Stockholm Research Reports in Demography | no 2021:23

Cohabitation and Mortality across the life course

Jesper Lindmarker

ISSN 2002-617X | Department of Sociology

Stockholm University
Demography Unit

Cohabitation and mortality across the life course

Jesper Lindmarker

Demography Unit, Department of Sociology, Stockholm University

Abstract

The literature on marriage status and mortality have shown that the married individuals enjoy longer lives than their non-married counterparts. The few studies that included cohabitation have found cohabitants to have a longevity between the married and other non-married groups. There are indications that the cohabiting population is diverse in terms of mortality risk, however, very little is known about how the association is related to age and stages of the life course. This is the first study on mortality and cohabitation for the Swedish population, which is a highly relevant context since Sweden is one of the countries where cohabitation is the most widespread and it has been a forerunner in many family trends. Using Swedish register data this study investigates how different partnership statuses are related to mortality across stages of the life course. It uses cox proportional hazards regression for the years 2012 – 2018 for the adult Swedish born population. Cohabiters were found to have consistently lower mortality risk than all other partnership statuses but the married except premarital cohabiters aged 30-49 who showed no excess mortality compared to the married. Further, the study reproduced findings that the difference between the cohabiters and the married is larger for women compared to men. These results contribute to our understanding of who cohabits at different stages of life, and it underlines that future research must consider cohabiters not as a homogenous group but as a status with diverse meaning that changes across the life course.

Keywords: Partnership status, Mortality differences, Sweden, Life Course, Hazard regression

Stockholm Research Reports in Demography 2021:23

ISSN 2002-617X

1 Introduction

Being married has consistently been found to be associated with a longer life (Lillard and Panis 1996; Murphy, Grundy, and Kalogirou 2007; Dupre, Beck, and Meadows 2009; Rendall et al. 2011). The proposed mechanisms are divided between selection effects and social causation effects. Selection being paths that lead to healthy individuals being more likely to marry and stay in marriage. Proposed paths of social causation are: Healthier behaviours among the married population, the ability to efficiently pool resources and various forms of support provided between spouses (Drefahl 2012). All these factors are theorized to be favourable for married individuals and lead to a better psychological and physiological health which in turn results in a longer life on average.

The same mechanisms, both selection and social causation, could be argued to apply for cohabiting individuals. The literature indicates that there are some similarities with cohabiters faring better than non-partnered individuals in a wide array of health measures (Carr 2019). However, in the mortality studies including cohabitation the consistent finding is that married individuals have even lower mortality which is generally explained by cohabitation being a less stable form of relationship, lower quality relationship and social selection (Koskinen et al. 2007; Carr and Springer 2010). However, there are results not conforming to the above pattern. One study found that cohabiting men and women with high SES have slightly lower mortality than their married counterparts (Drefahl 2012) and another found the never-married cohabiters, aged 30-49, to have lower mortality than the married in the same age group (Franke and Kulu 2018). Research on cohabitation has historically been focused on the younger population as a prelude to marriage (Susan L. Brown, Bulanda, and Lee 2012). However, there is an increasing amount of studies analysing union formation in older ages (Susan L. Brown, Lin, et al. 2019; Vespa 2012; Wright 2020; Susan L Brown and Wright 2017; Carr and Utz 2020) and the differences between young and older ages (Rapp 2018). Still, little is known about cohabitation at different ages and even less on how it relates to health and mortality over the life course. This is the gap where the present study proposes to make a contribution.

During the late 20th century, cohabitation has become more common in most advanced societies, although often seen as a prelude to marriage representing a change in the transitions into adulthood (Billari and Liefbroer 2010). However, to a larger and larger degree it is considered an alternative to marriage (Ohlsson-Wijk, Turunen, and Andersson 2020). Cohabitation is one trend of many in family behaviour. In these trends Sweden has been called a "family forerunner" (Ohlsson-Wijk, Turunen, and Andersson 2020; Sobotka and Toulemon 2008) which suggests that trends which take hold there are likely to occur in other countries and parts of the world later. Since the 1960s, Sweden has been early in many aspects of the increased diversity in family dynamics and regarding cohabitation Sweden are in the extremes. It is, but for iceland (Jónsson 2021), the only European country where the majority of first births happen in a cohabiting union (Andersson, Thomson, and Duntava 2017). However, until recently it has not been possible to study cohabitation in Sweden with register data since living arrangements was not included in the registers until 2011. Now, with almost a decade of data in the Dwelling register, it is possible to conduct a mortality analysis with the current study's research question.

The present study explores on the association between mortality and partnership status using Swedish register data, covering the full Swedish population, between 2012 and 2018. It examines the mortality risk for different partnership statuses by calculating separate regressions for men and women as well as three age groups: 30-49, 50-64 and 65+. Further, the cohabiters are grouped into premarital and post marital cohabiters which together with age groups make possible an analysis of the association across the life course. Lastly, the analysis controls for childlessness and two measures of socio-economic status: Education and income. It is the first study to produce estimates for the Swedish context and one of few separating the cohabiting population into groups at different stages of the life course. Only one study has used a similar approach (Franke and Kulu 2018). The aim of this study is to gain a more detailed understanding about the effects of different partnership statuses on mortality and about who cohabits at different stages of the life course.

2 Literature Review

2.1 Marriage status and mortality

There is a rich history and current progress in the research on the effects of partnership on mortality ranging back to Durkheim's finding that married individuals have lower risk of suicide (Durkheim 1951). Since then, multiple studies during the 20th century reported higher mortality levels for non-married individuals with analysis from various perspectives (Lillard and Panis 1996; Murphy, Grundy, and Kalogirou 2007; Dupre, Beck, and Meadows 2009; Rendall et al. 2011). A systematic review found that the relative mortality risk for married compared to non-married, was 0.88. An effect size shown to be consistent across gender, study quality and between Europe and North America (Manzoli et al. 2007). A more recent meta-analysis found that never-married persons had a hazard ratio of 1.24 compared to married persons and that previous differences in this effect between genders had decreased during the last decades (Roelfs et al. 2011).

The proposed mechanisms for this effect are divided between selection effects and protection effects (also called social causation effects). In recent decades however it is less of an either-or discussion, and rather a question of how much each mechanism contributes (Carr and Springer 2010). When discussing selection effects, it is important to separate health selection and social selection. Health selection refers to any underlying health factors that affect the probability for a person to find a partner and marry. Similarly, there is an argued selection effect out of marriage meaning that healthy people are less likely to transition out of marriage by divorce or into widowhood. It has been shown that married couples are more likely to separate if they are inflicted with morbidity or disability (Wyke and Ford 1992). Social selection refers to confounding factors that are associated with both mortality risk and propensity to find and maintain a partner. Such factors could be education, class, or income, but also personality and other individual characteristics and habits. It has been shown that there is positive selection into for healthy individuals partly because of their advantageous position on the marriage market and partly due to unobserved habits. In contrary, it has been shown that there could be health factors that are inversely related with marriage formation, meaning that unhealthy individuals are more likely to marry early, which is theorised to occur due to their increased incentives to seek out the protective effects from being in a marriage (Lillard and Panis 1996) Further it has been found that the size of the never married and divorced groups, in proportion to the whole population, is associated with the amount of increased mortality risk. In countries where a small share of the population remains unmarried or divorced, their respective mortality risks are higher compared to the married group (Hu and Goldman 1990). This indicates that in such countries there is an increased selection in play.

The protection effects, or social causation effects, encompass several mechanisms. First, married couples can pool resources and thus be more effective in its usage than their unmarried counterparts (Carr and Springer 2010). This is more pronounced for women who generally have lower income (Drefahl 2012). Next, married individuals tend to have healthier behaviours, which is believed to be a type of social control exerted over each other. This involves both less unhealthy habits such as bad food habits and smoking as well as less risk taking (Carr and Springer 2010). These protection effects seem to be stronger for men than for women. Lastly, support and care are another pathway of the association. The suggestion is that spouses provide each other with support through life, both emotional and instrumental, which decreases stress and has positive consequences for well-being (Rendall et al. 2011). Not least this would be relevant in older ages as the spouse is the most common informal caregiver, most pronounced in the direction of wives caring for their husbands (Agree and Glaser 2009).

2.2 The rise of cohabitation

Beginning in the 1970s, family patterns in most developed societies has undergone substantive changes. Changes which in the literature has been called the second demographic transition (Lesthaeghe 1995). In terms of partnering there has been a transition from marriage being an almost all-inclusive cultural norm to cohabitation being institutionalized and an accepted alternative to, rather than a prelude to, marriage (Ohlsson-Wijk, Turunen, and Andersson 2020). Nonmarital births, a measurement suitable as proxy for cohabiting parenthood, was 11% of total births in 1960 in Sweden, compared to the year 2000 when over 55% of births were nonmarital (Thomson, Winkler-Dworak, and Beaujouan 2019). This said, since the end of the 1990's marriage is on the rise in Sweden (Ohlsson-Wijk, Turunen, and Andersson 2020). Further, it has been found that in almost all European countries, over 50% of cohabiting unions still in union, have transitioned into marriage 10 years after union formation (Andersson, Thomson, and Duntava 2017).

2.3 Cohabitation and mortality

Even though lesser commitment in cohabiting partnerships has not been confirmed (Chambers 2012), a common view of cohabitation remains a weaker form of relationship. Regarding its association to mortality, the reasons for the weaker protection of cohabitation, relative to marriage, fall in the categories of "poorer relationship quality, greater instability and social selection" (Carr and Springer 2010, p. 751).

There are only a few mortality studies that include cohabiting or living arrangements. The results however seem to indicate that it is the partnership and not specifically marriage that is associated with lower mortality. Although, the mortality levels of cohabiting individuals tend to fall between the married and non-married (Koskinen et al. 2007; Scafato et al. 2008; Drefahl 2012; Staehelin et al. 2012; Franke and Kulu 2018) suggesting that there are significant differences to marriage worth studying. Further there are findings indicating that living arrangements, compared to marriage status, might account for more of the variation in mortality (Lund et al. 2002; Scafato et al. 2008). It is not clear how to understand cohabitation as a partnership type and there are reasons to believe that any protection effects vary by both gender and life course stage since cohabiters is a diverse group with varying reasons for cohabiting (Carr and Springer 2010).

A study in Finland found excess mortality compared to married individuals of 66% for working aged cohabiting men and women, and somewhat less for the 65+ (41% for men and 36% for women) (Koskinen et al. 2007). Living alone was the most detrimental state with two times the mortality for women and three times for men. For elderly the effects did not show the same gradient of increasing mortality. A gendered effect of living arrangement and marriage has been replicated in several studies. In Italy, one study found a significant difference between married and cohabiting men while no effect for women (Scafato et al. 2008). A Swiss study found a stronger benefit of marriage for men, however, after controlling for living arrangements the gendered effect disappeared. Also, the differences between the married and other statuses were most pronounced for the middle aged (Staehelin et al. 2012). The latter study also found that the larger effects of marriage status for men could largely be explained by the fact that living alone is more detrimental for men.

