

Accepted Manuscript

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A. Hiyoshi, K. Fall, G. Netuveli, S. Montgomery

PII: S0277-9536(15)30045-9

DOI: [10.1016/j.socscimed.2015.07.029](https://doi.org/10.1016/j.socscimed.2015.07.029)

Reference: SSM 10176

To appear in: *Social Science & Medicine*

Received Date: 14 January 2015

Revised Date: 21 July 2015

Accepted Date: 26 July 2015



Please cite this article as: Hiyoshi, A, Fall, K, Netuveli, G, Montgomery, S, Remarriage after divorce and depression risk, *Social Science & Medicine* (2015), doi: 10.1016/j.socscimed.2015.07.029.

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Title

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Author names and affiliation

Hiyoshi, A.¹, Fall, K.^{1,2}, Netuveli, G.^{3,4}, Montgomery, S.^{1,2,5}

Ayako Hiyoshi;

Affiliation: ¹ Clinical Epidemiology and Biostatistics, School of Medicine, Örebro University

Address: Clinical Epidemiology and Biostatistics, School of Medicine, Örebro University, Örebro SE-701 82, Sweden

Email: Ayako.Hiyoshi@oru.se

Tel: +46 (0)19-602 62 08

Corresponding author (no fax number is available)

Katja Fall;

Affiliation: ¹ Clinical Epidemiology and Biostatistics, School of Medicine, Örebro University

² Clinical Epidemiology Unit, Department of Medicine, Karolinska Institutet

Address: Clinical Epidemiology and Biostatistics, School of Medicine, Örebro University, Örebro SE-701 82, Sweden

Email: Katja.Fall@oru.se

Gopalakrishnan Netuveli;

Affiliation: ³ International Centre for Life Course Studies in Society and Health, University College London

⁴ Institute for Health and Human Development, University of East London

Address: IHHD, UH250, Stratford Campus, University of East London, Water Lane, London, E15 4LZ

Email: g.netuveli@uel.ac.uk

Scott Montgomery;

Affiliation: ¹ Clinical Epidemiology and Biostatistics, School of Medicine, Örebro University

² Clinical Epidemiology Unit, Department of Medicine, Karolinska Institutet

⁵ Department of Epidemiology and Public Health, University College London

Address: Clinical Epidemiology and Biostatistics, School of Medicine, Örebro University, Örebro SE-701 82, Sweden

Email: Scott.Montgomery@oru.se

Abstract

As marriage is associated with lower depression rates compared with being single in men, we aimed to examine if remarriage compared with remaining divorced is also associated with a reduced depression risk. Swedish register data were used to define a cohort of men who were born between 1952 and 1956, and underwent a compulsory military conscription assessment in adolescence. This study population comprised men who were divorced in 1985 (n=72,246). The risk of pharmaceutically treated depression from 2005 to 2009 was compared for those who remarried or remained divorced between 1986 and 2004. Cox proportional hazards analysis was used to estimate hazard ratios for the risk of depression identified by pharmaceutical treatment, with adjustment for a range of potential confounding factors including childhood and adulthood socioeconomic circumstances, cognitive, physical, psychological and medical characteristics at the conscription assessment. The results showed that, even though divorced men who remarried had markers of lower depression risk in earlier life such as higher cognitive and physical function, higher stress resilience and socioeconomic advantages than men who remained divorced, remarriage was associated with a statistically significant elevated risk of depression with an adjusted hazard ratio (and 95% confidence interval) of 1.27(1.03 1.55), compared with men who remained divorced. Remarriage following divorce is not associated with a reduced risk of depression identified by pharmaceutical treatment, compared with remaining divorced. Interpersonal or financial difficulties resulting from remarriage may outweigh the benefits of marriage in terms of depression risk.

