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Unemployment and Health: Contextual Level Influences on the Production of Health in Populations

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SEDAP Research Paper No. 54

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Requests for further information may be addressed to:
Secretary, SEDAP Research Program
Kenneth Taylor Hall, Room 426
McMaster University
Hamilton, Ontario, Canada
L8S 4M4
FAX: 905 521 8232
e-mail: qsep@mcmaster.ca

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UNEMPLOYMENT AND HEALTH: CONTEXTUAL LEVEL INFLUENCES ON THE PRODUCTION OF HEALTH IN POPULATIONS*

François Béland[1]
Stephen Birch[2]
Greg Stoddart[2]

1. Groupe de recherche interdisciplinaire en santé, Université de Montréal, Montréal, Québec.
2. Centre for Health Economics and Policy Analysis, McMaster University, Hamilton, Ontario, Canada.

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Send all correspondence to :

François Béland
GRIS
Faculté de Médecine
Université de Montréal
CP 6128, Succ. Centre-Ville
Montréal, H3C 3J7
Québec, Canada

Tel : 514-343-2225
Fax : 514-343-2207
E-Mail : belandf@mdas.umontreal.ca

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Abstract

While there is a large and growing literature investigating the relationship between an individuals' employment status and his or her health, considerably less is known about the effect on this relationship of the context in which unemployment occurs. The aim of this paper is to test for the presence and nature of contextual effects in the ways unemployment and health are related, based on a simple underlying model of stress, social support and health using a large population health survey. An individual's health can be influenced directly by own exposure to unemployment and by exposure to unemployment in the individual's context, and indirectly by the effects these exposures have on the relationship between other health determinants and health. Based on this conceptualization an empirical model, using multi-level analysis, is formulated that identifies a five -stage process for exploring these complex pathways through which unemployment affects health. Results showed that the association of individual unemployment with perceived health is statistically significant. Nevertheless, this study did not provide evidence to support the hypothesis that the association of unemployment with health status depends upon whether the experience of unemployment is shared with people living in the same environment. Above all, this study demonstrates both the subtlety and complexity of individual and contextual level influences on the health of individuals. Our results caution against simplistic interpretations of the unemployment-health relationship and reinforce the importance of using multi-level statistical methods for investigation of it.

Key words : Unemployment; Population health, contextual effect, Multi-level models, Survey data set, Census data set.

Introduction

Unemployment is consistently associated with poor health for individuals. Although part of this association is undoubtedly a selection effect, healthier people are more likely to be employed, sufficient evidence exists to suggest that employment protects and fosters health (Lavis et al, 2000; Dooley, Fielding, Levy, 1996; Platt, Pavis, Akram, 1999; Ross and Mirowsky, 1995; Kasl and Jones, 2000).

While there is a large and growing literature investigating the relationship between an individual's employment status and his or her health, considerably less is known about the effect on this relationship of the context in which unemployment occurs. For example, Iversen et al. (1997) found lower relative mortality among Danish unemployed individuals in areas where the local unemployment rate was comparatively high (Iversen, Andersen, Andersen et al., 1997). However, Moser and colleagues (1986) found an opposite effect in the U.K. The adverse health effects associated with unemployment were greater in areas with higher rates of unemployment. These contradictory findings might be explained by the failure to control for variations in other contextual factors that influence the unemployment - health relationship. Few studies consider the effect of local context while those that do use local unemployment rate as the only contextual variable. Alternatively the findings might reflect different social and psychosocial processes at work in different contexts (Turner, 1995). Either way, the findings help to illustrate the complexities of the association between unemployment and health in populations.

Our intention is not to provide a comprehensive understanding of the unemployment-health relationship. Instead we aim to test for the presence and nature of contextual effects in the ways unemployment and health are related, based on a simple underlying model of stress, social support and health using a large population health survey of the population of the province of Québec. Under the conceptual framework adopted in the paper an individual's health can be influenced directly by own exposure to unemployment and by exposure to unemployment in the individual's context, and indirectly by the effects these exposures have on the relationship between other health determinants and health. Based on this conceptualization an empirical model is formulated that identifies a five -stage process for exploring these complex pathways through which unemployment affects health. The focus of the paper is therefore on the application of the empirical model to the data in order to explore different components of contextual effects on health and hence provide a better understanding of pathways to health in populations.

The application of the empirical model uses multi-level analysis (Goldstein, 1995), a statistical procedure that estimates differences in the association of health status and individual-level characteristics in different contexts and takes into consideration variations in health status at both the individual and contextual levels. To the best of our knowledge this represents the first application of multi-level analysis to the study of the unemployment-health relationship.

Exploring the unemployment-health relationship

Based on their review of the literature on unemployment and health Kasl and Jones (2000) made a number of suggestions for future research: 1) that the effect of economic hardship stemming from unemployment be separated from the effect of unemployment per se; 2) that unemployment may affect the health of different subgroups of the population differently; 3) that the social matrix in which unemployment is embedded, such as the interdependence of the individual with his or her family, network of friends, and the immediate context, be considered; 4) that a complex set of modulators of the association between health status and unemployment may be at work, which may include financial strains, social support, psychosocial factors and contexts. In this paper, interest in the association of unemployment and health is extended to include, at the individual-level, modulators suggested by Kasl and Jones (2000); to consider the interactions of these modulators with individual-level unemployment; to consider characteristics of the contexts that determine the social matrix in which unemployment is experienced; and to examine the interactions between these contextual characteristics and individual-level characteristics.

Concerns about the impact of contexts on health and on the pathways to health are not limited to the association of unemployment and health (Macintyre and Ellaway, 2000; Patrick and Wickizer, 1995). In recent years increased attention has

been given by researchers to the development of broad conceptual frameworks for explaining the production and distribution of health within populations (Hancock, 1986; Gunning-Schepers and Hagen, 1987; Evans and Stoddart, 1990; Horowitz, 1993). In these frameworks, traditional interest in the individual's socioeconomic circumstances, genetic factors, access to health care and individual lifestyle (Lalonde, 1974) are complemented by recognition of the potential role of contextual-level factors on the distribution of health in populations (Epp, 1986; Syme, 1994). The social, economic, physical and cultural contexts in which people live and in which they experience a wide range of emotions over varying time frames are the particular focus of one synthesis of research evidence on the determinants of health of populations (Evans, Barer and Marmor, 1994). The conceptual framework used to organize and integrate this evidence (Evans and Stoddart, 1990) emphasizes the potential role of contexts in conditioning the opportunities and constraints of individuals and in doing so, shifts the focus of attention for the determinants of health from individuals and their *"*choices*"* to communities and their contexts. Under this framework we can start to explore heterogeneities within populations in the way different determinants affect health and the contextual characteristics that modulate these relationships.

Among contextual-level characteristics, business cycles seem to modulate the unemployment-health relationship (Brenner, 1983, 1987; Brenner and Monney, 1983; Short, 1996). Moser et al. (1986) found that the adverse effect of individual unemployment on health was greater in contexts with high unemployment rates.

However, Martikainen and Valkinen (1996) found, in a sample of Finnish workers, a lower association between unemployment and mortality with increasing unemployment rates, while Turner (1995), in a sample of the US population aged 25 and over, found that the adverse effects of unemployment on health were greater in contexts with low unemployment rates. Turner (1995) also examined the possibility that, for working classes, financial strains due to unemployment were responsible for the association of health with unemployment, while for the middle and upper classes, psychological hardships underlie the link between unemployment and health.

