Unemployment and suicidal behaviour in a New Zealand birth cohort: A fixed effects

regression analysis

David M. Fergusson, PhD

Joseph M. Boden, PhD

L. John Horwood, MSc

Christchurch Health and Development Study

Christchurch School of Medicine and Health Sciences

Christchurch, New Zealand

Corresponding author: Prof. David M. Fergusson, Christchurch Health and Development Study,

Christchurch School of Medicine and Health Sciences, PO Box 4345, Christchurch, New Zealand

Phone: +64 3 372 0406 Fax: +64 3 372 0407 Email: david.fergusson@chmeds.ac.nz

Abstract

This study examined the association between exposure to unemployment and suicidal behaviours (suicidal ideation and attempted suicide) in a birth cohort of New Zealand young adults using fixed effects logistic and Poisson regression models. Data were gathered on unemployment and suicidal behaviours at annual periods from ages 16-25 years. At all ages increasing exposure to unemployment was associated with increased risks of suicidal ideation ($p < .0001$) and number of suicide attempts ($p < .0001$). Following adjustment for fixed effects and time-dynamic covariates, associations between unemployment and suicidal ideation reduced to marginal significance ($p < .10$), while the association between unemployment and suicide attempt was not statistically significant ($p > .10$). After adjustment, those experiencing six or more months of unemployment in a given year had odds of suicidal ideation that were 1.43 (95% CI: .96 to 2.16) times higher, and rates of suicide attempt that were 1.72 (95% CI: .89 to 3.32) times higher, than those who were not exposed to unemployment. Although unemployment was associated with moderate increases in risks of suicidal behaviours, much of this association was explained by confounding factors.

There has been growing interest in the extent to which exposure to unemployment may increase risks of suicidal behaviour, including suicide (Blakely, Collings, & Atkinson, 2003; Foster et al., 1999; Kposowa, 2001; Lewis & Sloggett, 1998; Qin, Agerbo, & Mortensen, 2003; Yang & Lester, 1990; Yang, Stack, & Lester, 1992), suicide attempt (Beautrais, Joyce, & Mulder, 1998; Christoffersen, Poulsen, & Nielsen, 2003; Fu et al., 2002; Hawton, Fagg, & Simkin, 1988; Jones, Forster, & Hassanyeh, 1991; Ostamo, Lahelma, & Lonnqvist, 2001; Schmidtke et al., 1996), and suicidal ideation (Brown & Vinokur, 2003; Fanous, Prescott, & Kendler, 2004; Fu et al., 2002). Findings from this area have been mixed, with some studies finding associations between unemployment and suicidal behaviour (e.g. Blakely et al., 2003; Kposowa, 2001; Lewis & Sloggett, 1998), and others concluding that these associations may be explained by confounding factors (Agerbo, 2005; Beautrais et al., 1998).

An ongoing debate in this area has concerned the extent to which associations between unemployment and suicidal behaviour can be explained by non-observed confounding factors. Although a number of studies have controlled these associations for observed confounders, it may be argued that any associations between unemployment and suicidal behaviour may be explained by non-observed residual confounding (Beautrais et al., 1998; Blakely et al., 2003; Jones et al., 1991).

While it is commonly believed that epidemiological studies can control only observed factors, this is not strictly true. There are at least two approaches by which non-observed sources of confounding may be controlled using a correlational design. The first approach is via the discordant twin design, in which twins who are discordant for suicidal behaviour would be compared on unemployment. Because monozygotic twins share common genes and a common environment this comparison could account for these non-observed factors. This approach has been used in a number of studies to examine the linkages between unemployment and suicidal behaviours. In all cases these studies have found that associations between unemployment and suicidal behaviour persisted after control for common genes and environment (Fanous et al., 2004; Fu et al., 2002; Voss et al., 2004).

The second approach for controlling non-observed confounding is through the use of the fixed effects regression model (Cameron & Trivedi, 1998; Greene, 1990). Subject to the availability of longitudinal data, this model makes it possible to estimate the associations between unemployment and suicidal behaviours net of the effects of non-observed fixed sources of confounding. Using repeated measures of both the exposure and outcome variables, the fixed effects model accounts for fixed sources of variance that are correlated with both the exposure and outcome (see Methods for an account of this model). The fixed effects model has been applied to examine the linkages between unemployment and suicidal behaviour in a birth cohort of New Zealand young people to the age of 21. That analysis found that, after controlling for non-observed fixed sources of confounding, unemployment was significantly (p < .01) associated with suicidal ideation, whereas unemployment was not significantly associated with suicide attempt (p > .40) (Fergusson, Horwood, & Woodward, 2001).

