Work and Mental Health

– An Analysis of Canadian Community Health Survey

WORK AND MENTAL HEALTH

- AN ANALYSIS OF CANADIAN COMMUNITY HEALTH SURVEY

By

MIAO FANG

A Project

Submitted to the School of Graduate Studies

in Partial Fulfillment of the Requirements

for the Degree

Master of Science

McMaster University

MASTER OF SCIENCE (2005) McMaster University
(Statistics) Hamilton, Ontario

TITLE: Work and Mental Health – An Analysis of Canadian Community Health Survey

AUTHOR: Miao Fang

SUPERVISOR: Dr. Harry Shannon

NUMBER OF PAGES: x, 66

Abstract

Workplace mental health is a major concern in Canada. The primary objective of this research is to describe the relationship between work and mental health, paying particular attention to work stressors and further explore moderators and mediators of any relationships, that might be targeted in future intervention strategies. The source of the data is the two cycles of the Canadian Community Health Survey conducted by Statistics Canada. All estimates produced from the data were weighted to represent the target Ontario population using the weights provided by Statistics Canada. Estimates of the prevalence of the mental disorders and substance dependence and mean scores of work stressors, according to different groups of workers, were calculated. To examine health care use, we treated consultation with a mental health professional, use of medication-antidepressants and utilization of any resource as dependent variables. Bivariate relationships between mental health disorders and other variables explored the correlates of mental health disorders. Logistic regression was used to examine moderators and mediators of work stressors in relation to mental health disorders by including some socio-demographic variables and behavioral variables as covariates and we also included terms of their interactions with work stressors. Since the level of work stressors varied by occupation and was likely determined in part by occupation, we did not include both variables in regression analyses. Further regressions with health care utilization as the

dependent variable were conducted with work stressors and occupation as independent variables and other variables as covariates and in interaction terms for people with mental health disorders. The results of the study suggest that there is strong association between work and mental health problems. The findings regarding work stressors and occupation as predictors of mental health problems suggest that work health and safety practitioners must continue to pay attention to the psychosocial conditions of work. We also explored what factors predicted whether people consulted a mental health professional (CCHS1.1) or whether they used any resource available to deal with their problem (CCHS1.2).

Acknowledgements

I wish to express my deepest gratitude to my supervisor, Dr. Harry Shannon, for providing me the opportunity to work in the research area of work and mental health, for his expert guidance and continued support and encouragement during the course of this project.

I would like to thank my examiners Dr. P.D.M. Macdonald and Dr. Román Viveros-Aguilera for their helpful remarks.

Thanks are extended to Dr.Vishwanath V. Baba for his providing references and invaluable advice on my project as well as to James Chowhan and Vivek Jadon at the Statistics Canada Research Data Centre at McMaster University for their assistance in data provision and management.

I express my appreciation to the Department of Mathematics and Statistics at McMaster University for providing financial assistance and I thank all my academic professors for making my education an enjoyable experience.

I would also like to thank my colleagues, friends and all other departmental staff for their cooperation and help.

Finally, I want to thank my parents and my husband Rui for their love and support and for always being there for me.

Contents

List of Figures

List of Tables

Chapter 1

Introduction

1.1 Background

Workplace mental health is a major concern in Canada. Annually, 12% of Canadians aged from 15 to 64 – the working years – suffer from a mental disorder or substance dependence (Dewa et al., 2004). A recent Conference Board of Canada study, cited by Baba (2000), reported that nearly half of Canadian workers experience high levels of stress and suffer from its mental health consequences. The estimated cost of poor mental health in workplaces is in billions of dollars. Such costs occur, not only because of absenteeism, but also because of reduced productivity even when workers are present on the job. Many have also noted that work itself is crucial to an individual's sense of self-worth (Marmot and Feeney, 1996). Being a productive member of society – doing useful, meaningful work – is necessary for optimal mental health (Gini, 2000).

The quality of work is important. Job strain (an imbalance between job psychological demands and decision latitude) has been linked to mental health outcomes

(e.g., Karasek and Theorell, 1990; Amick and Kawachi, 1998). In other words, work itself appears to affect mental health.

We can thus distinguish two areas of concern in relation to workplace mental health. Firstly, the work itself may cause poor mental health. Secondly, regardless of its cause, poor mental health has consequences at the workplace, both in disability and loss of productivity.

I used the Canadian Community Health Survey (described below) data to conduct the study whose objectives were:

1. describe the relationship between work and mental health, paying particular attention to work stressors;
2. understand some of the antecedents and consequences of workers' mental health; and
3. further explore moderators and mediators of any relationships, that might be targeted in future intervention strategies.

1.2 Data

Data for this study were obtained from the two cycles of the Canadian Community Health Survey which were conducted by Statistics Canada in 2000-2001 and May 2002 to December 2002 respectively. (Statistics Canada, CCHS Cycle 1.1 (2000-2001) Public Use Microdata File Documentation and CCHS Cycle 1.2 (2002) Master File Documentation, provided by the Research Data Centre at McMaster University). CCHS1.1 was a cross-sectional survey designed to provide cross-sectional estimates of

health determinants, health status and health system utilization for community health regions and special populations across Canada. It covered approximately 98% of the Canadian population aged 12 or older and was a nationally representative survey covering the whole workforce. The response rate was 84.7% and the responding sample size for CCHS1.1 was 131,535. The total sample in Ontario was roughly 42,000, of whom about 23,000 answered the Work stressors items. These latter respondents were used in our analysis. CCHS1.2 focused on mental health and well-being. It was aimed to provide provincial cross-sectional estimates of mental health determinants, mental health status and mental health system utilization. CCHS1.2 collected 36,984 responses from persons aged 15 or older, living in private occupied dwellings. The response rate was 77.0% at the Canada level. There were 12,376 Ontario respondents, of whom 8,008 answered the Work stressors items. These 8,008 respondents constituted the sample in our analysis.

1.3 Sampling

Descriptions of the variables used and the methods of sampling are based heavily on Statistics Canada's documentation (Statistics Canada, CCHS Cycle 1.1 (2000-2001) Public Use Microdata File Documentation and CCHS Cycle 1.2 (2002) Master File Documentation, provided by the Research Data Centre at McMaster University).

The sample allocation strategy of CCHS1.1 consisted of three steps. In the first two steps, the sample was allocated among the provinces according to their respective populations and the number of health regions (HRs) they contain. In the third step, each province's sample was allocated among its HRs proportionally to the square root of the

estimated population in each HR. The CCHS1.1 used three sampling frames to select the sample of households. The majority of the sample of households came from an area frame. The CCHS1.2 used the area frame designed for the Canadian Labour Force Survey (LFS) as its frame. In the first stage homogeneous strata were formed and independent samples of clusters were drawn from each stratum. In the second stage dwelling lists were prepared for each cluster and dwellings, or households, were selected from the lists. Selection of individual respondents was designed to ensure over-representation of young persons (15 to 24) and seniors (65 or older). The selection strategy was designed to consider user needs, cost, design efficiency, response burden and operational constraints. In order to balance interviewer workload, the initial sample of dwellings was equally allocated at random, within each region, over the 3 collection periods covering 7 months (May to November 2002).

1.4 Variables

Variables used in this analysis are listed in Table 1.4.1. Appendix A provides more details of these variables.

1.5 Methods

All estimates produced from CCHS1.1 and CCHS1.2 data were weighted to represent the target Ontario population using the weights provided by Statistics Canada.

Estimates of the prevalence of the mental disorders and substance dependence and mean scores of work stressors, according to different groups of workers, were calculated.

To examine health care use, I treated consultation with a mental health professional, use of medication-antidepressants and utilization of any resource as dependent variables. I restricted the analysis to those with depression for CCHS1.1 and any mental health disorder or substance dependence (AMDSD) for CCHS1.2. Bivariate relationships between mental health disorders and other variables explored the correlates of mental health disorders. Logistic regression was used to examine moderators and mediators of work stressors in relation to mental health disorders by including some socio-demographic variables and behavioral variables as covariates and we also included terms of their interactions with work stressors. I thus obtained odds ratios for work stressors in predicting mental health disorders, adjusted for socio-demographic variables and behavioral variables. Since the level of work stressors varied by occupation and was likely determined in part by occupation, I did not include both variables in regression analyses. Further regressions with health care utilization as the dependent variable were conducted with work stressors and occupation as independent variables and other variables as covariates and in interaction terms for people with mental health disorders.

The analyses consist of three stages. Chapters 2 and 3 give descriptive and bivariate analyses for the CCHS data. In the bivariate analysis, contingency table analysis and Pearson's chi-squared tests are introduced. Chapter 4 presents topics related to logistic regression model building, interpretation of the models, variance estimations and assessing the fit of the models of CCHS data. Finally, I conclude with a summary of findings, implications, strengths and limitations of the study in Chapter 5.

All the analyses were conducted using SPSS 11.5 statistical software.

Table 1.4.1: Variables used in this analysis

Variable	CCHS1.1	CCHS1.2
Main predictors		
Work stressors	√	√
Occupation	√	√
Covariates		
Age	√	√
Sex	√	√
Marital status	√	√
Education	√	√
Body mass index	√	√
Income	√	√
Race	√	√
Type of smoker	√	
Mental health disorders and substance dependence		
Depression	√	
Major depressive episode		√
Manic episode		√
Panic disorder		√
Social phobia		√
Agoraphobia		√
Alcohol dependence		√
Illicit drug dependence		√
Any mental health disorder or substance dependence (AMDSD)		√
Mental health care services utilization		
Consultation with a mental health professional	√	
Use of medication - antidepressants	√	
Use of any resources for mental health problems		√

Chapter 2

Descriptive Analysis of CCHS Data

2.1 Work Stressors

Respondents between the ages of 15 and 75 years who worked at a job or business at any time in the past 12 months were asked to evaluate their main job in the past 12 months. The work stressors scale consisted of items to determine the respondent's perception about several dimensions of their work including job security, social support, monotony, physical effort required, and extent of participation in decision-making. The possible scores range from 0 to 48. Higher scores indicate greater levels of work stressors. Most respondents scored between 16 and 22, with an overall mean of 19.4 (s.d. =5.0) for CCHS1.1 and 19.1 (s.d. =5.2) for CCHS1.2 respectively (See Figure 1 and Figure 2 for histograms of work stressors).

2.2 Mental Health Disorders and Substance Dependencies

I focus my study on depression (CCHS1.1) and AMDSD - any mental disorder or substance dependence (CCHS1.2) as mental health outcomes in our analyses.

In CCHS1.1, depression is characterized by a depressed mood or lack of interest in most things (or both), along with other symptoms, that lasts at least 2 weeks. The prevalence of depression is the percentage of the population that is estimated to have experienced a depressive episode at some time in the year before the survey interview. From this information, the probability of a depressive episode occurring was estimated. For this analysis, respondents were considered to have had a depressive episode if they had a probability of 0.90 or more (five or more symptoms). The prevalence of depression in CCHS1.1 was 7.4%.

In CCHS1.2, respondents were classified as having "Any mental disorder or substance dependence" if the pattern of answers met the criteria for at least one of the five mental disorders or two substance dependencies covered in the survey. (i.e. major depressive episode, manic episode, panic disorder, social phobia, agoraphobia, alcohol dependence, or illicit drug dependence). In CCHS1.2, 11.5% of workers reported having experienced AMDSD listed. The prevalence rates for manic episode, agoraphobia and substance dependence on any illicit drug were all lower than 1%. (See Table 2.2.1)

2.3 Mental Health Care Services Utilization

The majority of the people who suffered mental disorders or substance dependence did not use any health care services for their condition. Among those who had depression, 41% had consulted a mental health professional in past 12 months and 23% had taken antidepressant medication, compared to 5% and 3% in those who did not meet our definition of being depressed. Of those reporting AMDSD, 31% had used a

health care or community resource for problems concerning emotions, mental health or use of alcohol and drugs compared to 5% in those not reporting AMDSD.

