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The role of family complexity in mental and physical health in mid-adulthood

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ABSTRACT

Objective: This study examines the association between accumulated family complexity and mental and physical health in mid-adulthood, with a focus on gender differences.

Background: While research on family and health often centers on the health effects of specific family transitions, the life course health development model emphasizes the cumulative influence of life experiences on health. Complex family trajectories, particularly those including episodes of singlehood or single parenthood, may have lasting implications for mental and physical health.

Method: Using data from the UK Household Longitudinal Study, differently weighted sequence complexity indices were developed to capture the number and the unpredictability of transitions in partnership and parenthood trajectories from ages 18 to 55.

Results: Family complexity is negatively associated with both women's and men's mental and physical health, but findings differ based on the specification of family complexity. Women's physical health appears to be particularly affected by the accumulation of family complexity following a separation involving children, whereas men's mental and physical health seem to be more affected by accumulated family complexity after any separation.

Conclusion: By uncovering substantial gender differences in patterns of associations between family complexity and health, this study highlights the importance of accounting for gender-specific dynamics in studies of accumulated family complexity. Our finding that long-term health disadvantages are associated with family complexity suggests that entire life course trajectories should be considered and quantified when examining long-term health outcomes.

INTRODUCTION

The link between family life events and health has been widely studied in family sociology and demographic research (Barban, 2013; Carr & Springer, 2010; O'Flaherty et al., 2016). Since the advent of the second demographic transition in the 1960s (Lesthaeghe, 2010, 2014), the prevalence of cohabitation, divorce, and single parenthood has increased while marriage has become less common. Classic theoretical approaches found in the literature on family and health sought to link these individual family events to health in terms of their protective functions (Wu & Hart, 2002) or as short-term crises or chronic strains (Amato, 2000; Booth & Amato, 1991).

Recent research on the relationship between individual transitions and health has used longitudinal data and fixed-effects regressions to focus on trajectories of health in the years directly before and after family transitions (Kalmijn, 2017; Kühn et al., 2023; Leopold & Kalmijn, 2016; Mikucka et al., 2021). For a number of transitions, such as re-partnering and outcomes related to physical health, the evidence is mixed (Dierker et al., 2024; Kalmijn, 2017; Mikucka et al., 2021; Recksiedler & Bernardi, 2019).

While these studies have effectively examined single family life events and their impact on various outcomes, particularly well-being, they fall short in two critical areas. First, they lack sensitivity to the increasing complexity of family life courses, which entails both the increasing number of family events experienced by individuals and the increasing unpredictability of these events (Brückner & Mayer, 2005). For example, research designs taking a fixed-effects approach have not captured the link between the accumulation of family transitions and health. Second, these studies are unable to adequately measure the long-term health impacts of family complexity, which can vary depending on the specific outcome being examined. This limitation is important because theoretical models, such as the life course health development model within the life span approach

(Halfon & Hochstein, 2002), conceptualize health as the cumulative result of various health-threatening and health-promoting factors (Barban, 2013).

In earlier research, the association between accumulated family complexity and health was modeled using the number of transitions (Hughes & Waite, 2009). More recent studies have used sequence analysis, mainly to identify various clusters of family trajectories and to examine the association between those family life course patterns and health at a certain age (Barban, 2013; Jung, 2023). However, in an era of life course destandardization, in which a small number of trajectory patterns represent a shrinking share of the population, these approaches of clustering life courses may be limited. Measures of family complexity, such as sequence complexity (Gabadinho et al., 2010), the precarity index (Ritschard et al., 2018), and the weighted partnership index (Hiekel & Vidal, 2020), offer ways to quantify the cumulative effects of transitions. However, few studies have examined the relationship between these more flexible measures of family complexity and mental or physical health in mid-adulthood.

In this study, we apply the complexity index and differently weighted indices to investigate the association between family complexity and both physical and mental health in mid-adulthood. In addition, we investigate differences by gender. Studies on health trajectories around individual transitions and sequence analysis approaches have increasingly focused on gender differences in the links between family complexity and health (Jung, 2023; Leopold, 2018). The findings indicate that for certain transitions or family history patterns, the strength or direction of associations differs by gender. In our analysis, we use family history and health data from the British Understanding Society study. These data allow us to examine the complete family histories of 3,407 women and 2,638 men and their physical and mental health at age 55, while also controlling for health diagnoses in childhood to address selection.

Our theoretical and methodological approach provides deeper insights into the link between family complexity and health in several different areas. (1) Our design allows us to investigate the long-term effects of family transitions and accumulated complexity on both physical and mental health. Prior findings for physical health have been mixed. While previous results for mental health have consistently reported short-term changes, less is known about the long-term consequences. Furthermore, while previous research has often focused on more sensitive well-being-related factors such as life satisfaction, we measure both mental and physical health based on the short form questionnaire score (SF-12). (2) We do not focus on the association between health and specific family states or transitions, but instead examine how the accumulation of family transitions over the life course shapes health in mid-adulthood, while adjusting for the current family state. (3) Lastly, the flexible weighting of certain transitions, such as re-partnering, as detrimental or beneficial enables us to investigate the extent to which accumulated re-partnering patterns in family histories tend to favor or harm health in mid-adulthood.

BACKGROUND

Family complexity over the life course

Family complexity is central to the study of different life course trajectories. It encompasses factors within partnership dynamics and fertility histories, and goes beyond composition to include union sequencing, origins, dispositions, and diversity across populations (Sassler & Lichter, 2020). Researchers often use basic metrics, such as the number of life course states or transitions (Hughes & Waite, 2009), to measure family complexity. However, complexity is also linked to increased life course uncertainty (Mills & Blossfeld, 2013). Therefore, a comprehensive assessment of an individual's family trajectory complexity must go beyond these metrics to consider not only the number and duration, but also the sequencing of partnerships and fertility episodes. This approach

acknowledges the inherent unpredictability of these sequences, for which the composite sequence complexity index (Gabadinho et al., 2010; Ritschard et al., 2018) is often used.

Examining family complexity from a life course perspective is a compelling framework for several reasons. Above all, it facilitates the study of extended family histories, as rather than focusing solely on individual transitions, it provides a unique perspective on how family states and transitions impact adult lives (Umberson et al., 2010). This perspective aligns with the concepts of cumulative advantage and disadvantage (DiPrete & Eirich, 2006). Thus, this approach enables us to examine how specific transitions can shape trajectories of increasing advantage or disadvantage over the life course. For instance, the challenges of single parenthood may result in additional disadvantages and increased parental distress, with potential long-term effects on an individual's physical and psychological well-being in later life (Umberson et al., 2010). Moreover, the life course perspective recognizes the complex interplay between family transitions and other life domains. Union status is inherently linked to various events that unfold throughout life. Some events, such as becoming a parent, are closely connected to the probability of transitioning from a cohabiting union to marriage (Groepler et al., 2021).

Additionally, studies of marital biographies have examined the duration of specific marital statuses, rather than just tracking transitions in and out of marriage (Hughes & Waite, 2009). Fragmenting individual studies into age-restricted snapshots cannot provide a comprehensive understanding of how critical transitions and contextual factors influence life trajectories. Adopting a life course perspective allows for the integration of diverse research strands on parenthood and well-being. This approach provides a more integrated and holistic perspective on the cumulative process, highlighting the interdependencies between family states and transitions (Umberson et al., 2010).

Essentially, the life course perspective offers a dynamic approach for studying the development of individual family members. It emphasizes the importance of time, context, process, and meaning in family life (Fasang et al., 2024). By adopting this approach, we shift from a static to a dynamic perspective on families, acknowledging the continually evolving nature of these dynamics. This dynamic perspective enhances our understanding of family complexity and sheds light on the relationships between family transitions and health outcomes.

Building on this approach, our study focuses on the link between accumulated family complexity and health. To do so, we first examine the individual transitions that constitute family trajectories, offering insights into how their accumulation may influence health. The following section explores these transitions and their associations with health.

Family transitions and health

Union formation

Research on family dynamics and health often overlooks the distinction between cohabitation and marriage, focusing instead on how moving into a joint household impacts health. Perelli-Harris et al. (2018) found minor heath differences between cohabiting and married individuals in the UK, which disappeared after controlling for childhood background and union characteristics like duration and prior union dissolution. Similarly, Metsä-Simola and Martikainen (2014) observed short-term improvements in mental health following marriage, but no long-term differences in mental health between individuals in marital and cohabiting unions. Thus, we assume that while transitioning from cohabitation to marriage provides small short-term health gains, moving in with a new partner is the key mechanism for explaining the association between union formation and health.

Both the marital protection model (Wu & Hart, 2002) and the marital resource model (Williams & Umberson, 2004) posit that union formation is generally linked to better mental and physical health, largely due to the social, financial, and emotional support that unions provide. Moreover, romantic partnerships provide social controls that reduce risky behaviors (Fleming et al., 2010; Hilz & Wagner, 2018; Koball et al., 2010; Salvatore et al., 2020), which may, in turn, lead to better physical health outcomes. Economically, union formation improves stability through resource sharing and the marital wage premium (Killewald, 2013; Ludwig & Brüderl, 2018; McDonald, 2020; Vespa & Painter, 2011), which can improve living conditions and, in some contexts, healthcare access (Devaux, 2015). Emotional support promotes both physical and mental health by fostering intimacy, reducing loneliness, and increasing commitment (Barban, 2013; Musick & Bumpass, 2012; Stokes, 2017; Uchino, 2006).

However, the results of recent studies on these associations have been more nuanced. Kravdal et al. (2022) found positive effects of union formation on mental health (operationalized with GP visits), while both Mikucka et al. (2021) and Kalmijn (2017) observed only weak effects of union formation on mental health (operationalized with the SF-12 score and number of depressive symptoms), but more pronounced positive effects on self-rated health and life satisfaction. However, they also found that these effects were mainly short-term increases, followed by an adjustment to initial levels. Kalmijn observed almost no effects of union formation on physical health, while Mikucka and colleagues reported similar, albeit non-significant, patterns of physical health compared to self-rated health. In less recent studies, Wu and Hart (2002) found no effects of union formation on mental and physical health, while Williams and Umberson (2004) found that differences in health depending on marital status were less likely to reflect the protective or resource effects of union formation than the crisis-based effects of union dissolution.

Re-partnering, which has become increasingly common in recent decades (Elzinga & Liefbroer, 2007), can improve health by providing new economic, social, and emotional resources (Williams & Umberson, 2004; Wu & Hart, 2002). While re-partnering has been shown to have well-being benefits (Dierker et al., 2024; see Gloor et al., 2021; Kühn et al., 2023), the effects of re-partnering appear to be smaller than those of first union formation (Barrett, 2000; Williams & Umberson, 2004). Moreover, re-partnering can also harm an individual's health by draining their resources (Hughes & Waite, 2009), triggering a residential move (Cooper et al., 2009), or causing role conflict with the new partner's children (Lansford et al., 2001). For parents with young children, the effects of re-partnering on health remain unclear, with some studies showing positive mental health outcomes (Kühn et al., 2023), and others finding no effects on mental (Dierker et al., 2024) or physical health (Recksiedler & Bernardi, 2019).

