



Job satisfaction developmental trajectories and health: A life course perspective



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ARTICLE INFO

Article history:

Received 7 June 2016

Received in revised form

20 January 2017

Accepted 22 January 2017

Available online 24 January 2017

Keywords:

Job satisfaction

Mental health

Physical health

Life course

ABSTRACT

Understanding the health consequence of job dissatisfaction becomes increasingly important because job insecurity, stress and dissatisfaction have significantly increased in the United States in the last decade. Despite the extensive work in this area, prior studies nonetheless may underestimate the harmful effect of job dissatisfaction due to the cross-sectional nature of their data and sample selection bias. This study applies a life-course approach to more comprehensively examine the relationship between job satisfaction and health. Using data from the NLSY 1979 cohort, we estimate group based job satisfaction trajectories of respondents starting at age 25 and ending at age 39. Four job satisfaction trajectory groups are identified, a consistently high satisfaction group, a downward group, an upward group, and a lowest satisfaction group. We examine the effects of these trajectories on several physical and mental health outcomes of respondents in their early forties. We find membership in the lowest job satisfaction trajectory group to be negatively associated with all five mental health outcomes, supporting the accumulation of risks life course model. Those in the upward job satisfaction trajectory group have similar health outcomes to those in the high job satisfaction trajectory group, supporting the social mobility life course model. Overall, we find the relationship between job satisfaction trajectories and health to be stronger for mental health compared to physical health.

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1. Introduction

Prior research has repeatedly shown job satisfaction to be associated with physical and mental health (Faragher et al., 2005; Nakata et al., 2013; Fischer and Sousa-Poza, 2009; Heslop et al., 2002). A meta-analysis on 485 studies found job satisfaction to be strongly associated with mental health and moderately associated with physical health (Faragher et al., 2005). Recent research has also discovered job satisfaction to influence several biomarkers and anti-inflammatory agents that are related to the immune system (Nakata et al., 2013; Nakata et al., 2010). Job satisfaction's influence over health is not surprising when we consider the substantial amount of time most people spend at work. Dissatisfaction at work can lead to elevated stress levels not to mention an increased strain in individuals' work and family interface (Schieman and Reid, 2009; Schieman et al., 2009). The last few decades have seen numerous technology advances and widespread globalization that have

changed previous job practices and increased job insecurity among workers (Kalleberg, 2011; Bernhardt, 2012; Fullerton and Wallace, 2007; Handel, 2005). This observed rise in job insecurity has been found to negatively affect overall job satisfaction levels (Kalleberg, 2011; Artz and Kaya, 2014; Bell and Blanchflower, 2011). The Great Recession has further contributed to these observed trends, suggesting that overall health and well-being may start to diminish without some sort of policy intervention (Kalleberg, 2011; Ferrie et al., 1999). Therefore, understanding the relationship between job satisfaction and health may be crucial for improving future health conditions.

Although the relationship between job satisfaction and health has been extensively studied, we still know very little about this relationship from a life course perspective. The majority of prior studies on job satisfaction and health are cross-sectional or based on a few recent time points. By neglecting possible additive cumulative effects from multiple experiences of job dissatisfaction these studies may underestimate the relationship between job satisfaction and health, but the incorporation of life course models that account for job satisfaction levels over an extended period of time may help correct for this. Life course models theorize that in order to understand health processes over the life course, we must

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analyze how exposures have accumulated over a lifetime (Haas, 2008). Social inequalities in adult health may be the result of exposures to cumulative disadvantage or stress accumulation during childhood, adolescence, young adulthood, and later adult life (Kuh et al., 2003). Another limitation of previous studies is they tend to only include the working population and as a result are unable to account for the downward bias that may occur due to unequal selection out of the labor market for those experiencing health problems or job dissatisfaction. A study that is able to include both the working and non-working population would be able to overcome this potential bias.

We use data from the National Longitudinal Survey of Youth 1979 cohort (NLSY79) to examine how heterogeneity in job satisfaction developmental trajectories of individuals starting at age 25 and ending at age 39 influence health outcomes after the age of 40. The application of job satisfaction developmental trajectories allows for the incorporation of life course models to observe if prolonged job satisfaction has a greater beneficial effect on health outcomes compared to intermittently experienced or most recent levels of job satisfaction. Trajectory analysis also permits us to include both the working and non-working population in our health models in contrast to prior studies that mainly include only the working population (Nakata et al., 2013; Fischer and Sousa-Poza, 2009; Heslop et al., 2002). Both advantages aid in our assessment of whether the effects of job satisfaction are strong enough to influence physical health more than the non-existent to modest relationship found in past studies (Faragher et al., 2005; Heslop et al., 2002).

1.1. Job satisfaction and health

Job satisfaction has been posited to influence health due to its effect on stress levels. Elevated stress levels have been found to be highly correlated with a number of negative health outcomes, including a weakened immune system (Schneiderman et al., 2005; Segerstrom and Miller, 2004). Low job satisfaction can upset the balance between work and family life, resulting in an additional strain for individuals and elevated stress levels (Schieman and Reid, 2009; Schieman et al., 2009). Previous research has found job satisfaction to affect a number of health outcomes (Faragher et al., 2005; Nakata et al., 2013; Fischer and Sousa-Poza, 2009; Heslop et al., 2002). In a meta-analysis of 485 studies, job satisfaction was found to be strongly associated with several mental health outcomes such as depression, burnout, self-esteem, and anxiety (Faragher et al., 2005). Another study found higher job satisfaction to be linked to higher self-rated health, less health service contact, less difficulty climbing up stairs, and fewer sick leaves from work (Fischer and Sousa-Poza, 2009). Past research has typically found the relationship between job satisfaction and mental health to be stronger than its relationship to physical health. One study concluded that job satisfaction was not linked to cardiovascular risk factors or mortality (Heslop et al., 2002). In the meta-analysis study, the correlation of job satisfaction to mental health was stronger than to physical health (Faragher et al., 2005).

