Psychological morbidity and return to work after injury: multicentre cohort study

Kendrick D,[1] Dhiman P,[2] Kellezi B,[3] Coupland C,[1] Whitehead J,[1] Beckett K,[4] Christie N,[5] Sleney J,[6] Barnes J,[7] Joseph S,[8] Morriss R.[9]

[1] School of Medicine, Division of Primary Care, Tower Building, University Park, Nottingham, NG7 2RD.

[2] School of Medicine, Research Design Service East Midlands (RDS EM), Queen's Medical Centre, Nottingham, NG7 2UH

[3] Division of Psychology, Nottingham Trent University, NG1 4BU, UK

[4] University of the West of England, Oakfield House
Bristol, BS8 2BN, UK

[5] Centre for Transport Studies, University College London, WC1E 6BT, UK

[6] Department of Sociology, University of Surrey, GU2 7XH, UK

[7] Loughborough Design School, Loughborough University, LE11 3TU, UK

[8] School of Education, University of Nottingham, NG8 1BB, UK

[9] Division of Psychiatry and Applied Psychology, University of Nottingham, NG7 2TU, UK

Correspondence to: Professor Denise Kendrick

(ORCID ID orcid.org/0000-0003-3603-6542)

E mail: denise.kendrick@nottingham.ac.uk

Tel: 0115 8466914

Word count:2499

Abstract word count: 250

Key words: injuries, work, mental health, cohort study

Abstract

Background: The benefits of work for physical, psychological and financial wellbeing are well known. Return to work (RTW) after unintentional injury is often delayed, and psychological morbidity may contribute to this delay. The impact of psychological morbidity on RTW after a wide range of unintentional injuries in the UK has not been adequately quantified.

Aims: To quantify the role of psychological factors including anxiety, depression and post-traumatic distress on return to work following unintentional injuries.

Design and Setting: Longitudinal multi-centre prospective study in four UK sites.

Method: Participants (n=273) were 16-69 year olds admitted to hospital with an unintentional injury who were employed prior to injury. They were surveyed at baseline, 1, 2, 4 and 12 months following injury on a range of demographic and injury characteristics, psychological morbidity and RTW. Associations between demographic, injury and psychological factors and RTW were quantified using random effects logistic regression.

Results: The odds of RTW reduced as depression scores one month post-injury increased (OR 0.87, 95%CI 0.79, 0.95) and as length of hospital stay increased (OR 0.91, 95%CI 0.86, 0.96). Those experiencing further life events following injury (OR 0.27, 95%CI 0.10, 0.72) and with higher scores on the crisis social support scale (OR 0.93, 95%CI 0.88, 0.99) had a lower odds of RTW. Multiple imputation analysis found similar results except for crisis social support which did not remain significant.

Conclusion: Primary care professionals can identify patients at risk of delayed RTW who may benefit from management of psychological morbidity and other support to RTW.

How this fits in

Injuries are common in working age-adults; resulting in a delayed return to work (RTW) for many.

The benefits of work for physical, psychological and financial wellbeing are well documented.

Depression occurring early in the recovery period, life events after the injury and a longer stay in hospital significantly reduce the odds of RTW in the first year after injury. Primary care professionals can identify patients at risk of delayed RTW, detect and manage psychological morbidity and provide other support to RTW.

Introduction

Being in work benefits physical and mental health,[1] while being out of work can have financial, physical and psychological consequences.[2] The Black Report, "Working for a healthier tomorrow"[2] stresses the importance of identifying factors which make work difficult for individuals, and the means of encouraging them to remain in work.

In England in 2014-15, over 319,000 working age adults were admitted to hospital with injuries.[3] These have a sizeable impact on return to work (RTW) in England and Wales; with 17% of emergency department attenders and 43% of hospital admissions not RTW 4 months post-injury.[4] Injuries also account for 10% of sick notes in the UK,[2] and 14% of benefit claimants.[5]

Depression,[6-10] anxiety[11] and post-traumatic stress disorder (PTSD)[12] are common post-injury. A review focussing on road traffic injuries[13] estimated prevalence at 1 year ranged from 21-67% for depression, 4-87% for anxiety and 0-100% for PTSD. These conditions impact negatively on ability to RTW.[7, 12, 14-19] One study,[19] for example, reporting outcomes six months post-injury, found 52% of depressed patients were working compared to 73% of those without depression, whilst 47% of patients with PTSD were working compared to 78% of those without.

As depression, anxiety and PTSD are detectable and treatable, it is important to quantify their impact on RTW amongst injured working-age adults in the UK. This paper reports findings on psychological morbidity and RTW from the Impact of Injuries Study, to inform identification and management of these conditions post-injury in primary care, and other services such as occupational health.

Methods

Study methods are fully described in the published protocol.[20]

Study design

Multi-centre longitudinal cohort study in four NHS hospital trusts in Nottingham, Bristol, Leicester and Guildford, UK.

Participants

Participants were recruited from June 2010-June 2012 within three weeks of hospital admission for unintentional injury. Those aged 16-70 years with a fixed address (to enable follow-up) were eligible. Those with loss of consciousness, amnesia or a Glasgow coma scale of <15 at presentation were excluded due to difficulty distinguishing between head injury sequelae and psychological morbidity.[21] Participants were recruited face-to-face, by post and by phone. Quota sampling by injury type was used from June 2010-May 2011, but subsequently due to slow recruitment, all eligible patients could participate. Only participants in paid employment at the time of injury were included in the analyses presented in this paper.

Data collection

Participants completed self-administered questionnaires at recruitment (baseline) and at 1, 2, 4 and 12 months post-injury. Baseline questionnaires assessed socio-demographic characteristics (age, marital status, ethnicity, number of cars in household, living alone, employment status, area-level deprivation (Index of Multiple Deprivation (IMD) 2010);[22] injury details, long term health conditions, anxiety and depression (Hospital Anxiety and Depression Scale (HADS)),[23] alcohol problems (Alcohol Use Disorder Identification Test (AUDIT)),[24] substance use (Drug Abuse Screening Test (DAST)),[25] social functioning (Social Functioning Questionnaire (SFQ))[26] and quality of life (EQ5D).[27] Injury severity was assessed from medical records using the Abbreviated Injury Scale (AIS)[28] grouped into: minor (AIS=1), moderate (AIS=2) and serious to maximum (AIS=3-6) and based on the most severe injury for participants with multiple injuries. Follow-up questionnaires included questions on time off work since injury, self-reported recovery,[29] Impact of Events Scale (IES) measuring post-

traumatic distress,[30] stressful life events related to the injury (List of Threatening Events (LTE)),[31] social support (Crisis Support Scale (CSS)),[32] positive and negative changes in outlook (Change in Outlook Questionnaire, (CiOQ))[33] and legal proceedings or compensation claims due to injury. Researchers administered structured clinical interviews (SCID)[34] measuring psychological morbidity for all participants at baseline and at follow-up for those scoring borderline or above on HADS depression (>7), HADS anxiety (>7), IES (>18 for each subscale or >29 for combined scores), AUDIT (>7) or DAST scales (>2).