Figure 1: Work stressors (CCHS1.1)

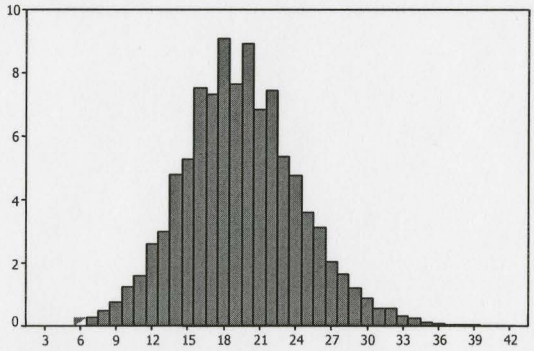

Figure 2: Work stressors (CCHS1.2)

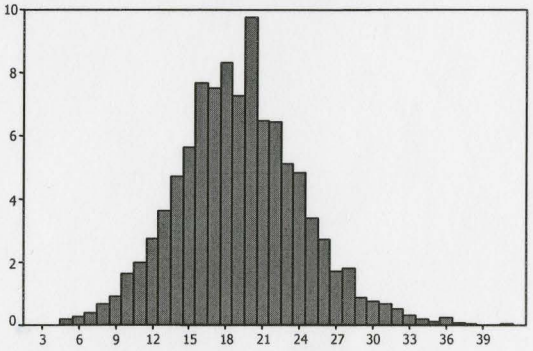

Table 2.2.1: Prevalence of mental health disorders and substance dependencies

Mental health disorders and substance dependence	Number in sample (n)	Number with characteristic (%)
Depression (CCHS1.1)	22805	1677 (7.4%)
Major depressive episode (CCHS1.2)	7993	385 (4.8%)
Manic episode (CCHS1.2)	8000	65 (0.8%)
Panic disorder (CCHS1.2)	7886	112 (1.4%)
Social phobia (CCHS1.2)	7967	279 (3.5%)
Agoraphobia (CCHS1.2)	7991	40 (0.5%)
Alcohol dependence (CCHS1.2)	7982	223 (2.8%)
Illicit drug dependence (CCHS1.2)	7986	51 (0.6%)
AMDSD (CCHS1.2)	7818	902 (11.5%)

Chapter 3

Bivariate Analysis of CCHS Data

3.1 Contingency Table Analysis

3.1.1 Contingency Table

Let X and Y denote two categorical response variables, X having I levels and Y having J levels. When we classify subjects on both variables, there are IJ possible combinations of classes. The responses (X, Y) of subjects randomly chosen from some population have a probability distribution. We display this distribution in a rectangular table having I rows for the categories of X and J columns for the categories of Y. The cells of the table represent the IJ possible outcomes. Their possibilities are $\{\pi_{ij}\}$, where π_{ij} denotes the probability that (X, Y) falls in the cell in row i and column j. When the cells contain frequency counts of outcomes, the table is called a *contingency* table; another name is *cross-classification* table (Agresti, 1990).

3.1.2 Pearson Chi-Squared Test for Independence

Pearson's Chi-Squared is a general test for the existence a relationship between two or more nominal level variables. This test is based on a comparison of observed cell frequencies to expected frequencies. Expected frequencies represent hypothetical values that would occur if there were no association between the variables being tested. The larger the difference between the observed frequencies and the expected frequencies, the larger the Chi-squared values.

We focus on the case with two variables here. Suppose we have a row variable (usually independent variable) X with i rows, where $i = 1, 2, \ldots, r$, and a column variable (usually dependent variable) Y with j columns, where $j = 1, 2, \ldots, c$. We test the following hypotheses:

H_0: no significant association between row and column variables

H_1: association between the row and column variables

Pearson's chi-square $X^2 = \sum_{i=1}^{r}\sum_{j=1}^{c}\frac{(O_{ij}-E_{ij})^2}{E_{ij}}$ where O_{ij} and E_{ij} are the observed frequency and expected frequency of cell in row i and column j, respectively.

Here $E_{ij} = (O_{i+} * O_{+j} / O_{++})$, where O_{i+}, O_{+j} and O_{++} represent the row total, column total and grand total, respectively.

Under the null hypothesis, Pearson's chi-squared statistic has a chi-squared distribution with $(r-1)$ $(c-1)$ degrees of freedom. Significant chi-squared values testing for independence allow us to reject the null hypothesis that column variable Y and row variable X have no significant association with each other.

3.1.3 Linear by Linear Association Chi-Squared Test for Trend

There are some ordinal variables in the CCHS data set. Besides testing for independence, sometimes we are interested in whether there is a discernible trend in the level of association between the row and column variables. Measures for ordinal variables describe the degree to which the relationship is monotonic. When we observe the ordering of two subjects on each of two variables, we call the pair of subjects as *concordant* if the subject ranking higher on variable X also ranks higher on variable Y. The pair is *discordant* if the subject ranking higher on X ranks lower on Y. The pair is *tied* if the subjects have the same classification on X and / or Y.

Consider two independent observations from a joint probability distribution $\{\pi_{ij}\}$ for two ordinal variables. For that pair of observations

$$\prod_c = 2\sum_i\sum_j \pi_{ij}\left(\sum_{h>i}\sum_{k>j}\pi_{hk}\right) \text{ and } \prod_d = 2\sum_i\sum_j \pi_{ij}\left(\sum_{h<i}\sum_{k<j}\pi_{hk}\right)$$

are the probabilities of concordance and discordance. The association is said to be positive if $\prod_c - \prod_d > 0$ and negative if $\prod_c - \prod_d < 0$. (Agresti, 1990).

3.2 Bivariate Analysis of CCHS Data

Work Stressors by Occupation

Table 3.2.1 presents the comparison of the 9 occupations for work stressors in both cycles. Mean scores differed across occupations. 'Processing, manufacturing, utilities' had the highest mean score whereas 'Professional (including accountants)' had

the lowest mean score followed by 'Management' for both cycles. The rank order of occupations was almost identical for both CCHS1.1 and CCHS1.2. Figures 3 and 4 show the means plots for work stressors among different occupation groups.

Figure 3: Means Plot for Work Stressors among Occupation groups (CCHS1.1)

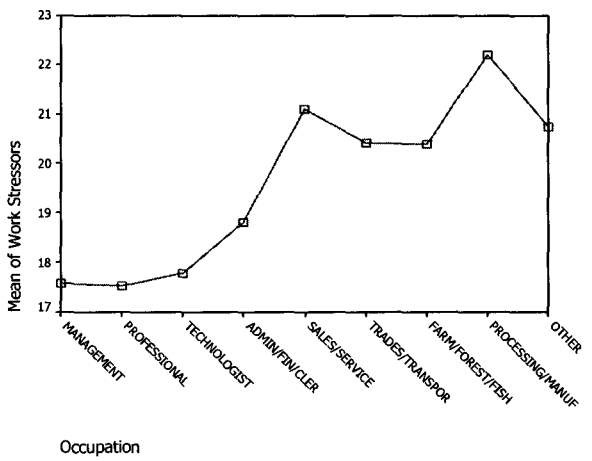

Figure 4: Means Plot for Work Stressors among Occupation groups (CCHS1.2)

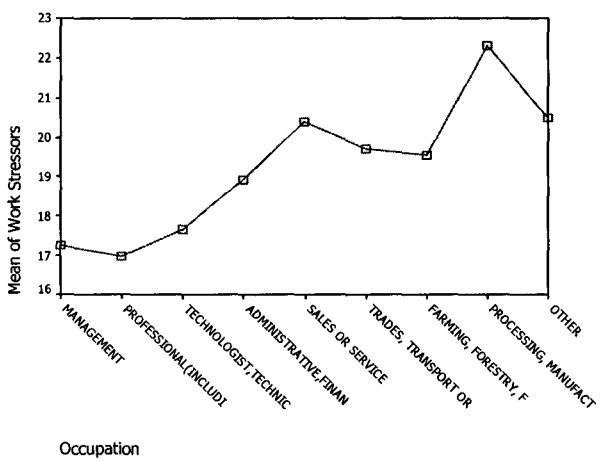

Table 3.2.1: Means and standard deviations of work stressors by occupation						
	CCHS1.1			CCHS1.2		
Occupation	**n**	**Mean**	**S.D.**	**n**	**Mean**	**S.D.**
Processing, manufacturing, utilities	1508	22.2	5.0	565	22.3	5.0
Sales or service	5095	21.1	4.9	1810	20.4	5.0
Other	1623	20.7	5.0	715	20.5	5.6
Trades, transport or equipment operator	2771	20.4	4.4	946	19.7	4.6
Farming, forestry, fishing, mining	404	20.4	4.2	147	19.6	4.4
Administrative, financial or clerical	2814	18.8	4.7	881	18.9	4.7
Technologist, technician	2070	17.8	4.8	637	17.7	5.2
Management	2797	17.6	4.5	983	17.3	4.7
Professional (including accountants)	4028	17.5	4.8	1323	17.0	4.6
Total	23110	19.4	5.0	8007	19.1	5.2

To test the hypothesis that the means of work stressors are equal among different occupation groups, I conducted one-way ANOVA. Table 3.2.3 shows that the mean scores of work stressors are significantly different among the nine occupation groups for both CCHS cycles.

Table 3.2.2: Test of homogeneity of variances of work stressors among occupation groups									
CCHS1.1	**Levene Statistic**	**df1**	**df2**	**Sig.**	**CCHS1.2**	**Levene Statistic**	**df1**	**df2**	**Sig.**
	9.653	8	23101	<0.01		6.535	8	7998	<0.01

Table 3.2.3: ANOVA – Test of equality of work stressors means among occupation groups						
		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
CCHS1.1	Between Groups	62565.85	8	7820.731	349.121	<0.01
	Within Groups	517489.9	23101	22.401		
	Total	580055.8	23109			
CCHS1.2	Between Groups	21321.69	8	2665.211	111.386	<0.01
	Within Groups	191373.3	7998	23.928		
	Total	212695.0	8006			

Work Stressors by Various Measures of Mental Health

Generally, the prevalence of mental health disorders and substance dependences increased statistically significantly as the level of work stressors increased with one exception - no close relationship was found between work stressors and agoraphobia in CCHS1.2.

Table 3.2.4: Prevalence of various mental health measures by work stressors

Work stressors	Depression (CCHS1.1)			Major depressive episode (CCHS1.2)			Manic episode (CCHS1.2)		
	n	Prevalence	Sig.	n	Prevalence	Sig.	n	Prevalence	Sig.
0-16	6406	4.9%		2447	2.1%		2456	0.3%	
17 -19	5470	5.3%	<0.01	1849	3.8%	<0.01	1850	0.4%	<0.01
20 - 22	5315	7.2%	(<0.01)	1813	4.4%	(<0.01)	1813	1.0%	(<0.01)
23 - 48	5614	12.3%		1884	9.7%		1881	1.7%	
	Panic disorder (CCHS1.2)			**Social phobia (CCHS1.2)**			**Agoraphobia (CCHS1.2)**		
0-16	2412	1.0%		2450	1.4%		2453	0.3%	
17 -19	1819	1.0%	<0.01	1840	2.8%	<0.01	1848	0.3%	0.12
20 - 22	1796	1.6%	(<0.01)	1803	4.2%	(<0.01)	1811	0.7%	(0.02)
23 - 48	1858	2.2%		1874	6.3%		1880	0.7%	
	Alcohol dependence (CCHS1.2)			**Illicit drug dependence (CCHS1.2)**			**AMDSD (CCHS1.2)**		
0-16	2448	1.6%		2452	0.2%		2378	6.0%	
17 -19	1847	2.8%	<0.01	1846	0.4%	<0.01	1814	9.7%	<0.01
20 - 22	1808	2.5%	(<0.01)	1810	0.9%	(<0.01)	1781	12.3%	(<0.01)
23 - 48	1879	4.7%		1878	1.1%		1845	19.8%	

() Numbers in parentheses represent p-values for trend tests (Linear by Linear Association).

Mental Disorders and Substance Dependencies by Occupation

The prevalence of mental disorders and substance dependences varied across the 9 occupations. Table 3.2.5 shows the data ordered by the prevalence of depression. 'Sales or service' (n=5009) had the highest prevalence of depression (9.8%) while the occupation with the lowest prevalence (4.8%) was 'Technologist, technician' (n=2041). For any mental disorder or substance dependence, 'Sales or service' (n=1773) again had

the highest prevalence (16.4%) and 'Farming, forestry, fishing, mining' (n=146) had the lowest prevalence (7.5%). Chi-Squared tests (Table 3.2.6) show that there is strong association between occupation and mental disorder and substance dependence.

Table 3.2.5: Prevalence of mental disorders and substance dependencies by occupation

Occupation	Depression (CCHS1.1)		AMDSD (CCHS1.2)	
	n	Prevalence	n	Prevalence
Sales or service	5009	9.8%	1773	16.4%
Administrative, financial, clerical	2786	9.3%	863	14.6%
Other	1605	9.3%	691	10.6%
Professional (including accountants)	3969	6.7%	1283	8.4%
Management	2755	6.1%	959	8.4%
Processing, manufacture, utilities	1477	5.4%	554	11.0%
Trades, transport, equipment operator	2727	5.4%	926	9.3%
Farming, forestry, fishing, mining	397	5.0%	146	7.5%
Technologist, technician	2041	4.8%	623	10.4%
Total	**22766**	**7.4%**	**7818**	**11.5%**

Table 3.2.6: Chi-Squared Tests for independence of occupation vs. mental disorder and substance dependence

Cycle	Pearson Chi-Squared Value	df	Sig.(2-sided)
CCHS1.1	125.63	8	<0.01
CCHS1.2	78.858	8	<0.01

Mental Disorders and Substance Dependencies by Other Variables

To explore the correlates of mental disorders and substance dependences, bivariate relationships between mental health outcomes and other variables were

examined. By checking Chi-Squared statistics and Linear by Linear association (for trend test), we found that work stressors, age, sex, BMI, marital status, education and race had statistically significant correlations ($p<=0.01$) with depression in cycle 1.1 and AMDSD in cycle 1.2. Income and type of smoker showed significant correlations ($p<0.01$) with depression in CCHS1.1. Income was not significantly related to AMDSD in CCHS1.2, while smoking information was not collected in CCHS1.2.