Social support has also been shown to modulate the effect of unemployment on individuals' health (Broomhall and Winefield, 1990; Turner, Kessler and House, 1991; Hammarstrom, 1994). Some social contexts provide more supportive social structure to individuals. The impact of unemployment on the health of individuals in supportive social contexts may be less than its effect on individuals living in less supportive contexts. Moreover, the effect of individual-level modulators such as financial resources, psychosocial characteristics, and social support, on the unemployment-health relationship might differ according to the contexts in which they occur.

To explore all potential modulators at the individual-level is beyond the scope of this paper. Instead the stress-social support model is used as the focus for exploring individual-level modulators of the relationship between health status and

unemployment. The three dimensions of the stress and social support model, sources of stress, sources of social support and psychosocial characteristics, provide the basis of the empirical framework for this paper. The hypothesized relationship between stress, social support and health is based on existing research in this area (Cohen and Syme, 1985). Following Aneshensel (1992) and Antonovsky (1985), stress is defined as a potential consequence of events or social position that affects an organism's capacity to cope, while social support is a counterweight to the negative effects of stress on health (Antonovsky, 1985 ; Vaux, 1988) and psychosocial factors such as locus of control (Pearlin and Schooler, 1978) and sense of coherence (Antonovsky, 1985) may help or hinder individuals' capacities to use social support effectively.

The role of social support as a determinant of health has been the focus of many studies (Berkman, 1984; Folkman, 1984; Cohen and Wills, 1985; Thoits, 1982; Cohen, 1988; Pearlin, 1989; Wortman and Conway, 1985; Landreville and Cappeliez, 1992; George, 1996). Social support and mortality were found to be inversely correlated in a number of studies (Orth-Gomér and Johnson, 1987; Seeman et al., 1987, 1993; House, Landis and Umberson, 1988; Hirdes and Forbes, 1992), although the association of social support with morbidity is less clear (Clarke, Clarke and Jagger, 1992; Hibbard and Pope, 1993; Iliffe et al., 1992; Marottoli et al., 1994; Seeman et al., 1993). While stress and social support affect health directly, stress and social support are hypothesized to be inversely correlated and social support is hypothesized to modulate the adverse effect of

stress on health. This is the buffering hypothesis. Psychosocial factors are hypothesized to have both a direct effect on health and an indirect effect via a buffering role on the social support-health relationship. Individual-level variables measuring sources of stress, sources of social support, and psychosocial factors are identified and controlled for together with demographic variables for age and gender in our analysis of the relationship between unemployment and health.

Following Patrick and Wickizer (1995), contexts include both social interaction and spatial aspects. Social interaction is the extent to which the population is interconnected and has direct or indirect contacts in the satisfaction of daily requirements (Hawley, 1950). However, such contexts are rarely the basis on which samples for large population health surveys are organized. Consequently, empirical analyses are often constrained to using contexts operationally defined for data collection such as census tracts that are more reflective of spatial contexts. In this study the characteristics of contexts available are limited to contextual variables reported in the Canadian censuses. The particular characteristics selected for study are chosen to represent the three dimensions of the stress-social support model. Contextual-level characteristics are therefore classified into collective sources of stress and resources, and availability and quality of social networks. Labor force participation, occupational status and proportion of immigrants are categorized as sources of stress. Average annual income and education are categorized as resources. Single parent families and two-parent families with one child describe family life and are categorized as measures of

social network. Finally, the proportions of males and of young females are categorized as demographic factors.

Traditional methods of empirical analysis have limited the extent to which contextual-level influences can be explored. In particular, empirical studies have tended to focus on either individual or aggregate level analyses. Individual-level analyses are focused on estimating the relationship between various individual level characteristics and health with no attention being given to possible ecological variation in the underlying relationships. The results therefore assume that the observed health outcomes are the result of only influences of individual level factors - what Jones and Duncan (1995) refers to as the atomistic fallacy. Aggregate level analyses, on the other hand, infer relationships observed at the aggregate level represent underlying relationships at the individual level, more commonly referred to as the ecological fallacy. Theoretical concerns about the role of contexts in the production of health and illness in populations have been accompanied by the development of multi-level models for exploring the roles of and relationships between individual and contextual-level factors as determinants of health.

There are a rapidly growing number of applications of these methods in the health research literature covering for example the exploration of the population distribution of chronic illness (Jones and Duncan, 1995), coronary heart disease (Diez-Roux et al., 1997) low-birth weight (O'Campo et al., 1997) and the

relationship between smoking and health (Duncan, Jones and Moon, 1999). However, applications of these methods have not been extended to studies of unemployment and health (Macintyre and Ellaway, 2000; Ross et al., 2000). Despite broad recognition of the multi-faceted nature of unemployment experiences and the potential for a wide range of "effect modifiers" within the unemployment-health literature, the methodological focus of the research has been largely confined to issues concerning causation and selection (Dooley, Fielding and Levi, 1996). These matters have tended to be addressed within the constraints of individual or aggregate level models (Kasl and Jones, 2000). Where researchers have broadened the scope of their study to explore both individual and ecological level factors, the empirical approaches followed have not been based on any clear conceptual foundation of the relationships of interest. For example, Dooley et al (1988) introduce contextual-level unemployment into their study of the relationship between unemployment and psychological symptoms using a single equation individual-level model. The same authors introduced individual-level measures of stress and psychological symptoms into aggregate level analyses of unemployment and suicide (Dooley et al., 1988, 1989). Similarly, Turner (1995) explored the relationship between individual level health and unemployment and contextual-level unemployment by entering the level of unemployment in an individual's place of residence into ordinary least squares regression equations. The limited number of observations within each context prevented exploration of variations in individual-level variables within contexts. Hence variations among contexts due to contextual influences could not be separated empirically from

variations due to the composition of those contexts. In this paper, multi-level methods of analysis (Goldstein et al., 1998) are used to enable us to distinguish between compositional and contextual effects, to test for differences in the association of individual-level characteristics among contexts, to estimate interactions between individual and contextual-level characteristics.

Materials and Methods

a) Sample

The goal of the analysis is to examine the synergistic relationship between health status and individuals' own personal experience of unemployment, given the level of unemployment and other characteristics of the individuals' context.

Individual-level data are taken from the 1987 Santé-Québec health survey of the non-institutionalised Quebec population (Courtemanche and Tarte, 1987). In the 844 primary sample units, 13,760 households were selected. Data were provided from an interviewer-administered questionnaire for 11,323 (82.3 per cent) of these households covering 31,995 individuals living in these households. In addition, a pre-paid postal questionnaire was provided for every household member aged 15 years and over. Questionnaires were received from 19,724 individuals, 80.9% of the residents of the sampled households in this age group.

In the Santé-Québec sample, 28,203 questionnaires had completed responses on the labor market and unemployment questions. Of these, 11,739 considered themselves as working or actively seeking work of which 11.5% reported being unemployed. Data on individual-level characteristics were taken from the postal questionnaire. Completed questionnaires were available for 17,284 individuals, among whom 9,422 were working or seeking work. Individuals not working or seeking work were excluded from the sample for analysis in order to reduce the possibility of selection effects confounding the analysis (i.e., poor health causing individuals to withdraw from the labour market). The unemployment rate among these 9,422 persons was 10.5%, 1% less than in the whole sample. A large proportion of respondents under 25 years of age were in full time education while many of the over 55 were either retired or considered themselves out of the labor market for health reasons. This explains the relatively low labor market participation rates of 11.7% and 37.6% respectively in these groups.