The modest association between job satisfaction and physical health may be due to previous analysis relying on cross-sectional measures of job satisfaction. These studies are not able to distinguish between those experiencing temporary job dissatisfaction and those who have been experiencing prolonged job dissatisfaction. Past studies may have also failed to find a strong relationship between job satisfaction and physical health because a majority of them were conducted on the working population only. They did not capture people who drop out of the labor market due to job dissatisfaction or health problems, which will lead to the underestimation of the beneficial effect of job satisfaction on health.

Group based trajectory models can correct for this bias by including both the working and non-working population (Nagin and Land, 1993; Jones et al., 2001). These models can generate several heterogeneous job satisfaction trajectories from individual level longitudinal data and assign individuals to these job satisfaction trajectories. Missing data at the individual level due to unemployment at one point in time does not prevent a respondent from being assigned to a trajectory group. Therefore, we are able to capture both the working and non-working population in our analyses. Our study will analyze the effect of job satisfaction trajectories on both mental and physical health outcomes to test whether the effect is stronger for mental or physical health, and whether the timing of initiation and length of duration of job satisfaction matter for health outcomes.

1.2. Job satisfaction over the life course

The life course perspective has been applied to investigate the effects of early-life socioeconomic status (SES) and health. These studies have shown for SES that both persistent disadvantage and downward mobility are detrimental for health (Pudrovska and Anikputa, 2013; Kahn and Pearlin, 2006; Hallqvist et al., 2004). While life course theories have been widely applied for SES and health, they have yet to be extensively applied to job satisfaction and health. Our analysis is based on a life-course perspective where various job satisfaction trajectories with different timings of initiation and lengths of duration are tested on later health outcomes. In particular, we draw on two life course models to examine the relationship between job satisfaction and health. The first is the accumulation of risks model, which suggests that repeated deleterious exposures (environmental, socioeconomic, or psychological) experienced over the life course will have a cumulative effect on health (Pudrovska and Anikputa, 2013). Evidence of this model has been found in relation to exposures of socioeconomic disadvantage (Hallqvist et al., 2004) and occupational stress (Montgomery et al., 2000). For example, Montgomery et al. (2000) found the total number of years individuals spent in a job with low decision latitude to be significantly associated with systolic blood pressure and pulse pressure.

The accumulation of risks model would predict each instance of job dissatisfaction experienced by a person to contribute to an overall negative cumulative effect on health and emphasizes that prolonged exposure will have added negative effects compared to intermittent negative exposure. Those who experience the most instances of job dissatisfaction would be predicted to have the worst health. The timing of job dissatisfaction is not important for this model, only the number of instances matter. This leads to our first hypothesis: *Those that experience prolonged job dissatisfaction trajectories will have worse health than those who experience intermittent or no job dissatisfaction.*

The second life course model we utilize is the social mobility model. This model allows for early deleterious exposures to be combated later by improved conditions (Ferraro and Shippee, 2009). Although early deleterious exposures to socioeconomic conditions or psychological stressors will contribute to an overall negative cumulative effect on health, this cumulative effect can be alleviated if further hardships are avoided in later periods (Kahn and Pearlin, 2006). Applied to job satisfaction, this theory would predict the negative effects of early job dissatisfaction on health to be reversed if increased job satisfaction is experienced in later life stages. Past research has shown that those who experience upward mobility in socioeconomic status have better health outcomes compared to those who experience prolonged socioeconomic disadvantage or downward mobility and to have similar health outcomes to those who experience prolonged high socioeconomic

status (Hallqvist et al., 2004; Pudrovska and Anikputa, 2013; Langenberg et al., 2003).

This model differs from the accumulation of risks model by allowing for upward mobility in job satisfaction to counteract earlier experiences of job dissatisfaction. While the predictions may differ, these two models are not in competition with each other. There is strong interdependence among these models and it is not possible to fully disentangle the effects of one from possible confounding effects of the other (Hallqvist et al., 2004). We present the predictions from each model as separate while acknowledging that the models are not necessarily mutually exclusive. This leads to our second hypothesis: *Those that experience upward mobility in job satisfaction will have better health than those that experience prolonged job dissatisfaction or downward mobility in job satisfaction and similar health to those that experience prolonged high job satisfaction.*

2. Data and methods

We use data from the National Longitudinal Survey of Youth 1979 cohort (NLSY79) to address our research questions. This survey is conducted by the Bureau of Labor Statistics and consists of 12,686 women and men between the ages of 14 and 22 when the survey began in 1979. It was administered every year until 1994, and is then administered every other year after that. The NLSY79 also includes a health module that was asked to respondents after they turned 40. This 40 + health module was administered in the 1998 to 2006 waves of the NLSY to 8465 respondents. We construct job satisfaction trajectories from age 25 to 39 for 8318 respondents from the health module, with 147 respondents being omitted due to missing information on job satisfaction for all ages 25 to 39. We use the health module to obtain information on health outcomes for respondents for a final sample size of 6591. The sample size is reduced primarily due to missing data for self-esteem, smoking status, marital status, and physical activity (1697 missing observations). We impute the group mean for income and highest grade completed to prevent further data loss, however income still has 30 missing observations for respondents who did not have at least one observation of family income. We do not use imputation for any additional variables. The sample sizes vary slightly across health outcomes due to missing data in the dependent variables. Table 1 reports the number of observations for each health outcome.

2.1. Measures

2.1.1. Job satisfaction developmental trajectories

Job satisfaction levels of respondents are obtained from a question that asks “Overall how do you feel about your job? Do you like it very much, fairly well, dislike somewhat, or dislike very much?” The responses range from 1 to 4 with 1 indicating the respondent likes their job very much and 4 indicating they dislike their job very much. A meta-analysis on single-item measures of global job satisfaction found this single-item measure to be reliable and strongly correlated with more complex multi-item scales (Wanous et al., 1997). Following other studies, responses are reverse coded so that movement to higher numbers would indicate increasing satisfaction. Information on job satisfaction from the ages of 25–39 from 8318 respondents are used to construct developmental trajectories using group based trajectory models which we explain in more detail in the analytic section.