In this paper we extend the previous analyses reported by Fergusson et al. (Fergusson et al., 2001) to examine the linkages between exposure to unemployment and suicidal behaviour taking account of both observed fixed sources of confounding and time-dynamic covariates. The aims of this analysis are to examine the extent to which exposure to unemployment increases risks of suicidal behaviours when due allowance is made for both observed and non-observed sources of confounding.

Method

The data were gathered over the course of the Christchurch Health and Development Study (CHDS), a longitudinal study of a birth cohort of 1265 children born in the Christchurch (New Zealand) urban region in mid-1977. This cohort has been studied at birth, 4 months, 1 year and annual intervals to age 16 years, and again at ages 18, 21 and 25 years. The present analyses were based on the samples assessed at ages 18, 21 and 25 years for whom full information on

unemployment and suicidal behaviours was available. These samples ranged from 1001-1025 and represented between 79% to 81% of the cohort of 1265 participants. All data were collected only on the basis of signed consent from research participants. The study had ethical approval from the Canterbury Ethics Committee.

Unemployment ages 16-25

Sample members were interviewed at ages 18, 21, and 25 about their employment history since the previous assessment. Participants were asked whether they had ever been unemployed and seeking work during the interview period, and the timing and duration of any such episodes were recorded. From this it was possible to construct a measure reflecting the duration of unemployment experienced by each individual in each year from age 16-17 to 24-25 years.

The duration of unemployment in each year was classified into three groups: never unemployed during the year; unemployed for <6 months; and unemployed for 6 months or longer. Overall, 59% of the sample reported being unemployed at some time during the interval from 16-25 years, and 21.7% for at least six months in at least one year over the nine-year period.

Suicidal behaviour ages 16-25

At ages 18, 21, and 25, sample members were questioned about the frequency and timing of any suicidal thoughts occurring in the interval since the previous assessment. Respondents who reported having suicidal thoughts were also asked whether they had made a suicide attempt during the interval, and about the timing, nature, and outcome of any such attempt(s). Using this information measures of suicidal ideation and suicide attempt were constructed for each year from age 16-17 to age 24-25 years. Overall, 32.6% of the sample reported having suicidal thoughts at some time over the nine-year period and 7.9% had made a suicide attempt.

Time-dynamic covariate factors

A series of time-dynamic covariate factors was included in the analysis in order to control the associations between unemployment and suicidal behaviour. These covariate factors were chosen on the basis that: (a) they were known to be correlated with unemployment status and (b) they were theoretically relevant to the experience of both unemployment and suicidal behaviour.

   Prior mental health. As part of the assessment at ages 18, 21 and 25 participants were interviewed on a comprehensive schedule designed to assess aspects of mental health since the previous assessment. Questioning combined components from standardised assessment tools including the Composite International Diagnostic Interview (CIDI) (World Health Organization, 1993) and the Self-Report Delinquency Inventory (Elliott & Huizinga, 1989) with custom written survey items to assess DSM-IV (American Psychiatric Association, 1994) criteria for a range of mental disorders including major depression, anxiety disorders (phobias, generalised anxiety disorder, panic disorder), and conduct and antisocial personality disorders. This information was combined with information derived from similar interviews conducted at ages 15 and 16 years to derive a series of dichotomous measures reflecting the individual's accumulative history of mental disorder for each year of observation. These measures included: (a) prior history of major depression; (b) prior history of anxiety disorder; (c) prior history of conduct disorder/ASPD.

   Prior substance use. As part of the assessments from 16-25 years participants were questioned about their use of alcohol and cannabis since the previous assessment. This information was used to derive the following measures reflecting the individual's prior history of substance use for each year of observation: (a) the frequency of alcohol use in the preceding year, assessed on a 6-point scale from never to most days; (b) the frequency of cannabis use in the previous year, assessed on a 4-point scale from never to at least weekly.