Because the primary sample units used in Santé-Québec are also census units, individual-level data from the health survey can be linked to the 1986 Canadian census data on the basis of census tracts. The «Bureau de la statistique du Québec» (BSQ), a Québec government statistical office, merged the Santé-Québec respondents' file with the Canadian census tracts files to produce a linked database for analysis. In this way, individual-level variables from the health survey can be analyzed alongside contextual-level variables from the population census. In order to protect respondents' anonymity, the BSQ selected for each census tract

a second census tract based on the best match of population characteristics according to a clustering procedure. The observed values of census variables for a particular census tract were replaced by the mean values for the two “matched” census tracts. Although this procedure may introduce systematic and random variations into the contextual variations appearing in the data set, the Bureau reported that these effects were minimal.

The 9422 subjects included in this study were distributed among 624 census tracts with an average of 15 subjects per census tract (range 1-120). This number of cases per “context” is insufficient for the use of multi-level analytical methods. In order to increase the number of cases per “context”, cluster analyses were performed within Census Subdivisions in order to group census tracts according to similarities in population characteristics and municipal boundaries. Data from the 1986 Canadian Census on socio-economic characteristics, family structure and immigration patterns at the level of census tracts were entered into a hierarchical clustering procedure. This grouping generated 361 “contexts” with an average of 30 respondents per “context”. In large metropolitan areas grouping could not always be based on adjoining subdivisions because of population heterogeneity within municipalities.

b) Individual-level variables.

The variables of primary interest in the analysis are perceived health and employment status. Perceived health is measured by the standard five-category self-assessed health question asking people to rate their health compared to people of their age. Because of the very small proportions falling into some categories, the perceived health variable is dichotomized. Excellent and very good health were grouped together for one category (“healthy”) and good, fair and poor together for the other (“unhealthy”). Perceived health has been used in other studies on contextual variations in health status (Malmström, Sundquist and Johansson, 1999; Pampalon et al., 1999) and has been shown to be related to occurrence of chronic disease (Wilson and Kaplan, 1995), functional disabilities (Idler et al., 1995), and mortality (Idler and Kasl, 1997; Sundquist and Johansson, 1997; Idler et al., 1997; Miilunpalo et al., 1997). Employment status is also a dichotomous variable measuring whether at the time of data collection the individual was in employment or unemployed. Unemployment is defined as persons seeking work, seasonally unemployed, on strike, laid off because of temporary closures or looking for a first job.

Several other individual level variables are used in the analysis in order to control for individual characteristics associated with health status other than employment status. Sources of stress are measured by the number of stressful events, self-perceived stress generated by these events and occupational status of the

respondent. Eight categories of stressful events are included based on the scale developed by Holmes and Rahe (1967). However, sickness was excluded from this scale for the current study because it is confounded with the dependent variable, perceived health. For each event, the perceived stress is measured using a four-point response scale. Socio-economic status is measured in relation to occupation using the Blishen and McRoberts (1976) scale. Because socio-economic status imposes self-images and obligations on individuals that they have to sustain we hypothesize that the lower the social status, the more difficult it is to maintain a good self-image and to assume obligations.

Social support is viewed as a resource available to individuals in the same way as other resources important in generating health such as education and income. Social support is a multidimensional construct (House and Kahn, 1985; Felton and Shinn, 1992; Barrera, 1986). Individuals obtain support from material, cultural and social resources available to them. Three dimensions of social support are considered in this analysis, the composition and characteristics of social networks, activities with social network partners and perceived social support. Household income is used as a measure of material resources. Education is used as a cultural resource and is measured by education quintiles (Guyon and Levasseur, 1991) to deal with the effect of changing educational opportunities over time on the level of educational achievements in a sample of different age cohorts.

Social networks and social support characteristics are used as indicators of social resources. Social network is measured by the presence of a spouse or a life companion, number of children, number of family reunions, partnership in leisure, and availability of a confidant. Perceived social support is measured using the responses to questions concerning satisfaction with social relationship, feelings of loneliness and feelings of being loved.

Indicators of “locus of control” and “sense of coherence” were used for psychosocial factors. In the absence of any direct measures of these constructs in the Santé-Québec survey, we combined items pertaining to “locus of control” or to “sense of coherence”. Loss of control items were based on elements of the scale of psychological distress (Ilfield, 1978) based on responses to questions about whether the individual had become angry at someone, had negative feelings towards others, or had been annoyed by someone. For sense of coherence we used the four items of the Dupuy (1980) scale of well being that relate to readiness for action without tension (“I feel full of energy”; “I am lighthearted”; “Interesting things are happening to me”; “I feel relaxed”). One variable was selected for each scale using factor analysis. The reliability of these scales was found to be acceptable with Cronbach reliability coefficients greater than 0.9.

d) Contextual-level variables

Contextual-level characteristics were measured according to place of residence based on census tracts. Unemployment rates were measured by the percentage unemployment in each census tract. Eight other contextual characteristics were selected and indicators for each of these characteristics identified using data from the 1986 Canadian census. The contextual-level characteristics selected together with their indicators were 1) *gender distribution*, measured by proportion of men in census tracts; 2) *age group distribution*, measured by the proportion of the female population aged 0 to 24 years of age; 3) *education*, measured by the proportion of individuals without a high school diploma; 4) *proportions of the population that are immigrants*; 5) *family structure*, measured by proportions of the population that are single parent families and proportions of the population that are two-parent families with one child; 6) *income*, measured by the average annual household income; 7) *employment status*, measured by the labor force participation rate; and 8) *occupational status*, measured by the proportions of the population categorized as professionals, white collar workers, blue collar workers and farm workers.

e) Statistical analysis

The data analysis involved the estimation of multi-level equations using five analytical stages (see appendix). In the first stage we examined whether perceived health status varied among census tracts. In stage 2 we considered whether any

contextual variation observed in stage 1 could be explained by compositional effects, i.e., the between-context distribution in individual employment status and other individual-level characteristics. This was considered by measuring the reduction in the level of significance of contextual variations in explaining variations in perceived health. Stage 3 tested for between-context differences in "slopes" i.e., the estimated association of individual-level unemployment with perceived health. In stage 4 we tested for the significance of the association of contextual unemployment rates with individual-level perceived health. Finally stage 5 tested for the significance of interactions of individual-level unemployment and contextual unemployment rates in explaining variations in perceived health, i.e., did contextual unemployment help explain contextual variations in the individual-level unemployment-health relationship.

Stages 2 to 5 were repeated introducing sources of stress (other than unemployment), social support and psychosocial or socio-economic characteristics. However, prior to estimating multi-level equations, the stress and social support model was estimated using individual-level data only. This allowed us to identify problems with collinearity and outliers and to identify interactions between individual-level variables within the stress and social support model. A correlation matrix of logistic regression coefficients and condition indexes was used to examine collinearity. Cook's distances, as computed by the SPSS (1997) software was used to identify potential outliers. Logistic regression analyses were run on the perceived health variable. No collinearity or outlier problems were

found. Some interactions between individual-level variables were identified and these were included in the multi-level procedures used in the rest of the analysis.

The variables were introduced into the analysis in seven hierarchical blocks. First, the socio-demographic background variables (age and gender) entered followed by measures of sources of stress, socio-economic resources, social network, perceived social support and psychosocial resources. Contextual variables and interactions between individual and contextual level variables were then entered as the final block.

The introduction of individual level variables from the stress/social support model allowed us to examine whether the association between individual unemployment and perceived health, or the level of contextual variation in that association, was affected by the inclusion of stress/social support variables as well as to test for interactions between these variables and individual unemployment and the importance of these variables in explaining contextual variations in the unemployment-perceived health association.