Outcomes

The primary outcome was whether a participant reported RTW. This was a binary outcome at each time point (1, 2, 4 and 12 months post-injury). RTW was defined as being in paid employment (including full, part-time work and self-employment), working at the specific time point and not prevented from working because of their injury since the previous follow-up time point.

The sample for this analysis comprised participants who were employed at baseline, returned the 1 month questionnaire, and at least one subsequent follow-up questionnaire (at 2, 4 or 12 months).

Statistical Analysis

Baseline characteristics were described and compared between the sample described above (responders) and those employed at baseline who returned the 1 month questionnaire but did not return any subsequent follow-up questionnaires (non-responders). Categorical data were compared using chi-square tests, and continuous data using t-tests or Mann-Whitney U tests dependent on distributions.

Proportions of participants who had RTW were calculated and a RTW trajectory was developed.[35] Non-responders and those with missing RTW data were categorised as 'unknown'.

Univariate and multivariable odds ratios with 95% confidence intervals were estimated for RTW using random effects logistic regression to account for repeated measures of RTW at 2, 4 and 12 months. Linearity of continuous predictors was assessed, and non-linear predictors were categorised into quintiles. Four multivariable models were built using predictors described in box 1.

[INSERT BOX 1]

Psychological predictors at 1 month (Model B) were added in order of statistical significance on univariate analysis, to Model A. Psychological predictors were retained in the model if the likelihood ratio test (LRT) p-value was <0.05. At this stage, correlations between predictors to be added in Models C and D with psychological predictors retained in Model B were assessed. Predictors with correlation coefficients ≥ 0.5 or ≤ -0.5 were excluded from the analysis.

Model C added potential predictors of RTW at baseline as a block to Model B. Predictors were retained in the model if the LRT $p<0.05$ or if their removal resulted in a >10% change in the 1 month psychological predictor odds ratio.

Model D added potential predictors of RTW reported at 1 month as a block to Model C, with predictors retained in the model as for model C. Interactions between included psychological predictors at 1 month and age, sex, and follow-up time were assessed by adding interaction terms to the final model (Model D) and were included in the model based on LRT $p<0.01$. Collinearity between predictors was assessed by the covariance correlation matrix and variance inflation factors. Model assumptions were checked using deviance residuals.

As a sensitivity analysis, multiple imputation with chained equations was used to impute missing data for all participants employed at baseline. The imputation model included all predictors in the univariate analysis and the outcome (RTW at 2, 4, and 12 months). Ten datasets were created and combined using Rubin's rules.[36, 37]

Results

Three fifths (393, 59%) of the total 668 study participants were employed at the time of injury. Of these 299 (76%) returned the 1 month follow-up questionnaire; and 273 (91%) returned at least one subsequent follow-up questionnaire and so formed the sample for these analyses. Figure 1 shows the flow of participants in the study.

[INSERT FIGURE 1]

Table 1 shows baseline characteristics of the study sample: 52% were men, 53% were aged 45 to 64; 66% had an injury of moderate severity; 43% reported single injuries; 62% had an injury of the lower limb; injuries most commonly occurred at work (30%), and were most frequently caused by falls (58%).

[INSERT TABLE 1]

Few (13%) participants had RTW at 1 month, 21% had RTW at 2 months, 48% at 4 months, and three fifths at 12 months (61%). Figure 2 shows the RTW trajectory over time. Only 6% of participants had fully RTW at all time points; 4% initially RTW, but had not RTW at a later time point; over 50% had a delayed RTW; 8% had not RTW at any time point and 29% had insufficient information to categorise RTW over the full 12 month period.

[INSERT FIGURE 2]

Univariate and multivariable associations with RTW are shown in tables 2 and 3 respectively. In Model A, the odds of RTW increased significantly over time. In Model B participants had 14% lower odds of returning to work per unit increase in the HADS-D scale (OR 0.86, 95% CI: 0.79, 0.94). None of the other psychological predictors were significantly associated with RTW once depression was included in the model. In Model C, depression at 1 month remained significant, with a 13% lower odds of RTW per unit increase in the HADS-D (OR 0.87, 95% CI: 0.80, 0.95).The only baseline predictor significant in the model was length of hospital stay, with an 11% reduction in the odds of RTW for each additional night spent in hospital (OR 0.89, 95% CI: 0.84, 0.95). In Model D, the odds ratio for depression at 1 month remained unchanged (OR 0.87, 95% CI: 0.79, 0.95) and length of stay remained significant (OR 0.91, 95% CI: 0.86, 0.96). Only two of the other 1 month predictors were significant in the model: the odds of RTW reduced by 7% per unit increase in crisis support (OR 0.93, 95% CI: 0.88, 0.99); and by 73% for those experiencing life events since the injury (OR 0.27, 95% CI: 0.10, 0.72). Social functioning and negative changes in outlook were excluded due to high correlations with the HADS-D at 1 month. No significant interactions between depression at 1 month and age, sex, and time were found. Variance inflation factors ranged from 1.03 to 3.08.

[INSERT TABLES 2 and 3]

Non-responders were significantly younger ($p<0.001$), more likely to be male ($p<0.001$), single ($p<0.001$), live in disadvantaged areas ($p<0.001$), and have scores indicating greater problems with alcohol ($P=0.001$) and drug use ($p=0.01$). Results from the multiple imputation analysis (table 4) were similar to the complete case analysis. Associations between depression at 1 month, nights in hospital, and life events and RTW were reduced in size but remained significant. Crisis support no longer remained significantly associated with RTW.

[INSERT TABLE 4]

Discussion

Main findings

Forty percent of participants had not RTW 12 months post-injury. A higher depression score at one month post-injury, longer hospital stay, subsequent life events and higher crisis support were associated with significantly lower odds of RTW after injury. Findings for depression, length of stay and life events remained significant in multiple imputation analyses.