A study on the Danish population using register data found results somewhat different to other studies (Drefahl 2012). After inclusion of control variables some gendered effects disappeared, most notably being single showed no difference between genders. Further, cohabitation went from having an equal effect for men and women, about 30% increased mortality risks compared to the married, to insignificance for men while increasing slightly for women. Another relevant finding of this study was interactions with SES. Highly educated, cohabiting men and women had slightly lower mortality than their married counterparts and the effect was similar for income, indicating that socioeconomic status is an important mediator for the association between mortality and partnership status.

2.4 Cohabitation and the life course

Studies of cohabitation has historically focused on cohabitation as union on the way to marriage without any extensive coverage of how it varies over the ages. Much since old age cohabitation is a contemporary trend (Susan L. Brown, Bulanda, and Lee 2012). However, there is an increasing amount of research more thoroughly considering the complexity of union formation that cohabitation has brought (Sassler and Lichter 2020).

Among with this, there has been a substantial body of research on cohabitation in older ages (Susan L. Brown, Lin, et al. 2019; Vespa 2012; Wright 2020; Susan L Brown and Wright 2017; Carr and Utz 2020) and some covering differences between young and old ages (Rapp 2018).

Regarding cohabitation and mortality there is no study to date focusing on the life course perspective. However, there are studies that include life course variables (Koskinen et al. 2007; Staehelin et al. 2012) albeit without making it the focus of the study nor drawing any conclusions about the matter.

The closest to a mortality study on cohabitation focusing on the life course is a British study which divided the cohabiting population into pre- and post-marital cohabiters (Franke and Kulu 2018). However, the study suffers from a small sample size and few of the relevant groups showed any significant effect. Although, they found some indications that pre-marital cohabiters have the same mortality as married while post-marital have higher, for both genders. Also, they found that young pre-marital cohabiters could have even lower mortality than the married counterparts supporting the hypothesis that the "best of the best" postpone marriage. This also lends some support to the idea of accumulation; cohabiting couples reap the same health benefits initially but that some mechanism allows married couples to accumulate advantages over the years. They also found that by including household structure and size, the effect sizes of partnership status were substantially decreased for men while not for women. This strengthens the argument that living arrangements can explain parts of the gendered effects of marriage on mortality.

When considering a life-course perspective it is important to consider the problem of age and cohort effects. This is of importance when studying a topic such as cohabitation which involves cohorts coming of age in periods of changing values on types of unions. This is not discussed in the mentioned literature on cohabitation and mortality.

2.5 Sweden and family research

Sweden constitutes a highly relevant context to conduct research regarding family formation since its history and reputation of being a family forerunner (Ohlsson-Wijk, Turunen, and Andersson 2020). When comparing countries on the timing of the onset of demographic trends, Sweden is consistently among the first, if not the first, to begin shifts. This has been shown for declining fertility, postponement of marriage, increasing divorce trends, family complexity and lately the stabilization of divorce rates and increasing marriage rates (Sobotka and Toulemon 2008; Thomson 2014; Sobotka 2008; Ohlsson-Wijk, Turunen, and Andersson 2020). Further, regarding values Sweden is an outlier with the more progressive values of any other country (World Values Survey 2020). Also in measures of progression into the second demographic transition, Sweden has reached the furthest (Sobotka and Toulemon 2008). This includes values and social policies regarding gender equality which is believed to be an important driver of progressive demographic trends in family formation (Oláh and Bernhardt 2008). In a comparison of family dynamics between European countries it was shown how Sweden maintains its position as family forerunner also regarding cohabitation. Sweden is the only country covered in the Generations and Gender Survey Programme where the majority of births occur with the mother in a cohabiting union and it is the country where individuals spend highest shares of their lives in a cohabiting union, both with and without a child (Andersson, Thomson, and Duntava 2017). Sweden is clearly an important country for studying family trends and it is time partnership status was connected to mortality in a Swedish context.

3 Research question

There is a gap in the literature on how the association between partnership status and mortality is moderated by age and life course stages. Further, there is limited research on cohabitation and mortality specifically, and nothing in a Swedish context. The present study aims to answer how partnership status is related to mortality at different ages and how cohabitation and mortality are associated depending on if the cohabiting relationship is formed before or after being married at least once. Based on previous research, my hypothesis is that married people will have the lowest mortality and that the differences between being married and other partnership statuses will be greatest in younger ages and decreasing with age. Regarding cohabitation I expect to observe mortality risks close to being married due to the high acceptance of cohabitation in Sweden. I expect to find that premarital cohabiters have lower mortality than postmarital cohabiters due to them sharing characteristics and protection mechanisms with the married. Especially young premarital cohabiters who are likely to get married in the future.

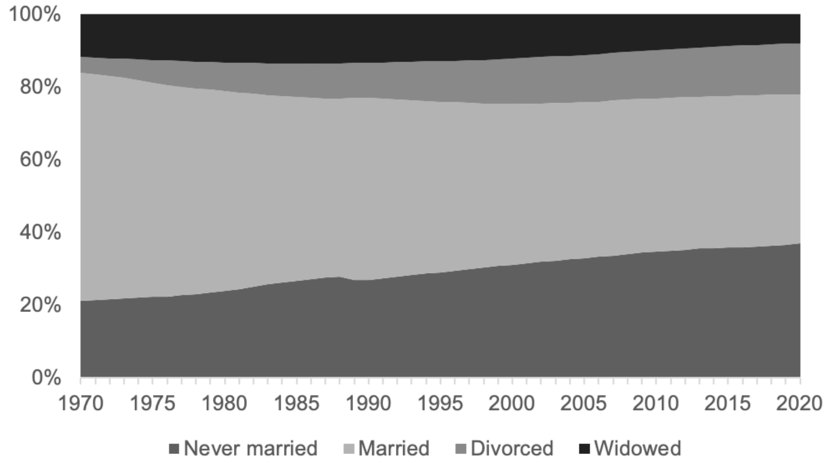
Lastly, I expect that by controlling for childlessness, education and income, the relative risks will decrease substantially since these are known moderators of the association.

4 Data

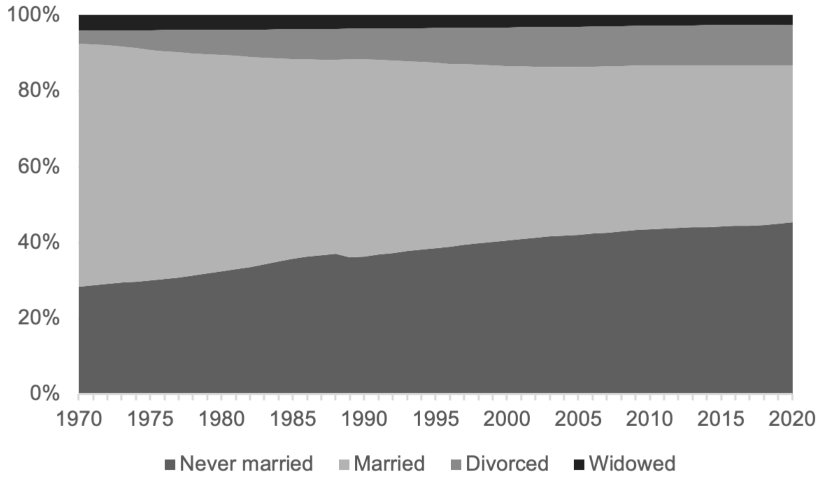
In this study I use Swedish register data to analyse the effects of partnership status and living arrangements on mortality. I include the Swedish born population living in Sweden 2011 and I follow them from January 1st, 2012, to December 31st, 2018, which are the years where the dwelling register has reliable data which allows me to include cohabiting relationships. I do not include 2011 in the analysis since I use previous year's partnership information as the covariate for a given year since it is the "last known" for the deceased individuals.

To enter the dataset an individual could either be 30 years or older on January 1, 2012, or turn 30 between January 1, 2012, and December 31, 2018. To exit the dataset there are two possible events: The event of death between January 1, 2012, and December 31, 2018, or emigration from Sweden between January 1, 2012, and December 31, 2018. The main independent variable is partnership status which relies on the data on living arrangements. Since this data source is relatively recent, I chose to exclude any groups that were deemed to have higher risk of unreliable values. Those are individuals immigrating during the study period as well as individuals younger than 30 years of age since they are more likely to cohabit with friend. This results in a study population of 5 701 515 individuals who were in the data set at least for one year.

Figure 1 show the distribution of the Swedish adult population by marriage status



(a) Women



(b) Men

Figure 1: Distribution of marriage status for Swedish population aged 18+ between 1970 and 2020 by sex. Source: Statistics Sweden

between the years 1970 and 2020 by sex. It is visible how the married share of the population has decreased with time and never married has increased. Further, one can see the onset of increasing divorce rates as well as the flattening. This highlights the need to include cohabitation in any analysis of partnership since a fraction of the never married, divorced, and widowed respectively are in a cohabiting relationship.

Table 1 and Table 2 show an overview of the distribution of time at risk, measured in years, by age group and sex during 2012 - 2018. To be noted is that all categories have deaths (events) during the study period. The tables show that the married individuals contribute with the most person years across all age groups. Never married are a smaller and smaller group for each older age group. Divorced individuals are a small group in the youngest age group and reaches a maintained level for the two older groups. Widowed individuals are very few until the oldest group where it increases for both men and women. Notably there is a gender difference, with women being more commonly married in the youngest age group and men in the oldest. Meanwhile, men consistently have a larger share in the never married category while women are more commonly divorced and widowed.

The study uses data over a six year period, which means that no full life course is observed for any cohort. For the life course perspective I wish to achieve in this study one must consider these a synthetic cohort, using mortality rates from the age distribution of the population, and treat them as a cohort passing through its life course.

Never married cohabiters exhibit a distinct pattern between the age groups for both men and women. In the youngest age group, they contribute with a large share of the person years at risk, the second largest group of women (24,2%) and third largest of men (25,3%). In the 50-64 age group the shares have decreased to 9,5% for women and 11,2% for men and in the oldest group the shares drop to 1,6% for women and 3,2% for men making them the smallest group except for the "other" category. This group can only grow with individuals transitioning from being never married single while it can decrease by individuals transitioning into any other of the partnership statuses.

Divorced/widowed cohabiters contribute with a small share of person years at risk in the youngest age group. 3,2% of women and 2,4% of men. These shares increase to 6,1% and 5,7% in the 50-64 age group. In the oldest age group, the share decreases to 4,4% for women and is maintained for men. Individuals in this group can only transition to and from the married, divorced, and widowed categories

The covariates on marriage status and partnership status are time varying for every year of the study. To get the most reliable data on cohabitation I have cross-referenced the registers and matched individuals with their respective partner using the dwelling register, civil status and the register for civil status changes and connections. Between the registers there are contradictions where one individual can be categorized as being in different partnership statuses in the three registers. Cases with too many contradictions and those without a known partner were categorised as "Other". Most of the individuals in this group are registered as married but with an alleged spouse either registered as divorced or cohabiting/married to someone else. Documentation on the cross-reference matching method is found in the appendix.

After cross referencing, I prepared the *marriage status* as a time varying variable with the following categories: Married (first- and higher order marriages), Never married (singles and those in cohabitation), Divorced (singles and those in cohabitation), Widowed (singles and those in cohabitation), and Other (Those that the cross-referencing method could not categorize).

