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Article

The differential impact of major life events on cognitive and affective wellbeing

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ABSTRACT

Major life events affect our wellbeing. However the comparative impact of different events, which often co-occur, has not been systematically evaluated, or studies assumed that the impacts are *equivalent in both amplitude and duration*, that different wellbeing domains are equally affected, and that individuals exhibit *hedonic adaptation*. We evaluated the individual and conditional impact of eighteen major life-events, and compared their effects on *affective and cognitive wellbeing* in a large population-based cohort using fixed-effect regression models assessing within person change. Several commonly cited events had little, if any, independent effect on wellbeing (promotion, being fired, friends passing), whilst others had profound impacts regardless of co-occurring events (e.g., financial loss, death of partner, childbirth). No life events had overall positive effects on both types of wellbeing, but separation, injury/illnesses and monetary losses caused negative impacts on both, which did not display hedonic adaptation. Affective hedonic adaptation to all positive events occurred by two years but monetary gains and retirement had ongoing benefits on cognitive wellbeing. Marriage, retirement and childbirth had positive effects on cognitive wellbeing but no overall effect on affective wellbeing, whilst moving home was associated with a negative effect on cognitive wellbeing but no affective wellbeing response. Describing the independent impact of different life events, and, for some, the differential affective and life satisfaction responses, and lack of hedonic adaptation people display, may help clinicians, economists and policy-makers, but individual's hopes for happiness from positive events appears misplaced.

Introduction

The observation that major life events, such as marriage, death of a child or spouse, bankruptcy or lottery winnings have a substantial impact on our wellbeing is widely appreciated and self-apparent. While such colloquial observations confirm our universal experience, they do not tell us anything about either the relative impact of different events on wellbeing, or the duration of any impact. For instance, is the death of one's spouse worse than separation or divorce? Does the positive benefit of marriage last longer than a major financial windfall?

A partial answer to these questions has been provided by research on hedonic adaptation, which suggests that wellbeing ultimately returns to a set baseline (Gilbert, 2009). Early cross-sectional studies claimed that people adapt to events, both good and bad, over time (Brickman, Coates, & Janoff-Bulman, 1978). Large scale longitudinal studies that follow individuals over time indicate that the amount of adaptation varies by event (Clark, Diener, Georgellis, & Lucas, 2008; Frijters, Johnston, & Shields, 2011; Lucas, 2007, 2005). However, such studies generally assess the impact through checklists that treat life-events as equal (Dohrenwend, 2006; Gray, Litz, Hsu, & Lombardo, 2004; Wethington, Brown, & Kessler, 1997); or are restricted to the impact of a small set of life events on a single measure of wellbeing (Luhmann, Hofmann, Eid, & Lucas, 2012). Clinical experience tells us that in some cases an individual's wellbeing does not return to baseline after a significant life

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event, or may take many years, and that responses differ greatly.

Subjective wellbeing is not a unitary entity (Diener et al., 2017), and different components of wellbeing may respond differently to life events. The facets of subjective wellbeing are separable by factor analysis and have distinct associations with other variables (Busseri & Sadava, 2011; Diener, 1984; Schimmack, 2008). In particular, cognitive and affective components have been distinguished. The cognitive component refers to a deliberate, goal-directed evaluation of life satisfaction (global or domain-specific), while the affective component refers to the frequency and intensity of positive and negative emotional responses to events and current moods. As such, it has been proposed that they differ in their stability over time, as well as in their reaction to life events. The single meta-analysis in the area found distinct temporal dynamics of cognitive and affective components to events such as unemployment, bereavement and childbirth, but only when comparing across different studies (Luhmann et al., 2012).

An important confounder this meta-analysis found in many longitudinal studies was the differential ascertainment and handling of other concurrent life events, which obfuscates any direct comparison between studies. For instance, losing one's job may co-occur with moving home, separation from a loved one or a change in socioeconomic status, any of which may be the primary driver of changes in wellbeing. Few longitudinal studies have compared the impact of life events on wellbeing in the context of a wide range of other events; and none to our knowledge have compared their impact on different components of wellbeing over the same time period in the same sample.

We fill this gap by comparing the impact of a broad range of supposedly positive and negative major life events (18) on cognitive and affective components of wellbeing in a single large population-representative cohort spanning sixteen years (2001–2016), which allows us to track changes within individuals over a sizeable time window around each event's occurrence.

Methods

Data

The HILDA survey is a longitudinal, nationally representative study of Australian households. The survey covers a range of dimensions including social, demographic, health and economic conditions using a combination of face-to-face interviews with trained interviewers and a self-completion questionnaire. It began in 2001 with the survey of 13,969 persons in 7682 households. Each year since interviews have been conducted with all willing members of each household who are at least 15 years old at the time of the interview. The sample attrition is comparable to other national longitudinal surveys such as the British Household Panel Survey and the German Socio-Economic Panel Survey (Watson & Wooden, 2006). We use the 2002–2016 waves of HILDA in our main analysis.

Wellbeing measures

The cognitive and affective wellbeing measures were obtained from a single-item question (life-satisfaction) and item 9 from the SF-36 (a 36-item questionnaire) respectively.

Cognitive wellbeing. Overall life satisfaction was obtained from the annual face-to-face interview using the response to the question:

"All things considered, how satisfied are you with your life?"

Respondents were asked to:

"Pick a number between 0 and 10 to indicate how satisfied you are" and that "the more satisfied you are, the higher the number you should pick".