Equations were estimated using multi-level logistic regressions (Goldstein, 1995) found in the MLwiN software (Goldstein et al., 1998). Markov Chain Monte Carlo methods (Goldstein et al., 1998) were used to examine the behaviour of the distribution of contextual-level variance only. Results of this procedure showed that each dependent variable was distributed normally. Statistical significance was

examined using the Wald test**.** A term is included in the model if it is statistically different from zero at the 0.05 level.

Results

Sample characteristics:

Among the study sample, 34% had levels of perceived health that formed the unhealthy category. This compared to 49% reporting having experienced some illness in the last two weeks and 14% having experienced functional disability of some form during the same period as recorded by separate questions in the survey.

The rate of unemployment in the sample was 10.5%. Unemployment in women was 7% and in men 12%. Unemployment was highest in the youngest age cohort (15-25) at 17%. Marital status was associated with unemployment. Only 8% of respondents living with a spouse or a companion were unemployed compared to 17% for those without a spouse or companion. Unemployment for single parents reached 18.1%. Occupational status, income and education were strongly associated with unemployment. A fifth of those classified in the first quintile of the educational level distribution, representing the lowest level of education, were unemployed, but only 3% of those in the fifth quintile were. The relationship between unemployment and income was linear, starting at 40% for those with

annual income of less than $6,000 through 3% for those with an annual income greater than $40,000. Similarly, the prevalence of unemployment was inversely associated with occupational status.

Males made up two thirds of the sample. Individuals in the 25-44 year age group made up 61% of the sample, with another 15% aged 15 to 24. Respondents were distributed normally in the occupational status scale, with less than five per cent at each end of the scale. Median income was between 20,000-30,000 Canadian dollars with 40% of the sample having income less than $20,000 and 20% having more than $40,000.

More than a third of respondents had experienced at least one stressful event. However, 45% claimed to live a life without stress. A quarter of the sample did not have a spouse or companion living with them while 82% had at least one child. Family size was small with more than two thirds with a single child. Two thirds of the respondents reported seeing family members at least once a week and 67% reported that leisure activities involved friends or family members. Over 80 per cent of the sample had a confidant, 75% did not feel lonely and 62% felt loved. One in ten respondents was not satisfied with their social relationships. The range of scores for both sense of coherence and locus of control is 1 to 16. Sense of coherence increases with higher scores, while locus of control decreases. Averages are respectively 12.6 and 5.9 respectively, indicating that both distributions are skewed on the positive side.

Analysis of unemployment and perceived health without modulators (Table 2):

The variation in perceived health attributable to variations among contexts is given by the variance of the intercept attributable to contexts. The results of estimating the variance component model (equation 1 in appendix) are reported in columns 1 and 2. This variance (0.049) is statistically significant with a standard error of 0.015 indicating that perceived health differs between contexts.

Introducing individual-level unemployment as a predictor of perceived health tests for the robustness of this contextual variation in health for compositional effects (equation 2, appendix). The results are shown in columns 3 and 4. Individual-level unemployment is significantly associated with perceived health in the expected direction: 39% of the unemployed were “unhealthy”, compared with 33% for the employed. However, differences in the prevalence of individual unemployment among contexts did not change the estimate for the variance of the intercept attributable to contexts. Thus, contextual variation in perceived health is not a consequence of the distribution of unemployed individuals in different contexts.

Contextual variation in the association of individual-level unemployment with perceived health is determined by the variance of the regression coefficient for individual-level unemployment in the perceived health equation attributable to contexts and the covariance of the intercept with the regression coefficient

equations 4-6, appendix). These estimates are recorded in columns 5 and 6, line 6 and 7. Neither estimate is statistically significant indicating that the hypothesis of no difference in the association of individual-level unemployment and perceived health among contexts cannot be rejected.

The significance of contextual level unemployment in explaining contextual variations in perceived health is determined by introducing contextual-level unemployment into the equation (equation 9, appendix). The bi-variate association of contextual-level unemployment with individual-level perceived health was statistically significant, indicating a decrease in perceived health with an increase in unemployment rates. However the regression coefficient associated with contextual unemployment was not statistically significant (see columns 7 and 8, line 3) at the 0.05 level implying that variations in contextual level unemployment did not explain the contextual variations observed in perceived health.

Finally, the significance of interactions between individual employment status and contextual-level unemployment in explaining variations in perceived health is determined by the regression coefficient on the interaction term (equation 9, appendix). The sign on the coefficient indicates that the association between individual-level unemployment and perceived health is less in contexts with higher levels of unemployment. However this coefficient is not statistically significant (columns 9 and 10, line 5) indicating that the hypothesis that the association

between individual level unemployment and perceived health is independent of contextual level unemployment cannot be rejected.

In summary, the multi-level analysis of unemployment and perceived health based on the “simple” model with no modulators found that contextual variation in perceived health remained after allowing for individual level employment status. However, the association between individual level unemployment and perceived health did not differ significantly between contexts and contextual level unemployment did not help to explain the contextual level variation in perceived health.

Analysis of unemployment and perceived health with the stress/social support modulating variables (Table 3)

The estimated contextual variation in perceived health following introduction of the socio-demographic variables was 0.049 (column 1 line 30) indicating that contextual variation was not explained by differences in the socio-demographic composition of contexts. Gender and age associations with perceived health did not differ significantly among contexts. The regression coefficient for individual unemployment was not affected significantly with the introduction of these variables.

Introducing sources of stress reduced contextual variation of perceived health to zero (column 3 line 30). The association between the number of stressful events and perceived health and between perceived stress and perceived health both varied among contexts (column 3, lines 33 and 34) though the association between occupational status and perceived health did not. These associations were all in the expected direction.

The rest of the analysis was focussed on the estimated coefficients for the remaining blocks of variables and their interactions with variables already entered into the equations, because the introduction of the stress/social support variables removed all contextual variations in perceived health.

The introduction of socio-economic variables individual unemployment reduced remained by a third the estimated size of the unemployment-perceived health association, though it remained statistically significant. This could not be explained by collinearity as shown by the stability in the estimates of the standard error of the regression coefficients (Table 3, part A) and the contextual variances and covariances (Table 3, part B). The estimated coefficients were statistically significant for all the socio-economic variables. Though perceived health was greater with higher education and higher occupational status, respondents with both higher education and higher occupational status were not at a special advantage. However, there was positive interaction between income and occupational status. This suggests a synergy between income and occupational

status in the determination of health perceptions. The interaction of age and income was statistically significant: with higher income, the association of age and perceived health was decreased.

All of the regression coefficients of socio-economic resources were statistically significant. Also, interactions between occupational status and income and education were found. Though respondents perceived their health as better with higher education and higher occupational status, respondents with both higher education and higher occupational status were not at a special advantage. By contrast, income and occupational status more than add up: there seems to be a synergy between them.

Following the introduction of the social network variables, the estimated coefficient for individual unemployment was reduced slightly and the contextual variation in the coefficient on number of stressful events lost statistical significance. This provides some support for the notion that social networks might “dampen” the effects of stress and unemployment on perceived health. All social network variables were significantly associated with perceived health. Interactions between living with a companion and the number of children, and between education and having a confidant were statistically significant indicating that the presence of social networks increased the odds for health perceptions being in the “healthy” category. However, the interaction between living with a companion and number of

children is due to a high proportion of respondents without children *and* not living with a companion being “unhealthy”, which may reflect a selection effect.