The variable *partnership status* was prepared dividing the marriage status variable into further categories: "Never married" is divided into "Never married, in cohabiting relationship" and "Never married, not in cohabiting relationship". "Divorced" and "Widowed" are divided into "Divorced, not in cohabiting relationship", "Widowed, not in cohabiting relationship" and "Divorced/Widowed, in cohabiting relationship". Thus, the categories are not overlapping but a subset of categories in marriage status. The two different categories of cohabitation: "Never married, in cohabiting relationship" and "Divorced/Widowed, in cohabiting relationship" are prepared to make possible analysis of pre-marital cohabitation and post-marital cohabitation. Both marriage status and partnership status are time varying covariates with the value at a given year being the status at the end of the previous year.

Table 1: Person years at risk (PY) and events (E) by sex, covariates and age group between 2012 and 2018

	Female								
	Aged 30-49			Aged 50-64			Aged 65+		
	PY	%	Deaths	PY	%	Deaths	PY	%	Deaths
Marriage status									
Married	3 441 953	46,1	1240	3 106 807	54,1	6065	3 051 228	42,7	41415
Never married	3 200 325	42,9	2046	1 299 449	22,6	4581	566 129	7,9	17247
Divorced	711 228	9,5	626	1 129 542	19,7	3740	1 230 278	17,2	31655
Widowed	22 153	0,3	32	165 088	2,9	633	2 171 703	30,4	130337
Other	89 426	1,2	59	39 315	0,7	114	123 194	1,7	5508
Partnership status									
Married	3 441 953	46,1	1240	3 106 807	54,1	6065	3 051 228	42,7	41415
Never married, not in cohabiting relationship	1 397 482	18,7	1432	754 171	13,1	3402	452 246	6,3	15778
Divorced, not in cohabiting relationship	479 927	6,4	482	810 453	14,1	2971	1 004 599	14,1	28826
Widowed, not in cohabiting relationship	16 938	0,2	27	135 471	2,4	545	2 080 633	29,1	127889
Other	89 426	1,2	59	39 315	0,7	114	123 194	1,7	5508
Never married, in cohabiting relationship	1 802 843	24,2	614	545 278	9,5	1179	113 883	1,6	1469
Divorced/Widowed, in cohabiting relationship	236 515	3,2	149	348 706	6,1	857	316 749	4,4	5277
Childless									
No	5 459 479	73,1	2506	4 952 583	86,3	11570	6 229 567	87,2	188288
Yes	2 005 606	26,9	1497	787 618	13,7	3563	912 965	12,8	37874
Education									
1	11 351	0,2	31	103 267	1,8	661	2 051 542	28,7	111001
2	438 301	5,9	675	591 561	10,3	2832	623 853	8,7	18044
3	3 205 177	42,9	1960	2 837 618	49,4	7817	2 785 822	39,0	68817
4	480 124	6,4	219	244 324	4,3	464	107 304	1,5	1421
5	3 239 486	43,4	1012	1 908 647	33,3	3163	1 510 785	21,2	23336
6	65 608	0,9	18	46 768	0,8	47	33 713	0,5	398
999	25 038	0,3	88	8 015	0,1	149	29 514	0,4	3145
Income Quantile									
0-25	2 568 720	34,4	1548	936 475	16,3	3717	2 226 447	31,2	76358
26-50	1 896 954	25,4	1240	1 531 647	26,7	5160	2 473 063	34,6	106376
51-75	1 786 281	23,9	777	1 705 170	29,7	3539	1 309 236	18,3	27624
76-100	1 213 131	16,3	438	1 566 910	27,3	2717	1 133 787	15,9	15804
Total over all categories of each variable	7 465 086	100,0	4 003	5 740 201	100,0	15 133	7 142 532	100,0	226 162

Source: Authors calculations based on Swedish register data

Percentages may not sum up to 100 due to rounding

Table 2: Person years at risk (PY) and events (E) by sex, covariates and age group between 2012 and 2018

	Male								
	Aged 30-49			Aged 50-64			Aged 65+		
	PY	%	Deaths	PY	%	Deaths	PY	%	Deaths
Marriage status									
Married	3 197 439	40,6	1397	3 093 658	52,6	7260	3 705 614	60,8	90120
Never married	4 049 236	51,4	4627	1 705 999	29,0	9565	725 672	11,9	25582
Divorced	534 555	6,8	802	974 859	16,6	5275	919 616	15,1	29569
Widowed	10 210	0,1	12	63 113	1,1	320	635 238	10,4	46783
Other	86 070	1,1	55	43 321	0,7	195	103 922	1,7	8084
Partnership status									
Married	3 197 439	40,6	1397	3 093 658	52,6	7260	3 705 614	60,8	90120
Never married, not in cohabiting relationship	2 058 618	26,1	3765	1 049 092	17,8	7921	533 591	8,8	22024
Divorced, not in cohabiting relationship	348 735	4,4	645	655 294	11,1	4366	637 141	10,5	23898
Widowed, not in cohabiting relationship	7 583	0,1	11	49 177	0,8	281	572 472	9,4	44192
Other	86 070	1,1	55	43 321	0,7	195	103 922	1,7	8084
Never married, in cohabiting relationship	1 990 618	25,3	862	656 908	11,2	1644	192 081	3,2	3558
Divorced/Widowed, in cohabiting relationship	188 448	2,4	158	333 501	5,7	948	345 240	5,7	8262
Childless									
No	4 775 729	60,6	3359	4 651 063	79,1	14796	5 076 923	83,4	159182
Yes	3 101 780	39,4	3534	1 229 887	20,9	7819	1 013 138	16,6	40956
Education									
1	19 805	0,3	94	195 389	3,3	1548	1 868 597	30,7	90178
2	741 267	9,4	1594	952 248	16,2	5216	408 050	6,7	10098
3	4 100 601	52,1	3772	2 917 331	49,6	11444	2 361 183	38,8	67680
4	607 645	7,7	398	526 691	9,0	1325	197 912	3,2	3121
5	2 283 386	29,0	870	1 188 202	20,2	2693	1 135 621	18,6	25515
6	89 821	1,1	42	86 478	1,5	136	94 410	1,6	1711
999	34 984	0,4	123	14 611	0,2	253	24 288	0,4	1835
Income Quantile									
0-25	1 427 467	18,1	2333	613 424	10,4	5001	739 496	12,1	32836
26-50	1 335 455	17,0	1660	801 716	13,6	5350	1 482 033	24,3	80709
51-75	2 468 641	31,3	1553	1 473 658	25,1	4991	1 708 688	28,1	53728
76-100	2 645 946	33,6	1347	2 992 152	50,9	7273	2 159 845	35,5	32865
Total over all categories of each variable	7 877 510	100,0	6 893	5 880 950	100,0	22 615	6 090 061	100,0	200 138

Source: Authors calculations based on Swedish register data
Percentages may not sum up to 100 due to rounding

I control for three variables known to moderate the association between partnership status and mortality. *Childless* is a time constant covariate, coded "1" for individuals without any living children in 2011 and "0" for those with at least one living child in 2011. Education, also time constant, was prepared using the Swedish LISA register from 2011 and categorized using the same categories as in the register: "1" represents not having finished compulsory education, "2" represents having finished compulsory school (lower secondary education), "3" represent is finished upper secondary education, "4" represent supplementary education less than 2 years or not finished tertiary education, "5" represents more than 2 years of tertiary education and "6" represents doctoral education. Income quantile, time constant, was also prepared using the LISA register from 2011, using the measure of disposable income individualized from the household which measures the total household income divided by weighted individual consumption and total family consumption (Statistics Sweden 2016). Quantiles were calculated from the adult Swedish born population living in Sweden in 2011.

The proportion of missing information in the data can be considered low as it is consistently below 1%. Thus, it can be assumed that the effect of missing values is negligible on the results.

5 Method

For this study I will conduct an event history analysis, also called survival analysis or hazard regression. These are methods suitable when studying mortality or any other time-to-failure distribution of events. Specifically, I use the Cox proportional hazards model which is defined as:

$$h_i(t) = h_0(t)exp(\beta_1 x_{i1} + \beta_2 x_{i2} + ... + \beta_k x_{ik}),$$

where $h_i(t)$ is the individual hazard rate at time t. $h_0(t)$ is the baseline hazard at time t, which represents the hazard when each of the independent variables $x_1, \dots x_k$ are equal to zero. $beta_1, \dots beta_k$ are the estimated coefficients of the model. The Cox Proportional Hazard model (Cox 1972) is a semiparametric model that makes no assumptions about the shape of the baseline hazard which means that one can only draw conclusions about the relative risks between groups. However, the model does assume that the covariates result in proportional hazards over time. An alternative would have been to use parametric model with a Gompertz baseline which quite well matches the baseline hazard of mortality with age. However, since I am primarily interested in the relative risks of mortality between groups it serves my purpose well to use a Cox model. Process time in my models is the individual's age in months which means that the effect of age on mortality is controlled for and does not need its own variable in the regressions. The observations are clustered on ID for individuals to get robust variance. Further, I test for the proportional hazards assumption.

All regressions are calculated separately by sex and three age-groups: 30-49, 50-64 and 65+. The lower age limit allows me to reasonably assume that two individuals of different sex living together are in a relationship and that most of the study population has finished their studies. I use three models for every age group where I include more variables step by step. This is to first use the univariate association and then test how each additional variable explains some of the effect. The assumption is that the effect size decreases for every additional variable added. In model 1 I include only the variable marriage status without any information on cohabitation. In model 2 I use partnership status as independent variable which differs from marriage status by dividing each category: Never married, Divorced, and Widowed into "in cohabiting relationship" and "not in cohabiting relationship" while keeping the same values for individuals in categories: Married and Other. In model 3 I keep partnership status variable and add control variables for being childless, level of education, and income quantile. The SES variables have been shown in previous literature to substantially affect the association between partnership status and mortality and is of high importance to considered. Childlessness could confound the association through different mechanisms depending on the age group. In younger ages it could capture health selection associated with infertility or social selection that is not captured by SES such as risky or unhealthy behaviours that defer individuals from having children. Further, in younger ages it is likely that the child is living in the household and affecting the parents' behaviours to a larger extent than in older ages when most children have left the household. In older ages childlessness could also affect mortality through lack of support, instrumental and emotional.

6 Results

The aim of this study is to explore the association between cohabitation and mortality for people at different stages of the life course. This result is highlighted in Figure 2 which shows the relative mortality risk for cohabiters in the three age groups with married individuals as the reference category in each age group. Cohabiters are divided between never married and divorced/widowed which represents two stages of a life course. The results are taken from model 3 in Table 3 and Table 4 and are adjusted for other partnership statuses, age, childlessness, level of education and income quantile. As can be seen, for both women and men, the never married cohabiters show a mortality risk, at ages 30-49, not significantly different from their married counterparts. This was not the case in the unadjusted model (model 2) suggesting that said risk was explained in model 3 by childless individuals and those with low SES being more likely to cohabit. In the two older age groups there is a gradient of increasing relative mortality risk, more pronounced for women than for men.