Union dissolution

Similar to the research on union formation, studies on the association between union dissolution and health often do not distinguish between the termination of a cohabiting relationship and the dissolution of a marriage. Most studies focus primarily on the loss of a partner with whom an individual has shared a household, rather than on the specific legal status of the union. Some studies have suggested that marital divorce has more severe detrimental effects on well-being than the dissolution of a cohabitation (Kalmijn, 2017), while others have found no significant difference (Kamp Dush, 2013). In the following, we explore theories regarding the effects of union dissolution on health without explicitly differentiating between marriages and cohabitations.

Two perspectives on the health effects of union dissolution dominate the literature. Both assume that union dissolution has a negative impact on mental and physical health, but they differ on the duration. The crisis perspective argues that stressors from separation are short-lived, leading to an

initial health decline followed by a recovery (Booth & Amato, 1991; Pearlin, 2010; Stroebe et al., 2007). In contrast, the chronic strain perspective posits that such transitions have both short- and long-term effects, leading to persistent health disadvantages due to chronic strain (Barrett, 2000; Halpern-Meekin & Turney, 2022).

Longitudinal studies on union dissolution often align with the crisis perspective, particularly for mental health outcomes (Booth & Amato, 1991; Carr & Springer, 2010; Kalmijn, 2017; Strohschein et al., 2005). However, the findings on physical health are mixed. Some studies have observed long-term disadvantages, consistent with the chronic strain perspective (Lorenz et al., 2006), while others have found no significant differences in health outcomes (Kalmijn, 2017; Williams & Umberson, 2004). As the evidence generally indicates that union dissolution tends to negatively affect health, we classify it as a transition that increases family complexity. Additionally, studies by Leopold and Kalmijn (2016) and Kühn et al. (2023) have shown that dissolutions involving children have a greater short-term negative impact on parents' health than separations among childless couples.

Childbirth

The baseline hypothesis regarding the impact on well-being of the birth of a child suggests that while parents tend to experience a short-term increase in well-being immediately after childbirth, their well-being eventually returns to previous levels (Clark et al., 2008; Clark & Georgellis, 2013). Previous research found short-term well-being increases after childbirth, supporting the baseline hypothesis (Clark & Georgellis, 2013; Myrskylä & Margolis, 2014), but also uncovered sustained positive trends (Mikucka, 2016; Radó, 2020). However, it should be emphasized that there is as yet no conclusive evidence regarding the influence of childbirth on the health of parents

who do not live together. Research on parenthood has suggested that negative effects can be expected in such cases (Evenson & Simon, 2005).

The impact of parenthood on health may be different for separated parents, who face social and economic challenges that can intensify the stressors associated with raising children. Following separation, single parents – especially mothers – often experience financial strain (Leopold & Kalmijn, 2016), which is a critical factor in mental and physical health outcomes. Separated parents may lack the shared responsibilities and emotional support that partnered parents typically benefit from, making the demands of parenting more isolating and exhausting. The absence of co-parenting support has been linked to heightened psychological distress, as single parents often have to manage their child-rearing responsibilities alone, and with more constrained resources and limited social support (Nomaguchi & Milkie, 2020).

Accumulated family complexity and health

In our study, we move beyond individual transitions to examine the impact of accumulated family histories on mid-adulthood health outcomes. Accordingly, we view health as an outcome of the life course health development model (Halfon & Hochstein, 2002), which posits that a person's health at any given time results from the cumulative influence of multiple experiences throughout their life (Barban, 2013).

Most studies focusing on well-being and mental health in the context of family transitions support the set-point theory, which suggests that individuals experience temporary changes in mental health before returning to their baseline levels. However, some research has indicated that unstable relationship patterns result in worse mental health than stable relationship patterns. No substantial difference was found between individuals experiencing a single union dissolution and those with on-off relationship patterns (Halpern-Meekin & Turney, 2022). Jung (2023) observed that union

instability has a detrimental impact on mental health at age 45, and that stable relationships are linked to better well-being compared to trajectories marked by instability or long-term singlehood. We therefore hypothesize that *accumulated family complexity in mid-adulthood is negatively associated with mental health (Hypothesis 1a)*.

The accumulation of unstable relationship patterns may also harm physical health (Williams et al., 2008), although the results reported in the literature are mixed (for a null result, see Recksiedler & Bernardi, 2019). Chronic strains due to union dissolution have been associated with long-term health declines, and the absence of a partner's social control may negatively affect long-term health behaviors (Hughes & Waite, 2009). For health behaviors that become habits, such as regular doctor visits, or health behaviors leading to physical addiction, such as smoking or alcohol consumption, union dissolution may have a long-term impact.

The existing evidence from studies examining the link between complex family histories and physical health is mixed. Rapp and Stauder (2020) demonstrated that physical health benefits accumulate in stable relationships over time. In contrast, Williams and Umberson (2004) found no notable disparities in self-rated health (which is, however, not a pure physical health measure) in mid-adulthood among consistently divorced, never-married, or consistently married individuals, which suggests that physical health may revert to prior levels after initial changes. O'Flaherty et al. (2016) compared physical health in family sequences from ages 18 to 50 and found that, compared to experiencing a standard partnership trajectory with children (single – union formation – children), experiencing union dissolution and re-partnering with children was linked to poorer physical health. However, the authors also observed that experiencing this partnership history without children was related to better health compared to the baseline trajectory. Individuals with an unstable marital history and three or more children were found to be particularly vulnerable in

terms of their physical health. We therefore hypothesize that *accumulated family complexity in mid-adulthood is negatively associated with physical health (Hypothesis 1b)*.

Gender differences in health implications of complexity

Gender differences in family complexity and mental health

Family transitions tend to have a more significant impact on women's mental health. After marriage, women have reduced depressive symptoms while men tend to use alcohol less frequently (Simon, 2002). After union dissolution, women are more prone to internalizing stress, which can lead to an increased risk of depression, whereas men tend to exhibit externalizing behaviors, such as a heightened risk of alcoholism (Wu & Hart, 2002). Furthermore, after separation, women tend to be more affected by resource loss, and especially by the loss of economic stability, which can exacerbate their mental health challenges (Leopold, 2018). This gender difference may explain why re-partnering offers women, and particularly mothers, a potential route to recovery (Jansen et al., 2009). However, research for the UK showed that while women's life satisfaction and satisfaction with their financial situation improved after re-partnering, their mental health did not (Dierker et al., 2024).

Research also indicates that childbirth has more pronounced mental health benefits for women than for men (Metzger & Gracia, 2023). However, single mothers, and especially those experiencing union dissolution, remain a particularly vulnerable group in terms of mental health issues (Burstrom et al., 2010; Crosier et al., 2007). Generally, women's mental health seems to be more affected by having an unstable family history than that of men (Jung, 2023).

Given these considerations, we hypothesize that *the negative association between family complexity and mental health is stronger for women than for men (Hypothesis 2a)*.

Gender differences in family complexity and physical health

In contrast, family transitions are often linked to more significant physical health effects for men. Marriage provides more physical health protection for men than for women (Kiecolt-Glaser & Newton, 2001), and union transitions appear to have more pronounced effects on men's physical health (Leopold, 2018; Wu & Hart, 2002). Men also appear to benefit more from the stability provided by a union, as O'Flaherty et al. (2016) found that family life course trajectories have a greater effect on men's physical health than that of women. Another study showed that men experience health improvements only after marriage, not after cohabitation (Rapp & Stauder, 2020). However, none of these studies investigated the role of accumulated family complexity and its long-term impact on physical health. Thus, this study is the first to compare gender differences in these associations.

Based on the theoretical considerations and findings of previous research, we therefore hypothesize that *the negative association between family complexity and physical health is stronger for men than for women (Hypothesis 2b)*.

ANALYTICAL APPROACH

Data

We use data from the UK Household Longitudinal Study (UKHLS), a nationally representative, household-based longitudinal survey (University of Essex, 2023). The survey began in 2009 and is conducted annually as a follow-up to the British Household Panel Study (BHPS). We obtained family histories from the Marital and Cohabitation Histories, 1991-2021 dataset, which includes the start and end dates for partnerships, including marriages, civil partnerships, and cohabitations, reported by adult respondents in all survey samples. Additionally, we included information on the

number and the ages of biological children, as well as information on mental and physical health and basic demographics from the individual respondent datasets.

The Marital and Cohabitation Histories dataset initially contained 66,671 individuals (36,597 women, 29,965 men, and 109 with missing sex). We first removed records with missing sex (109), resulting in a refined dataset of 66,515 individuals (36,571 women and 19,944 men). Next, we considered individuals with 37 years of documented partnership history between the ages of 18 and 55, resulting in a sample of 27,002 individuals (14,757 women and 12,245 men). Finally, to analyze the association between family trajectories and health outcomes, we selected a subset of 6,045 individuals (3,407 women and 2,638 men) with data on mental and physical health (assessed using the SF-12) and relevant control variables at age 55. The age cutoff of 55 years was chosen because we need a sample with consistent family trajectories from early to mid-adulthood for comparable analyses, and because widowhood is less relevant in this age group. Previous research has also defined a mean of age 55 as "mid-life" (Hughes & Waite, 2009). All individuals in this analytical sample were born between 1954 and 1967.

Variables

Family complexity

To estimate the impact of family complexity on health at age 55, we quantify complexity into individual scores using sequence analysis. In total, we consider 12 different states covering all combinations of the four partnership states (single, cohabiting, married, previously partnered) and the three child information states (no children, youngest child 0-17 years old, youngest child 18 years old or older). Figure 1 shows the relative frequencies of these states from age 18 to age 55.