Affective wellbeing. Each survey contains the SF-36, a widely used self-completion measure of health status (Ware Jr, 2000). It comprises 36 items which are used to measure eight scales covering various aspects of physical, emotional and mental health. We calculated a summed score based on item 9 (9a-9i), where 5 questions dealt with positive and negative aspects of mental health (e.g., "Felt so down in the dumps nothing could cheer me up", "Been happy"), and four questions dealt with positive and negative aspects of vitality (e.g., "feel full of life", "felt worn out"). We reverse scored relevant items to ensure the summed score represented better well-being with higher scores. The Cronbach's alpha for the 9 questions in item 9 was 0.894 (see Supplementary Material).

Life events. Details on life events are collected in the self-completion questionnaire of HILDA and have been included since wave 2 (2002). This section is completed after the life satisfaction scores and SF-36 questions, minimising the potential bias that respondent's recollection of the life events may have on their evaluation of the wellbeing measures. For each event, respondents were asked whether the event occurred in the last 12 months and how recently it occurred in three-month intervals (i.e. quarters).

The life events are shown in Table 1 below:

Model design

Using the quarterly and annual indicators for an event, we modelled the effect of life events on the current wellbeing score as a function of time since the life event. To estimate these *within-subject* effects, we estimated a series of linear fixed effects regression models.

Under this approach we have a linear model with N individuals and T time-points:

$$y_{it} = \beta X_{it} + \alpha_i + \varepsilon_{it} \quad for \;\; t = 1...T \;\; and \;\; i = 1...N \tag{1}$$

X_{it} is a matrix of control variables, that is, a set of dummy variables representing lags and leads on the life event. For example, *pre36* = 1 if wellbeing (the outcome) was measured 2–3 years before the life event; *pre24* = 1 if wellbeing was measured 1–2 years before the event; … *post24* = 1 if wellbeing was measured 2–3 years after the event; and *post36* = 1 if wellbeing was measured 3–4 years after the event. In total, we had seven dummy variables indicating the outcome variable y_{it} was obtained after the life event (*post00*, *post03*, *post06*, *post09*, *post12*,

Table 1
List of 22 life events and their description.

Event	Description
Widowed	death of a spouse or a child
Separated	separated or divorced from a spouse or long-term partner
Money lost	major worsening in financial situation (e.g. bankruptcy)
Jailed	detained in jail /correctional facility
Attacked	victim of physical violence (e.g. assault)
Health shock	serious personal injury or illness (e.g., disability)
Reconciled	reconciled with spouse/long-term partner after separation
Fired	fired or made redundant by an employer
Family harmed	serious injury or illness to a close family member
Robbed	victim of property crime (e.g. theft, house breaking)
Friend died	death of a close friend
Relative died	death of a close family member (e.g. parent or sibling)
Relative jailed	jail for a close friend or relative
Home lost	home destroyed in a natural disaster (2009–2016 only)
Moved	changed residence
Hired	changed jobs (i.e. employer)
Promoted	promoted at work
Retired	retired from workforce
Money gained	major gain in finances (e.g., lottery win, inheritance)
Pregnant	you (or your partner) got pregnant
Married	got married
Childbirth	birth (or adoption) of a child

Note: *Widowed* includes deaths of children but with only 1407 deaths under 15 in the entire population in 2016 we expect few such deaths so we use the label for simplicity.

post24, *post36*), as well as three dummy variables indicating y_{it} was obtained before the event (*pre12*, *pre24*, *pre36*). Note that *pre36* acted as the reference timepoint against which the effects of all other time-points were expressed.

We estimated conditional models to determine the independent effect of each life event in the context of other events which may be present for an individual. Our conditional models included all other events as potential channels in X_{it}, as well as socioeconomic status (termed the "SEIFA index" and derived from the postcode of the participant), education (coded in a standard Australian Bureau of Statistics method) and age; features which may change with time along with the changes in wellbeing outcome (Table S3). Each conditional model also included a set of year dummies in X_{it}. We estimated (1) by OLS after taking a *within-subject* transformation of each variable (such that β was identified by deviations in X_{it} over time). This allows us to remove any time invariant heterogeneity contained in α_i (for example, if innately unhappy people are more likely to divorce, and other potential selection effects).

We assumed that an individual can be affected simultaneously by more than one occurrence of the same life event, which essentially allows for an additive effect of multiple events on wellbeing. This is not of particular concern for events that occur infrequently (e.g. death of spouse or child) but may matter for more frequent events (e.g. moving home). We also estimated models that assumed only the most proximate event affected current wellbeing (similar to Frijters et al., 2011) as a sensitivity check, and obtained similar results to those reported below.

Finally, when an event occurred in the last 12 months but the respondent did not specify the quarter the event occurred (between 4.5%-31.7% of cases depending on the event), we treated that year as a missing observation (we do however use the fact that we know an event occurred in that year to construct pre- and post-indicators for other years). In a follow-up sensitivity analysis presented in the Supplementary Material (*Uncontaminated Models*) we restricted our sample to only those observed consistently for a seven-year window around the life event.

The analysis was performed in *R* (version 3.5.1) (R Core Team, 2013), using the tidyverse package (version 1.2.1) (Wickham, 2017), and the plm package (1.6–6) for fixed effects estimates (Croissant & Millo, 2008).

Comparing the total impact of life events

In order to compare the total impact of life events, taking into account both magnitude and duration of effect, we calculated the area-under-the-curve (AUC) for each event in each model (as well as variance). The AUC was calculated by:

$$AUC_{event} = \sum_{i=1}^{T} x_{\beta}\delta_t \tag{2}$$

where x_{β} is a T length vector of beta coefficients for each time-point, and δ_t is the vector of time (months) between each time-point. The AUC is therefore the summation of all of the marginal effects on the pre- and post-event dummies (both positive and negative) between −24 months and 48 months of the event occurring, weighted by the number of months the marginal effect represents. This serves as a useful summary of the overall effect of the event on wellbeing and facilitates comparison between events with different time paths.