The introduction of indicators of perceived social support led to the loss of statistical significance for the coefficient on unemployment and modified the association of perceived health with social network indicators, (except for those indicators pertaining to children). These findings imply that perceptions of social support may “dampen” the effect of unemployment on perceived health as well as “dampening” the importance of social networks in the determination of health perceptions. All indicators of perceived social support were strongly associated with perceived health. The interactions of satisfaction with both social relations and feeling lonely were significant, indicating a more than proportional decrease in perceived health when an individual is unsatisfied with social relations or feels lonely.

Three contextual-level variables were significantly associated with perceived health: proportion of families with both parents present, proportion of non-immigrants and average income.

Although estimated coefficients for both sources of stress and perceived stress varied significantly between contexts, these variations were not explained by contextual unemployment. However, the interaction between contextual average income and perceived stress was significant indicating that the contextual variation

in the association of perceived stress with perceived health is partially explained by the between-context distribution of income. In other words, as illustrated in Figure 1, the variation in perceived health associated with differences in perceived stress is significantly less in higher income contexts. In contexts with average income below $20,000, individuals with a very high level of perceived stress were over three times (50% versus 14%) as likely to have health perceptions in the "unhealthy" category as individuals with low levels of perceived stress. In contexts with average incomes of $50,000 or more, those with very high perceived stress were less likely to have "unhealthy" health perceptions, both in absolute terms (34%) and relative to individuals with other levels of perceived stress (twice as likely as individuals with low stress).

Discussion

The goal of this paper was to examine the association of unemployment with health status within the context provided by an environment where the individual experience of unemployment was more or less shared with others. It was also recognized that the association of unemployment and health status depended on a number of individual and contextual characteristics. These characteristics, at both the individual and the contextual levels, were taken from the stress/social support model of health.

Results showed that individual unemployment was significantly related to perceived health. However, this association did not vary among contexts and contextual unemployment was not related to perceived health. However, unemployment rates were significantly related to individuals' perceived health in a bi-variate regression equation. Thus, ecological analysis of the association of unemployment with health status would yield statistically significant results, as in Mansfield et al. (1999). Nevertheless, this study did not provide evidence to support the hypothesis that the association of unemployment with health status depends upon whether the experience of unemployment is shared with people living in the same environment. Turner (1995) found that the association between individual unemployment and individual health increased with increasing unemployment rates. One explanation of Turner's findings is the different analytical methods employed in the analysis of unemployment and health. In particular Turner (1995) did not use a multi-level procedure. Past studies have shown that significant contextual variations obtained with ordinary least square methods were not reproduced using multi-level procedures (Duncan, Jones and Moon, 1999). Alternatively, because Turner used a sample of the US workforce, the different findings might reflect underlying differences in the relationships between unemployment and health in the two study settings associated with the marked differences in social security and medical care systems between Canada and the US (Ross et al., 2000; World Health Organisation, 2000).

All of the individual-level variables selected from the stress/social support model showed significant association with perceived health and this remained so for almost all of the variables through the introduction of the seven blocks of variables.

Education and household income were significantly associated with perceived health either as main effects or in interactions, mainly with occupational status. These results support the suggestion of Arber (1996) that social status or social class, measured by indicators of access to social and economic resources, is one of the main sources of inequality in health. Unemployment can be seen as one dimension of social class. Thus, health status, unemployment and socio-economic resources of the individual are intrinsically linked. Wadsworth et al. (1999) interpreted similar results in a social capital framework in which unemployment is related to both socio-economic and health capitals. Our results also support Turner's suggestion that the association between unemployment and health may be due to financial strain derived from loss of income experienced with unemployment (Turner, 1995).

Unemployment ceased to be significantly associated with perceived health with the introduction of perceived social support variables. It may be that social support is playing an intervening role in the relationship of unemployment and health, as suggested by Roberts et al. (1997). In a study of unemployment and health in samples of African-American and white populations, other investigators found that

satisfaction with social relations was the best predictor of psychosocial well-being (Rodriguez et al., 1999).

The only individual-level relationship found to vary among contexts was that between stress and health. This suggests that the effect of stress on health is sensitive to context, and among the contextual characteristics, economic well-being seems to have a dominant role buffering the effect of stress on health.

These findings must be viewed in the light of restrictions on analysis arising from the cross-sectional study design and the inability of such designs to establish causality. Iversen et al. (1987) concluded that the association between health and unemployment is due to a selection effect, i.e. bad health predicts unemployment. Kasl and Jones (2000) examined the ability of different research designs to distinguish between causality and selection hypotheses. They concluded that research findings provide support for both hypotheses. This paper was not concerned with the direction of the potential causal linkages between unemployment and health. Instead we were interested in examining the variations in their association in contexts with varying unemployment rates. Nevertheless, by excluding individuals who report being unemployed due to illness from the study sample we reduce the potential influence of health status on employment in the analysis. A number of recent studies have investigated the causal links between unemployment and health. Clausen (1999) concluded that unemployment does predict mental health status; however, physical health seemed to play a selection

role in the success of job seekers. Hammarstrom et al. (2000), studying a sample of young Swedes, showed that health status had only a minor selection effect. Finally, unemployment is a predictor of mortality (Martikainen and Valkinen, 1996; Morrel et al., 1999). The general impression emerging from research on this issue is that both the selection effect (health status predicts unemployment) and the causal hypothesis (unemployment is a risk factor for health) seem to be valid, and are reinforcing each other sequentially--low health status increases the odds for unemployment, while unemployment decreases health status (Leino-Arjas et al., 1999).

Above all, studies such as ours demonstrate both the subtlety and complexity of individual and contextual level influences on the health of individuals. We have reported this investigation in systematic detail to illustrate this as concretely as possible. Our results caution against simplistic interpretations of the unemployment-health relationship and reinforce the importance of using multi-level statistical methods for investigation of it.

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Appendix

The five analytical steps are as followed:

Step 1: *Variance component model*: *contextual variation in perceived health.* In this stage we examined whether perceived health status vary among census tracts. The examination of the two components (individual and contextual) of perceived health variance helps answer the following question: Does the distribution of the "I" (i=1,…,I) individuals health status vary among "J" contexts (j=1,…,J)? If the contextual variance component (γ_j) is not significantly different from zero, the hypothesis that perceived health do not vary among contexts cannot be rejected (Table 1, Step 1). For individual <i>, in context <j>, perceived health, h_{ij}, is given by:

(1) $h_{ij} = \overline{a}_j + \varepsilon_{ij} + \gamma_j$

where $\overline{a_j}$ is the weighted average of h_{ij} over 'J' contexts and the weights are a function of the number of individuals in each of the contexts. Dependent variable h_{ij} will vary among contexts if the standard error of γ_j is significantly different from zero.

Step 2: Compositional effects on contextual average perceived health status. We then examined whether perceived health differences between contexts could be explained by the composition of the population in different contexts. This hypothesis cannot be rejected if, after introducing individual-level variables (such as individual unemployment), the contextual variance component, γ_j, is not significantly different from zero (Table 1, Step 2). Thus, we are looking forward to answer to this question: Are variations in perceived health among contexts explained by differences in the composition of context? Let K be the vector of individual-level independent or control variables used to describe the individual-level process by which perceived health is generated. When individual-level unemployment only is entered in the regression equation, K=1. Equation 1 can be modified to:

(2) $h_{ij} = \overline{a}_j + \gamma_j + \sum_k \overline{\mathrm{B}}_{kj}\Omega_{kij} + \varepsilon_{ij}$

where $\overline{\mathrm{B}_{kj}}$ is a vector of weighted averaged regression coefficients over contexts.

