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Article abstract

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Some Effects of Unemployment on the Health of Unemployed Québec Workers

Lee Soderstrom

The author estimates the effect of being unemployed on the health of unemployed Québec workers. The results imply that the health effects are heterogenous, at least for unemployed men and women.

The idea that unemployment is bad for people's health is a popular one. The search for evidence has led to this paper. To assess the effects of unemployment for the health of unemployed Québec workers, the health of some unemployed workers has been compared with the health of some employed workers, using 5 measures of their mental and physical health.

This analysis relates to Québec workers because this is a significant group of workers, not because the health effects for them are thought to be unique. Unemployment has existed elsewhere, too. However, job scarcity having long been such a persistent problem in Québec, any health effects may be easier to detect using Québec data.

The focus here is on two questions. First, is the health of unemployed workers affected by their being unemployed rather than employed? Second, if there are effects, are they socially important, in terms of both the proportion of the unemployed who experience health effects and the size of the effects they experience? Even if there is a statistically significant relationship between health and unemployment, the social importance of the effects depends on their distribution among the unemployed and on their size. If unemployment reduced by 1% the health of 2% of the unemployed, one's appraisal of the importance of the unemployment effects would be different than if it reduced by 20% the health of 40% of the unemployed.

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To answer these questions, a series of multivariate health models have been developed. These models relate the workers' health to their unemployment status and to other determinants of their health. A number of unemployment variables are used not only to differentiate the unemployed from the employed, but also to differentiate the unemployed themselves. A key idea underlying this analysis is that the health effects of unemployment are not the same for all unemployed workers, varying among them according to their socio-economic and personal characteristics.

In the first section of this paper the theoretical underpinnings of the models are sketched, and this analysis is situated within the existing empirical literature. Then, the cross-section data used to estimate the models is described in the second section, and the models' specification in the third. The parameters of each model were estimated using one of the multivariate estimation techniques listed in the fourth section. Using the models' parameter estimates, the health effects of unemployment were gauged. The results regarding the existence of effects are presented in the fifth section, and their social importance in the sixth section.

A GLIMPSE OF THE LITERATURE

There are at least two reasons why unemployment caused by difficulties in finding work might have a negative effect on the health of the unemployed. One is that being unemployed reduces one's income, and having less to spend on food, housing, clothing, and medical care, the health of the unemployed deteriorates. Although this argument may still have some relevance, it is probably more applicable to the situation in the 1930s. Unemployment insurance, publicly financed health care, higher real wages while working and multi-earner families mean that the adverse financial consequences of unemployment may not be as great today as they were in the 1930s. Consequently, most researchers now emphasize a second reason for negative health effects: unemployment can be stressful and stress can cause mental and physical health problems. This stress may stem from concerns about family finances and about one's social role. This argument that unemployment is stressful has been widely discussed in the literature, so it is unnecessary to present it again here¹.

This argument suggests that the health of unemployed workers should be worse than what it would be if they were employed. But why should the income loss and the stress caused by unemployment necessarily be bigger

¹ For a more detailed survey of this literature, see DOOLEY and CATALANO, 1980; GRAVELLE, 1984; KASL, 1979; RABKIN, 1976; or WARR, 1982.

health hazards than the stress and physical dangers associated with work? Working involves a variety of physical dangers. It can be stressful, too. And for working women, balancing the demands of their jobs and their homemaker responsibilities may also be stressful. An additional complication is that the health effects may vary among the unemployed, depending on their line of work, for example. Some jobs are certainly more stressful than others. Thus, even if unemployment itself engendered no stress, the effect on stress — and thereby on health — of being unemployed rather than employed will vary among the unemployed according to their line of work. For some workers, being unemployed may be less stressful than working, and for others, more stressful.

Moreover, the health effects may be different for the unemployed who had been working steadily in the months prior to their current spell of unemployment than for those who were not. And someone who had recently experienced other stressful events (e.g. a divorce or a death in their family) may react differently to unemployment than someone who had not.

Thus, unemployment may improve the health of some workers, have no effect for some, and impair the health of others. And the magnitudes of the positive and negative effects may vary as well. The models used in this analysis provide for such heterogeneous health effects. Most researchers, however, have paid little attention to the heterogeneity of the effects. Some have studied relatively small, homogeneous groups of unemployed. But one cannot generalize from such results. Other researchers have assumed the effects are the same for all unemployed. But, if that assumption is invalid — as the results presented here suggest — their results yield a misleading picture of unemployment's health effects.

Researchers have generally used either mortality rates (e.g. suicide rates) or various mental health indices to measure the health effects. But any effects need not be limited to these two aspects of health. Results are presented here not only for 3 mental health measures, but also for two physical health measures — blood pressure and the probability of new health problems — which have not been widely used by previous researchers.