Strengths and limitations

This is the first prospective multicentre UK study to quantify the impact of early psychological morbidity on RTW in working age adults admitted to hospital following a wide range of injuries. Our study addressed some limitations of previous studies. We included a general injury population with injuries of varying levels of severity. We measured a series of psychological predictors of RTW and adjusted for many potential confounders.

Thirty percent of eligible patients who were approached to participate took part and some selection bias may have occurred if participants were more or less likely to RTW. Follow-up rates were higher than, or comparable to studies using similar recruitment methods.[38-42] Those not returning 2, 4 and 12 month questionnaires differed from those returning questionnaires, but multiple imputation analyses suggested findings for depression, length of hospital stay and life events were robust to missing data.

The number of participants with some types of injuries was small, limiting analyses to broad injury groupings (upper, lower limb, upper and lower, and other injuries), but consistent with a previous systematic review of prognostic factors associated with RTW post-injury.[43] Black and minority ethnic groups were under-represented, potentially limiting generalisability of our findings.

Work injuries are likely to have poorer work-related outcomes than those occurring elsewhere.[42, 44, 45] This may be partly explained by depression and PTSD which may be more common after occupational injuries.[7, 46-48] Small numbers of occupational injuries in our study precluded further analysis.

The finding of a lower odds of RTW with increasing crisis support was unexpected. The scale we used measured support provided in a crisis, not longer term social support. Higher levels of crisis support may reflect greater emotional distress or physical impairment, which could both reduce the odds of RTW. Also the short-term nature of crisis support may not provide the buffering effect on depression often seen with longer term social support.

Comparison with other studies

Non-UK studies show post-injury depression and PTSD are associated with delayed RTW,[18, 49, 50] but differences in occupations, benefits and compensation systems limit comparability with the UK. A 2010 systematic review of RTW prognostic factors after acute orthopaedic trauma[43] included only 2 UK studies and we have not found more recent UK studies. The first study from 2002,[42] was small (n=154), recruited injured male hospital admissions and found greater PTSD symptoms were associated with a reduced odds of RTW 18 months post-injury. The second study from 1992,[51] was also small (n=101), confined to road traffic injury patients receiving compensation and found psychological problems (undefined) and older age were associated with a reduced likelihood of RTW. We found no association between PTSD symptoms and RTW, once depression was in the multivariable model. This may be explained by depression and PTSD often co-existing.[52] Most (81%) of our participants with moderate or severe PTSD met borderline or case criteria for depression and/or anxiety. In addition, injuries due to assaults[42] and road traffic injuries[51] were more frequent in these studies than in ours, and PTSD may be more common after such injuries. Differences in study

populations may explain variation in findings for gender[42] and age[51] and our larger sample size may explain our significant finding for length of hospital stay.

Implications for practice and research

GPs are ideally placed to identify patients with psychological morbidity post-injury because patients consult frequently after injury.[53] Some GPs may regard such symptoms almost as "normal" after an injury and are reluctant to "medicalise unhappiness".[54] Watchful waiting may be appropriate for short-lived symptoms, but our study clearly shows the negative impact of depressive symptoms lasting one month or more post-injury. The National Institute for Health and Care Excellence (NICE) guideline on recognising and managing depression in adults with chronic physical health problems highlights the high risk of depression, particularly where there is functional impairment.[55] Traumatic injuries requiring hospital admission frequently result in functional impairments for many months; [41, 56] hence these NICE guidelines should be applied. However traumatic injuries present additional challenges, such as impaired mobility limiting access to group-based peer support, talking therapies or to undertaking physical activity, whilst analgesics and adjuvant pain medications may interact with antidepressants.

Patients with depression, longer inpatient stays, with life events subsequent to their injury and greater crisis support take longer to RTW. GPs and occupational health services can use these factors to identify people who may benefit from help to RTW. Most injured patients have not RTW one month after injury and would be eligible for the Fit For Work service.[57] This service provides occupational health assessments addressing factors preventing RTW and develops a RTW Plan with patients.

Further work exploring GPs perceptions of psychological problems post-injury, the extent and ways in which they identify, manage and coordinate care for these patients and barriers and facilitators to doing so would be useful. Longitudinal studies assessing the

impact of psychological problems on RTW after traumatic occupational injuries would also be useful, because this group may be at particular risk of psychological problems.

Funding:

This study was funded by the National Institute for Health Research (NIHR) Collaboration for Leadership in Applied Health Research and Care (CLAHRC) Nottinghamshire Derbyshire and Lincolnshire. RM is currently funded by NIHR CLAHRC East Midlands. The views expressed are those of the authors and not necessarily of the National Health Service, NIHR or the Department of Health.

Ethical approval: for the study was provided by Nottingham Research Ethics Committee 1 (number: 09/H0407/29).

Competing interests: None

Box 1: Predictors and potential predictors of RTW included in the multivariable model building

Model A (a-priori predictors): age, sex, study centre, and time.

Model B (psychological predictors at 1 month): HADS depression (HADS-D), HADS anxiety (HADS-A), IES avoidance (IES-A), IES intrusion (IES-I), AUDIT and DAST.

Model C (potential predictors at baseline): number of psychological morbidities, HADS-D, HADS-A, AUDIT, DAST, long standing illness, work status, ethnicity, deprivation, marital status, length of hospital stay, injury characteristics (severity, number, body part, mechanism and location).

Model D (potential predictors at 1 month): social functioning, social support, changes in outlook (positive and negative), life events since injury, pain visual analogue scale, compensation, and litigation.

Table 1. Baseline characteristics of the study participants.

Characteristics measured at baseline	Participants employed at baseline, returned 1 month questionnaire and at least 1 follow-up questionnaire (n=273)
Centre	
Nottingham	99 (36.3)
Loughborough	74 (27.1)
Bristol	71 (26.0)
Surrey	29 (10.6)
Age	
16-24	29 (10.6)
25-44	92 (33.7)
45-64	145 (53.1)
65+	7 (2.6)
Sex	
Female	132 (48.4)
Male	141 (51.7)
Number of psychiatric diagnoses in past (obtained from the SCID)	
0	237 (86.8)
1	27 (9.9)
≥2	9 (3.3)
HADS-D	[1]
Median (IQR)	0 (0, 2)
HADS-A	[1]
Median (IQR)	2 (0, 4)
AUDIT scale	[5]
Median (IQR)	4 (2, 6)
DAST scale	[2]
Median (IQR)	0 (0, 0)
Social functioning scale	
Median (IQR)	1 (0, 3)
Pain visual analogue scale	[1]
Median (IQR)	0 (0, 2)
Long standing illness	[1]
No	230 (84.3)
Yes	42 (15.4)
Ethnic group	
White	265 (97.1)
Black or ethnic minority	8 (2.9)
Deprivation (IMD)	[3]
Median (IQR)	12 (7, 20)
Marital status	
Single	74 (27.1)
Married/partnership	164 (60.1)
Divorced/widowed	35 (12.8)