The variance for each *AUC* was estimated by:

$$\sigma_{AUC} = \delta_t^{'} \sum_{t} \delta_t^{'}$$

where Σ is the variance-covariance matrix from each model.

Results

Subjective wellbeing

The mean levels of affective wellbeing (mental component score) and cognitive wellbeing (life satisfaction score) in the HILDA dataset were 39 and 8 respectively. The mean level of wellbeing over years (2001–2016) suggested that trends in affective wellbeing were not matched by trends in cognitive wellbeing, in particular a recent decline in the former with no change in the latter, as shown in Fig. S2 (Supplementary materials). The correlation between cognitive and affective wellbeing measures was $r^2 = 0.23$, indicating they share less than a quarter of variance.

Life events

The most widely experienced event (i.e., highest proportion of sample experiencing it at least once) was *Moved*, while the least widely experienced event was *Jailed* (Fig. S3 Supplementary Material). The four most frequent events, with a similar frequency, were *Family harmed* (serious injury or illness of a close family member), *Hired*, *Pregnant* and *Moved*, which occurred about once every 4.5 years on average (Fig. S4 Supplementary Material). The least frequent events were *Widowed* and *Married*, which occurred once every nine years or less. Fig. S4 (Supplementary Material) shows the frequency of most events was once every six years or less, indicating the occurrence of multiple events in our time window was relatively infrequent. We excluded home destroyed by natural disaster (*Home lost*), *Relative died* and *Jailed* events in the plots presented below as they were experienced by a relatively small number of individuals or were not measured for the entire 15 years. However, they were still included as covariates in the modeling below.

Effect of life events on subjective wellbeing

Unconditional effect of life events. Figs. 1 and 2 below show the effect of each life event on cognitive and affective wellbeing, ignoring any concurrent life events (or any other covariates apart from year).

We a priori defined 9 positively and 9 negatively valenced events and present them in separate figures to facilitate comparison between events of the same valence (although this was not born out for reconciliation which had an anticipatory negative effect and no positive effect). *Married*, *Childbirth* and a major financial gain (*Money gained*) produce the largest positive impact on wellbeing, while *Widowed*, *Separated* and major financial loss (*Money lost*) produced the largest negative impact on wellbeing.

Sometimes the effect of a life event seems to precede the time of the event (−24 or −12 on the x-axis). These anticipatory effects suggest the life events are not completely unexpected or surprising, and in some cases (e.g., moving) the effect seemed entirely anticipatory with no post-event impact.

Conditional effect of life events. Figs. 3 and 4 show the results of a model which includes all other life events as covariates, as well as year, age, changes in education, and changes in a socioeconomic proxy (i.e., SEIFA index). This model thus estimates effect of each event on wellbeing independent of other events, time-varying observable characteristics, and all time-invariant characteristics (observed and unobservable).

The conditional effect of most life events on wellbeing revealed a similar relative magnitude among events as the unconditional effect; *Widowed*, *Separated* and *Money lost* are worst, while *Married*, *Childbirth* and *Money gained* are best. Furthermore the differential effect of positive events on cognitive over affective wellbeing is still generally present. However, conditioning on other events did change the impact of some individual events. For instance, the conditional effect of reconciliation with partner (*Reconciled*) on cognitive wellbeing is more positive than the unconditional effect.