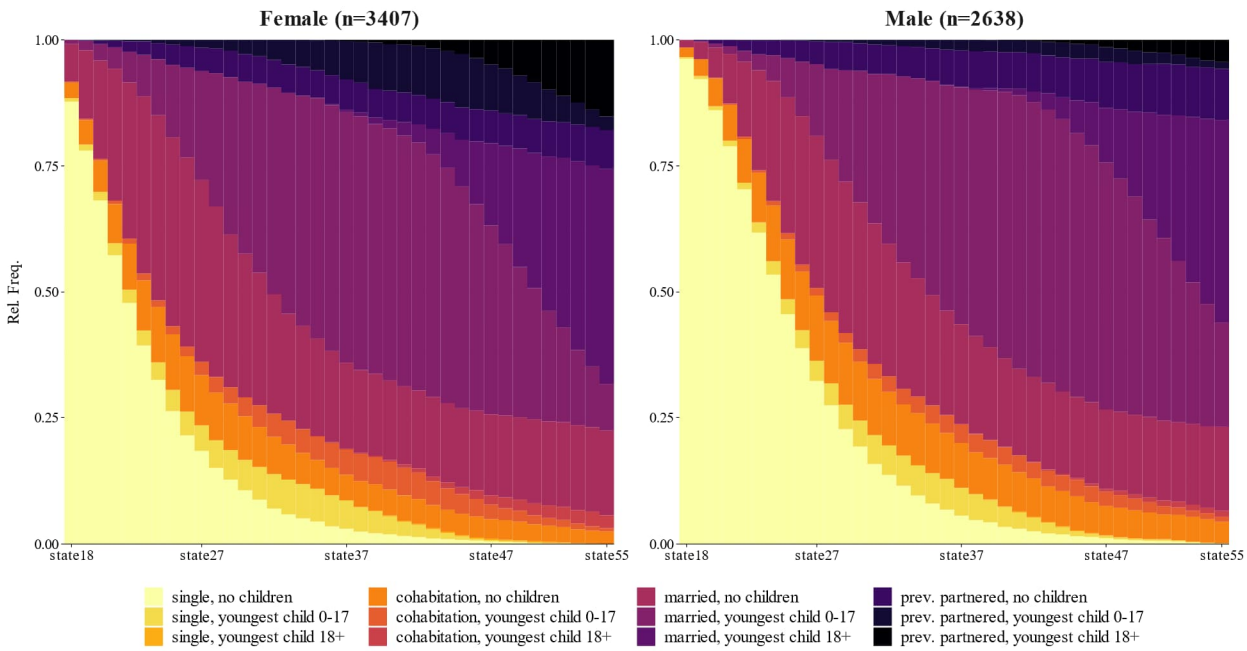

Figure 1: State frequencies

To assess the impact of family complexity on health at age 55, we quantify this complexity with an index score. The composite sequence complexity index measures variability within sequences by calculating the geometric mean of normalized transitions and normalized longitudinal entropy in a sequence (Gabadinho et al., 2010, 2011; Van Winkle, 2018). Formally, the complexity *C* of a sequence *x* is defined as

$$C(x) = \sqrt{\frac{q(x)}{q_{max}} \times \frac{h(x)}{h_{max}}}$$

where the number of transitions within a sequence $q(x)$ is divided by the theoretical maximum number of transitions possible q_{max} and the longitudinal entropy of a sequence $h(x)$ is divided by the theoretical maximum h_{max} of longitudinal entropy. The longitudinal entropy represents the degree of unpredictability of a sequence and is defined as

$$h(x) = -\sum_{i}^{s} \pi_i \log \pi_i$$

where π_i is the proportion of occurrences in a given state *i* of the sequence alphabet *s*. Accordingly, the theoretical maximum h_{max} is given when each state occurs an equal number of times. This is defined as

$$h_{max} = -\log\frac{1}{A}$$

where *A* is the size of the sequence alphabet. The sequences we focus on encompass 12 possible elements in 38 consecutive years for all individuals in our sample, which is why h_{max} is $-log\frac{1}{12} = 2.485$.

A detailed applied example on the construction of the complexity index is presented in the appendix. Overall, the complexity index $C(x)$ is based on the number of different life course states and the unpredictability of individual partnership life courses. It cannot assess whether it captures potentially advantageous or disadvantageous transitions. This can be captured by the precarity index (Ritschard et al., 2018), where the complexity index is weighted with a correction factor based on the share of potentially negative transitions (Raab & Struffolino, 2022, p. 47). The precarity index increases with the number of negative transitions and the degree of complexity. It is defined as

$$wC(x) = C(x)^{\alpha}\big(1 + q(x)\big)^{\beta}$$

where $(1 + q(x))$ is a non-negative correction factor for the unweighted sequence complexity $C(x)$. The difference between the proportion of potentially disadvantageous and advantageous transitions in a sequence is represented by $q(x)$. Additionally, α and β are weights for the unweighted index and the correction factor. In our analyses, we set α to one and β to 1.5, since it needs to be >1 to strengthen the correction. However, analyses using smaller or larger β rendered similar results. For partnership histories, Hiekel and Vidal (2020) introduced the weighted

partnership index based on the precarity index, where the first episode of union instability is the starting point of a complex partnership trajectory. Based on this weighting scheme, we have constructed two weighted partnership indices: one where the first separation is the starting point of complexity, and the other where the first separation with a child is the starting point of complexity. Detailed information on how the weightings are applied is presented in the appendix.

Physical and mental health

We measure our outcome variables as physical and mental health at age 55. We use the six-item physical health and mental health subscales of the SF-12 as indicators. The Short Form Survey SF-12 contains six items related to physical and mental health problems. These items are self-assessed with varying response options. A standard norm-based algorithm is employed to combine item scores into a total physical and mental health score (J. Ware et al., 1996; J. E. Ware et al., 1995). Both scores are continuous, ranging from zero to 100. More detailed information on the individual items and the construction of the scales is provided, among others, by Turner-Bowker and Hogue (2014).

Controls

Focusing on health and family complexity at age 55 for all individuals, adjusting for the calendar year accounts for both cohort and period effects. This is crucial, as family complexity has been demonstrated to change across different cohorts and time periods (Van Winkle, 2018). Furthermore, we control for any health conditions diagnosed during childhood for each individual. In the UKHLS individual respondent questionnaire, participants are asked to indicate the age at which they were first informed that they had a specific health condition with the following question: “What age were you when you were first told you had [condition]?” We generate a binary variable with a value of one for respondents who reported being diagnosed with any health

condition before the age of 18. Additionally, we include controls for the highest educational or vocational qualification at age 55 based on six categories: “Degree,” “Other higher degree,” “A-level etc.,” “GCSE etc.,” “Other qualification,” and “No qualification.” The specific educational and vocational qualifications falling into each category are detailed in the appendix. We do not adjust for employment status because labor market decisions can be determined by certain transitions in family histories, which casts doubt on the confounding effect of employment status on the relationship between family complexity and health we seek to examine. We also control for the current family status at age 55.

Method

We estimate the association between family complexity and mental and physical health using OLS regressions with standard errors clustered at the household level. This approach accounts for the nesting of 6,045 individuals aged 55 within 5,864 households, and thus recognizes that some individuals share the same household. For all models, we estimate the association of family complexity with health at age 55 separately for physical and mental health. Gender is included as an interaction variable and a main covariate in all models, and we present marginal effects by gender in the results section.

For the non-weighted complexity index, we estimate three models. First, we run a base model without any control variables. Second, we include calendar year, health conditions during childhood, and education as control variables. Third, we extend the second model by adding the current family status as a control variable. Controlling for current family status in an additional model allows us to assess whether the associations between family complexity and health in mid-adulthood primarily reflect the current family status. Moreover, controlling for this status enables

us to examine whether accumulated family complexity is independently associated with health, beyond the potential impact of the current marital status.

For the weighted complexity indices, we also estimate three models. First, we include calendar year, health conditions during childhood, and education in addition to the respective weighted complexity index as covariates. Second, we add a dummy variable that takes a value of one if the complexity of the respondent is zero, and a value of zero if the respondent has experienced any transition defined as complex. This approach aligns with He et al.'s (2014) recommendations for addressing zero-inflated independent variables in regression analyses. This is done to capture the association among individuals who have experienced any complex transition. Third, we also include the current family status.

RESULTS

Descriptive results

Descriptive characteristics of the analytical sample are presented in Table 1. The sample consists of 2,638 men and 3,407 women with an average birth year of 1960. The family complexity score is 0.19 (SD: 0.07) for men, and is slightly higher for women, at 0.20 (SD: 0.08). A greater proportion of women (46.2%) than of men (36.9%) have experienced union dissolution between the ages of 18 and 55. The weighted family complexity following union dissolution is also higher for women (mean: 0.11, SD:0.15) than for men (mean: 0.09, SD:0.15). The share of respondents who have experienced union dissolution with a minor child between the ages of 18 and 55 is 9.3% for men and 22.9% for women. However, we are not able to differentiate according to custody arrangements due to data limitations. The weighted family complexity following union dissolution with a minor child is lower for men (mean: 0.01, SD:0.05) than for women (mean: 0.03, SD:0.08). Regarding health outcomes, men have a mean physical health score of 49.7 (SD:10.6) on the SF-

12 scale, while women have a slightly lower mean health score of 48.3 (SD: 11.9). In terms of mental health, men have a mean score of 50.2 (SD: 9.7), while women have a mean score of 48.0 (SD: 10.5). Additionally, 29.0% of men and 24.5% of women hold a university degree, and 5.5% of men and 5.6% of women report having a health condition diagnosed during childhood.

Table 1: Descriptive sample characteristics

	Men Mean/%	SD	Women Mean/%	SD
Family complexity (range: 0-1)	0.19	0.07	0.20	0.08
Ever experienced union dissolution (%)	36.9		46.2	
Weighted family complexity following union dissolution (range: 0-1)	0.09	0.15	0.11	0.15
Ever experienced union dissolution with a minor child (%)	9.3		22.9	
Weighted family complexity following union dissolution with a minor child (range: 0-1)	0.01	0.05	0.03	0.08
Physical health (SF-12) (range: 0-100)	49.7	10.6	48.3	11.9
Mental health (SF-12) (range: 0-100)	50.2	9.7	48.0	10.5
University degree (%)	29.0		24.5	
Health condition diagnosed during childhood	5.5		5.6	

(%)				
Birth year (1954-1964)	1959.7	3.4	1959.6	3.5
N	2638		3407	

Multivariate results

Family complexity and physical and mental health in mid-adulthood

The association between accumulated family complexity in mid-adulthood and health outcomes is illustrated in Figure 2, in which three models progressively add control variables. Model 1 includes only the standardized family complexity index as the independent variable; Model 2 controls for calendar year, childhood health conditions, and education; and Model 3 adds current family status at age 55. The coefficients of all variables in the models are presented in the appendix.

The coefficients of Models 1 and 2 show a negative association between family complexity and mental health, particularly for women. Women's mental health scores significantly decrease in both Model 1 (-0.57) and Model 2 (-0.58) with each additional standard deviation in family complexity, indicating that complex family histories have adverse mental health implications. However, this association loses significance after controlling for current family status in Model 3, which suggests that women's mental health is more sensitive to recent family circumstances than it is to cumulative complexity alone. For men, no significant association between family complexity and mental health emerges in any model, which implies that men's mental health is less influenced by accumulated family transitions.

In contrast, the coefficients show no significant association between family complexity and physical health across the models for either men or women. This lack of association indicates that in this sample, accumulated family complexity in mid-adulthood does not appear to impact physical health. These results imply that while family complexity affects mental health selectively

among women, it does not affect physical health outcomes in mid-adulthood among either men or women.

