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# Risk of Major Depressive Episodes After Separation: The Gender-Specific Contribution of the Income and Support Lost Through Union Dissolution

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**Abstract** Marital status and union dissolution are strongly associated with health. Separated men and women have a mental health disadvantage compared to partnered individuals. The lower financial and social resources of separated individuals partly explained their poorer health. However, it is unclear whether this association is due to the loss in income and support precisely experienced through the separation. Due to the frequent asymmetry in partners' individual resources within couples, these losses are gender-specific, giving rise to a debate currently in France. As part of this debate, we explored to what extent gender-specific losses contribute to the separation/mental health association. We used the two-wave survey "Health and Occupational Trajectories," looking at 7321 individuals aged 25–74 in couple in 2006. We analyzed their depressive symptoms self-reported at second wave (2010) and their association with separation between the two waves; we took into account the concomitant social and income changes, as well as the socioeconomic and health situation in 2006. Separation between 2006 and 2010 is significantly associated with depressive symptoms in 2010, independently of the situation in 2006; it is associated with a loss of income, mainly in women, and a loss of support,

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slightly more pronounced in men. Nested logistic models indicate that the loss of support explained 5.5% of the separation/mental health association in men; the loss of income explained 19.2% of it in women. In France, an economic penalty of separation still primarily affects women and substantially contributes to the mental health vulnerability of newly separated women.

**Keywords** Mental health · Gender · Union dissolution · Socioeconomic determinants · France

## 1 Introduction

Over recent decades, there has been a profound change in partnership transitions over the life course, with a substantial increase in union dissolutions in many countries (Amato 2010). Although the increase seems to be leveling off, the rate of separations (marriages and non-marital unions) remains high. In France, the administration recorded 44 divorces for every 100 marriages in 2014. Many newly separated partners are exposed to the multidimensional consequences of separation, relating to health, wellbeing, financial resources and social network (Amato 2010).

Numerous studies on the health disadvantage of people who have separated show that the health disadvantage of separated men and women is partly explained by their lower socioeconomic resources, in terms of living standard and social support, compared to people in a union. However, it remains unclear whether this association is due to a selection effect of couples with lower resources into separation, or whether the loss of resources experienced at the time of separation contributes to increased health risks, irrespective of the level of resources prior to separation.

From a public policy perspective, it is important to identify and characterize the potential vulnerability that may be triggered by separation, and that potentially mediates the health consequences of separation. This is particularly important given that the health disadvantage of separated men and women, together with the increase in their percentage in the French population over recent decades, seems to have contributed significantly to the increase in depressive symptoms in France (Pan Ké Shon and Duthé 2013). Moreover, partners are not equally exposed to the consequences of separation. The frequent specialization of each partner into work (most often men) and family (most often women) produces asymmetry in their individual social support and economic resources.

The asymmetry becomes visible upon separation, which leaves each partner with only his or her own resources. The payment of alimony, in the case of divorce only, usually does not fully offset the economic loss. Due to the slower progress of gender equality in the labor market in recent decades, both in France and in other countries (European Union 2017; Ponthieux and Meurs 2015), the asymmetry between partners persists: in the early 2010s, three out of four French women in working-age couples earned less than their partner, and the asymmetry increased with the presence of children in the household (Morin 2014; Tsang et al. 2014). This is one reason for the ongoing debate in France on the gender-specific cost of separation,

involving issues such as how to offset the asymmetry of partners' incomes after separation or to limit it before separation (Fragonard et al. 2016; Bourreau-Dubois and Doriat-Duban 2016; Leroyer 2016; Jeandidier 2016).

As part of this debate, our study aims to analyze whether separation is associated with mental health issues, because some resources are lost through separation. We make the assumption that:

(1) the association of separation, poor health and low resources is not only explained by the fact that separation occurs more often among couples with low resources, but that separation coincides with a change in the resources that itself impacts the mental health of the separated men and women;
(2) Women experience the health consequences of income loss to a greater extent than men, because women experience such loss through separation more frequently; in contrast, men are more disadvantaged than women by a loss in social support through separation.

Using a two-wave survey (2006 and 2010), we carry out a longitudinal analysis of the mental health risk in 2010 of partners who separated between the two waves. The objective is to assess whether and to what extent the association between separation and mental health is potentially mediated by the gendered loss of resources experienced through union dissolution.

## 2 Background

### 2.1 Partnership Status, Union Dissolution and Mental Health

Marital status in general, and being divorced/separated in particular, is linked to disease, disability and mortality. The evidence is not new (Berkson 1962; Gove 1973; Zick and Smith 1991), but as the rate of divorce/separation remains high, its association with health has attracted substantial attention (Hughes and Waite 2009; Arcaleni 2012; Grundy and Tomassini 2010; Zhang and Hayward 2006; Pienta et al. 2000; Tamborini et al. 2016; Ploubidis et al. 2015; Robards et al. 2012; Shor et al. 2012; Philipov and Scherbov 2016). With specific regard to mental health, studies have shown that separations are associated with more depression, poorer self-perceived health and greater unhappiness or unhealthy behaviors, with different symptoms for men and women (Williams 2003; Strohschein et al. 2005; Gardner and Oswald 2006; Marks and Lambert 1998; Simon 2002; Williams and Dunne-Bryant 2006; Scott et al. 2010).

One specific point of interest is the varying magnitude of the health disadvantage of separated individuals across genders and cohorts and by duration of the dissolved union (Shor et al. 2012; Liu 2012). Mental health risks are also modified by the number of unions formed and dissolved over a lifetime (Demey et al. 2014; Grundy and Holt 2000). Furthermore, the mental health of people who separate starts to decline in the preceding 2–3 years, reaching a low point at dissolution and then improving over the next few years (Booth and Amato 1991; Simon 2002; Gardner

and Oswald 2006; Blekesaune 2008; Wade and Pevalin 2004; Metsä-Simola and Martikainen 2013; Amato 2010). Some studies have found that the effect of dissolution persists over the longer term (Johnson and Wu 2002; Lorenz et al. 2006; Hughes and Waite 2009).