2.1.2. Health outcomes

Five mental health outcomes are assessed. Two of the outcomes are mental health scale variables: SF12-Mental component score and CES-Depression 7-item score. The SF12-Mental Component

Score was created according to the manual by Ware et al. (1995). Consult the NLSY79 Appendix 25 for more information on how the CES-Depression 7-item scores were calculated. The SF12-Mental score is a good indicator of overall mental health status while the CES-Depression 7-item score measures one of the most disabling mental disorders worldwide, depression (Mossakowski, 2011). The remaining three mental health outcomes are dummy variables that indicate whether the respondent has been diagnosed with emotional/nervous/psychiatric problems, or has the following two health problems: frequent trouble sleeping, and depression/nervous/excessive worry. The diagnosed outcome is included to analyze mental health problems that are severe enough to merit a diagnosis from a doctor. Trouble sleeping and excessive worry are assessed to examine the relationship between job satisfaction trajectories and self-reported mental health symptoms.

Four physical health outcomes are analyzed in this paper as well. They include the SF12-Physical component score, which was created according to the formula by Ware et al. (1995). The SF12-Physical component score is a good overall indicator of the physical functioning of respondents. Self-Rated Health is also analyzed by a question that asks respondents to rate their health on a scale of 1–5 with 1 being excellent health and 5 being poor health. We use this ordinal measurement of self-rated health in our analysis. Self-Rated health has been found in the past to be a good measure of overall health status (DeSalvo et al., 2006). Two summary scales are also created as physical health outcomes. The first scale is a Diagnosed Summary Scale that consists of whether the respondent has been diagnosed with six health problems: High Blood Pressure/Hypertension, Diabetes, Cancer, Arthritis, Heart Problems, and Chronic Lung Disease. This measure is included to analyze physical health problems that are serious enough to merit a diagnosis by a doctor. The second scale is a Health Problems Summary Scale that is obtained from yes or no questions on whether a respondent has one of thirteen health problems: Back, Foot/Leg, Kidney/Bladder, Stomach/Intestinal Ulcers, High Cholesterol, Heart Trouble/Chest Pain/Chest Pressure/Heart Palpitations, Low Blood Pressure, Frequent Indigestion/Stomach/Liver/Gallbladder/Gallstones, Scarlet/Rheumatic Fever/Tuberculosis/Jaundice/Hepatitis, Frequent Colds/Sinus, Thyroid/Goiter, Osteoporosis, and Anemia. This summary scale is constructed to analyze if job satisfaction trajectories have an effect on self-reported physical health problems.

2.1.3. Predictors of health

For our analysis of job satisfaction on health, we include several other covariates as controls. Demographic factors in this analysis include age at the time of the 40 + health module, gender (female = 1, male = 0), and race/ethnicity (Non-Hispanic Black, Hispanic, Non-Hispanic White (omitted reference category)). All demographic factors are time-invariant. Socioeconomic factors include real family income, educational attainment (highest grade completed in years), parental status (1 = children present in household, 0 = no children present) and marital status (married, divorced/separated/widowed, never married (omitted reference category)). Real family income is in 2009 dollars and is measured by taking an individual's reported family income and dividing by 10,000. Although all socioeconomic factors are time-variant, our analysis on health outcomes is cross-sectional. Therefore, all socioeconomic factors are measured at only one time point, in the survey year before the respondent completed the 40 + health module. Health and behavioral factors include smoking status (former smoker, current smoker, never smoker (omitted reference category)), and two physical activity dummies that indicate if individuals engage in light or vigorous physical activity at least once a week (light, vigorous, none (omitted reference category)). Smoking status and physical activity values are observed in 1998, the first

Table 1
Descriptive statistics for health outcomes analyses.

	Mean (percentage)	Standard deviation	Min	Max	N
Independent Variables:					
Job Sat Lowest Group	(46)	–	0	1	6591
Job Sat Upward Group	(16.8)	–	0	1	6591
Job Sat Highest Group	(20.9)	–	0	1	6591
Female	(52)	–	0	1	6591
Age	40.64	0.71	39	45	6591
Black	(30.3)	–	0	1	6591
Hispanic	(17.8)	–	0	1	6591
Married	(59.8)	–	0	1	6591
Divorced	(21)	–	0	1	6591
Children Present	(67.7)	–	0	1	6591
Highest Grade Completed	13.19	2.43	0	20	6591
Family Income	3.56	3.52	0	24.17	6591
Light Physical Activity	(75.3)	–	0	1	6591
Vigorous Physical Activity	(39)	–	0	1	6591
Former Smoker	(14.6)	–	0	1	6591
Current Smoker	(32.1)	–	0	1	6591
Self-Esteem 1987	23.50	4.10	6	30	6591
Number of Previous Jobs	10.76	6.20	0	55	6591
Depression 1992	4.13	3.95	0	21	6434
Dependent Variables:					
SF12-Mental Score	53.14	8.24	7.54	72.01	6555
CES-Depression Score	3.26	4.11	0	21	6378
Diagnosed Emotional Problems	(6.8)	–	0	1	6579
Trouble Sleeping	(12.7)	–	0	1	6574
Excessive Worry	(15.6)	–	0	1	6575
SF12-Physical Score	52.15	7.92	11.22	68.37	6555
Self-Rated Health	3.67	0.99	1	5	6581
Diagnosed Summary Index	0.41	0.74	0	5	6570
Health Problem Summary Index	1.19	1.49	0	13	6439

year the 40 + health module was administered.

A respondent's self-esteem in 1987 is also included as past research has found self-esteem to be a mediator for mental health (Corning, 2002; Jex and Elacqua, 1999; Makikangas and Kinnunen, 2003). Finally, the number of previous jobs an individual has had is added as a control as frequent job change has been linked to negative health outcomes (Metcalfe et al., 2003; Mandal et al., 2011). Job change operates as a life shock that increases psychosocial stress in individuals. This increase in stress can result in a higher incidence of health risk behaviors and may lead to depression (Metcalfe et al., 2003; Mandal et al., 2011). The number of jobs is observed from the survey year before the respondent completed the 40 + health module. These controls are included in all health models unless otherwise noted. For the depression mental health outcome model, we include an individual's depression score in 1992 as an additional control.