Table 3.2.7 shows the prevalence of mental health outcomes by these variables. Work stressors showed a very strong association with depression and presence of AMDSD. As the level of work stressors increased, the prevalence of mental disorders increased significantly. Females and white people had higher prevalences of depression and AMDSD than males and non-white people, respectively. Married people had a lower prevalence of mental health disorders than other groups of people. Generally, the prevalence of mental health disorders decreased as income increased with the exception that the prevalence of AMDSD in the 'Highest income' group was higher than prevalence in the 'Upper middle income' and 'Lower middle income' groups in CCHS1.2. 'Type of smoker' was significantly associated with prevalence of depression. The prevalence in current smokers was more than twice in those who had never smoked. The results also showed differences by age group. Young people aged 15 to 29 were most likely to report suffering from depression and AMDSD. As age increased, the prevalence decreased in both CCHS cycles. This agreed with the results for the whole population, including those not working. (Statistics Canada, 2003). People with BMI values 30 or more had the

highest prevalence of mental disorders while those whose BMI ranging from 25 to 29.9 had the lowest prevalence in both cycles.

Table 3.2.7: Prevalence of mental health outcomes by selected variables

Variable		Depression (CCHS1.1)			AMDSD (CCHS1.2)		
		n	Prevalence	Sig.	n	Prevalence	Sig.
Sex	Male	11870	4.8%	<0.01	4172	10.7%	0.01
	Female	10935	10.2%		3646	12.5%	
Marital status	Married	12681	5.3%	<0.01	4399	6.5%	<0.01
	Common-law	1487	8.6%		550	19.3%	
	Widow/Sep/Div	1852	11.2%		604	15.9%	
	Single	6773	9.8%		2250	18.3%	
Education	Less than secondary	3668	8.9%	<0.01 (<0.01)	1332	14.3%	<0.01 (<0.01)
	secondary graduation	5073	7.3%		1595	11.6%	
	some post-secondary	1993	8.7%		749	20.2%	
	Post-secondary	11920	6.7%		4084	9.1%	
Income	Lowest income	1238	9.2%	<0.01 (<0.01)	341	13.5%	0.53 (0.53)
	Lower middle income	3127	8.9%		999	11.1%	
	Upper middle income	7163	8.5%		2573	10.8%	
	Highest income	9392	5.8%		3381	11.2%	
Race	Non-white	4179	5.5%	<0.01	1707	7.4%	<0.01
	White	18472	7.8%		6110	12.7%	
Type of smoker	Current smoker	6452	10.8%	<0.01 (<0.01)	–		
	Former smoker	8156	6.8%				
	Never smoked	8189	5.2%				
Work stressors	0 - 16	6406	4.9%	<0.01 (<0.01)	2378	6.0%	<0.01 (<0.01)
	17 -19	5470	5.3%		1814	9.7%	
	20 - 22	5315	7.2%		1781	12.3%	
	23 - 48	5614	12.3%		1845	19.8%	
Age	15 to 29 years old	6639	9.6%	<0.01 (<0.01)	2144	18.0%	<0.01 (<0.01)
	30 to 44 years old	8794	7.3%		3088	10.7%	
	45 to 64 years old	6947	5.4%		2425	7.3%	
	65 years old or more	425	3.5%		161	5.0%	
BMI	Less than 25	10232	7.6%	<0.01 (0.80)	2853	11.9%	<0.01 (0.16)
	25 to 29.9	6735	6.4%		2100	8.9%	
	30 or more	5837	8.0%		2865	13.1%	

- CCHS1.2 did not include this variable.
- () Numbers in parentheses represent p-values for trend tests (Linear by Linear Association)

Mental Health Care Services Utilization by Occupation

In CCHS1.1, depressed workers in 'Processing, manufacturing, utilities' were most likely to consult with a mental health professional followed by workers in 'Administrative, financial, clerical' whereas depressed workers in 'Farming, forestry, fishing, mining' were least likely to consult with a mental health professional. In CCHS1.2, workers with AMDSD in 'Administrative, financial, clerical' and 'Technologist, technician' had the highest and lowest prevalence of utilization of any resource for mental health problems, respectively.

Table 3.2.8: Prevalence of mental health care services utilization by occupation (for people with Depression in CCHS1.1 and AMDSD in CCHS1.2 respectively)

	Consultation with a m.h. professional (CCHS1.1)		Utilization of any resource (CCHS1.2)	
Occupation	n	Prevalence	n	Prevalence
Processing, manufacturing, utilities	80	48.8%	61	36.1%
Administrative, financial or clerical	258	46.9%	123	48.0%
Professional (incl. accountants)	264	43.6%	108	28.7%
Management	167	42.5%	81	35.8%
Trades, transport, equip. operator	146	39.7%	86	24.4%
Sales or service	493	38.9%	290	29.0%
Technologist, technician	97	38.1%	65	20.0%
Other	148	34.5%	73	27.4%
Farming, forestry, fishing, mining	21	23.8%	11	-
Total	**1674**	**41.2%**	**898**	**31.4%**

- Data not shown because of the small sample size (n=11) of this sub-group ('Farming, forestry, fishing, mining').

Mental Health Care Services Utilization by Other Variables

Among people who had depression (CCHS1.1) and AMDSD (CCHS1.2), women and white people were more likely to seek professional help than men and non-white

people, respectively. Although young people aged 15 to 29 had the highest prevalence of mental disorders and substance dependences (see Table 3.2.7), they were the least likely to use any health care services for problems concerning emotions, mental health or use of alcohol and drugs. Work stressors did not show a significant association with utilization of mental health care services in either cycle. Income did not show a significant association with consultation with a mental health professional in CCHS1.1 but did show a strong association with utilization of any resource in CCHS1.2.

Table 3.2.9: Prevalence of utilization of mental health care services by selected variables (for people with depression in CCHS1.1 and AMDSD in CCHS1.2 respectively)

Variable		Consultation with m.h. professional CCHS1.1)			Utilization of any resource (CCHS1.2)		
		n	Prevalence	Sig.	n	Prevalence	Sig.
Sex	Male	563	32.7%	<0.01	444	19.6%	<0.01
	Female	1112	45.4%		455	42.9%	
Marital status	Married	677	40.9%	<0.01	286	35.7%	<0.01
	Common-law	128	47.7%		106	32.1%	
	Widow/Sep/Div	207	53.6%		96	55.2%	
	Single	664	36.3%		410	22.7%	
Education	Less than secondary	325	33.2%	0.01 (0.04)	190	29.5%	0.12 (0.11)
	secondary graduation	369	44.4%		183	29.0%	
	some post-secondary	173	42.8%		151	25.8%	
	Post-secondary degree	798	42.5%		370	35.4%	
Income	Lowest income	114	44.7%	0.96 (0.68)	46	39.1%	<0.01 (<0.01)
	Lower middle income	278	42.4%		111	43.2%	
	Upper middle income	608	42.3%		276	33.7%	
	Highest income	542	42.1%		378	25.7%	
Race	Non-white	228	27.2%	<0.01	125	15.2%	<0.01
	White	1433	43.5%		773	34.0%	
Work stressors	0 - 16	314	40.4%	0.92 (0.67)	142	36.6%	0.22 (0.62)
	17 -19	290	41.4%		176	26.1%	
	20 - 22	382	40.1%		218	33.0%	
	23 - 48	690	42.0%		363	30.9%	
Age	15 to 29 years old	640	36.1%	<0.01 (0.01)	385	21.0%	<0.01 (<0.01)
	30 to 44 years old	645	45.1%		329	38.6%	
	45 years old or more*	390	42.8%		184	40.2%	

* Includes a small number (n=14 in CCHS1.1 and n=8 in CCHS1.2) aged 65 years or more.
() Numbers in parentheses represent p-values for trend tests (Linear by Linear Association).

Chapter 4

Logistic Regression Analysis of CCHS Data

4.1 The Multiple Logistic Regression Model

Consider a collection of p independent variables denoted by the vector $\mathbf{x}' = (x_1, x_2, \ldots, x_p)$. Let the conditional probability that the binary outcome {0, 1} is present be denoted by $P(Y=1|\mathbf{x}) = \pi(\mathbf{x})$. The logit of the multiple logistic regression model is given by the equation

$$g(\mathbf{x}) = \ln\frac{\pi(\mathbf{x})}{1-\pi(\mathbf{x})} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_p x_p \tag{4.1}$$

in which case the logistic regression model is

$$\pi(\mathbf{x}) = \frac{e^{g(x)}}{1+e^{g(x)}} \tag{4.2}$$

In the situation where some of the independent variables are discrete or nominal scale, we need to use a collection of design variables (or dummy variables). In general, if a nominal scaled variable has k possible values, then k-1 design variables will be needed. Suppose that the j^{th} independent variable x_j has k_j levels. The $k_j - 1$ design variables will

be denoted as D_{jl} and the coefficients for these design variables will be denoted as $\beta_{jl}, l = 1,2,\ldots,k_j - 1$. The logit for a model with p variables and the j^{th} variable being discrete is

$$g(\mathbf{x}) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \sum_{l=1}^{k_j-1} \beta_{jl} D_{jl} + \cdots + \beta_p x_p \tag{4.3}$$

(Hosmer & Lemeshow, 2000)

4.2 Fitting the Multiple Logistic Regression Model

4.2.1 Point Estimation of Coefficients

We use maximum likelihood method to obtain estimates of the vector $\boldsymbol{\beta}' = (\beta_0, \beta_1, \cdots, \beta_p)$. Suppose we have a sample of n independent observations ($\mathbf{x}_i$, y_i), $i = 1,2,\cdots,n$. The likelihood function is

$$l(\boldsymbol{\beta}) = \prod_{i=1}^{n} \pi(\mathbf{x}_i)^{y_i} [1 - \pi(\mathbf{x}_i)]^{1-y_i} \tag{4.4}$$

where $\pi(\mathbf{x})$ is defined as in equation (4.2) and the log likelihood function is

$$L(\boldsymbol{\beta}) = \ln[l(\boldsymbol{\beta})] = \sum_{i=1}^{n} \{y_i \ln[\pi(\mathbf{x}_i)] + (1 - y_i) \ln[1 - \pi(\mathbf{x}_i)]\} \tag{4.5}$$

Differentiate the log likelihood function with respect to the $p + 1$ coefficients generates $p + 1$ likelihood equations as follows:

$$\sum_{i=1}^{n} [y_i - \pi(\mathbf{x}_i)] = 0 \tag{4.6}$$

and

$$\sum_{i=1}^{n} x_{ij} [y_i - \pi(\mathbf{x}_i)] = 0 \tag{4.7}$$

for $j = 1, 2, \ldots, p$. The solution to these equations $\hat{\boldsymbol{\beta}}$ can be obtained by SPSS software. The fitted values for the multiple logistic regression model are $\hat{\pi}(\mathbf{x}_i)$ which can be calculated by equations (4.2) and (4.3).

4.2.2 Variance and Covariance Estimation of the Estimated Coefficients

I will introduce two methods of variance and covariance estimation of the estimated coefficients here – one is based on maximum likelihood estimation, and the other one is estimation of the variance using bootstrap weights.