The health disadvantage of separated men and women might be explained by the fact that union dissolution occurs in couples characterized by factors relating to poor health. And poor health itself increases the probability of separating and lowers the probability of re-partnering (Lillard and Panis 1996). However, the health disadvantage of separated men and women might be also attributable to the loss of certain health-related benefits of living in a union, experienced through separation (Wade and Pevalin 2004; Breslau et al. 2011; Monden and Uunk 2013; Lillard and Panis 1996; Williams and Umberson 2004; Robards et al. 2012; Lillard and Waite 1995). We are particularly interested in this factor, and in how the losses of such benefits, experienced at the precise moment of separation, contribute to health risks. Existing studies have only provided partial results so far.

### 2.2 Health Benefits of Being in a Union and Losses Associated with Separation

Being in a union seems to reduce partners' unhealthy behaviors, for instance due to social control or a better standard of living (Tamers et al. 2014; Lee et al. 2005; Umberson 1987). More generally, the health benefits of living in a union are attributable to better living conditions and a larger social network, known to be positively related to health. Living in a union provides better living conditions thanks to pooled financial resources and shared expenses, as well as pooled social resources (network) and shared family/domestic responsibilities (Browning et al. 2014). So, not surprisingly, union dissolution is often accompanied by a decline in social resources and in living standards, or even a slide into poverty, which occurs less frequently in men (Avellar and Smock 2005; Andreß and Bröckel 2007; Aassve et al. 2007; Bonnet et al. 2015a; McManus and DiPrete 2001).

Women are more affected by a decline in living standards. The literature on the economic consequences of divorce is extensive (Bonnet et al. 2015b). To sum it up, it emphasizes the gendered economic consequences of union dissolution, generally showing a worsening of women's living standards after separation. The magnitude of the decrease ranges from 10% to 40% (Duncan and Hoffman 1985; Bianchi et al. 1999; Holden and Smock 1991; McKeever and Wolfinger 2001). In France it ranges between 20 and 30% (Uunk 2004; Bonnet et al. 2015b). For men, the debate focuses more on the sign of the variation in income than on its magnitude. Most studies found a significant improvement in living standards following divorce, yet with large variations (Finnie 1993; Bianchi et al. 1999; Smock 1993, 1994). Some studies found stability (Jarvis and Jenkins 1999; Poortman 2000; Kalmijn and Alessie 2008), and a few found a deterioration (Burkhauser et al. 1991; McManus and DiPrete 2001; Jauneau and Raynaud 2009). According to Bonnet et al. (2015a), marital specialization constitutes the main driver of the decrease in adjusted income following separation induced in women, related to a smaller investment in paid work than their male partners (Goffman 1977; Ponthieux and Schreiber 2006;

Fontaine and Stehlé 2014; Avellar and Smock 2005; Pailhé et al. 2013; Anxo et al. 2011). Low income and economic difficulties are associated with poor health (Marmot 2002; Ennis et al. 2000); so we expect the financial losses caused by separation to specifically mediate the impact of separation on health risks after separation, and probably to a greater extent for women.

In addition to the financial benefits, living in a union also tends to enlarge the partners' social network. However, several studies have suggested that men and women do not have the same sources of support; they are varied for women, but more limited for men and sometimes restricted only to their partner (Antonucci and Hiroko 1987; Matud et al. 2003; Bookwala et al. 2014). Separation therefore tends to modify the separated partners' social network, especially for men; it becomes smaller for the non-custodial parent, generally the father, due to the weakening of links with the children (Régnier-Loilier 2013; Kalmijn 2007, 2015; Lye et al. 1995). Lack of social support is strongly associated with poor health (Fuhrer et al. 1999; Okechukwu et al. 2012; Berkman et al. 2015; Melchior et al. 2003; Kawachi and Berkman 2001). Furthermore, after a separation, the support provided by the social network may attenuate the emotional consequences as well as the strain in daily organization or the economic hardship of separated partners, especially for single parents (Okechukwu et al. 2012; Berkman et al. 2015). Separation may thus cut off sources of support at a time of potentially greater need. We expect changes in social support to mediate the health consequences of separation; due to gender differences in social networks, however, the mediating effect might be stronger in men.

### 2.3 Socioeconomic Factors and the Health Disadvantage of Separated Men and Women

Several studies have shown that differences in socioeconomic resources explain the health differences of partnered and separated individuals. Financial wellbeing contributes to the mortality advantage of married women, but not men (Lillard and Waite 1995; Zick and Smith 1991); Lillard and colleagues also tested the effect of social support (presence of other adults within the household), but did not find significant results. The larger social network explained the mental health advantage of partnered men over single men, with a larger effect for widowed compared to separated men (Bookwala et al. 2014; Hewitt et al. 2012). Based on a cohort of North American women followed in the 1980 and 1990s, La Pierre found that the poorer mental health of separated/divorced women compared to women living with a partner was partly mediated by a lower living standard, fewer social activities and lower self-esteem (LaPierre 2012).

These studies showed that people who separate and people who remain in a union are significantly different in terms of their financial and social resources. However, they did not show whether this difference is attributable to the initial socioeconomic disadvantage of the couples that break up or whether it is attributable to the losses encountered when separating. In our study, we assess this pattern to better understand the gender-specific determinants of the health disadvantage of separated men and women in the French context, looking at the asymmetry of their losses of financial resources and social support.