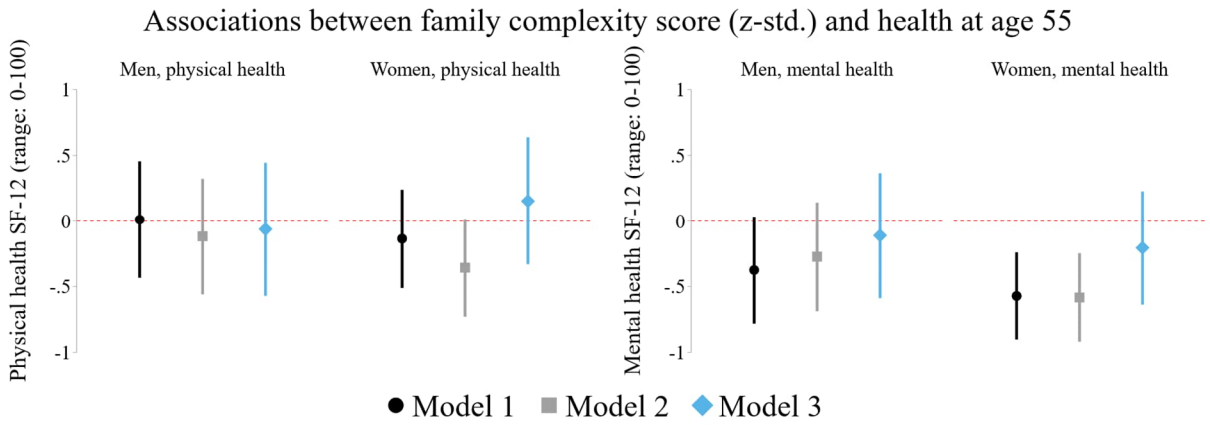

Figure 2: Regression coefficients showing the associations between the basic family sequence complexity index and physical and mental health among men and women

Family complexity following a separation and physical and mental health in mid-adulthood

Figure 3 presents the association between family complexity and health outcomes, focusing on family transitions occurring after an initial separation. Model 1 includes controls for calendar year, education, and childhood health diagnoses. Model 2 introduces a zero-dummy to account for individuals who have not experienced separation, while Model 3 further controls for current family status.

Increased family complexity following a separation is significantly associated with poorer mental health outcomes, particularly for men. Men's mental health scores show consistent reductions across all models, with declines of -0.79 in Model 1, -0.74 in Model 2, and -0.87 in Model 3. These findings suggest that accumulated transitions post-separation have a sustained adverse effect on men's mental health. Women also experience a significant decline in mental health in Model 1 (-1.02), although the effect becomes non-significant after additional controls are applied in Models 2 and 3. These results highlight that while both men and women experience mental health declines

with increased family complexity after separation, the effects on men appear to be more robust across different model specifications.

The coefficients show that family complexity following separation is significantly associated with poorer physical health in both men and women. For men, each additional standard deviation in family complexity is linked to consistent reductions in physical health across all models, with significant declines of -0.77 in Model 1, -0.89 in Model 2, and -0.94 in Model 3. Similarly, among women, there is a significant reduction in physical health scores in Models 1 and 3 (-0.80 and -0.77, respectively), although this association is non-significant in Model 2. These findings indicate that family complexity following separation negatively impacts physical health for both women and men, though the association is somewhat stronger for men.

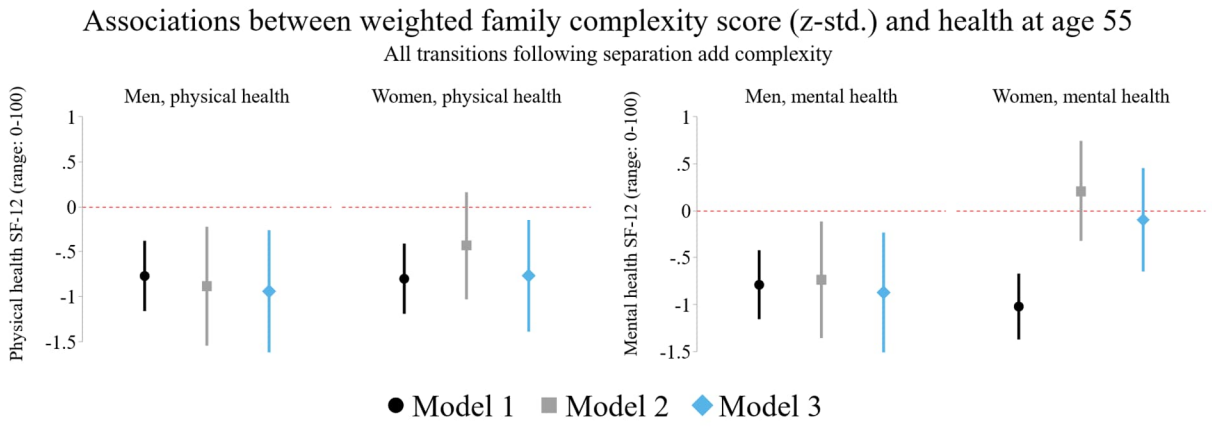

Figure 3: Regression coefficients showing the associations between the weighted family sequence complexity index (all transitions following an initial separation add complexity) and physical and mental health among men and women

Family complexity following a separation with a minor child and physical and mental health in mid-adulthood

In Figure 4, we explore the association between family complexity and health outcomes in cases of a separation involving a minor child. Model 1 controls for calendar year, education, and childhood health diagnoses. Model 2 includes a zero dummy for individuals without separation experience, and Model 3 added controls for current family status.

The results show that family complexity following a separation with a minor child is significantly associated with poorer mental health, especially for women. For women, each standard deviation increase in family complexity results in a significant reduction in mental health in Model 1 (-0.88), although this association becomes non-significant in Models 2 and 3. For men, a significant negative association with mental health is found only in Model 1 (-0.47), and becomes non-significant with the addition of further controls. These findings imply that family complexity following a separation with a minor child has a limited but notable impact on mental health, primarily among women.

We also observe that family complexity following a separation with a minor child significantly reduces physical health across all models. Women's physical health scores decrease by -0.89 in Model 1, -0.77 in Model 2, and -1.03 in Model 3, suggesting a sustained adverse impact of family complexity on physical health in this context. For men, physical health declines significantly only in Model 1 (-0.65), and the association becomes non-significant in subsequent models. These results indicate that family complexity following a separation with a minor child more consistently affects the physical health of women than of men.

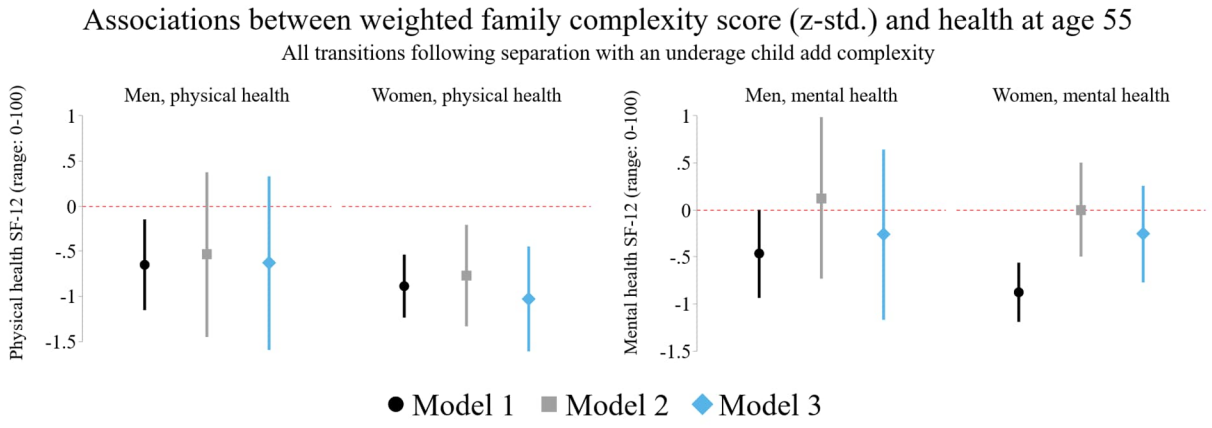

Figure 4: Regression coefficients showing the associations between the weighted family sequence complexity index (all transitions following an initial separation with an underage child add complexity) and physical and mental health among men and women

When linking these findings to the hypothesis, the evidence provides partial support for all hypotheses. However, the extent of support is highly contingent on the type of complexity specification. Hypothesis 1a, which states that accumulated family complexity in mid-adulthood is negatively associated with mental health, is supported based on the results of all three specifications of family complexity, with some differences between women and men. Hypothesis 1b, which states that accumulated family complexity in mid-adulthood is negatively associated with physical health, is only supported when family complexity following either a separation or a separation with an underage child is examined.

Regarding the gender-specific hypotheses, there is also some variation across specifications of family complexity. Hypothesis 2a, which states that the negative association between family complexity and mental health is stronger for women than for men, is partially supported regarding the association between the non-weighted family complexity and mental health. However, these findings are sensitive to the inclusion of current family status, which renders the association non-significant for women as well. For complexity after separation, there is no support for Hypothesis 2a, while it is supported when complexity after a separation with an underage child is considered. Regarding physical health and gender differences, Hypothesis 2b states that the negative association between family complexity and physical health is stronger for men than for women. This hypothesis is supported only by the results from the models investigating the association between family complexity following a separation and physical health, with the association being stronger among men.

DISCUSSION

This study aimed to enhance our understanding of how family complexity, viewed through a life course perspective, influences long-term physical and mental health in mid-adulthood for both

men and women. We examined whether complexity, i.e., unpredictability and uncertainty, in family life courses between ages 18 and 55 is associated with health outcomes, and whether patterns of accumulation following certain transitions have particularly strong health impacts.

Our analysis of family sequence complexity and health outcomes in mid-adulthood produced three main findings. First, the base sequence complexity index showed a negative association with mental health for mid-aged women, which indicates that complexity is detrimental for mental health. Weaker and non-significant associations with men's mental health were found, which suggests that family complexity has larger negative impacts on women's mental health than on men's mental health. However, this effect disappeared when controlling for the current family status, which suggests that current circumstances may reflect the current mental health status more strongly than accumulated family complexity. Second, for men, the association between complexity following separation and health was found to be consistently significant, which indicates that complexity is detrimental for physical health. For women, health disparities were linked primarily to whether or not they have experienced separation, and not to the accumulation of complexity beyond separation. The more substantial negative associations observed between physical health and men's family complexity support Hypothesis 2b. Third, we found that transitions following a separation with children do not significantly impact men's health, but negatively affect mothers' physical health, which indicates that accumulated complexity after a separation with children impacts mothers in particular, an outcome that was not anticipated by the gender-specific hypotheses.

Adding to the increased attention given to family complexity as a function of transitions and life course unpredictability (Elzinga & Liefbroer, 2007; Van Winkle, 2018), we make three main contributions to the literature in this study. First, we are the first to use family complexity measures

(Gabadinho et al., 2010) to demonstrate that accumulated family complexity negatively impacts both mental and physical health in mid-adulthood, even beyond the current health status. Second, we have applied flexible weighting techniques (Hiekel & Vidal, 2020; Ritschard et al., 2018) to highlight the increased vulnerability of individuals who experience separation, especially with children, showing that accumulated complexity following a separation is associated with a further deterioration of health outcomes. Third, while previous research has primarily observed gender differences when comparing individuals in different living arrangements (Kiecolt-Glaser & Newton, 2001; Simon, 2002) or within individual family transitions (Leopold, 2018; Myrskylä & Margolis, 2014; Rapp & Stauder, 2020), we have revealed that there are also gender differences in the impact of accumulated family complexity on health, thus shedding light on the long-term impact of complex family histories. Our results largely support the life course health development model (Halfon & Hochstein, 2002) by indicating that health in mid-adulthood reflects not only the specific family status, but also the cumulative effect of family transitions over time.