There is no direct evidence available regarding the health effects experienced by unemployed Québec workers. Much of the available evidence for workers elsewhere, however, suggests that unemployment does have negative health effects. But the significance of those health effects is still not completely clear for at least 4 reasons. First, some researchers using similar methods reach opposite conclusions. The American researcher Brenner (1979) argues that unemployment (a business downturn) has substantial negative health effects. But using very similar methods, Adams (1981) using

data for Canada as well as Forbes and McGregor (1984) using data for Scotland find little evidence that it does. At minimum, this warns that results for other countries may not be applicable to Québec.

Second, a number of researchers have argued that the likelihood of health problems is directly related to the number of stressful 'life events', one of which is unemployment (Dohrenwend and Dohrenwend, 1974). But these researchers often do not separate the effects of unemployment from the effects of other stressful events; they only count the number of stressful events of all types. Thus, they do not provide direct evidence that unemployment has health effects. Some Canadian results of this type are provided by McFarlane, Norman, Streiner, and Roy (1983). In the work reported here, however, the health effects of unemployment and of other stressful events have been estimated separately.

Thirdly, many researchers have been preoccupied with determining only whether there are «statistically significant» health effects. They have neglected to estimate the percent of the unemployed whose health is affected and the size of the effects experienced. But, as argued above, such information is needed in order to judge the importance of the effects. Thus, results are presented here on the distribution and size of the health effects.

Finally, the sparse Canadian literature does not provide strong evidence that unemployment has substantial effects on Canadians' health. Certainly the previously cited works of Adams (1981) and McFarlane *et al.* (1983) do not. Grayson (1985) monitored the health of a group of laid-off Ontario workers over a 2 year period following the closure of their factory. But he did not use an adequate control group². Krahn, Lowe and Tanner (1985) argue that unemployment caused mental health problems. But they have data for only 39 unemployed, and their evidence is equally consistent with the hypothesis that the mental health problems caused the unemployment.

D'Arcy and Siddique (1986), using the same type of cross-section data as used in this research, found a stronger negative relationship between unemployment and health than is reported here. The problems with their analysis are discussed at the end of this paper.

2 Grayson apparently only compares at various points in time the health of the laid-off workers who remained unemployed with the health of those who had found work elsewhere. He apparently does not control for other difference between the people in these two groups which might account for the reported differences in their health, even though his own results suggest that the health of the people in the two groups was quite different even before the factory was shutdown.

DATA FROM CANADA HEALTH SURVEY

The data used are from the recent Canada Health Survey (CHS), a special household survey covering the noninstitutionalized population of the 10 provinces (Statistics Canada, 1981). The CHS provides data for 2493 Québec workers who were either employed or unemployed and who were between 15 and 64 years of age. Because the health effects may vary among demographic groups, separate analyses have been made for married women aged 25 to 64, married men 25 to 64, and youth 15 to 24³.

These data were gathered between July 1978 and March 1979, a period in which work opportunities for unemployed workers were limited. The Québec unemployment rate (seasonally adjusted) varied between 11,0% (August 1978) and 10,2% (February 1979), while the comparable rates for Canada ranged between 8,5 and 7,9%. Moreover, the number of unemployed greatly exceeded the number of job vacancies. In the 3rd quarter of 1978 the weekly average in Québec was 28 unemployed workers for each job vacancy, and nationally 18 unemployed for each vacancy (Statistics Canada, 1978).

Unemployment Data

In the Canada Health Survey (CHS) someone at least 15 years old is classified as employed if he had a job sometime during the 2 weeks preceding his CHS interview. A person is classified as unemployed if he did not have a job during the 2 weeks preceding the CHS and had looked for work sometime during the preceding 12 months⁴.

This definition of unemployment is less restrictive than the definition used by Statistics Canada in its monthly Labour Force Survey (LFS). The LFS requires that someone without a job must have looked for work within 4 weeks of the LFS interview — not within the preceding 12 months — in order to be classified as unemployed. Consequently, the CHS definition has the advantage that «discouraged workers» are included among the unemployed, and the disadvantage that some people with little current interest in working may also be included.

3 «Married women» includes women with common law husbands, and excludes women separated from their husbands. The definition of «married men» is comparable.

4 There is also a third necessary condition relating to the person's availability for work: if the person had worked sometime during the preceding 5 years, that either he could have worked during the week of the interview if a job similar to his last one were available, or that he could not have worked because he was sick or had family responsibilities.

The inclusion of the latter among the CHS unemployed implies that the estimated health effects are biased towards zero. For the married men this is probably not a serious problem, the number of unemployed men being similar in the LFS and CHS (Soderstrom, 1986a). This suggests that the CHS data have not been inflated by numerous men with little current interest in working. For both the women and youth, however, the number of CHS unemployed exceeds the sum of the LFS unemployed and a generous estimate of discouraged workers (Soderstrom, 1986b, 1986d). To minimize the resulting bias, only unemployed with work experience were included in the analysis. In contrast with the unemployed without work experience, a larger fraction of this group probably had significant labour force attachment⁵. Thus, the results relate only to unemployed with work experience⁶.