Step 3. C*ontextual variation in the individual-level process.* This involves a test of the variation among contexts in the association of individual-level variables with perceived health. We are seeking an answer to the following question: Does the individual-level process of association between individual characteristics and their

perceived health status vary among contexts? In equation (2) the individual-level process is the same in each contextual. This constraint can be relaxed by introducing μ_{kj}, which measures variations in the K regression coefficients attributable to the J contexts, i.e.:

(3) $h_{ij} = (\overline{a}_j + \gamma_j) + \sum_k (\overline{\mathrm{B}}_{kj} + \mu_{kj})\Omega_{kij} + \varepsilon_{ij}$

The μ_{kj} terms are tested for statistical significance (Table 1, Step 3). If the terms are not statistically significant then the hypothesis that there is no variation among contexts in the individual-level process cannot be rejected.

Steps 4 and 5: *contextual effects on health:* Does variation in contextual-level variables explain variations in perceived health? In equation (3), the a_j intercepts and the B_{kj} individual-level effects are represented by:

(4) $a_j = \overline{a_j} + \gamma_j$

(5) $\mathrm{B}_{kj} = \overline{\mathrm{B}_{kj}} + \mu_{kj}$

respectively. Hence both a_j and B_{kj} can be substituted in equation (3) to leave:

(6) $h_{ij} = a_j + \sum_k \mathrm{B}_{kj}\Omega_{kij} + \varepsilon_{ij}$

Suppose it is possible to identify a contextual-level process defined by 'L' contextual-level characteristics Γ_{lj}, or a single contextual-level variable such as unemployment rates, to explain contextual-level variations in both the a_j intercepts and the B_{kj} individual-level process. Contextual-level variables can be used to predict both a_j and B_{kj} as follows:

(7) $a_j = \overline{a}_j + \sum_l \Phi_l' \Gamma_{lj} + \gamma_j$; and

(8) $\mathrm{B}_{kj} = \overline{\mathrm{B}}_{kj} + \sum_l \Phi_l'' \Gamma_{lj} + \mu_{kj}$

where vectors Φ_l' and Φ_l'' represent regression coefficients associated with contextual-level characteristics. In equations (4) and (5), all contextual-level variations in perceived health is attributable to the two error terms γ_j and μ_{kj} in contrast with (7) and (8) where part of the contextual variation is attributable to specific contextual-level characteristics. Thus, contextual characteristics in equations (7) and (8) are linked explicitly with contextual variations. Equations (7)

and (8) can be substituted in equation (6) to give an equation for a multi-level model in which both individual-level and contextual-level processes generate the distribution of the dependent variable as follows:

(9) $h_{ij} = (\overline{a}_j + \sum_l \Phi_l' \Gamma_{lj} + \gamma_j) + (\overline{\mathrm{B}}_{kj} + \sum_l \Phi_l'' \Gamma_{lj} + \mu_{kj})\Omega_{kij} + \varepsilon_{ij}$

Step 4. *Contextual effects on health: Are contextual-level variables associated with perceived health?* The first term of equation (9), contains the vector of regression coefficients representing the direct effects of contextual-level variables on perceived health. Attention is therefore focused on $\sum_l \Phi_l' \Gamma_{lj}$ in the estimates of a regression equation were interaction terms between individual and contextual-level interactions are excluded (Table 1, Step 4). If the Φ' terms are not significant then the hypothesis that variation in perceived health is not explained by the contextual-level variable cannot be rejected.

Step 5. C*ontextual effects on health: Are there interactions between contextual-level variables and individual-level variables?* This involves a test of the significance of the interactions between individual and contextual-level variables. Attention is focused on terms in the form of $\sum_l \Phi_l'' \Gamma_{lj}$ in the estimates of equation (9) (Table 1, Step 5). If the interaction term is not significant, the hypothesis that variation in the individual level process between contexts not explained by the contextual-level variable cannot be rejected.

Interactions between individual and contextual-level variables are incorporated in the third term of equation (9) in the form of the product of the expression for the contextual-level variables and the vector of individual-level independent variables. However, contextual-level variables are entered in the model where an individual-level process has already been considered and contextual-level variations in the dependent variable and the individual-level process are defined with explicit terms. Once these features have been accommodated in the model, failure to reject the contextual-level model is a strong indication of the presence of contextual effects.

Finally, perceived health, the dependent variable in this study, is dichotomous; the regression equations in Table 2 require transformation. A dichotomous, dependent variable y_{ij} is distributed according to the binomial:

(10) $y_{ij} = \pi_{ij} + e_{0ij} x^{*_0}$

The term h_{ij} in equations (1), (2), (3), and (9) is defined as:

(11) $h_{ij} = logit(\pi_{ij})$

while in the new error term, the term e_{0ij} is fixed to one and :

(12) $h_{ij}=(\overline{a}_j+\sum_l \Phi_l' \Gamma_{lj}+\gamma_j)+(\overline{B}_{kj}+\sum_l \Phi_l'' \Gamma_{lj}+\mu_{kj})\Omega_{kij}+\varepsilon_{ij}$

In equation (12), the γ_j and the μ_{kj} terms refer to '"random"' variations. Equations (12) can be rearranged to emphasize the fixed and the random effects:

(13) $h_{ij}=(\overline{a}_j+\sum_l \Phi_l' \Gamma_{lj}+(\overline{B}_{kj}+\sum_l \Phi_l'' \Gamma_{lj})\Omega_{kij})+(\varepsilon_{ij}+\gamma_j+\mu_{kj}\Omega_{kij})$

The fixed part of the model is defined in the first set of parentheses. The terms referred to the usual components of the regression models: intercept, regression coefficients, predictor variables and interactions terms. In the last set of parenthesis the random terms are found. They refer to the usual individual error of prediction in regression model, plus a term for the random variation linked to the intercept and terms linked to the variation in the regression coefficients themselves. These are the γ_j and the μ_{kj} terms. Also the covariances between them can be defined. These covariances are indicators of join variation between the level of perceived health state in a context and the direction of the association of a predictor of health with the perceived health status. For example, a positive covariance between γ_j and the μ_{kj} in this study, were μ_{kj} refer to individual level unemployment, means that the higher the average health status in a context, the more positive the association of unemployment with not being in good health. Thus, it is in the random part of the equation that evidence for contextual variation in health status and for differences in the association of health status with unemployment among contexts is found.

The equations were estimated using multi-level logistic regressions (Goldstein 1995) found in the MLwiN software (Goldstein et al. 1998). Markov Chain Monte Carlo methods (Goldstein et al. 1998) were used to examine the behaviour of the distribution of contextual-level variance γ_j only. Results of this procedure showed that for each dependent variable this was distributed normally. Statistical significance was examined using the Wald test**.** A term (γ_j, μ_{kj}, Φ_l, $\Phi_l^{"}$, B_{kj}, Γ_{lj}) is included in the model, if it is statistically different from zero at the 0.05 level.