Our findings highlight important gender differences in the health implications of family complexity. For women, the effects on mental health appeared to be primarily short-term, with significant negative associations observed when complexity was compared to no family complexity. These associations disappeared when controlling for current family status, in line with theories and previous findings suggesting that after union dissolution, individuals experience short-term mental health effects, followed by adjustment (Kravdal & Wörn, 2023; Kühn et al., 2023; Leopold, 2018). In contrast, physical health impacts among women emerged only when complexity arose from transitions related to separation, particularly with children. These associations were negatively significant after controlling for the current family status, which suggests that the long-term accumulation of complexity is more consequential for physical health.

This aligns with research demonstrating that there are long-term changes in physical health after separation, at least for certain indicators (Kravdal & Wörn, 2023). It is also consistent with the life course health development model, which posits that (physical) health reflects cumulative experiences over time (Barban, 2013; Halfon & Hochstein, 2002). For men, accumulated family complexity following a union dissolution was found to have consistent and enduring negative associations with both mental and physical health that persisted even after controlling for current family status. This pattern suggests that while mental health may initially return to baseline after union dissolution (Kalmijn, 2017; Leopold, 2018), accumulated complexity in an individual's family history throughout the life course may translate into adverse health outcomes by mid-adulthood.

Our findings regarding the cumulative impact of family complexity highlights the need for policies that support individuals who experience complex family transitions in order to mitigate long-term health disparities. For example, these policies could combine our findings with previous research that showed that single mothers in the UK – a welfare state context with rather weak support for vulnerable families compared to other OECD countries (OECD, 2021) – are more likely to end up in unstable relationship patterns that can be detrimental for health (Dierker et al., 2024). Future research could further investigate nuances in our findings to inform targeted interventions aimed at reducing health inequalities linked to family complexity.

While previous research showed that family transitions have short-term effects on health and well-being, our results highlight the importance of considering family dynamics over a longer period when conducting research on cumulative health disadvantages over the life course. Interestingly, we found that this pattern mainly applies to physical health, while mental health tends to reflect the current family state. This aligns with literature suggesting that mental health, as an affective

indicator (Diener, 1984; Diener et al., 1999), is more sensitive to short-term dynamics, whereas physical health often develops over time; and with a study by Hughes and Waite (2009), who found that physical health is more influenced by marital history while mental health is more affected by the current status, because physical health conditions tend to develop gradually while mental health reactions tend to be rapid.

In light of these findings, future research should further examine the mechanisms behind the observation that women who experience a period of single motherhood are especially likely to suffer from the additional accumulation of family complexity. In particular, the potentially detrimental effects on physical health of unstable patterns of new family formations (Recksiedler & Bernardi, 2019) should be considered. Our findings also call for a deeper examination of the question of why accumulated complexity has a stronger impact on the physical health of mothers than of fathers, which contradicts the theoretical assumption that the impact of single life events on physical health is larger for men than for women (Simon, 2002).

Several limitations of this study merit consideration. First, while our models account for health diagnoses during childhood, our analytical approach based on retrospective family history information does not permit any causal conclusions. Selection into family arrangements is a major topic in family and health research (Carr & Springer, 2010), and we fully acknowledge that our findings show only associations between family complexity and health in mid-adulthood. Second, our lack of data on custody arrangements – relying on retrospective partnership histories and birth years of biological children – limits the interpretation of models examining complexity after a separation with children. It is known that most separations of parents in the UK lead to households where the child resides with the mother (Office for National Statistics, 2021). However, analytically differentiating households according to custody arrangements could clarify whether

single mothers' (physical) health disadvantages stem from mothers typically having the primary care responsibilities after a separation.

In conclusion, our study has shown for the first time that family sequence complexity, characterized by the accumulation of family transitions and the unpredictability of family life courses, is associated with health outcomes in mid-adulthood, with notable gender differences. Specifically, we found that while women's physical health is particularly vulnerable to the accumulation of family complexity following a separation with children, men's mental and physical health seems to be more affected by accumulated family complexity following any separation. These findings highlight the importance of considering both the type and the sequence of family events when examining their long-term and accumulated health impacts. Importantly, our study has revealed that physical health inequalities are not solely a consequence of experiencing a particular family status (such as single parenthood), but are also related to the broader life course trajectory and accumulated family complexity.

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Online Appendix to "The role of family complexity in mental and physical health in mid-adulthood"

REGRESSION COEFFICIENTS

Table A 1: Association between base complexity and mental health in mid-adulthood

	(1) SF-12 Mental Component Summary (PCS)	(2) SF-12 Mental Component Summary (PCS)	(3) SF-12 Mental Component Summary (PCS)	(4) SF-12 Mental Component Summary (PCS)	(5) SF-12 Mental Component Summary (PCS)	(6) SF-12 Mental Component Summary (PCS)
Base complexity	-0.37	-0.27	-0.11	-0.57***	-0.58***	-0.21
	(0.21)	(0.21)	(0.24)	(0.17)	(0.17)	(0.22)
Health condition diagnosed in childhood (0/1)		-2.80***	-2.80***		-2.77***	-2.29**
		(0.82)	(0.82)		(0.77)	(0.76)
Calendar year (Ref.: 2009)						
2010		-1.41	-1.27		-1.27	-1.36
		(1.07)	(1.07)		(0.94)	(0.93)
2011		-1.25	-1.24		-1.44	-1.60
		(1.08)	(1.08)		(0.95)	(0.94)
2012		-1.99	-1.98		-2.15*	-2.34*
		(1.08)	(1.09)		(0.95)	(0.94)
2013		-2.24*	-2.22*		-2.43*	-2.54**
		(1.10)	(1.10)		(0.96)	(0.95)
2014		-1.39	-1.42		-1.62	-1.89*
		(1.10)	(1.11)		(0.96)	(0.95)
2015		-1.62	-1.63		-2.27*	-2.37*
		(1.09)	(1.09)		(0.96)	(0.95)
2016		-2.08	-2.08		-2.13*	-2.41*
		(1.11)	(1.11)		(0.98)	(0.97)
2017		-2.26*	-2.07		-3.03**	-3.24***
		(1.11)	(1.11)		(0.98)	(0.98)
2018		-2.96*	-2.87*		-2.95**	-3.32***
		(1.15)	(1.16)		(0.99)	(0.99)
2019		-4.06***	-4.03***		-2.65**	-2.94**
		(1.13)	(1.13)		(1.01)	(1.00)
2020		-3.32**	-3.19**		-4.73***	-5.19***
		(1.14)	(1.14)		(1.00)	(0.99)
2021		-3.24*	-3.19*		-3.38*	-3.66**
		(1.44)	(1.44)		(1.36)	(1.35)
2022		-0.90	-1.58		-9.51	-9.01
		(4.89)	(4.88)		(5.22)	(5.16)
Education (Ref.: Degree)						
Other higher		-0.44	-0.41		-0.64	-0.63
		(0.63)	(0.63)		(0.57)	(0.57)
A level etc		-0.42	-0.33		-1.13*	-0.95
		(0.55)	(0.54)		(0.56)	(0.56)

GCSE etc		0.28	0.31		-1.62**	-1.47**
		(0.56)	(0.56)		(0.52)	(0.51)
Other qual		-0.62	-0.68		-2.45***	-2.17***
		(0.66)	(0.66)		(0.65)	(0.64)
No qual		-3.54***	-3.25***		-6.22***	-5.63***
		(0.75)	(0.76)		(0.68)	(0.68)
Current family status (Ref.: Single, no children)						
cohabitation, no children			-3.49			0.87
			(4.92)			(10.29)
cohabitation, youngest child 0-17			-4.88			0.24
			(5.20)			(10.46)
cohabitation, youngest child 18+			-0.32			2.99
			(5.18)			(10.30)
married, no children			-2.59			1.69
			(4.85)			(10.24)
married, youngest child 0-17			-3.46			1.05
			(4.86)			(10.25)
married, youngest child 18+			-2.54			1.82
			(4.86)			(10.24)
prev. partnered, no children			-5.10			-2.75
			(4.88)			(10.25)
prev. partnered, youngest child 0-17			-6.30			-2.33
			(5.13)			(10.29)
prev. partnered, youngest child 18+			-6.00			-1.93
			(4.97)			(10.25)
single, youngest child 0-17						0.00
						(.)
Constant	50.16***	52.87***	56.02***	48.03***	51.97***	51.29***
	(0.19)	(0.95)	(4.95)	(0.18)	(0.82)	(10.22)
Observations	2638	2638	2638	3407	3407	3407

Standard errors in parentheses

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

Table A 2: Association between base complexity and physical health in mid-adulthood

	(1) SF-12 Physical Component Summary (PCS)	(2) SF-12 Physical Component Summary (PCS)	(3) SF-12 Physical Component Summary (PCS)	(4) SF-12 Physical Component Summary (PCS)	(5) SF-12 Physical Component Summary (PCS)	(6) SF-12 Physical Component Summary (PCS)
Base complexity	0.01	-0.12	-0.06	-0.14	-0.36	0.15
	(0.23)	(0.23)	(0.26)	(0.19)	(0.19)	(0.25)
Health condition diagnosed in childhood (0/1)		-4.30***	-4.13***		-5.11***	-4.88***
		(0.87)	(0.87)		(0.86)	(0.86)
Calendar year (Ref.: 2009)						
2010		0.73	0.58		-0.04	-0.25
		(1.14)	(1.14)		(1.04)	(1.04)
2011		0.15	-0.12		1.36	1.15
		(1.15)	(1.15)		(1.06)	(1.05)
2012		0.41	0.09		0.77	0.57
		(1.15)	(1.16)		(1.06)	(1.06)
2013		-0.23	-0.57		0.41	0.27
		(1.17)	(1.17)		(1.07)	(1.07)
2014		-0.34	-0.71		-0.00	-0.22
		(1.17)	(1.18)		(1.07)	(1.07)
2015		0.62	0.23		0.07	-0.07
		(1.16)	(1.16)		(1.07)	(1.07)
2016		-0.29	-0.53		-0.64	-0.85
		(1.18)	(1.18)		(1.09)	(1.09)
2017		-0.11	-0.29		-0.56	-0.72
		(1.18)	(1.18)		(1.09)	(1.09)
2018		0.36	0.04		0.19	-0.09
		(1.22)	(1.23)		(1.10)	(1.10)
2019		-0.02	-0.35		0.62	0.39
		(1.20)	(1.20)		(1.12)	(1.12)
2020		0.52	0.17		0.27	0.03
		(1.21)	(1.22)		(1.11)	(1.11)
2021		0.10	-0.18		-0.53	-0.60
		(1.54)	(1.54)		(1.51)	(1.51)
2022		-0.51	-1.10		0.15	0.09
		(5.20)	(5.19)		(5.80)	(5.78)
Education (Ref.: Degree)		0.00	0.00		0.00	0.00
		(.)	(.)		(.)	(.)
Other higher		-2.87***	-2.82***		-1.95**	-1.80**
		(0.67)	(0.67)		(0.64)	(0.64)
A level etc		-3.43***	-3.41***		-2.83***	-2.61***
		(0.58)	(0.58)		(0.63)	(0.63)
GCSE etc		-4.20***	-4.13***		-3.83***	-3.58***
		(0.59)	(0.59)		(0.58)	(0.58)
Other qual		-5.58***	-5.50***		-6.54***	-6.18***
		(0.70)	(0.70)		(0.72)	(0.72)
No qual		-9.72***	-9.51***		-10.22***	-9.69***
		(0.80)	(0.81)		(0.76)	(0.77)
Current family			0.00			