Maximum Likelihood Estimation

The theory of maximum likelihood estimation states that the estimators are obtained from the matrix of second partial derivatives of the log likelihood function. The partial derivatives of the log likelihood function (4.5) have the following general form

$$\frac{\partial^2 L(\beta)}{\partial \beta_j^{\,2}} = -\sum_{i=1}^{n} x_{ij}^{\,2} \pi_i (1-\pi_i) \tag{4.8}$$

and

$$\frac{\partial^2 L(\beta)}{\partial \beta_j \partial \beta_l} = -\sum_{i=1}^{n} x_{ij} x_{il} \pi_i (1-\pi_i) \tag{4.9}$$

for $j, l = 0, 1, 2, \ldots, p$ where π_i denotes $\pi(\mathbf{x}_i)$. The $(p+1)\times(p+1)$ observed information matrix $\mathbf{I}(\boldsymbol{\beta})$ contains the negative of the terms given in equations (4.8) and (4.9). The variances and covariances of the estimated coefficients are obtained from the inverse of this observed information matrix, i.e. $\mathrm{Var}(\boldsymbol{\beta}) = \mathbf{I}^{-1}(\boldsymbol{\beta})$. The estimators of the variances and

covariances, $\hat{\text{Var}}(\hat{\boldsymbol{\beta}})$, are obtained by evaluating $\text{Var}(\boldsymbol{\beta})$ at $\hat{\boldsymbol{\beta}}$. The estimated standard errors of the estimated coefficients are $\hat{\text{SE}}(\hat{\beta}_j) = [\hat{\text{Var}}(\hat{\beta}_j)]^{1/2}$ for $j = 0, 1, 2, \ldots, p$. (Hosmer & Lemeshow, 2000).

Estimation of the Variance Using Bootstrap Weights

A bootstrap approach to design-based variance estimation is used increasingly in the survey sampling community. The principle of the bootstrap estimation is to use a resampling method to calculate the variance in surveys (e.g. CCHS) with complex sampling designs since failure to account for the design usually leads to an underestimate of the variance. Bootstrap replicates are generated by randomly choosing, with replacement, a sample of primary sampling units (PSUs) within each stratum and adjusting the original sampling weights of the units in the selected PSUs to reflect the probability of selection into the subsample. If a unit does not appear in the bootstrap replicate, its bootstrap weight variable is set to zero. This process of selecting samples and reweighing is repeated B times to arrive at B bootstrap samples, B bootstrap weight variables and consequently B bootstrap estimates. These B (B=500 in this study) weights, the bootstrap weights, have been produced by Statistics Canada and are available with the data.

The variance of the estimate $\hat{\theta}$ of the finite population parameter θ of interest – for example a regression coefficient, population mean, ratio of two totals, etc. – is estimated by

$$\hat{V}_{BOOT}(\hat{\theta}) = \frac{1}{B}\sum_{b=1}^{B}(\hat{\theta}_b - \hat{\theta})^2 \qquad (4.10)$$

where $\hat{\theta}$ is obtained using the full-sample weight variable and the estimates $\hat{\theta}_b$, b=1,...,B are obtained in exactly the same manner using the bootstrap weight variables. (Philips, 2004)

The SPSS program BOOTVARE_V21.SPS was created by Statistics Canada to obtain precise estimates of the variance simple statistics such as totals and ratios, as well as for more complex analysis like regressions. This program enables the estimation of variances for the Canadian Community Health Survey (CCHS). The major steps to follow to obtain estimate for the variance of a particular estimate are as follows:

1) Calculate an estimate using the final weight included in the data file. This estimate is the point estimate.
2) Calculate the same estimate, this time using each of the B bootstrap weights contained in the bootstrap file. B estimates are then obtained.
3) Finally, calculate the variance of the B estimates. This variance is the estimate of the variance of the point estimate calculated in the first step.

Since I only have bootstrap weights file for CCHS1.2, I will use both methods - maximum likelihood estimation and bootstrap method, to estimate the variances of coefficients in logistic regression models for CCHS1.2 data and compare the results.

4.2.3 Testing for the Significance of the Coefficients

There are several kinds of tests for the significance of the coefficients like the likelihood ratio test, the Wald test and the Score test. The likelihood ratio statistic and its corresponding squared Wald statistic give approximately the same value in very large samples (Kleinbaum, 1994). The sample sizes of both CCHS1.1 and CCHS1.2 are large enough, so we used the Wald test Statistics in this study.

The univariate Wald test Statistic is computed by dividing the estimated coefficient by its standard error, i.e. $W_j = \hat{\beta}_j / \hat{\mathrm{SE}}(\hat{\beta}_j)$. Under the hypothesis that an individual coefficient is zero, these statistics will follow the standard normal distribution in large samples. Thus the endpoints of a 100(1-α) % confidence interval for the estimated coefficients are $\hat{\beta}_j \pm z_{1-\alpha/2}\hat{\mathrm{SE}}(\hat{\beta}_j)$. The square of this Wald test Statistic is approximately a chi-squared statistic with one degree of freedom. The multivariable analog of the Wald test is obtained from the vector-matrix calculation $W = \hat{\boldsymbol{\beta}}'\left[\hat{\mathrm{Var}}(\hat{\boldsymbol{\beta}})\right]^{-1}\hat{\boldsymbol{\beta}}$, which will be distributed as chi-squared with $p+1$ degrees of freedom under the hypothesis that each of the $p+1$ coefficients is equal to zero (Hosmer & Lemeshow, 2000).The SPSS package computed the chi-squared statistics and P-values accordingly.

4.3 Fitting the Logistic Regression Models of CCHS Data
- Mental Health Outcomes vs. Work Stressors & Occupation

To illustrate the approach we used (Hierarchical Backward Elimination Procedure) to determine the final model in the regression analyses, I present a more detailed description for one situation – model 1. I adopted this approach for all regression analyses. This approach was recommended by Kleinbbaum, D.G. (1994).

Model 1: Relationship between depression and work stressors adjusted for socio-demographic variables (CCHS1.1) (See Table 4.3.1 in Appendix B)

Depression (0, 1) – Dependent variable (*D*)

Step 1: Variable specification

Exposure (*E*): Work stressors

Potential confounders(*C*): Age, sex, BMI, marriage, education, income, race, type of smoker.

Potential effect modifiers (interaction terms): E^*C_i

Step 2: Interaction assessment

Initial model: Input *D*, *E*, all potential confounders, all potential modifiers into model:

$$\text{Logit}\, P(D) = \alpha + \beta E + \sum \gamma_i C_i + E\sum \delta_j C_j$$

(Note that to distinguish coefficients for confounders and interaction terms, the β_j notation from the previous section has been replaced with β, γ_i and δ_j. If *E* is occupation with nine categories, we need to use $\beta_k E_k (k = 1,2,\cdots,8)$ to replace βE in above model).

Firstly we checked for the interaction terms in the model. By likelihood ratio test at 5% significance level, we eliminated some nonsignificant interaction terms. The result was as follows:

Interaction terms eliminated	Interaction terms remaining in the model
Age * Work stressors	Sex * Work stressors
Income * Work stressors	Race * Work stressors
Marriage * Work stressors	Education * Work stressors
Type of smoker * Work stressors	BMI * Work stressors

Step 3: Assessment of confounding

1) Gold standard model: model containing E, all C_i and remaining EC_j.
2) By the Hierarchy Principle, sex, BMI, race and education must remain in all further models considered and work stressors stamps in because it is the Exposure of interest.
3) Candidate potential confounders eligible for elimination: age, income, marriage and type of smoker.
4) Drop each of above candidates from the gold standard model if non-significant unless the estimated odds ratio changes significantly (greater than 10%) from the gold standard mode in which case do not eliminate the candidate variable. Otherwise, remove it from the gold standard model.

Potential confounders eliminated	Potential confounders remaining in the model
Income	Age, sex, BMI, race, education, marital status, type of smoker

Final model

Logit $P(D) = \alpha + \beta E + \sum \gamma_i C_i + E \sum \delta_j C_j$, where

E: Work stressors

C_i's: Age, sex, BMI, race, education, marital status, type of smoker.

$E*C_j$'s: Sex * Work stressors, Race * Work stressors, Education * Work stressors, BMI *Work stressors

Model 2: Relationship between depression and occupation adjusted for socio-demographic variables (CCHS1.1) (See Table 4.3.2)

After adjusting for other variables in logistic regression analyses, work stressors significantly predicted depression. It also showed significant interactions with BMI, sex, race and education. Being male vs. female showed a statistically significant increase in the association of depression with work stressors but the estimated change was only by a factor of 1.02 per unit increase in the stressors measure. Although the main effect of race suggested being non-white was related to an increased risk of depression, the interaction term implied that the effect of work stressors was lower for non-whites. For a female, non-white worker with less than secondary school education and BMI ranging from 25 to 29.9, a 10 point increase in work stressors was related to virtually no change in the odds of depression (Odds Ratio, OR=1.0, 95% confidence interval, CI = 0.7 to 1.5). This contrasted with white men with secondary school education and BMI ranging from 30 or more for whom a 10 point increase in work stressors was linked to a 2.7-fold increase in the odds of depression (95% CI=1.2 to 6.3).

Model 1 and Model 2 also show associations between socio-demographic variables with depression. Again, just as interactions change the estimated odd ratios for work stressors, the interactions change the odds ratios for sex and BMI. Women were more likely to suffer depression than men. As age increased, the risk of depression decreased. People with greater BMI had higher risks of depression. 'Current smokers' were most likely to suffer depression followed by 'Former smokers'. Those who never smoked had the lowest probability of depression compared with former and current smokers. People with 'Secondary school education but no post-secondary education' had higher risk of depression than others. The interactions between education and work stressors implied that the effect of work stressors was higher for people with 'Secondary school education but no post-secondary education' and 'Some post-secondary education'. In terms of marital status, married people had the lowest adjusted prevalence of depression. Those widowed, separated or divorced had the highest adjusted prevalence. These corresponded to the results in previous prevalence analyses. But one exception occurred in association with race in Model 1. In the crude analysis, white people suffered more than non-white people, but this was reversed in the logistic regression analysis.

Model 3: Relationship between AMDSD and work stressors adjusted for socio-demographic variables (CCHS1.2) (See Table 4.3.3)

Model 4: Relationship between AMDSD and occupation adjusted for socio-demographic variables (CCHS1.2) (See Table 4.3.4)

For Model 3 and Model 4, I also used the program BOOTVARE_V21.SPS and bootstrap weights provided by Statistics Canada to estimate the variances of the estimated coefficients. The BOOTVARE_V21.SPS programs for Model 3 and Model 4 are attached in Appendix C and the results from the bootstrap method for Model 3 and Model 4 are shown in Table 4.3.3a and Table 4.3.4a, respectively. By comparing the results of Table 4.3.3 vs. Table 4.3.3a for Model 3 and Table 4.3.4 vs. Table 4.3.4a for Model 4, we can see that the estimated coefficients and the odds are the same while the standard deviations of the estimated coefficients and the Wald values differ. The standard deviations of the estimated coefficients calculated by the bootstrap method are larger and hence the Wald values are smaller since the estimated point coefficients are the same for both methods. Accordingly, the 95% confidence intervals of odds ratios from bootstrap methods are wider.

The logistic regression with AMDSD as the outcome (Model 3) showed the estimated coefficient of work stressors was 0.09. This corresponded to an odds ratio for a 10 point increase in work stressors of 2.5 (95% CI = 2.0 to 3.0).The associations between some of the socio-demographic variables and AMDSD in CCHS1.2 were somewhat different from the associations between socio-demographic variables and depression in CHS1.1. In CCHS1.2 (Model 4) people aged 30 to 44 suffered most from AMDSD but the difference with that of people aged 15 to 29 was very small. Those in common-law relationships had the highest risk of AMDSD, but the difference with that of people who were 'Widowed/Separated/Divorced' was very small. People with 'Some post-secondary education' had higher risk than others. Non-white people were more likely to have the

outcome than white people. BMI, sex did not show close association with mental disorder or substance dependence.

A side-by-side comparison of the estimated odds ratios for mental health outcomes by occupation adjusted for socio-demographic variables are shown in Table 4.3.5 (based on Model 2 and Model 4). For the outcome of depression, workers in 'Other' jobs were at the highest risk followed by 'Sales or service', while 'Technologist, technician' workers had the lowest risk. For AMDSD, 'Administrative, financial, clerical' had the highest risk followed by 'Sales or service' while 'Farming, forestry, fishing, mining' had the lowest risk. This was consistent with the results in the prevalence analysis.