Divorced/widowed cohabiters show an opposite gradient of the relative mortality risk. The youngest age group exhibit the largest difference in mortality risk compared to the married. The gradient differs between men and women in the 50-64 age group. For women it is only a slight decrease while for men the decrease is substantial. The introduction of the controls increases the relative risk for women in this age group, however with overlapping confidence intervals, indicating that they can be considered a select group even when taking childlessness and SES into consideration. As can be seen for the 65+ age group, there is a crossover between the two groups of cohabiters, and the divorced/widowed cohabiters now exhibit lower mortality risk than never married cohabiters.

In the following section I will present my results from the regressions presented in Table 3 and Table 4.I will refer to changes between age groups. It is however important to remember that the results can consist of both life course and cohort effects and I do not have the data to draw conclusions on the effect composition between the two. The regressions are calculated separately for each sex and for three age groups resulting in a total of six regressions. The reference category is married individuals which is the largest group as well as the most common reference in mortality studies on partnership. In the first model of the regressions (model 1), only marriage status is included as a covariate,

Table 3: Relative risk of mortality by partnership status and age group for Swedish born women

	Aged 30-49						Aged 50-64						Aged 65+					
	Model 1a		Model 2a		Model 3a		Model 1b		Model 2b		Model 3b		Model 1c		Model 2c		Model 3c	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Marriage status																		
Married (ref)	1						1						1					
Never married	2.05***	(1.91 - 2.20)					2.05***	(1.97 - 2.13)					1.53***	(1.51 - 1.56)				
Divorced	2.06***	(1.87 - 2.27)					1.72***	(1.65 - 1.79)					1.41***	(1.39 - 1.43)				
Widowed	3.04***	(2.14 - 4.31)					1.60***	(1.47 - 1.74)					1.23***	(1.21 - 1.24)				
Other	2.14***	(1.64 - 2.78)					1.59***	(1.32 - 1.91)					1.61***	(1.56 - 1.65)				
Partnership status																		
Married (ref)			1		1				1		1				1		1	
Never married, not in cohabiting relationship			3.18***	(2.94 - 3.43)	2.01***	(1.85 - 2.19)			2.54***	(2.43 - 2.65)	2.04***	(1.95 - 2.14)			1.55***	(1.52 - 1.58)	1.46***	(1.43 - 1.49)
Divorced, not in a cohabiting relationship			2.34***	(2.11 - 2.61)	2.07***	(1.87 - 2.31)			1.88***	(1.80 - 1.96)	1.99***	(1.90 - 2.08)			1.45***	(1.42 - 1.47)	1.43***	(1.40 - 1.45)
Widowed, not in a cohabiting relationship			3.36***	(2.30 - 4.92)	3.02***	(2.07 - 4.43)			1.67***	(1.53 - 1.82)	1.74***	(1.60 - 1.91)			1.23***	(1.22 - 1.25)	1.20***	(1.19 - 1.22)
Other			2.13***	(1.64 - 2.76)	1.73***	(1.33 - 2.25)			1.59***	(1.32 - 1.91)	1.40***	(1.16 - 1.68)			1.61***	(1.57 - 1.66)	1.59***	(1.55 - 1.64)
Never married, in cohabiting relationship			1.12*	(1.01 - 1.23)	0.99	(0.89 - 1.09)			1.31***	(1.23 - 1.40)	1.18***	(1.11 - 1.25)			1.39***	(1.32 - 1.46)	1.29***	(1.23 - 1.36)
Divorced/Widowed, in cohabiting relationship			1.51***	(1.28 - 1.80)	1.40***	(1.18 - 1.65)			1.29***	(1.20 - 1.38)	1.37***	(1.28 - 1.47)			1.17***	(1.14 - 1.21)	1.14***	(1.11 - 1.18)
Childless																		
No (ref)					1						1						1	
Yes					2.20***	(2.03 - 2.39)					1.61***	(1.55 - 1.68)					1.12***	(1.10 - 1.13)
Education																		
1					2.85***	(1.99 - 4.08)					1.32***	(1.22 - 1.43)					1.15***	(1.14 - 1.17)
2					2.08***	(1.91 - 2.28)					1.45***	(1.38 - 1.51)					1.05***	(1.04 - 1.07)
3 (ref)					1						1						1	
4					0.78***	(0.68 - 0.90)					0.78***	(0.71 - 0.85)					0.86***	(0.82 - 0.91)
5					0.63***	(0.58 - 0.68)					0.68***	(0.66 - 0.71)					0.80***	(0.79 - 0.81)
6					0.53**	(0.34 - 0.85)					0.47***	(0.35 - 0.63)					0.71***	(0.65 - 0.79)
999					3.36***	(2.69 - 4.19)					2.74***	(2.32 - 3.23)					1.10***	(1.06 - 1.14)
Income quantile																		
0-25					1.12**	(1.04 - 1.21)					1.14***	(1.09 - 1.19)					0.96***	(0.96 - 0.97)
26-50 (ref)					1						1						1	
51-75					0.65***	(0.60 - 0.72)					0.61***	(0.58 - 0.63)					0.88***	(0.87 - 0.89)
76-100					0.52***	(0.47 - 0.58)					0.52***	(0.49 - 0.54)					0.83***	(0.81 - 0.84)

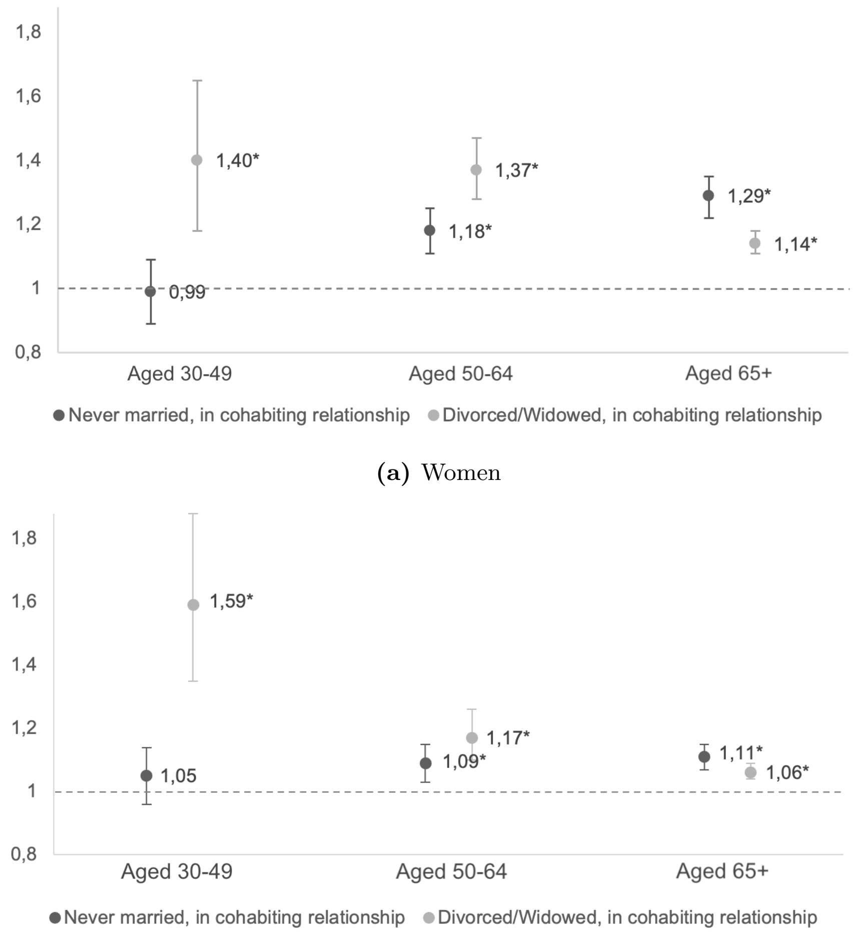
HR = Hazard Ratio, CI = Confidence Interval
*p <.05. **p <.01. ***p <.001.

Table 4: Relative risk of mortality by partnership status and age group for Swedish born men

	30-49						50-64						65+					
	Model 1a		Model 2a		Model 3a		Model 1b		Model 2b		Model 3b		Model 1c		Model 2c		Model 3c	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Marriage status																		
Married (ref)	1						1						1					
Never married	3.02***	(2.84 - 3.21)					2.72***	(2.64 - 2.81)					1.73***	(1.70 - 1.75)				
Divorced	3.00***	(2.75 - 3.27)					2.34***	(2.26 - 2.42)					1.52***	(1.50 - 1.54)				
Widowed	2.19**	(1.24 - 3.87)					1.75***	(1.57 - 1.96)					1.20***	(1.19 - 1.22)				
Other	1.66***	(1.27 - 2.17)					2.10***	(1.82 - 2.42)					1.63***	(1.59 - 1.66)				
Partnership status																		
Married (ref)			1		1				1		1				1		1	
Never married, not in cohabiting relationship			4.77***	(4.48 - 5.07)	3.39***	(3.15 - 3.65)			3.58***	(3.46 - 3.69)	2.36***	(2.27 - 2.45)			1.84***	(1.82 - 1.87)	1.58***	(1.55 - 1.61)
Divorced, not in a cohabiting relationship			3.69***	(3.36 - 4.06)	3.19***	(2.90 - 3.50)			2.87***	(2.77 - 2.98)	2.47***	(2.38 - 2.56)			1.67***	(1.65 - 1.69)	1.58***	(1.55 - 1.60)
Widowed, not in a cohabiting relationship			2.72***	(1.50 - 4.92)	2.39**	(1.32 - 4.32)			1.98***	(1.76 - 2.23)	1.78***	(1.58 - 2.01)			1.21***	(1.20 - 1.23)	1.17***	(1.16 - 1.19)
Other			1.65***	(1.26 - 2.16)	1.37*	(1.04 - 1.79)			2.09***	(1.82 - 2.41)	1.69***	(1.47 - 1.95)			1.63***	(1.60 - 1.67)	1.59***	(1.56 - 1.63)
Never married, in cohabiting relationship			1.15**	(1.06 - 1.25)	1.05	(0.96 - 1.14)			1.26***	(1.19 - 1.33)	1.09**	(1.03 - 1.15)			1.23***	(1.19 - 1.28)	1.11***	(1.07 - 1.15)
Divorced/Widowed, in cohabiting relationship			1.71***	(1.45 - 2.02)	1.59***	(1.35 - 1.88)			1.22***	(1.14 - 1.31)	1.17***	(1.10 - 1.26)			1.10***	(1.08 - 1.13)	1.06***	(1.04 - 1.09)
Childless																		
No (ref)					1						1						1	
Yes					1.28***	(1.20 - 1.36)					1.23***	(1.19 - 1.27)					1.06***	(1.05 - 1.08)
Education																		
1					2.47***	(2.00 - 3.03)					1.15***	(1.09 - 1.22)					1.07***	(1.06 - 1.09)
2					1.73***	(1.63 - 1.83)					1.21***	(1.17 - 1.25)					1.08***	(1.06 - 1.11)
3 (ref)					1						1						1	
4					0.72***	(0.65 - 0.80)					0.78***	(0.73 - 0.82)					0.90***	(0.87 - 0.93)
5					0.54***	(0.50 - 0.58)					0.69***	(0.66 - 0.72)					0.89***	(0.87 - 0.90)
6					0.66**	(0.49 - 0.90)					0.54***	(0.45 - 0.64)					0.79***	(0.76 - 0.83)
999					1.91***	(1.59 - 2.29)					2.06***	(1.82 - 2.33)					1.15***	(1.10 - 1.21)
Income quantile																		
0-25					1.30***	(1.22 - 1.38)					1.11***	(1.06 - 1.15)					0.98*	(0.97 - 1.00)
26-50 (ref)					1						1						1	
51-75					0.58***	(0.54 - 0.62)					0.59***	(0.57 - 0.61)					0.87***	(0.86 - 0.88)
76-100					0.46***	(0.42 - 0.49)					0.46***	(0.44 - 0.48)					0.70***	(0.69 - 0.71)

HR = Hazard Ratio, CI = Confidence Interval

*p <.05. **p <.01. ***p <.001.



