ORIGINAL ARTICLE

The impact of late career job loss on myocardial infarction and stroke: a 10 year follow up using the health and retirement survey

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Background: Involuntary job loss is a major life event associated with social, economic, behavioural, and health outcomes, for which older workers are at elevated risk.
Objective: To assess the 10 year risk of myocardial infarction (MI) and stroke associated with involuntary job loss among workers over 50 years of age.
Methods: Analysing data from the nationally representative US Health and Retirement Survey (HRS), Cox proportional hazards analysis was used to estimate whether workers who suffered involuntary job loss were at higher risk for subsequent MI and stroke than individuals who continued to work. The sample included 4301 individuals who were employed at the 1992 study baseline.
Results: Over the 10 year study frame, 582 individuals (13.5% of the sample) experienced involuntary job loss. After controlling for established predictors of the outcomes, displaced workers had a more than twofold increase in the risk of subsequent MI (hazard ratio (HR) = 2.48; 95% confidence interval (CI) = 1.49 to 4.14) and stroke (HR = 2.43; 95% CI = 1.18 to 4.98) relative to working persons.
Conclusion: Results suggest that the true costs of late career unemployment exceed financial deprivation, and include substantial health consequences. Physicians who treat individuals who lose jobs as they near retirement should consider the loss of employment a potential risk factor for adverse vascular health changes. Policy makers and programme planners should also be aware of the risks of job loss, so that programmatic interventions can be designed and implemented to ease the multiple burdens of joblessness.

Research has demonstrated that involuntary job loss after age 50 is a stressful life event that has significant negative consequences for health.[1–4] Whereas job loss, in general, may involve numerous outcomes that threaten somatic wellbeing and longevity,[5] including loss of income and health and pension benefits,[6–9] increased tobacco use,[10] and adverse changes in mental health,[11–15] unemployment in the years directly leading to retirement carries additional risks.[16] Late career job loss can entail severance or restriction of long standing, social supportive relationships at the workplace, disruption of critical savings and pension accrual necessary for post-employment consumption,[17 18] and reduced probability of reemployment, frequently resulting in lengthy unemployment periods.[19–21] The causal pathway between late career involuntary job loss and physical health is thus complex, likely comprising numerous mediating factors,[22] many of which are accompanied by substantial anxiety and psychological stress. Given the probable role of stress in vascular disease,[23 24] it is plausible that job loss might be an important risk factor for vascular events, including myocardial infarction (MI) and stroke.

Previous research has provided fairly consistent evidence of cross-sectional or ecological associations between unemployment and vascular disease or related mortality.[25–28] However, the results of relevant longitudinal research[3 29–32] are equivocal. While a study of laid-off shipyard workers[29] found increased risk of hospitalisation for cardiovascular disease among job losers, just one[30] of the three studies investigating changes in blood pressure following job loss[30–32] reported a significant association. Older workers have been the focus of only one previous inquiry[3] of the relationship between unemployment and vascular disease. In this study, the current research team found that involuntary job loss among workers 50 and older was associated with a significantly increased risk of stroke, but not MI. The study, however, was limited by a relatively short (six year) follow up period, resulting in a modest number of respondents with MI and stroke events, and leaving uncertain the association between involuntary job loss and longer term vascular outcomes.

In the present study, we use 10 years of follow up data to re-examine the impact of involuntary job loss, among workers over 50, on subsequent risk of MI and stroke. Our goal in this study is to use the additional data to provide a more accurate assessment of the relationship between unemployment and adverse vascular outcomes. The Health and Retirement Survey (HRS) is uniquely suited for such a study, as the sole dataset in the USA with sufficient information on both employment and health and an adequately large sample of older adults.

METHODS

Study design and sample

This longitudinal study uses data from the first 10 years (1992–2002) of the HRS, a national survey, funded primarily by the US National Institute on Aging, designed to investigate the experience of late career workers as they transition to retirement, with particular emphasis on trajectories of wellbeing. The nationally representative HRS sample,[33] drawn via a multistage stratified cluster design, comprises 12 652 individuals from 7702 households; the sample includes a target cohort of individuals born between 1931 and 1941 and their spouses, regardless of age. Blacks, Hispanics, and Florida residents are oversampled. Baseline surveys were conducted in 1992, via face-to-face interviews. Follow up interviews, completed every two years, were completed by telephone or mail.