   Stressful life events. At each interview, exposure to adverse life events was assessed using responses to a life events checklist that included items from the Feeling Bad Scale (Lewis, Seigel, & Lewis, 1984), supplemented by other custom-written survey items. For each year, a measure of

prior exposure to adverse life events was derived based upon a count of the number of adverse life events reported for the preceding year.

Parenthood/partnerships. Participants were questioned about their history of pregnancy, parenthood and partnerships since the previous assessment. These data were used to derive the following dichotomous measures for each year: (a) whether the participant had a dependent child; and (b) whether the participant was living in a cohabiting relationship. In addition, those in partnerships were questioned about the extent to which their partner used tobacco, alcohol, or illicit drugs; had problems resulting from alcohol or illicit drugs; engaged in criminal offending; had problems with aggressive behaviour; or were in trouble with the law. This information was used to derive a scale score measure of the extent of deviant partner behaviour (Woodward, Fergusson, & Horwood, 2002) for each year ($\alpha = .69$).

Prior history of unemployment, suicidal behaviour. In addition to the above time dynamic factors, the fitted models also included measures reflecting (a) the individual's prior history of unemployment in the preceding year; and (b) the accumulative history of suicidal ideation prior to the current year and number of previous suicide attempts.

Statistical analyses

Associations between duration of unemployment in each year and rates of suicidal behaviour were modelled by fitting random effects models (Gibbons et al., 1988) to the annual rate data for the period from 16-25 years. For suicidal ideation a logistic regression model was fitted, whereas for number of suicide attempts a Poisson regression model was used. These models had the general form:

$$G(Y_{it}) = B_{0i} + B_1 X_{it} + B_2 A_{it} + U_{it} \qquad \text{(EQ1)}$$

where Y_{it} was the outcome (ideation or number of attempts) for participant i at age t (t = 16, 17 …24); the function $G(Y_{it})$ represented either the log odds of suicidal ideation or the log rate of suicide attempt respectively; X_{it} was the duration of unemployment for participant i at age t; A_{it}

was the participant's age; and Uit was a random error term. In these models the coefficients B0i represent individual specific random intercepts that are uncorrelated with unemployment (Xit) or age. The age term was included in the model to allow for changes in the rate of suicidal behaviour over time. In both cases a linear model was assumed since tests of linear and non-linear trend showed that there was: (a) a significant linear association between Xit and the outcome; and (b) no significant non-linear association. In addition, tests for duration of unemployment by age interactions were non-significant, suggesting that the associations between unemployment and suicidal behaviours did not vary with age.

Covariate adjusted estimates of the associations between unemployment and suicidal behaviour were obtained by fitting conditional fixed effects logistic and Poisson regression models (Cameron & Trivedi, 1998; Greene, 1990) respectively to the observed annual rate data for ideation and attempt. Fixed effects models are used to control for all non-observed sources of variation that are correlated with both the exposure variable and the outcome variable, prior to the onset of exposure. In the first instance models were fitted of the form:

$$G(Yit) = B0i + B1\ Xit + B2\ Ait + Uit \qquad (EQ2)$$

This model form is similar form to the unadjusted model in EQ1 above. However, in this instance the coefficients B0i are individual specific intercept terms representing the effects of (non-observed) fixed confounding factors specific to the ith individual that are correlated with unemployment (Xit) and may also influence suicidal behaviour. The models were then extended to incorporate the set of observed time dynamic confounding factors (Zjt) as follows:

$$G(Yit) = B0i + B1\ Xit + B2\ Ait + \sum Bj\ Zijt + Uit \qquad (EQ3)$$

The coefficient B1 thus represents the effects of unemployment (Xit) on the outcome (Yit) net of: a) non-observed fixed confounding factors; and b) observed time-dynamic confounding factors.

All models were fitted using Stata 8 (StataCorp, 2003). To provide estimates of effect size the parameter estimates for unemployment derived in each step above were used to calculate rate ratio (RR) estimates and corresponding 95% CIs for the effect of varying levels of exposure to

unemployment on rates of suicidal behaviours. For suicidal ideation the RR estimate was the odds

ratio (OR), whereas for number of suicide attempts the RR was the incidence rate ratio (IRR).