(a) Women

(b) Men

Figure 2: Relative mortality risk compared to married individuals. Analysis controlled for other partnerships statuses, age, childlessness, level of education, and income quantile.
*Significantly different from the married individuals.
Source: Table 3 and Table 4: Model 3

however the model is also controlled for the effect of age on mortality since the process time in the analysis is age in months. In the age group 30-49, never married and divorced women have twice the mortality risk and widowed women three times the risk compared to the married group. For the same age group of men, the differences are even larger, with never married and divorced men experiencing three times the risk of dying and widowed men more than two times the risk. In the age group 50-64, the differences between the married and the other partner statuses are generally smaller. Never married women still have twice the mortality risk compared to married women. Divorced and widowed women have 72% and 69% higher mortality risks respectively. Never married men have 172% higher mortality risk, divorced men 134% increased mortality risk and widowed men 75% higher mortality risk. For women in the age group 65+ relative risks decrease even more, never married women have 53% higher mortality risk, divorced women 41% higher mortality risk and widowed women 23% higher mortality risk. Never married men have 73% higher mortality risk, divorced men 52% higher mortality risk and widowed men 20% higher mortality risk.

In model 2 I substitute marriage status for the variable partnership status, which categorises the people who are never married, divorced, and widowed into groups not cohabiting and cohabiting respectively. Not surprisingly, subsetting by cohabitation results in higher relative mortality risks for the statuses not cohabiting since they likely consist mostly of single people. For women in the age group 30-49 (model 2a), never married not cohabiting individuals have 218% increased risk, divorced not cohabiting 134% increased risk, and widowed not cohabiting 236% increased risk, compared to the married. For men, the equivalent risks are 377% for never married not cohabiting, 269% for the divorced not cohabiting, and 172% for the widowed not cohabiting. In the youngest age group, the differences between model 1 and 2 are substantial, although it becomes smaller for each older age group. The cohabiting subset is experiencing lower risk and the non-cohabiting counterparts higher risks than when they were one group in model 1. The model 1 and 2 differences are especially prominent for the non cohabiting groups. This is likely to be an effect of both partnership differences generally decreasing with age and the relative sizes of the subsetted groups.

Never married cohabiters show a mortality risk very close to their married counterparts in the youngest age group, 12% increased risk for women and 15% for men. In the age group 50-64 however, the mortality risks are increased to 31% and 26%, and in the 65+ age group it is 39% for women and 23% for men. For divorced/widowed cohabiters there is a gradient in the other direction. In the youngest age group divorced/widowed cohabiters have an increased mortality risk of 51% for women and 71% for men. In the 50-64 age group the relative risks decrease to 29% and 22% and in the 65+ age group the risks are 17% for women and 10% for men. This crossover of relative risk between the two cohabiting groups shows that both age and partnership trajectory as expressions of the life course, changes the effect of cohabitation.

In model 3 I control for three additional covariates: Being childless, level of education and income quantile. With this, the mortality differences between those married and those in other partnership statuses generally decrease, except for divorced and widowed women in model 3b, aged 50-64, cohabiting and not cohabiting, for whom the differences increase slightly. The risks of the never married cohabiters are substantially affected by the introduction of control variables, especially men. In the age group 30-49, both men and women, now show no significant difference in mortality risk compared to their married counterparts. In the age group 50-64 there is still a significant difference, 18% higher risk for women and 9% higher risk for men. In the oldest age group, never married cohabiters no longer experience the second lowest mortality risk but are surpassed by the divorced/widowed cohabiters for both sex and the widowed not cohabiting for women. Divorced/widowed cohabiters are not as affected by introduction of the control variables. In the oldest age group, divorced/widowed cohabiting individuals have just slightly increased risk compared to the married group, 14% for women and 6% for men. I did test a stepwise model including childlessness as the only control in one and education and income (SES) in the other. This showed that childlessness explained almost none of the excess mortality for the divorced and widowed, both cohabiting and not cohabiting, indicating some of the increased mortality risk for divorced/widowed individuals is rather related to their low socioeconomic status. For the never married however, cohabiting and not, childlessness did explain some of the excess mortality. Especially for women for whom it was a stronger predictor than SES. This indicates that some of the excess mortality for never married people is rather related to them being childless and their low socioeconomic status. The stepwise regressions can be found in the appendix.

The “Other” category of partnership status, which consists of individuals categorized as “married” in at least one register but which my partner matching model could not verify compared to other registers, consistently have an increased mortality risk between 37% and 73% compared to their respective married counterparts in model 3 of their respective age group. This indicates that my matching model captures some aspect of vulnerability or life course instability in that population. I have made no further investigation into this group; however, I conclude that it is correct for this study not to categorize them as married.

The control variables all behave as expected. Being childless results in higher relative mortality risks for women compared to men. For both men and women, the increased mortality risk for the childless decreases with age. Higher levels of education are associated with lower mortality risks. The gradient is slightly steeper for women and levels out with age for both men and women. Placement in a higher income quantile is also associated with lower mortality risk. There is little to no difference between the two younger age groups, model 3a and 3b, while the gradient levels out in the 65+ age group model 3c.

The models violate the proportional hazards assumption. However, after calculating the regressions with smaller age spans, thereby interacting with time to a larger extent, the assumption holds, and the results do not change substantially, rather the patterns of my findings become more clear. I therefore consider the presented models to represent the data accurately.

7 Discussion

In this study I analyse how partnership status is associated with mortality, and how the association varies across life course stages with the aim of capturing some of the heterogeneity of cohabiters. I use register data on the Swedish born population over age 30, living in Sweden in 2011, between the years 2012 to 2018. Married individuals enjoy the longest lives in all age groups. For the youngest age group, there is no significant difference between the married and cohabiters who have never been married. Cohabiters generally experience mortality risks at a level between the married and the non-married/not cohabiting. However, the relative mortality risk changes over the life course. The study is one of the first including cohabitation in a mortality study and the first using register data while analysing life course stages. Further, it contributes with the first estimates for the association between mortality and partnership status in the Swedish context. The results indicate that cohabiting is associated with longer life in all ages compared to not being in a relationship, regardless of whether it is pre- or post-marital cohabitation.

The most important result is that the association between cohabitation and mortality risk is different depending on when in the life course it occurs, with a mortality crossover across age groups for pre- and post-marital cohabitation. Premarital cohabiters have a mortality risk similar to the married in the youngest age group and a gradient of increasing risk for each older age group. Meanwhile, postmarital cohabiters have a gradient in the opposite direction with higher relative mortality risk in the younger ages and gradually lower risk for each older age group. One interpretation of this is as a result of selection mechanisms. Hu and Goldman (1990) found that the mortality risks were inversely related to the size of the marital group. In countries where a small minority remained single, their excess mortality was high indicating that smaller groups suggest negative selection. When applied to the present study's data, one can first read from Table 1 and Table 2 that the size of cohabiting groups changes across age groups. Never married cohabiters for example, constitute a large share of the population in the youngest age group and a very small share in the oldest age group. The gradient of increasing mortality risk for this group could thus be interpreted as it, with age, being a more and more select group. This interpretation is consistent with the observed gender differences. Premarital women and men are equal in relative group size in the youngest age group, while in the oldest age group women are half the relative size. This corresponds to the steeper gradient of increasing mortality risk for premarital women indicating that the small share of the female cohabiting population who never marries is a highly select group. Likewise, being a post marital cohabiter is more uncommon in the youngest age group, which correspond that age group exhibiting the highest relative mortality risk suggesting them to be a more select group.

This poses a question of who cohabits, and how the group changes at different age groups and cohorts. In Sweden, and most other developed countries, cohabitation before marriage is becoming the norm, however it is also still the norm that cohabiting couples eventually marry (Sobotka and Toulemon 2008; Ohlsson-Wijk, Turunen, and Andersson 2020). In Sweden it has been found that over 50% of the population has been in a marriage at age 37 and almost 70% at age 50 (Andersson, Thomson, and Duntava 2017). From the descriptive data on my study population, it can be read that only a minority deviate from the life course norm of cohabitation or marriage in younger ages and a transition into marriage or a post marital status in older ages. The non-significant difference between premarital cohabiters 30-44 and the married counterparts could be due to that the group consists largely of individuals who eventually will marry which would make them subjects to the same, or very similar, selection mechanisms and therefore in mortality terms be indistinguishable. It is also consistent with the idea that the "best-of-the-best" postpone marriage and stay longer in cohabitation (Franke and Kulu 2018). The higher mortality risk of never married cohabiters in older ages can be explained by how the group includes not only those in long lasting cohabiting relationships, but also serial cohabiters and those who have been single for most of their lives; Two groups who have been shown to experience high morality risks (Sassler and Lichter 2020). The pattern is also consistent with the idea that advantages accumulate over time for the married compared to the cohabiters. This could arise from marriage being a more stable, higher quality, form of relationship (Carr and Springer 2010) resulting in lower stress levels which over time has health effects. Another stress related advantage for the married is being part of the majority group which has been shown to be associated with lower stress levels (Lillard and Panis 1996). Further, accumulated advantages for the married could be due to differences in wealth as married couples are more likely to pool resources in investments (Franke and Kulu 2018). Lastly, Sweden, although being progressive in legal equality between marriage and cohabitation, there are some minor legal advantages that make marriage more favourable, such as inheritance rules (Ohlsson-Wijk, Turunen, and Andersson 2020).

As for the post marital cohabiters. In young ages they are a select group of those who at an early age got divorced or were widowed but then found a new partner to cohabit with. Also the non cohabiting divorced and widowed's relative mortality risks are highest in younger ages which indicates that all three groups are more selected groups who share characteristics associated with a higher mortality risk. In older ages however, postmarital cohabiters are not necessarily a group as highly selected. The group now includes those who have had long lasting marriages and who share perhaps more characteristics with the married population than the divorced/widowed, which could explain the less elevated relative mortality risk. The likelihood of partnership formation decreases with age (Rapp 2018) and it has been shown that choosing cohabitation is more common than remarriage in older age (Susan L. Brown, Lin, et al. 2019). Therefore, there might be some positive selection for some in this group who find a partner after their marriage has ended. For postmarital cohabiters, between the two youngest age groups, there is a substantial drop in relative mortality risk for men while not for women, which is not consistent with the association to relative group size mentioned above and I have found no explanation for this. However, just as in the study by Franke and Kulu (2018) the gendered pattern is found for the not cohabiting divorced groups suggesting that it is not specific to cohabiters.