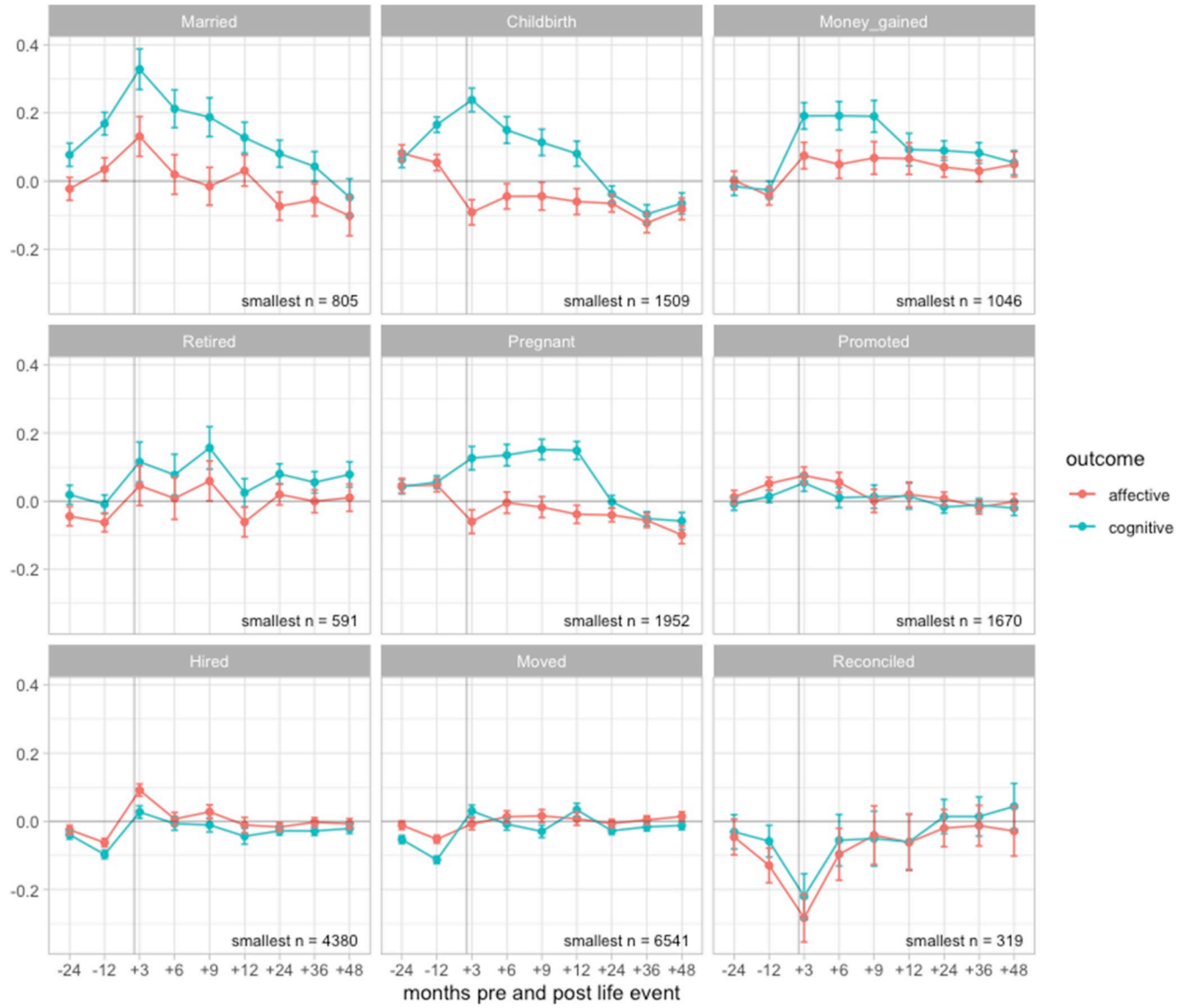

Fig. 1. Unconditional effect of positive events on wellbeing (HLDA 2002 to 2016) FE coefficients (sd units) ± 90 percent confidence intervals.
Fig. 1 legend. *Impact of positively-valenced ("good") events on affective and cognitive wellbeing. For each life event (panel), coefficients are plotted with the time of the event relative to measurement on the x-axis, and the amount of change in wellbeing (in standard deviation units) produced by the event on the y-axis. Differences from zero represent the marginal effect of the life event on wellbeing. The panels in each figure are ordered by the magnitude change in wellbeing (from large to small). Confidence intervals were calculated using cluster-robust standard errors (on individuals).*

Total impact of life events and the comparative effect on cognitive and affective wellbeing

The combined magnitude and duration of life events, summarised by the area-under-the-curve (AUC) of the wellbeing response to each event is shown in Fig. 5. Comparing the AUC from each unconditional model with each conditional model indicates the strength of the confounding by other events and time varying covariates. Each vertical crossbar represents the AUC and the interval around the crossbar represents 95 percent confidence intervals. As expected, the conditional effects are generally closer to zero (i.e. smaller) than the unconditional effects. However, there are exceptions such as *Widowed*, where the large negative impact is not affected by adjusting for other life events, and the three events with the most negative impact remain significant. The differential impact of positive events on cognitive wellbeing and affective wellbeing is shown in Fig. 5 (and Supplementary Table S6). Marriage, retirement and childbirth had positive effects on cognitive wellbeing but no overall effect on affective wellbeing, separation had a greater negative effect on cognitive than affective wellbeing, whilst moving home was associated with a negative effect on cognitive wellbeing but no affective wellbeing response.

Discussion

The present study confirms what people know; that not all life events are equal and many are concurrent with other events. In some respect, this may seem to be a self-apparent conclusion to anyone who has ever lived but epidemiological research often ignores this by using summed checklists to assess impact, or just evaluates the impact of one event (Dohrenwend, 2006; Gray et al., 2004; Wethington et al., 1997). Our results also quantify the difference and allow us to infer the average effect in the population. Other studies have noted differences between events in the magnitude or duration of effect on wellbeing (Frijters et al., 2011; Luhmann et al., 2012), however we focus on the total impact (both magnitude and duration). Previous longitudinal studies following individuals across time also indicate health shocks (the duration of