Results

Associations between duration of unemployment and rates of suicidal behaviour

Table 1 shows the associations between exposure to unemployment and rates of suicidal ideation

and suicide attempt over the period from 16 to 25. Unemployment is classified into three levels

(none, <6mths, 6+mths). For each level of unemployment the Table gives the percentage of the

sample reporting suicidal ideation and the rate of suicide attempts (per 100) in each year. Inspection

of the Table suggests that there was evidence of a general trend for increasing exposure to

unemployment in a given year to be associated with increases in rates of both suicidal ideation and

suicide attempts.

INSERT TABLE 1 ABOUT HERE

Random effects logistic (for suicidal ideation) and Poisson (for number of suicide attempts)

regression models were fitted to the data in Table 1. For both outcomes the fitted models suggested

evidence of a significant ($p<.0001$) main effects for duration of unemployment (suicidal ideation B

= .501, SE = .085; number of attempts B = .563, SE = .091).

From the parameters of the fitted models estimates of the rate ratio (RR) of suicidal

behaviour were derived for varying levels of unemployment relative to those who were never

unemployed. These estimates are given in Table 2. For suicidal ideation the RR is given by the OR;

for suicide attempt the RR estimate is the IRR. Examination of the Table shows that prior to

adjustment for confounding those who experienced 6+ months of unemployment in any year had

estimated odds of suicidal ideation that were 2.72 (95%CI 1.95-3.80) times higher and rates of

suicide attempt that were 3.08 (95%CI 1.88-5.05) times higher than for those who were never

unemployed in the year.

INSERT TABLE 2 ABOUT HERE

Associations adjusted for confounding

The observed associations between unemployment and suicidal behaviours were adjusted for

confounding factors using a two-stage process. In the first stage conditional fixed effects logistic

(for suicidal ideation) and Poisson (for number of suicide attempts) models were fitted to the data to

adjust for confounding by non-observed fixed factors. In the second stage the fixed effects models

were then extended to include a series of time dynamic factors reflecting changes in individual

circumstances over time (see Methods). The results are summarised in Table 2, which shows the

adjusted RR estimates and 95%CIs for levels of unemployment. The Table shows:

1. Adjustment for fixed factors via the fixed effects regression model explained a substantial

   component of the observed associations between unemployment and the outcome measures.

   After adjustment those who experienced 6 months or longer unemployment in any year had

   estimated odds of suicidal ideation that were 1.83 (95%CI 1.28-2.61) times higher and a rate of

   suicide attempt that was 2.08 (95%CI 1.21-3.58) times higher than for those who were not

   unemployed. In both cases the association remained statistically significant after adjustment

   (suicidal ideation B = .301, SE = .091, p < .001; suicide attempt B = .367, SE = .138, p = .008).

2. The addition of observed time dynamic confounding factors to the fixed effects model further

   reduced the associations with unemployment to the point of statistical non-significance (suicidal

   ideation B = .181, SE = .104, p = .080; suicide attempt B = .271, SE = .168, p = .106). After

   adjustment those who experienced 6 months or longer unemployment in any year had estimated

odds of suicidal ideation that were 1.43 (95%CI 0.96-2.16) times higher and a rate of suicide

attempt that was 1.72 (95%CI 0.89-3.32) times higher than for those who were not unemployed.

Supplementary analyses

It could be argued that the model specification provided above does not ensure that exposure to

unemployment preceded the onset of suicidal ideation and suicide attempt within any given year of

observation. To address these comments the data were re-analysed, after changing the random and

fixed effects model specification by replacing the contemporaneous measure of unemployment with

a lagged measure of unemployment in the preceding year, ensuring that the assessment of

unemployment was temporally prior to the assessment of suicidal ideation and suicide attempt. The

results of these analyses were consistent with those reported above.

1. Random effects models suggested a significant association between the lagged measure of

    unemployment and later suicidal ideation and suicide attempt (p's < .0001).

2. Adjustment for non-observed fixed effects reduced the magnitude of the associations between

    the lagged measure of unemployment and later suicidal ideation and suicide attempt, but these

    remained statistically significant (p's < .05).

3. Adjustment for non-observed fixed effects and time dynamic covariate factors reduced the

    associations with unemployment to the point of statistical non-significance (p's > .05).