Table 4.3.5: Estimated odds ratios for mental health outcomes by occupation adjusted for socio-demographic variables

Occupation	Depression (CCHS1.1)			AMDSD (CCHS1.2)		
	OR	95% C.I.		OR	95% C.I.	
		Lower	Upper		Lower	Upper
Other	1.27	1.00	1.60	0.99	0.70	1.40
Sales or service	1.19	0.98	1.44	1.51	1.14	1.99
Administrative, financial, clerical	1.09	0.88	1.34	1.69	1.25	2.29
Professional (incl. accountants)	1.02	0.83	1.25	1.04	0.76	1.42
Management	1			1		
Trades, transport, equipment operator	0.93	0.74	1.18	0.93	0.67	1.28
Farming, forestry, fishing, mining	0.87	0.54	1.42	0.69	0.35	1.34
Processing, manufacturing, utilities	0.82	0.62	1.08	1.17	0.81	1.69
Technologist, technician	0.79	0.61	1.03	1.21	0.85	1.72

4.4 Fitting the Logistics Regression Models of CCHS Data
- Health Care Utilization vs. Work Stressors & Occupation

Model 5: Relationship between consultation with a mental health professional and work stressors (for depressed people) adjusted for socio-demographic variables (CCHS1.1) (See Table 4.4.1)

Model 6: Relationship between consultation with a mental health professional and occupation (for depressed people) adjusted for socio-demographic variables (CCHS1.1) (See Table 4.4.2)

Neither work stressors nor occupation significantly predicted consultation with a mental health professional among depressed people (Model 5 and Model 6). Women and white people suffering depression were more likely to consult with a mental health professional than men and non-white people, respectively. People with 'Some post-secondary education' were most likely to consult with a mental health professional while people with education of 'Less than secondary school graduation' were least likely to consult. Young people aged between '15 to 29 years old' were least likely to consult with a mental health professional whereas people aged between '30 to 44 years old' were most likely to consult.

Model 7: Relationship between utilization of any resource and work stressors (for people with AMDSD) adjusted for socio-demographic variables (CCHS1.2) (See Table 4.4.3)

Model 8: Relationship between utilization of any resource and occupation (for people with AMDSD) adjusted for socio-demographic variables (CCHS1.2) (See Table 4.4.4)

Again, for Model 7 and Model 8, I also used the program BOOTVARE_V21.SPS and bootstrap weights provided by Statistics Canada to estimate the variances of the estimated coefficients. The BOOTVARE_V21.SPS programs for Model 7 and Model 8 are attached in Appendix 3 and the results from the bootstrap method for Model 7 and Model 8 are shown in Table 4.4.3a and Table 4.4.4a, respectively. By comparing the results of Table 4.4.3 vs. Table 4.4.3a for Model 7 and Table 4.4.4 vs. Table 4.4.4a for Model 8, we can see that the estimated coefficients and the odds are quite similar while the standard deviations of the estimated coefficients and the Wald values differ. The 95% confidence intervals of odds ratios from bootstrap methods are wider.

Among those with AMDSD in CCHS1.2, occupation was not significantly associated as a main effect with utilization of any resource but work stressors was. Work stressors also had a significant interaction with marital status (Model 7 and Model 8). Being common-law, widowed/separated/divorced and single vs. married increased the odds of using any resource with work stressors. The main effects of sex and race suggested being female or non-white were related to increased use of any resource. The likelihood of use increased with age. People with 'Lower middle income' were more likely to use any resource than others while people with 'highest income' were least likely to use the resources. This finding is somewhat surprising.

A side-by-side comparison of the estimated odds ratios for mental health care services utilization by occupation adjusted for socio-demographic variables (for depressed people in CCHS1.1 and people with AMDSD in CCHS1.2 respectively) is shown in Table 4.4.5 (based on Model 6 and Model 8). For workers with depression,

'Processing, manufacturing, utilities' workers were most likely to consult with a mental health professional in past 12 months while workers in 'Farming, forestry, fishing, mining' were least likely to consult. For workers with AMDSD, 'Administrative, financial, clerical' workers were most likely to use any resource for mental health problems followed by workers in 'Processing, manufacturing, utilities' while 'Farming, forestry, fishing, mining' workers were least likely to use any resource.

Table 4.4.5: Estimated odds ratios for mental health care services utilization by occupation adjusted for socio-demographic variables (for depressed people and people with AMDSD respectively)

Occupation	Consultation with a mental health professional (CCHS1.1)			Utilization with any resource (CCHS1.2)		
	OR	95% C.I.		OR	95% C.I.	
		Lower	Upper		Lower	Upper
Processing, manufacture, utilities	1.48	0.85	2.59	1.15	0.56	2.39
Trades, transport, equip. operator	1.17	0.73	1.89	0.83	0.41	1.71
Technologist, technician	1.15	0.67	1.97	0.65	0.29	1.46
Administrative, financial, clerical	1.08	0.72	1.62	1.43	0.76	2.68
Professional (incl. accountants)	1.05	0.70	1.58	0.64	0.34	1.24
Management	1			1		
Sales or service	0.99	0.68	1.45	0.92	0.52	1.61
Other	0.80	0.49	1.28	0.75	0.36	1.56
Farming, forestry, fishing, mining	0.60	0.20	1.83	0.60	0.14	2.51

4.5 Assessing the Fit of the Models

4.5.1 The Hosmer-Lemeshow Tests

The principle of the Hosmer-Lemeshow tests is grouping based on the values of the estimated probabilities. Suppose there are p independent variables contained in our fitted model, $\mathbf{x}' = (x_1, x_2, \cdots, x_p)$, and let J denote the number of distinct values of $\mathbf{x}$ observed. m_j represents the number of subjects with $\mathbf{x}=\mathbf{x}_j$, $j = 1,2,\cdots J$. Suppose that $J =$

n and let n columns corresponding to the n values of the estimated probabilities, with the first column corresponding to the smallest value, and the nth column to the largest value. Hosmer and Lemeshow proposed two grouping strategies as follows: (1) collapse the table based on percentiles of the estimated probabilities and (2) collapse the table based on fixed values of the estimated probability. The first method is preferable to the second one shown by Hosmer, Lemeshow, and Klar (1988) especially in the case that many of the estimated probabilities are small. So we use the grouping method based on percentiles of the estimated probabilities.

With this method, use of g = 10 groups results in the first group containing the $n_1' = n/10$ subjects having the smallest estimated probabilities, and the largest group containing the $n_{10}' = n/10$ subjects having the largest estimated probabilities. For the $y = 1$ row, estimates of the expected values are obtained by summing the estimated probabilities over all subjects in a group. For the $y = 0$ row, the estimated expected value is obtained by summing, over all subjects in the group, one minus the estimated probability. The Hosmer-Lemeshow goodness-of-fit statistic, $\hat{C}$, is obtained by calculating the Pearson chi-squared statistic from the $g \times 2$ table of observed and estimated expected frequencies. The calculating formula can be expressed as follows:

$$\hat{C} = \sum_{k=1}^{g} \frac{(o_k - n_k' \bar{\pi}_k)^2}{n_k' \bar{\pi}_k (1 - \bar{\pi}_k)}, \tag{4.11}$$

where n_k' is the total number of the subjects in the k^{th} group, $o_k = \sum_{j=1}^{c_k} y_j$ is the number of

responses among the c_k covariate patterns where c_k denotes the number of covariate patterns in the k^{th} decile and $\overline{\pi}_k = \sum_{j=1}^{c_k} \frac{m_j \hat{\pi}_j}{n_k}$ is the average estimated probability.

Hosmer and Lemeshow (1980) demonstrated that, when $J \approx n$ and the fitted logistic regression model is the correct model, the distribution of the statistic $\hat{C}$ is approximated by the chi-squared distribution with $g-2$ degrees of freedom, $\chi^2(g-2)$. (Hosmer & Lemeshow, 2000).

4.5.2 The Hosmer-Lemeshow Tests for the Models of CCHS Data

Except for the Model 1 and Model 4, the corresponding *p*-values of other models indicate that the models seem to fit quite well. P-values of the Hosmer and Lemeshow test indicate some lack of fit in the models 1 and 4, but results from models with other possible combinations of variables are even poorer than these two. Also, I think the covariates in these two models are important and should not be eliminated. So I accept Model 1 and Model 4 as the final models.

Chapter 5

Discussion and Conclusion

Summary of Findings

Our results confirm that workplace mental health is a continuing concern. CCHS1.1 found that the prevalence of depression (using Statistics Canada's definition for the survey) is 7.4% in the working population of Ontario. Similarly, CCHS1.2 data showed the prevalence of a major depressive episode in the previous year was 4.8% in this population. Including other mental disorders and substance dependencies gave a prevalence of 11.5%.

We looked for correlates of these disorders using regression methods to adjust simultaneously for a range of potential predictors. Since occupation is a strong predictor of level of work stressors, we did separate analyses with each of these as independent variables (along with other variables).

In CCHS1.1 the outcome was depression. While the effects of variables are complicated by the presence of interactions in our model, higher levels of work stressors

increased the odds of depression. The odds were also increased for non-whites, women, younger workers, smokers those with higher BMI and those not married. The effects in non-whites, women, and those with greater BMI were moderated by interactions with work stressors. When occupation replaced work stressors as a predictor, the highest odds were for those in 'Other' occupations followed by 'Sales or service' and 'Administrative, financial and clerical' and the lowest for 'Technologist, technician' workers. This finding largely agreed with that in the simple prevalence analysis. The results for other variables largely confirmed the previous analysis, with higher odds for younger workers, women, non-whites, smokers and those not married.

Our outcome for CCHS1.2 was the presence of any of several mental disorders or substance dependencies. This was predicted by the work stressors score. As with CCHS1.1, higher odds were related to being younger, non-white and not married. With occupation, rather than work stressors as the outcome, the pattern for these variables was similar. The occupation with the highest odds of our outcome was 'Administrative, financial, clerical' followed quite closely by 'Sales or service'. Notably, sex was not a significant factor.

Thus, overall, our data are consistent with other literatures (Quick, Horn & Quick, 1986; Grosch & Murphy, 1998) showing that mental health outcomes were predicted by work stressors or occupation (as well as other variables).

We then explored, for those with each outcome, what factors predicted whether people consulted a mental health professional (CCHS1.1) or whether they used any resource available to deal with their problem (CCHS1.2).

In CCHS1.1, those more likely to consult were older workers, women and whites, as well as those with education at least to high school graduation. Neither work stressors nor occupation was a significant predictor.

In CCHS1.2, the pattern of those using any resource was similar for age and sex. However, non-whites were more likely to use the resources. People with lower work stressors scores were more likely to use the resources. Occupation was not a significant predictor.

Implications

The findings regarding work stressors and occupation as predictors of mental health problems suggest that work health and safety practitioners must continue to pay attention to the psychosocial conditions of work (Baba, Jamal, Tourigny, 1998). The scale we used includes job control, demands, social support as well as job security and physical demands of the job. Strazdins and colleagues (2004) have just reported that job strain (a combination of low control and high demands) and job insecurity together have a particularly strong relationship to mental (and physical) health problems. Our measure of work stressors includes them both, although it does not look at any synergistic effect. Nevertheless, greater awareness among health professionals and the workforce of the combined risks of job strain and insecurity seems warranted.

The work stressors score was not a significant predictor of resource use in CCHS1.1 but it was in CCHS1.2. People suffering any mental disorder or substance dependence with lower work stressors scores were more likely to use resources.

Occupation does not seem to determine whether those suffering mental health problems will consult professionals or use resources. Our results do show, though, that young workers are not only more likely to have mental health problems, but even when they are less likely to seek professional help. Workplaces could play a role in guiding those in need to available resources; this could benefit both the workers themselves and the company. We note that 'Farming, forestry, fishing and mining' workers were least likely to use resources when they had mental health problems. This is presumably because they tend to work in remote locations and it draws attention to the issue of equitable access to services.

Strengths and Limitations of the Study

An important strength of our study is that it is based on a representative sample of the Canadian population. As well, Statistics Canada obtained exceptional response rates for both CCHS1.1 (84.7%) and CCHS1.2 (77.0%), so that selection bias is not a concern. Further, the samples are large, especially in the case of CCHS1.1.

Both waves asked a wide range of questions, allowing us to control for (and indeed investigate) the effects of other important variables. Finally, we generally found a good fit of the data in the regression models.

Naturally there were some weaknesses. All the data were obtained by self-reports, so there are concerns about reporting biases. Not all the scales were ideal – for example, the JCQ measure was abbreviated from the full version. Still, the use of less-than-ideal scales typically reduces the power to observe significant relationships, so those we found

can be considered solidly established. Finally, both CCHS1.1 and 1.2 are cross-sectional surveys, so that causal inferences cannot be made.

Conclusion

We have found that work stressors and other variables are related to poor mental health, reinforcing the need to address these issues in the workplace. As well, we have identified sub-groups of the workforce that do not consult health professionals or use resources for their mental health problems. Ensuring access to and use of appropriate services to these groups will benefit both the workers affected and their employers.