status (Ref.: Single, no children)						
			(.)			
cohabitation, no children			-4.61			24.59*
			(5.24)			(11.54)
cohabitation, youngest child 0-17			-3.88			24.87*
			(5.54)			(11.72)
cohabitation, youngest child 18+			-4.74			22.55
			(5.51)			(11.55)
married, no children			-6.08			24.14*
			(5.16)			(11.47)
married, youngest child 0-17			-5.01			24.27*
			(5.17)			(11.49)
married, youngest child 18+			-5.46			23.35*
			(5.18)			(11.48)
prev. partnered, no children			-8.41			21.58
			(5.19)			(11.49)
prev. partnered, youngest child 0-17			-8.24			22.54
			(5.46)			(11.54)
prev. partnered, youngest child 18+			-6.49			20.77
			(5.29)			(11.49)
single, youngest child 0-17						0.00
						(.)
Constant	49.70***	53.03***	59.05***	48.33***	51.78***	28.69*
	(0.21)	(1.01)	(5.27)	(0.20)	(0.91)	(11.45)
Observations	2638	2638	2638	3407	3407	3407

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

Table A 3: Association between complexity following separation and mental health in mid-adulthood

	(1) SF-12 Mental Component Summary (PCS)	(2) SF-12 Mental Component Summary (PCS)	(3) SF-12 Mental Component Summary (PCS)	(4) SF-12 Mental Component Summary (PCS)	(5) SF-12 Mental Component Summary (PCS)	(6) SF-12 Mental Component Summary (PCS)
Weighted complexity (after separation)	-0.79***	-0.74*	-0.87**	-1.02***	0.21	-0.10
	(0.19)	(0.32)	(0.32)	(0.18)	(0.27)	(0.28)
Health condition diagnosed in childhood (0/1)	-2.68**	-2.68**	-2.78***	-2.57***	-2.42**	-2.23**
	(0.82)	(0.82)	(0.82)	(0.77)	(0.77)	(0.76)
Calendar year (Ref.: 2009)	0.00	0.00	0.00	0.00	0.00	0.00
2010	-1.40	-1.40	-1.26	-1.15	-1.24	-1.35
	(1.07)	(1.07)	(1.07)	(0.94)	(0.93)	(0.93)
2011	-1.37	-1.36	-1.24	-1.52	-1.59	-1.61
	(1.07)	(1.07)	(1.08)	(0.95)	(0.94)	(0.94)
2012	-2.06	-2.06	-1.93	-2.20*	-2.25*	-2.33*
	(1.08)	(1.08)	(1.09)	(0.95)	(0.94)	(0.94)
2013	-2.32*	-2.32*	-2.23*	-2.48**	-2.42*	-2.49**
	(1.09)	(1.09)	(1.10)	(0.96)	(0.96)	(0.95)
2014	-1.55	-1.54	-1.41	-1.76	-1.92*	-1.91*
	(1.09)	(1.09)	(1.10)	(0.95)	(0.95)	(0.95)
2015	-1.62	-1.62	-1.56	-2.37*	-2.44*	-2.38*
	(1.08)	(1.08)	(1.09)	(0.96)	(0.95)	(0.95)
2016	-2.15	-2.14	-2.05	-2.28*	-2.30*	-2.36*
	(1.10)	(1.10)	(1.11)	(0.97)	(0.96)	(0.97)
2017	-2.30*	-2.29*	-2.03	-3.20**	-3.20**	-3.22***
	(1.10)	(1.10)	(1.11)	(0.98)	(0.97)	(0.97)
2018	-3.07**	-3.06**	-2.83*	-3.15**	-3.13**	-3.28***
	(1.14)	(1.14)	(1.15)	(0.98)	(0.98)	(0.98)
2019	-4.19***	-4.19***	-4.00***	-2.90**	-2.90**	-2.93**
	(1.11)	(1.11)	(1.13)	(1.00)	(0.99)	(0.99)
2020	-3.38**	-3.38**	-3.10**	-4.95***	-5.17***	-5.21***
	(1.12)	(1.12)	(1.14)	(0.99)	(0.99)	(0.99)
2021	-3.38*	-3.38*	-3.15*	-3.55**	-3.56**	-3.67**
	(1.43)	(1.43)	(1.44)	(1.35)	(1.34)	(1.34)
2022	-1.32	-1.31	-1.60	-9.63	-8.99	-8.91
	(4.87)	(4.87)	(4.87)	(5.20)	(5.17)	(5.15)
Education (Ref.: Degree)	0.00	0.00	0.00	0.00	0.00	0.00
	(.)	(.)	(.)	(.)	(.)	(.)
Other higher	-0.40	-0.40	-0.41	-0.64	-0.61	-0.60
	(0.63)	(0.63)	(0.63)	(0.57)	(0.57)	(0.57)
A level etc	-0.35	-0.35	-0.31	-1.04	-0.93	-0.90
	(0.54)	(0.54)	(0.54)	(0.56)	(0.56)	(0.56)
GCSE etc	0.37	0.37	0.36	-1.55**	-1.45**	-1.43**
	(0.55)	(0.55)	(0.56)	(0.52)	(0.51)	(0.51)
Other qual	-0.53	-0.52	-0.66	-2.34***	-2.15***	-2.11**
	(0.66)	(0.66)	(0.66)	(0.64)	(0.64)	(0.64)
No qual	-3.46***	-3.45***	-3.28***	-5.90***	-5.70***	-5.55***

	(0.75)	(0.75)	(0.75)	(0.68)	(0.68)	(0.68)
Zero-indicator (Ref: Any complexity)		0.00	0.00		0.00	0.00
Zero-indicator: no complexity		0.14	-1.17		3.24***	1.12
		(0.66)	(0.73)		(0.55)	(0.66)
Current family status (Ref.: Single, no children)			0.00			
			(.)			
cohabitation, no children			-3.21			1.55
			(4.90)			(10.29)
cohabitation, youngest child 0-17			-4.89			0.72
			(5.16)			(10.45)
cohabitation, youngest child 18+			-0.32			3.50
			(5.11)			(10.29)
married, no children			-2.68			2.04
			(4.82)			(10.23)
married, youngest child 0-17			-3.65			1.14
			(4.82)			(10.24)
married, youngest child 18+			-2.84			1.71
			(4.81)			(10.23)
prev. partnered, no children			-4.95			-1.73
			(4.86)			(10.25)
prev. partnered, youngest child 0-17			-6.35			-1.49
			(5.08)			(10.28)
prev. partnered, youngest child 18+			-6.55			-1.22
			(4.91)			(10.24)
single, youngest child 0-17						0.00
						(.)
Constant	52.86***	52.77***	56.85***	51.99***	50.16***	50.37***
	(0.94)	(1.03)	(4.93)	(0.82)	(0.87)	(10.22)
Observations	2638	2638	2638	3407	3407	3407

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

Table A 4: Association between complexity following separation and physical health in mid-adulthood

	(1) SF-12 Physical Component Summary (PCS)	(2) SF-12 Physical Component Summary (PCS)	(3) SF-12 Physical Component Summary (PCS)	(4) SF-12 Physical Component Summary (PCS)	(5) SF-12 Physical Component Summary (PCS)	(6) SF-12 Physical Component Summary (PCS)
Standardized values of weighted_complex01	-0.77***	-0.89**	-0.94**	-0.80***	-0.43	-0.77*
	(0.20)	(0.34)	(0.34)	(0.20)	(0.30)	(0.32)
Health condition diagnosed in childhood (0/1)	-4.18***	-4.18***	-4.11***	-4.94***	-4.90***	-4.77***
	(0.87)	(0.87)	(0.87)	(0.86)	(0.86)	(0.85)
Calendar year (Ref.: 2009)	0.00	0.00	0.00	0.00	0.00	0.00
2010	0.78	0.76	0.59	0.05	0.03	-0.19
	(1.14)	(1.14)	(1.14)	(1.04)	(1.04)	(1.04)
2011	0.11	0.10	-0.12	1.32	1.30	1.16
	(1.14)	(1.14)	(1.15)	(1.05)	(1.05)	(1.05)
2012	0.42	0.41	0.15	0.76	0.74	0.65
	(1.15)	(1.15)	(1.16)	(1.05)	(1.05)	(1.06)
2013	-0.23	-0.24	-0.56	0.40	0.41	0.33
	(1.16)	(1.16)	(1.17)	(1.07)	(1.07)	(1.07)
2014	-0.40	-0.41	-0.69	-0.06	-0.11	-0.06
	(1.16)	(1.16)	(1.18)	(1.06)	(1.06)	(1.06)
2015	0.70	0.69	0.31	0.04	0.01	0.01
	(1.15)	(1.15)	(1.16)	(1.07)	(1.07)	(1.07)
2016	-0.26	-0.27	-0.48	-0.70	-0.70	-0.69
	(1.17)	(1.17)	(1.18)	(1.08)	(1.08)	(1.08)
2017	-0.05	-0.06	-0.24	-0.65	-0.65	-0.62
	(1.17)	(1.17)	(1.18)	(1.09)	(1.09)	(1.09)
2018	0.37	0.36	0.10	0.10	0.11	0.05
	(1.21)	(1.21)	(1.23)	(1.09)	(1.09)	(1.10)
2019	-0.05	-0.05	-0.30	0.49	0.49	0.50
	(1.18)	(1.18)	(1.20)	(1.11)	(1.11)	(1.11)
2020	0.57	0.57	0.29	0.15	0.08	0.18
	(1.19)	(1.20)	(1.21)	(1.10)	(1.11)	(1.11)
2021	0.06	0.06	-0.12	-0.61	-0.62	-0.53
	(1.52)	(1.52)	(1.53)	(1.50)	(1.50)	(1.51)
2022	-0.76	-0.77	-1.10	0.12	0.32	0.11
	(5.18)	(5.18)	(5.18)	(5.78)	(5.78)	(5.78)
Education (Ref.: Degree)	0.00	0.00	0.00	0.00	0.00	0.00
	(.)	(.)	(.)	(.)	(.)	(.)
Other higher	-2.83***	-2.84***	-2.82***	-1.95**	-1.94**	-1.79**
	(0.67)	(0.67)	(0.67)	(0.64)	(0.64)	(0.64)
A level etc	-3.35***	-3.35***	-3.39***	-2.76***	-2.73***	-2.60***
	(0.58)	(0.58)	(0.58)	(0.62)	(0.63)	(0.62)
GCSE etc	-4.11***	-4.11***	-4.09***	-3.78***	-3.75***	-3.57***
	(0.59)	(0.59)	(0.59)	(0.57)	(0.57)	(0.58)
Other qual	-5.49***	-5.49***	-5.49***	-6.46***	-6.41***	-6.21***
	(0.70)	(0.70)	(0.70)	(0.72)	(0.72)	(0.72)
No qual	-9.66***	-9.68***	-9.55***	-10.00***	-9.94***	-9.77***