Nights in hospital	[11]
Median (IQR)	5.5 (3, 8)
Injury severity*	[1]
Minor	15 (5.5)
Moderate	206 (75.5)
Serious or worse	51 (18.7)
Number of injuries	
1	117 (42.9)
2	91 (33.3)
≥3	65 (23.8)
Body part injured	
Other	28 (10.3)
Upper limb	49 (18.0)
Lower limb	170 (62.3)
Upper and lower limbs	26 (9.5)
Injury mechanism	
Other	28 (10.3)
Falls	159 (58.2)
Traffic	63 (23.1)
Struck	23 (8.4)
Place of injury	[1]
Other	42 (15.4)
Home	39 (14.3)
Work	83 (30.4)
Road	29 (10.6)
Countryside	38 (13.9)
Sports facilities	41 (15)

[ ] missing values. SCID= structured clinical interview; HADS-D=HADS depression; HADS-A= HADS anxiety; AUDIT=alcohol use disorder identification test; DAST=drug abuse screening test; IMD = Index of Multiple Deprivation. *Injury severity measured using the Abbreviated Injury Scale (AIS); minor = AIS=1, Moderate = AIS=2, Serious or worse = AIS> =3.

Table 2. Unadjusted odds ratios for potential factors associated with RTW (with 95% confidence intervals).

Variables	**Unadjusted OR (95% CI)**
A-priori confounders	
Centre	
Nottingham	1.00
Loughborough	0.82 (0.51, 1.31)
Bristol	0.92 (0.57, 1.48)
Surrey	1.96 (1.00, 3.84)
Age	
16-24	1.00
25-44	1.29 (0.67, 2.51)
45-64	0.95 (0.51, 1.76)
65+	0.65 (0.19, 2.28)
Sex	
Female	1.00
Male	1.04 (0.71, 1.51)
Follow-up Time	
2 months	1.00
4 months	11.72 (6.06, 22.70)
12 months	77.39 (30.91, 193.77)
Psychological predictors at 1 month post-injury	
HADS-D	0.92 (0.88, 0.96)
HADS-A	0.92 (0.88, 0.97)
IES-A	0.96 (0.93, 0.98)
IES-I	0.96 (0.94, 0.99)
AUDIT scale	
1 (0)	1.00
2 (1-2)	1.08 (0.64, 1.83)
3 (2.2-3)	1.73 (0.95, 3.16)
4 (3.3-6)	2.12 (1.19, 3.76)
5 (7-25)	1.16 (0.65, 2.05)
DAST scale	1.08 (0.69, 1.67)
Psychological, social-demographic, and injury characteristics at baseline	

Number of psychiatric diagnoses in past (SCID)	
0	1.00
1	0.88 (0.46, 1.68)
≥2	0.27 (0.09, 0.80)
HADS-D	0.94 (0.85, 1.04)
HADS-A	0.99 (0.93, 1.05)
AUDIT scale	1.00 (0.96, 1.04)
DAST scale	0.92 (0.61, 1.37)
Long standing illness	
No	1.00
Yes	0.76 (0.46, 1.27)
Ethnic group	
White	1.00
Black or minority ethnic group	0.43 (0.12, 1.48)
Deprivation (IMD)	0.98 (0.97, 1.00)
Marital status	
Single	1.00
Married/partnership	1.43 (0.92, 2.22)
Divorced/widowed	1.17 (0.62, 2.20)
Nights in hospital	0.93 (0.90, 0.97)
Injury severity*	
Minor	1.00
Moderate	0.73 (0.32, 1.63)
Serious or worse	0.42 (0.17, 1.02)
Number of injuries	
1	1.00
2	1.12 (0.73, 1.72)
≥3	0.60 (0.38, 0.97)
Body part injured	
Other	1.00
Upper limb	0.95 (0.46, 1.96)
Lower limb	0.55 (0.29, 1.04)
Upper and lower limbs	0.45 (0.19, 1.03)
Injury mechanism	
Other	1.00
Falls	1.00 (0.54, 1.84)
Traffic	0.75 (0.38, 1.49)

Struck	1.10 (0.47, 2.57)
Place of injury	
Other	1.00
Home	0.63 (0.32, 1.22)
Work	0.70 (0.40, 1.24)
Road	0.90 (0.44, 1.85)
Countryside	1.28 (0.64, 2.55)
Sports facilities	0.61 (0.31, 1.17)
Other predictors at 1 month post-injury	
Social functioning scale (Quintiles)	
1 (0-4.6)	1.00
2 (5-6.9)	0.42 (0.24, 0.73)
3 (7-8)	0.31 (0.18, 0.54)
4 (9-10)	0.29 (0.16, 0.52)
5 (10.3-18.3)	0.23 (0.13, 0.42)
CCS scale	1.00 (0.97, 1.04)
CiOQ-P scale	0.96 (0.94, 0.98)
CiOQ-N scale	0.97 (0.93, 1.01)
Life events since injury	
No	1.00
Yes	0.38 (0.22, 0.66)
Pain visual analogue scale	0.98 (0.98, 0.99)
Seeking compensation	
No	1.00
Yes	0.59 (0.38, 0.90)
Involved in litigation	
No	1.00
Yes	0.57 (0.35, 0.94)

SCID= structured clinical interview; HADS-D=HADS depression; HADS-A=HADS anxiety; IES-A=IES avoidance; IES-I=IES intrusion; AUDIT=alcohol use disorder identification test; DAST=drug abuse screening test; IMD = Index of Multiple Deprivation; CSS=Crisis Support Scale; CiOQ-P=Change in outlook questionnaire (positive); CiOQ-P=Change in outlook questionnaire (negative). *Injury severity measured using the Abbreviated Injury Scale (AIS); minor = AIS=1, Moderate = AIS=2, Serious or worse = AIS>3

Table 3. Adjusted odds ratios for psychological predictors at 1 month post-injury associated with RTW.