Discussion

There have been long standing debates over the extent to which exposure to unemployment is a risk

factor for suicidal behaviours (Beautrais et al., 1998; Blakely et al., 2003; Brown & Vinokur, 2003;

Christoffersen et al., 2003; Fanous et al., 2004; Foster et al., 1999; Fu et al., 2002; Hawton et al.,

1988; Jones et al., 1991; Kposowa, 2001; Lewis & Sloggett, 1998; Ostamo et al., 2001; Qin et al.,

2003; Schmidtke et al., 1996; Yang & Lester, 1990; Yang et al., 1992). These debates have centred

around the extent to which associations between unemployment and suicidal behaviours can be

explained by confounding factors that are associated with both unemployment and suicidal behaviours. This study has used data gathered over the course of a 25-year longitudinal study to examine linkages between unemployment and suicidal behaviours, following extensive adjustments for confounding.

In this analysis, fixed effects regression models were used to estimate the associations between exposure to unemployment and suicidal behaviour net of: (a) non-observed sources of confounding; and (b) observed time-dynamic covariates. This analysis showed that prior to adjustment for confounding, exposure to unemployment was associated with significant increases in risks of suicidal ideation and suicide attempt. Those exposed to six months or greater unemployment in a given year had rates of these outcomes that were 2.5 to 3 times higher than those not exposed to unemployment. However, control for confounding factors using fixed effects models reduced these associations to marginal significance. These adjustments suggested that those exposed to six or more months of unemployment in any given year had rates of suicidal behaviours in the region of 1.4 to 1.7 times higher than those not exposed to unemployment.

These results lead to two general conclusions. First, much of the association between unemployment and suicide appears to be explained by confounding and selection processes that are related to unemployment and suicidal behaviours. Second, even following control for both observed and non-observed sources of confounding, there is some suggestion of a modest relationship between exposure to unemployment and suicide.

These findings have relevance for the broader debate about the extent to which exposure to socio-economic adversity is a causative factor in the development of suicidal behaviours. This issue was examined in a recent review of the role of macro-social and macro-economic factors on population rates of suicide (Collings & Beautrais, 2005). That analysis found that, with the exception of unemployment, there was no evidence of linkages between macro-social and macro-economic factors and suicide. Furthermore, effects of unemployment on suicide rates were, as in the present study, relatively modest.

These findings need to be leavened by recognition of the potential limitations of this study. First and foremost, the present study was based on a particular birth cohort studied in a specific social context. The extent to which study findings generalise to other cohorts and social contexts is open to question and requires verification. Second, the variables included in the analyses are based on report data that have been provided by the participants. As such these variables may be subject to errors of measurement that may compromise the estimation of model parameters. Third, although we have attempted to control sources of confounding, it is possible that the analyses may have omitted some important time-dynamic confounding factors. Fourth, although the fixed-effects models used in this investigation control extensively for non-observed confounding, they may not explain all confounding, particularly for fixed confounding factors whose effects on unemployment and suicidal behaviour vary with age.

Nothwithstanding these limitations, the weight of the evidence from this study suggests that much of the apparent association between exposure to unemployment and suicidal behaviours in young people is explained by confounding and selection. However, there is also some evidence to suggest a small direct influence of unemployment on risks of suicidal behaviours.

References

Agerbo, E. (2005). Effect of psychiatric illness and labour market status on suicide: a healthy

worker effect? *J Epidemiol Community Health, 59*(7), 598-602.

American Psychiatric Association. (1994). *Diagnostic and Statistical Manual of Mental Disorders,*

fourth ed. Washington, DC: American Psychiatric Association.

Beautrais, A. L., Joyce, P. R., & Mulder, R. T. (1998). Unemployment and serious suicide attempts.

Psychological Medicine, 28(1), 209-218.

Blakely, T. A., Collings, S. C. D., & Atkinson, J. (2003). Unemployment and suicide. Evidence for

a causal association? *Journal of Epidemiology & Community Health, 57*(8), 594-600.

Brown, S. L., & Vinokur, A. D. (2003). The interplay among risk factors for suicidal ideation and

suicide: The role of depression, poor health, and loved ones' messages of support and

criticism. *American Journal of Community Psychology, 32*(1-2), 131-141.