Key words

Remarriage, divorce, depression, antidepressant, Sweden

Introduction

Marriage is associated with lower rates of depression (Yan et al., 2011) and mortality than being unmarried (Manzoli et al., 2007). Such associations with marriage have been attributed to intimacy and mutual care, emotional reward, increased living standards through stable and improved financial circumstances, extension of kinship and social support, improved access to social services, and engagement in healthier lifestyles (Musick & Bumpass, 2012). However, less is known about whether remarriage compared with a persistently divorced state is associated with a reduced risk of depression. The average rate of marriage has declined, but divorce and remarriage have become more common in OECD countries (OECD, 2014; United Nations - Department of Economic and Social Affairs - Population Division, 2009). In Sweden, the proportion who marry for the first time has declined from approximately 90% in 1970 to 75% in 2010 (OECD, 2014).

Remarriage may be different from a first marriage, as such unions tend to be less stable (Martin & Bumpass, 1989) and may be more often influenced by factors that were absent in first marriages – such as stepchildren and former partners, which may create conflict for reasons such as parenting issues and financial arrangements (Hughes & Waite, 2009; Skinner et al., 2002) and thus increasing depression risk. Additionally, divorce may be associated with personality traits less suitable for stable relationships (Teachman, 2008), which also can increase stress and depression risk.

To our knowledge, comparison of depression risk between those who remained divorced and remarried has been assessed only rarely. Two studies reported that, compared with constantly divorced or widowed men, remarried men had a lower depression risk (Williams, 2003), higher life satisfaction (Williams, 2003) and better self-rated health (Williams & Umberson, 2004). Although informative, these studies had some limitations, including combining divorce with being widowed, which may introduce some heterogeneity.

Using longitudinal Swedish register data, we examined whether remarriage is associated with a lower risk of depression compared with being persistently divorced among men born in the 1950s. We examined marital history during 1985-2004 and identified pharmaceutically treated depression during 2005-2009.

Materials and methods

This cohort study used Swedish register data on men born from 1 January 1952 to 31 December 1956 who underwent compulsory military conscription examinations and were included in the *Swedish Military Conscription Register*. At the time, military conscription was compulsory for all young Swedish men (Otto, 1976). Fewer than 4% of all men were not included, and exclusion was usually due to severe illness or disability (Otto, 1976). We analysed information on men who underwent the conscription examination between 1970 and 1976 (mean ages of conscription assessment were 18 and 21 years, respectively, and over 98% of subjects were included). Follow-up started from July 2005 (at ages 49 to 53 years), and ended on the date of depression, death, emigration or 31st December 2009 (at ages 54 to 58 years), whichever occurred first. Dates of death and emigration were identified using the *Total Population Register* and the *Cause of Death Register*.

Marriage history

The *Population and Housing Censuses*[FoB] in 1960 and 1985(Statistics Sweden, n.d.-b), and the *Longitudinal Database of Education, Income and Occupation* in 1990, 2001 and 2008 (Statistics Sweden, n.d.-a) provided data for marital status and childhood and adulthood socioeconomic characteristics. Married, unmarried, divorced and widowed at the end of a given year was available in each survey year. The duration of the most recent (that year) marital status was reported in 1990, 2001 and 2008, which was used to fill the gaps between survey years. Men who were married but divorced by 1985 (at ages 29 and 33 years) were identified, and among them, those who remarried once during 1986-2004 ('remarried') were compared with men who remained divorced during this period ('persistently divorced'). Remarriages that had dissolved by 2004 were included and accounted for a quarter of remarriages. For

comparison, men who were married in 1985 were divided into two groups; those who remained married ('constantly married') and those who were later divorced but not remarried ('divorced after 1985').

