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Mortality of cohabitants with common children
versus married with children:
a study based on Norwegian register-data 1990-2002

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Abstract

The association between marital status and mortality has been analyzed in many studies. However, marital status is now a less suitable indicator of social relations than a few decades ago, in particular in the Nordic countries. This paper uses event history techniques and unique Norwegian register data to estimate effects of never-married cohabitation on all-cause mortality in the years 1990-2002 controlling for age, sex, parenthood and education. The Nordic countries are probably among the few in the world to have register data on cohabitants. The current paper is the first attempt to use these data to analyze mortality of cohabitants. The longitudinal and individual-level data covers the whole population, while most other studies with similar data have analyzed very small sample sizes. Preliminary findings show that male but not female cohabitants with at least one common child have lower mortality than the married with at least one child. This result should be interpreted with caution as there still are several aspects that are not equal between the two groups and that are not taken into account in the present analysis. So far we cannot conclude whether cohabitation confers more or less protection than marriage.

1. Introduction[1]

Marital status is now a less suitable indicator of actual living arrangement than a few decades ago. In many industrialized countries, a large proportion of those who are not married live together in cohabitation, and often with children or step-children. Besides, a substantial proportion of the adults without a partner have children, especially as a result of rising disruption rates. Many of these family changes have been more pronounced in Norway and other Nordic countries than elsewhere in Europe. The drift away from the "traditional" family consisting of a married couple with common children may have important implications for the health and well-being of the adults and children directly involved (and also consequences for society at large). For example, one might speculate whether cohabitation confers less protection than marriage. Because of these changes, Rikke *et al.* (2002) have suggested that future studies of social relations and mortality, cohabitation status should replace marital status as this variable may explain more of the variation in mortality. A large majority of those classified as never married in other studies, for example, have probably lived in a consensual union or have experienced several break ups with partners whom they have lived with but never been formally married. As a consequence the marriage premium on mortality may appear stronger in studies that take into account the increasing popularity of consensual unions, at least in the Nordic countries, than those who disregard these social realities. The association between marital status and mortality is well established (for two reviews, see Livi-Bacci 1985 and Hu and Goldman 1990). Generally, the greatest differences are found between the married and the never-married, but the mortality of the married is also markedly lower than that of the previously married. A particularly high mortality is seen for divorced men compared with married men (Prinz 1995; Kravdal 2001). In fact, the bulk of the evidence suggests more generally that marriage seems to be more beneficial to men's health and survival than to women (Gove 1973).

Few empirical studies have analyzed the mortality of cohabitants. In studies based on Swedish data from 1985 and 1990, it was reported that all-cause age-specific mortality risks for cohabitants were higher than those for married persons, but that the differences diminish rapidly for higher ages (Prinz 1995; Prinz *et al.* 1995). Hemström (1996) has analyzed the mortality among Swedish cohabitants 1981-1986, but only those who had previously been married. Mortality for male cohabitants was slightly higher compared to those married to the same spouse as in 1970, but lower compared to the remarried, separated, divorced or widowed. Female cohabitants also had higher mortality than those who remained married, but somewhat surprisingly also higher mortality than the separated and widowed (but not the divorced). Cohabitation is more common than remarriage after divorce in Sweden, in particular for women. However, remarriage and recohabitation seems to be a better coping strategy for men than for women. Although cohabitation was fairly widespread in Sweden in the early 1980s, another possible explanation might be that the social stigma attached to being divorced and in a consensual union was larger for women than for men.

The objective of this study is to go beyond the current marital status. Rather than omitting marital status, this paper considers different categories across marital, cohabitation and parental statuses. Effects on mortality 1990-2002 of consensual unions, marital status and parenthood are estimated in an event history analysis based on Norwegian register data. Only all-cause mortality and status a few years before death is hitherto considered, but in a future version of this paper a few different causes of death as well as previous marital status history will be included in the analysis. It is highly likely that the effects of such factors, just as that of the current living arrangement, will be cause-specific. In addition to being an interesting country because of the family changes, along with the other Nordic countries, Norway has unique longitudinal and individual-level register which covers the whole population including the cohabitants. Most of the previous research is on cohabitants from countries which do not have register data that must rely instead on surveys with much smaller sample sizes. As a consequence, very few studies have investigated effects of union status on the mortality of young age-groups and even fewer have investigated effects of union status on cause-specific mortality

(because of too few deaths). The advantage of a large sample size is that it increases the likelihood that the relevant covariates have statistically significant effects on mortality.