2.1.4. Analytic strategy

Our analysis proceeds in two stages. The first stage begins with the estimation of job satisfaction developmental trajectories. These trajectories are estimated over the full sample of respondents who completed the 40 + health module with job satisfaction histories ($n = 8318$) using group based trajectory models. We use Jones et al. (2001) group based trajectory models to obtain job satisfaction developmental trajectories. Group based trajectory models identify latent groups of individuals who share a particular trajectory of some attribute (job satisfaction). This technique estimates trajectories for a finite number of groups and estimates the predicted probability of membership in each latent class for every observation in the sample. Individuals are assigned to the trajectory group that they have the highest predicted probability of belonging to. These trajectories were estimated in Stata 12 using the user written program 'Traj' (Jones and Nagin, 2007). We use a censored normal distribution to estimate trajectories. Once these groups are

estimated, we assigned individuals to the group they had the highest posterior probability with and constructed dummy variables for the groups individuals belonged to. These dummy variables are then used to analyze the effect of job satisfaction trajectory group membership on health outcomes.

The second stage analyzes the effect of job satisfaction trajectory group membership on health outcomes using the 40 + health sample ($n = 6591$). Three job satisfaction trajectory group dummy variables are included along with other controls to assess their effect on both mental and physical health outcomes. Data from individuals on health outcomes and controls are combined into one cross-sectional sample. OLS Regression is used on continuous health outcomes (SF12-Mental Component Score, CES-Depression Score, SF12-Physical Component Score, Diagnosed Summary Scale, and Health Problems Summary Scale), Ordered Logistic Regression is used for Self-Rated Health, and Logistic Regression is employed on binary health outcomes (Diagnosed with Emotional/Nervous/Psychiatric problems, Depression/Nervous/Excessive worry, and Frequent Trouble Sleeping).

3. Results

3.1. Job satisfaction developmental trajectory analysis

We use information on job satisfaction collected for individuals between the ages of 25 and 39 who also completed the 40 + health module and had at least one observation of job satisfaction ($n = 8318$). In total, we use 81,082 observations of job satisfaction with a mean of 3.32 and a standard deviation of 0.724. Fig. 1 graphs means of job satisfaction levels for the sample population from ages 25 to 39. It shows an upward trend in job satisfaction levels over life course with an overall increase of 0.12 from age 25 to 39. However, this graph of mean job satisfaction levels conceals the heterogeneity in job satisfaction trajectories among individuals.

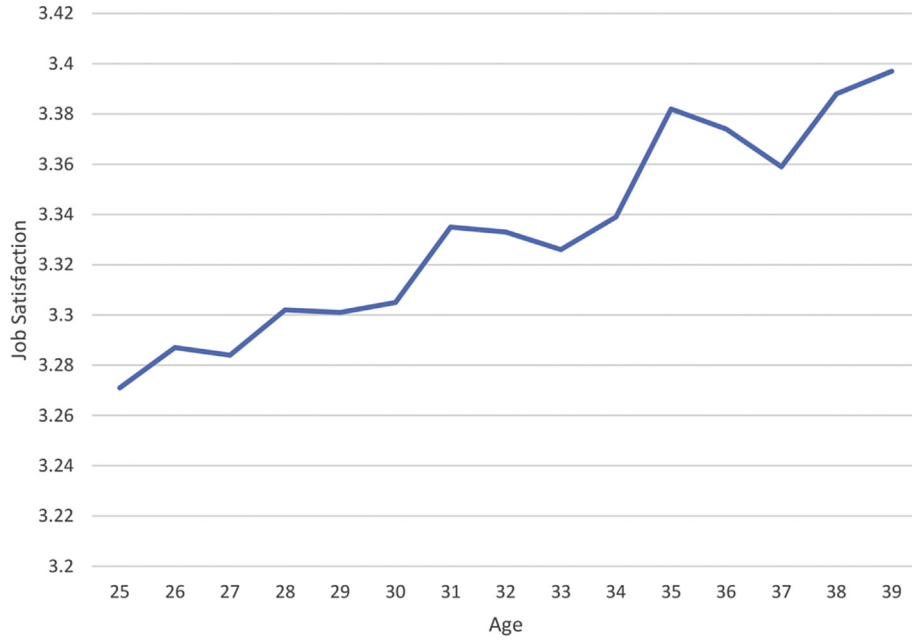


Fig. 1. Means of job satisfaction across ages 25–39.

Fig. 2 graphs the four job satisfaction developmental trajectories we identified using group based trajectory modeling. We refer to the bottom trajectory group as lowest job satisfaction group; 44.7% of respondents are predicted to fall into this group. It's worth mentioning that the 'lowest' job satisfaction group still has an average job satisfaction level around 3 (satisfied) and therefore should not be construed as containing individuals with 'low' job satisfaction levels but rather 'lower' levels compared to others. The upwardly sloped trajectory group is labeled upward job satisfaction group and the group with a downward slope is labeled downward job satisfaction group. In this sample, 17.6% of respondents are predicted to belong to the upward group and 22.5% are predicted

for the downward group. Finally, the top trajectory group is referred to as highest job satisfaction group with 15.3% of the sample predicted for this group. Using these trajectory groups, we construct three dummy variables for whether a respondent belongs to the lowest, upward, or downward job satisfaction trajectory group. These dummy variables are then included in the health analysis with the highest job satisfaction trajectory group as the omitted reference category.

Jones et al. (2001) recommend using changes in BIC statistics to select the models. Following this approach, an eight-group model (BIC = -94350.03) is favored over the four-group model we select (BIC = -94953.59). However, we utilize the four-group model in