Characteristics	**Model A: A-priori confounders**	**Model B: Model A + psychological predictors at 1 month**	**Model C: Model B + psychological, socio-demographic, and injury characteristics at baseline**	**Model D: Model C + other predictors at 1 month**
	Odds Ratio (95% CI)	**Odds Ratio (95% CI)**	**Odds Ratio (95% CI)**	**Odds Ratio (95% CI)**
A-priori confounders				
Centre				
Nottingham	1.00	1.00	1.00	1.00
Loughborough	0.60 (0.25, 1.42)	0.66 (0.28, 1.52)	0.82 (0.37, 1.82)	0.86 (0.40, 1.85)
Bristol	0.74 (0.31, 1.75)	0.78 (0.34, 1.81)	0.71 (0.32, 1.59)	0.68 (0.31, 1.48)
Surrey	3.28 (0.99, 10.89)	3.02 (0.93, 9.74)	2.58 (0.86, 7.69)	2.62 (0.92, 7.50)
Age				
16-24	1.00	1.00	1.00	1.00
25-44	1.64 (0.50, 5.38)	1.60 (0.51, 5.09)	1.40 (0.46, 4.25)	1.13 (0.39, 3.29)
45-64	0.68 (0.22, 2.10)	0.65 (0.22, 1.95)	0.53 (0.18, 1.52)	0.44 (0.16, 1.24)
65+	0.38 (0.04, 3.75)	0.31 (0.03, 2.85)	0.29 (0.04, 2.35)	0.27 (0.04, 1.99)
Sex				
Female	1.00	1.00	1.00	1.00
Male	0.97 (0.50, 1.90)	0.79 (0.41, 1.54)	0.72 (0.38, 1.35)	0.73 (0.39, 1.34)
Time				
2 months	1.00	1.00	1.00	1.00
4 months	11.82 (6.10, 22.89)	11.76 (6.07, 22.78)	10.93 (5.69, 20.99)	10.80 (5.62, 20.76)
12 months	78.97 (31.55, 197.69)	77.80 (31.12, 194.46)	73.62 (29.58, 183.24)	72.17 (29.02, 179.45)
Psychological predictors at 1 month post-injury				
HADS-D		0.86 (0.79, 0.94)	0.87 (0.80, 0.95)	0.87 (0.79, 0.95)
Psychological, socio-demographic, and injury characteristics at baseline				

Nights in hospital			0.89 (0.84, 0.95)	0.91 (0.86, 0.96)
Other predictors at 1 month post-injury				
CSS scale				0.93 (0.88, 0.99)
Life events since injury No Yes				 1.00 0.27 (0.10, 0.72)

HADS-D=HADS depression; CSS=Crisis Social Support.

Table 4**.** Adjusted odds ratios for psychological predictors at 1 month post-injury, associated with RTW, using multiply imputed data.

Characteristics	**Model A: A-priori confounders**	**Model B: Model A + psychological predictors at 1 month**	**Model C: Model B + psychological, socio-demographic, and injury characteristics at baseline**	**Model D: Model C + other predictors at 1 month**
	Odds Ratio (95% CI)	**Odds Ratio (95% CI)**	**Odds Ratio (95% CI)**	**Odds Ratio (95% CI)**
A-priori confounders				
Centre				
Nottingham	1.00	1.00	1.00	1.00
Loughborough	0.83 (0.44, 1.59)	0.84 (0.44,1.62)	0.88 (0.46, 1.69)	0.90 (0.48, 1.71)
Bristol	1.03 (0.56, 1.90)	1.05 (0.57, 1.96)	0.93 (0.51, 1.69)	0.95 (0.52, 1.73)
Surrey	2.68 (1.09, 6.58)	2.56 (1.02, 6.42)	2.09 (0.85, 5.09)	1.97 (0.81, 4.80)
Age				
16-24	1.00	1.00	1.00	1.00
25-44	1.08 (0.50, 2.32)	1.17 (0.54, 2.53)	1.08 (0.50, 2.33)	0.95 (0.44, 2.08)
45-64	0.74 (0.34, 1.65)	0.76 (0.35, 1.65)	0.68 (0.31, 1.47)	0.60 (0.27, 1.31)
65+	0.34 (0.06, 1.95)	0.29 (0.05, 1.71)	0.36 (0.06, 1.95)	0.31 (0.06, 1.68)
Sex				
Female	1.00	1.00	1.00	1.00
Male	1.32 (0.57, 1.70)	0.83 (0.47, 1.45)	0.76 (0.43, 1.34)	0.79 (0.45, 1.38)
Time				
2 months	1.00	1.00	1.00	1.00
4 months	7.14 (3.57, 14.25)	7.40 (3.68,14.87)	7.18 (3.62, 14.26)	7.16 (3.61, 14.19)
12 months	28.54 (11.74, 69.41)	31.74 (13.41 to 75.15)	31.87 (13.92, 72.98)	31.78 (13.87, 72.81)
Psychological predictors at 1 month post-injury				
HADS-D		0.90 (0.84, 0.97)	0.92 (0.85, 0.98)	0.91 (0.85, 0.99)
Psychological, socio-demographic, and injury characteristics at baseline				

Nights in hospital			0.92 (0.87, 0.96)	0.92 (0.88, 0.97)
Other predictors at 1 month post-injury				
CSS scale				0.97 (0.92, 1.03)
Life events since injury No Yes				 1.00 0.42 (0.19, 0.92)

HADS-D=HADS depression, CSS=Crisis Social Support.