Further, the observed associations could arise from cohort effects rather than life course effects. There are reasons to believe that selection into cohabitation differs between cohorts. First, the second demographic transition is said to follow partly from shifting individual values (Sobotka 2008) which could affect cohorts in different parts of their life course in different ways and further affect the view on cohabitation. Second, the legal differences between cohabitation and marriage occurred gradually during the last decades of the 20th century. All the above surely affects the distribution of cohabiters, not least the size of cohabiting groups in old ages. Since the time window of this study is only six years, I have no possibility to draw conclusions about age- vs. cohort effects.

The present study also confirms some results from previous literature on the association between marriage status and mortality. Like previous studies, I found the increased mortality risk from not being in a relationship to be greater for men than for women (Koskinen et al. 2007) and the difference between the married and the cohabiting to be larger for women (Drefahl 2012). These types of gender differences have been theorized to be due to unmarried men having an increased tendency for unhealthy behaviours which decrease in a marriage, further they tend to be more in need of social support. Meanwhile, women benefit more than men from the economic support (Staehelin et al. 2012). One interpretation is that the latter is not as present in cohabiting relationships as in marriages while the two former mechanisms are, resulting in men in cohabiting relationships enjoying the advantage of social control and support while women miss out on the economic advantages. Also, I found the mortality differences to decrease with age (Staehelin et al. 2012; Franke and Kulu 2018; Koskinen et al. 2007).

A major limitation when studying the effect of relationships is the lack of measurement of relationship quality. It is quite likely that the health effect can go both ways depending on quality of the relationship (Carr and Springer 2010; Wright 2020). Another limitation is the validity of the dwelling register. The values of the living arrangement variable are coded by method of assumptions. I have taken precautions in my method, by cross referencing three registers, still, the Swedish dwelling register has not been used by many other scholars and thus lack collected know-how from experience which mean I could be unaware of errors. Further there is no way of capturing same sex cohabiters since they are considered co-living friends rather than in a relationship. Also, the data misses any two people living together while registered in different dwellings as well as those in living-apart-together relationships. Further, individuals living in institutions could affect the data for the elderly population.

8 Conclusion

The present study explores the effect of cohabitation across the life course on mortality using Swedish register data. Previous literature has been primarily focused on marriage status and few studies include cohabitation. Those that do have found the mortality to differ within the cohabiting group and there are reasons to believe that it is due to differences across the life course. The contribution of the present study is addition of multiple measures of life course stages in a mortality study, with data on the full population in a forerunner country of cohabitation. The results indicate that cohabitation is associated with a longer life compared to not having a partner a shorter life compared to being married. The most notable result was the change in the association across the life course with increased mortality risks for groups not following the life course norm. The study provides support for both selection and social causation theories and stresses that cohabitation must be treated as a diverse partnership status in future research.

9 Acknowledgements

I am thankful for the help I have received from my two supervisors Sven Drefahl and Martin Kolk, who's great experience and knowledge have inspired me to strive for higher quality in my academic work. I am grateful for financial support from the Swedish Research Council for Health, Working life and Welfare (FORTE), grant number 2016-07115. I also want to thank my fiancé Josefin Löwing who have supported me in completing this at an intensive period in our family life with two-year-old twins Otis and Loui and awaiting our third boy Teddy.

References

Agree, Emily M. and Karen Glaser (2009). "Demography of Informal Caregiving". In: *International Handbook of Population Aging*. Ed. by Peter Uhlenberg. Dordrecht:

Springer Netherlands, pp. 647–668. ISBN: 978-1-4020-8355-6. DOI: 10.1007/978-1-4020-8356-3_29.

Andersson, Gunnar, Elizabeth Thomson, and Aija Duntava (Oct. 17, 2017). “Life-Table Representations of Family Dynamics in the 21st Century”. In: *Demographic Research* 37, pp. 1081–1230. ISSN: 1435-9871. DOI: 10.4054/DemRes.2017.37.35.

Billari, Francesco C. and Aart C. Liefbroer (June 2010). “Towards a New Pattern of Transition to Adulthood?” In: *Advances in Life Course Research* 15.2-3, pp. 59–75. ISSN: 10402608. DOI: 10.1016/j.alcr.2010.10.003.

Brown, Susan L and Matthew R Wright (Sept. 1, 2017). “Marriage, Cohabitation, and Divorce in Later Life”. In: *Innovation in Aging* 1.2. Ed. by J Jill Suitor, igx015. ISSN: 2399-5300. DOI: 10.1093/geroni/igx015.

Brown, Susan L., Jennifer Roebuck Bulanda, and Gary R. Lee (Aug. 2012). “Transitions Into and Out of Cohabitation in Later Life”. In: *Journal of Marriage and Family* 74.4, pp. 774–793. ISSN: 00222445. DOI: 10.1111/j.1741-3737.2012.00994.x.

Brown, Susan L., I-Fen Lin, et al. (Apr. 1, 2019). “Repartnering Following Gray Divorce: The Roles of Resources and Constraints for Women and Men”. In: *Demography* 56.2, pp. 503–523. ISSN: 0070-3370, 1533-7790. DOI: 10.1007/s13524-018-0752-x.

Carr, Deborah (Oct. 4, 2019). “Aging Alone? International Perspectives on Social Integration and Isolation”. In: *The Journals of Gerontology: Series B* 74.8, pp. 1391–1393. ISSN: 1079-5014, 1758-5368. DOI: 10.1093/geronb/gbz095.

Carr, Deborah and Kristen W. Springer (June 18, 2010). “Advances in Families and Health Research in the 21st Century”. In: *Journal of Marriage and Family* 72.3, pp. 743–761. ISSN: 00222445, 17413737. DOI: 10.1111/j.1741-3737.2010.00728.x.

Carr, Deborah and Rebecca L. Utz (Feb. 2020). “Families in Later Life: A Decade in Review”. In: *Journal of Marriage and Family* 82.1, pp. 346–363. ISSN: 0022-2445, 1741-3737. DOI: 10.1111/jomf.12609.

Chambers, Deborah (2012). *A Sociology of Family Life: Change and Diversity in Intimate Relations*. Cambridge ; Malden, MA: Polity Press. 240 pp. ISBN: 978-0-7456-4779-1.

Cox, D. R. (Jan. 1972). “Regression Models and Life-Tables”. In: *Journal of the Royal Statistical Society: Series B (Methodological)* 34.2, pp. 187–202. ISSN: 00359246. DOI: 10.1111/j.2517-6161.1972.tb00899.x.

Drefahl, Sven (2012). “Do the Married Really Live Longer? The Role of Cohabitation and Socioeconomic Status”. In: *Journal of Marriage and Family* 74.3, pp. 462–475. DOI: 10.1111/j.1741-3737.2012.00968.x.

Dupre, M. E., A. N. Beck, and S. O. Meadows (Sept. 1, 2009). “Marital Trajectories and Mortality Among US Adults”. In: *American Journal of Epidemiology* 170.5, pp. 546–555. ISSN: 0002-9262, 1476-6256. DOI: 10.1093/aje/kwp194.

Durkheim, Emile (1951). *Suicide: A Study in Sociology*. New York: Free Press.

Franke, Sebastian and Hill Kulu (Feb. 2018). “Mortality Differences by Partnership Status in England and Wales: The Effect of Living Arrangements or Health Selection?” In: *European Journal of Population* 34.1, pp. 87–118. ISSN: 0168-6577, 1572-9885. DOI: 10.1007/s10680-017-9423-7.

Hu, Yuanreng and Noreen Goldman (1990). “Mortality Differentials by Marital Status: An International Comparison”. In: *Demography* 27.2, pp. 233–250.

Jónsson, Ari Klængur (Mar. 2021). “A Nation of Bastards? Registered Cohabitation, Childbearing, and First-Marriage Formation in Iceland, 1994–2013”. In: *European Journal of Population* 37.1, pp. 65–95. ISSN: 0168-6577, 1572-9885. DOI: 10.1007/s10680-020-09560-2.

Koskinen, S. et al. (Dec. 1, 2007). “Mortality Differences According to Living Arrangements”. In: *International Journal of Epidemiology* 36.6, pp. 1255–1264. ISSN: 0300-5771, 1464-3685. DOI: 10.1093/ije/dym212.

Lesthaeghe, Ron (1995). “The Second Demographic Transition in Western Countries: An Interpretation”. In: *Gender and Family Change in Industrialized Countries*. Ed. by Karen Oppenheim Mason and Ann-Magritt Jensen. Oxford: Oxford University Press, pp. 17–62.

Lillard, Lee A. and Constantijn W. A. Panis (Aug. 1996). “Marital Status and Mortality: The Role of Health”. In: *Demography* 33.3, p. 313. ISSN: 00703370. DOI: 10.2307/2061764.

Lund, Rikke et al. (Aug. 2002). “Cohabitation and Marital Status as Predictors of Mortality—an Eight Year Follow-up Study”. In: *Social Science & Medicine* 55.4, pp. 673–679. ISSN: 02779536. DOI: 10.1016/S0277-9536(01)00219-2.

Manzoli, Lamberto et al. (Jan. 2007). “Marital Status and Mortality in the Elderly: A Systematic Review and Meta-Analysis”. In: *Social Science & Medicine* 64.1, pp. 77–94. ISSN: 02779536. DOI: 10.1016/j.socscimed.2006.08.031.

Murphy, Michael, Emily Grundy, and Stamatis Kalogirou (Nov. 2007). “The Increase in Marital Status Differences in Mortality up to the Oldest Age in Seven European Countries, 1990–99”. In: *Population Studies* 61.3, pp. 287–298. ISSN: 0032-4728, 1477-4747. DOI: 10.1080/00324720701524466.

Ohlsson-Wijk, Sofi, Jani Turunen, and Gunnar Andersson (2020). “Family Forerunners? An Overview of Family Demographic Change in Sweden”. In: *International Handbook on the Demography of Marriage and the Family*. Ed. by D. Nicole Farris and A. J. J. Bourque. Vol. 7. International Handbooks of Population. Cham: Springer International Publishing, pp. 65–77. ISBN: 978-3-030-35077-2. DOI: 10.1007/978-3-030-35079-6_5.

Oláh, Livia Sz. and Eva Bernhardt (July 1, 2008). “Sweden: Combining Childbearing and Gender Equality”. In: *Demographic Research* 19, pp. 1105–1144. ISSN: 1435-9871. DOI: 10.4054/DemRes.2008.19.28.

Rapp, Ingmar (Sept. 2018). “Partnership Formation in Young and Older Age”. In: *Journal of Family Issues* 39.13, pp. 3363–3390. ISSN: 0192-513X, 1552-5481. DOI: 10.1177/0192513X18783469.

Rendall, Michael S. et al. (May 2011). “The Protective Effect of Marriage for Survival: A Review and Update”. In: *Demography* 48.2, pp. 481–506. ISSN: 0070-3370, 1533-7790. DOI: 10.1007/s13524-011-0032-5.

Roelfs, David J. et al. (Aug. 15, 2011). “The Rising Relative Risk of Mortality for Singles: Meta-Analysis and Meta-Regression”. In: *American Journal of Epidemiology* 174.4, pp. 379–389. ISSN: 1476-6256, 0002-9262. DOI: 10.1093/aje/kwr111.