Depression

Using the *Prescribed Drug Register*, which holds records for all prescribed drugs dispensed by Swedish pharmacies since July 2005, we defined depression as those who had approximately continuous antidepressant medication. Defined Daily Dose indicated the number of days the dispensed drug is expected to be used for its main indication (World Health Organization Collaborating Centre for Drug Statistics Methodology, n.d.). The date that the sum of dispensed antidepressant (N06A) became equivalent to the use of more than or equal to 180 days within 365 days for the first time was used to define incidence of approximately continuous treatment for depression (Andersen et al., 2009; Spijker et al., 2002). Information on depression diagnoses among inpatients (from 1964) and outpatients (2001 onwards) hospitals was provided by *the Patient Register*. Men with an inpatient diagnosis of depression before 1985 were excluded, as such serious depression may have consequences for subsequent partnership formation and stability. During the subsequent follow-up period when remarriage was examined, in- and outpatient diagnoses of depression were used to provide a measure that may be considered a potential confounding factor.

Potential confounding factors

Childhood living conditions were indicated by social classification of the head of household based on occupation in the 1960 FoB (census), grouped as: 1) self-employed professionals, 2) managers, 3) office worker, 4) self-employed (non-farmer), 5) self-employed (farmer), 6) lower service, 7) manual worker (non-farmer), 8) manual worker (farmer), 9) other unclassifiable jobs or students, and 10) not in gainful employment.

Measures in adolescence were provided by the *Military Conscription Register*. Stress resilience was measured using a semi-structured interview with trained psychologists, and it evaluated psychological

dimensions relevant to everyday life such as social maturity, psychical energy and emotional stability (Otto, 1976). The normally distributed nine-level scale was coded so that higher values show lower stress resilience. Cognitive function was estimated by a nine-grade normally distributed scale summarising assessments of linguistic understanding, spatial recognition, general knowledge, and ability to follow mechanical instructions, and was recorded one to be the highest function and nine to be the lowest. (Otto, 1976) Physical function was derived from an endurance test using an electronically braked bicycle ergometer with gradually increasing load (Mattsson et al., 2012), and, after combining the lowest two categories, the nine level variable was coded so that higher values indicated lower physical function. The summary disease score (0-9) details the results of the medical examination. The variable was collapsed into six categories with higher values indicating poorer health, except for the last category for ill-defined problems.

Information on adult social class based on the men's own occupation, disposable income, presence of children in the household, and residential region were obtained from the 1985 FoB (census). The Erikson-Goldthorpe social class was derived from the occupational classification (Bihagen, 2007) according to the theory of employment status (such as employer, employee or self-employed) and employment relations for employees (Erikson & Goldthorpe, 1992). The categories are: 1) Higher professional, 2) Lower professional, 3) Routine higher non-manual, 4) Routine lower non-manual, 5) Self-employed, 6) Self-employed farmers, 7) Skilled manual worker, 8) Unskilled manual worker, and 9) Farm labourer.

Disposable income was grouped into deciles, and was used as a continuous variable. The presence of children in 1985 was used to produce a dichotomous variable. The region of residence was grouped into northern, central and southern Sweden.

Analytic sample

Among 284,257 men who were born between 1952 and 1956, 72,246 were married or divorced in 1985 and had complete data for the relevant variables. Exclusions were due to inconsistencies in vital status (n=2,623), those who did not have the conscription examination between 1970 and 1977 (n= 28,859), or

had a psychiatric condition recorded at the conscription examination in adolescence (Swedish International Classification of Diseases [ICD]-8 290-309) or a depression diagnosis recorded in *the National Patient Register* (ICD-8 296.00, 296.99 and 298) before 1985 (n=31,450). Finally, men who had never married or were widowed by 1985 (n=125,471), those who died or emigrated before the start of follow-up (n=5,444) or with missing data for the relevant variables (n=18,164) were excluded from the analysis (Figure 1).

Statistical analyses

Using Cox proportional hazards regression, hazard ratios [HRs] and 95% confidence intervals were calculated for the association of marital history with depression. The association between depression and the remarriage variable met the proportional hazard assumption. Although some covariates showed violation, the effect of violation was minimal as assessed by survival curves and internal stratification; therefore, we present the analyses assuming proportionality. Separate models were fitted to include childhood and other potential confounding variables (birth year, area of residence, and inpatient diagnoses of depression in 1985-June 2005) (model 1), cognitive, physical and psychological characteristics and health status in adolescence (model 2), and adulthood variables in 1985 (around age 30 years) (model 3).