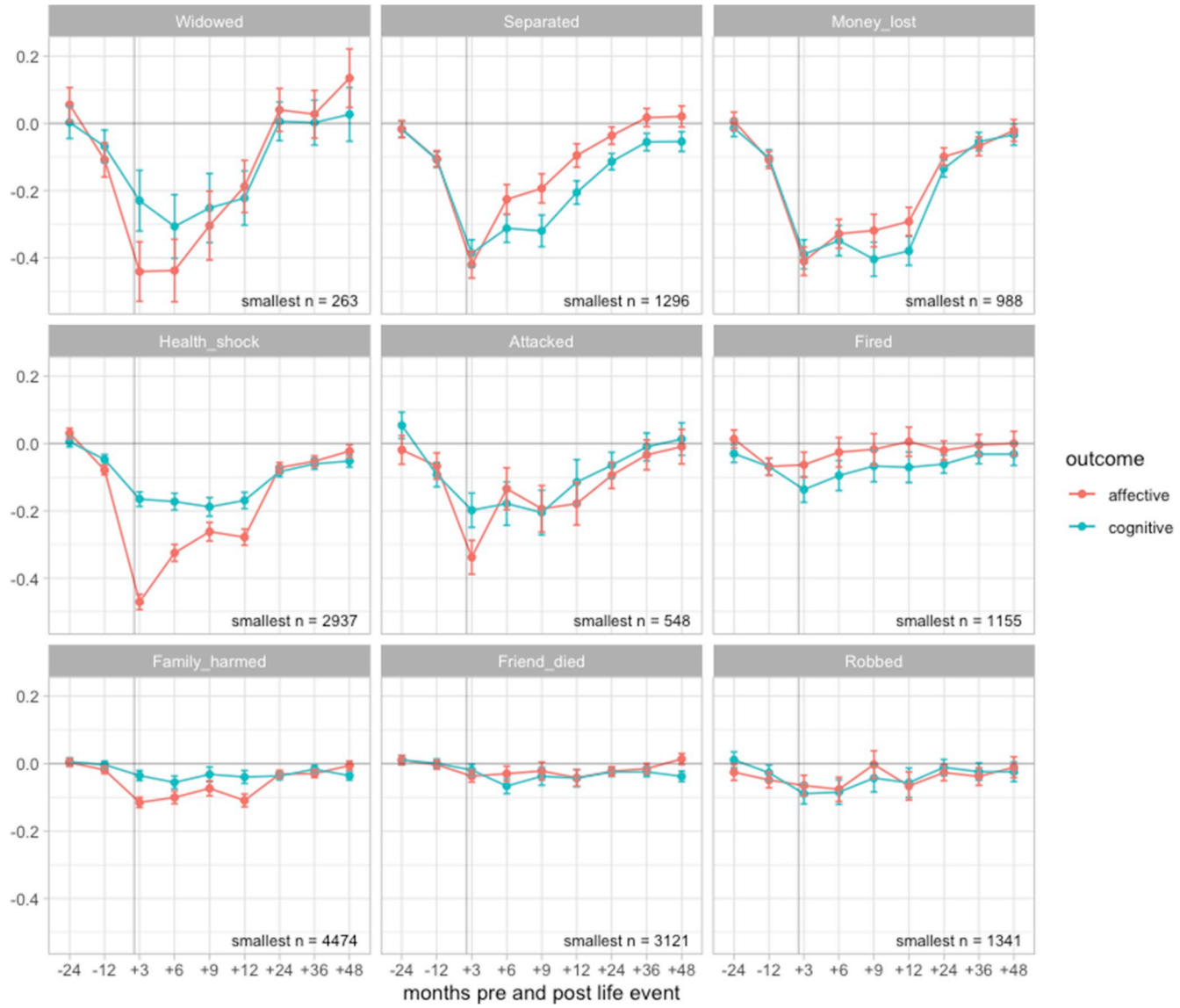

Fig. 2. Unconditional effect of negative events on wellbeing (HLDA 2002 to 2016) FE coefficients (sd units) ± 90 percent confidence intervals.
Fig. 2 legend. *Impact of negatively-valenced ("bad") events on affective and cognitive wellbeing. Coefficients are plotted across months between event and measurement on the x-axis, and the marginal effect on wellbeing (in standard deviation units) on the y-axis. Confidence intervals were calculated using cluster-robust standard errors (on individuals).*

disability) (Lucas, 2007), and separation (divorce) (Lucas, 2005; Lucas, Clark, Georgellis, & Diener, 2003) have long-term negative effects but unlike Lucas (2005), we found that the impact of the death of a spouse seemed to diminish by 2 years. The evidence for long-term effects of marriage and unemployment is mixed, with some studies showing that they continue to influence wellbeing long after they have occurred (Lucas, Clark, Georgellis, & Diener, 2004), while others report adaption to these same events (Clark et al., 2008; Frijters et al., 2011) as we found. Fig. 5 provides a comparison of the total impact (magnitude and duration) of each event on wellbeing. For instance, on average the impact of a major financial loss on both types of wellbeing was the greatest whilst health shocks, losing a loved one (widowed), separation or divorce tended not to have as much negative impact on both. Conversely, getting married, a major financial gain, retirement and childbirth had positive effects on cognitive wellbeing with little overall positive effect on affective wellbeing. These data demonstrate that the practice of treating life events as comparable is untenable.

The impact of some events is negligible after accounting for the impact of concurrent events. In general, the conditional effects of life events were a little closer to zero than the unconditional effects, but in almost all cases this was minimal, reflecting how uncommon co-occurrence actually was. However the unconditional positive effect of pregnancy on cognitive wellbeing was all but reversed once concurrent events (childbirth) were accounted for.

These results also challenge the notion of many of the identified life events as being intrinsically "stressful", the implication of which is that they should have some negative effect on wellbeing. Holmes and Rahe's Social Readjustment Scale (Holmes & Rahe, 1967) weights marriage as the sixth most stressful event yet we found no negative impact on affective wellbeing and a profound anticipatory and subsequent positive effect on life satisfaction. Conversely people's wellbeing in the lead up to some positive events was impaired, the most notable being reconciliation which most likely demonstrates the effect of relationship difficulties just prior to the event.

The differential impact of events on the components of affective and cognitive wellbeing supports *their distinction as separate constructs, although both show hedonic adaptation.* A novel aspect of the present study is the comparative differences of the affective and cognitive wellbeing