2. Hypotheses

Q1. How is all-cause and sex-specific mortality risks among cohabitants with common children compared to those of the married? Main focus of the analysis is on never married cohabitants, but also previously married cohabitants are considered. There are many possible reasons why people prefer to cohabit rather than marry. One is that they have doubts about the quality of the relationship compared to what they think they might be able to achieve with another partner, and therefore want an easier way out (Kravdal 1997). They may also have more individualistic attitudes. For example, women who value their career highly and men who value their leisure time highly are also much more likely to cohabit than marry (Clarkberg *et al.,* 1995). Without commitment and the long-term view that goes with it, cohabitees tend not to risk specializing their roles as married couples do. The splitting or duplicating of all roles are not only inefficient but also reduces the mutual responsibility. Cohabitants also tend to be non-traditional, have less religious values and attitudes and are more likely to be liberal. If consensual unions really are characterized by relatively low quality, for example with respect to communication, companionship and a feeling of mutual responsibility for each other, it would not be surprising to see also a higher mortality associated with this living arrangement. It is neither surprising that cohabitants have 2-3 times higher break-up risks compared to the married (Jensen and Clausen 1997a). In other words, cohabitation may confer less protection than marriage. Besides, the selection into cohabitation may be different than that into marriage with respect to socio-economic characteristics. Cohabitants may, for example, have lower education and less economic resources (Kravdal 1999). Differences in both education and income are particularly evident in Norway for cohabiting fathers versus married fathers (Jensen and Clausen 1999). Such factors may well have a bearing on mortality. In a study of self reported health among cohabitants and currently married in Canada 1994-95, no differences were found between the two groups after controlling for socioeconomic factors and self-selection into cohabitation and marriage (Wu, Penning, Pollard, and Hart 2003). It was concluded that protection effects are the most

likely to explain the positive health advantage of married/cohabitants compared to the divorced/separated, widowed and the never married. The differences in mortality between cohabitants and married in Sweden (Prinz 1995; Prinz *et al.* 1995) may partly be explained by the fact that these studies apparently did not control for socioeconomic factors or self-selection into marriage and cohabitation or other confounders, parenthood being one of the most important. A control for parenthood is necessary because studies have shown that having children (not necessarily living with children under 18 years) have a negative effect on mortality (Kobrin and Hendershot 1977; Lillard 1995; Rogers 1996; Hemström 1996). Actually, having children may explain some of the mortality premium of the married. Based on previous studies, it is expected in this study that the married with children benefits from a stronger protective effect of the union than the never married cohabitants with children, and thus experience lower mortality, but that the never married cohabitants have lower mortality than the previously married cohabitants, widows/widowers and the separated/divorced and the never married, even after controlling for parenthood.

Q2. Have the differences in all-cause mortality changed over time?

The selection differentials may have changed considerably over time, as consensual unions have become more common and the number of older cohabitants is increasing. In other words, the cohabiting population has become more heterogeneous. One would expect small differences in mortality between those who chose to marry and the pioneers who chose to cohabit in the 1970s, i.e. cohorts born ca. 1940-1960 (aged 40-60 in year 2000), who were ideologically selective opponents of marriage, not so uncertain of their relationship and who have had low break-up rates, but that the mortality differences would increase when cohabitation became increasingly common, i.e. from the mid 1980s and onwards for cohorts born after 1960 (those 40 years and younger in year 2000). These cohabitants are assumed, at least initially, to be more uncertain about the quality of their relationship and thus also less committed. Those who have married in the past ten to fifteen years may also be more selective and stable than before (maybe with respect to religion and life style behavior) since they have an alternative to marriage – adding to the mortality differences. These ideas are in accordance with the findings of Prinz (1995) and

Prinz *et al.* (1995), who found that the excess mortality of female cohabitants, as compared to married women in Sweden, increased between 1980 and 1990. The trend was less clear for men.

3. Data and methods

Dependent variable

The dependent variable is whether or not a death, disregarding cause, occurred during the years 1990-2002. The data is from the Norwegian cause of death registry, which is made up of individual death certificates. A national 11-digit personal identification number, used both in the cause of death register and the Norwegian Central Population Register, makes it possible to link the two data sources. Since cohabitation is (still) most frequent among the younger (never married) age groups, where one should expect few deaths, the number of annual deaths of cohabitants is not very large. Furthermore, this study only considers cohabitants with common children (see below). The total number of deaths of cohabitants available for the analysis over the years 1990-2002 is 1414 (990 for males and 424 for females, see tables 2 and 3). However, this figure is much larger than some panel or cohort studies which often do analysis with only a few hundred deaths (see for example Rikke *et al.* 2002).

Independent variables

The individual-level information used to construct the independent variables (see table 1) in this study is from the Norwegian Central Population Register for the period 1990-2002. The data are arranged by Statistics Norway such that several individual life courses are constructed for all persons who have lived in Norway since 1. January 1990. These life courses include marital status and cohabitation biographies as well as parental and educational histories.