All analyses were conducted using Stata V.13/SE software.

Ethics

This study was approved by the Uppsala Regional Ethics Committee (Dnr 2014/324).

Results

Table 1 summarises the characteristics of the men. The mean age at the start of follow-up was 51 years. All potential confounding variables were statistically significantly associated with marital history and depression, apart from year of birth, which was only associated with depression (data not shown). In general, constantly married men were the most advantaged, followed by those who remarried or divorced between 1986 and 2004, prior to the start of follow-up from July 2005. Persistently divorced men tended

to have greater pre-existing risks for depression, including an in- and outpatient diagnosis of depression (1985-2005 June), than men who remarried. Parents of persistently divorced men were more likely to have been manual workers than parents of constantly married men. Low stress resilience and lower level cognitive and physical function in adolescence were more common in persistently divorced men than those who remarried. In 1985 (at a mean age of 30.5 years) the proportion of those with lower socioeconomic circumstances was largest among persistently divorced men. More than 80% of men who were married in 1985 (including men who divorced after 1985) had children, whereas less than 20% of men who were divorced in 1985 (including men who remarried after 1985) had children.

Table 2 shows that compared with persistently divorced men, remarried men had an elevated risk of depression. Adjustment for residential area and birth year, severe depression between 1985 and June 2005 (with an in- or outpatient admission) increased the magnitude of the association between remarriage and depression. This is because pre-existing depression was positively associated with depression after July 2005, and inversely associated with remarriage; i.e. remarried men tended not to have prior in- or outpatient diagnoses of depression. The estimates were hardly changed by further adjustment for childhood circumstances, stress resilience, cognitive and physical function and health in adolescence (model 2) and socioeconomic factors in adulthood (model 3).

There was no notable difference when depression risk was compared by the year of divorce (data not shown). Men with psychological conditions including severe depression prior to 1985 were excluded from the main analysis; when they were included, the hazard ratios were somewhat attenuated, as these men were more likely to both suffer from chronic depression and remain in the persistently divorced group (data not shown). The estimates were hardly changed when men who were cohabitating (but not married) in 1990 or 2001 were excluded (n=2,060) (data not shown). Some individuals experienced multiple remarriages and then further divorces (n=202). Such complex sequences did not occur in 93% of the men divorced by 1985 and they were not included in the main analysis. When they were included, the results were not altered notably (data not shown).

Discussion

We investigated whether, among divorced men, remarriage is associated with a reduced risk of depression compared with remaining persistently divorced. Contrary to the hypothesis, remarriage was not associated with a *reduced* risk of subsequent depression defined by the antidepressant medication usage. This is notable as pre-existing depression risks, such as lower cognitive and physical function and stress resilience and socioeconomic indicators, were lower among those who remarried compared with those who remained divorced. Men who married and were never divorced had a notably lower risk of depression.

The higher risk of depression in remarried men compared with those who remained divorced was in contrast to a general view that the quality of life associated with marriage is improved for reasons such as enhanced economic and psychological wellbeing. Improved psychological wellbeing and self-rated health and lowered depression risk in remarried men compared with persistently divorced men has been reported (Williams, 2003; Williams & Umberson, 2004). The reason that we did not find this is not entirely clear. In order to rule out selection and confounding effects (Hope et al., 1999), we excluded those with psychiatric diagnoses prior to 1985. When these men were included in a sensitivity analysis, the estimate was attenuated but the direction of the association was unaltered, indicating that a selection effect does not account entirely for our results. The analysis was adjusted for a variety of relevant factors measured well before the start of follow-up. These included cognitive, physical, psychological and health characteristics and in adolescence and socioeconomic and demographic circumstances in adulthood. These factors are relevant to partnership patterns, marriage stability and depression risk (Karney & Bradbury, 1995). For example, the presence of preschool age children is associated with stabilising marriages while older children are associated with increased divorce risk (Waite & Lillard, 1991).