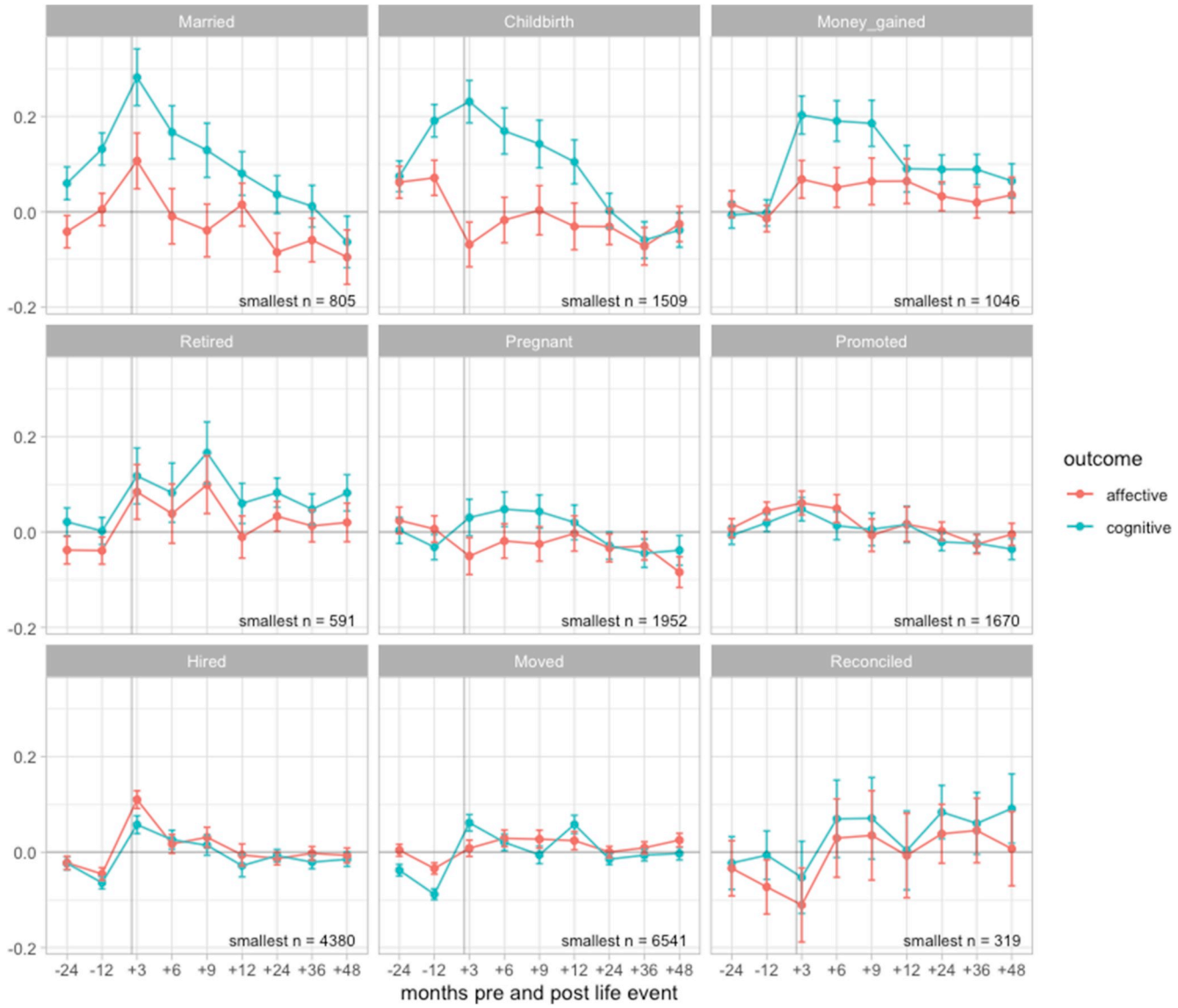

Fig. 3. Conditional effect of positive events on wellbeing (HLDA 2002 to 2016) FE coefficients (sd units) ± 90 percent confidence intervals.
Fig. 3 legend. *Conditional effect of positively-valenced ("good") events on affective and cognitive wellbeing, after accounting for all 21 other events as well as changes in education, age, and SEIFA. Coefficients are plotted across time on the x-axis, with the marginal effect on the y-axis. Confidence intervals were calculated using cluster-robust standard errors (on individuals).*

response to certain events. For instance, some positive events had a substantial impact on cognitive wellbeing while eliciting relatively little impact on affective wellbeing or "happiness" (e.g., *Married, Retired, Childbirth, Pregnant*). In contrast, negative events tended to have comparable and untoward effects on both cognitive and affective wellbeing, with the exception of *Separated* which again elicited a greater (negative) impact on cognitive wellbeing, and *Moving* which had no affective response but reduced life satisfaction. The differential impact of events on the components of affective and cognitive wellbeing supports the distinction between wellbeing components and their treatment as separate constructs. It also implies that, on average, hoping for happiness from positive events appears misplaced.

Limitations

A few general issues are worth discussing in large, longitudinal models and studies of this kind. Such studies preclude the use of the experience sampling method of assessing affective wellbeing which many consider the best method for assessing short term intra-individual variation in affective wellbeing. The fixed effects models exclude anyone who did not experience the event in the time window of interest. This means that in any particular event, such as marriage, average differences in subjective wellbeing between married people and unmarried people may be present, however these *between-group* differences will not be revealed by the fixed effects model which estimates *within-subject* changes in the sample of interest. As a result, these population estimates can reveal what to expect once an event has occurred, but cannot be used to predict whether an event such as marriage will increase or decrease wellbeing in any particular case. That is, the effects of marriage may be specific to the kinds of people who get married and should not be offered as evidence or a reason to get married.