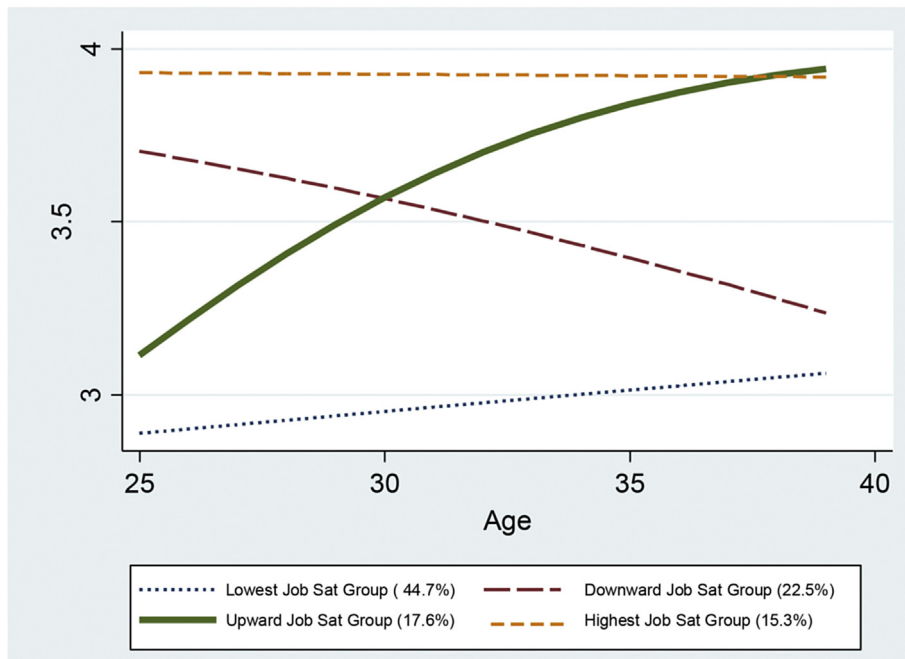


Fig. 2. Job satisfaction developmental trajectories for ages 25–39.

this analysis for several reasons. First, the four-group model identifies all the comparison groups necessary to analyze both life-course theories, making the four-group model the most parsimonious. Additional trajectories identified in models with a higher number of groups only differ in the initial level of job satisfaction without additional distinctive slopes of trajectories. Second, the eight-group model resulted in trajectories with a very small percentage of respondents. Four of the groups closely mirror the groups in the four-group model with the remaining four groups only containing 12 percent of respondents. Using any of the models beyond the four-group model results in groups that contain less than 5 percent of respondents. In order to ensure adequate variability in the health analysis, we select the four-group model instead where all groups have at least 15 percent of respondents. Finally, the BIC and other statistics are just guidelines for selecting the number of groups and it is reasonable to use more sensible models instead of the model with the best BIC (Zheng et al., 2013). We specify a linear functional form for these four trajectory groups as non-linear specifications are not found to significantly improve model fit.

Table 1 presents descriptive statistics for the dependent and explanatory variables used in both the mental and physical health analyses. The sample size for each of the health outcomes is presented in the last column as this sample size varies slightly across health outcomes with the smallest sample for the depression model ($n = 6378$) and the largest sample for the self-rated health model ($n = 6581$). The mean for the health problem summary index is 1.186 with a minimum of 0 and a maximum of 13. The mean age of respondents in our sample is 40.6, with a range of 39–45 indicating that most respondents answered the health module close to turning 40.

3.2. Mental health analysis

Table 2 summarizes the results of the effect of job satisfaction developmental trajectories on five mental health outcomes. All five models show that membership in the lowest job satisfaction trajectory group has a negative impact on mental health. Those in the lowest group have a higher probability of scoring low on the SF12-

Mental test and high on the CES-Depression test. They are also more likely to be diagnosed with emotional problems ($OR = 1.64$), to have frequent trouble sleeping ($OR = 1.66$), and to suffer from excessive worry ($OR = 1.34$). Those who belong to the downward job satisfaction group have significantly greater odds of having frequent trouble sleeping ($OR = 1.58$) and excessive worry ($OR = 1.28$). Being in this group also has a negative impact on the respondents SF12-Mental score. However, being in the downward job satisfaction group does not significantly impact an individual's depression score or their probability of being diagnosed with emotional problems. Membership in the upward job satisfaction group only significantly impacts one mental health outcome, frequent trouble sleeping ($OR = 1.39$).

3.3. Physical health analysis

Table 3 presents the results of job satisfaction developmental trajectories and four physical health outcomes. For the SF12-Physical score model, we omit the two physical activity dummies because several questions in this test assess physical activity. None of the job satisfaction trajectory group dummies appear to have any influence on respondents SF12-Physical score, which suggests that job satisfaction is not related to physical functioning. There also appears to be no link between job satisfaction trajectory group membership and the probability of being diagnosed with a disease as seen in the diagnosed summary index model. Although job satisfaction trajectory groups are not linked to physical functioning or the diagnosis of diseases, they are related to self-rated health. Membership in the lowest ($OR = 1.61$), upward ($OR = 1.24$) or downward ($OR = 1.40$) job satisfaction groups' resulted in lower levels of self-rated health. The lowest and downward job satisfaction groups are also significantly associated with the health problem summary index.

3.4. Supplementary analysis

In Appendix A and B we display results from supplementary analysis that analyzes the effect of job satisfaction on mental and physical health outcomes for the working population only. This

Table 2
The relationship between job satisfaction developmental trajectories and mental health.