The main measure of depression used here is pharmaceutically treated depression. Although the measure only identifies diagnosed and treated depression (as discussed in the limitations section below) it will have identified the vast majority of men in this cohort who were diagnosed with depression requiring

pharmaceutical treatment during the relevant years. Most depression is diagnosed and treated in primary care, and pharmaceutical treatment is common and other forms, such as talking therapies, are often in conjunction with prescribed medication. Among individuals with psychiatric problems, between one and two thirds are prescribed medication with treatment in general practice, but a only small proportion of people receive hospital outpatient or inpatient treatment (Singleton et al., 2001). The use of the Prescribed Drug Register, that records all drugs dispensed throughout Sweden (Wettermark et al., 2007), allowed us therefore to achieve extensive identification of depression managed in primary care. Our use of an extended period of treatment to define the outcome is more indicative of true depression rather than a transient emotional episode. As the aetiology of psychological conditions in earlier life and more severe inpatient-treated depression may be different (and have consequences for relationship formation), we excluded men with such diagnoses before 1985 from the analysis.

The results of previous studies of changes in psychological wellbeing on entering marriage remain inconclusive (Johnson & Wu, 2002). Although remarriage has been associated with lower depression risk and improvements in psychological well-being and self-rated health in the short to medium term (Williams, 2003; Williams & Umberson, 2004), life satisfaction following marriage appeared to increase initially but then decreases after two years (Zimmermann & Easterlin, 2006) or returns to its initial level in approximately five years (R. E. Lucas et al., 2003). We could not identify research that investigated longer-term outcomes. In our data, when remarried men were divided into three groups by duration of remarriage and compared with men who remained divorced, remarriage was associated with a raised depression risk across the categories (data not shown). Remarriage may result in some specific challenges and difficulties. Marriage is a legal contract institutionalised in society with defined rights, responsibilities and expected behaviour, and therefore there are guidelines for work and family life that can result in integration of individuals in society (Cherlin, 1978; Musick & Bumpass, 2012). Such benefits of a stable marriage are evident from the lower risk of depression we observed. For remarriage, however, there may be more of a lack of norms and standards to guide people how to behave in key roles,

such as how to discipline stepchildren or to allocate financial and non-financial assets or assistance to former and current families (Cherlin, 1978; Ganong & Coleman, 2006). Assistance provided to stepparents and stepchildren tends to be of lower priority than for biological relatives (Ganong & Coleman, 2006). Therefore, stress may arise due to conflicting feelings of obligation and frequent negotiations thus increasing depression risk among those who have remarried. Our analysis focused on men who were divorced by around age 30 years, and the raised depression risk was not due to even earlier divorces followed by remarriage before age 35 years (data not shown).

People who experience divorce may be more likely to have a personality disorder (Disney et al., 2012). Personality characteristics such as lower neuroticism and higher agreeableness, conscientiousness and extraversion have been associated with higher relationship satisfaction (Malouff et al., 2010), which in turn influence evaluation and judgement of relationships (Gustavson et al., 2012; Zimmermann & Easterlin, 2006) and therefore relationship stability. Even before the marriage or cohabitation (for at least one year), subjective wellbeing has been shown to be lower in those who would eventually divorce, after controlling for socioeconomic characteristics (R. Lucas, 2005; Zimmermann & Easterlin, 2006). Even though the proportion with such problems was lower among those who remarried, such personal characteristics associated with greater divorce risk may have meant that entering a second marriage, that actually requires higher coping skills, may have been even more problematic than the first marriage.