Appendix A

Variables

Depression: Depression is characterized by a depressed mood or lack of interest in most things (or both), along with other symptoms, that lasts at least 2 weeks. Prevalence of depression is the percentage of the population that is estimated to have experienced a depressive episode at some time in the year before the survey interview. From this information, the probability of a depressive episode occurring was estimated. For this analysis, respondents were considered to have had a depressive episode if they had a probability of 0.90 or more (five or more symptoms).
1 – Depression 0 – No depression

Major depressive episode: This is the final variable that identifies whether respondents meet or fail to meet the CCHS1.2 /WMH-CIDI (WMH2000 version of the Composite International Diagnostic Interview) criteria for major depressive episode in the 12 months prior to the interview. Respondents who meet the criteria reported: 1. meeting the criteria for lifetime major depressive episode; 2. having a major depressive episode in the 12 months prior to the interview; 3. clinically significant distress or impairment in social, occupational or other important areas of functioning.
1- Yes 0 - No

Manic episode (Mania): This is the final variable that identifies whether respondents meet or fail to meet the CCHS1.2 /WMH-CIDI (WMH2000 version of the Composite International Diagnostic Interview) criteria for manic episode in the 12 months prior to the interview. Respondents who meet the criteria reported: 1. meeting the criteria for lifetime manic episode; 2. having a manic episode in the 12 months prior to the interview; 3. clinically significant distress or impairment in social, occupational or other important areas of functioning.
1- Yes 0 – No

Panic disorder: This variable identifies whether respondents meet or fail to meet the CCHS1.2 /WMH-CIDI (WMH2000 version of the Composite International Diagnostic Interview) criteria for Panic Disorder in the 12 months prior to interview. Respondents who meet the criteria reported: 1. meeting the criteria for lifetime Panic Disorder; 2. having a panic attack in the 12 months prior to interview; 3. significant emotional distress during a panic attack in the 12 months prior to interview.

1- Yes 0 – No

Social phobia: This is the final variable that identifies whether respondents meet or fail to meet the CCHS1.2 /WMH-CIDI (WMH2000 version of the Composite International Diagnostic Interview) criteria for social phobia in the 12 months prior to the interview. Respondents who meet the criteria reported: 1. meeting the criteria for lifetime social phobia; 2. fearing or avoiding social or performance situation(s) in the 12 months prior to the interview; 3. clinically significant distress or impairment in social, occupational or other important areas of functioning.
1- Yes 0 – No

Agoraphobia: This is the final variable that identifies whether respondents meet or fail to meet the CCHS1.2 /WMH-CIDI (WMH2000 version of the Composite International Diagnostic Interview) criteria for Agoraphobia in the 12 months prior to the interview. Respondents who meet the criteria reported: 1. meeting the lifetime CCHS1.2/WMH-CIDI criteria for Agoraphobia; 2. fearing or avoiding the agoraphobic situations in the 12 months prior to the interview.
1- Yes 0 – No

Alcohol dependence: Population aged 15 and over is classified by the probability of meeting the criteria for alcohol dependence in the 12 months prior to interview. Respondents who meet the criteria report at least 3 symptoms related to aspects of tolerance, withdrawal, loss of control and social or physical problems related to alcohol use in daily life.
1 – Probable cases 0 – Probable non-cases

Illicit drug dependence: Population aged 15 and over are classified as meeting or failure to meet criteria for illicit drug dependence in the 12 months prior to interview. Respondents who meet the criteria report at least 3 symptoms related to aspects of tolerance, withdrawal, loss of control and social or physical problems related to drug use in daily life.
1 – Probable cases 0 – Probable non-cases

Any mental disorder or substance dependence (AMDSD): Respondents were classified as having "Any mental disorder or substance dependence" if the pattern of answers met the criteria for at least one of the five mental disorders or two substance dependencies covered in the survey. (i.e. major depressive episode, manic episode, panic disorder, social phobia, agoraphobia, alcohol dependence, or illicit drug dependence).
1 – Yes 0 – No

Consultation with a mental health professional: Respondents were asked if they had seen or talked on the telephone to a health professional about their emotional or mental health in 12 months before the survey interview.
1 -Yes 0 - No

Use of medication – anti-depressants: Respondents were asked whether they took anti-depressants such as Prozac, Paxll or Effexor in the month before the survey interview.
1 – Yes 0 – No

Utilization of any resource: This variable identifies whether the respondent used resources for problems concerning emotions, mental health or use of alcohol or drugs in the 12 months prior to the interview. Specifically, it assesses whether the respondent was ever hospitalized overnight or ever consulted a professional, used internet support group or chat room, went to a self-help group or used a telephone helpline in the 12 months prior to the interview.
1 -Yes 0 - No

Work stressors: Respondents between the age of 15 and 75 who worked at a job or business at anytime in the past 12 months were asked to evaluate their main job n the past 12 months. The work stressors scale – all items variable determines the respondent's perception about all dimensions of their work including job security, social support, monotony, physical effort required, and extent of participation in decision-making. The scores range from 0 to 48. Higher scores indicate greater work stressors.

Occupation: Main job or business. 1 – Management 2 – Professional (including accountants) 3 – Technologist, technician 4 – Administrative, financial or clerical 5 –

Sales or service 6 – Trades, transport or equipment operator 7 – Farming, forestry, fishing, mining 8 – Processing, manufacturing, utilities 9 – Other

Sex: 1 – Male 0- Female

Age: 1 – 15 to 29 years old 2- 30 to 44 years old 3 – 45 to 64 years old 4 – 65 years or older 3a – 45 years or older

Body mass index (BMI): BMI is calculated by dividing one's weight in kilograms by one's squared height, measured in meters. This original variable defined by Statistics Canada is calculated for persons 20 to 64 years old, excluding pregnant women .We categorized this variable as following:

1 – Less than 25

2 – 25 to 29.9

3 – 30 or more

Marital status: 1 – Married 2 – Common-law 3 – Widow/Sep/Div 4 - Single

Education: The variable describes the highest level of education acquired by the respondent.

1 – Less than secondary school graduation

2 – Secondary school graduation, no post-secondary education

3 – Some post-secondary education

4 – Post-secondary degree/diploma

Income: The variable classifies the total household income into four categories based on total household income and the number of people living in the household.

1 – Lowest income (<$15,000 if 1 or 2 people; <$20,000 if 3 or 4 people; <$30,000 if 5+ people)

2 – Lower middle income ($15,000 to $29,999 if 1 or 2; $20,000 to $39,999 if 3 or 4; $30,000 to $59,999 if 5+)

3 – Upper middle income ($30,000 to $59,999 if 1 or 2; $40,000 to $79,999 if 3 or 4; $60,000 to $79,999 if 5+)

4 – Highest income (> $60,000 if 1 or 2; >$80,000 if 3+)

Race: The variable indicates the racial background of the respondent, based on self report.
1 – Non-white 0 – White

Type of smoker: The variable describes the type of smoker the respondent is, based on his/her smoking habits.
1 – Current smoker 2 – Former smoker 3 –Never smoked

Appendix B

Logistic Regression Models of CCHS Data

Model 1:

Table 4.3.1 : Logistic regression model for depression (by work stressors) (CCHS1.1)							
	Coeff.	S.E.	OR	95%C.I. for OR Lower	Upper	Wald	Sig.
Constant	-3.47	0.36	0.03				<0.01
Work stressors	0.08	0.02	1.08	1.05	1.12	27.33	<0.01
15 - 29 years old	0.00		1.00				<0.01
30 - 44 years old	-0.09	0.08	0.91	0.79	1.06	1.56	
45 - 64 years old	-0.37	0.09	0.69	0.58	0.82	17.69	
65 years old or more	-0.70	0.29	0.50	0.28	0.87	5.87	
BMI less than 25	0.00		1.00				0.01
BMI 25 to 29.9	0.54	0.27	1.71	1.01	2.90	3.96	
BMI 30 or more	0.80	0.28	2.23	1.28	3.89	8.02	
Female	0.00		1.00				<0.01
Male	-1.32	0.23	0.27	0.17	0.42	32.21	
Less than secondary school graduation	0.00		1.00				<0.01
Sec. grad, no post-secondary education	-1.13	0.39	0.32	0.15	0.69	8.39	
Some post-secondary education	-0.82	0.47	0.44	0.18	1.10	3.09	
Post-secondary degree/diploma	0.01	0.34	1.01	0.52	1.96	0.00	
Married	0.00		1.00				<0.01
Common-law	0.20	0.20	1.22	0.99	1.51	3.43	
Widowed/Separated/Divorced	0.63	0.09	1.88	1.58	2.23	51.85	
Single	0.41	0.08	1.51	1.30	1.75	29.23	
White	0.00		1.00				<0.01
Non-white	1.05	0.31	2.85	1.56	5.20	11.58	
Current smoker	0.00		1.00				<0.01
Former smoker	-0.30	0.06	0.74	0.66	0.84	22.20	
Never smoked	-0.71	0.07	0.49	0.43	0.56	107.61	
BMI less than 25 * Work stressors	0.00		1.00				0.01
BMI 25 to 29.9 * Work stressors	-0.02	0.01	0.98	0.95	1.00	3.92	
BMI 30 or more * Work stressors	-0.04	0.01	0.96	0.94	0.99	8.83	
Female * Work stressors	0.00		1.00				0.03
Male * Work stressors	0.02	0.01	1.02	1.00	1.05	4.73	
Less than sec. graduate * Work stressors	0.00		1.00				<0.01
Sec. grad * Work stressors	0.04	0.02	1.05	1.01	1.08	6.66	
Some post-sec.edu. * Work stressors	0.04	0.02	1.04	1.00	1.08	2.83	
Post-secondary graduate * Work stressors	0.00	0.02	1.00	0.97	1.03	0.02	
White * Work stressors	0.00		1.00				<0.01
Non-white * Work stressors	-0.06	0.02	0.94	0.92	0.97	17.42	

Goodness-of-fit: Hosmer and Lemeshow χ^2=18.04 on 8 d.f., P=0.02

Model 2:

Table 4.3.2 : Logistic regression model for depression (by occupation) (CCHS1.1)

Variable	Coeff.	S.E.	OR	95% C.I. for OR		Wald	Sig.
				Lower	Upper		
Constant	-1.91	0.12	0.15			258.43	<0.01
Management	0.00		1.00				<0.01
Professional(including accountant)	0.02	0.10	1.02	0.83	1.25	0.02	
Technologist, technician	-0.23	0.13	0.79	0.61	1.03	3.07	
Administrative, financial, clerical	0.08	0.11	1.09	0.88	1.34	0.61	
Sales or service	0.17	0.10	1.19	0.98	1.44	3.19	
Trades, transport, equipment operator	-0.07	0.12	0.93	0.74	1.18	0.34	
Farming, forestry, fishing, mining	-0.14	0.25	0.87	0.54	1.42	0.30	
Processing, manufacturing, utilities	-0.20	0.14	0.82	0.62	1.08	1.94	
Other	0.24	0.12	1.27	1.00	1.60	3.81	
15 - 29 years old	0.00		1.00				<0.01
30 - 44 years old	-0.06	0.07	0.94	0.81	1.09	0.69	
45 - 64 years old	-0.39	0.09	0.68	0.57	0.81	19.86	
65 years old or more	-0.83	0.29	0.44	0.25	0.76	8.54	
Female	0.00		1.00				<0.01
Male	-0.79	0.06	0.45	0.40	0.51	174.66	
Married	0.00		1.00				<0.01
Common-law	0.22	0.11	1.24	1.01	1.53	4.12	
Widowed/Separated/Divorced	0.66	0.09	1.94	1.64	2.30	58.33	
Single	0.45	0.08	1.57	1.35	1.82	36.09	
White	0.00		1.00				0.01
Non-white	-0.21	0.08	0.81	0.70	0.94	7.59	
Current smoker	0.00		1.00				<0.01
Former smoker	-0.39	0.06	0.68	0.60	0.77	38.37	
Never smoked	-0.78	0.07	0.46	0.40	0.52	133.70	

Goodness-of-fit: Hosmer and Lemeshow χ^2=6.47 on 8 d.f., P=0.59

Model 3:

Table 4.3.3 : Logistic regression model for any mental disorder or substance dependence (by work stressors) (CCHS1.2)

Variable	Coeff.	S.E.	OR	95% C.I. for OR		Wald	Sig.
				Lower	Upper		
Constant	-4.70	0.23	0.01			413.44	<0.01
Work stressors	0.09	0.01	1.09	1.07	1.10	141.06	<0.01
15 - 29 years old	0		1				<0.01
30 - 44 years old	-0.02	0.11	0.98	0.79	1.22	0.03	
45 - 64 years old	-0.38	0.13	0.69	0.53	0.88	8.50	
65 years old or more	-0.68	0.38	0.51	0.24	1.06	3.23	
Less than secondary school graduation	0		1				<0.01
Sec. school grad, no post-sec. edu	0.02	0.12	1.02	0.81	1.28	0.02	
Some post-secondary education	0.53	0.13	1.69	1.33	2.17	17.71	
Post-secondary degree/diploma	-0.04	0.10	0.97	0.79	1.18	0.12	
Married	0		1				<0.01
Common-law	0.98	0.13	2.68	2.08	3.45	57.62	
Widowed/Separated/Divorced	0.98	0.13	2.67	2.07	3.45	56.39	
Single	0.85	0.11	2.34	1.87	2.91	56.80	
White	0		1				<0.01
Non-white	0.64	0.11	1.89	1.54	2.32	37.35	