The sample used in this analysis includes 4301 individuals selected from 4730 age-eligible (51–61 years) HRS participants

who were at risk for involuntary job loss at baseline; that is, persons who reported working in 1992, but were not self-employed and responded to at least one follow up survey. Of the 429 potential sample members who were eliminated because of missing data (not accounting for overlap), 384 lacked the type of labour force transition and 165 were missing the month and/or year of the transition. An additional 52 respondents were missing the date of the MI or stroke. Thirty had a missing survey weight, seven lacked information on race, and five had missing occupation codes. Although the two groups were similar in the majority of attributes, respondents excluded because of missing data were at baseline slightly older (55.7 *v* 55.4 years) and less likely to be female (42% *v* 50%) than members of the analytic samples. They were more likely to report MI (10.7% *v* 4.9%) and stroke (13.4% *v* 3.3%) over the study frame.

Sensitivity analyses were performed to determine whether the omission of the 429 subjects with missing data could have biased our findings. Missing information on the timing of involuntary job loss made impossible the use of survival analysis; we therefore estimated unadjusted logistic regression models, both with and without the missing data, comparing risk of MI or stroke only between job losers and workers who were continuously employed over the study frame. The results indicated that the addition of the omitted observations only slightly altered (increased) the risk estimates (i.e. odds ratios) generated without the excluded participants. This finding suggests that the relative (exposed/unexposed) proportion of individuals who suffered MI and stroke events in the omitted group was similar to that of the study sample. As such, the results reported in this study are likely not biased by missing data. Even so, only 300 of the 429 omitted observations were eligible to be used in the sensitivity analysis, because of missing data for the outcome, exposure, or both. The results should therefore still be interpreted with some caution.

Measures

Outcome variables

For respondents who experienced MI or stroke, the outcome is time, in months, from the 1992 baseline interview to the date of occurrence of the event. For respondents who did not report an MI or stroke (i.e. censored observations), the outcome is time, in months, from the baseline interview to last follow up (i.e. censor date). For the continuously employed, the censor date is the 2002 survey date. For respondents who died or were lost to follow up between survey waves, the censor date is the date of the final interview. The censor date for respondents who had job transitions other than involuntary job loss, such as voluntary quitting or retirement, is the date of the job transition, as participants who exit the labour force are ineligible for involuntary job loss while not working.

Determination of MI events was made by considering responses to the following questions: ''Since [last interview date] has a doctor told you that you had a heart attack, coronary heart disease, angina, congestive heart failure, or other heart problems?'' [If so] ''Did you have a heart attack or myocardial infarction?''. Similarly, we ascertained the occurrence of stroke events based on responses to a parallel question: ''Since [last interview date] has a doctor told you that you had a stroke?''. Beginning with the 1996 follow up survey, respondents who reported an MI or stroke were asked for both the month and year in which the event took place. Time, in months, to MI or stroke could thus be directly calculated. At the initial (1994) follow up, however, only the year was requested from participants who reported vascular events. To avoid excluding these cases, we combined information on the 1992 and 1994 survey dates with the year of the event to create the smallest possible interval in which we were certain that the event took place, and then imputed the onset month by randomly selecting one month in that interval. The proportions of imputed values for the MI and stroke outcomes were 21% and 19%, respectively.

Independent variables

Primary independent variable

The primary independent variable is a binary indicator for involuntary job loss, which reflects the loss of a job due to either a business/plant closing or layoff. Involuntary job loss is treated as a time dependent variable.[34] Thus, respondents who experience job loss contribute time to the working (unexposed) group prior to the time of separation, and thereafter contribute time to the job loss (exposed) group. As a rule, involuntary job losers will have two data records. The exception is where a censoring event, including vascular outcomes, takes place prior to the involuntary job loss. Such individuals will have only one observation, which is censored at the date of the event.

Adjustment variables

Sociodemographic status was measured by age, gender, race, marital status, and educational attainment. Economic variables included job tenure, occupation class, and labour income (divided by 10 000 for scalar consistency). Smoking status was ascertained by self report, and problem drinking was established by responses to the CAGE Questionnaire.[35] Specific co-morbid conditions included self-reported (i.e. has a doctor told you that have [condition]) presence of: angina, hypertension, diabetes, and high cholesterol. Obesity was measured by body mass index $\geqslant 30$.[36] An eight item scale adapted from the Center for Epidemiologic Studies–Depression (CES-D) scale was used to measure depressive symptomatology (range: 0–8). Physical function was measured by a scale (range: 0–15) that included self-reported difficulty with strength, mobility, and basic activities of daily living (ADLs), and a binary variable indicating physical activity or exercise three or more times per week. Control variables and potential confounding influences were selected based on bivariate analyses and previous evidence of their association with cardiovascular[37 38] and cerebrovascular[39] disease.