References

1. Waddell G, Burton AK. Is work good for your health and well-being? - an evidence review London: The Stationery Office; 2006.
2. Black C. 'Working for a healthier tomorrow' - Dame Carol Black's review of the health of Britain's working age population. London: The Stationery Office, 2008.
3. Office for National Statistics. Death Registrations Summary Statistics, England and Wales, 2014. Available from http://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/deathregistrationssummarytablesenglandandwalesreferencetables [Accessed 31/10/16].
4. Kendrick D, Vinogradova Y, Coupland C, Christie N, Lyons RA, Towner EL. Getting back to work after injury: the UK Burden of Injury multicentre longitudinal study. BMC public health. 2012;12:584.
5. Black C, Frost D. Health at work – an independent review of sickness absence. London: Department for Work and Pensions, 2011.
6. Bultmann U, Franche R-L, Hogg-Johnson S, Cote P, Lee H, Severin C, et al. Health status, work limitations, and return-to-work trajectories in injured workers with musculoskeletal disorders. Quality of Life Research. 2007;16(7):1167-78. PubMed PMID: 17616838. Pubmed Central PMCID: PMC2039824.
7. Carnide N, Franche R-L, Hogg-Johnson S, Côté P, Breslin FC, Severin CN, et al. Course of Depressive Symptoms Following a Workplace Injury: A 12-Month Follow-Up Update. Journal of Occupational Rehabilitation. 2016;26(2):204-15.
8. Lin K-H, Shiao JS-C, Guo N-W, Liao S-C, Kuo C-Y, Hu P-Y, et al. Long-Term Psychological Outcome of Workers After Occupational Injury: Prevalence and Risk Factors. Journal of Occupational Rehabilitation. 2014;24(1):1-10.
9. Vles WJ, Steyerberg EW, Essink-Bot M-L, van Beeck EF, Meeuwis JD, Leenen LPH. Prevalence and determinants of disabilities and return to work after major trauma. Journal of Trauma-Injury Infection & Critical Care. 2005;58(1):126-35. PubMed PMID: 15674163.
10. Wall CL, Ogloff JR, Morrissey SA. Psychological consequences of work injury: Personality, trauma and psychological distress symptoms of noninjured workers and injured workers returning to, or remaining at work. The International Journal of Disability Management Research. 2007;2(2):37-46. PubMed PMID: Peer Reviewed Journal: 2008-18561-002.
11. Noble J, Gomez M, Fish JS. Quality of life and return to work following electrical burns. Burns. 2006;32(2):159-64. PubMed PMID: 16448771.
12. Zatzick D, Jurkovich G, Rivara F, Wang J, Fan M, Joesch J, et al. A national US study of posttraumatic stress disorder, depression, and work and functional outcomes after hospitalization for traumatic injury. Ann Surg. 2008;248.
13. Blaszczynski A, Gordon K, Silove D, Sloane D, Hillman K, Panasetis P. Psychiatric morbidity following motor vehicle accidents: A review of methodological issues. Comprehensive Psychiatry. 1998;39(3):111-21.
14. Ash P, Goldstein SI. Predictors of Returning to Work. Journal of the American Academy of Psychiatry and the Law Online. 1995;23(2):205-10.
15. Franche RL, Carnide N, Hogg-Johnson S, Cote P, Breslin FC, Bultmann U, et al. Course, diagnosis, and treatment of depressive symptomatology in workers following a workplace injury: a prospective cohort study. Can J Psychiatry. 2009;54(8):534-46.
16. Matthews LR. Work potential of road accident survivors with post-traumatic stress disorder. Behav Res Ther. 2005;43(4):475-83.
17. Opsteegh L, Reinders-Messelink HA, Schollier D, Groothoff JW, Postema K, Dijkstra PU, et al. Determinants of return to work in patients with hand disorders and hand injuries. J Occup Rehabil. 2009;19(3):245-55.

18. Toien K, Skogstad L, Ekeberg O, Myhren H, Schou Bredal I. Prevalence and predictors of return to work in hospitalised trauma patients during the first year after discharge: a prospective cohort study. Injury. 2012;43(9):1606-13. PubMed PMID: 21489524.
19. Ching AC, Wessler L, Blizzard SR, Zusman NL, Yoo JU. The Relation between Depression, PTSD and the Likelihood of Returning to Work After Spine Trauma. The Spine Journal.14(11):S6.
20. Kendrick D, O'Brien C, Christie N, Coupland C, Quinn C, Avis M, et al. The impact of injuries study. Multicentre study assessing physical, psychological, social and occupational functioning post injury-a protocol. BMC public health. 2011;11(1):963.
21. Jacobson RR. The post-concussional syndrome: physiogenesis, psychogenesis and malingering. An integrative model. J Psychosom Res. 1995;39(6):675-93.
22. Department for Communities and Local Government. English indices of deprivation 2010. Available from https://www.gov.uk/government/statistics/english-indices-of-deprivation-2010, [Accessed 18/11/16].
23. Bjelland I, Dahl AA, Haug TT, Neckelmann D. The validity of the Hospital Anxiety and Depression Scale: An updated literature review. Journal of Psychosomatic Research. 2002;52(2):69-77.
24. Saunders JB, Aasland OG, Babor TF, De La Fuente JR, Grant M. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption-II. Addiction. 1993;88:791-804.
25. Maisto SA, Carey MP, Carey KB, Gordon CM, Gleason JR. Use of the AUDIT and the DAST-10 to identify alcohol and drug use disorders among adults with a severe and persistent mental illness. Psychol Assess. 2000;12(2):186-92. PubMed PMID: 10887764.
26. Tyrer P, Nur U, Crawford M, Karlsen S, MacLean C, Rao B, et al. The Social Functioning Questionnaire: a rapid and robust measure of perceived functioning. International Journal of Social Psychiatry. 2005;51(3):265-75.
27. The EuroQol Group. EuroQol--a new facility for the measurement of health-related quality of life. The EuroQol Group. Health Policy. 1992;20(3):321-8, discussion 9-32
28. Association of the Advancement of Automotive Medicine. Abbreviated Injury Scale (AIS) 2005 – Update 2008 Manuals. Barrington: AAAM; 2008.
29. Harms L. After the accident: Survivors' perceptions of recovery following road trauma. Australian Social Work. 2004;57(2):161-74.
30. Horowitz M, Wilner N, Alvarez W. Impact of Event Scale: a measure of subjective stress. Psychosom Med. 1979;41(3):209-18.
31. Brugha T, Bebbington P, Tennant C, Hurry J. The List of Threatening Experiences: a subset of 12 life event categories with considerable long-term contextual threat. Psychol Med. 1985;15:189-94.
32. Joseph S, Andrews B, Williams R, Yule W. Crisis support and psychiatric symptomatology in adult survivors of the Jupiter cruise ship disaster. British Journal of Clinical Psychology. 1992;31(1):63-73.
33. Joseph S, Linley PA, Andrews L, Harris G, Howle B, Woodward C, et al. Assessing positive and negative changes in the aftermath of adversity: psychometric evaluation of the changes in outlook questionnaire. Psychological assessment. 2005;17(1):70.
34. First MB, Spitzer RL, Gibbons M, Williams JBW. Structurd Clinical Interview for DSM-IV Axis I Disorders, research version, Non-Patient Edition APA. 1997.
35. Harcombe H, Langley J, Davie G, Derrett S. Functional status following injury: What recovery pathways do people follow? Injury. 2015;46(7):1275-80.
36. Rubin DB. Multiple Imputation for Nonresponse in Surveys. New York: John Wiley & Sons, 2004.
37. Royston JP. Multiple imputation of missing values. Stata Journal. 2004;4:227-41.