Five Measures of Mental and Physical Health

Three measures refer to different aspects of mental health⁷. The first two are the Positive Affect (POSAFF) score and its sibling, the Negative Affect (NEGAFF) score. Both use an integer scale ranging between 5 and 15. A higher POSAFF score is supposed to indicate poorer health, a higher NEGAFF score better health. Neither scale is supposed to measure psychiatric health; their development was motivated by a concern about

«... the problems that ordinary Americans face in the pursuit of their life goals. The fundamental question that underlies the study concerns the most fruitful way to understand the psychological reactions of normal individuals to the stresses and strains of everyday life.» (Bradburn, 1969)

The POSAFF score is supposed to reflect problems associated with social interaction, and NEGAFF, people's reactions to stressful personal events

⁵ The situation is complex, but in general a woman who has worked probably has more information about what it means to work than a woman without work experience. The idea of working is less abstract for the former woman. Moreover, as noted in the preceding footnote, only women with work experience had to indicate that they were actually available for work in order to be counted as unemployed. Thus, when a woman with work experience indicates that she wants to work, one has more confidence that she really is committed to working.

⁶ In addition, one unemployment variable (UNOTWK) identifies youth who were classified as unemployed at the time of their CHS interview, but whose primary activity during the preceding 12 months for reasons other than ill-health had been something other than working, doing housework, or going to school. By using this variable, the health effects of unemployment for youth have been estimated, controlling for the presence of some unemployed youth whose labour force attachment was questionable.

⁷ These 3 measures are based on responses to 2 sets of questions contained in a CHS questionnaire completed by the workers themselves.

such as a death in the family or a divorce. According to their developer and subsequent researchers, unemployment should affect both measures (Bradburn, 1969; Warr, 1978).

The third mental health measure is the «Health Opinion Survey» (HOS) score. It uses an integer scale between 16 and 48, higher scores indicating better psychiatric health. Unlike the first two measures, this scale is a measure of psychiatric health; it

«...has been widely used to assess the extent of anxiety and depression in populations. It does not measure opinions, but rather, the frequency of occurrence of psycho-physiological symptoms of anxiety and depression and, hence of distress.» (Statistics Canada, 1981)

Workers' scores for the 3 scales are not highly correlated, suggesting the scales do measure different aspect of mental health (McDowell and Praught, 1982, 1985).

The fourth health measure is systolic blood pressure. If unemployment causes stress and if, as many researchers believe, stress increases blood pressure, then there should be a relationship between unemployment and blood pressure. A two equation model is used to analyze two aspects of this relationship. The first is the effect of unemployment on the probability that a worker had high blood pressure⁸. («High blood pressure» here refers to a pressure level such that, if it persisted, the worker would be categorized as having hypertension⁹.) The second aspect analyzed is the effect of unemployment on the blood pressure level of people without high blood pressure. The results for this second equation are very useful, as explained below, when deciding whether unemployment is a *cause* of high blood pressure.

The fifth health measure is the probability of incurring at least one new health problem. (This measure is also referred to here as the «incidence» of new problems.) A «new health problem» is a mental or physical health pro-

⁸ Unfortunately, the CHS data cannot be used to estimate directly the effect of unemployment on the incidence of hypertension. Hypertension involves a high level of blood pressure which persists for a long time; it is not a transitory phenomenon. Stressful events may cause blood pressure increases, but this does not imply that the increases persist. With the CHS data one can only estimate the effect on blood pressure of unemployment at a single point in time during the spell of unemployment; one cannot determine whether any observed high blood pressure persists. But a necessary condition for unemployment to cause hypertension is obviously that it raise the probability of having high blood pressure.

⁹ The blood pressure data were collected from a subset of the people interviewed by specially trained nurses. People with high blood pressure include those with border line or definite hypertension, as defined in Table 1.

blem which existed at the time of the CHS interview and which had only begun within the preceding 2 weeks¹⁰.

Data for these 5 health measures are presented in Table 1. The incidence data for Québec are not reliable because the number of unemployed with new health problems is very small, so the incidence data presented on line 6 are for workers across Canada. Note that for each measure the difference between the values for the employed and the unemployed is small. Moreover, the differences in mental health and blood pressure are small not only for Québec workers, but also for workers across Canada (Soderstrom, 1986a, 1986b, 1986d).

Because the number of Québec workers with «new health problems» is so small, meaningful models could not be estimated using the Québec data. Instead, the models were estimated using national data¹¹. For the same reason, only national blood pressure models have been estimated. For each of the 3 mental health measures, however, it was possible to estimate for each demographic group not only separate models for Québec and for Canada, but also separate regional models for the Atlantic Provinces and for Ontario and the Western Provinces (Soderstrom, 1986a, 1986b, 1986d).