## 3 Data and Methods

### 3.1 Data Source

Our analysis used the two waves (2006 and 2010) of the survey on "Health and Occupational Trajectories" (*Santé et itinéraire professionnel*, SIP) conducted in France by the French statistical institute (INSEE). It covers a representative sample of the French population[1] aged 20–74 years living in a private household. The survey recorded 76% completed interviews of the initially expected sample: most of the failures were due to wrong addresses or non-eligible households (*e.g.,* no members in the age range) (Bahu et al. 2012). The 2006 wave ($N$ = 13,648) yielded information on health and partnership status and used the event history grid method to record data on partnership history and past health events. In 2010, almost 81% of the full 2006 sample was interviewed again ($N$ = 11,016) (see Sect. 5 for losses to follow-up); the weighting provided in the dataset corrected for the non-participants in 2006 (based on general sociodemographic variables) as well as for attrition between the two waves (based on sociodemographic and self-rated health information collected at the first wave). The 2010 questionnaire was identical to that of the first wave, with supplementary questions on events that had occurred since 2006, including union dissolution. Our study population, aged 25 and above in 2006, included 5637 women and 4659 men who were surveyed in both the 2006 and 2010 waves with non-missing data for educational level. We excluded students and apprentices whose personal financial resources were difficult to evaluate. We also excluded the rare cases of men and women who were widowed between 2006 and 2010, to focus on the mental health impact of separation compared with those who remained in a couple. From this population, we selected the 3743 men and 3578 women who reported being in a union in 2006 to observe union dissolutions over the two waves (135 in men and 205 in women), their association with major depressive episodes (MDE) in 2006 and in 2010, as well as changes in income and social support.

### 3.2 Measures

*Mental health* was assessed using the "Mini International Neuropsychiatric Interview" (Sheehan et al. 1998; Amorim et al. 1998), a non-clinical questionnaire used to detect MDE through self-reported symptoms in the previous two weeks. It includes two screening questions followed by seven questions on other symptoms (see Appendix Box A1). MDE is diagnosed if there are at least four positive answers to these seven questions. We used this indicator for 2006 (MDE2006) and for 2010 (MDE2010).

[1] With the exception of the French overseas territories.

*Union Status in 2006 and Past Unions* In the survey, respondents were defined as in a union if they reported having either a cohabiting or a non-cohabiting intimate partner with whom they have a child or with whom they have been in a relationship for at least 1 year.[2] Marital status is not documented in the questionnaire to further qualify the union, so it is not possible to distinguish between married or unmarried unions; due to this limitation, we cannot assess the specific impact of marital status on the separation, although some differences may be found in married and unmarried couples (see Sect. 5). Based on this definition, the persons surveyed reported their union status in 2006, and also their past unions (with start and end dates) in the life event history grid. So we also took into account the number of unions prior to the current union, where one was reported in 2006, as the literature indicated a positive association with poor health. We also considered the duration of the union reported in 2006 to see whether the length of the broken union was relevant.

*Union Dissolution Between 2006 and 2010* Of the persons in a union in 2006, 205 women and 135 men reported its dissolution between the waves. Too few separated persons had re-partnered by 2010 (30 women and 36 men) to consider this variable in the analyses. For those who had separated, we assessed the time since the dissolution between the two waves (centered on the mean and set at 0 if there was no dissolution) to assess whether the association with poor health diminishes with time.

*Financial Resources and Changes Between 2006 and 2010* Household income was self-reported and included wages and earnings, social benefits, income from savings and child support received.[3] Missing household incomes in 2006 (277 persons) or in 2010 (276 persons) were estimated with linear regression (using gender, age, employment status, level of education, occupational class and household composition). Where separation had occurred, we corrected the 2010 income of non-custodial parents (53 men and 44 women) by subtracting child support payments, which were not documented in the survey, to avoid overestimating their financial resources; we also tested the models without correction. We computed the level of

[2] Definition of union includes non-cohabiting unions (due to job constraints, recent union, re-partnership, family constraints, etc.), which cannot be identified in this survey. In France, couples in this situation, known as LAT (Living Apart Together), represented less than 10% of people aged 21–50 years old in 2005, and 29% of them had been in this union for less than 1 year and were therefore not counted as being in a union according to the definition used for this survey (Régnier-Loilier et al. 2009). The way in which LAT partners' living standards might change after a separation could be very different across LAT situations; however, compared with cohabiting couples, changes after separation might be smaller because the LAT arrangement results in fewer economies of scale for the couple.

[3] Although self-reported, we consider this measure of income as objective, in line with the literature presented in the background section. It may have been interesting to use subjective measures (such as economic well-being or difficulties making ends meet), as these might differ from objective ones, especially in the case of separation. Such variables are not available in the survey we used. Moreover, from a public policy perspective, if we highlight some associations between a decrease in adjusted income and the worsening of mental health, this clears the way for public interventions to moderate the income decrease following separation to avoid mental health deterioration.

child support payments based on the person's income in 2010 and the number of children in 2006.[4]

To take into account family size and the loss of economies of scale following separation, we use an adjusted household income, dividing household income by the number of consumption units.[5]

We used quartiles to describe the income situation of our population in 2006. However, to account for income levels in 2006 in the regression analysis and to account for income change between 2006 and 2010, we used adjusted income (continuous variable). For income changes, we used a binary variable: increase in adjusted income (which was the most frequent situation) versus stagnation or decrease in adjusted income (we also tested the binary variable "increase or stagnation" versus "decrease").

*Loss of Emotional and Material Support Between 2006 and 2010* We identified loss of emotional support between 2006 and 2010 in two steps. First, we identified lack of emotional support in 2006 and again in 2010: those who reported either that "there is no one [they] can count on to discuss personal matters or to make a difficult decision" or that they "need more of this type of help than [they] get." Second, loss of emotional support between 2006 and 2010 was defined as "lack of emotional support in 2010 but not in 2006", a binary variable for loss of support in those who did not lack support before separating. Unfortunately, with these questions, it was not possible to measure any decrease in the quantity or quality of support in those who were already lacking support in 2006 (see Sect. 5). Using the same two-step process, we defined loss of material support between 2006 and 2010: first, we identified those who reported either that "Apart from [their] partner, there is no one [they] can count on to look after the children, do odd jobs or gardening, or lend [them] something [they] need" or that they "need more of this kind of help"; second, loss of material support between 2006 and 2010 corresponds to "lack of material support in 2010 but not in 2006."