Cameron, A. C., & Trivedi, P. K. (1998). *Regression Analysis of Count Data*. Cambridge:

Cambridge University Press.

Christoffersen, M., Poulsen, H., & Nielsen, A. (2003). Attempted suicide among young people:

Risk factors in a prospective register based study of Danish children born in 1966. *Acta*

Psychiatrica Scandinavica, 108(5), 350-358.

Collings, S., & Beautrais, A. (2005). *Suicide Prevention in New Zealand: A contemporary*

perspective. Wellington, New Zealand: Ministry of Health.

Elliott, D. S., & Huizinga, D. (1989). Improving self-reported measures of delinquency. In M. W.

Klein (Ed.), *Cross-national research in self-reported crime and delinquency* (pp. 155-186).

Boston, MA: Kluwer.

Fanous, A., Prescott, C., & Kendler, K. (2004). The prediction of thoughts of death or self-harm in a

population-based sample of female twins. *Psychological Medicine, 34*(2), 301-312.

Fergusson, D. M., Horwood, L. J., & Woodward, L. J. (2001). Unemployment and psychosocial adjustment in young adults: Causation or selection? *Social Science and Medicine, 53*(3), 305-320.

Foster, T., Gillespie, K., McClelland, R., & Patterson, C. (1999). Risk factors for suicide independent of DSM-III--R Axis I disorder: Case-control psychological autopsy study in Northern Ireland. *British Journal of Psychiatry, 175*, 175-179.

Fu, Q., Heath, A., Bucholz, K., Nelson, E., Glowinski, A., Goldberg, J., Lyons, M., Tsuang, M., Jacob, T., True, M., & Eisen, S. (2002). A twin study of genetic and environmental influences on suicidability in men. *Psychological Medicine, 32*(1), 11-24.

Gibbons, R. D., Hedeker, D., Waternaux, C., & Davis, J. M. (1988). Random regression models: A comprehensive approach to the analysis of longitudinal psychiatric data. *Psychopharmacological Bulletin, 24*, 438-443.

Greene, W. T. (1990). *Econometric analysis*. New York: Macmillan.

Hawton, K., Fagg, J., & Simkin, S. (1988). Female unemployment and attempted suicide. *British Journal of Psychiatry, 152*, 632-637.

Jones, S. C., Forster, D. P., & Hassanyeh, F. (1991). The role of unemployment in parasuicide. *Psychological Medicine, 21*, 169-176.

Kposowa, A. J. (2001). Unemployment and suicide: A cohort analysis of social factors predicting suicide in the US National Longitudinal Mortality Study. *Psychological Medicine, 31*(1), 127-138.

Lewis, C. E., Seigel, J. M., & Lewis, M. A. (1984). Feeling bad: Exploring sources of distress among pre-adolescent children. *American Journal of Public Health, 74*, 117-122.

Lewis, G., & Sloggett, A. (1998). Suicide, deprivation, and unemployment: Record linkage study. *British Medical Journal, 317*, 1283-1286.

Ostamo, A., Lahelma, E., & Lonnqvist, J. (2001). Transitions of employment status among suicide attempters during a severe economic recession. *Social Science & Medicine, 52*(11), 1741-1750.

Qin, P., Agerbo, E., & Mortensen, P. B. (2003). Suicide risk in relation to socioeconomic, demographic, psychiatric, and familial factors: A national register-based study of all suicides in Denmark, 1981-1997. *American Journal of Psychiatry, 160*(4), 765-772.

Schmidtke, A., Bille-Brahe, U., DeLeo, D., Kerkhof, A., Bjerke, T., Crepet, P., Haring, C., Hawton, K., Lonnqvist, J., Michel, K., Pommereau, X., Querejeta, I., Phillipe, I., Salander-Renberg, E., Temesvary, B., Wasserman, D., Fricke, S., Weinacker, B., & Sampaio-Faria, J. G. (1996). Attempted suicide in Europe: Rates, trends and sociodemographic characteristics of suicide attempters during the period 1989-1992. Results of the WHO/EURO Multicentre Study on Parasuicide. *Acta Psychiatrica Scandinavica, 93*(5), 327-338.