Marital status histories reflect the individual's marital status as of 1 January of each year since 1990, in which the following five statuses can be distinguished: never married, married, separated/divorced, and widow(er). Statistics Norway identify couples as cohabitants when they have at least one common child (disregarding age) and where both parents and child share residential address. To my knowledge, register data on

cohabitants of this type is only available for research for Sweden, Denmark and Finland in addition to Norway (Byberg, Foss and Noack 2001), but this paper is the first attempt to use these data to analyze mortality of cohabitants. Cohabitant couples with common children constitute an estimated 38 per cent of the total Norwegian cohabitant population which also includes those without children and cohabitants where one or both of the partners have own but no common children (Noack 2002).[2] The estimation of the population of cohabitants with common children as of 1 January every year 1990-2002 is probably disturbed by missing or late reports of moving (Byberg, Foss and Noack 2001). This problem is not due to underreporting of common children in the Central Population Registry which is insignificant. However, the underreporting may be explained by four other factors. First, some couples may move in and out several times, making the time of moving rather vague. Second, some may not be aware that it is mandatory to notify the Central Population Registry if changing dwelling, and others may think it is enough to notify the local post office when moving. Third, some may also hold back information on people they live with to receive economic support as lone-mothers. Fourth, there may also be some underreporting of young cohabitants with common children who are students. There is a certain delay in reports of moving connected to the birth of a child. However, among unmarried parents who do not have common address at time of birth of a child, a substantial number change address before the end of the year. It seems reasonable to believe that a great deal of these unmarried couples lived together also before the child was born, but that the childbirth increased the probability of formalizing the consensual union, i.e. notifying the Central Population Register. Interview data from 2002 showed that disregarding parental status, 81 per cent of the of the Norwegian cohabitants have never been married, that 14 per cent were separated/divorced, and that 2 per cent were widows/widowers and 3 per cent were married but cohabiting a different partner (Noack 2004). The register data on cohabitants with common children used here captures the never married and the previously married, but not the married which is cohabiting a different partner. The distribution of person-years, in absolute numbers and

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[2] All types of cohabitants are captured by the Finnish and Danish but not the Norwegian and Swedish registers. However, the Norwegian 2001 housing and population census provide information which can be used to identify all cohabitants. Unfortunately, this data source has so far not been made available for research.

in per cent, is given for the independent variables in table 1. In addition to time and age, the independent variables consist further of 11 variables across marital, cohabitation and parental status (all are categorical dummy variables).

Table 1. Distribution of independent variables

| | Distribution of person-years (absolute numbers) | | | | Distribution of person-years (%) | | | |
| | Males | | Females | | Males | | Females | |
	1990-1996	1997-2002	1990-1996	1997-2002	1990-1996	1997-2002	1990-1996	1997-2002
Independent variables								
Age								
20-24 years	1 142 602	829 533	1 089 589	791 284	10.47	8.59	9.62	7.91
25-29 years	1 176 600	956 063	1 116 650	923 621	10.79	9.90	9.85	9.24
30-34 years	1 131 379	1 036 101	1 075 589	993 780	10.37	10.72	9.48	9.94
35-39 years	1 108 883	996 122	1 063 008	951 624	10.16	10.31	9.37	9.52
40-44 years	1 095 263	959 961	1 039 192	926 138	10.04	9.94	9.16	9.26
45-49 years	1 060 686	929 435	1 007 597	894 431	9.72	9.62	8.88	8.95
50-54 years	810 493	924 158	791 531	884 116	7.43	9.57	6.98	8.84
55-59 years	653 252	734 764	661 282	721 026	5.99	7.60	5.83	7.21
60-64 years	634 224	546 631	663 988	563 844	5.81	5.66	5.85	5.64
65-69 years	644 144	485 994	715 700	528 894	5.90	5.03	6.31	5.29
70-74 years	601 113	463 228	741 562	548 665	5.51	4.79	6.54	5.49
75-79 years	445 061	405 431	631 944	554 697	4.08	4.20	5.57	5.55
80-84 years	276 747	265 542	468 794	443 249	2.54	2.75	4.13	4.43
85-89 years	128 507	128 760	275 644	272 449	1.18	1.33	2.43	2.73
Union/parental status								
Never married, no children	3 175 144	2 782 978	2 211 786	1 916 385	29.11	28.80	19.49	19.17
Never married, at least one child	567 986	594 645	657 332	668 195	5.21	6.15	5.80	6.68
Never married cohabitant, at least one child at home	224 093	396 733	224 598	397 420	2.05	4.11	1.98	3.98
Married, no children	558 824	381 066	567 513	377 885	5.12	3.94	5.00	3.78
Married, at least one child	5 577 909	4 638 573	5 744 246	4 784 047	51.13	48.02	50.65	47.85
Widower/widows, no children	63 918	37 990	316 882	173 362	0.59	0.39	2.79	1.73
Widower/widows, at least one child	192 867	177 368	934 220	867 035	1.77	1.84	8.24	8.67
Widower/widows cohabitants, at least one child at home	949	1 300	961	1 333	0.01	0.01	0.01	0.01
Separated/divorced, no children	86 011	80 503	93 120	84 590	0.79	0.83	0.82	0.85
Separated/divorced, at least one child	419 943	513 653	549 746	670 375	3.85	5.32	4.85	6.71
Separated/divorced cohabitant, at least one child at home	41 310	5 6914	41 666	57 191	0.38	0.59	0.37	0.57
Education								
9 years of schooling	2 949 026	2 005 261	3 713 132	2564229	27.03	20.76	32.74	25.65
12 years of schooling	5 599 447	5 181 724	5 597 775	5083341	51.33	53.63	49.35	50.84
13-16 years of schooling	1 752 908	1 842 474	1 851 782	2089693	16.07	19.07	16.33	20.90
17+ years of schooling	607 573	632 264	179 381	260555	5.57	6.54	1.58	2.61
Number of observations	10 908 954	9 661 723	11 342 070	9 997 818	100.00	100.00	100.00	100.00