MODELING THE HEALTH EFFECTS OF UNEMPLOYMENT

For each demographic group a set of multivariate health models have been developed, one for each health measure. Each model contains two sets of variables, the other health determinants as well as the unemployment variables. Statistically, each health model's general form is that of the linear regression model, as the formal description of the models in Appendix B indicates. For each explanatory variable there is a regression coefficient, indicating the effect of that variable on the model's health measure.

Other Health Determinants

The current health of workers obviously depends on more than their unemployment status, so it was necessary to control for the effects of other

¹⁰ The data for this measure were gathered by CHS interviewers who asked a series of questions about the existence and duration of any health problems. The most frequently mentioned new problem was influenza. Among both the employed and unemployed married men and women nationally 32 percent of the new problems involved influenza. The other problems were scattered among 19 other diagnostic categories.

¹¹ Moreover, to meet software-imposed constraints on the number of observations, it was necessary to use only a subset of the full CHS data set when the incidence models were estimated. For married women, all unemployed and every third employed were included. For married men, all unemployed and every sixth employed were included. For youth every second unemployed and every fourth employed were included.

TABLE 1
Health Status Measures,
Employed and Unemployed Québec Workers

	<i>Married Women, 25-64</i>		<i>Married Men, 25-64</i>		<i>Youth, 15-24</i>	
	<i>Employed</i>	<i>Unemployed</i>	<i>Employed</i>	<i>Unemployed</i>	<i>Employed</i>	<i>Unemployed</i>
<i>Mental Health Measures</i>						
1. Mean POSAFF						
(scale: 15 = > 5) ^a	8,7	9,0	8,8	9,1	8,7	8,9
Std. Dev.	(1,97)	(1,79)	(1,94)	(2,06)	(2,02)	(2,00)
Number of Obs.	340	80	929	63	499	194
2. Mean NEGAFF						
(scale: 5 = > 15) ^a	11,8	10,8	12,2	11,8	11,5	11,1
Std. Dev.	(2,02)	(2,10)	(1,93)	(2,20)	(2,11)	(1,85)
Number of Obs.	344	79	927	62	499	193
3. Mean HOS						
(scale: 16 = > 48) ^a	40,7	38,8	42,5	40,4	41,4	40,9
Std. Dev.	(5,16)	(5,47)	(4,19)	(5,33)	(4,84)	(4,90)
Number of Obs.	273	62	747	52	341	143
<i>Blood Pressure</i>						
4. Mean Systolic BP						
(mmHg)	123,4	118,0	127,1	129,0	120,4	120,4
Std. Dev.	(16,71)	(14,61)	(15,76)	(16,82)	(12,11)	(12,93)
Number of Obs.	77	25	210	25	110	47
5. Hypertension:						
(Percent of People)						
a. Normal ^b	77%	80%	66%	60%	91%	89%
b. Borderline HT ^b	16%	20%	23%	24%	6%	11%
c. Definite HT ^b	7%	0%	11%	16%	3%	0%
<i>Incidence of</i>						
<i>New Health Problems^c</i>						
6. Percent of people						
with a new problem						
which started within						
preceding 2 Weeks						
(Canada)	7,7(c)	8,0(c)	7,2(c)	5,8(c)	7,5(c)	8,2(c)
Number of Obs.	767(c)	437(c)	884(c)	258(c)	710(c)	437(c)

Notes:

- a. Scale indicates the range of possible values for the mental health indicator, from poorest to best health.
- b. Normal: diastolic BP < 90 mmHg and systolic BP < 140 mmHg
 Borderline: (90 mmHg < diastolic BP < 95 mmHg and systolic < 160 mmHg)
 or (diastolic BP < 95 mmHg and 140 mmHg < systolic BP < 160 mmHg)
 Definite: (95 mmHg < diastolic BP) or (160 mmHg < systolic)
- c. Proportion of people who at the time of their CHS interview reported they were experiencing at least one health problem which had started within two weeks of their interview. The Québec data are unreliable because the number of available observations is very small, so data for Canada are presented.

important determinants of workers' health. Given the detailed data provided by the CHS, the number of potential variables for each health measure was large. The possibilities included variables describing people's recent health histories, socio-economic variables describing people's education, family income and occupation, age variables, and life-style variables describing smoking, drinking and exercise habits. Preliminary regressions were used to select for each health model a preliminary set of other health determinants¹². The set used in the NEGAFF model for married women is described in Appendix A.

Unemployment Variables

The next step was to model the effect of the workers' current unemployment status on their health. The simplest way to do this is by including in each health model a dummy variable (UNEMPLOY) which differentiates the unemployed from the employed. If being unemployed instead of employed negatively effected the health of all unemployed, then there should be a negative health effect associated with this variable.