	SF12-Mental score		CES-Depression score		Diagnosed emotional problems ^a		Trouble sleeping ^a		Excessive worry ^a	
	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI
Low Job Sat Group	-1.91	[-2.48, -1.35]	0.35	[0.07, 0.62]	1.64	[1.16, 2.30]	1.66	[1.29, 2.14]	1.34	[1.08, 1.67]
Upward Job Sat Group	-0.51	[-1.19, 0.16]	-0.02	[-0.35, 0.30]	1.48	[1.00, 2.20]	1.39	[1.04, 1.88]	1.00	[0.77, 1.30]
Downward Job Sat Group	-1.14	[-1.78, -0.49]	0.22	[-0.09, 0.53]	1.45	[1.00, 2.12]	1.58	[1.19, 2.09]	1.28	[1.00, 1.62]
Female	-1.88	[-2.31, -1.45]	0.66	[0.45, 0.87]	2.04	[1.61, 2.59]	1.84	[1.54, 2.19]	1.56	[1.33, 1.82]
Age	0.03	[-0.25, 0.30]	0.02	[-0.11, 0.15]	0.98	[0.85, 1.12]	0.98	[0.89, 1.10]	1.03	[0.94, 1.14]
Black	0.99	[0.52, 1.47]	0.09	[-0.14, 0.32]	0.34	[0.26, 0.45]	0.52	[0.43, 0.63]	0.72	[0.61, 0.85]
Hispanic	0.82	[0.27, 1.36]	-0.27	[-0.54, -0.01]	0.48	[0.35, 0.65]	0.67	[0.54, 0.84]	0.79	[0.65, 0.96]
Married	0.86	[0.26, 1.45]	-0.35	[-0.64, -0.07]	0.75	[0.56, 1.01]	0.77	[0.61, 0.96]	0.84	[0.68, 1.03]
Divorced	-0.26	[-0.88, 0.37]	0.22	[-0.08, 0.53]	1.18	[0.88, 1.60]	1.11	[0.88, 1.39]	1.18	[0.96, 1.45]
Children Present	0.04	[-0.44, 0.52]	-0.04	[-0.27, 0.19]	0.68	[0.54, 0.85]	0.78	[0.65, 0.93]	0.93	[0.79, 1.10]
Highest Grade Completed	-0.08	[-0.18, 0.01]	-0.06	[-0.11, -0.02]	1.08	[1.03, 1.14]	1.01	[0.97, 1.05]	0.96	[0.93, 0.99]
Family Income	0.06	[-0.00, 0.13]	-0.04	[-0.07, -0.01]	0.85	[0.80, 0.90]	0.90	[0.87, 0.94]	0.95	[0.92, 0.98]
Light Physical Activity	0.46	[-0.01, 0.94]	-0.21	[-0.44, 0.02]	0.81	[0.65, 1.03]	0.83	[0.70, 0.99]	0.79	[0.67, 0.92]
Vigorous Physical Activity	0.72	[0.29, 1.16]	-0.31	[-0.52, -0.11]	0.69	[0.55, 0.88]	0.75	[0.63, 0.89]	0.81	[0.69, 0.95]
Former Smoker	-0.36	[-0.94, 0.22]	0.15	[-0.12, 0.43]	1.52	[1.13, 2.03]	1.28	[1.03, 1.60]	1.05	[0.85, 1.30]
Current Smoker	-1.12	[-1.58, -0.66]	0.55	[0.33, 0.78]	1.75	[1.39, 2.21]	1.38	[1.16, 1.64]	1.27	[1.08, 1.48]
Self-Esteem Score 1987	0.25	[0.20, 0.30]	-0.10	[-0.12, -0.07]	0.97	[0.94, 0.99]	0.96	[0.94, 0.98]	0.96	[0.94, 0.98]
Number of Jobs	-0.07	[-0.10, -0.03]	0.03	[0.01, 0.04]	1.02	[1.01, 1.04]	1.02	[1.01, 1.04]	1.02	[1.01, 1.03]
Depression Score 1992	-	-	0.26	[0.24, 0.29]	-	-	-	-	-	-
Sample Size	6555		6378		6579		6574		6575	
R-squared	0.0675		0.1508		0.0967		0.0694		0.0487	

^a Coefficients are odds ratios.

Table 3

The relationship between job satisfaction developmental trajectories and physical health.

	SF12-Physical score		Self-Rated health ^a		Diagnosed summary index		Health problem summary index	
	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI
Low Job Sat Group	-0.34	[-0.89, 0.21]	1.61	[1.41, 1.84]	-0.01	[-0.06, 0.05]	0.16	[0.06, 0.27]
Upward Job Sat Group	0.34	[-0.31, 1.00]	1.24	[1.06, 1.45]	0.01	[-0.05, 0.07]	0.08	[-0.04, 0.21]
Downward Job Sat Group	-0.29	[-0.91, 0.33]	1.40	[1.20, 1.62]	0.02	[-0.04, 0.07]	0.16	[0.04, 0.28]
Female	-1.11	[-1.52, -0.70]	1.14	[1.03, 1.25]	0.07	[0.03, 0.11]	0.37	[0.29, 0.45]
Age	-0.25	[-0.51, 0.02]	1.04	[0.98, 1.11]	0.02	[-0.01, 0.05]	0.03	[-0.02, 0.08]
Black	-0.44	[-0.90, 0.01]	1.21	[1.09, 1.35]	0.04	[-0.00, 0.08]	-0.26	[-0.35, -0.17]
Hispanic	0.05	[-0.48, 0.57]	1.18	[1.04, 1.34]	-0.06	[-0.11, -0.01]	-0.21	[-0.31, -0.10]
Married	0.68	[0.11, 1.25]	0.82	[0.71, 0.94]	-0.03	[-0.08, 0.03]	-0.06	[-0.17, 0.05]
Divorced	-0.09	[-0.70, 0.52]	0.91	[0.79, 1.06]	0.01	[-0.05, 0.07]	0.05	[-0.07, 0.16]
Children Present	0.13	[-0.34, 0.59]	1.00	[0.90, 1.12]	-0.01	[-0.05, 0.03]	-0.01	[-0.10, 0.08]
Highest Grade Completed	0.33	[0.24, 0.42]	0.92	[0.90, 0.94]	-0.01	[-0.02, -0.00]	-0.00	[-0.02, 0.02]
Family Income	0.16	[0.10, 0.22]	0.97	[0.96, 0.99]	-0.01	[-0.02, -0.00]	-0.02	[-0.03, -0.01]
Light Physical Activity	-	-	0.83	[0.74, 0.93]	-0.00	[-0.05, 0.04]	-0.04	[-0.13, 0.05]
Vigorous Physical Activity	-	-	0.60	[0.54, 0.66]	-0.08	[-0.12, -0.04]	-0.21	[-0.28, -0.13]
Former Smoker	-0.57	[-1.12, -0.01]	1.04	[0.91, 1.18]	0.01	[-0.04, 0.07]	0.15	[0.05, 0.26]
Current Smoker	-1.11	[-1.55, -0.67]	1.40	[1.26, 1.55]	0.07	[0.02, 0.11]	0.14	[0.06, 0.23]
Self-Esteem Score 1987	0.08	[0.04, 0.13]	0.94	[0.93, 0.95]	-0.01	[-0.01, -0.00]	-0.01	[-0.02, -0.00]
Number of Jobs	-0.04	[-0.07, -0.01]	1.01	[1.00, 1.02]	0.00	[-0.00, 0.01]	0.01	[0.01, 0.02]
Sample Size	6556		6581		6570		6439	
R-squared	0.0556		0.0514		0.0247		0.0427	

^a Coefficients are odds ratios.

allows for current job satisfaction to be included as an additional control in order to demonstrate that job satisfaction trajectories have an effect beyond most recent job satisfaction experiences. The sample size for each model is reduced by around 9% due to the restricting of the sample on the working population only. Each health outcome is estimated with two models, one that includes job satisfaction trajectories, and one that includes both job satisfaction trajectories and a dummy variable that measures current job dissatisfaction (Dissatisfied = 1, Satisfied = 0). Current job dissatisfaction has a standard deviation of 0.262 with 7.4% of respondents belonging to the dissatisfied group.