Table 1. Analytic steps, research questions, multi-level equations, and statistical tests

Research questions	Equations	Tests
Do health status differs among contexts?	$h_{ij} = \overline{a}_j + \varepsilon_{ij} + \gamma_j$	$\gamma_j = 0$
Are health status differences between contexts due to compositional effects?	$h_{ij} = \overline{a}_j + \gamma_j + \sum_k \overline{\mathrm{B}}_{kj}\Omega_{kij} + \varepsilon_{ij}$	$\gamma_j = 0$
Do associations of individual-level characteristics with health status differ among contexts?	$h_{ij} = (\overline{a}_j + \gamma_j) + \sum_k (\overline{\mathrm{B}}_{kj} + \mu_{kj})\Omega_{kij} + \varepsilon_{ij}$	$\mu_{kj} = 0$
Are contextual-level variables associated with contextual differences in intercepts?	$h_{ij} = (\overline{a}_j + \sum_l \Phi_l{}' \Gamma_{lj} + \gamma_j) + (\overline{\mathrm{B}}_{kj} + \sum_l \Phi_l{}'' \Gamma_{lj} + \mu_{kj})\Omega_{kij} + \varepsilon_{ij}$	$\Phi_l{}' = 0$
Are there interactions between contextual-level variables and individual-level variables whose association with health status indicators showed variations among contexts?	$h_{ij} = (\overline{a}_j + \sum_l \Phi_l{}' \Gamma_{lj} + \gamma_j) + (\overline{\mathrm{B}}_{kj} + \sum_l \Phi_l{}'' \Gamma_{lj} + \mu_{kj})\Omega_{kij} + \varepsilon_{ij}$	$\Phi_l{}'' = 0$

Table 2. Association of Perceived Health with individual-level unemployment and contextual-level rate of unemployment

	Direction of variables	Variance Component		Composition Effect		Contextual Variation		Contextual Unemployment		Interaction: individual & contextual unemployment	
		Coeff.	Std err.	Coeff.	Std err.	Coeff.	Std err.	Coeff.	Std err.	Coeff.	Std err.
Fixed part		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Individual-level variables											
1. Constant		- 0,665 (*)	0,026	- 0,684 (*)	0,028	- 0,684 (*)	0,028	- 0,756 (*)	0,058	- 0,761 (*)	0,062
2. Respondent unemployment	No=0/ Yes=1	----($)	----	0,257 (*)	0,071	0,256 (*)	0,071	0,240 (*)	0,072	0,245 (*)	0,076
Contextual-level variables											
3. Unemployment rates	Low to high	----	----	----	----	----	----	0,514	0,364	0,551	0,399
Interaction between individual and context											
4. 2 by 3		----	----	----	----	----	----	----	----	-0,189	0,850
Random part											
Variance components											
5. Constant		0,049 (*)	0,015	0,049 (*)	0,016	0,050 (*)	0,017	0,049 (*)	0,017	0,049 (*)	0,017
6. Respondent unemployment		----	----	----	----	0,010	0,087	0,014	0,088	0,013	0,088
Covariances components											
7. 5 by 6		----	----	----	----	-0,007	0,032	-0,007	0,032	-0,008	0,032

($) Not included in the model

(*) Coefficient greater than 1.96 their standard errror

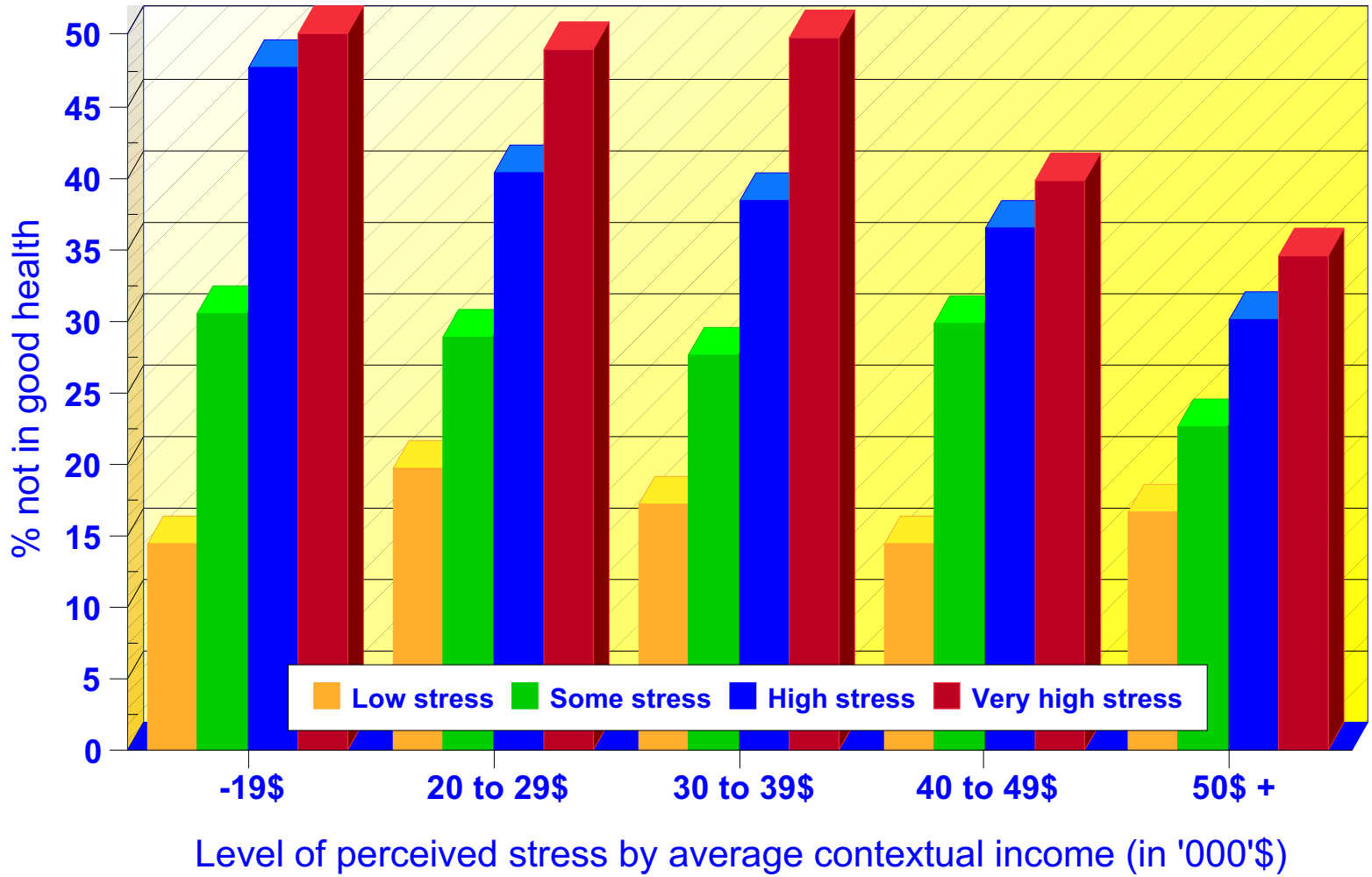
Table 3. Association of Perceived Health with individual-level unemployment and contextual-level rate of unemployment:
Introducing control variables--Socio-demographic, Sources of stress, Socio-economic resources, Social network, Perceived social support, and Psycho-social resources