But allowance must also be made for the possibility that the health effects vary among the unemployed depending on their socio-economic and personal characteristics. This heterogeneity was modeled by adding a series of unemployment variables to differentiate the unemployed workers. Unfortunately, existing theoretical and empirical work provide little guidance as to which characteristics of the unemployed determine how their health responds to their unemployment. Thus, the characteristics used in this analysis are those for which it seems plausible intuitively that there might be distinct health effects and for which the necessary data were available. For example, as indicated earlier, it seems plausible that a worker's occupation could affect his response to unemployment.

The 23 unemployment variables used in the NEGAFF model for married women are described in Table 2; similar characteristics were used in all the other models. There are 9 sets of these variables. Age, for example, is set III, which includes 3 variables. Most of these characteristics have been modeled using dummy variables.

¹² Included in these preliminary regressions was a dummy variable which identified the unemployed. Moreover, unemployment characteristics described below in the main text were also included in some of the regressions to see if the choice of other health determinants was sensitive to the specification of unemployment, or the specification of unemployment sensitive to the specification of other health determinants. No serious problems were apparent.

TABLE 2
Unemployment Variables in Negaff Model
Married Women, 25-64

Listed below are the unemployment variables included in the initial NEGAFF model for the married women. Following the name of each variable, the number of women with the characteristic and the definition of the variable are indicated. The definition of each set of unemployment variables is also indicated. Where applicable, the reference group for the set of dummy variables is defined; this is the group of women for whom the dummy variables in the set all equal zero.

I. Current Employment Status (Ref: Employed)

1. UNEMPLOY (n=65): Unemployed at time of CHS interview

II. Primary Activity During the Preceding 12 Months (Ref: Employed)

2. UHOUSE (n=55): Doing housework

III. Age (Ref: 25-34 Years)

3. UAGE1 (n=14): 35-44 Years
4. UAGE2 (n=10): 45-54 Years
5. UAGE3 (n=1): 55-64 Years

IV. Occupation (Ref: Manual Occupations)

6. UCLER (n=25): Clerical, sales and service occupations
7. UPROF (n=15): Professional, technical and managerial occupations
8. UASSEM (n=6): Assembly workers

V. Education (Ref: Completed no more than high school)

9. UEDPH (n=13): Some post-secondary education
10. UEDUN (n=4): At least a university degree

VI. Family Income

11. UFAM (Aver = \$5,538): Total family income per family member during preceding 12 months^a

VII. Month of CHS Interview (Ref: Jan. Feb. and March 1979)

12. USUM (n=13): July and August 1978
13. UFALL (n=13): September and October 1978
14. UWIN (n=17): November and December 1978

VIII. Personal Characteristics^b

15. ULIFE (Aver = 0.65 per unemployed): Number of other stressful life events in past 12 months
16. ULONER (n=10): Spent «almost all» or «a lot» of leisure time during past 2 weeks by herself
17. UCURSMOK (n=31): Current smoker

IX. (Long-term) Health Characteristics at the time of CHS Interview^c

18. ULIMLG (n=5): Had had at least one major activity limitation for at least one year
19. UTRANQ (n=6): Had taken a tranquilizer during the previous two days
20. UHACHE4 (n=6): Had had persistent headaches for at least 12 months
21. UOTHPR3 (Aver = 0.17 per unemployed): Had had other health problems for 1 to 12 months
22. UOTHPR4 (Aver = 0.91 per unemployed): Had had other health problems for more than 1 year
23. UMENTL (n=5): Had had a mental disorder for at least one month

Notes:

- a. Other specifications were tried in some preliminary work, but the results were similar for all specifications. UFAM was used because it was the simplest.
- b. Other personal characteristics — including current drinking, current exercising and past smoking behaviors — were tried in preliminary work. But they did not have significant effects in the NEGAFF models. Some are included in other models, however.
- c. Other health characteristics — including the use of drugs during the two days prior to the CHS interview — were tried in preliminary work, but they did not have significant effects in the NEGAFF models. Some are included in other models, however.

Consider a simple, illustrative model for which the only unemployment variables are UNEMPLOY and the 3 age-unemployment variables. For an employed woman, all 4 variables equal zero. For an unemployed 30 year old woman, UNEMPLOY equals one and the 3 age variables zero. And for unemployed 40 year old woman, UNEMPLOY and UAGE1 both equal one, and UAGE2 and UAGE3 zero. If unemployment negatively affects the mental health of the younger woman, the health effect associated with UNEMPLOY would be negative. If the 40 year old woman experienced larger negative effects than the younger ones, the health effect associated with UAGE1 would also be negative. And the net health effect for her would be the sum of the negative effects associated with UNEMPLOY and UAGE¹³. In this case the health effects are heterogeneous because the size of the effects varies among the unemployed depending on their age.

Although there has been interest recently in the possible moderating influence of social support networks, little could be done in this analysis to estimate their influence. The CHS provides little information about the networks into which people were tied¹⁴. Similarly, because the data are not available, no allowance was made for the duration of the current spell of unemployment or for other family members' labour market situation.