*Sociodemographic and Past Health Variables* Mental health is strongly linked with sociodemographic variables and with general health status; these last two may therefore interact in the links between mental health and union dissolution (Demey et al. 2014). Our analyses controlled for age and age squared, number of children in the household in 2006, educational level (primary/lower secondary, upper/post-secondary, tertiary) and employment status in 2006 (employed, unemployed, retired, inactive). For employment, we tested a dynamic variable to account for changes in employment status after separation, such as inactive women entering the labor market in France (Bonnet et al. 2010); however, the results were not conclusive due to large confidence intervals (see Sect. 5). With regard to general health status, we used the number of self-reported current health problems in 2006

[4] The amount was determined from the 2010 reference tables for setting child support payments (Ministère de la justice et des libertés, Direction des affaires civiles et du sceau).

[5] We use the OECD-modified equivalence scale. This scale assigns a value of 1 to the household head, 0.5 to each additional adult member or child aged 14 and over and 0.3 to each younger child.

and past health problems, and whether or not the individuals reported "any adverse health event in childhood."

### 3.3 Empirical Strategy

Our objective was twofold: to identify the association between the risk of MDE2010 and separation between 2006 and 2010, and to assess to what extent the coefficient measuring the "separation/MDE association" is modified when accounting for covariates such as income change or loss of support. Income change and loss of support are considered to be related to separation and to contribute to the separation/MDE association; the total effect of separation can be broken down into the direct effect of separation and its indirect effect, through income and support changes (Fig. 1).

Measuring direct and indirect effects is straightforward when using linear regression models; the coefficients of separation in two models—the first without and the second with the mediating variables—can be directly compared. In nonlinear models, such as logit models, the coefficients of each model depend on the variance of the residual, which differs when a new variable is introduced (corresponding to the extent to which the mediating variable and the explanatory variable are associated). Comparing the change in the coefficients of two nonlinear models can therefore be misleading (Mood 2010; Karlson et al. 2012). The Karlson, Holm and Breen (KHB) method proposes nested models and enables comparison of the coefficients (Stata command "khb") (Karlson et al. 2012; Kohler et al. 2011). Box 1 details the implementation of the method. Model 1 regresses MDE2010 on separation and covariate variables, but not on income and support changes, and comprises the residuals obtained from the "intermediate equation": the intermediate equations regress the risk of income loss and support loss on separation, to check the

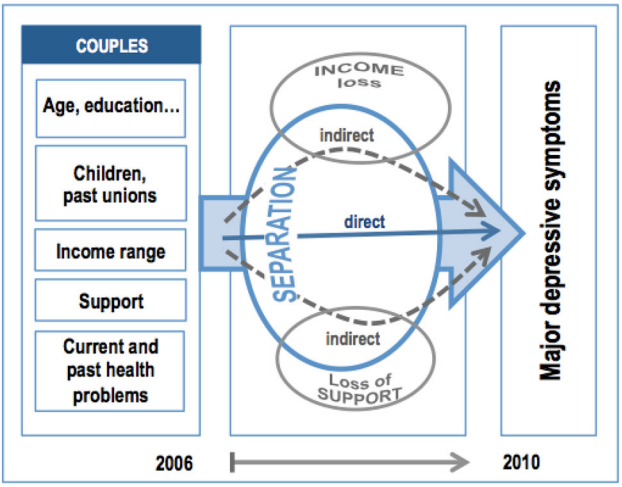



**Fig. 1** Model on the association between mental health and separation and the mediating effect of income and social support losses concomitant to separation

necessary significance of the relationship between union dissolution and the mediators, and to provide the residual to be included in Model 1. Model 1 estimates the "total effect of separation" in the separation/MDE association. Model 2, the full model, introduces the mediating variables to provide the direct effect of separation in the separation/MDE association, net of the effect of the mediating variables. The KHB method breaks down the total effect obtained in Model 1 into the direct effect of separation and the indirect effect of the mediating variables, controlling for the statistical significance of these direct and indirect effects.

In our study, the intermediate equations showed a weak link between separation and loss of emotional support (significant only in men) and no association between dissolution and loss of material support; so loss of material support cannot be considered a mediating variable (see Online supplementary material Table S1).

Note that only the date of the separation occurring between the two survey waves is known. We do not have the dates of the loss of support or income or of the onset of depressive symptoms. The models were mainly based on the hypothesis that the separation had led to the change in resources. However, the causal relationship may be the reverse: a decrease in financial and social resources may have preceded the separation. Therefore, our results actually describe how union dissolution and losses of income or support have a synergic effect on the risk of MDE2010. To check the robustness of our results, we also estimated models designed using the reverse causation hypothesis: assuming that union dissolution was induced by a loss of income and loss of support to assess whether it mediated the respective impact of these losses on MDE2010. The results are commented on in Sect. 5.

In the results section below, we begin by presenting our study population, men and women in partnerships in 2006, and those of them who separated between 2006 and 2010. Next, we present the results of our nested models, Model 1 and Model 2. These models show the association between MDE2010 and separation, and sociodemographic characteristics; they show the changes in the coefficient (and odds ratios) of separation when accounting for the mediating variables. Finally, we present the direct and indirect effects of separation as a percentage contribution to the total MDE/separation association.

## 4 Results

### 4.1 Partnership Status, Number of Past Partnerships and Mental Health

In the population aged 25–74 years surveyed both in 2006 and 2010, fewer women reported living in a partnership than men in 2006 (74 vs. 80%). Of those in couples, 6% of women and 5% of men separated between the two survey waves.

Table 1 compares the characteristics of the men and women in couples in 2006 and, of those, the men and women who had separated by 2010. Regarding mental health, 7% of women and 3% of men reported MDE in 2006; it was 7 and 4%, respectively, in 2010. The prevalence of MDE was higher in those who had separated by 2010. More specifically, the onset of MDE (no MDE in 2006 but MDE in 2010) was much more frequent in those who separated; note that recovery (MDE