Sassler, Sharon and Daniel T. Lichter (Feb. 2020). “Cohabitation and Marriage: Complexity and Diversity in Union-Formation Patterns”. In: *Journal of Marriage and Family* 82.1, pp. 35–61. ISSN: 0022-2445, 1741-3737. DOI: 10.1111/jomf.12617.

Scafato, Emanuele et al. (Nov. 2008). “Marital and Cohabitation Status as Predictors of Mortality: A 10-Year Follow-up of an Italian Elderly Cohort”. In: *Social Science & Medicine* 67.9, pp. 1456–1464. ISSN: 02779536. DOI: 10.1016/j.socscimed.2008.06.026.

Sobotka, Tomáš (July 1, 2008). “Overview Chapter 6: The Diverse Faces of the Second Demographic Transition in Europe”. In: *Demographic Research* 19, pp. 171–224. ISSN: 1435-9871. DOI: 10.4054/DemRes.2008.19.8.

Sobotka, Tomáš and Laurent Toulemon (July 1, 2008). “Overview Chapter 4: Changing Family and Partnership Behaviour: Common Trends and Persistent Diversity across Europe”. In: *Demographic Research* 19, pp. 85–138. ISSN: 1435-9871. DOI: 10.4054/DemRes.2008.19.6.

Staehelin, Katharina et al. (July 2012). “Marital Status, Living Arrangement and Mortality: Does the Association Vary by Gender?” In: *Journal of Epidemiology and Community Health* 66.7, e22–e22. ISSN: 0143-005X, 1470-2738. DOI: 10.1136/jech.2010.128397.

Statistics Sweden (2016). *Integrated Database for Labour Market Research*. Background Facts 2016:1. URL: https://www.scb.se/contentassets/f0bc88c852364b6ea5c1654a0cc90234/dokumentation-av-lisa.pdf (visited on 05/28/2021).

Thomson, Elizabeth (July 2014). “Family Complexity in Europe”. In: *The ANNALS of the American Academy of Political and Social Science* 654.1, pp. 245–258. ISSN: 0002-7162, 1552-3349. DOI: 10.1177/0002716214531384.

Thomson, Elizabeth, Maria Winkler-Dworak, and Éva Beaujouan (Dec. 1, 2019). “Contribution of the Rise in Cohabiting Parenthood to Family Instability: Cohort Change in Italy, Great Britain, and Scandinavia”. In: *Demography* 56.6, pp. 2063–2082. ISSN: 0070-3370, 1533-7790. DOI: 10.1007/s13524-019-00823-0.

Vespa, Jonathan (Aug. 2012). “Union Formation in Later Life: Economic Determinants of Cohabitation and Remarriage Among Older Adults”. In: *Demography* 49.3, pp. 1103–1125. ISSN: 0070-3370, 1533-7790. DOI: 10.1007/s13524-012-0102-3.

World Values Survey (2020). *The Inglehart-Welzel World Cultural Map - World Values Survey 7 [Provisional Version]*. URL: http://www.worldvaluessurvey.org/.

Wright, Matthew R (Sept. 14, 2020). “Relationship Quality Among Older Cohabitors: A Comparison to Remarrieds”. In: *The Journals of Gerontology: Series B* 75.8. Ed. by Deborah Carr, pp. 1808–1817. ISSN: 1079-5014, 1758-5368. DOI: 10.1093/geronb/gbz069.

Wyke, Sally and Graeme Ford (Mar. 1992). “Competing Explanations for Associations between Marital Status and Health”. In: *Social Science & Medicine* 34.5, pp. 523–532. ISSN: 02779536. DOI: 10.1016/0277-9536(92)90208-8.

Stockholm Research Reports in Demography
Stockholm University,
106 91 Stockholm,
Sweden
www.su.se | info@su.se | ISSN 2002-617X

Stockholm University
Demography Unit

A Appendix

A.1 Regressions with stepwise inclusion of control variables

Figure 3: Men aged 30-49

Stepwise regressions - Men							**Aged 30-49**					
	HR[1]	**95% CI[1]**	**p-value**	**HR[1]**	**95% CI[1]**	**p-value**	**HR[1]**	**95% CI[1]**	**p-value**	**HR[1]**	**95% CI[1]**	**p-value**
as.factor(partnerstatus)												
1. married	—	—		—	—		—	—		—	—	
2. never married	4.77	4.48, 5.07	<0.001	4.48	4.18, 4.81	<0.001	3.90	3.67, 4.15	<0.001	3.39	3.15, 3.65	<0.001
3. divorced	3.69	3.36, 4.06	<0.001	3.69	3.36, 4.05	<0.001	3.22	2.93, 3.53	<0.001	3.19	2.90, 3.50	<0.001
4. widowed	2.72	1.50, 4.92	<0.001	2.69	1.49, 4.87	0.001	2.46	1.36, 4.45	0.003	2.39	1.32, 4.32	0.004
5. pre-mar cohab	1.15	1.06, 1.25	0.001	1.13	1.04, 1.23	0.005	1.09	1.00, 1.19	0.050	1.05	0.96, 1.14	0.3
6. post-mar cohab	1.71	1.45, 2.02	<0.001	1.71	1.45, 2.02	<0.001	1.59	1.35, 1.88	<0.001	1.59	1.35, 1.88	<0.001
Other	1.65	1.26, 2.16	<0.001	1.62	1.24, 2.12	<0.001	1.43	1.09, 1.88	0.009	1.37	1.04, 1.79	0.023
childless												
Not childless				—	—					—	—	
Childless				1.12	1.05, 1.19	<0.001				1.28	1.20, 1.36	<0.001
Missing												
education												
3							—	—		—	—	
1							2.49	2.03, 3.07	<0.001	2.47	2.00, 3.03	<0.001
2							1.73	1.63, 1.84	<0.001	1.73	1.63, 1.83	<0.001
4							0.73	0.66, 0.81	<0.001	0.72	0.65, 0.80	<0.001
5							0.55	0.51, 0.59	<0.001	0.54	0.50, 0.58	<0.001
6							0.67	0.50, 0.91	0.010	0.66	0.49, 0.90	0.008
999							2.01	1.68, 2.42	<0.001	1.91	1.59, 2.29	<0.001
income_quantile												
26-50							—	—		—	—	
0-25							1.30	1.22, 1.39	<0.001	1.30	1.22, 1.38	<0.001
51-75							0.58	0.54, 0.62	<0.001	0.58	0.54, 0.62	<0.001
76-100							0.47	0.43, 0.50	<0.001	0.46	0.42, 0.49	<0.001
Missing												

[1] HR = Hazard Ratio, CI = Confidence Interval

Figure 4: Men aged 50-64

Stepwise regressions - Men						Aged 50-64						
	HR[1]	95% CI[1]	p-value	HR[1]	95% CI[1]	p-value	HR[1]	95% CI[1]	p-value	HR[1]	95% CI[1]	p-value
1. married												
2. never married	—	—		—	—		—	—		—	—	
3. divorced	3.58	3.46, 3.69	<0.001	3.04	2.93, 3.16	<0.001	2.64	2.56, 2.73	<0.001	2.36	2.27, 2.45	<0.001
4. widowed	2.87	2.77, 2.98	<0.001	2.87	2.76, 2.98	<0.001	2.46	2.37, 2.56	<0.001	2.47	2.38, 2.56	<0.001
5. pre-mar cohab	1.98	1.76, 2.23	<0.001	1.93	1.71, 2.17	<0.001	1.82	1.61, 2.05	<0.001	1.78	1.58, 2.01	<0.001
6. post-mar cohab	1.26	1.19, 1.33	<0.001	1.19	1.13, 1.26	<0.001	1.13	1.07, 1.19	<0.001	1.09	1.03, 1.15	0.002
Other	1.22	1.14, 1.31	<0.001	1.23	1.15, 1.32	<0.001	1.17	1.09, 1.25	<0.001	1.17	1.10, 1.26	<0.001
childless	2.09	1.82, 2.41	<0.001	2.02	1.75, 2.32	<0.001	1.73	1.50, 2.00	<0.001	1.69	1.47, 1.95	<0.001
Not childless												
Childless				—	—					—	—	
Missing				1.32	1.27, 1.36	<0.001				1.23	1.19, 1.27	<0.001
education												
3												
1							—	—		—	—	
2							1.16	1.10, 1.23	<0.001	1.15	1.09, 1.22	<0.001
4							1.21	1.17, 1.25	<0.001	1.21	1.17, 1.25	<0.001
5							0.78	0.74, 0.83	<0.001	0.78	0.73, 0.82	<0.001
6							0.69	0.66, 0.72	<0.001	0.69	0.66, 0.72	<0.001
999							0.54	0.46, 0.64	<0.001	0.54	0.45, 0.64	<0.001
income_quantile							2.16	1.91, 2.45	<0.001	2.06	1.82, 2.33	<0.001
26-50												
0-25							—	—		—	—	
51-75							1.11	1.07, 1.16	<0.001	1.11	1.06, 1.15	<0.001
76-100							0.58	0.56, 0.61	<0.001	0.59	0.57, 0.61	<0.001
Missing							0.46	0.44, 0.47	<0.001	0.46	0.44, 0.48	<0.001

[1]HR = Hazard Ratio, CI = Confidence Interval

Figure 5: Men aged 65+

Stepwise regressions - Men						Aged 65+						
	HR[1]	95% CI[1]	p-value	HR[1]	95% CI[1]	p-value	HR[1]	95% CI[1]	p-value	HR[1]	95% CI[1]	p-value
1. married												
2. never married	—	—		—	—		—	—		—	—	
3. divorced	1.84	1.82, 1.87	<0.001	1.74	1.71, 1.77	<0.001	1.65	1.63, 1.68	<0.001	1.58	1.55, 1.61	<0.001
4. widowed	1.67	1.65, 1.69	<0.001	1.67	1.64, 1.69	<0.001	1.58	1.55, 1.60	<0.001	1.58	1.55, 1.60	<0.001
5. pre-mar cohab	1.21	1.20, 1.23	<0.001	1.21	1.20, 1.23	<0.001	1.18	1.16, 1.19	<0.001	1.17	1.16, 1.19	<0.001
6. post-mar cohab	1.23	1.19, 1.28	<0.001	1.19	1.15, 1.23	<0.001	1.14	1.10, 1.18	<0.001	1.11	1.07, 1.15	<0.001
Other	1.10	1.08, 1.13	<0.001	1.10	1.08, 1.12	<0.001	1.06	1.04, 1.09	<0.001	1.06	1.04, 1.09	<0.001
childless	1.63	1.60, 1.67	<0.001	1.64	1.60, 1.67	<0.001	1.59	1.56, 1.63	<0.001	1.59	1.56, 1.63	<0.001
Not childless												
Childless				—	—					—	—	
Missing				1.08	1.06, 1.09	<0.001				1.06	1.05, 1.08	<0.001
education												
3												
1							—	—		—	—	
2							1.07	1.06, 1.09	<0.001	1.07	1.06, 1.09	<0.001
4							1.08	1.06, 1.11	<0.001	1.08	1.06, 1.11	<0.001
5							0.90	0.87, 0.93	<0.001	0.90	0.87, 0.93	<0.001
6							0.89	0.87, 0.90	<0.001	0.89	0.87, 0.90	<0.001
999							0.80	0.76, 0.83	<0.001	0.79	0.76, 0.83	<0.001
income_quantile							1.15	1.10, 1.21	<0.001	1.15	1.10, 1.21	<0.001
26-50												
0-25							—	—		—	—	
51-75							0.99	0.97, 1.00	0.047	0.98	0.97, 1.00	0.023
76-100							0.87	0.86, 0.88	<0.001	0.87	0.86, 0.88	<0.001
Missing							0.70	0.69, 0.71	<0.001	0.70	0.69, 0.71	<0.001