Appendix A and B show that current job dissatisfaction is significantly associated with all health outcomes except diagnosed emotional problems. The second models in these appendices show that the inclusion of current job dissatisfaction does not substantially change the effects of job satisfaction trajectories on health. In sensitivity analyses not shown here several explanatory variables were imputed to achieve a sample size close to the 8318 maximum size. This imputation does not decrease the significance of any of the job satisfaction trajectory results from Tables 2 and 3

4. Discussion and conclusion

In this study, we analyze the influence job satisfaction levels experienced over the life course have on later health outcomes. We construct job satisfaction developmental trajectories that start at age 25 and end at age 39 and examine the effects of these trajectories on several physical and mental health outcomes of respondents in their early forties. We identify four job satisfaction trajectory groups, a highest group featuring individuals who consistently experience high levels of job satisfaction throughout the life course, a downward group of individuals who start with high job satisfaction but experience slightly decreasing job satisfaction levels from then on, an upward group whose members initially start with lower job satisfaction but then experience sharp increases, and a lowest group that consists of individuals whose job satisfaction levels are repeatedly lower than the other three groups. Overall, job satisfaction developmental trajectories are found to be a more important determinant of mental health than physical health. This is true even when both the working and non-working

population are analyzed, which corrects for potential downward bias due to increased attrition out of the labor market for those with job dissatisfaction or health problems.

The lowest job satisfaction trajectory group has significantly worse mental health for all five mental health outcomes. However, it only has a negative impact on two of the four physical health outcomes. These findings are consistent with past research that finds job satisfaction to be strongly associated with mental health outcomes such as depression and anxiety but only moderately or non-associated with physical health outcomes such as cardiovascular disease (Faragher et al., 2005; Heslop et al., 2002). A majority of people spend half of their waking hours at work (Bureau of Labor Statistics, 2016); those who are dissatisfied for half of their waking hours experience increased anxiety and depression. Although we only find a modest effect of lowest job satisfaction trajectory membership on physical health, these mental health manifestations may likely serve as a precursor to future physical health problems whereby eventually increased anxiety and depression lead to cardiovascular or other physical health problems (Cuijpers and Smit, 2002; Hall et al., 1998; Lane et al., 2000). Therefore, job satisfaction's influence on physical health most likely operates through its deleterious effect on mental health and may manifest in old age rather than age 40s examined in this study.

Belonging to the downward job satisfaction group also has a significantly negative effect on mental health, but this effect is not as strong as the lowest job satisfaction group. This suggests that prolonged low job satisfaction has a greater effect on mental health than more recent or intermittent job dissatisfaction, supporting the accumulation of risks life course model. The upward job satisfaction group performed the most similar to the highest job satisfaction group, which implies that job dissatisfaction experienced in early-life can be counterbalanced with increased job satisfaction later in life, as the social mobility life course model would predict. However, membership in this group did have a negative effect on whether an individual was diagnosed with an emotional problem, had trouble sleeping, and self-rated health. This suggests that past instances of low job satisfaction may still have some lingering effect on health outcomes in later life.

The supplementary analyses in Appendix A and B demonstrate that job satisfaction trajectories have an effect beyond current job

satisfaction levels. The inclusion of current job dissatisfaction as an additional control did not significantly alter any of the main results in Tables 2 and 3. Current measures of job satisfaction, however, are unable to detect heterogeneity in job satisfaction levels over time. Fig. 2 illustrates that those who belong to the downward job satisfaction group and those who belong to the lowest job satisfaction group would have similar current job satisfaction values at age 39. However, belonging to the lowest job satisfaction group had stronger negative effects on health than belonging to the downward job satisfaction group did. Current job satisfaction measures are also not able to distinguish between the upward job satisfaction group and the highest job satisfaction group in Fig. 2 at age 39. But those in the upward job satisfaction group had significantly worse health for a third of the health outcomes compared to those in the highest job satisfaction group.

These findings illustrate the importance of analyzing the effect of job satisfaction on health from a life course perspective. Job satisfaction experiences over time are found in this study to exhibit significant negative health effects that are distinct from current job satisfaction experiences. The job satisfaction trajectories reveal greater heterogeneity in the sample compared to current job satisfaction, and are more useful for unpacking the relationship between job satisfaction and health by accounting for heterogeneity in job satisfaction levels over time. Moreover, only focusing on current job satisfaction levels would miss those who were unsatisfied with their job and removed from the current job market. This sample selection bias would cause underestimation of the effect of job dissatisfaction.

Neo-Fordist theory states that material conditions have deteriorated for most of the workforce since the mid-1970s (Handel, 2005; Kalleberg, 2011). Many benefits enjoyed in the postwar era such as job security and wage growth began to evaporate. Mean earnings growth switched from the first half postwar period growth rate of 2.26% to stagnation for the second half postwar period (Handel, 2005). Kalleberg (2011: 100) found “the odds of perceiving greater risk of job loss grow by a factor of 1.5 percent per year between 1977 and 2006”. As a result of this decrease in material conditions, job satisfaction levels have also declined in recent decades. In 1987, 61 percent of Americans said they were satisfied with their jobs compared to only 45 percent in 2009 (Kalleberg, 2011). This decline in satisfaction levels is also evident in our study, as over two-thirds of respondents are predicted to belong to either the low or downward job satisfaction trajectory group. It's important to note that our analysis ends in the early 2000s, before the Great Recession exacerbated this growing trend in job insecurity and dissatisfaction (Auerbach and Gale, 2009; Margalit, 2013; Bell and Blanchflower, 2011). Newer data may find an even stronger downward trend in job satisfaction, resulting in additional

deleterious health effects.