Source: Norwegian Central Population Registry

The analysis considers two parental statuses, having no children or at least one child. We do not know whether the children lived with or without their parents for no other group than the cohabitants. Education is grouped into four categories, those having respectively 9, 12, 13-16 or 17+ years of schooling.

Mortality risk estimation

The mortality risks are estimated separately for men and women using discrete-time logistic regression models in SAS. So far, only all-cause mortality is considered. The men and women are followed from 1 January 1990 at ages from 20 to 89 years. The life courses are censored at the time of emigration, age 89 years or the last date that the data cover (31.12 2002). Two periods, 1990-1996 and 1997-2002, are considered to analyze whether changes have taken place over time in the mortality of the cohabitants relative to the married. The total exposure time was estimated at ca. 11 and 10 million person-years for each sex in respectively the seven-year period from 1990 to 1996 and the six-year period from 1997-2002 (see table 1). It seems reasonable to assume that only those who survive a substantial part of year t would be in a position to submit a change of address form to the local population registry if moving. Further, those who die early in the year may not have time to do this and may also in fact be cohabitants. To allow for time lags in moving and registration of new address (a formalizing of a consensual union) in the models presented we considered the effect on mortality of marital, cohabitation and parental status 1 January in the last three years before year t (t-3, t-2, and t-1). However, there were no significant differences in the effects of the relevant covariates on mortality.

4. Results

Preliminary findings indicate that never married male cohabitants with at least one child have significantly lower mortality than the married with at least one child in the years 1990-1996 and 1997-2002 (tables 2, models 1-4). When education is controlled for in models 2 and 4, mortality for never married cohabitants are lowered by ca. 5 percentage points to respectively 29 and 22 per cent compared to the married. The sign of the coefficient as well as the reduced differences over time are not in accordance with what was expected.

Table 2. Observed number of deaths and estimated effects of covariates on the probability of dying for Norwegian males 1990-1996 and 1997-2002