[1]HR = Hazard Ratio, CI = Confidence Interval

Figure 6: Women aged 30-49

Stepwise regressions - Women							**Aged 30-49**					
Characteristic	**HR**[1]	**95% CI**[1]	**p-value**	**HR**[1]	**95% CI**[1]	**p-value**	**HR**[1]	**95% CI**[1]	**p-value**	**HR**[1]	**95% CI**[1]	**p-value**
as.factor(partnerstatus)												
1. married	—	—		—	—		—	—		—	—	
2. never married	3.18	2.94, 3.43	<0.001	2.45	2.25, 2.67	<0.001	2.77	2.56, 2.99	<0.001	2.01	1.85, 2.19	<0.001
3. divorced	2.34	2.11, 2.61	<0.001	2.32	2.09, 2.58	<0.001	2.10	1.88, 2.33	<0.001	2.07	1.87, 2.31	<0.001
4. widowed	3.36	2.30, 4.92	<0.001	3.24	2.21, 4.74	<0.001	3.16	2.16, 4.63	<0.001	3.02	2.07, 4.43	<0.001
5. pre-mar cohab	1.12	1.01, 1.23	0.027	1.03	0.94, 1.14	0.5	1.07	0.97, 1.18	0.2	0.99	0.89, 1.09	0.8
6. post-mar cohab	1.51	1.28, 1.80	<0.001	1.51	1.27, 1.79	<0.001	1.39	1.17, 1.64	<0.001	1.40	1.18, 1.65	<0.001
Other	2.13	1.64, 2.76	<0.001	1.97	1.52, 2.57	<0.001	1.91	1.47, 2.48	<0.001	1.73	1.33, 2.25	<0.001
childless												
Not childless				—	—					—	—	
Childless				1.81	1.67, 1.95	<0.001				2.20	2.03, 2.39	<0.001
Missing												
education												
3							—	—		—	—	
1							3.25	2.27, 4.64	<0.001	2.85	1.99, 4.08	<0.001
2							2.17	1.98, 2.36	<0.001	2.08	1.91, 2.28	<0.001
4							0.83	0.72, 0.95	0.008	0.78	0.68, 0.90	<0.001
5							0.65	0.60, 0.70	<0.001	0.63	0.58, 0.68	<0.001
6							0.55	0.34, 0.87	0.011	0.53	0.34, 0.85	0.008
999							4.63	3.72, 5.76	<0.001	3.36	2.69, 4.19	<0.001
income_quantile												
26-50							—	—		—	—	
0-25							1.08	1.00, 1.16	0.054	1.12	1.04, 1.21	0.003
51-75							0.72	0.66, 0.79	<0.001	0.65	0.60, 0.72	<0.001
76-100							0.62	0.56, 0.70	<0.001	0.52	0.47, 0.58	<0.001
Missing												

[1]HR = Hazard Ratio, CI = Confidence Interval

Figure 7: Women aged 50-64

Stepwise regressions - Women							**Aged 50-64**					
	HR[1]	**95% CI**[1]	**p-value**	**HR**[1]	**95% CI**[1]	**p-value**	**HR**[1]	**95% CI**[1]	**p-value**	**HR**[1]	**95% CI**[1]	**p-value**
1. married												
2. never married	—	—		—	—		—	—		—	—	
3. divorced	2.54	2.43, 2.65	<0.001	2.09	1.99, 2.19	<0.001	2.49	2.38, 2.59	<0.001	2.04	1.95, 2.14	<0.001
4. widowed	1.88	1.80, 1.96	<0.001	1.88	1.80, 1.96	<0.001	2.00	1.91, 2.09	<0.001	1.99	1.90, 2.08	<0.001
5. pre-mar cohab	1.67	1.53, 1.82	<0.001	1.64	1.50, 1.79	<0.001	1.78	1.63, 1.95	<0.001	1.74	1.60, 1.91	<0.001
6. post-mar cohab	1.31	1.23, 1.40	<0.001	1.22	1.14, 1.30	<0.001	1.26	1.18, 1.34	<0.001	1.18	1.11, 1.25	<0.001
Other	1.29	1.20, 1.38	<0.001	1.29	1.20, 1.39	<0.001	1.37	1.28, 1.47	<0.001	1.37	1.28, 1.47	<0.001
childless	1.59	1.32, 1.91	<0.001	1.53	1.27, 1.84	<0.001	1.45	1.20, 1.75	<0.001	1.40	1.16, 1.68	<0.001
Not childless												
Childless				—	—					—	—	
Missing				1.59	1.52, 1.65	<0.001				1.61	1.55, 1.68	<0.001
education												
3												
1							—	—		—	—	
2							1.34	1.24, 1.46	<0.001	1.32	1.22, 1.43	<0.001
4							1.46	1.40, 1.52	<0.001	1.45	1.38, 1.51	<0.001
5							0.80	0.73, 0.88	<0.001	0.78	0.71, 0.85	<0.001
6							0.70	0.67, 0.73	<0.001	0.68	0.66, 0.71	<0.001
999							0.49	0.37, 0.66	<0.001	0.47	0.35, 0.63	<0.001
income_quantile							3.41	2.89, 4.02	<0.001	2.74	2.32, 3.23	<0.001
26-50												
0-25							—	—		—	—	
51-75							1.16	1.12, 1.21	<0.001	1.14	1.09, 1.19	<0.001
76-100							0.61	0.58, 0.63	<0.001	0.61	0.58, 0.63	<0.001
Missing							0.52	0.50, 0.55	<0.001	0.52	0.49, 0.54	<0.001

[1]HR = Hazard Ratio, CI = Confidence Interval

Figure 8: Women aged 65+

Stepwise regressions - Women						**Aged 65+**						
	HR[1]	**95% CI[1]**	**p-value**	**HR[1]**	**95% CI[1]**	**p-value**	**HR[1]**	**95% CI[1]**	**p-value**	**HR[1]**	**95% CI[1]**	**p-value**
1. married												
2. never married	—	—		—	—		—	—		—	—	
3. divorced	1.55	1.52, 1.58	<0.001	1.47	1.44, 1.50	<0.001	1.57	1.54, 1.60	<0.001	1.46	1.43, 1.49	<0.001
4. widowed	1.45	1.42, 1.47	<0.001	1.45	1.42, 1.47	<0.001	1.43	1.40, 1.45	<0.001	1.43	1.40, 1.45	<0.001
5. pre-mar cohab	1.23	1.22, 1.25	<0.001	1.24	1.22, 1.25	<0.001	1.20	1.19, 1.22	<0.001	1.20	1.19, 1.22	<0.001
6. post-mar cohab	1.39	1.32, 1.46	<0.001	1.34	1.27, 1.41	<0.001	1.35	1.28, 1.42	<0.001	1.29	1.23, 1.36	<0.001
Other	1.17	1.14, 1.21	<0.001	1.17	1.14, 1.20	<0.001	1.14	1.11, 1.18	<0.001	1.14	1.11, 1.18	<0.001
childless	1.61	1.57, 1.66	<0.001	1.61	1.57, 1.66	<0.001	1.59	1.55, 1.63	<0.001	1.59	1.55, 1.64	<0.001
Not childless												
Childless				—	—					—	—	
Missing				1.09	1.08, 1.10	<0.001				1.12	1.10, 1.13	<0.001
education												
3												
1							—	—		—	—	
2							1.15	1.14, 1.16	<0.001	1.15	1.14, 1.17	<0.001
4							1.05	1.04, 1.07	<0.001	1.05	1.04, 1.07	<0.001
5							0.87	0.82, 0.91	<0.001	0.86	0.82, 0.91	<0.001
6							0.80	0.79, 0.81	<0.001	0.80	0.79, 0.81	<0.001
999							0.72	0.65, 0.79	<0.001	0.71	0.65, 0.79	<0.001
income_quantile							1.11	1.06, 1.15	<0.001	1.10	1.06, 1.14	<0.001
26-50												
0-25							—	—		—	—	
51-75							0.97	0.96, 0.98	<0.001	0.96	0.96, 0.97	<0.001
76-100							0.88	0.87, 0.89	<0.001	0.88	0.87, 0.89	<0.001
Missing							0.83	0.82, 0.85	<0.001	0.83	0.81, 0.84	<0.001

[1]HR = Hazard Ratio, CI = Confidence Interval

A.2 Documentation of matching method

Figure 9: Documentation matching method

DOCUMENTATION – PARTNER MATCHING

STOCKHOLM UNIVERSITY DEMOGRAPHY DEPARTMENT. RESEARCH PROJECT: AGEING WELL – WP5.
RESEARCHERS: EMMA PETTERSON, JESPER LINDMARKER

ABSTRACT

We attempt to match as many as possible of the Swedish population who are in a relationship to their respective partner. We do so by combining three registers with information on civil status, civil status changes, household type and apartment number

SQL DATABASES

RTB2017: [LopNr], [civil]

Hushall2017: [LopNr], [HushallsStallning], [Hushallstyp], [LopNrLGH]

Civil_Koppling_1968_2017: [LopNr], [SenPnr], [LopNrSamh], [Civil], [Datum]

Totalpopulation: [LopNr], [SenPnr], [Kon]

MATCHING PROCESS

Starting population, N = 10 120 242

MATCH 1

Matched individuals, N = 2 313 616

In a first step we clean the connections that exist in Civil_Koppling_1968_2017(CK). We keep only connections where each person in the relation's latest change in civil status is marriage to the other person. There are cases when one part has marriage as the latest change while the other has divorce.

MATCH 2

Matched individuals, N = 882 720

We take the part of our population who were not matched through CK and match individuals who has the same civil status in RTB2017 and apartment number in Hushall2017. A condition for this match is that there are only two people with the same civil in the same apartment. For the cases where this does not apply, we cannot be sure who are married to whom.

MATCH 3

Matched individuals, N = 1 481 518

For the sub-population that were not matched in match 1 or 2 we match individuals who have the same Hushållsställning and apartment number in Hushall2017. The same conditions as in match 2 applies: Only two people with the same hushållsställning in the same apartment for a match to be made.

MATCHING RESULT

Total matched individuals, N = 4 677 854

We end up with a table with information on all variables for the ego and an eventual partner for the population present in RTP2017.

CATEGORIZATION

By looking at combinations of variable values for each partner we sort them into categories that represent a spectrum of certainty of their partnership status(See flowchart). There are three categories of partnership status: No partner, partner and unknown partner. The latter are cases when civil status or hushållsställning indicate partnership but we were unable to find a match(N = 171 187). Sub-categories are type of partnership(G, RP, Sambo) and same-sex/diff-sex partnership.

Figure 10: Flowchart - Matching method