There are several limitations of this study. The first limitation is like many other studies, this study has missing data. However, imputed models and additional analysis not shown here that estimate job satisfaction developmental trajectories on the full sample show almost identical results to ones found here. The second limitation is we only have cross-sectional data on health outcomes and therefore can't rule out reverse causality bias. Health problems may lead to lower levels of job satisfaction rather than the reverse. Another limitation of the health data is it is on individuals who are only in their forties. Although this analysis has revealed a modest link of job satisfaction trajectories and physical health outcomes, a stronger link may be found if an older population is studied where the percentage of the sample population suffering from physical health problems increases. The NLSY79 is currently conducting an over 50 health module that will be completed in 2016. Future studies that use this health module can overcome the limitations mentioned here by having longitudinal health data on an older sample population.

The relationship between job satisfaction and health is a widely studied topic (Faragher et al., 2005; Nakata et al., 2013; Fischer and Sousa-Poza, 2009; Heslop et al., 2002). This paper contributes to the numerous previous studies by applying a life course approach to this relationship. We find evidence of a cumulative effect of job satisfaction on health and confirm the predictions of two life course models, the accumulation of risks and social mobility model. Early lower levels of job satisfaction were shown to be counteracted by later higher levels of job satisfaction. These findings serve as both optimistic and a warning for future health levels. We can be optimistic that potential declining health levels in the future due to current experiences of low job satisfaction can possibly be reversed by policy interventions that increase job security and wage growth. The findings also give us fair warning of the negative health effects to come if current declining job satisfaction trends are not reversed. Those in the lowest job satisfaction trajectory group have 64% greater odds of being diagnosed with emotional problems than those in the high job satisfaction trajectory group. Some scholars have already suggested that the negative effects of the Great Recession such as increased job dissatisfaction and insecurity will be felt for years to come (Auerbach and Gale, 2009; Margalit, 2013; Bell and Blanchflower, 2011). If recent trends of declining job satisfaction continue, understanding the cumulative effects of job satisfaction on health may become crucial for policymakers when considering all the potential costs of wage stagflation and eroding job security.

Appendix A

The relationship between job satisfaction developmental trajectories and mental health on the working population only

	SF12-Mental score		CES-Depression score		Diagnosed emotional problems ^a		Trouble sleeping ^a		Excessive worry ^a	
Lowest Job Sat Group	-1.85	-1.46	0.32	0.19	1.63	1.58	1.73	1.63	1.50	1.42
	[-2.41, -1.30]	[-2.02, -0.90]	[0.04, 0.59]	[-0.09, 0.46]	[1.10, 2.42]	[1.07, 2.36]	[1.30, 2.30]	[1.22, 2.17]	[1.18, 1.91]	[1.11, 1.82]
Upward Job Sat Group	-0.66	-0.63	0.02	0.02	1.64	1.63	1.46	1.45	1.18	1.17
	[-1.31, 0.00]	[-1.28, 0.02]	[-0.30, 0.35]	[-0.31, 0.34]	[1.06, 2.54]	[1.05, 2.54]	[1.05, 2.03]	[1.05, 2.02]	[0.88, 1.57]	[0.88, 1.56]
Downward Job Sat Group	-1.15	-0.98	0.22	0.17	1.40	1.39	1.55	1.52	1.37	1.35
	[-1.77, -0.52]	[-1.60, -0.36]	[-0.08, 0.53]	[-0.14, 0.48]	[0.91, 2.16]	[0.90, 2.14]	[1.14, 2.13]	[1.11, 2.08]	[1.05, 1.80]	[1.03, 1.76]
Current Job Dissatisfaction	-	-3.83	-	1.29	-	1.32	-	1.66	-	1.58
	-	[-4.56, -3.10]	-	[0.93, 1.66]	-	[0.90, 1.93]	-	[1.27, 2.18]	-	[1.23, 2.02]
Sample Size	5953	5953	5790	5790	5970	5970	5964	5964	5963	5963
R-squared	0.0593	0.0759	0.1321	0.1394	0.0990	0.0998	0.0697	0.0728	0.0409	0.0435

^aCoefficients are odds ratios.

95% confidence intervals are in brackets.

All models include additional controls from Table 2 not shown here.

Appendix B

The relationship between job satisfaction developmental trajectories and physical health on the working population only

	SF12-Physical score		Self-Rated health ^a		Diagnosed summary index		Health problem summary index	
Lowest Job Sat Group	-0.37	-0.24	1.62	1.58	-0.01	-0.01	0.17	0.14
	[-0.87, 0.13]	[-0.75, 0.26]	[1.41, 1.87]	[1.37, 1.82]	[-0.06, 0.05]	[-0.07, 0.04]	[0.06, 0.27]	[0.03, 0.24]
Upward Job Sat Group	0.13	0.14	1.24	1.24	0.03	0.03	0.10	0.10
	[-0.46, 0.72]	[-0.45, 0.73]	[1.05, 1.46]	[1.06, 1.46]	[-0.03, 0.09]	[-0.03, 0.09]	[-0.02, 0.23]	[-0.02, 0.22]
Downward Job Sat Group	-0.21	-0.16	1.39	1.37	0.01	0.01	0.16	0.14
	[-0.77, 0.35]	[-0.72, 0.40]	[1.19, 1.62]	[1.17, 1.61]	[-0.04, 0.07]	[-0.05, 0.07]	[0.04, 0.27]	[0.03, 0.26]
Current Job Dissatisfaction	-	-1.18	-	1.33	-	0.09	-	0.29
	-	[-1.84, -0.53]	-	[1.11, 1.60]	-	[0.02, 0.15]	-	[0.15, 0.43]
Sample Size	5954	5954	5972	5972	5960	5960	5846	5846
R-squared	0.0419	0.0439	0.0459	0.0465	0.0169	0.0180	0.0426	0.0454

^aCoefficients are odds ratios.

95% confidence intervals are in brackets.

All models include additional controls from Table 3 not shown here.

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