**Table 1** Numbers and weighted distribution of women and men in a partnership in 2006, for all and for those who separated, age 25–79 (between 2006 and 2010)

| In partnership in 2006 | Women | | Men | |
|---|---|---|---|---|
| | All ($N$ = 3743) % | Separated ($N$ = 205) % | All ($N$ = 3578) % | Separated ($N$ = 135) % |
| Union dissolution | 6 | – | 5 | – |
| MDE in 2006 | 7 | 9 | 3 | 4 |
| MDE in 2010 | 7 | 12 | 4 | 11 |
| Change in MDE: | | | | |
| - No MDE (2006 or 2010) | 88 | 82 | 94 | 85 |
| - MDE in 2006, no MDE in 2010 | 5 | 6 | 2 | 4 |
| - No MDE in 2006, MDE in 2010 | 5 | 9 | 3 | 11 |
| - MDE 2006 and 2010 | 2 | 3 | 1 | 0 |
| Lack of emotional support 2006 | 22 | 35 | 19 | 27 |
| Loss of emotional support 2006–2010 | 10 | 14 | 9 | 17 |
| Lack of material support 2006 | 34 | 38 | 26 | 21 |
| Loss of material support 2006–2010 | 18 | 15 | 14 | 17 |
| Adjusted income in 2006: | | | | |
| - Lowest Q1 | 26 | 36 | 24 | 22 |
| - Q2 | 26 | 22 | 25 | 22 |
| - Q3 | 25 | 26 | 26 | 24 |
| - Highest Q4 | 23 | 16 | 26 | 31 |
| Change in adjusted income: | | | | |
| - Stable | 16 | 6 | 19 | 3 |
| - Increase | 52 | 34 | 52 | 64 |
| - Decline | 32 | 60 | 29 | 33 |
| Number of cohabiting children in 2006: | | | | |
| - 0 | 43 | 31 | 44 | 36 |
| - 1 | 23 | 26 | 23 | 27 |
| - 2 | 24 | 26 | 23 | 30 |
| - 3 | 10 | 16 | 9 | 6 |
| Employment in 2006: | | | | |
| - Employed | 62 | 73 | 71 | 88 |
| - Unemployed | 7 | 11 | 4 | 8 |
| - Retired | 16 | 1 | 23 | 3 |
| - Inactive | 15 | 15 | 3 | 1 |
| Educational level in 2006: | | | | |
| - Low | 27 | 17 | 27 | 11 |
| - Middle | 44 | 43 | 50 | 54 |
| - High | 29 | 40 | 23 | 35 |
| Age group in 2006: | | | | |
| - 25–34 | 21 | 41 | 18 | 36 |
| - 35–44 | 25 | 37 | 26 | 40 |

**Table 1** continued

| In partnership in 2006 | Women | | Men | |
|---|---|---|---|---|
| | All ($N$ = 3743) % | Separated ($N$ = 205) % | All ($N$ = 3578) % | Separated ($N$ = 135) % |
| - 45–54 | 25 | 15 | 23 | 18 |
| - 55–64 | 18 | 7 | 21 | 5 |
| - 65–74 | 11 | 0 | 12 | 1 |
| Current health problems in 2006 | 39 | 36 | 37 | 30 |
| Health problems before 2006 | 16 | 17 | 14 | 9 |
| Adverse health event/s in childhood | 8 | 9 | 8 | 8 |
| | Average | Average | Average | Average |
| Duration of the union | 23.0 | 13.1 | 22.4 | 12.6 |
| Number of unions prior to current one | 0.2 | 0.5 | 0.2 | 0.3 |

in 2006, but not in 2010) was also more frequent in those who separated, but relatively uncommon.

The separated men and women were, on average, younger, which partly explains their sociodemographic characteristics (Table 1). Women who separated between the two waves were more often in the lowest adjusted income quartile initially. Between the two waves, the living standard of separated individuals was less likely to increase and more likely to decrease, compared to all the partners in 2006. However, the data highlight a massive difference between men and women: 34% of separated women versus 60% of separated men experienced an upward change in their income between 2006 and 2010, and 60% of separated women versus 33% of separated men experienced a decrease. Of those who did not report a lack of support in 2006, separated men and women were more likely than all partners to have lost emotional support; men slightly more than women.

### 4.2 Union Dissolution and the Risk of MDE in 2010

Model 1 showed that separation experienced between 2006 and 2010 significantly increased the risk of reporting MDE2010, even when adjusting for covariates, including poor mental health in 2006 or prior to 2006 (Table 2). Reporting MDE in 2006, as well as other past or current health problems, strongly predicted the reporting of such symptoms in 2010 for both men and women. The number of unions prior to the one reported in 2006 predicted MDE2010 in women only. Women with a high level of education were less likely than women with a low level of education to report MDE2010. In men, the number of cohabiting children and an employment status of inactive (other than retired) in 2006 predicted MDE2010. Time since separation protected separated men from reporting MDE in 2010, suggesting a decreasing effect of separation with time in men only. Neither the

**Table 2** Odds ratios of MDE2010 associated with separation based on nested logistic models without (Model 1) and with (Model 2) the introduction of loss of income and loss of support in men and women in a union in 2006

| | Women | | Men | |
|---|---|---|---|---|
| | Model 1 | Model 2 | Model 1 | Model 2 |
| Total and direct effects of separation | Total | Direct | Total | Direct |
| | 1.8** | 1.6 | 3.9*** | 3.7*** |
| Changes in income and support (2006–2010): | | | | |
| Income decline or stagnation versus increase | – | 1.6** | – | 1.2 |
| Loss of emotional support (Yes vs. No) | – | 2.2** | – | 2.3** |
| Covariates: | | | | |
| Time since separation (continuous) | 1.1 | 1.1 | 0.6* | 0.6* |
| MDE2006 (Yes vs. No) | 6.3*** | 5.8*** | 6.4*** | 5.9*** |
| Income in 2006 (cont.) | 1.0 | 1.0 | 1.0 | 1.0 |
| Duration of the broken union (cont.) | 1.0 | 1.0 | 1.0 | 1.0 |
| Number of unions prior to 2006 union (cont.) | 1.3* | 1.3* | 0.9 | 0.9 |
| Number of cohabiting children in 2006 (cont.) | 1.0 | 1.0 | 1.3*** | 1.3*** |
| Unemployed versus Employed in 2006 | 0.9 | 0.9 | 2.2 | 2,2 |
| Retired versus Employed in 2006 | 1.1 | 1.1 | 0.9 | 0,9 |
| Inactive versus Employed in 2006 | 0.9 | 0.9 | 2.8*** | 2.8*** |
| Middle level of education versus low level | 1.0 | 1.0 | 0.9 | 0.9 |
| High level of education versus low level | 0.5*** | 0.5** | 0.7 | 0.7 |
| Age in 2006 (cont.) | 1.0 | 1.1 | 1.1 | 1.1 |
| Age squared | 1.0 | 1.0 | 1.0 | 1.0 |
| Number of current health problems in 2006 (cont.) | 1.3*** | 1.2*** | 1.3*** | 1..3*** |
| Number of health problems before 2006 (cont.) | 1.0 | 1.0 | 1.4** | 1.4** |
| Adverse health event/s as child (Yes vs. No) | 1.9*** | 1.7*** | 2.1** | 2.2** |
| *N* | 3743 | | 3578 | |

