structure and Fathers' Well-Being: Trajectories of Mental Health and Self-Rated Health. *Journal of Health and Social Behavior*, 50(2):115.

Miech, R. and M. Shanahan, 2000. Socioeconomic Status and Depression over the Life Course. *Journal of Health and Social Behavior*, 41(2):162–176.

Mirowsky, J., 2005. Age at First Birth, Health, and Mortality. *Journal of Health and Social Behavior*, 46(1):32–50.

Mouw, T., 2005. Sequences of Early Adult Transitions: A Look at Variability and Consequences. In R. Settersten, F. Furstenberg, and R. Rumbaut, editors, *On the Frontier of Adulthood: Theory, Research, and Public Policy*. Chicago, IL: University of Chicago Press.

Musick, K. and L. Bumpass, 2006. Cohabitation, marriage, and trajectories in well-being and relationships. *UC Los Angeles: California Center for Population Research. Retrieved from: http://www. escholarship. org/uc/item/34f1h2nt*.

Nock, S., 1981. Family Life-Cycle Transitions: Longitudinal Effects on Family Members. *Journal of Marriage and Family*, 43(3):703–714.

Nock, S., 2005. Marriage as a Public Issue. *The Future of Children*, 15(2):13–32. Marriage and Child Wellbeing.

O'Connell, M. and C. Rogers, 1984. Out-of-Wedlock Births, Premarital Pregnancies and their Effect on Family Formation and Dissolution. *Family Planning Perspectives*, 16(4):157–162.

Peters, A. and A. Liefbroer, 1997. Beyond Marital Status: Partner History and Well-Being in Old Age. *Journal of Marriage and Family*, 59(3):687–699.

Piccarreta, R. and F. C. Billari, 2007. Clustering work and family trajectories by using a divisive algorithm. *Journal of the Royal Statistical Society. Series A*, 170(4):1061 – 1078.

Radloff, L., 1977. The CES-D scale: A self report depression scale for research in the general population. *Applied Psychological Measurement*, 1:385–401.

Rendall, M., L. Clarke, H. Peters, N. Ranjit, and G. Verropoulou, 1999. Incomplete Reporting of Men's Fertility in the United States and Britain: A Research Note. *Demography*, 36(1):135–144.

Rindfuss, R., 1991. The young adult years: Diversity, structural change, and fertility. *Demography*, 28(4):493–512.

Rindfuss, R., C. Swicegood, and R. Rosenfeld, 1987. Disorder in the Life Course: How Common and Does It Matter? *American Sociological Review*, pages 785–801.

Schoen, R., N. Landale, and K. Daniels, 2007. Family Transitions in Young Adulthood. *Demography*, 44(4):807–820.

Schoen, R., N. Landale, K. Daniels, and Y. Cheng, 2009. Social Background Differences in Early Family Behavior. *Journal of Marriage and Family*, 71:384–395.

Schoenborn, C., 2004. Marital status and health: United States, 1999-2002. *Advance data*.

Seltzer, J., 2004. Cohabitation in the United States and Britain: Demography, Kinship, and the Future. *Journal of Marriage and Family*, 66(4):921–928.

Shanahan, M., 2000. Pathways to Adulthood in Changing Societies: Variability and Mechanisms in Life Course Perspective. *Annual Review of Sociology*, 26:667–692.

Soons, J. and M. Kalmijn, 2009. Is Marriage More Than Cohabitation? Well-Being Differences in 30 European Countries. *Journal of Marriage and Family*, 71(5):1141–1157.

Soons, J., A. Liefbroer, and M. Kalmijn, 2009. The Long-Term Consequences of Relationship Formation for Subjective Well-Being. *Journal of Marriage and Family*, 71(5):1254–1270.

Teachman, J., 2002. Stability across cohorts in divorce risk factors. *Demography*, 39(2):331–351.

Waite, L. J. and C. Bachrach, 2000. *The ties that bind: perspectives on marriage and cohabitation*. New York: Aldine de Gruyter.

Waldron, I., M. Hughes, and T. Brooks, 1996. Marriage protection and marriage selection–prospective evidence for reciprocal effects of marital status and health. *Social Science & Medicine*, 43(1):113–123.

Widmer, E. D. and G. Ritschard, 2009. The de-standardization of the life course: Are men and women equal?. *Advances in Life Course Research*, 14(1-2):28–39. doi: 10.1016/j.alcr.2009.04.001.

Wood, R., B. Goesling, and S. Avellar, 2007. The effects of marriage on health: A synthesis of recent research evidence. Technical report, Department of Health and Human Services.

Wu, L., 2000. Some Comments on" Sequence Analysis and Optimal Matching Methods in Sociology: Review and Prospect". *Sociological Methods & Research*, 29(1):41–64.

Wu, Z. and R. Hart, 2002. The Effects of Marital and Nonmarital Union Transition on Health. *Journal of Marriage and Family*, 64(2):420–432.