	Direction of variables	Socio-demographic control variables		Sources of Stress control variables		Socio-economic resources control variables		Social network control variables		Perceived social support control variables		Psycho-social control variables		Individual and contextual variable interactions	
		Coeff.	Std err.	Coeff.	Std err.	Coeff.	Std err.	Coeff.	Std err.	Coeff.	Std err.	Coeff.	Std err.	Coeff.	Std err.
A) Fixed part		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
a) Unemployment															
Individual-level variables															
1. Constant		- 0.904 (*)	0.24401	1.092 (*)	0.275	1.521 (*)	0.285	1.947 (*)	0.334	0.735 (*)	0.356	1.477 (*)	0.387	2.011 (*)	0.633
2. Respondent unemployment	No=0 / Yes=1	0.262 (*)	0.073	0.293 (*)	0.078	0.192 (*)	0.080	0.164 (*)	0.080	0.108	0.081	0.078	0.083	0.085	0.083
Contextual-level variables															
3. Unemployment rates	% of unemployed	0.572	0.368	0.511	0.385	0.235	0.388	0.281	0.386	0.333	0.393	0.213	0.400	-0.115	0.450
Interaction between individual and context															
4. 2 by 3		----	----	----	----	----	----	----	----	----	----	----	----	----	----
b) Control variables															
Individual-level variables															
Socio-demographic variables															
1. Gender	Male=0 / female=1	0.013	0.046	-0.024	0.048	3.10E-03	0.048	0.008	0.049	-0.053	0.050	- 0.108 (*)	0.051	- 0.114 (*)	0.051
2. Age	From 15 to 95	-0.013	0.013	-0.019	0.013	-0.024	0.013	- 0.030 (*)	0.014	- 0.035 (*)	0.015	-0.027	0.015	-0.026	0.015
3. Age square	Square of age	3.97E-04 (*)	1.52E-04	4.86E-04 (*)	1.58E-04	5.53E-04 (*)	1.26E-04	6.17E-04 (*)	1.70E-04	6.91E-04 (*)	1.72E-04	5.75E-04 (*)	1.75E-04	5.64E-04 (*)	1.75E-04
Sources of stress															
4. Number of stressful events	Few to many	----	----	0.045	0.036	0.032	0.036	0.029	0.036	-3.05E-03	0.036	-0.038	0.038	-0.039	0.038
5. Perceived stress	High to low	----	----	- 0.534 (*)	0.033	- 0.544 (*)	0.033	- 0.527 (*)	0.033	- 0.439 (*)	0.034	- 0.342 (*)	0.035	- 0.567 (*)	0.113
6. Occupational status	Low to high	----	----	- 0.016 (*)	0.002	- 0.010 (*)	0.002	- 0.010 (*)	2.25E-03	- 0.011 (*)	0.002	- 0.010 (*)	2.34E-03	-9.48E-03 (*)	2.35E-03
Socio-economic resources															
7. Education	Low to high	----	----	----	----	- 0.059 (*)	0.014	-8.72E-03	0.029	-0.026	-0.030	-1.42E-02 (*)	3.02E-02	-0.015	0.030
8. Household income	Low to high	----	----	----	----	- 0.062 (*)	0.017	- 0.051 (*)	0.017	- 0.046 (*)	0.017	- 0.041 (*)	0.017	- 0.037 (*)	0.018
9. Interaction of 3 by 8		----	----	----	----	-3.29E-03 (*)	1.26E-03	-3.50E-03 (*)	1.27E-03	-3.79E-03 (*)	1.29E-03	-3.63E-03 (*)	1.32E-03	-3.69E-03 (*)	1.32E-03
10. Interaction of 6 by 7		----	----	----	----	2.53E-03 (*)	8.86E-04	2.51E-03 (*)	8.89E-04	2.33E-03 (*)	8.99E-04	2.33E-03 (*)	9.17E-04	2.30E-03 (*)	9.18E-04
11. Interaction of 6 by 8		----	----	----	----	-4.32E-03 (*)	1.22E-03	-4.33E-03 (*)	1.22E-03	-4.37E-03 (*)	1.24E-03	-4.26E-03 (*)	1.26E-03	-4.06E-03 (*)	1.27E-03
Social network															
11. Living with a companion	Not married=0 / married=1	----	----	----	----	----	----	-0.063	0.062	0.035	0.064	-2.89E-03	0.065	5.38E-03	0.065
12. # of children	None to many	----	----	----	----	----	----	- 0.222 (*)	0.107	- 0.209 (*)	0.109	-0.208	0.110	-0.200	0.110
13. Family reunions	Many to none	----	----	----	----	----	----	0.050 (*)	0.024	-4.52E-04	0.025	-0.016	0.025	-0.015	0.025
14. Group leisure	Alone to accompagnied	----	----	----	----	----	----	- 0.118 (*)	0.023	-0.017	0.024	-7.75E-03	0.025	-8.10E-03	0.025
15. Have a confidant	None=0 / confidant=1	----	----	----	----	----	----	- 0.157 (*)	0.063	0.020	0.065	0.066	0.066	0.066	0.066
16. Interaction of 11 by 12		----	----	----	----	----	----	0.282 (*)	0.119	0.269 (*)	0.120	0.260 (*)	0.122	0.259 (*)	0.122
17. Interaction of 7 by 15		----	----	----	----	----	----	- 0.065 (*)	0.031	-0.056	0.031	-0.054	0.032	-0.053	0.032
Perceived social support															
18. Satisfaction with social relations	High to low	----	----	----	----	----	----	----	----	0.445 (*)	0.050	0.386 (*)	0.051	0.383 (*)	0.051
19. Feeling lonely	Not alone=0 / alone=1	----	----	----	----	----	----	----	----	0.314 (*)	0.062	0.116	0.065	0.116	0.065
20. Feeling loved	Not loved=0 / loved=1	----	----	----	----	----	----	----	----	- 0.368 (*)	0.052	-0.035	0.058	-0.038	0.056
21. Interaction of 18 by 19		----	----	----	----	----	----	----	----	- 0.242 (*)	0.081	- 0.324 (*)	0.083	- 0.325 (*)	-0.132
Psycho-social resources															
22. Sense of coherence	High to low	----	----	----	----	----	----	----	----	----	----	- 0.132 (*)	0.010	- 0.132 (*)	0.010
23. Locus of control	Low to high	----	----	----	----	----	----	----	----	----	----	0.072 (*)	0.013	0.073 (*)	0.013
24. Interaction of 8 by 23		----	----	----	----	----	----	----	----	----	----	- 0.017 (*)	7.31E-03	- 0.016 (*)	7.32E-03
25. Interaction of 6 by 22		----	----	----	----	----	----	----	----	----	----	-1.53E-03 (*)	6.09E-03	-1.55E-03 (*)	6.09E-04
Contextual-level variables															
26. % of families	% family with both parents	----	----	----	----	----	----	----	----	----	----	----	----	- 1.171 (*)	0.378
27. % of non-immigrant persons	% not immigrants	----	----	----	----	----	----	----	----	----	----	----	----	1.056 (*)	0.514
28. Average income	Average income in CAN$	----	----	----	----	----	----	----	----	----	----	----	----	-1.75E-05 (*)	8.70E-06
Interaction between individual and context															
29. 5 by 28		----	----	----	----	----	----	----	----	----	----	----	----	7.50E-06 (*)	3.50E-06
B) Random part															
a) Unemployment															
Variance components															
30. Constant		0.052 (*)	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
31. Respondent unemployment		7.00E-03	0.088	1.50E-02	0.087	0.006	0.086	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Covariance components															
32. 30 by 31		-0.012	0.032	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
b) Control variables															
Variance components															
33. Number of stressful events		----	----	0.044 (*)	0.021	0.040 (*)	0.021	0.036	0.020	0.037	0.020	0.056	0.023	0.053	0.023
34. Perceived stress		----	----	8.13E-03 (*)	2.81E-03	7.76E-03 (*)	2.77E-03	7.24E-03 (*)	2.69E-03	7.50E-03 (*)	2.78E-03	7.36E-03 (*)	2.84E-03	6.51E-03 (*)	2.74E-03

($) Not included in the model

(*) Coefficient greater than 1.96 their standard errror

Figure 1. Association of perceived health with perceived stress in context with different average income levels



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