StataCorp. (2003). *Stata Statistical Software: Release 8.0*. Texas: Stata Corporation, College Station.

Voss, M., Nylen, L., Floderus, B., Diderichsen, F., & Terry, P. D. (2004). Unemployment and early cause-specific mortality: A study based on the Swedish Twin Registry. *American Journal of Public Health, 94*(12), 2155-2161.

Woodward, L. J., Fergusson, D. M., & Horwood, L. J. (2002). Deviant partner involvement and offending risk in early adulthood. *Journal of Child Psychology & Psychiatry, 43*(2), 177-190.

World Health Organization. (1993). *Composite International Diagnostic Interview (CIDI)*. Geneva, Switzerland: World Health Organization.

Yang, B., & Lester, D. (1990). Time-series analyses of the American suicide rate. *Social Psychiatry and Psychiatric Epidemiology, 25*(5), 274-275.

Yang, B., Stack, S., & Lester, D. (1992). Suicide and unemployment: Predicting the smoothed trend and yearly fluctuations. *Journal of Socio-Economics, 21*(1), 39-41.

Table 1: Associations between rates of suicidal ideation and number of suicide attempts and duration of unemployment (ages 16-25).

Age	Measure	Duration of unemployment in year		
		None	< 6 months	6+ months
16-17	% suicidal ideation	10.2	20.0	66.7
	Rate of suicide attempt (per 100)	2.6	15.7	100.0
	(N)	(940)	(70)	(15)
17-18	% suicidal ideation	9.4	17.8	28.6
	Rate of suicide attempt (per 100)	1.8	7.3	16.7
	(N)	(820)	(163)	(42)
18-19	% suicidal ideation	6.6	10.7	20.4
	Rate of suicide attempt (per 100)	2.0	2.5	10.2
	(N)	(803)	(159)	(49)
19-20	% suicidal ideation	7.4	16.7	9.8
	Rate of suicide attempt (per 100)	1.4	2.5	9.8
	(N)	(788)	(162)	(61)
20-21	% suicidal ideation	7.3	13.0	12.5
	Rate of suicide attempt (per 100)	1.9	1.9	7.1
	(N)	(794)	(161)	(56)
21-22	% suicidal ideation	5.7	10.0	20.0
	Rate of suicide attempt (per 100)	0.9	0.0	11.7
	(N)	(881)	(60)	(60)
22-23	% suicidal ideation	6.3	9.2	18.5
	Rate of suicide attempt (per 100)	0.5	1.0	4.6
	(N)	(839)	(98)	(65)
23-24	% suicidal ideation	5.3	12.1	10.4
	Rate of suicide attempt (per 100)	0.5	0.0	0.0
	(N)	(870)	(83)	(48)
24-25	% suicidal ideation	5.0	11.1	9.8
	Rate of suicide attempt (per 100)	1.2	1.2	2.0
	(N)	(869)	(81)	(51)

Table 2: Rate ratio estimates (95% CI) for levels of unemployment before and after adjustment for confounding factors

Model	Duration of unemployment in year		
	None	< 6 months	6+ months
Suicidal ideation			
1. Unadjusted random effects	1	1.65 (1.40-1.95)	2.72 (1.95-3.80)
2. Adjusted for non-observed fixed factors	1	1.35 (1.13-1.61)	1.83 (1.28-2.61)
3. Adjusted for non-observed fixed factors and time-dynamic confounders*	1	1.20 (0.98-1.47)	1.43 (0.96-2.16)
Suicide attempts			
1. Unadjusted random effects	1	1.75 (1.37-2.25)	3.08 (1.88-5.05)
2. Adjusted for non-observed fixed factors	1	1.44 (1.10-1.89)	2.08 (1.21-3.58)
3. Adjusted for non-observed fixed factors and time-dynamic confounders†	1	1.31 (0.94-1.82)	1.72 (0.89-3.32)

* Significant ($p < .05$) time-dynamic covariate factors for suicidal ideation included: prior suicidal ideation, prior number of suicide attempts, prior life stress, partner deviance, cohabitation with partner, and prior cannabis use.

† Significant ($p < .05$) time-dynamic covariate factors for number of suicide attempts included: prior suicidal ideation, prior number of suicide attempts, prior life stress, and history of depression.