Table 1 Description of study sample (n = 4301)

Variable	
Age in years*	55.4 ± 3.0
Female sex	2137 (50%)
White race	3202 (74%)
Married	3292 (77%)
Educational attainment (number of years)*	12.5 ± 3.0
Blue collar occupation	1244 (29%)
Job tenure ⩾3 years	3584 (83%)
Labour income (annual US$)†	23900 (23910)
Current smoker	1087 (25%)
History of problem drinking (CAGE positive)	876 (20%)
Prevalence of angina	434 (10%)
Prevalence of hypertension	1372 (32%)
Prevalence of diabetes	308 (7%)
Prevalence of high cholesterol	1003 (23%)
Obese (BMI ⩾30)	955 (22%)
History of MI	178 (4%)
History of stroke	71 (2%)
Mental health score (0–8)†	0 (1)
Physical functioning score (0–15)†	2 (3)
Physical activity 3+ times/week	829 (19%)

Unless otherwise indicated, table value represents number (percentage).
*Mean ± SD.
†Median (interquartile range).

Data analyses

We described the study sample using mean and standard deviation for continuous variables and frequency analysis for categorical variables. We used Cox proportional hazards regression[40] to evaluate the effect of involuntary job loss on the risk of MI and stroke, relative to individuals who continue to work. This survival approach was selected because it permits the inclusion of participants who are lost to follow up or have job transitions other than involuntary job loss before the end of observation. Unadjusted models were first fit. We then developed pruned multivariable models, using the following procedure. The initial specification included independent variables that have been identified consistently in previous research as risk factors for vascular disease or were related to the outcomes in bivariate specifications ($p < 0.20$). We then sequentially removed non-significant ($p > 0.15$) covariates, making certain that their elimination did not change the estimated coefficient on the exposure variable by more than 10%.[41] Age, sex, and race were adjusted regardless of their association. Because our models may be overspecified, given the limited number of vascular events in the exposed group, we also estimated reduced form models, selecting covariates based on statistical significance in the pruned adjusted models. Tests of the proportional hazards assumption were also conducted. All analyses were conducted with SAS-callable SUDAAN release 9.0.0. SUDAAN was used to adjust variance estimates for intra-subject correlation resulting from the repeated observation of participants with involuntary job loss and intra-class correlation due to HRS survey design effects.

RESULTS

Sample description

The characteristics of the sample (n = 4301) are shown in table 1. During the 10 year follow up time, 582 individuals experienced involuntary job loss. Of the remaining participants, 478 were continuously employed, 1231 retired, 452 had a temporary employment interruption, and 960 left the labour force for other reasons. The majority of exits in this category were quitting and leaving for a better job. Nearly 600 (n = 598) respondents either died (n = 100) or were lost to follow up (n = 498). A total of 202 sample members reported an MI: 179 of the MIs were reported by respondents in the non-job loss group (n = 3719), and 23 by respondents who had previously experienced involuntary job loss (n = 582). Sixty three of the 179 MIs in the non-job loss group occurred while working (i.e. before censoring); the 23 MIs in the job loss group occurred after separation. Thus, 86 total MIs were used in our analysis. A total of 140 strokes were reported: 127 in non-job loss group, and 13 in the group of job losers. Thirty three of the 127 strokes in the non-job loss group occurred while working; the 13 strokes among job losers were dated after job loss. Forty six total strokes were thus used in the analysis.

Involuntary job loss and subsequent myocardial infarction and stroke

Our results (table 2) indicate that involuntary job loss is associated with a more than twofold increase in the risk of MI relative to working individuals, in both unadjusted (hazard ratio (HR) = 2.51; 95% confidence interval (CI) = 1.52 to 4.17) and adjusted analyses (HR = 2.48; 95% CI = 1.49 to 4.14). Other significant variables in the adjusted MI model include being female (HR = 0.57; 95% CI = 0.34 to 0.93), white (HR = 3.18; 95% CI = 1.36 to 7.41), higher income (HR = 1.07; 95% CI = 1.00 to 1.15), cigarette smoking (HR = 2.55; 95% CI = 1.62 to 4.02), and hypertension (HR = 2.19; 95% CI = 1.37 to 3.50). In the reduced form model, the effect of job loss (HR = 2.68; 95% CI = 1.61 to 4.48) is slightly increased, as is the effect of hypertension (HR = 2.53; 95% CI = 1.62 to 3.95); the estimated effects on the remainder of the retained variables are stable. Our findings also indicate a significant association between involuntary job loss and the subsequent risk of stroke in both unadjusted (HR = 2.39; 95% CI = 1.16 to 4.95) and adjusted (HR = 2.43; 95% CI = 1.18 to 4.98) analyses. The other significant variable in the adjusted model was prevalence of diabetes (HR = 2.68; 95% CI = 1.15 to 6.23). The effect of job loss was slightly attenuated (HR = 2.38; 95% CI = 1.15 to 4.92) in the reduced form model, which controlled diabetes, the only statistically significant variable from the adjusted model.

DISCUSSION

In this national, 10 year follow up study, we explored the relationship between late career involuntary job loss and subsequent vascular events. We found that workers over 50 years of age who experience involuntary job loss are at increased risk for both subsequent MI and stroke relative to individuals who continue to work. The magnitudes of association are substantial, with job losers having over twice the risk of these events compared with workers who remain employed. Moreover, the estimated effects of job loss persist even after adjustment for several important risk factors for vascular events, including obesity, tobacco use, hypertension, diabetes, and a range of sociodemographic attributes.

Our findings both confirm and extend the results of our previous, six year follow up study.[3] While the results of this study validate the finding in the original inquiry that the risk of stroke was significantly higher (adjusted HR = 2.64; 95% CI = 1.01 to 6.94) for workers who suffered involuntary job loss, they also differ from the conclusion of the earlier research that job loss was not associated with increased risk of MI. The contrast in the results is likely the result of inadequate statistical power in the original examination, due to fewer vascular events, and supports our decision to re-examine this research question. The power argument appears persuasive in light of the fact that a number of other established risk factors, which were strongly non-significant in the six year study, were significant or nearly significant in the reassessment.

The present study has several methodological improvements over the previous research in this area, which should be noted in evaluating our findings. First, the longitudinal nature of this study, in contrast to cross-sectional or retrospective approaches of many previous inquiries, assures the temporal sequence of job loss and health events. Our study examined only post-job loss health events, while controlling for pre-displacement health, thus providing greater evidence of the causal nature of the relationship between job loss and stroke or MI. Second, the survival technique used in the present study allowed participants who left the labour force and those who died or were lost to attrition to contribute data to the analysis algorithm until their exit from the labour force or survey, resulting in greater precision of the risk estimates. Finally, in an improvement over our previous six year follow up study, reemployed involuntary job losers, who later left the labour force, were censored at the time of the secondary exit, so that MI and stroke events among these individuals would not be attributed to the earlier job loss exposure.

There are nonetheless limitations to this study. The occurrence of stroke and MI are self-reported and not confirmed by medical records of physician reports. However, as these are significant life events, it is unlikely that participants would be misinformed about or misreport this information, and improbable that inaccurate recall would vary by job loss status. In addition, the 10 year follow up increases the potential for occurrence of unmeasured, mediating events which may

Table 2 Unadjusted and adjusted risk of MI and stroke associated with involuntary job loss

	MI model (n = 4301)			Stroke model (n = 4301)		
Variable	Unadjusted model HR (95% CI)	Adjusted model HR (95% CI)	Reduced form model HR (95% CI)	Unadjusted model HR (95% CI)	Adjusted model HR (95% CI)	Reduced form model HR (95% CI)
Primary independent variable						
Involuntary job loss	2.51 (1.52–4.17)	2.48 (1.49–4.14)	2.68 (1.61–4.48)	2.39 (1.16–4.95)	2.43 (1.18–4.98)	2.38 (1.15–4.92)
Adjustment variables						
Age	–	1.03 (0.95–1.12)	–	–	1.06 (0.97–1.16)	–
Female	–	0.57 (0.34–0.93)	0.63 (0.38–1.05)	–	0.54 (0.29–1.01)	–
White	–	3.18 (1.36–7.41)	3.07 (1.35–6.98)	–	1.61 (0.70–3.70)	–
Blue collar occupation	–	–	–	–	0.51 (0.23–1.15)	–
Labour income	–	1.07 (1.00–1.15)	1.06 (0.99–1.14)	–	–	–
Current smoker	–	2.55 (1.62–4.02)	2.55 (1.62–4.02)	–	–	–
Prevalence of hypertension	–	2.19 (1.37–3.50)	2.53 (1.62–3.95)	–	1.77 (0.96–3.27)	–
Prevalence of diabetes	–	–	–	–	2.68 (1.15–6.23)	2.95 (1.27–6.88)
Obese (BMI ⩾30)	–	1.53 (0.91–2.57)	–	–	–	–
Mental health score	–	1.12 (0.98–1.29)	–	–	–	–
Physical functional score	–	1.08 (0.99–1.18)	–	–	–	–

HR, hazard ratio; CI, confidence interval.

explain the associations between job loss and health outcomes. Important risk factors, such as family history, are moreover not measured in our data. Although 100 participants died over the study period, data limitations precluded our attributing the death to the outcomes examined, where applicable. Finally, we did have limited numbers of vascular events subsequent to job loss, despite the 10 year follow up; hence we lacked sufficient statistical power to investigate whether the risk of MI and stroke associated with involuntary job loss was disproportionately pronounced in certain sociodemographic or occupational subgroups.

For many individuals, late career job loss is an exceptionally stressful experience with the potential for provoking numerous undesirable outcomes, including cardiovascular and cerebrovascular events. Physicians who treat individuals who lose jobs as they approach retirement should therefore consider the loss of employment, with its associated anxiety and affective symptomatology, a risk factor for adverse vascular health changes. Similarly, policy makers and programme planners should also be aware of the risks of job loss, so that programmatic interventions, particularly those designed to return jobless individuals to work, can be designed and implemented to ease the multiple burdens of joblessness. Based on our results, the true costs of unemployment exceed the obvious economic costs and include substantial health consequences as well.

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REFERENCES

1 **Gallo WT**, Bradley EH, Siegel M, *et al*. Health effects of involuntary job loss among older workers: findings from the health and retirement survey. *J Gerontol* 2000;**55**:S131–40.
2 **Gallo WT**, Bradley EH, Siegel M, *et al*. The impact of involuntary job loss on subsequent alcohol consumption by older workers: findings from the health and retirement survey. *J Gerontol* 2001;**56**:S3–9.
3 **Gallo WT**, Bradley EH, Falba TA, *et al*. Involuntary job loss as a risk factor for subsequent myocardial infarction and stroke: findings from the Health and Retirement Survey. *Am J Ind Med* 2004;**45**:408–16.
4 **Falba T**, Teng HM, Sindelar JL, *et al*. The effect of involuntary job loss on smoking intensity and relapse. *Addiction* 2005;**100**:1330–9.
5 **Nylen L**, Voss M, Floderus B. Mortality among women and men relative to unemployment, part-time work, overtime work, and extra work: a study based on data from the Swedish twin registry. *Occup Environ Med* 2001;**58**:52–7.
6 **Jacobson L**, LaLonde R, Sullivan D. Earnings losses of displaced workers. *Am Econ Rev* 1993;**83**:685–709.
7 **Carrington W**. Wage losses for displaced workers: is it really the firm that matters? *J Hum Resour* 1993;**28**:435–62.
8 **Couch KA**. Earnings losses and hours reductions of displaced workers in Germany. *Ind Labor Relat Rev* 2001;**54**:559–73.
9 **Ruhm CJ**. Are workers permanently scarred by displacements? *Am Econ Rev* 1991;**81**:319–24.
10 **Matoba T**, Ishitake T, Noguchi R. A 2-year follow-up survey of health and life style in Japanese unemployed persons. *Int Arch Occup Environ Health* 2003;**76**:302–8.
11 **Brenner S-O**, Starrin B. Unemployment and health in Sweden: public issues and private troubles. *J Soc Issues* 1988;**44**:125–40.
12 **Breslin FC**, Mustard C. Factors influencing the impact of unemployment on mental health among young and older adults in a longitudinal, population-based survey. *Scand J Work Environ Health* 2003;**29**:5–14.
13 **Broman CL**, Hamilton VL, Hoffman WS, *et al*. Race, gender, and the response to stress: autoworkers' vulnerability to long-term unemployment. *Am J Commun Psychol* 1995;**23**:813–42.
14 **Frese M**, Mohr G. Prolonged unemployment and depression in older workers: a longitudinal study of intervening variables. *Soc Sci Med* 1987;**25**:173–8.
15 **Turner JB**. Economic context and the health effects of unemployment. *J Health Soc Behav* 1995;**36**:213–29.
16 **Beckett JO**. Plant closings: how older workers are affected. *Social Work* 1988;**33**:29–33.
17 **Bernheim BD**. The adequacy of personal retirement saving: issues and options. In: Wise DA, eds. *Facing the age wave*. Palo Alto, CA: Hoover Institution Press, 1997:30–56.
18 **Bernheim BD**, Forni L, Gokhale J, *et al*. How much should Americans be saving for retirement? *Am Econ Rev* 2000;**90**:288–92.
19 **Chan S**, Stevens AH. Job loss and employment patterns of older workers. *J Labor Econ* 2001;**19**:484–521.
20 **Fallick BC**. A review of the recent empirical literature on displaced workers. *Ind Labor Relat Rev* 1996;**50**:5–16.
21 **Hipple S**. Worker displacement in the mid-1990s. *Mon Labor Rev* 1999;**122**:15–32.
22 **Price RH**, Choi JN, Vinokur AD. Links in the chain of adversity following job loss: how financial strain and loss of personal control lead to depression, impaired functioning, and poor health. *Occup Health Psychol* 2000;**7**:302–12.
23 **Kubzansky LD**, Kawachi I. Going to the heart of the matter: do negative emotions cause coronary heart disease? *J Psychosom Res* 2000;**48**:323–37.
24 **Rozanski A**, Blumenthal JA, Kaplan J. Impact of psychological factors on the pathogenesis of cardiovascular disease and implications for therapy. *Circulation* 1999;**99**:2192–217.
25 **Brenner MH**. Heart disease mortality and economic changes; including unemployment; in Western Germany 1951–1989. *Acta Physiol Scand* 1997;**640**:149–52.
26 **Cook DG**, Cummins RO, Bartley MJ, *et al*. Health of unemployed middle-aged men in Great Britain. *Lancet* 1982;**1**:1290–4.

27 **Iversen L**, Andersen O, Andersen PK, *et al*. Unemployment and mortality in Denmark, 1970–80. *BMJ* 1987;**295**:879–84.
28 **Martikainen PT**. Unemployment and mortality among Finnish men, 1981–5. *BMJ* 1990;**301**:407–11.
29 **Iversen L**, Sabroe S, Damsgaard MT. Hospital admissions before and after shipyard closure. *BMJ* 1989;**299**:1073–6.
30 **Janlert U**. Unemployment and blood pressure in Swedish building labourers. *J Intern Med* 1992;**231**:241–6.
31 **Kasl SV**, Cobb S. The experience of losing a job: some effects on cardiovascular functioning. *Psychother Psychosom* 1980;**34**:88–109.
32 **Schnall PL**, Landsbergis PA, Pieper CF, *et al*. The impact of anticipation of job loss on psychological distress and worksite blood pressure. *Am J Ind Med* 1992;**21**:417–32.
33 **Juster FT**, Suzman R. An overview of the Health and Retirement Study. *J Hum Resour* 1995;**30**:S7–56.
34 **Crowley J**, Hu M. Covariance analysis of heart transplant survival data. *J Am Stat Assoc* 1977;**72**:27–36.
35 **Ewing JA**. Detecting alcoholism. The CAGE questionnaire. *JAMA* 1984;**252**:1905–7.
36 **Flegal KM**, Carroll MD, Kuczmarski RJ, *et al*. Overweight and obesity in the United States: prevalence and trends, 1960–1994. *Int J Obes Relat Metab Disord* 1998;**22**:39–47.
37 **Grundy SM**, Pasternak R, Greenland P, *et al*. Assessment of cardiovascular risk by use of multiple-risk-factor assessment equations: a statement for healthcare professionals from the American Heart Association and the American College of Cardiology. *Circulation* 1999;**100**:1481–92.
38 **Wilson PW**, D'Agostino RB, Levy D, *et al*. Prediction of coronary heart disease using risk factor categories. *Circulation* 1998;**97**:1837–47.
39 **Wolf PA**, D'Agostino RB, Belanger AJ, *et al*. Probability of stroke: a risk profile from the Framingham Study. *Stroke* 1991;**22**:312–18.
40 **Cox DR**. Regression models and life-tables (with discussion). *J R Stat Soc* 1972;**B34**:187–220.
41 **Greenland S**. Modeling and variable selection in epidemiologic analysis. *Am J Public Health* 1989;**79**:340–9.