The study has several potential limitations. Although the use of the Prescription Register allowed us to identify all those people being treated pharmaceutically, it is likely that there were many other individuals with depression in this population who did not receive treatment. Further, if the use of health care services differed between divorced and remarried men, this could have introduced bias. For example, the presence of a spouse may have resulted in a higher proportion of depressed men being encouraged to seek medical care, thus inflating the proportion being treated for depression among the remarried men. Although some studies have found that care utilisation for depression is greater in married than unmarried individuals (Coryell et al., 1995; Prokofyeva et al., 2013), others found the opposite (Gudmundsdottir &

Vilhjalmsson, 2010) or found no difference by marital status (Kessler et al., 2001). Such variation may in part relate to the type of contact (including inpatient, outpatient, primary care) and depression characteristics and care needs, such as severity, duration and perception (Gudmundsdottir & Vilhjalmsson, 2010). In our data, it is not possible to assess such variations in health seeking behaviour, so we cannot rule out the possibility that our findings may have been biased.

Marital history prior to 1985 was not defined although multiple marital transitions during this period is unlikely in the majority as the men were aged between 29 and 33 years in 1985. The marital history was constructed based on status and duration of marriage at several specific time points, limiting precision. Family structures and transitions are in reality more complicated than it was possible to capture in our study. Cohabiting and the presence of some children shared between households could not be identified adequately using our material. While the use of official marriage and divorce has the advantage of removing some measurement heterogeneity, it cannot capture associations with all types of relationships and family structures. As in many other countries, divorce and remarriage have become more common in Sweden over the time. It is possible that individual characteristics relating to the choice of marital transition might have been changed over time as divorce and remarriage have become more common. However, in our data there were no significant differences by period of remarriage for pre-existing characteristics of the men, including stress resilience, cognitive and physical function and disease summary score; and nor were there later differences in presence/absence of children and adulthood socioeconomic characteristics, when the timing of remarriage was divided into three groups: 1986-1992, 1993-1998, and 1999-2004.

It is not possible to confirm that *onset* of depression was subsequent to remarriage, although the outcome (depression *treatment*) was identified after the beginning of the remarriage. Given the distribution of pre-existing risks for depression by marital history, it seems unlikely that depression pre-dated and thus *resulted in* remarriage. Cohabitation and separation without divorce have become more common over time, yet we did not have information to investigate such informal arrangements as we could only identify

cohabitation among couples with a common child. Since our data included only men who remarried after 29 years of age, the results may not be applicable to men at different ages. There may be different associations for women whose social and financial consequences associated with divorce and marital roles may be different from men (Hope et al., 1999; Kalpakjian et al., 2011). Strengths of this study include that the marital history was investigated over two decades prior to the measurement of outcome. Depression was identified using records of pharmaceutical treatment and therefore not subject to reporting bias. Some information was not available to us that could have been used to disentangle why the association was observed. Future research using data including clinically treated and untreated depression, quality of marital relationship and detailed information on living arrangement will help to elucidate mechanisms linking remarriage and depression.

Conclusions

Risk of depression identified by pharmaceutically treated depression was higher in men who remarried compared with those who remained divorced and it seems unlikely that this is due to a selection effect, as the men who remarried were most advantaged and hence had fewer risks for depression prior to remarriage. This suggests that interpersonal or financial difficulties resulting from remarriage can outweigh the benefits of marriage. As expected, men who were married and never divorced had the most notably reduced depression risk.

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Acknowledgement

This study received support from the UK Economic and Social Research Council (ESRC) as grants to the International Centre for Life Course Studies (grants RES-596-28-0001 and ES/JO19119/1), and was also funded by Strategic funding from Örebro University.

Table 1 Socioeconomic, demographic, cognitive, and physical characteristics by marital history between 1985 and 2004