Statistically significant at the level ***$p < 1\%$; **$p < 5\%$; *$p < 10\%$ (two tailed test)

Model 1: Nested logistic regression of the risk of MDE2010 providing the total effect of separation, i.e., without the variables of changes in income and support between 2006 and 2010 (but including the residuals) (see Box 1). Model 2: Nested logistic regression of the risk of MDE2010 providing the direct effect of separation, i.e., considering the indirect effect of variables of changes in income and support between 2006 and 2010

duration of the broken union, income in 2006 nor age was associated with MDE2010 in men or women.

When introducing changes in income and support concomitant to the separation in Model 2, the association between MDE2010 and separation remained significant in men, but not in women: both these changes were significantly related to MDE2010 in women, and only loss of support was related to MDE2010 in men.

**Box 1** Analysis of the contribution of socioeconomic changes to the link between union dissolution and mental health: the implementation of the KHB method

The Karlson, Holm and Breen (KHB) method (Stata command "khb"), developed to compare estimated coefficients of two nested logit models, involves 3 stages (Karlson et al. 2012, Kohler et al. 2011):

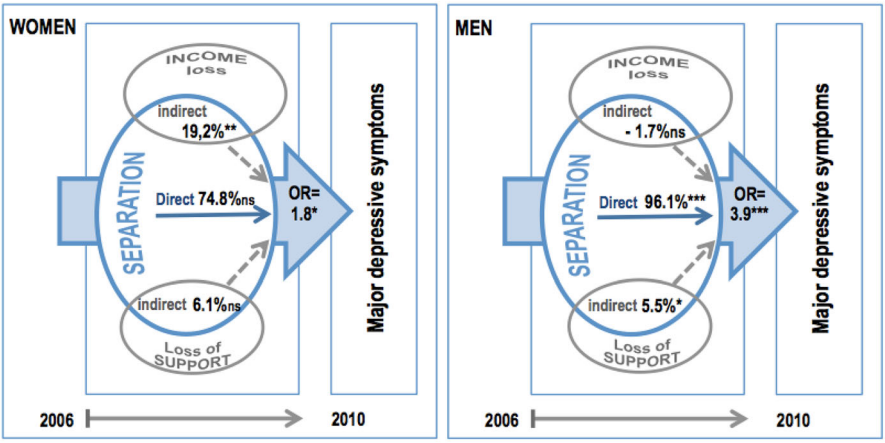
- Intermediate equations are used to estimate the coefficients of union dissolution in estimating the probability of experiencing changes in income or in social support, considered possible mediators of the dissolution/MDE association (with adjustment for other control variables). This stage checks that these associations are significant, a necessary step before pursuing the investigation. The residuals of these intermediate equations correspond to the proportion of socioeconomic changes not explained by the dissolution
- First, Model 1 estimates the coefficient of dissolution on the risk of MDE2010 (corresponding to the total effect of dissolution in the dissolution/MDE association), without the variables of changes, but introducing the residuals obtained using the intermediate equations (adjustment for control variables)
- Second, Model 2 estimates the coefficient of dissolution on the risks of MDE2010, including the mediating variables (with adjustment for control variables)

The extent of the contribution of each of the mediating variables is the product of the coefficient that relates it to dissolution (stage 1) and of the coefficient that relates it to MDE2010 (stage 3). It is expressed as a percentage of the total effect of dissolution on MDE2010 (stage 2)

### 4.3 Contribution of Resource Changes to the Health Risks Associated with Separation

A decline or stagnation in living standard over the period significantly contributed to the separation/MDE association in women, while the models also showed that income level in 2006 was not related to MDE2010. Loss of emotional support, in those who were not lacking support in 2006, significantly contributed to the separation/MDE association in men, while supplementary analyses have shown that not lacking support in 2006 reduced MDE2010 (see Online Supplementary Material Table S2). In women, the mediating effect of a decline/stagnation in adjusted income was 19% of the total separation/MDE association; the contribution of loss of emotional support was smaller and non-significant. We cannot determine the sequence of changes between 2006 and 2010; so the models show that if none of the separated women experienced any decline/stagnation in their living standard over the period of separation, the separation/MDE association would be reduced by 19% (accounting for the initial health and socioeconomic characteristics of the separated women). Finally, in women, the direct effect of separation on the separation/MDE association is not significant when accounting for decline in living standard and loss of emotional support.

In men, both the total and direct effects of separation were significant; the separation/MDE association was modestly but significantly mediated by loss of emotional support (5.5%). In other words, if none of the separated men (not lacking support in 2006) experienced loss of support, the separation/MDE2010 association would be reduced by 5.5% (accounting for the initial health and socioeconomic characteristics of the separated men). These results remain robust irrespective of the




*For women in a union in 2006, the total risk of MDE2010 is significantly increased by union dissolution between 2006 and 2010 (OR = 1.8*): the total risk is mediated significantly by the loss of income (indirect risk = 19.2% of the total risks) and not significantly by the loss of support (6.1%). Statistically significant at the level *** p < 1%; ** p < 5%; * p < 10% (two tailed test); ns = not statistically significant. Covariates as in Table 2*

**Fig. 2** Contribution of loss of income and loss of support between 2006 and 2010, and direct contribution of the dissolution based on the nested models (adjustment, see covariates in Table 2). Women and men aged 25–79. France 2010

imputation method for child support payments or the measure of decline in living standard (see Online Supplementary material, Tables S3 and S4) (Fig. 2).