We used an unbalanced panel, which means a slightly different set of individuals may contribute to the pre- and post-event coefficients (although there is considerable overlap). A balanced approach (Clark et al., 2008) only includes people with measurements before and after the event, which ensures the same cohort is followed over time. However, balancing reduces efficiency and risks inducing potential selection effects, so other researchers have taken a more liberal approach and

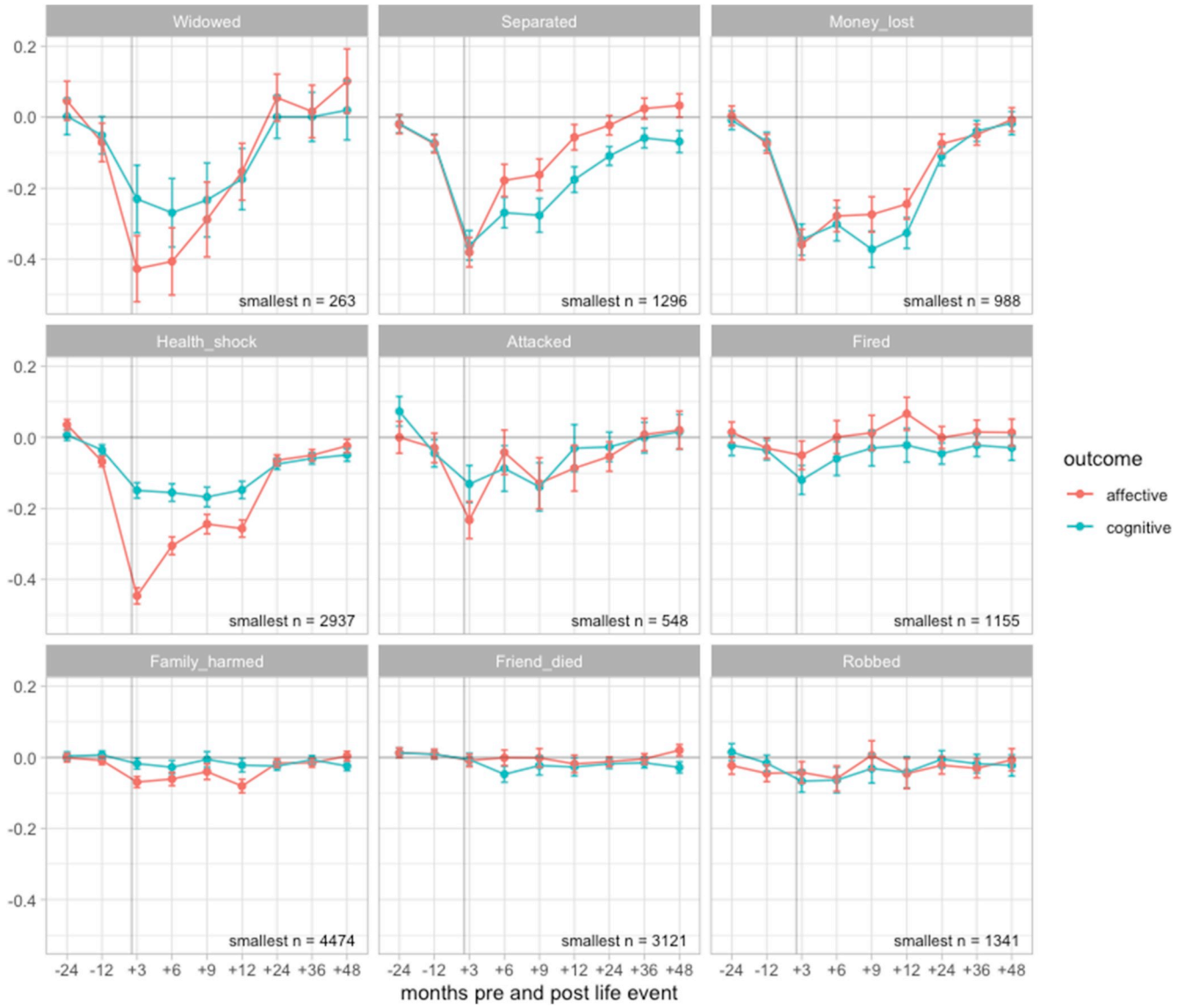

Fig. 4. Conditional effect of negative events on wellbeing (HLDA 2002 to 2016) FE coefficients (sd units) ± 90 percent confidence intervals.
Fig. 4 legend. *Conditional effect of negatively-valenced ("bad") events on affective and cognitive wellbeing, after accounting for all 21 other events as well as changes in education, age, and SEIFA. Coefficients are plotted across time on the x-axis, with the marginal effect on the y-axis. Confidence intervals were calculated using cluster-robust standard errors (on individuals).*

included anyone with more than one consecutive observation, regardless of when those observations occurred (Frijters et al., 2011), which we follow in this study. In a sensitivity analysis we restricted the sample to a balanced panel observed pre- and post-event (see *Balanced Models* in Supplementary Materials) which did not materially change the overall results or inferences.

We also note some causes of potentially non-random measurement error inherent in any dynamic model of this sort. First, due to censoring issues we do not know at time $t = 1$ if a life event occurred before that first year (e.g., 2002). Similarly, at time $t = T$ we do not know whether an event occurred after the final year (e.g., 2016). We do not expect this to significantly bias our estimates since many events occur infrequently and this only affects years close to the endpoints of our data. A similar issue arises in the case of missing life event information, either because the respondent did not complete that part of the questionnaire or because they are missing from the sample in a particular year. In both cases, we assumed no life event occurred in the missing year when constructing pre- and post-indicators. Again, we expect any bias to be small given that most life events are infrequent and more than 65 percent of people are responding year-to-year (see Table S2 in Supplementary Material). In a follow-up analysis (*Uncontaminated Models* in Supplementary Materials), we excluded from the sample any observations within three years of missing life event data to estimate an uncontaminated (as well as balanced) model. This means we only estimated effects for the years 2005–2012, and so after balancing and de-contamination this was our most restricted sample. As a result, our estimates became less precise and, while generally qualitatively similar to the main results, some effects became statistically insignificant (particularly for the positive events).