Goodness-of-fit: Hosmer and Lemeshow χ^2=3.79 on 8 d.f., P=0.88

Model 4:

Table 4.3.4 : Logistic regression model for any mental disorder or substance dependence (by occupation) (CCHS1.2)

Variable	Coeff.	S.E.	OR	95% C.I. for OR		Wald	Sig.
				Lower	Upper		
Constant	-3.07	0.21	0.05			217.14	<0.01
Management	0		1				<0.01
Professional(including accountant)	0.04	0.16	1.04	0.76	1.42	0.06	
Technologist, technician	0.19	0.18	1.21	0.85	1.72	1.12	
Administrative, financial, clerical	0.53	0.16	1.69	1.25	2.29	11.48	
Sales or service	0.41	0.14	1.51	1.14	1.99	8.42	
Trades, transport, equipment operator	-0.08	0.17	0.93	0.67	1.28	0.22	
Farming, forestry, fishing, mining	-0.37	0.34	0.69	0.35	1.34	1.21	
Processing, manufacturing, utilities	0.15	0.19	1.17	0.81	1.69	0.66	
Other	-0.01	0.18	0.99	0.70	1.40	0.01	
15 - 29 years old	0		1				<0.01
30 - 44 years old	0.01	0.11	1.01	0.81	1.25	0.00	
45 - 64 years old	-0.41	0.13	0.66	0.52	0.86	10.08	
65 years old or more	-0.87	0.38	0.42	0.20	0.87	5.38	
Less than secondary school graduation	0		1				<0.01
Sec. school grad, no post-sec education	-0.08	0.12	0.93	0.74	1.17	0.41	
Some post-secondary education	0.41	0.12	1.50	1.18	1.92	10.71	
Post-secondary degree/diploma	-0.22	0.11	0.81	0.65	1.00	3.85	
Married	0		1				<0.01
Common-law	1.07	0.13	2.91	2.26	3.75	68.97	
Widowed/Separated/Divorced	1.02	0.13	2.79	2.16	3.59	62.55	
Single	0.88	0.11	2.41	1.94	3.01	61.79	
White	0		1				<0.01
Non-white	0.63	0.10	1.87	1.53	2.30	36.30	

Goodness-of-fit: Hosmer and Lemeshow χ^2=18.51 on 8 d.f., P=0.02

Table 4.3.3a: Estimation using bootstrap weights for Model 3

BETA	BHAT	ODDS	WALD	PVALUE	BS_SD	BS_CV	CIL95	CIU95
Const_	-4.69681	.00912	250.8756	.00000000	.29653	6.31	.00510	.01632
WKST	.08521	1.08895	80.5808	.00000000	.00949	11.14	1.06888	1.10940
AGE2	-.01934	.98084	.0240	.87678160	.12476	644.95	.76808	1.25254
AGE3	-.37670	.68612	4.6273	.03146729	.17512	46.49	.48678	.96709
AGE4	-.68265	.50527	.9132	.33925411	.71434	104.64	.12459	2.04921
EDU2	.01615	1.01628	.0127	.91036359	.14348	888.26	.76715	1.34633
EDU3	.52689	1.69366	11.0462	.00088870	.15853	30.09	1.24131	2.31084
EDU4	-.03608	.96456	.0603	.80608508	.14697	407.37	.72315	1.28657
MAR2	.98402	2.67518	18.7418	.00001497	.22730	23.10	1.71345	4.17671
MAR3	.98174	2.66910	41.9422	.00000000	.15159	15.44	1.98303	3.59253
MAR4	.84780	2.33451	38.8835	.00000000	.13596	16.04	1.78840	3.04739
RACE	.63864	1.89391	10.4900	.00120022	.19718	30.88	1.28681	2.78744

Table 4.3.4a: Estimation using bootstrap weights for Model 4

BETA	BHAT	ODDS	WALD	PVALUE	BS_SD	BS_CV	CIL95	CIU95
Const_	-3.06587	.04661	130.5849	.00000000	.26829	8.75	.02755	.07887
OCC2	.03932	1.04011	.0343	.85312891	.21241	540.17	.68592	1.57718
OCC3	.19078	1.21020	.4318	.51111283	.29034	152.18	.68504	2.13796
OCC4	.52482	1.69015	5.8781	.01533012	.21647	41.25	1.10577	2.58335
OCC5	.41042	1.50744	4.7297	.02964608	.18872	45.98	1.04137	2.18212
OCC6	-.07836	.92463	.1454	.70294522	.20549	262.23	.61808	1.38320
OCC7	-.37355	.68829	.8409	.35913804	.40735	109.05	.30976	1.52939
OCC8	.15342	1.16581	.4459	.50429696	.22976	149.76	.74312	1.82895
OCC9	-.01398	.98611	.0039	.95010942	.22351	1598.23	.63631	1.52821
AGE2	.00661	1.00663	.0028	.95809052	.12577	1902.95	.78671	1.28803
AGE3	-.41015	.66355	5.0004	.02534154	.18342	44.72	.46318	.95061
AGE4	-.87009	.41891	1.5730	.20977023	.69374	79.73	.10755	1.63174
EDU2	-.07455	.92816	.2639	.60746424	.14513	194.67	.69836	1.23356
EDU3	.40639	1.50139	6.7987	.00912251	.15586	38.35	1.10618	2.03782
EDU4	-.21508	.80648	2.0769	.14954671	.14924	69.39	.60194	1.08051
MAR2	1.06842	2.91078	21.4610	.00000361	.23063	21.59	1.85222	4.57432
MAR3	1.02429	2.78513	47.6194	.00000000	.14843	14.49	2.08207	3.72559
MAR4	.88121	2.41383	41.1326	.00000000	.13740	15.59	1.84395	3.15983
RACE	.62716	1.87229	10.4515	.00122552	.19400	30.93	1.28009	2.73845

Model 5:

Table 4.4.1 : Logistic regression model for consultation with a professional (by work stressors) for depressed people (CCHS1.1)

Variable	Coeff.	S.E.	OR	95% C.I. for OR		Wald	Sig.
				Lower	Upper		
Constant	-0.87	0.26	0.42			11.67	<0.01
Work stressors	0.01	0.01	1.01	0.99	1.03	1.61	0.21
15 - 29 years old	0		1				0.02
30 - 44 years old	0.33	0.12	1.40	1.10	1.77	7.65	
45 years old or more	0.27	0.14	1.32	1.01	1.72	4.04	
Less than sec. school graduation	0		1				0.02
Sec. school grad, no post-sec. edu	0.38	0.16	1.47	1.07	2.01	5.67	
Some post-secondary education	0.49	0.20	1.63	1.11	2.41	6.08	
Post-secondary degree/diploma	0.40	0.14	1.48	1.12	1.97	7.50	
Female	0		1				<0.01
Male	-0.55	0.11	0.58	0.47	0.72	24.23	
White	0		1				<0.01
Non-white	-0.66	0.16	0.52	0.38	0.71	16.78	

Goodness-of-fit: Hosmer and Lemeshow χ^2=3.99 on 8 d.f., P=0.86

Model 6:

Table 4.4.2 : Logistic regression model for consultation with a mental health professional (by occupation) for depressed people (CCHS1.1)

Variable	Coeff.	S.E.	OR	95% C.I. for OR		Wald	Sig.
				Lower	Upper		
Constant	-0.58	0.23	0.56			6.50	0.01
Management	0		1				0.59
Professional(including accountant)	0.05	0.21	1.05	0.70	1.58	0.06	
Technologist, technician	0.14	0.28	1.15	0.67	1.97	0.26	
Administrative, financial, clerical	0.08	0.21	1.08	0.72	1.62	0.14	
Sales or service	-0.01	0.19	0.99	0.68	1.45	0.00	
Trades, transport, equipment operator	0.16	0.24	1.17	0.73	1.89	0.42	
Farming, forestry, fishing, mining	-0.51	0.57	0.60	0.20	1.83	0.80	
Processing, manufacturing, utilities	0.39	0.29	1.48	0.85	2.59	1.90	
Other	-0.23	0.24	0.80	0.49	1.28	0.90	
Female	0		1				<0.01
Male	-0.58	0.12	0.56	0.44	0.71	22.94	
Less than secondary school graduation	0		1				0.06
Sec. school grad, no post-sec. education	0.36	0.16	1.43	1.04	1.97	4.75	
Some post-secondary education	0.47	0.20	1.60	1.08	2.38	5.42	
Post-secondary degree/diploma	0.35	0.15	1.41	1.05	1.90	5.20	
15 - 29 years old	0		1				0.04
30 - 44 years old	0.30	0.12	1.35	1.06	1.73	5.98	
45 years old or more	0.24	0.14	1.28	0.97	1.68	3.02	
White	0		1				<0.01
Non-white	-0.68	0.16	0.51	0.37	0.70	17.43	

Goodness-of-fit: Hosmer and Lemeshow χ^2=9.06 on 8 d.f., P=0.34

Model 7:

Table 4.4.3 : Logistic regression model for utilization of any resource (by work stressors) for people with any mental disorder or substance dependence (CCHS1.2)

Variable	Coeff.	S.E.	OR	95% C.I. for OR		Wald	Sig.
				Lower	Upper		
Constant	0.11	0.75	1.12			0.02	0.88
Work stressors	-0.08	0.03	0.93	0.88	0.98	7.78	<0.01
15 - 29 years old	0		1				<0.01
30 - 44 years old	0.83	0.25	2.30	1.40	3.77	10.92	
45 years old or more	1.01	0.30	2.75	1.54	4.90	11.76	
Female	0		1				
Male	-1.00	0.17	0.37	0.26	0.52	33.83	<0.01
Married	0		1				<0.01
Common-law	-3.44	1.14	0.03	0.00	0.30	9.03	
Widowed/Separated/Divorced	-1.49	1.09	0.23	0.03	1.91	1.87	
Single	-2.14	0.82	0.12	0.02	0.59	6.80	
Lowest income	0		1				<0.01
Lower middle income	0.26	0.39	1.30	0.60	2.79	0.44	
Upper middle income	-0.08	0.36	0.92	0.46	1.86	0.05	
Highest income	-0.57	0.36	0.57	0.28	1.15	2.45	
White	0		1				<0.01
Non-white	0.83	0.29	2.29	1.31	4.00	8.44	
Married * Work stressors	0		1				<0.01
Common-law* Work stressors	0.16	0.05	1.18	1.07	1.30	10.84	
Wid/Sep/Div * Work stressors	0.09	0.05	1.09	0.99	1.21	3.20	
Single * Work stressors	0.10	0.04	1.11	1.03	1.19	6.97	

Goodness-of-fit: Hosmer and Lemeshow χ^2=9.23 on 8 d.f., P=0.32

Model 8:

Table 4.4.4 : Logistic regression model for utilization of any resource (by occupation) for people with any mental disorder or substance dependence (CCHS1.2)

Variable	Coeff.	S.E.	OR	95% C.I. for OR		Wald	Sig.
				Lower	Upper		
Constant	-1.66	0.38	0.19			18.67	<0.01
Management	0		1				0.24
Professional(including accountant)	-0.44	0.33	0.64	0.34	1.24	1.76	
Technologist, technician	-0.43	0.41	0.65	0.29	1.46	1.09	
Administrative, financial, clerical	0.36	0.32	1.43	0.76	2.68	0.24	
Sales or service	-0.08	0.29	0.92	0.52	1.61	0.09	
Trades, transport, equipment operator	-0.18	0.37	0.83	0.41	1.71	0.25	
Farming, forestry, fishing, mining	-0.52	0.73	0.60	0.14	2.51	0.50	
Processing, manufacturing, utilities	0.14	0.37	1.15	0.56	2.39	0.15	
Other	-0.29	0.37	0.75	0.36	1.56	0.59	
Female	0		1				<0.01
Male	-1.03	0.17	0.36	0.26	0.50	36.15	
15 - 29 years old	0		1				<0.01
30 - 44 years old	0.87	0.18	2.39	1.67	3.43	22.70	
45 years old or more	0.88	0.21	2.41	1.60	3.64	17.58	
White	0		1				<0.01
Non-white	1.00	0.28	2.71	1.58	4.65	13.00	