## 5 Discussion

### 5.1 Main results

We used a large representative sample of the French household population with detailed information on union history, union dissolution and a large number of control variables, including various past health measures and socioeconomic indicators. Our approach revealed an association between dissolution and MDE2010, independent of MDE2006, in line with the literature and with our hypotheses, and it further allowed us to quantify the synergy between separation and the concomitant loss in resources, which is likely to increase the mental health risks.

As studies have previously shown, we confirmed the gender-specific socioeconomic disadvantage of separated men and women (Poortman 2000; Aassve et al. 2007; Bonnet et al. 2015a) and identify an association with their mental health disadvantage (Hewitt et al. 2012; Lillard and Waite 1995; LaPierre 2012; Zick and Smith 1991). However, we were also able to refine the conclusions. While income level in 2006 was not associated with MDE2010, we found that a decline in financial resources in separated women explains one-fifth of the increased risk of poor mental health (compared to women who remained partnered). This result suggests that the association between mental health, union dissolution and low

income is not so much due to a selection effect of the poorest couples into separation (higher risk of separation among the couples with lowest income): the association mainly exists for women due to the income decline over the period of the separation. We found no significant contribution of income loss in men, whereas separated men have a higher risk of reporting MDE2010 that is partly related to the loss of emotional support concomitant to separation.

Contrary to what might have been expected, especially for women, we found no link between dissolution and loss of material support, due to organizational problems associated with single-parenthood (Okechukwu et al. 2012; Berkman et al. 2015; Bookwala et al. 2014; Struffolino et al. 2016; Lillard and Waite 1995; LaPierre 2012). As described below, our results may be affected by data limitations, which could explain why we did not find the expected associations.

Our results suggest that union dissolution is associated with the risk of depressive symptoms in the following years. The regression also suggests that the MDE2010 probability, for men only, decreases with time since separation within the 4-year period and increases with the number of cohabiting children; for women, it increases with the number of past unions; yet the duration of the broken union does not seem to matter here, just as other studies have found (Gardner and Oswald 2006; Blekesaune 2008; Booth and Amato 1991; Simon 2002; Williams and Dunne-Bryant 2006; Demey et al. 2014; Lillard and Waite 1995; Williams and Umberson 2004; Lillard and Panis 1996; Grundy and Tomassini 2010; Hewitt et al. 2012; Strohschein et al. 2005).

Because our observation period was limited to the 4 years between the two waves, our results may reflect the short-term health effects of dissolution. We conducted additional analyses on the 2006 sample including single men and women to check the association between a past union and MDE2006 and MDE2010 (within the previous 4 years or longer ago). In these cross-sectional analyses, in accordance with previous studies, we found that always-single men had a higher risk of MDE2010, but it was no more significant when accounting for depressive symptoms in 2006 (Grundy and Tomassini 2010; Pan Ké Shon and Duthé 2013; Wade and Pevalin 2004; Breslau et al. 2011; Monden and Uunk 2013); in women, when accounting for depressive symptoms in 2006, always-single women were even less likely to report depressive symptoms in 2010. This is also consistent with previous results (Demey et al. 2014; Grundy and Holt 2000) and shows heterogeneity among always-single men and women. The additional analyses also demonstrated that single men and women in 2006 who reported a union dissolution prior to 2006 were more at risk of depressive symptoms in 2006, especially for recent dissolution (less than 4 years). These results may confirm that the detrimental effect of past unions on mental health in 2010 diminishes with time, as found with our longitudinal approach for men only: in France, the effect of dissolution might be a short-term rather than long-term one.

### 5.2 Limitations

The major limitation of our data was the lack of information on the timing of socioeconomic changes between the two waves, meaning we could not verify that

they were a consequence of separation. Therefore, unlike the sequence of events assumed in our models, the income and support changes may have preceded the union dissolution. However, the time between the two waves is only 4 years; therefore, for some of the separated men and women, the information collected in 2006 precisely corresponds to their mental health and resources immediately before the separation. Our results may reflect, at least partly, the consequences of separation or the consequences of a troubled partnership situation that resulted in separation and, for some of them, in losses of income and support. However, to further explore this issue, additional model estimations using the KHB method tested a "reverse" model, where income and support losses induced separation; we found evidence, but only for men.[6] For them, separation might also be the result of a loss of support, mediating the association between loss of support and MDE. Separation, loss of support and depressive illness are interwoven processes, as evidenced in studies showing deterioration in mental health preceding separation. As such, we cannot interpret the links observed as being strictly causal, but rather as associations of situations which, in synergy, increase the risk of MDE in separated partners. In other words, the concomitance of union dissolution and loss of support increases mental health risks.

In that sense, our results suggest that other situations could increase or attenuate the health risks associated with union dissolution (age at the time of dissolution, children's age, re-partnering, etc.); however, despite the large sample size, the experience of union dissolution affected a relatively small sample, so further analysis of such situations was impossible. Likewise, we could not analyze further the interaction with social status to identify variations across social classes in terms of the contribution of resources losses to mental health risks. This might have been a way to approach subjective aspects of the economic changes experienced following separation; losing ten percent of adjusted income could have a different meaning and consequences at the top and bottom of the income distribution. Unfortunately, the models testing interactions between the initial income level and income loss between the two waves were not conclusive (confidence intervals were large); neither were the models testing the impact of changing employment status and type of occupation. Similarly, we were unable to identify separately the risk of onset of MDE and the likelihood of recovery (rather than the risk of MDE2010 controlling for MDE2006), due to too few recovery events. Some studies have found that dissolution has a beneficial effect on mental health, particularly when separation puts an end to conflict situations or when it is chosen by the partners (Andreß and Bröckel 2007; Monden and Uunk 2013). We found non-significant associations with recovery, but were unable to determine whether this was the result of sample size or of a non-existent association (type II error). However, our results at this stage are an encouragement to pursue further research using other data sources to explore these different avenues.