	Observed number of deaths		Maximum Likelihood Estimates							
			1990-1996				1997-2002			
	1990-1996	1997-2002	Model 1		Model 2		Model 3		Model 4	
Independent variables			Coeff	SE	Coeff	SE	Coeff	SE	Coeff	SE
Intercept			-5.838***	0.130	-5.848***	0.130	-5.392***	0.179	-5.508***	0.179
Time (calendar years)			-0.018***	0.001	-0.015***	0.001	-0.020***	0.002	-0.016***	0.002
Age										
20-24 years (ref)	1 045	908	0	/	0	/	0	/	0	/
25-29 years	1 161	1 025	0.138***	0.043	0.170***	0.043	0.006	0.046	0.060	0.046
30-34 years	1 310	1 185	0.442***	0.042	0.461***	0.042	0.208***	0.045	0.254***	0.045
35-39 years	1 631	1 425	0.779***	0.040	0.781***	0.040	0.573***	0.043	0.587***	0.043
40-44 years	2 198	1 794	1.125***	0.038	1.112***	0.038	0.906***	0.041	0.900***	0.041
45-49 years	3 464	2 560	1.624***	0.036	1.597***	0.036	1.320***	0.039	1.303***	0.039
50-54 years	4 115	4 112	2.070***	0.035	2.028***	0.035	1.814***	0.038	1.780***	0.038
55-59 years	5 652	5 115	2.606***	0.034	2.541***	0.035	2.279***	0.037	2.228***	0.037
60-64 years	9 317	6 541	3.146***	0.033	3.065***	0.034	2.831***	0.036	2.752***	0.036
65-69 years	15 635	9 722	3.661***	0.033	3.569***	0.033	3.361***	0.036	3.259***	0.036
70-74 years	23 886	15 694	4.170***	0.032	4.068***	0.033	3.909***	0.035	3.794***	0.035
75-79 years	28 390	23 134	4.661***	0.032	4.549***	0.033	4.454***	0.035	4.329***	0.035
80-84 years	28 276	25 233	5.150***	0.032	5.032***	0.033	4.998***	0.035	4.864***	0.035
85-89 years	20 197	19 565	5.606***	0.033	5.492***	0.033	5.503***	0.035	5.361***	0.035
Union/parental status										
Never married, no children	22 164	17 968	0.497***	0.008	0.443***	0.008	0.586***	0.009	0.518***	0.009
Never married, at least one child	1 011	1 468	0.446***	0.034	0.389***	0.034	0.727***	0.029	0.653***	0.029
Never married cohabitant, at least one child at home	211	407	-0.239***	0.070	-0.289***	0.070	-0.166***	0.051	-0.218***	0.051
Married, no children	17 823	9 278	0.207***	0.009	0.189***	0.009	0.160***	0.012	0.133	0.012
Married, at least one child (ref)	76 435	62 879	0	/	0	/	0	/	0	/
Widower, no children	6 712	3 702	0.419***	0.014	0.385***	0.014	0.413***	0.018	0.363***	0.019
Widower, at least one child	12 832	12 504	0.238***	0.010	0.216***	0.010	0.282***	0.011	0.256***	0.011
Widower cohabitants, at least one child at home	10	10	0.636**	0.322	0.626*	0.322	0.426	0.320	0.403	0.320
Separated/divorced, no children	2 510	1 949	0.707***	0.021	0.673***	0.021	0.749***	0.024	0.707***	0.024
Separated/divorced, at least one child	6 390	7 675	0.598***	0.014	0.585***	0.014	0.587***	0.013	0.568***	0.013
Separated/divorced cohabitant, at least one child at home	179	173	0.321***	0.076	0.301***	0.076	0.056	0.077	0.036	0.077
Education										
9 years of schooling (ref)	80 247	62 879			0	/			0	/
12 years of schooling	52 560	47 002			-0.161***	0.006			-0.198***	0.007
13-16 years of schooling	9 010	9 168			-0.399***	0.012			-0.461***	0.012
17+ years of schooling	4 460	3 922			-0.486***	0.016			-0.619***	0.017
Total number of deaths	146 277	118 013								
-2 Log L			1219446.9		1217149.6		996151.44		993233.04	

* p ≤ 0.10; ** p ≤ 0.05; *** p ≤ 0.01

Table 3. Observed number of deaths and estimated effects of covariates on the probability of dying for Norwegian females 1990-1996 and 1997-2002