Causality

When using cross-section data such as that provided by the CHS, it is hazardous to make judgments about the causal ordering underlying any observed statistical relationship between *current* health and *current* unemployment. The statistical relationship may reflect the influence of unemployment on health, the influence of health on unemployment status, or the influence of some third phenomenon (e.g. old health problems) operating simultaneously on both. Three features of the modeling, however, increase the likelihood that any observed relationship does reflect the effect of current unemployment on current health.

¹³ Alternatively, if the older women also experienced the same health effect as the younger women, the health effect associated with UAGE 1 would be zero. And the negative health effect associated with UNEMPLOY would relate to both groups of women.

¹⁴ In the youth models two variables were included which indicated whether the unemployed were «married» or «separated». The only variable used in all 3 demographic groups relates to the extent of social interaction during leisure time (i.e. ULONER). «Loners» are people who had spent «almost all» or «a lot» of their leisure time by themselves during the 2 weeks preceding their interviews. Such people may not have the networks to which they can turn in times of trouble that people who spend a lot of leisure time with other people may have.

One feature is the inclusion in all the models of some unemployment variables and other health determinants describing aspects of each worker's past¹⁵. For example, one variable (LIMLG) indicates whether the worker had a health problem which had limited his activities for at least one year prior to his CHS interview. To the extent that long-standing health problems and other past events influence simultaneously current health and employment status, including indicators of them among the variables in the models should help isolate the effect of current unemployment on current health.

Secondly, given the definition of the «incidence of new problems», the causal ordering underlying a statistical relationship between incidence and unemployment seems reasonably clear. The relationship probably reflects the effect that current unemployment has on incidence, rather than vice versa. This is because the advent of the unemployment spell must have preceded the occurrence of the new health problem; the new problems started within the preceding two weeks, while the spell of unemployment must have started before that¹⁶.

Finally, if a relationship is found between the probability of high blood pressure and unemployment, the results regarding the effect of unemployment on blood pressure levels of workers *without* high blood pressure help clarify the causality underlying it. Suppose being unemployed is associated with 5% higher blood pressure levels among such workers. It is implausible that a 5% increase in blood pressure of such workers would cause their unemployment. It is more plausible that being unemployed increased their

15 Available data on people's medical histories include indications as to whether they had been suffering from mental troubles, headaches or hypertension for either between a month and a year prior to the CHS or for more than a year prior to it, and whether they had experienced a major activity limitation during the preceding 12 months. There is also similar data on the number of other health problems from which each person had been suffering. Of special interest for the blood pressure models is an indication as to whether each person's parents were (are) hypertensive. Available data on people's nonmedical pasts include the number of other stressful «life events» experienced during the preceding 12 months, and an indication of major activity in the preceding 12 months (e.g. employed, doing housework, going to school, or not working). In addition, the detailed modeling of unemployment should also help. Six of the unemployment variables identify unemployed with long-term health problems (Table 2). If the people with such problems were people for whom unemployment was the result of poor health, identifying them should help isolate the effects of unemployment on the health of other workers.

16 The CHS includes many other measures of the workers' health status. But they have not been used because the proper interpretation of any association observed between them and unemployment status is ambiguous. Because of the time frame used for these measures, the association could just as easily reflect the effect of health status on employment status as the effect of employment status on health. This problem is illustrated in the final section of this paper when the results of D'Arcy and Siddique are discussed.

blood pressure. Then, in light of this result suggesting that unemployment can raise blood pressure levels, it is reasonable to think that unemployment can also increase the probability of high blood pressure.

But it would be harder to accept that interpretation if there were no relationship between unemployment and the blood pressure levels of workers without high blood pressure. In this case, it is quite plausible that the high blood pressure (or hypertension) was the cause of the unemployment. Certainly if the high blood pressure were the cause of the unemployment, there would be no reason to expect any relationship between unemployment and the pressure levels of people without high blood pressure. Of course, one could not rule out the possibility that unemployment increased the probability of high blood pressure, but it would be puzzling why unemployment affected only the probability of having high blood pressure and not the blood pressure levels of people without high blood pressure, too.

ECONOMETRIC MODELS AND METHODS

To estimate the coefficients for the unemployment variables and other health determinants in each mental health model, the usual ordinary least squares (OLS) estimator was used. But the parameters of the models of blood pressure levels of workers without high blood pressure were estimated using a special non-linear, maximum likelihood estimator. For these models the dependent variable is truncated, all observations for workers with high blood pressure having been excluded from the dataset. Because of this, the special estimator is more appropriate theoretically than the OLS estimator (Maddala, 1983).

In addition, to estimate the parameters of the models for the probability of having high blood pressure and for the incidence of new problems, the multivariate logit estimator was used because the dependent variables in these models are dichotomous. In the incidence models, for example, the dependent variable equals one for people who had a new health problem; and zero for those who did not have one¹⁷.