Marital history		Persistently divorced	Remarried	Constantly married	Divorced after 1985
		%	%	%	%
Total		2.4	3.8	74.7	19.0
Childhood					
Parental socioeconomic position	Professional	0.7	0.9	0.9	0.9
	Manager	1.4	1.8	2.4	1.9
	Office work	23.7	27.9	28.4	27.2
	Self-employed (non-farmer)	6.7	6.9	8.1	7.3
	Self-employed (farmer)	7.7	7.2	12.4	9.7
	Lower service	3.1	2.4	1.5	2.0
	Manual worker (non-farmer)	48.2	44.8	39.7	43.1
	Manual worker (farmer)	4.0	3.5	3.5	3.7
	Other (unclassified job or student)	0.9	1.5	1.1	1.3
	Not in gainful employment	3.7	3.2	2.0	2.9
Adolescence					
Stress resilience	1=high 9=low resilience	5.0(1.7) ^a	4.6(1.7) ^a	4.3(1.6) ^a	4.6(1.7) ^a
Cognitive function	1=high 9=low function	5.2(1.9) ^a	4.8(1.9) ^a	4.5(1.9) ^a	4.8(1.9) ^a
Physical fitness	1=high 9=low function	3.8(1.8) ^a	3.7(1.8) ^a	3.4(1.8) ^a	3.6(1.8) ^a
Summary disease score	No diagnosis	50.1	48.7	51.3	50.5
	No serious problem	39.9	42.6	40.5	40.2
	Fairly significant	7.0	6.0	6.0	6.5
	Significant problem	1.9	1.8	1.5	1.9
	Very significant problem	1.1	1.0	0.7	0.9
	Ill-defined problem	0	0	0	0
Adulthood					

Social class	Higher professional	4.0	6.6	11.1	7.5
	Lower professional	20.1	25.7	29.1	25.2
	Routine higher non-manual	7.3	5.3	5.8	5.9
	Routine lower non-manual	6.3	6.5	4.3	5.1
	Self-employed	3.8	4.4	3.9	4.8
	Self-employed farmers	2.1	1.8	4.2	3.0
	Skilled manual worker	30.6	26.1	25.9	28.5
	Unskilled manual worker	24.1	22.5	14.3	18.7
	Farm labourer	1.7	1.2	1.5	1.4
Disposable income	Decile, 1=highest, 10=lowest	5.3(2.7) ^a	4.8(2.8) ^a	4.2(2.6) ^a	4.4(2.6) ^a
Children	No	81.6	84.4	12.9	14.1
	Yes	18.4	15.6	87.1	85.9
Depression in 1985 Jan -2005 June	No	97.4	98.2	99.2	97.4
	Yes	2.6	1.8	0.9	2.6

n=72,246

^a: mean(standard deviation)

Persistently divorced comprises those who were divorced in 1985 who did not remarry by 2005

Remarried comprises those who were divorced in 1985 and remarried by 2005 (not including those with multiple remarriages)

Constantly married comprises those who were married in 1985 and remained married by 2005

Divorced after 1985 comprises those who were married in 1985 and divorced by 2005 (not including those who remarried)

Table 2 Marital history 1985-2004 and depression in 2005-2009

	Event/time(yr)	Unadjusted	Model 1	Model 2	Model 3
Persistently divorced	141/7398	Reference	Reference	Reference	Reference
Remarried	266/11632	1.20 [0.97, 1.47]	1.27 [1.03, 1.55]*	1.28 [1.04, 1.57]*	1.27 [1.03, 1.55]*
Constantly married	3168/233040	0.72 [0.60, 0.85]*	0.82 [0.69, 0.97]*	0.85 [0.72, 1.00]	0.87 [0.72, 1.04]
Divorced after 1985	1068/58484	0.96 [0.80, 1.14]	0.95 [0.80, 1.14]	0.97 [0.81, 1.16]	0.99 [0.82, 1.19]