	Observed number of deaths		Maximum Likelihood Estimates							
			1990-1996				1997-2002			
	1990-1996	1997-2002	Model 5		Model 6		Model 7		Model 8	
Independent variables			Coeff	SE	Coeff	SE	Coeff	SE	Coeff	SE
Intercept			-7.331***	0.149	-7.329***	0.149	-7.641***	0.198	-7.785***	0.198
Time (calendar years)			-0.013***	0.001	-0.011***	0.001	-0.008***	0.002	-0.005**	0.002
Age										
20-24 years (ref)	322	260	0	/	0	/	0	/	0	/
25-29 years	375	342	0.214***	0.076	0.263***	0.076	0.202**	0.083	0.284***	0.083
30-34 years	542	467	0.743***	0.071	0.790***	0.071	0.582***	0.078	0.666***	0.078
35-39 years	779	650	1.173***	0.067	1.205***	0.067	1.031***	0.074	1.098***	0.074
40-44 years	1 230	997	1.670***	0.063	1.687***	0.063	1.502***	0.070	1.550***	0.070
45-49 years	1 897	1 510	2.137***	0.061	2.136***	0.061	1.953***	0.068	1.982***	0.068
50-54 years	2 316	2 555	2.578***	0.060	2.557***	0.060	2.493***	0.066	2.498***	0.066
55-59 years	3 064	3 188	3.040***	0.059	2.992***	0.059	2.920***	0.065	2.902***	0.065
60-64 years	4 909	3 779	3.504***	0.058	3.437***	0.058	3.340***	0.065	3.286***	0.065
65-69 years	8 530	5 577	3.964***	0.058	3.883***	0.058	3.791***	0.064	3.710***	0.064
70-74 years	14 803	9 804	4.457***	0.057	4.364***	0.057	4.302***	0.064	4.205***	0.064
75-79 years	22 412	17 727	5.007***	0.057	4.903***	0.057	4.861***	0.063	4.751***	0.063
80-84 years	30 160	26 168	5.582***	0.057	5.472***	0.057	5.462***	0.063	5.342***	0.063
85-89 years	31 649	29 638	6.167***	0.057	6.059***	0.057	6.083***	0.063	5.955***	0.063
Union/parental status										
Never married, no children	15 030	10 172	0.390***	0.011	0.421***	0.011	0.450***	0.012	0.491***	0.012
Never married, at least one child	974	1 033	0.416***	0.034	0.387***	0.034	0.440***	0.033	0.408***	0.033
Never married cohabitant, at least one child at home	107	205	-0.044	0.099	-0.064	0.099	-0.098	0.072	-0.115	0.072
Married, no children	10 626	5 631	0.283***	0.012	0.275***	0.012	0.247***	0.015	0.238***	0.015
Married, at least one child (ref)	34 147	30 627	0	/	0	/	0	/	0	/
Widower, no children	22 209	11 663	0.422***	0.010	0.408***	0.010	0.396***	0.012	0.372***	0.012
Widower, at least one child	33 184	36 063	0.204***	0.009	0.192***	0.009	0.244***	0.009	0.224***	0.009
Widower cohabitants, at least one child at home	5	0	1.452***	0.450	1.412***	0.450	-6.350	19.152	-6.403	19.422
Separated/divorced, no children	2 375	1 666	0.575***	0.022	0.576***	0.022	0.622***	0.026	0.622***	0.026
Separated/divorced, at least one child	4 276	5 550	0.393***	0.017	0.396***	0.017	0.394***	0.015	0.396***	0.015
Separated/divorced cohabitant, at least one child at home	55	52	0.261*	0.136	0.247*	0.136	-0.043	0.140	-0.048	0.140
Education										
9 years of schooling (ref)	81 205	63 129			0	/			0	/
12 years of schooling	35 683	33 263			-0.201***	0.007			-0.235***	0.007
13-16 years of schooling	5 628	5 761			-0.419***	0.014			-0.511***	0.014
17+ years of schooling	472	509			-0.462***	0.047			-0.636***	0.045
Number of deaths	122 988	102 662								
-2 Log L			1058873.7		1057255.6		889776.21		887655.32	

* p ≤ 0.10; ** p ≤ 0.05; *** p ≤ 0.01

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The mortality of never married female cohabitants does not differ from that of the married with children in the two periods considered (table 3, models 5-8). There are not many studies of mortality of cohabitants. Therefore, studies of the health of cohabitants are also of interest. For example, the finding that there were no difference in mortality of never married female cohabitants and the married in this study is similar to what Wu, Penning, Pollard, and Hart (2003) found in a study of self reported health among cohabitants and currently married in Canada 1994-95 after controlling for socioeconomic factors and self-selection into cohabitation and marriage. The lower mortality risks of male cohabitants relative to the married is at odds with theory, but the increase in the differences in this relative mortality relationship when education is controlled for is as expected given the lower education among cohabiting fathers compared to married fathers (Jensen and Clausen 1999). In studies based on Swedish data from 1985 and 1990, it was reported that all-cause sex and age-specific mortality risks for cohabitants were higher than those for married persons, but that the differences were minimal in ages 20-34, relatively large in ages 40-50 and diminishing for higher ages (Prinz 1995; Prinz *et al.* 1995). One should note that the results of the current paper are not directly comparable to the Swedish studies because they do not control for socioeconomic selection into cohabitation and marriage.