As mentioned above, the absence of an association between mental health, union dissolution and loss of material support was unexpected and may result from the criteria used to measure the latter in the survey. They probably do not identify all

[6] Results available from the authors on request.

the relevant dimensions of social support, such as network size and quality of relations (Fuhrer and Stansfeld 2002). Moreover, our results may underestimate the contribution of decreasing support among persons who already reported a lack of support before dissolution, generally women.

Our analysis was also restricted by the fact that we could not distinguish between divorce and non-married union dissolution. Even though specialization is slightly greater in married couples than cohabiting ones, cohabitation has been widespread in France for a long time and unmarried couples are currently quite similar to married ones. However, married partners who divorce can claim spousal alimony to compensate for resource asymmetry before separation. This observation has led to suggestions that spousal alimony following divorce should be extended to all types of separation (Jeandidier 2016).

We must also mention a possible bias related to sample attrition between the two survey waves. We determined that the respondents not followed up in the second wave were on average younger, were mostly men, had experienced more partnerships before 2006 and were more likely to have had an MDE in 2006. Nevertheless, our estimations are based on a satisfactory second wave response rate of over 83% for our specific study population. Moreover, the weighting corrects the bias as much as possible, accounting for health and sociodemographic variables observed at the first wave.

Lastly, we note that the MDE reflects self-reported depressive symptoms experienced very recently (in the 2 weeks before the interview) which may limit the scope of our results, as such episodes are not a diagnosed mental health disorder and we cannot link the onset of MDE specifically to the separation. However, the MDE indicator has been validated and found to be a good predictor of major depressive episodes (Amorim et al. 1998). Self-reported depression, also included in the survey, was considered for analysis, but as it was much less frequent it would have limited the robustness of the results.

## 6 Conclusion

In spite of these limitations, our study yields solid results that are consistent with the existing literature, as well as revealing new findings. Our longitudinal approach confirmed that separation is significantly associated with later mental health risk, at least in the short term, regardless of previous mental health and economic and social status. We also showed that gender-specific losses of resources experienced over the period of separation by separated men and women have a synergic effect with separation, resulting in an increased mental health disadvantage. We identified social determinants of mental health nested in the experience of union dissolution and clarified the contribution of the social support and economic losses more often experienced by separated individuals. For men, dissolution embeds the effect of the loss of social support to which they seem more exposed. For women, separation embeds the effect of economic difficulties on mental health, due to the associated loss of income resources rather than an initial income disadvantage of women who separate.

In conclusion, while separated men are affected, to a moderate extent, by the mental health risks associated with the loss of emotional support they experience

through separation, the economic penalty of union dissolution to which women are largely exposed is likely to increase the mental health vulnerability generally associated with separation. The change in situation of separated women results from the frequent asymmetry of partners' individual incomes, mainly due to their unequal involvement in paid and unpaid work (domestic and family) and aggravated by the fact that mothers are often the custodial parent. As such, our results are in line with discussions in favor of a better equity in partners' own resources (Leroyer 2016) and of policies to promote gender equality in both the labor market and family activities to favor work–life balance (Borrell et al. 2014). This may also help to reduce the "cost of separation", not only in terms of resources but also in terms of mental health.

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## Appendix

**Box A1** Symptoms identifying a major depressive episode according to the Mini International Neuropsychiatric Interview (MINI) and included in the questionnaire used in the SIP (Santé et Itinéraire Professionnel) survey

Symptômes nécessaires (filtres) :

1. *« Au cours des deux dernières semaines, vous êtes-vous senti(e) particulièrement triste, cafardeux(se), déprimé(e), la plupart du temps au cours de la journée, et ce, presque tous les jours ? »*
2. *« Au cours des deux dernières semaines, avez-vous eu presque tout le temps le sentiment de n'avoir plus goût à rien, d'avoir perdu l'intérêt ou le plaisir pour les choses qui vous plaisent habituellement ? »*

Symptômes supplémentaires :

3. *« Votre appétit a notablement changé, ou vous avez pris du poids ou perdu du poids sans en avoir l'intention (variation au cours du mois de ± 5%, c.à.d. ± 3,5 kg pour une personne de 65 kg) »*
4. *« Vous aviez des problèmes de sommeil presque toutes les nuits (endormissement, réveils nocturnes ou précoces, dormir trop) »*
5. *« Vous parliez ou vous vous déplaciez plus lentement que d'habitude, ou au contraire vous vous sentiez agité(e), et vous aviez du mal à rester en place, presque tous les jours »*
6. *« Vous vous sentiez presque tout le temps fatigué(e), sans énergie, et ce presque tous les jours »*
7. *« Vous vous sentiez sans valeur ou coupable, et ce presque tous les jours »*
8. *« Vous aviez du mal à vous concentrer ou à prendre des décisions, et ce presque tous les jours »*
9. *« Vous avez eu à plusieurs reprises des idées noires (comme penser qu'il vaudrait mieux que soyez mort(e)), ou vous avez pensé à vous faire du mal »*

Key symptoms (screening questions)

1. *Have you been consistently depressed or down, most of the day, nearly every day, for the past 2 weeks?*
2. *In the past 2 weeks, have you been much less interested in most things or much less able to enjoy the things you used to enjoy most of the time?*

Subsidiary symptoms

Over the past 2 weeks, when you felt depressed or uninterested:

3. *Was your appetite decreased or increased nearly every day? Did your weight decrease or increase without trying intentionally (i.e., by ± 5% of body weight or ± 8 lb or ± 3.5 kg, for a 160 lb/ 70 kg person in a month)?*
4. *Did you have trouble sleeping nearly every night (difficulty falling asleep, waking up in the middle of the night, early morning wakening or sleeping excessively)?*
5. *Did you talk or move more slowly than normal or were you fidgety, restless or having trouble sitting still almost every day?*
6. *Did you feel tired or without energy almost every day?*
7. *Did you feel worthless or guilty almost every day?*
8. *Did you have difficulty concentrating or making decisions almost every day?*
9. *Did you repeatedly consider hurting yourself, feel suicidal, or wish that you were dead?*

The survey version (and the English reference) of the MINI (Sheehan et al. 1998)

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