38. Polinder S, van Beeck EF, Essink-Bot ML, Toet H, Looman CWN, Mulder S, et al. Functional Outcome at 2.5, 5, 9, and 24 Months After Injury in the Netherlands. Journal of Trauma: Injury, Infection and Critical Care 2007;62(1):133-41.
39. Wilson R, Hansen P, Langley J, Derrett S. A comparison of injured patient and general population valuations of EQ-5D health states for New Zealand. Health Qual Life Outcomes. 2014;12(1):1-7.
40. Kendrick D, Vinogradova Y, Coupland C, Mulvaney CA, Christie N, Lyons RA, et al. Recovery from injury: the UK Burden of Injury Multicentre Longitudinal Study. Inj Prev. 2013;19:370-81.
41. Meerding WJ, Looman CWN, Essink-Bot M-L, Toet H, Mulder S, van Beeck EF. Distribution and Determinants of Health and Work Status in a Comprehensive Population of Injury Patients. Journal of Trauma and Acute Care Surgery. 2004;56(1):150-61.
42. Mason S, Wardrope J, Turpin G, Rowlands A. Outcomes after Injury: A Comparison of Workplace and Nonworkplace Injury. J Trauma. 2002;53(1):98-103.
43. Clay FJ, Newstead SV, McClure RJ. A systematic review of early prognostic factors for return to work following acute orthopaedic trauma. Injury. 2010;41(8):787-803.
44. Schneider JC, Bassi S, Ryan CM. Employment Outcomes After Burn Injury: A Comparison of Those Burned at Work and Those Burned Outside of Work. J Burn Care Res. 2011;32(2):294-301. PubMed PMID: 01253092-201103000-00015.
45. Lilley R, Davie G, Langley J, Ameratunga S, Derrett S. Do outcomes differ between work and non-work-related injury in a universal injury compensation system? Findings from the New Zealand Prospective Outcomes of Injury Study. BMC public health. 2013;13:995-. PubMed PMID: PMC4015720.
46. Kim J. Depression as a psychosocial consequence of occupational injury in the US working population: findings from the medical expenditure panel survey. BMC public health. 2013;13(1):1-10.
47. Ghisi M, Novara C, Buodo G, Kimble MO, Scozzari S, Di Natale A, et al. Psychological Distress and Post-Traumatic Symptoms Following Occupational Accidents. Behavioral Sciences. 2013;3(4):587-600. PubMed PMID: PMC4217600.
48. Buodo G, Novara C, Ghisi M, Palomba D. Posttraumatic and Depressive Symptoms in Victims of Occupational Accidents. Depression Research and Treatment. 2012;2012:8.
49. Zatzick D, Jurkovich GJ, Rivara FP, Wang J, Fan M-Y, Joesch J, et al. A national US study of posttraumatic stress disorder, depression, and work and functional outcomes after hospitalization for traumatic injury. Ann Surg. 2008;248(3):429-37. PubMed PMID: 18791363.
50. Richmond TS, Amsterdam JD, Guo W, Ackerson T, Gracias V, Robinson KM, et al. The Effect of Post-Injury Depression on Return to Pre-injury Function: A Prospective Cohort Study. Psychol Med. 2009;39(10):1709-20. PubMed PMID: PMC2741535.
51. Cornes P. Return to work of road accident victims claiming compensation for personal injury. Injury. 1992;23(4):256-60. PubMed PMID: 1618568. Epub 1992/01/01.
52. O'Donnell ML, Creamer M, Pattison P. Posttraumatic Stress Disorder and Depression Following Trauma: Understanding Comorbidity. American Journal of Psychiatry. 2004;161(8):1390-6. PubMed PMID: 15285964.
53. Kendrick D, Vinogradova Y, Coupland C, Christie N, Lyons R, Towner E. Getting back to work after injury: the UK Burden of Injury multicentre longitudinal study. BMC public health. 2012;12(584).
54. Christie N, Beckett K, Earthy S, Kellezi B, Sleney J, Barnes J, et al. Seeking support after hospitalisation for injury: a nested qualitative study of the role of primary care. Br J Gen Pract. 2016;66(642):e24-e31.
55. National Institute for Health and Care Excellence. Depression in adults with a chronic physical health problem: recognition and management. NICE guidelines [CG91] Published date: October 2009.

56. Holbrook TL, Anderson JP, Sieber WJ, Browner D, DB. H. Outcome after major trauma: 12-month and 18-month follow-up results from the Trauma Recovery Project. Journal of Trauma-Injury Infection & Critical Care 1999;46(5):765-71; discussion 71-3.
57. Fit For Work: Guidance for GPs. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/458954/gp-fit-for-work-gps.pdf. [Accessed 29/9/16].

Figure 1. Flow chart to show the flow of participants in the study, and those eligible for the analysis.