Preliminary results also indicates that compared to married men and women with children, all other groups (expect for the cohabitants) have significantly higher mortality. Furthermore, mortality is significantly (at 0.05 level) *lower* among those who have at least one child compared to the childless except among the never married women and men and married men 1997-2002 (and for the significantly *higher* mortality for never married males with children compared to the never married without children in the period 1997-2002) where there is no difference along this dimension. This effect is consistent for the married as well as for the separated/divorced and the widows/widower. Moreover, the effect of having at least one child is significantly stronger for women than for men. These differences for the married and separated/divorced males and the widowers were in the two periods studied respectively 13-19, 9-14, and 10-17 per cent, while the corresponding female differences were respectively 24-28, 15-22, and 18-23 per cent. Among the separated/divorced, those with at least one child who have not remarried or

cohabit have significantly higher mortality than those who cohabit and have at least one common child. Further, the separated/divorced which do not cohabit and are childless have significantly higher mortality compared to the counterpart who has at least one child. The two never married groups are probably very heterogeneous, and include substantial number of cohabitants without children or own but no common children, and the relative effects on mortality of the two groups compared to married with children must therefore be interpreted with caution. Note that controlling for age, sex, marital, cohabitation, and parental status as well as education, mortality is decreasing significantly within the two periods considered. Note also that the mortality differences by education are larger for males than for females and that the differences in mortality by education have increased significantly over the decade considered. These finding is in accordance with previous research (Zahl *et al.* 2003).

5. Discussion and conclusion

This paper has analyzed the question whether cohabitation has similar protective effects on mortality as marriage after controlling for age, sex, parental status and education. Given the widespread phenomenon of cohabitation in Norway and several other western countries, this question is certainly of great importance. The finding that mortality for the never married female cohabitants with common children is equal to the mortality of the married females with children is not controversial. However, the finding that never married male cohabitants had lower mortality than the married counterpart is very surprising and definitively at odds with theory. This result should nevertheless be interpreted with caution as there are many things that are not equal between the two groups that are not controlled for in the present analysis. The following factors may explain why male cohabitants seem to have lower mortality than the married. First, there may be a certain socioeconomic selection when it comes to never married couples which submit a change of address form to the Central Population Registry when having a common child. Some "lone mothers" may also be cohabiting but is not registered as cohabitants. It may be reasonable to believe that such persons have less economic resources – this make the cohabitant group of both sexes appear more selective than they actually may be. However, it is difficult to come up with a good explanation why this

should affect the population of male cohabitees more than the female counterpart. A second difference that is not taken into account in the analysis is that the married population also includes the remarried which normally has higher mortality than those who have not been previously married (se for example Hemström 1996). Although the never-married cohabitants may have experienced several break-ups of previous consensual unions (as is probably also the case for large proportion of the married), they have not gone through the strains of divorce(s). In a future analysis the effect of never-married cohabitation on mortality should be compared to first as well as later marriages. Likewise, rather than comparing the mortality of separated/divorced cohabitants to that of the total population of the married one should compare this group instead to the separated/divorced who have remarried. Third, the married do not necessarily have common children as is the case for the cohabitants. The number of own/step children, and the age (and possibly also sex) of their children may also matter. For example, step-families may experience stress related to issues like custody, daily care, and visiting right contracts for the step-children. While an adult child can provide care and assistance (the role of adult daughters as caregivers has received widespread attention), a social effect of younger children should rather be taken as an indication that children tend to induce a healthy life style in their parents or that there may be a selection of healthy people into parenthood, in terms of socio-economic resources, health, values and life-style preferences.

We do not know the differences in mortality between cohabitees with own but no common children (or both own and common children) and married with own but no common children (or both own and common children). It may well be the case that cohabitees without children have higher mortality than the married with children, or for that sake higher mortality than the "equal" counterpart of married without children. Only cohabitants with common children are captured in the Norwegian register data which is used in this paper. Cohabitants defined this way constitute an estimated 38 per cent of all Norwegian cohabitant couples (Noack 2002). Fourth, we know for sure that children are present in the homes of the cohabitants. This is not necessarily the case for the married with children although it can be assumed that most of the married in the ages 20-50 years also have children present in their homes. Kobrin and Hendershot (1977), for example,

found that married persons aged 35-44 who did not live with children under 18 years had 2.1 (men) to 2.4 (women) times as high all-cause mortality as those living with children under 18 years. For higher ages, the effect was weaker, but still stronger for women than for men. In a study of Swedish data, it was found that the mortality of women with one child at home was 24 per cent lower than that of childless women – for two or more children the reduction was 47 per cent (Hemström 1996). For men, the child effects were 19 per cent and 33 per cent, respectively. Nevertheless, the finding in the current paper that the married and the previously married with at least one child had significantly lower mortality compared to their childless counterparts, but also the stronger effect of children for women than for men, is in accordance with Kobrin and Hendershot (1977), Hemström (1996) as well as analyses by Rogers (1996) and to a certain extent Lillard (1995). These differences may be explained by selection as well as social effects of parenthood. Physiological effects related to pregnancy, delivery and lactation may explain why the effect of children on mortality is stronger for women than for men (Kravdal 2003).