	(0.80)	(0.80)	(0.80)	(0.76)	(0.76)	(0.76)
Zero-indicator (Ref: Any complexity)		0.00	0.00		0.00	0.00
Zero-indicator: no complexity		-0.29	-1.29		0.97	-0.57
		(0.70)	(0.78)		(0.61)	(0.74)
Current family status (Ref.: Single, no children)			0.00			
			(.)			
cohabitation, no children			-4.20			25.35*
			(5.21)			(11.53)
cohabitation, youngest child 0-17			-3.75			25.87*
			(5.50)			(11.71)
cohabitation, youngest child 18+			-4.56			23.62*
			(5.44)			(11.53)
married, no children			-6.08			24.34*
			(5.13)			(11.46)
married, youngest child 0-17			-5.08			24.57*
			(5.13)			(11.48)
married, youngest child 18+			-5.63			23.63*
			(5.12)			(11.46)
prev. partnered, no children			-8.14			22.25
			(5.17)			(11.49)
prev. partnered, youngest child 0-17			-8.14			23.55*
			(5.41)			(11.53)
prev. partnered, youngest child 18+			-6.91			21.42
			(5.22)			(11.48)
single, youngest child 0-17						0.00
						(.)
Constant	52.94***	53.13***	59.82***	51.77***	51.22***	28.53*
	(1.00)	(1.10)	(5.25)	(0.91)	(0.97)	(11.45)
Observations	2638	2638	2638	3407	3407	3407

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

Table A 5: Association between complexity following separation with a minor child and mental health in mid-adulthood

	(1) SF-12 Mental Component Summary (PCS)	(2) SF-12 Mental Component Summary (PCS)	(3) SF-12 Mental Component Summary (PCS)	(4) SF-12 Mental Component Summary (PCS)	(5) SF-12 Mental Component Summary (PCS)	(6) SF-12 Mental Component Summary (PCS)
Standardized values of weighted_complex03	-0.47	0.13	-0.26	-0.88***	0.00	-0.26
	(0.24)	(0.44)	(0.46)	(0.16)	(0.26)	(0.26)
Health condition diagnosed in childhood (0/1)	-2.86***	-2.90***	-2.81***	-2.87***	-2.73***	-2.36**
	(0.82)	(0.82)	(0.82)	(0.77)	(0.77)	(0.76)
Calendar year (Ref.: 2009)	0.00	0.00	0.00	0.00	0.00	0.00
2010	-1.43	-1.37	-1.29	-1.23	-1.21	-1.30
	(1.07)	(1.07)	(1.07)	(0.94)	(0.93)	(0.93)
2011	-1.28	-1.25	-1.25	-1.44	-1.39	-1.55
	(1.08)	(1.08)	(1.08)	(0.95)	(0.94)	(0.94)
2012	-2.04	-1.98	-2.00	-2.10*	-2.01*	-2.23*
	(1.08)	(1.08)	(1.09)	(0.95)	(0.95)	(0.94)
2013	-2.26*	-2.20*	-2.23*	-2.42*	-2.32*	-2.45*
	(1.09)	(1.09)	(1.10)	(0.96)	(0.96)	(0.95)
2014	-1.45	-1.41	-1.44	-1.61	-1.53	-1.77
	(1.10)	(1.10)	(1.10)	(0.95)	(0.95)	(0.95)
2015	-1.69	-1.62	-1.66	-2.20*	-2.05*	-2.26*
	(1.09)	(1.09)	(1.09)	(0.96)	(0.96)	(0.95)
2016	-2.18*	-2.12	-2.12	-2.10*	-1.96*	-2.25*
	(1.10)	(1.10)	(1.11)	(0.97)	(0.97)	(0.97)
2017	-2.37*	-2.28*	-2.11	-3.05**	-2.96**	-3.18**
	(1.10)	(1.10)	(1.11)	(0.98)	(0.98)	(0.97)
2018	-3.01**	-2.90*	-2.90*	-2.79**	-2.66**	-3.10**
	(1.14)	(1.14)	(1.15)	(0.99)	(0.99)	(0.99)
2019	-4.12***	-4.06***	-4.06***	-2.64**	-2.52*	-2.82**
	(1.12)	(1.12)	(1.13)	(1.00)	(1.00)	(0.99)
2020	-3.40**	-3.30**	-3.23**	-4.73***	-4.68***	-5.10***
	(1.13)	(1.13)	(1.14)	(0.99)	(0.99)	(0.99)
2021	-3.30*	-3.27*	-3.20*	-3.31*	-3.03*	-3.51**
	(1.44)	(1.44)	(1.44)	(1.35)	(1.35)	(1.34)
2022	-1.17	-1.15	-1.64	-8.99	-8.78	-8.83
	(4.89)	(4.88)	(4.88)	(5.20)	(5.19)	(5.15)
Education (Ref.: Degree)	0.00	0.00	0.00	0.00	0.00	0.00
	(.)	(.)	(.)	(.)	(.)	(.)
Other higher	-0.45	-0.44	-0.41	-0.48	-0.44	-0.52
	(0.63)	(0.63)	(0.63)	(0.57)	(0.57)	(0.57)
A level etc	-0.41	-0.40	-0.33	-0.93	-0.88	-0.83
	(0.54)	(0.54)	(0.54)	(0.56)	(0.56)	(0.56)
GCSE etc	0.33	0.37	0.32	-1.49**	-1.41**	-1.41**
	(0.56)	(0.56)	(0.56)	(0.52)	(0.52)	(0.51)
Other qual	-0.61	-0.62	-0.67	-2.23***	-2.17***	-2.09**
	(0.66)	(0.66)	(0.66)	(0.65)	(0.64)	(0.64)
No qual	-3.51***	-3.44***	-3.24***	-5.85***	-5.81***	-5.50***

	(0.75)	(0.75)	(0.75)	(0.68)	(0.68)	(0.68)
Zero-indicator (Ref: Any complexity)		0.00	0.00		0.00	0.00
Zero-indicator: no complexity		1.92	-0.40		2.99***	1.49
		(1.19)	(1.51)		(0.68)	(0.88)
Current family status (Ref.: Single, no children)			0.00			
			(.)			
cohabitation, no children			-3.74			0.64
			(4.89)			(10.27)
cohabitation, youngest child 0-17			-5.06			0.39
			(5.17)			(10.43)
cohabitation, youngest child 18+			-0.62			3.57
			(5.12)			(10.28)
married, no children			-2.80			1.52
			(4.83)			(10.22)
married, youngest child 0-17			-3.71			0.87
			(4.82)			(10.23)
married, youngest child 18+			-2.84			1.63
			(4.81)			(10.22)
prev. partnered, no children			-5.38			-3.08
			(4.84)			(10.23)
prev. partnered, youngest child 0-17			-6.55			-0.87
			(5.15)			(10.28)
prev. partnered, youngest child 18+			-6.37			-1.00
			(4.95)			(10.23)
single, youngest child 0-17						0.00
						(.)
Constant	52.86***	51.13***	56.64***	51.87***	49.31***	49.95***
	(0.95)	(1.43)	(5.09)	(0.82)	(1.00)	(10.23)
Observations	2638	2638	2638	3407	3407	3407

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

Table A 6: Association between complexity following separation with a minor child and physical health in mid-adulthood

	(1) SF-12 Physical Component Summary (PCS)	(2) SF-12 Physical Component Summary (PCS)	(3) SF-12 Physical Component Summary (PCS)	(4) SF-12 Physical Component Summary (PCS)	(5) SF-12 Physical Component Summary (PCS)	(6) SF-12 Physical Component Summary (PCS)
Standardized values of weighted_complex03	-0.65*	-0.54	-0.63	-0.89***	-0.77**	-1.03***
	(0.25)	(0.47)	(0.49)	(0.18)	(0.29)	(0.29)
Health condition diagnosed in childhood (0/1)	-4.39***	-4.40***	-4.18***	-5.18***	-5.17***	-4.95***
	(0.87)	(0.87)	(0.87)	(0.85)	(0.85)	(0.85)
Calendar year (Ref.: 2009)	0.00	0.00	0.00	0.00	0.00	0.00
2010	0.77	0.78	0.59	-0.00	-0.00	-0.21
	(1.14)	(1.14)	(1.14)	(1.04)	(1.04)	(1.04)
2011	0.22	0.23	-0.09	1.40	1.40	1.17
	(1.14)	(1.14)	(1.15)	(1.05)	(1.05)	(1.05)
2012	0.47	0.48	0.11	0.88	0.89	0.66
	(1.15)	(1.15)	(1.15)	(1.05)	(1.05)	(1.05)
2013	-0.11	-0.10	-0.50	0.48	0.50	0.34
	(1.16)	(1.16)	(1.17)	(1.07)	(1.07)	(1.07)
2014	-0.26	-0.25	-0.67	0.12	0.13	-0.03
	(1.17)	(1.17)	(1.17)	(1.06)	(1.06)	(1.06)
2015	0.67	0.68	0.24	0.24	0.26	0.03
	(1.16)	(1.16)	(1.16)	(1.07)	(1.07)	(1.07)
2016	-0.27	-0.25	-0.53	-0.47	-0.45	-0.65
	(1.17)	(1.17)	(1.18)	(1.08)	(1.08)	(1.08)
2017	-0.09	-0.07	-0.32	-0.47	-0.46	-0.60
	(1.17)	(1.17)	(1.18)	(1.09)	(1.09)	(1.09)
2018	0.50	0.52	0.11	0.51	0.53	0.22
	(1.21)	(1.22)	(1.23)	(1.10)	(1.10)	(1.10)
2019	0.08	0.09	-0.30	0.78	0.80	0.59
	(1.19)	(1.19)	(1.20)	(1.11)	(1.11)	(1.11)
2020	0.62	0.64	0.21	0.39	0.40	0.21
	(1.20)	(1.20)	(1.21)	(1.11)	(1.11)	(1.11)
2021	0.19	0.20	-0.15	-0.34	-0.30	-0.52
	(1.53)	(1.53)	(1.53)	(1.50)	(1.50)	(1.51)
2022	-0.62	-0.62	-1.21	0.85	0.87	0.54
	(5.19)	(5.19)	(5.18)	(5.78)	(5.78)	(5.77)
Education (Ref.: Degree)	0.00	0.00	0.00	0.00	0.00	0.00
	(.)	(.)	(.)	(.)	(.)	(.)
Other higher	-2.88***	-2.88***	-2.85***	-1.79**	-1.79**	-1.71**
	(0.67)	(0.67)	(0.67)	(0.64)	(0.64)	(0.64)
A level etc	-3.38***	-3.38***	-3.38***	-2.63***	-2.63***	-2.51***
	(0.58)	(0.58)	(0.58)	(0.63)	(0.63)	(0.62)
GCSE etc	-4.12***	-4.11***	-4.06***	-3.70***	-3.69***	-3.54***
	(0.59)	(0.59)	(0.59)	(0.57)	(0.57)	(0.58)
Other qual	-5.56***	-5.57***	-5.47***	-6.34***	-6.33***	-6.13***
	(0.70)	(0.70)	(0.70)	(0.72)	(0.72)	(0.72)
No qual	-9.71***	-9.70***	-9.56***	-9.92***	-9.91***	-9.65***