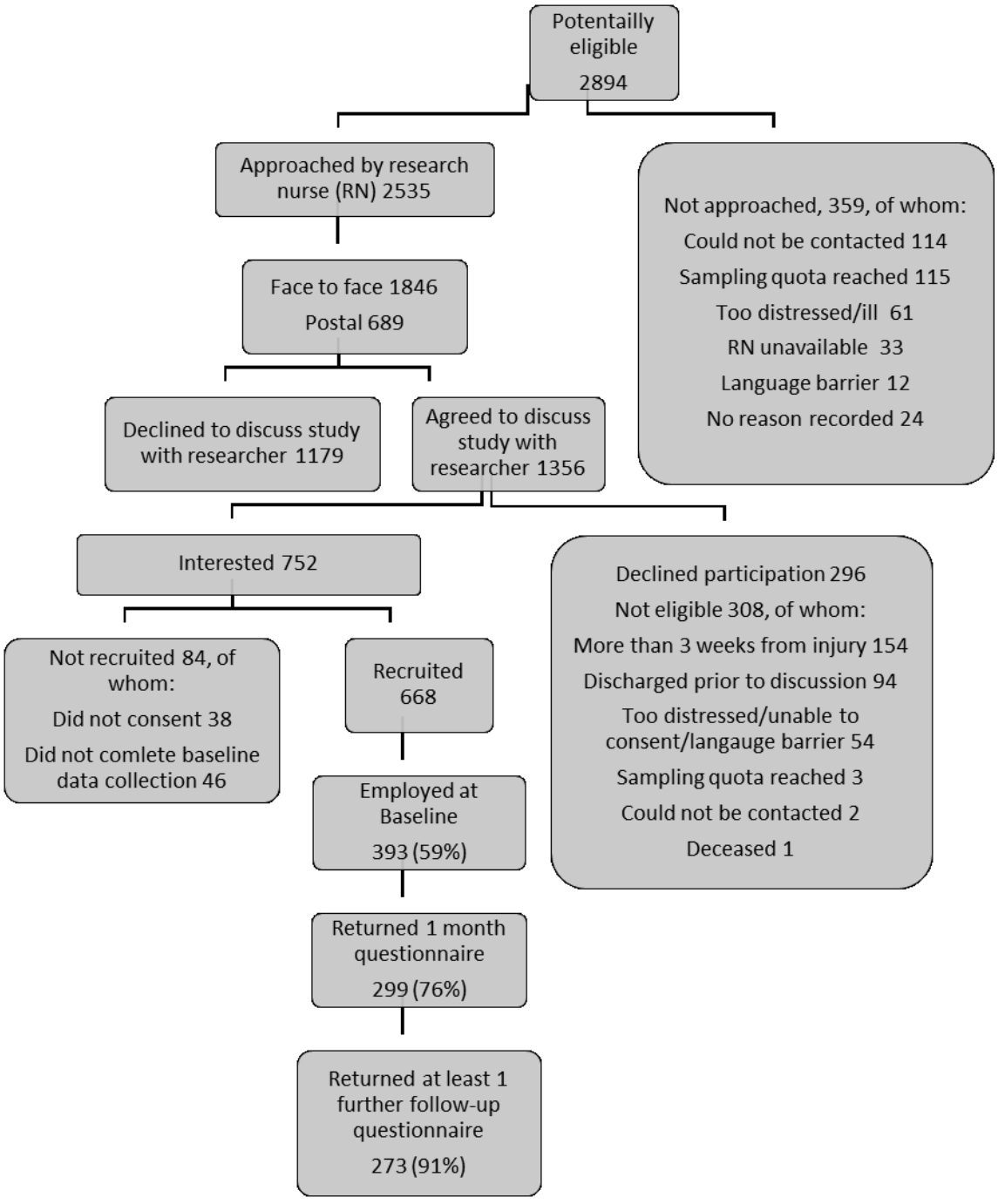
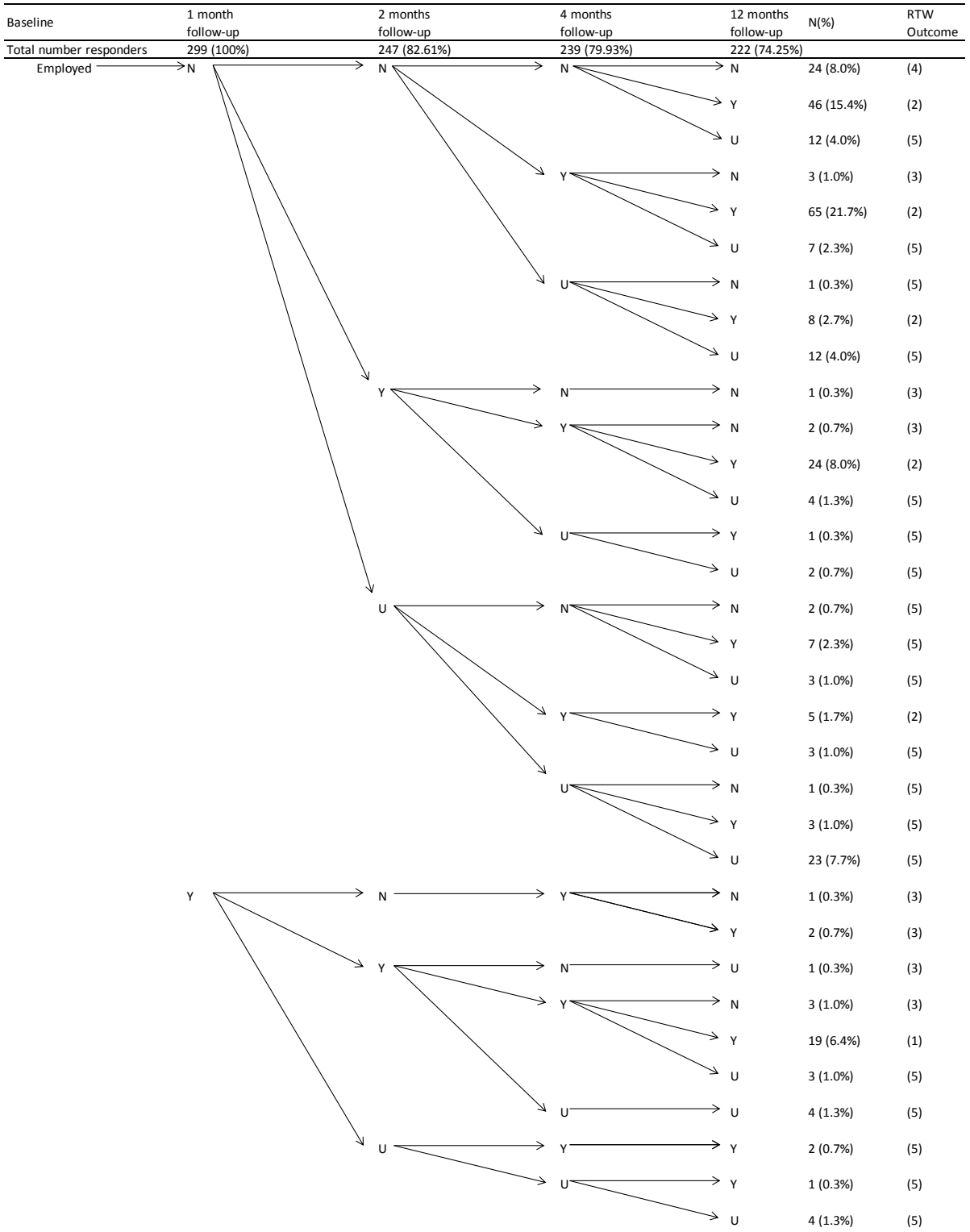


Figure 2. Trajectory of participants returning to work (RTW) at each follow-up time point, including participants with missing data and non-responders to follow-up questionnaires.



Key: Y=Yes, N=No, U=Unknown
Five RTW outcomes: (1) fully RTW (participant RTW by 1 month and remains in work at following time points); (2) delayed RTW (participant RTW after 1 month, stays in work for subsequent time points); (3) attained, but not maintained RTW (participant RTW at any time point but could not maintain this at subsequent time points); (4) not RTW at any time point (participant never RTW at all time points); (5) insufficient information for categorisation.