Preliminary results also indicates that compared to married men and women with children all other groups (expect for the cohabitants) have higher mortality. The highest relative mortality for both sexes is found for the separated/divorced, while the second highest is found for the never-married. These results are in accordance with previous research (Livi-Bacci 1985; Hu and Goldman 1990; Prinz 1995, Kravdal 2001). Also, marriage and cohabitation seems to be more beneficial to men's health and survival than to women. This is also consistent with previous research (see Gove 1973 for an early account). In previous studies, remarriage among widowers and the divorced has been found to lower mortality compared to that of the men and women who do not remarry (Helsing, Szklo, and Comstock 1981; Weingarten 1985). Based on these findings, there may therefore be no surprise that the current paper shows that divorced/separated which are in a consensual union where there also are common children involved also have lower mortality than divorced/separated who are not remarried or cohabit, in particular compared to those who are childless. This result is in basically in accordance with a study on Sweden by Hemström (1996). The relative effect on mortality for the widows/widower cohabitants in the current study should be interpreted with caution due to the low number of deaths in this category.

There are several weaknesses with the preliminary analysis in this paper. One is that the database that the analysis relies on do not include information to control for baseline biological (e.g. birth weight), lifestyle (risk taking), and health behavior variables (e.g. alcohol intake, smoking, physical activity), religious affiliation, or, for that sake, a rating of each union, if in one. Second, the analysis do not control for union history and union duration. However, such controls can be incorporated in a later version of this paper as such information is possible to extract from the current database. When cohabitants and married with common children were compared in Norway in 1996, cohabitants had shorter experience in the union (Jensen and Clausen 1997a). Zick and Smith (1991) and Lilard and Waite (1995) showed that the low mortality premium increased with marriage duration. The shorter lived consensual unions may not benefit to the same extent from this effect. Third, effects of marital status are not the same for all causes of death. For example, Gove (1973) and Verbrugge (1979) found that high mortality rates among unmarried persons were related to high-risk life styles, such as tobacco and alcohol consumption, few hours of sleep, unhealthy diets, and more risky driving habits. Causes that are unrelated to life-style, such as death due to leukemia, showed very little difference between marital statuses. In a follow-up of this study, effects of union status on three broad groups of causes of death (using a competing-risk approach), those related to health behavior (cancer, cardiovascular diseases, cirrhosis of the liver), lifestyle (e.g. risk taking; motor vehicle accidents, other accidents) and all other cause of death will be considered. Moreover, cohabitants who on average are younger than the married (Jensen and Clausen 1997a) may die of different causes (maybe accidents rather than cancer or cardiovascular diseases). A fourth weakness of the analysis is that it does not include controls for age of children and the number of own/step children, which are factors, discussed above, that may have bearing on parents mortality. Cohabitants have for example younger children than the married (Jensen and Clausen 1997a). One should also include interactions of age and cohabitation status to analyze whether the pioneers who started to cohabit in the 1970s have lower mortality than the followers in the 1980s and the 1990s.

The very preliminary analysis presented in this paper should be interpreted with caution. However, and despite the shortcomings of the data on cohabitants, the strength

of the analysis is the use of unique Norwegian individual-level register data. The potential of the database is large, and when hitherto uncontrolled covariates discussed above is taken into account in future analysis, some promising research lies ahead. So far we cannot conclude whether cohabitation confers more or less protection than marriage.

6. Future work

The database that is used in this paper contains information that makes it possible to investigate several other important research questions than those taken up in this paper. For example, one might speculate whether mortality risks of cohabitants with common children change when they marry each other. This question may be difficult to answer as the proportion of the cohabitants that have married has declined substantially from the 1970s and the 1980s (75 per cent for cohorts born in the 1940s, 64 per cent for cohorts born in the 1950s) compared to the late 1990s (42 per cent of cohort born in the 1960s) (Texmoen 1999). However, the cohabitants who married in the late 1990s had cohabited for an increasingly longer time period. It was also found that there were little differences in educational background among the cohabitants marrying (Texmoen 1999). A second important research question is whether mortality risks after a break-up of cohabitation with common children differ from that of a corresponding divorce? Based on Jensen and Clausen (1997b), who found that after a break up cohabitant mothers were more likely to have custody of common children alone (73 vs 52 per cent), to have daily care of common children (89 vs 84 per cent), and that cohabitant fathers were less likely to have visiting right contracts for common children (80 vs 90 per cent), one would expect cohabiting men with common children to suffer higher mortality after a break-up than a married man, and that such differences between women would be smaller. A last research question that the current database in principle may be used to analyze is whether the bereavement effects for the cohabitants are different from the married. Does remarrying or re-cohabiting lower the mortality of bereaved cohabitants? However, this research question is not possible to investigate empirically before consensual unions become even more common for the oldest population groups.

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