Summary

These results present for the first time the comparative anticipatory, short- and medium-term effects of a wide range of life events on people's happiness (affective wellbeing) and life satisfaction (cognitive wellbeing). Policy makers now focus on measuring wellbeing as an indicator of success through such metrics as the OECD's "Better Life Index", Gallup's "Global Wellbeing Index" and the European Social Survey. The

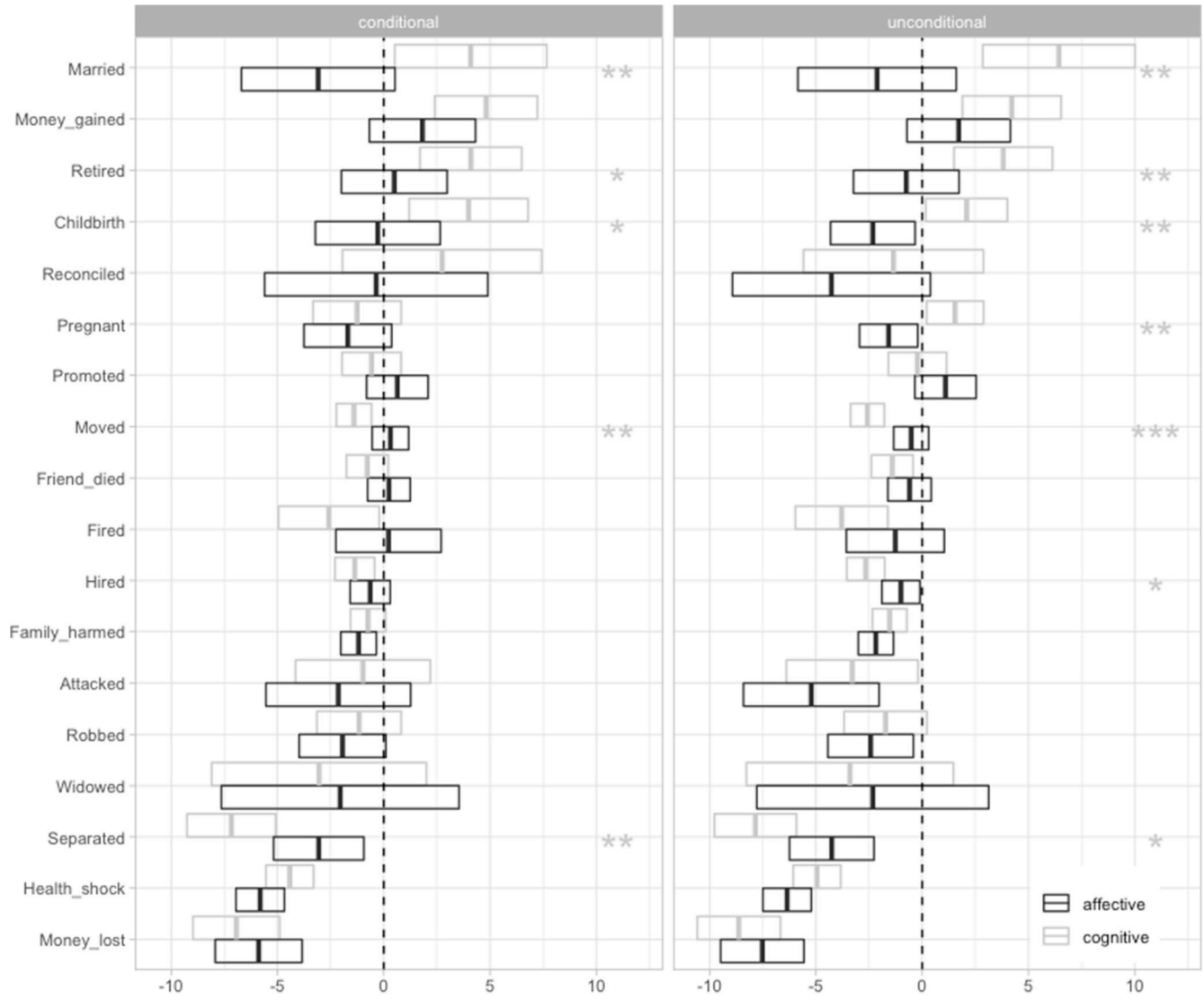

Fig. 5. Combined magnitude and duration effect of life events of life events on wellbeing AUC ± 95 percent confidence interval.
Fig. 5 legend. *Total impact (AUC) of life-events on affective and cognitive wellbeing, for conditional (left panel) and unconditional models (right panel) in sd units. See* equation (2) *for formulaic details. Stars indicate the results of a two-tailed test of differences between cognitive and affective wellbeing for each event* (*$p < .05$, **$p < .01$, ***$p < .001$).

Global Wellness Economy Monitor suggests this is now a $4.2 trillion dollar industry. Identifying whether there are life events, the prevalence of which can be enhanced or reduced through health, family or justice policies, that will affect these outcomes is likely to become more important in the future.

Financial Support

This research received no specific grant from any funding agency, commercial or not-for-profit sectors.

Availability of data and materials

Data are available on application to the Australian Government Department of Social Services. All code used to produce this report is available on GitHub: https://github.com/datarichard/shit-happens.

Ethics statement

This paper uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) survey. The HILDA project was initiated and is funded by the Australian Government Department of Social Services (DSS) and is managed by the Melbourne Institute of Applied Economic and Social Research Melbourne Institute. The authors were not involved in the collection and dissemination of the data and as such did not seek ethics approval for this study, which only utilises pre-existing data.

Declaration of competing interest

None.

Acknowledgements

This paper uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) survey. The HILDA project was initiated and is funded by the Australian Government Department of Social Services (DSS) and is managed by the Melbourne Institute of Applied Economic and Social Research Melbourne Institute. The findings and views reported in this paper, however, are those of the author and should not be attributed to either DSS or the Melbourne Institute.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssmph.2019.100533.

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