¹⁷ Three steps were followed to develop each of the final models. First, the initial version of the model estimated included all the plausible unemployment variables and the other health determinants selected in preliminary regressions. An F-statistic was calculated for each of the 9 sets of unemployment variables. In all of the initial regressions these statistics were very small for some sets. Thus, in the second step each group having a p-value greater than 50 percent in the initial model was dropped, and the revised model was then estimated. Finally, after again dropping unemployment groups with very high p-values, the model was again estimated several more times to choose the final set of unemployment variables and other determinants; before each reestimation, individual variables with low t-statistics were removed.

For each model two hypotheses were tested, each test based on either an F-statistic or a Chi-square statistic, depending on the estimation method used. The first hypothesis is that none of the explanatory variables affect health — that all the model's regression coefficients are zero. And the second hypothesis is that unemployment does not affect health — that the coefficients for all the unemployment variables in the model are zero.

If the health effects are heterogeneous, the regression coefficient for at least one of the unemployment characteristics must be significant, whatever the significance of the variable UNEMPLOY. For example, suppose in the women's NEGAFF model that UAGE1 was the only significant unemployment variable. This would imply that the health of unemployed women aged 35 to 44 was affected by their being unemployed rather than employed, and that the health of all other unemployed women was unaffected by their unemployment. But if the health effects are the same for all the unemployed workers, then the only unemployment variable with a significant coefficient would be UNEMPLOY.

Net Health Effects

The estimated coefficients for the unemployment variables in the final models were used to estimate the net health effects for each of the unemployed workers. The net health effect is the (proportional) difference between the actual health of the unemployed person and an estimate of what his health would have been had he been employed. As indicated formally in Appendix B, this effect for each unemployed worker equals the sum of the regression coefficients for the variable UNEMPLOY and for the unemployment characteristics which the worker has¹⁸.

The estimation method has been widely used in the analysis of other problems. To illustrate it, consider again the simple model for which the only significant unemployment variables are UNEMPLOY and the three age variables. For a 40 year old unemployed worker, the net health effect equals the sum of the coefficients on UNEMPLOY and UAGE1. The coefficient for UNEMPLOY indicates for workers between 25 and 34 years of age the health effect of being unemployed rather than employed, and the coefficient on UAGE1 indicates the health effect of being both unemployed and 40 years old rather than between 25 and 34 years old.

It is important to estimate not only the models' regression coefficients, but also these net health effects. As explained earlier, the social significance

¹⁸ The health effects associated with the other health determinants do not enter into these calculations because they exist whether each worker is unemployed or employed.

of any health effects depends on the proportion of the unemployed workers whose health is affected and the size of the net effects they experience. But the estimates of the individual regression coefficients only indicate the sign and magnitude of the health effect of each unemployment variable by itself. The estimates by themselves do not indicate whether the combined effect of all the characteristics is quantitatively important. Even though a number of characteristics each has a statistically significant effect, their combined effect would be unimportant if the size of their individual effects were all small, if some had opposite signs and canceled out each other's influence, or if the number of unemployed who had the particular characteristics in the final models were small.

RESULTS FOR HEALTH MODELS

The test results for the two hypotheses are presented in Tables 3, 4 and 5. The health of Québec workers is related to some variables considered in this analysis, the results for the first test imply. Indeed, for each health measure, it was possible for each demographic group to identify some unemployment variables and other health determinants which are apparently related to the measure. The test results are presented in the Tables on lines 1 and 2 or lines 11 and 12, depending on the model. For example, for the NEGAFF model for married women (Table 3) the F-statistic is 8,90 ($p < 0,005\%$). In fact, for every model, as indicated on lines 2 and 12 in the 3 tables, the p-value — the probability of the F-statistic (χ^2 -statistic) having the observed value if the null hypothesis of no relationship were true — is less than 0,01 %¹⁹.

Moreover, being unemployed apparently does affect the health of at least some of the unemployed Québec workers, the results of the second F-test (χ^2 -test) for each model indicate. For most models the hypothesis that no unemployment variable had any effect on health is rejected. The mental health test results are presented on lines 5 and 6 of the 3 tables, and the blood pressure and incidence results on lines 15 and 16.

Consider first these test results for the married women presented in Table 3. With respect to the NEGAFF model for women, the hypothesis of no unemployment effect is certainly rejected ($F = 5,33$; $p < 0,005\%$). That hypothesis can also be reasonably rejected for the women's two other men-

¹⁹ This conclusion is robust with respect to the precise specification of the models; it is not contingent on the inclusion of just the variables actually included in the final models. Throughout the process of model development, the values of the F-statistics (Chi-square statistics) were quite satisfactory.