Goodness-of-fit: Hosmer and Lemeshow χ^2=6.44 on 8 d.f., P=0.60

Table 4.4.3a: Estimation using bootstrap weights for Model 7

BETA	BHAT	ODDS	WALD	PVALUE	BS_SD	BS_CV	CIL95	CIU95
Const_	.11071	1.11708	.0173	.89543534	.84239	760.86	.21430	5.82287
WKST	-.07769	.92525	5.5485	.01849647	.03298	42.45	.86733	.98704
AGE2	.83349	2.30133	10.8711	.00097676	.25279	30.33	1.40216	3.77711
AGE3A	1.01098	2.74828	9.7970	.00174796	.32299	31.95	1.45923	5.17606
SEX	-.99689	.36903	20.8701	.00000492	.21821	21.89	.24061	.56599
INC2	.25890	1.29550	.4149	.51951652	.40196	155.26	.58923	2.84836
INC3	-.08150	.92173	.0531	.81783542	.35384	434.16	.46069	1.84416
INC4	-.56509	.56831	2.1297	.14446643	.38722	68.52	.26606	1.21392
MAR2	-3.43792	.03213	3.9489	.04690296	1.73005	50.32	.00108	.95407
MAR3	-1.48836	.22574	1.5161	.21820693	1.20876	81.21	.02112	2.41285
MAR4	-2.13956	.11771	6.0953	.01355427	.86662	40.50	.02153	.64340
RACE	.82797	2.28866	5.5436	.01854823	.35165	42.47	1.14881	4.55947
M2_S_INT	.16327	1.17736	4.4397	.03511311	.07749	47.46	1.01146	1.37047
M3_S_INT	.09015	1.09434	2.6913	.10089656	.05495	60.96	.98260	1.21879
M4_S_INT	.10058	1.10581	6.0735	.01372229	.04081	40.58	1.02080	1.19790

Table 4.4.4a: Estimation using bootstrap weights for Model 8

BETA	BHAT	ODDS	WALD	PVALUE	BS_SD	BS_CV	CIL95	CIU95
Const_	-1.66033	.19008	16.3686	.00005214	.41038	24.72	.08504	.42487
OCC2	-.44114	.64330	1.1194	.29004290	.41694	94.52	.28412	1.45655
OCC3	-.43249	.64889	.6682	.41368768	.52910	122.34	.23004	1.83040
OCC4	.35709	1.42916	1.8067	.17890279	.26566	74.40	.84907	2.40557
OCC5	-.08427	.91919	.0428	.83606354	.40722	483.25	.41378	2.04190
OCC6	-.18156	.83397	.3618	.54752162	.30186	166.26	.46153	1.50694
OCC7	-.51659	.59655	.2698	.60345163	.99450	192.51	.08494	4.18972
OCC8	.14179	1.15233	.1031	.74817743	.44165	311.48	.48488	2.73856
OCC9	-.28545	.75167	1.3588	.24373808	.24488	85.79	.46514	1.21471
AGE2	.87281	2.39362	9.7039	.00183877	.28019	32.10	1.38216	4.14528
AGE3A	.87979	2.41039	7.7506	.00536945	.31602	35.92	1.29744	4.47802
SEX	-1.02628	.35834	34.7557	.00000000	.17408	16.96	.25475	.50405
RACE	.99568	2.70658	28.1092	.00000011	.18780	18.86	1.87310	3.91092

Appendix C

SPSS Program BOOTVARE_V21.SPS

Model 3:

```
SET COM NO HEA ON MES ON ERR ON RES ON JOU ON LEN NONE WID 132
PRI NO MPR NO.


DEFINE !Bootvar()

!Let !Tot=!Null
!Let !Reg=!Null


!LET !Mfile='C:\Documents and
Settings\agnes\Desktop\masterproject\cchs1.2\CCHS1.2_BOOT\layout.sav'
/*  <- (ex: c:\data\analysis.sav).

!LET !BWsav='C:\Documents and
Settings\agnes\Desktop\masterproject\cchs1.2\CCHS1.2Bootstrp\ont_boot_distr.sav'

!LET !Classes = ''

!LET !B = 500
INCLUDE FILE='C:\Temp\MACROE_V22.SPS'.

!Prepare B=!B /Classes=!Classes /mfile=!Mfile /bwsav=!bwsav.

!Log_Reg !B !Classes/ Cri=SAS Dep = anydisor  Indep = wkstress age2 age3 age4 edu2
edu3 edu4 mar2 mar3 mar4 race
!Let !Reg=1.
SET PRI NO MPR NO.

!IF (!Reg=1) !THEN
+ !Print_R !Classes.   /* Printing of Linear and Logistic Regressions results
!IFEND

!Stop !NBlocks.
!ENDDEFINE /* !Bootvar.

SET MPR ON.
!Bootvar.
SET MPR NO.
```

Model 4:

```
SET COM NO HEA ON MES ON ERR ON RES ON JOU ON LEN NONE WID 132
PRI NO MPR NO.


DEFINE !Bootvar()

!Let !Tot=!Null
!Let !Reg=!Null


!LET !Mfile='C:\Documents and
Settings\agnes\Desktop\masterproject\cchs1.2\CCHS1.2_BOOT\layout.sav'
/*  <- (ex: c:\data\analysis.sav).

!LET !BWsav='C:\Documents and
Settings\agnes\Desktop\masterproject\cchs1.2\CCHS1.2Bootstrp\ont_boot_distr.sav'

!LET !Classes = ''

!LET !B = 500
INCLUDE FILE='C:\Temp\MACROE_V22.SPS'.

!Prepare B=!B /Classes=!Classes /mfile=!Mfile /bwsav=!bwsav.

!Log_Reg !B !Classes/ Cri=SAS Dep = anydisor  Indep = occ2 occ3 occ4 occ5 occ6 occ7
occ8 occ9 age2 age3 age4 edu2 edu3 edu4 mar2 mar3 mar4 race
!Let !Reg=1.
SET PRI NO MPR NO.

!IF (!Reg=1) !THEN
+ !Print_R !Classes.   /* Printing of Linear and Logistic Regressions results
!IFEND

!Stop !NBlocks.
!ENDDEFINE /* !Bootvar.

SET MPR ON.
!Bootvar.
SET MPR NO.
```

Model 7:

```
SET COM NO HEA ON MES ON ERR ON RES ON JOU ON LEN NONE WID 132
PRI NO MPR NO.


DEFINE !Bootvar()

!Let !Tot=!Null
!Let !Reg=!Null

!LET !Mfile='C:\Documents and
Settings\agnes\Desktop\masterproject\cchs1.2\CCHS1.2_BOOT\layout1.sav'
/*  <- (ex: c:\data\analysis.sav).

!LET !BWsav='C:\Documents and
Settings\agnes\Desktop\masterproject\cchs1.2\CCHS1.2Bootstrp\ont_boot_distr.sav'

!LET !Classes = ''

!LET !B = 500
INCLUDE FILE='C:\Temp\MACROE_V22.SPS'.

!Prepare B=!B /Classes=!Classes /mfile=!Mfile /bwsav=!bwsav.

!Log_Reg !B !Classes/ Cri=SAS Dep = utilize  Indep = wkstress age2 age3a sex inc2 inc3
inc4 mar2 mar3 mar4 race m2_s_int m3_s_int m4_s_int
!Let !Reg=1.
SET PRI NO MPR NO.

!IF (!Reg=1) !THEN
+ !Print_R !Classes.   /* Printing of Linear and Logistic Regressions results
!IFEND

!Stop !NBlocks.
!ENDDEFINE /* !Bootvar.

SET MPR ON.
!Bootvar.
SET MPR NO.
```

Model 8:

```
SET COM NO HEA ON MES ON ERR ON RES ON JOU ON LEN NONE WID 132
PRI NO MPR NO.


DEFINE !Bootvar()

!Let !Tot=!Null
!Let !Reg=!Null

!LET !Mfile='C:\Documents and
Settings\agnes\Desktop\masterproject\cchs1.2\CCHS1.2_BOOT\layout1.sav'
/*  <- (ex: c:\data\analysis.sav).

!LET !BWsav='C:\Documents and
Settings\agnes\Desktop\masterproject\cchs1.2\CCHS1.2Bootstrp\ont_boot_distr.sav'

!LET !Classes = ''

!LET !B = 500
INCLUDE FILE='C:\Temp\MACROE_V22.SPS'.

!Prepare B=!B /Classes=!Classes /mfile=!Mfile /bwsav=!bwsav.

!Log_Reg !B !Classes/ Cri=SAS Dep = utilize  Indep = occ2 occ3 occ4 occ5 occ6 occ7
occ8 occ9  age2 age3a sex  race
!Let !Reg=1.
SET PRI NO MPR NO.

!IF (!Reg=1) !THEN
+ !Print_R !Classes.   /* Printing of Linear and Logistic Regressions results
!IFEND

!Stop !NBlocks.
!ENDDEFINE /* !Bootvar.

SET MPR ON.
!Bootvar.
SET MPR NO.
```

Bibliography

[1] Agresti, A. (1990). *Categorical Data Analysis*. New York, USA: John Wiley & Sons.

[2] Amick B.C., Kawachi I., et al. (1998). The relationship of job strain and iso-strain to health status in a cohort of women in the US. *Scandinavian Journal of Work, Environment & Health, 24 (1): 60-67.*

[3] Baba, V.V. (2000). Mental health in the work place: Implications for management. *The HRM Research Quarterly, 4,* 2:1-5.

[4] Baba, V.V., Jamal, M., & Tourigny, L. (1998). Work and mental health: A decade in Canadian research. *Canadian Psychology, 39*: 94-107.

[5] Brown, D.W., Balluz, L.S., Ford, E.S., Giles, W.H., Strine, T.W., Moriarity, D.G., Croft, J.B., & Mokdad, A.H. (2003). Associations between short- and long-term unemployment and frequent mental distress among a national sample of men and women. *J Occup Environ Med, 45*:1159-1166.

[6] Bültmann, U., Kant, I., van Amelsvoort, L.G.P.M., van den Brandt, P.A., & Kasl, S.V. (2001). Differences in fatigue and psychological distress across occupations: Results from the Maastricht cohort study of fatigue at work. *J Occup Environ Med 2001* :976- 983.

[7] Carroll, L.J., Cassidy, J.D., & Côté, P. (2004). Depression as a risk factor for onset of an episode of troublesome neck and low back pain. *Pain 107*:134-139.

[8] COMPAS INC (2001): *The 2001 Canadian Mental Health Survey.* http://www.cmha.ca/english/research/compas_survey.htm. Accessed 11 January 2004

[9] Conference Board of Canada (2000). Cited by Baba, op cit.

[10] Dewa et al. (2004). Mental health and the workplace: Towards a research agenda in Canada. *HealthcarePapers Vol.5 No.2.*

[11] Gini, A. (2000). *My job, my self: work and the creation of the modern individual.* New York, Routledge.

[12] Grosch, J.W., & Murphy, L.R. (1998). Occupational differences in depression and global health: Results from a national sample of US workers. *J Occup Environ Med 40* :153-164.

[13] Hosmer, D.W., Lemeshow, S. (1980). A goodness-of-fit test for the multiple logistic regression model. *Communications in Statistics, A10*, 1043-1069.

[14] Hosmer, D.W., Lemeshow, S. (2000). *Applied Logistic Regression.* New York, USA: John Wiley & Sons.

[15] Johnson, J.V., & Hall, E.M. (1988). Job strain, workplace social support and cardiovascular disease: A cross-sectional study of a random sample of the Swedish working population. *Am J Public Health 78:*1336-1342.

[16] Karasek, R.A. (1979). Job demands, job decision latitude and mental strain: implications for job redesign. *Admin Sci Q 24:*285-307.

[17] Karasek, R.A.,Theorell T. (1990). *Healthy Work.* New York: Basic Books.

[18] Kleinbaum, D.G. (1994). *Logistic Regression- A Self-Learning Text.* New York, USA: Springer-Verlag.

[19] Marmot, M., & Feeney, A. (1996). Work and health: implications for individuals and society. In Blane, D., Brunner, E., & Wilkinson, R. (Eds.), *Health and social organization: Towards a health policy for the twenty-first century* (pp235-254). London, England: Routledge.

[20] Philips, O. (2004). Using bootstrap weights with Wes Var and SUDAAN. *Statistics Canada: The Research Data Centres Information and Technical Bulletin, Fall 2004, vol.1 no.2.*

[21] Quick, J. D., Horn, R.S., & Quick, J. C. (1986). Health consequences of stress. *Journal of Organizational Behavior Management, 8*, 19-31.

[22] Statistics Canada, CCHS Cycle 1.1 (2000-2001) Public Use Microdata File Documentation.

[23] Statistics Canada, CCHS Cycle 1.2 (2002) Master File Documentation.

[24] Wieclaw, J., Agerbo, E., Mortensen, P.B., & Bonde J.P. (2003). Occupational risk of depression and stress-related conditions. Unpublished paper. NIOH, Copenhagen.