* p<0.05

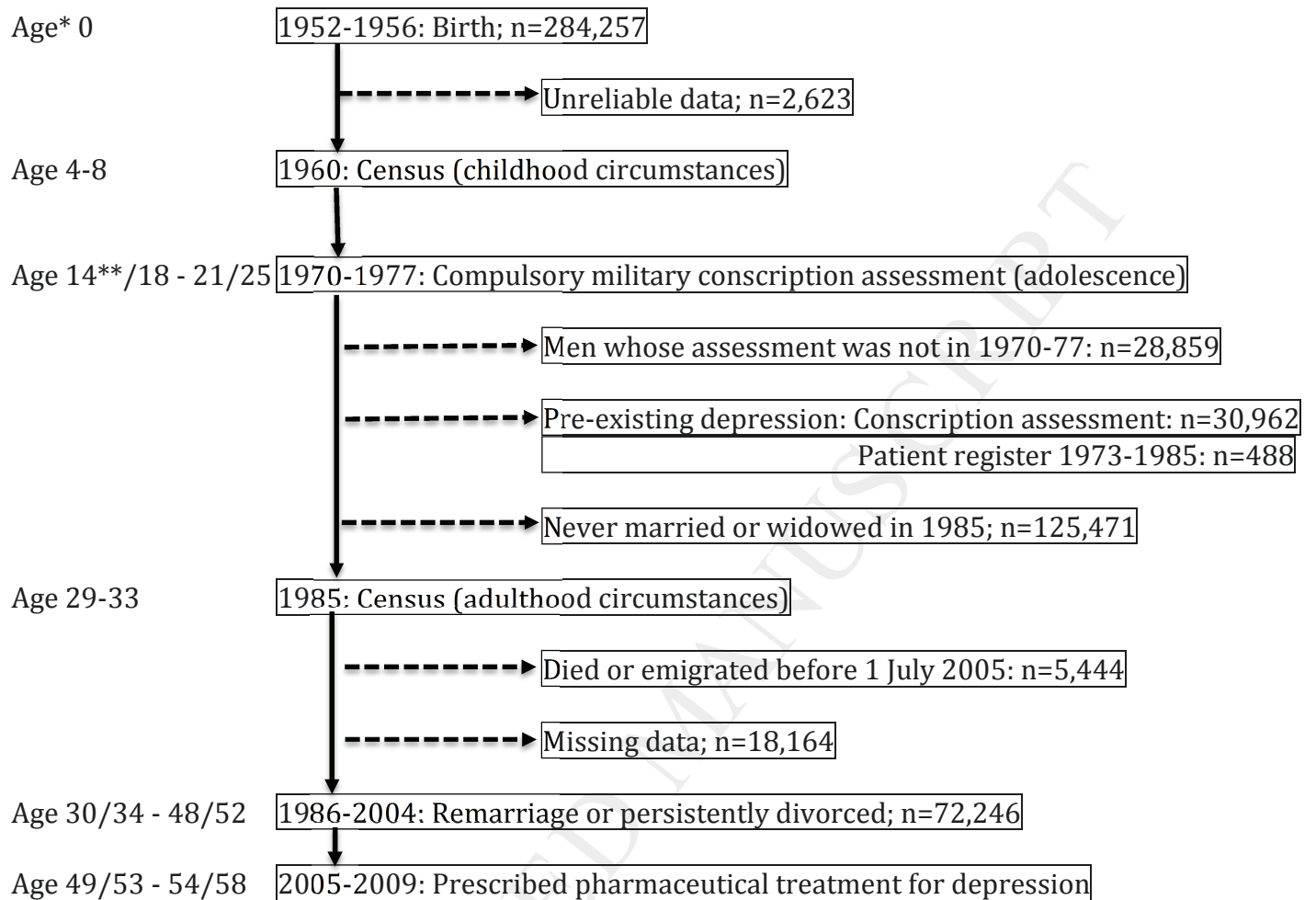
n=72,246

Model 1: Parent's socioeconomic position, residential area in 1985, birth year and depression diagnosis in 1985-2004 were entered in the model.

Model 2: Stress resilience, cognitive function, physical function, and disease summary score at adolescence were added to Model 1.

Model 3: Social class and income were added to Model 2.

Figure 1



*Age in this figure is calculated based on the age on 1 January of a given year

**The minimum age at conscription assessment is 16 years in the sample analysed.

HIGHLIGHTS

- Depression risk in remarried men compared with divorced men has been understudied
- Remarried men were more advantaged prior to remarriage than divorced men
- Depression medication risk was higher in remarried men than divorced men