Table 12: Regression estimates. Effects of timing indicators on health outcomes: age at first union

	(1) Poor Health	(2) Depression	(3) Smoking	(4) Drinking
Age at first union >25 (ref.)				
Age at first union <18	0.378***	0.625	3.175**	−0.121
	(0.0820)	(0.384)	(1.001)	(0.121)
Age at first union 19-20	0.238**	0.464	2.051*	−0.0702
	(0.0871)	(0.414)	(1.023)	(0.125)
Age at first union 21-25	0.126	0.176	0.979	−0.105
	(0.0805)	(0.387)	(0.935)	(0.117)
Age at wave I	−0.0570	−3.407	−12.75	0.978
	(0.860)	(5.332)	(13.43)	(0.783)
Age squared at wave I	0.000429	0.0916	0.320	−0.0300
	(0.0237)	(0.146)	(0.369)	(0.0215)
Living with bio-parents at wave I	−0.0540	−0.338	−1.119	−0.0129
	(0.0514)	(0.232)	(0.680)	(0.0765)
College educated parents	−0.198**	−0.620*	−3.338***	0.0563
	(0.0634)	(0.271)	(0.790)	(0.0984)
Hispanic	0.121	0.0115	−3.615***	−0.111
	(0.0834)	(0.378)	(0.806)	(0.0977)
Black	0.264***	0.349	−0.643	−0.277**
	(0.0627)	(0.314)	(0.806)	(0.0857)
Asian	0.247*	0.159	−1.778	−0.103
	(0.118)	(0.396)	(1.287)	(0.158)
Self-reported health at wave I	0.280***			
	(0.0291)			
Depression WI		0.275***		
		(0.0255)		
Smoking WI			0.509***	
			(0.0320)	
Drinking WI				0.176***
				(0.0279)
Constant	2.363	35.21	129.8	−7.137
	(7.800)	(48.68)	(122.2)	(7.155)
Observations	2168	2159	2155	2164
Adjusted R^2	0.149	0.113	0.303	0.054

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 13: Regression estimates. Effects of timing indicators on health outcomes: age at first child

	(1) Poor Health	(2) Depression	(3) Smoking	(4) Drinking
Age at first children >25 (ref.)				
Age at first children <18	0.432***	0.771*	4.348***	0.223*
	(0.0839)	(0.382)	(1.060)	(0.104)
Age at first children 19-20	0.278**	−0.0794	2.867*	0.224
	(0.0980)	(0.411)	(1.232)	(0.121)
Age at first children 21-25	0.238**	0.469	1.538	0.0886
	(0.0808)	(0.330)	(0.869)	(0.0868)
Age at wave I	0.0200	−3.560	−0.921	1.279*
	(0.702)	(5.698)	(8.631)	(0.537)
Age squared at wave I	0.0000226	0.0971	0.00795	−0.0373*
	(0.0196)	(0.156)	(0.240)	(0.0148)
Living with bio-parents at wave I	−0.0291	−0.441	−1.997**	0.00160
	(0.0606)	(0.262)	(0.758)	(0.0727)
College educated parents	−0.215**	−0.677	−3.774***	−0.195*
	(0.0761)	(0.361)	(0.860)	(0.0796)
Hispanic	−0.0167	−0.380	−4.349***	0.0134
	(0.0967)	(0.425)	(0.945)	(0.114)
Black	0.0986	0.146	−2.838**	−0.251**
	(0.0705)	(0.379)	(0.931)	(0.0849)
Asian	0.353*	0.912	−2.027	−0.143
	(0.179)	(0.517)	(1.369)	(0.171)
Self-reported health at wave I	0.227***			
	(0.0335)			
Depression WI		0.234***		
		(0.0286)		
Smoking WI			0.535***	
			(0.0368)	
Drinking WI				0.131***
				(0.0286)
Constant	1.272	36.57	18.58	−10.51*
	(6.309)	(52.07)	(77.88)	(4.892)
Observations	1509	1504	1502	1505
Adjusted R^2	0.126	0.097	0.367	0.052

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 14: Regression estimates. Effects of quantum indicators on health outcomes: sequences' turbulence.

	(1) Poor Health	(2) Depression	(3) Smoking	(4) Drinking
Turbulence	0.0217	0.0166	0.243*	0.000212
	(0.0114)	(0.0326)	(0.117)	(0.0135)
Age at wave I	0.329	−8.882*	−30.49*	0.562
	(1.477)	(4.495)	(15.03)	(1.108)
Age squared at wave I	−0.0105	0.242	0.806*	−0.0185
	(0.0406)	(0.124)	(0.410)	(0.0297)
Living with bio-parents at wave I	−0.0752	−0.106	−1.429*	−0.0103
	(0.0533)	(0.152)	(0.649)	(0.0722)
College educated parents	−0.274***	−0.492**	−3.553***	0.0694
	(0.0640)	(0.167)	(0.756)	(0.0914)
Hispanic	0.166	−0.121	−3.680***	−0.155
	(0.0912)	(0.238)	(0.749)	(0.0957)
Black	0.162**	0.417	−1.134	−0.283***
	(0.0620)	(0.221)	(0.783)	(0.0809)
Asian	0.190	−0.140	−1.850	−0.107
	(0.119)	(0.244)	(1.249)	(0.155)
Self-reported health at wave I	0.282***			
	(0.0295)			
CES-D scale at wave I		0.229***		
		(0.0254)		
Smoking WI			0.517***	
			(0.0316)	
Drinking WI				0.177***
				(0.0273)
Constant	−0.900	83.55*	292.0*	−3.461
	(13.43)	(40.79)	(137.7)	(10.32)
Observations	2254	2241	2236	2247
Adjusted R^2	0.128	0.086	0.305	0.060

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 3: Average time spent in each state by typology of trajectory