	(0.80)	(0.80)	(0.80)	(0.76)	(0.76)	(0.76)
Zero-indicator (Ref: Any complexity)		0.00	0.00		0.00	0.00
Zero-indicator: no complexity		0.38	0.36		0.39	-1.24
		(1.26)	(1.60)		(0.76)	(0.98)
Current family status (Ref.: Single, no children)			0.00			
			(.)			
cohabitation, no children			-4.75			24.62*
			(5.20)			(11.51)
cohabitation, youngest child 0-17			-3.47			25.64*
			(5.50)			(11.69)
cohabitation, youngest child 18+			-4.29			23.62*
			(5.45)			(11.52)
married, no children			-6.19			24.12*
			(5.13)			(11.45)
married, youngest child 0-17			-5.02			24.54*
			(5.13)			(11.46)
married, youngest child 18+			-5.52			23.71*
			(5.12)			(11.45)
prev. partnered, no children			-8.57			21.68
			(5.15)			(11.46)
prev. partnered, youngest child 0-17			-6.88			23.79*
			(5.47)			(11.52)
prev. partnered, youngest child 18+			-5.58			21.46
			(5.26)			(11.47)
single, youngest child 0-17						0.00
						(.)
Constant	52.85***	52.51***	58.59***	51.61***	51.28***	29.25*
	(1.01)	(1.52)	(5.41)	(0.91)	(1.12)	(11.46)
Observations	2638	2638	2638	3407	3407	3407

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

CALCULATION OF COMPLEXITY INDICES

We present the following example to demonstrate in more detail how the unweighted and weighted complexity indices are calculated.

Unweighted complexity index

The basic formula for the unweighted complexity is

$$C(x) = \sqrt{\frac{q(x)}{q_{max}} \times \frac{h(x)}{h_{max}}}$$

In the example sequence, the individual begins with nine years of childless single life, followed by a two-year childless marriage. Subsequently, they spend nine years married with underage children. Next, the individual experiences a seven-year period of single life with a minor child. The individual re-partners in a cohabitation with a minor child for two years, continuing for two more years when the youngest child is an adult. Following another separation, the individual is single for two years before entering a second re-partnering union that lasts two years before another separation. Two additional years of single life follow before the individual enters a third re-partnering union, which lasts for a year before the individual turns older than 55 and is no longer covered by our observation period.

(single, no children; 9)-(married, no children; 2)-(married, youngest child 0-17; 9)-(prev. partnered, youngest child 0-17; 7)-(cohabitation, youngest child 0-17; 2)-(cohabitation, youngest child 18+; 2)-(prev. partnered, youngest child 18+; 2)-(cohabitation, youngest child 18+; 2)-(prev. partnered, youngest child 18+; 2)-(cohabitation, youngest child 18+; 1)

With this information, we can apply the formula for the longitudinal entropy of individual sequences

$$h(x) = -\sum_{i}^{s} \pi_i \log \pi_i$$

and the formula for the theoretical maximum entropy to calculate it for the example sequence as follows:

$$h = -\left[2 \times \left(\frac{9}{38} log \frac{9}{38}\right) + \left(\frac{7}{38} log \frac{7}{38}\right) + \left(\frac{5}{38} log \frac{5}{38}\right) + \left(\frac{4}{38} log \frac{4}{38}\right) + 2 \times \left(\frac{2}{38} log \frac{2}{38}\right)\right]$$

$$= 1.808$$

With this individual sequence entropy, the maximum entropy

$$h_{max} = -log \frac{1}{12} = 2.485$$

and the information that there is a maximum of 37 transitions for 38 consecutive states, along with the example sequence having 9 transitions, we can calculate the basic sequence complexity:

$$\sqrt{\frac{9}{37} \times \frac{1.808}{2.485}} = 0.421$$

Weighted complexity indices

Using the information from Table A1, which indicated which transitions are defined as negative for the different weighted indices, we adjust this basic complexity by applying the correction factor and weighting. For instance, in the case of the first weighted complexity index, where all partnership transitions following the first union dissolution are considered complex, six out of the nine transitions are designated as complex. The four different complexity indices for the example sequence and their calculation are shown in Table A2.

Table A 7: Calculations of differently weighted example sequence

Type of complexity index	Complexity of example sequence

Weighted complexity 1	$0.421^{1}\left(1+\left(\frac{6}{9}-\frac{3}{9}\right)\right)^{1.5}=0.648$
Weighted complexity 2	$0.421^{1}\left(1+\left(\frac{2}{9}-\frac{7}{9}\right)\right)^{1.5}=0.125$

We apply these weighted complexity indices to all individuals' sequences in our data and analyze them as predictors of physical and mental health at age 55, which is the final year of the sequence. The impacts of these complexities are meaningful in themselves. A negative effect of weighted complexity of family histories that start with union dissolution and may include transitions such as re-partnering is linked to poorer health at age 55. Furthermore, we can interpret these effects in relation to other complexity indices. For instance, if the impact of weighted complexity 2 (excluding re-partnering as complex transitions) is more negatively linked to health than the impact of weighted complexity 1 (including re-partnering as complex transitions), it could indicate that re-partnering transitions tend to have a positive effect on mid-adulthood health, even when accumulated over the life course.

It should be noted that for all indices, individuals who have a "normative" family trajectory, meaning they have not experienced any transitions defined as potentially disadvantageous, have a weighted complexity of 0 at age 55. The same applies to individual who have not undergone any transitions between the ages of 18-55. In our final sample, there are only five cases where individuals began with the "single" status at age 18 and retained this status at age 55, without experiencing and partnership transition in between. While this number may seem exceptionally los, official UK statistics from 2011 show that 7.5% of women aged 55-59 and 12.1% of men in the same age group have never been married or in a civil partnership (Office for National Statistics 2023). Considering that we also account for cohabitation, which is not included in these official

statistics, it is reasonable to assume that the number is lower in our dataset. To check for potential bias in the results due to these observations, we conducted all analyses again, excluding these cases, and found that it did not alter the results.

DEFINITION OF TRANSITIONS THAT ADD COMPLEXITY IN WEIGHTED INDICES

The following table presents which transitions are defined as adding complexity in the two weighted complexity indices.

Table A 8: Definition of which transitions add complexity for the weighted complexity indices

Transitions	Weighted complexity 1	Weighted complexity 2
cohabitation, no children → prev. partnered, no children	✓	
cohabitation, no children → prev. partnered, youngest child 0-17	✓	✓
cohabitation, youngest child 0-17 → prev. partnered, youngest child 0-17	✓	✓
cohabitation, youngest child 0-17 → prev. partnered, youngest child 18+	✓	
cohabitation, youngest child 18+ → prev. partnered, youngest child 18+	✓	
cohabitation, youngest child 18+ → prev. partnered, youngest child 0-17	✓	✓
married, no children → prev. partnered, no children	✓	
married, no children → prev. partnered, youngest child 0-17	✓	✓
married, youngest child 0-17 → prev. partnered, youngest child 0-17	✓	✓
married, youngest child 0-17 → prev. partnered, youngest child 18+	✓	
married, youngest child 18+ → prev. partnered, youngest child 18+	✓	
married, youngest child 18+ → prev. partnered, youngest child 0-17	✓	✓
married, no children → cohabitation, no children	✓	
married, no children → cohabitation, youngest child 0-17	✓	✓
married, youngest child 0-17 → cohabitation, youngest child 0-17	✓	✓
married, youngest child 0-17 → cohabitation, youngest child 18+	✓	
married, youngest child 18+ → cohabitation, youngest child 18+	✓	
married, youngest child 18+ → cohabitation, youngest child 0-17	✓	✓
prev. partnered, no children → cohabitation, no children	✓	
prev. partnered, no children → cohabitation, youngest child 0-17	✓	
prev. partnered, youngest child 0-17 → cohabitation, youngest child 0-17	✓	✓
prev. partnered, youngest child 0-17 → cohabitation, youngest child 18+	✓	
prev. partnered, youngest child 18+ → cohabitation, youngest child 18+	✓	
prev. partnered, youngest child 18+ → cohabitation, youngest child 0-17	✓	
prev. partnered, no children → married, no children	✓	
prev. partnered, no children → married, youngest child 0-17	✓	
prev. partnered, youngest child 0-17 → married, youngest child 0-17	✓	✓
prev. partnered, youngest child 0-17 → married, youngest child 18+	✓	
prev. partnered, youngest child 18+ → married, youngest child 18+	✓	
prev. partnered, youngest child 18+ → married, youngest child 0-17	✓	
prev. partnered, no children → prev. partnered, youngest child 0-17	✓	✓
prev. partnered, youngest child 18+ → prev. partnered, youngest child 0-17	✓	✓

DETAILED INFORMATION ON EDUCATION CONTROL VARIABLE

In Table A9 below are the educational levels included in the categories of the variable in our regression models:

Table A 9: Coding of education control variable

Coding education control variable (HIQUAL_DV in UKHSL)	Education included in category
1 – Degree	- University Higher Degree - First degree level qualification including foundation degrees, graduate membership of a professional institute, PGCE
2 – Other higher degree	- Diploma in higher education - Teaching qualification - Nursing or other medical qualification not yet mentioned
3 – A-level etc	- A Level - Welsh Baccalaureate - International Baccalaureate - AS Level - Higher Grade/Advanced Higher (Scotland) - Certifiicate of sixth year studies
4 – GCSE etc	- GCSE/O Level - Standard/Ordinary (O) Grade / Lower (Scotland)
5 – Other qualification	- CSE - Other school (inc. school leaving exam certificate or matriculation)
9 – No qualification	- None of the above