TABLE 3
Summary of Results for Health Models^a
Married Women, Aged 25-64

Estimation Method	Mental Health Models		
	NEGAFF	POSAFF	HOS
	ols	ols	ols
Summary Statistics			
<i>All Variables</i>			
1. F-Statistic	8,90	6,42	10,57
2. P-value less than	0,005%	0,01%	0,005%
3. Number of Observations	355	352	283
4. Number of Variables	14	10	15
<i>Unemployment Variables</i>			
5. F-Statistic	5,33	4,60	3,62
6. P.-value less than	0,005%	0,38%	1,37%
7. Number of Unemployed	65	66	53
8. Number of Unemploy. Vars.	6	3	3
9. Heterogeneous Unemploy. Effects	Yes	Yes	Yes
Estimation Method	Blood Pressure ^c		Incidence ^c
	<i>All Pressure Levels</i>	<i>Without High Blood Pressure</i>	<i>Probability of New Health Problems</i>
	ols	trunc(ml)	logit
Summary Statistics			
<i>All Variables</i>			
11. F-Statistic (χ^2 -Stat.) ^b	15,92	(94,0)	(73,32)
12. P-value less than	0,005%	0,005%	0,005%
13. Number of Observations	380	313	380
14. Number of Variables	16	16	16
<i>Unemployment Variables</i>			
15. F-Statistic (χ^2 -Stat.) ^b	4,96	(4,67)	(0,06)
16. P-value less than	2,52%	3,07%	80,34%
17. Number of Unemployed	73	60	73
18. Number of Un. Vars.	1	1	1
19. Heterogeneous Un. Effect	Yes	Yes	—

Notes:

- a. See text for an explanation of the contents of this table.
b. Chi-square statistics for the likelihood ratio test for nonlinear models.
c. Models estimated using data for Canada. See text for explanation.

TABLE 4
Summary of Results for Health Models^a
Married Men, Aged 25-64

Estimation Method	Mental Health Models		
	NEGAFF	POSAFF	HOS
Summary Statistics	ols	ols	ols
<i>All Variables</i>			
1. F-Statistic	8,65	3,24	15,50
2. P-value less than	0,01%	0,01%	0,01%
3. Number of Observations	799	798	660
4. Number of Variables	11	13	12
<i>Unemployment Variables</i>			
5. F-Statistic	4,53	3,32	4,80
6. P.-value less than	1,11%	0,18%	0,08%
7. Number of Unemployed	52	53	47
8. Number of Unemployed Vars.	2	7	4
9. Heterogeneous Unemploy. Effect	Yes	Yes	Yes

Estimation Method	Blood Pressure ^c		Incidence ^c
	<i>All Pressure Levels</i>	<i>Without High Blood Pressure</i>	<i>Probability of High Blood Pressure</i>
Summary Statistics	ols	trunc(ml)	logit
<i>All Variables</i>			
11. F-Statistic (χ^2 -Stat.) ^b	10,79	(74,0)	(158,67)
12. P-value less than	0,01%	0,01%	0,005%
13. Number of Observations	713	511	713
14. Number of Variables	27	26	27
<i>Unemployment Variables</i>			
15. F-Statistic (χ^2 -Stat.) ^b	3,53	(3,40)	(15,58)
16. P-value less than	0,11%	76,0%	4,20%
17. Number of Unemployed	38	22	38
18. Number of Un. Vars.	7	6	7
19. Heterogeneous Un. Effect	Yes	—	Yes

Notes:

- a. See text for an explanation of the contents of this table.
b. Chi-square statistics for the likelihood ratio test for nonlinear models.
c. Models estimated using data for Canada. See text for explanation.

TABLE 5
Summary of Results for Health Models^a
Youth, Aged 15-24

	Mental Health Models		
	<i>NEGAFF</i>	<i>POSAFF</i>	<i>HOS</i>
Estimation Method	ols	ols	ols
Summary Statistics			
<i>All Variables</i>			
1. F-Statistic	14,23	5,24	14,26
2. P-value less than	0,01%	0,01%	0,01%
3. Number of Observations	586	548	396
4. Number of Variables	8	8	9
<i>Unemployment Variables</i>			
5. F-Statistic	8,33	3,57	4,12
6. P.-value less than	0,40%	1,39%	4,31%
7. Number of Unemployed	163	151	116
8. Number of Unemployed Vars.	1	3	1
9. Heterogeneous Unemploy. Effect	No	Yes	Yes
	Blood Pressure^c	Incidence^c	
	<i>All Pressure Levels</i>	<i>Probability of New Health Problems</i>	
Estimation Method	ols	logit	
Summary Statistics			
<i>All Variables</i>			
11. F-Statistic (χ^2 -Stat.) ^b	15,61	(28,50)	
12. P-value less than	0,01%	0,01%	
13. Number of Observations	380	842	
14. Number of Variables	16	9	
<i>Unemployment Variables</i>			
15. F-Statistic (χ^2 -Stat.) ^b	2,45	2,36	
16. P-value less than	8,72	67,00	
17. Number of Unemployed	130	295	
18. Number of Unemploy. