

A B S T R A C T

This study examines how an extensive set of covariates identified in previous research – sociodemographics, social stressors, health status and psychosocial resources – influence the age-depression relationship. The analyses were based on data collected for the 1994 National Population Health Survey (N = 16,291) by Statistics Canada. Analyses were conducted using OLS regression for generalized distress and logistic regression for major depressive episode. The relationship between age and both outcomes was linear and negative after controlling for sociodemographics. Controlling for social stress reduced levels of depression among younger cohorts while controlling for poor health status reduced levels of depression among the elderly. Controlling for psychosocial resources generally reduced the level of depression among older cohorts, however, the results were mixed across outcomes. The inclusion of all covariates appears to negate the effects of one another in that the fully adjusted relationships between age and depression across both outcomes were not significantly different from their bivariate relationships.

A B R É G É

Cette étude porte sur la manière dont un ensemble complet de covariables déterminées dans le cadre d'une étude précédente – les données sociodémographiques, les facteurs sociaux d'agression, la situation de la santé et les ressources psychosociales – influencent la relation entre l'âge et la dépression. Les analyses étaient fondées sur des données recueillies dans le cadre de l'Enquête nationale sur la santé de la population de 1994 (N = 16 291) effectuée par Statistique Canada. Les analyses ont été menées à l'aide de la méthode classique des moindres carrés pour la détresse généralisée et de la régression logistique pour les troubles dépressifs majeurs. La relation entre l'âge et les deux résultats étaient linéaire et négative après l'évaluation des données sociodémographiques. Le contrôle du stress social a permis de réduire les niveaux de dépression parmi les jeunes sujets tandis que le contrôle de la mauvaise condition physique a permis de réduire les niveaux de dépression chez les gens âgés. Le contrôle des ressources psychosociales a généralement permis de réduire les niveaux de dépression chez les sujets âgés, cependant, on est parvenu à des résultats mitigés du point de vue des conséquences. Si l'on inclut toutes les covariables, leurs influences semblent s'annuler car la relation entre l'âge et la dépression, lorsqu'elle est pleinement ajustée, n'est pas particulièrement différente de la relation à deux variables, quel que soit le résultat.

The Effect of Sociodemographics, Social Stressors, Health Status and Psychosocial Resources on the Age-Depression Relationship

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Depression is a significant public health concern that affects a sizeable proportion of the population of Canada.¹ While the extant research clearly shows prevalence rates of depression to be higher among women than men,^{2,3} the relationship between depression and other demographic characteristics is less definitive. It is unclear, for example, whether or not the prevalence of depression increases or decreases with age.^{4,22} Some studies show an increase in depressive symptomatology across successively older cohorts;^{4,5} other studies show that the prevalence of depressive disorder decreases with age.^{1,22} Given that the proportion of elderly in our society continues to increase relative to other age groups, the relationship between age and depression is an important avenue for further inquiry in public health.

Our recent study published in this journal presented some preliminary findings on this topic.²² Using the 1994 National Population Health Survey, we found the relationship between depression and age among Canadians to be negative and linear once gender, marital status, socioeconomic status and region of the country were controlled. This is consistent with other published data on the prevalence of depression among Canadians.¹ Thus, at least in Canada, it would appear as though the

prevalence of depression decreases across older cohorts.

Although this research is important in that it established a negative relationship between depression and age using a large, representative sample of Canadians, many questions still remain unanswered. Most notably, it is not clear how the age-depression relationship is affected by factors other than basic demographics. A considerable body of evidence has accumulated in recent years identifying social stress,^{6,23-29} psychosocial resources^{25,26,30} and health status^{23,31} as important correlates of depression and psychological distress. Since these variables are also likely to be correlated with age, it is important to examine them as potential confounders in the age-depression relationship. The purpose of this investigation is to extend our previous work²² to examine how social stress, health status and psychosocial resources, in addition to demographic factors, influence the relationship between age and depression in a large sample of Canadians. We use both a measure of distress (including depressive symptomatology) and a diagnostic measure of depression since it has been argued that different measures may produce different results in terms of the shape of the age-depression distribution.^{4,5,19,21} The results are presented in two parallel analyses allowing for an assessment of how these various factors influence the age-depression relationship across the two outcome measures.

METHODS

The following analyses were conducted using the National Population Health Survey (NPHS). Using a multi-staged, stratified, random sampling procedure,

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TABLE I
Pearson Correlations Between Generalized Distress and Social Stressors, Health Status and Psychosocial Resources for Males and Females†

	Social Stressors				Health Status		Psychosocial Resources		
	Chronic Strain	Recent Life Events	Traumatic Events	Work Strain	General Health Status	Self-Rated Health	Self-Esteem	Mastery	Social Support
Males	0.449*	0.281*	0.239*	0.214*	-0.347*	-0.239*	-0.252*	-0.378*	-0.145*
Females	0.448*	0.291*	0.271*	0.189*	-0.409*	-0.324*	-0.324*	-0.447*	-0.221*

† Sample size for all indicators except work strain are n = 6,891 for males and n = 8,682 for females. The sample size for work strain is n = 4,524 for males and n = 4,314 for females.

* p < 0.001.

19,600 households across Canada were surveyed in which one person in each household was selected to provide detailed personal information for the longitudinal component of the survey. People living in Native reserves, military bases, institutions, and some remote areas in Ontario and Quebec were excluded. Of the 18,342 possible respondents aged 12 and older, 17,626 participated resulting in a response rate of 96.1%. Those aged 12 to 17 (n=1,335) were not asked some questions of interest to this analysis and were excluded reducing the total sample to 16,291. All analyses were computed using the standardized weighting scheme suggested by Statistics Canada.³² Appendix 1 provides a description of all measures included in the analysis.

Conditionally relevant variables

This survey contains a large age range of respondents from 18 to over 80 and, as a consequence, many of them are not currently employed. Thus, in order to include job classification and work strain measures in the analyses, it was necessary to construct them to be conditional upon employment status. This procedure allows for respondents who are not currently employed to be retained in the analysis rather than be excluded by the listwise deletion technique used in most regression algorithms. For a detailed discussion of conditionally relevant variables, consult the following references.³³⁻³⁵

RESULTS

Table I presents the zero-order correlations between generalized distress and social stress, health status and psychosocial resources by gender. The results are very similar for both males and females. Higher

TABLE II
Comparison of Means Across Negative and Positive Classification of Major Depressive Episode (MDE) among Social Stressors, Health Status and Psychosocial Resources for Males and Females†

	Males		Females	
	MDE -	MDE +	MDE -	MDE +
Social Stressors				
Chronic strain	2.78 (2.45) *	5.29 (2.98)	2.97 (2.44) *	5.53 (2.94)
Recent life events	0.54 (0.90) *	1.36 (1.31)	0.57 (0.89) *	1.41 (1.23)
Traumatic events	0.76 (1.05) *	1.51 (1.44)	0.86 (1.11) *	1.86 (1.41)
Work strain	19.10 (5.40) *	22.27 (5.14)	20.02 (5.23) *	22.57 (5.32)
Health Status				
General health status	0.91 (0.12) *	0.80 (0.17)	0.89 (0.13) *	0.76 (0.17)
Self-rated health	2.81 (1.00) *	2.26 (1.05)	2.74 (0.96) *	2.16 (1.00)
Psychosocial Resources				
Self-esteem	20.44 (2.87) *	18.07 (3.46)	20.24 (2.81) *	17.64 (3.93)
Perceived mastery	20.06 (4.22) *	16.55 (4.75)	19.62 (4.04) *	15.89 (4.49)
Social support	3.70 (0.74) *	3.21 (1.13)	3.80 (0.56) *	3.50 (0.96)

† Sample size for all indicators except work strain are n = 6,891 for males and n = 8,682 for females. The sample size for work strain is n = 4,524 for males and n = 4,314 for females.

* Significant mean difference between negative and positive MDE classification, p < 0.001.

levels of stress and lower levels of health status and resources are associated with higher levels of psychological distress. Table II presents the means and standard deviations of all risk factors for those classified as having a major depressive episode (MDE) versus others. For both genders, those classified as having a MDE had significantly higher average levels of social stress and lower levels of health status and psychosocial resources. Finally, in addition to being associated with both psychological distress and MDE, all social stress, health status and psychosocial resource measures with the exception of self-esteem were significantly associated with age (Table III), emphasizing the need to examine how these covariates potentially affect the age-depression relationship.

Tables IV and V respectively examine how these covariates affect the relationship between age and depression in two parallel analyses, using OLS regression for generalized distress and logistic regression for MDE. In Table IV, Model 1, both age and

age-squared were significant indicating that the bivariate relationship is curvilinear. After adjusting for socio-demographic indicators (Model 2), the effect of age-squared was no longer significant indicating that the adjusted relationship is linear and negative. Once the effects of stress were partialled out in Model 3, age-squared was again significant. In Model 4, controlling for health status indicators, the strength of the linear relationship between age and depression almost doubled compared to Model 2 and the age-squared coefficient was no longer significant. When psychosocial resources were introduced into the model, the curvilinear effect of age on depression was again significant (Model 5). In the final model (Model 6), all covariates were included and the linear and squared effects of age were not significantly different from the unadjusted effects in Model 1. The adjusted effects of all psychosocial resources, health status indicators and social stressors except for work strain were also significant. This final model

TABLE III
Pearson Correlations Between Age and Social Stressors, Health Status and Psychosocial Resources for Males and Females†

	Social Stressors				Health Status		Psychosocial Resources		
	Chronic Strain	Recent Life Events	Traumatic Events	Work Strain	General Health Status	Self-Rated Health	Self-Esteem	Mastery	Social Support
Males	-0.221*	-0.167*	-0.115*	-0.185*	-0.288*	-0.256*	-0.007	-0.075*	-0.097*
Females	-0.227*	-0.207*	-0.204*	-0.179*	-0.256*	-0.272*	0.054	-0.080*	-0.086*

† Sample size for all indicators except work strain are n = 6,891 for males and n = 8,682 for females. The sample size for work strain is n = 4,524 for males and n = 4,314 for females.

* p < 0.001.

TABLE IV
OLS Regression of Generalized Distress on Sociodemographics, Social Stressors, Health Status and Psychosocial Resources (n=14,140)†

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Age	-0.430*	-0.146*	-0.269*	-0.325*	-0.304*	-0.418*
Age ²	0.288*	-0.076	0.200*	0.009	0.080*	0.234*
Sociodemographics						
Sex		0.074*	0.045*	0.067*	0.064*	0.047*
Single		0.043*	0.035*	0.022	0.022	0.016
Sep/div/wid		0.072*	0.035*	0.052*	0.054*	0.027*
Income adequacy		-0.091*	-0.026	-0.041*	-0.034*	0.008
Education		-0.046*	-0.008	0.005	0.008	0.035*
Nfld		-0.021	0.006	-0.007	-0.029*	-0.001
PEI		-0.007	-0.001	-0.005	-0.010	-0.004
NS		0.005	0.006	-0.008	-0.001	-0.011
NB		0.005	0.012	-0.001	-0.007	0.000
Que		0.082*	0.109*	0.100*	0.081*	0.114*
Ont		0.022	0.019	0.011	0.017	0.023
Man		0.026	0.021	0.027*	0.006	0.013
Sask		-0.014	-0.006	-0.019	-0.025	-0.019
Alta		0.002	0.007	0.001	-0.004	0.001
Work status		-0.104*	-0.078*	-0.030	-0.056*	-0.019
Work classification		0.003	0.018	-0.002	0.029*	0.017
Immigrant status		-0.022	-0.041*	-0.024	0.003	-0.022
Social Stressors						
Chronic strains			0.364*			0.226*
Recent life events			0.096*			0.069*
Traumatic events			0.093*			0.053*
Work strain			0.036*			-0.014
Health Status						
General health status				-0.359*		-0.228*
Self-rated health				-0.179*		-0.095*
Psychosocial Resources						
Self-esteem					-0.133*	-0.091*
Mastery					-0.340*	-0.178*
Social support					-0.096*	-0.037*
R ²	0.025	0.080	0.268	0.268	0.266	0.409

† Standardized OLS regression coefficients are reported.

* p < 0.001.

explained over 40% of the variance of distress among the sample.

In Table V, Model 1, age was negative and significant indicating that younger cohorts were at a greater risk of MDE. Inclusion of an age-squared term was not significant (not shown) and all subsequent models were examined using only age. In Model 2, controlling for sociodemographic indicators, the effect of age on MDE increased. Controlling for stress in Model 3 decreased the effect of age on MDE by

almost 50% from Model 1 and more than 60% from Model 2. When health status indicators were added to the model (Model 4), the negative relationship between age and MDE increased substantially compared to Models 1 and 2. The inclusion of the psychosocial resources (Model 5) also increased slightly the negative effect of age on MDE compared to the first two models. In the final model (Model 6), however, when all of the covariates were included, the effect of age on MDE was not signifi-

cantly different from the bivariate relationship in Model 1. Furthermore, similar to the results in Table V, psychosocial resources, health status and social stressors with the exception of work stress were also significant. To be consistent with our previous study,²² we also ran an additional logistic regression analysis using a 0.50 probability of caseness for MDE. The substantive results (not shown) were isomorphic to the results presented here.

The final analysis examined whether social stress, health status or personal resources moderated the relationship between age and depression by testing for interactions between each variable and age on both outcomes (results not shown). For 18 tests, 9 on each outcome, no interactions were significant after a Bonferroni correction factor for multiple tests was applied. The previous analysis also found the relationship between age and depression to be independent of socio-demographic indicators.²²

DISCUSSION

The central focus of this investigation was to assess how the age-depression relationship we identified previously²² varies in relation to other, theoretically important factors. Previous literature has identified social stress, health status and psychosocial resources as important covariates for both age and depression. Overall, we find the negative age-depression relationship persists indicating that age may be a protective mechanism for mental health. However, this study demonstrates that these covariates do influence the strength and shape of the age-depression relationship. After controlling for social stress, health status and psychosocial resources, the adjusted relationships between age and both outcomes

of depression were not significantly different from the original bivariate relationships. Thus, the inclusion of social stress, health status and psychosocial resource variables may offset the effects of one another. Why might this be so?

First, it appears that social stress may be, in large part, responsible for the higher levels of depression among younger age cohorts. As is evident using both outcome measures, the association between depression and age shows a relative increase among the elderly compared to the younger cohorts. This suggests that the burden of stress among the younger and middle-aged cohorts may result in inflated levels of depression compared to older cohorts. This was illustrated by the larger age and age-squared coefficients indicating a steeper decline into the middle age cohorts and a relative increase in level of distress among the elderly compared to the younger cohorts. Furthermore, the effect of age on MDE was reduced by almost 60%, indicating a reduction in the prevalence rates among younger cohorts after adjusting for social stress. This is understandable since most measures of stress identified in previous literature and included here tend to reflect the social roles occupied by younger cohorts.⁶ For example, chronic strains endemic to marital relationships, raising children, and financial troubles as well as work strain are generally very age-specific.

Second, it is also evident that health status may be responsible for a large portion of depression among the elderly. The strength of the negative linear relationship between age and depression across both outcomes was greatly increased when we controlled for health status. The adjusted age-depression relationship was consistent with the findings of the 1990 US Survey of Work, Family and Well-Being.⁴ However, concentrating on health status and neglecting other important factors may direct one towards misleading conclusions about depression across the life cycle. Mirowsky and Ross,⁴ for example, found that controlling for health and mastery (sense for control) dramatically reduced the relative prevalence of distress among the elderly. These variables are clearly important for the elderly. However, Mirowsky and Ross

TABLE V
Logistic Regression of Major Depressive Episode on Sociodemographics, Social Stressors, Health Status, and Psychosocial Resources (n = 14,742)[†]

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Age	-0.108*	-0.149*	-0.055*	-0.219*	-0.164*	-0.129*
Sociodemographics						
Sex		0.670*	0.537*	0.683*	0.663*	0.574*
Single		0.265	0.390*	0.221	0.255	0.346
Sep/div/wid		0.830*	0.695*	0.731*	0.752*	0.708*
Income adequacy		-0.077	0.067	0.030	0.046	0.140*
Education		-0.005	0.063	0.061	0.077	0.116*
Nfld		-0.644	-0.169	-0.500	-0.735	-0.302
PEI		-0.472	-0.268	-0.482	-0.541	-0.380
NS		0.243	0.311	0.052	0.008	0.057
NB		-0.360	-0.194	-0.493	-0.445	-0.350
Que		-0.220	-0.157	-0.161	-0.136	-0.016
Ont		-0.137	-0.110	-0.199	-0.206	-0.197
Man		0.266	0.274	0.289	0.105	0.175
Sask		-0.249	-0.111	-0.283	-0.358	-0.242
Alta		-0.205	-0.124	-0.191	-0.240	-0.206
Immigrant status		0.249	-0.043	0.231	0.380*	0.143
Work status		-0.402*	-0.412*	-0.113	-0.191	-0.142
Work classification		0.010	0.019	0.009	0.026	0.023
Social Stressors						
Chronic strains			0.195*			0.099*
Recent life events			0.263*			0.248*
Traumatic events			0.190*			0.128*
Work strain			0.048*			0.027
Health Status						
General health status				-3.408*		-1.541*
Self-rated health				-0.419*		-0.221*
Psychosocial Resources						
Self-esteem					-0.134*	-0.092*
Mastery					-0.150*	-0.076*
Social support					-0.239*	-0.109

[†] Estimated logistic regression coefficients are reported.
* p < 0.001

failed to control for other factors that may be more salient for younger cohorts. In effect, they underestimated the burden of stress in younger cohorts. This analysis suggests that failure to control for measures more relevant to the young may have biased their findings on the age-depression relationship.

The current finding that both outcomes behave very similarly after adjusting for health status may contradict previous evidence that depression scales versus indexes lead to differing conclusions for the elderly. Psychiatrists and epidemiologists argue that the u-shaped pattern identified by Mirowsky²¹ is due to the inclusion of health-related questions in distress scales. Some of the symptoms of these scales are somatic and may be confounding increases in health problems among the elderly with increases in depressed mood. However, even when the somatic items are eliminated from these distress scales, the non-somatic dimensions also displayed U-shaped patterns.⁵ Mirowsky argues that many symptoms contained within depres-

sion diagnostic indexes exclude the elderly from being classified as having a MDE by attributing such things as losing a spouse to the process of aging. The distress measure employed in this analysis was not confounded with somatic complaints and, while there are modest differences between the two outcomes, overall both fully adjusted models show a general negative linear pattern consistent with their bivariate relationships as presented in Wade and Cairney (1997: Figure 1).²²

Finally, the role of psychosocial resources appears to aid in the reduction of psychological distress and likelihood of MDE among middle and older cohorts. Previous theory suggests that older cohorts, because they have had opportunities to develop and nurture their personal and social resources, are better equipped to withstand threats to their well-being (maturational theory).⁴ However, using distress as the outcome, there appears to be a slight increase among the elderly, suggesting that the protective effect is stronger through middle age with a gradual reduction in

Appendix 1

Description of All Measures Included in Analysis

Variable	Description
Dependent Variables	
Psychological Distress	The 6-item measure of distress is derived from a larger scale of 45 items developed at the University of Michigan; higher scores among these 6 items indicate greater distress ($\alpha = 0.79$).
Major Depressive Episode (MDE)	This variable is derived using the UM-CIDI-short form (UM-CIDI-SF), a shortened version of the original CIDI and UM-CIDI, providing a one-year population prevalence rate of diagnosable depression (depressed mood) based upon criteria from the DSM-III-R and the ICD-10. For a complete description of this instrument, see references 22 and 36. This diagnostic instrument predicts caseness based on two central dimensions of depression: feeling sad, blue, or depressed and/or losing interest in most things. If respondents reported experiencing either dimension at least most of the day, almost every day, for a period of two weeks in the previous 12 months, they were prompted to answer "yes" or "no" to a series of symptoms. Respondents answering "yes" to 4 or more symptoms in addition to the primary stem had a probability for caseness of .90 and were classified as having a MDE. Field trials of the original CIDI, conducted by the World Health Organization, have documented good inter-rater reliability, ³⁷ test-retest reliability, ³⁸ and validity for most diagnoses. ^{39,40} Preliminary field trials of the UM-CIDI-SF suggests that it is a feasible instrument for large-scale population surveys. ⁴¹ Using a .90 probability level in a community study of approximately 3,000 respondents, one study found the negative predictive value of the UM-CIDI-SF was near perfect while its positive predictive value was about 75% compared to the full CIDI (Written communication with Dr. Scott B. Patten, Dec 17, 1999).
Independent Variables	
Sources of Social Stress	
Chronic Stress	This summative measure is based on 16 questions in which the respondent was asked whether certain situations were perceived as stressful or not. These items are a subset of a larger scale developed by Wheaton. ²⁴ The 16-item index used here is adjusted and standardized to account for the number of situations applicable to each respondent. For example, those who are married and/or have children answered more questions than others.
Recent Life Events	This summative measure indicates the number of stressful events the respondent experienced in the previous 12 months. The set of 10 items asked in the NPHS is a subset of a life events inventory used in the Toronto Co-morbidity study. ⁴²
Traumatic Events	Traumatic childhood and adult events is a count of 7 severe events that respondents may have been exposed to over their lifetime. ²⁴
Work Strain	Work strain is a 12-item composite measure of overall stress on the job. ^{43,44} There were 6 highly correlated underlying dimensions of work strain within this composite measure including decision latitude (both skill discretion and decision authority), psychological demands, job insecurity, physical exertion and social support. ³² The internal consistency of the total measure was $\alpha = 0.53$.
Health Status Indicators	
General Health Status	The derived measure of general health is composed of a generic health status index that synthesizes both quantitative and qualitative dimensions of health to provide a score of the respondent's overall functional health. ³² This measure incorporates 8 different dimensions of health including vision, hearing, speech, mobility, dexterity, cognition, pain and discomfort, and emotion.
Self-Rated Health	Self-rated health is a single 5-point item asking respondents to rate their physical health from poor (1) to excellent (5).
Psychosocial Resources	
Mastery	Mastery refers to the extent to which individuals view themselves as being in control of their own lives. This construct is measured using Pearlin and Schooler's ⁴⁵ 7-item scale. Respondents were asked how strongly they agreed or disagreed with each item on a 5-point scale ($\alpha = 0.76$).
Self-esteem	Self-esteem is a subset of 6 items from Rosenberg's original 10-item scale that measures one's perception of self. ^{46,47} The items were scored using a 5-point Likert scale to indicate how strongly one agrees or disagrees with a series of questions measuring one's personal self-worth. The derived 6-item self-esteem scale used in the NPHS had an internal consistency of $\alpha = 0.85$.
Social Support	Social support is based on four dimensions of perceived social support. Respondents were prompted to answer yes or no to four questions asking whether they had someone who they could confide in, count on, who could give them advice, and who makes them feel loved.
Socio-demographic Indicators	
Age	Age is collapsed into 5-year intervals over the life span. The first age interval includes only those aged 18 and 19. The final category includes those aged 80 years and greater and ranges from 80 to 102.
Marital Status	Marital status consists of two variables comparing married, single, and other (separated, divorced and widowed) where married is the reference group.
Education	Education is a 6-category measure constructed to reflect increasing amounts of schooling.
Income Adequacy	Income is composed of 5 levels indicating increasing income and was calculated by adjusting data on total household income by household size. The criterion for each category is based on Statistics Canada low-income cut-offs. ^{48,49}
Employment Status	Employment status is a dichotomous measure to indicate whether one is currently employed or not.
Occupation	Occupational classification is based on the Pineo-Porter socio-economic classification. ³²
Immigrant Status	Immigrant status indicates whether the respondent was born outside of Canada.

one's support network and resources as people progress through old age.

From this analysis, it appears that age may be a protective mechanism for depression and that other factors do influence this relationship. However, since this study was based on synthetic cohorts, we cannot assess whether changes in depression by age, and

the respective changes in these additional covariates, are due to aging, period, or cohort effects. For example, it could be that the estimates of depression within older cohorts have remained constant across their life-cycle and that the rates among the younger cohorts will remain high across their life-cycle. Conversely, as people

progress through life, entering and exiting various social roles, they will be exposed to changing levels of stress, health status, and psychosocial resources that may effect changes in their relative rates of depressive symptomatology. To examine whether the relationship between age, depression and other covariates is due to cohort or life-cycle

differences, it will be necessary to examine this relationship longitudinally.

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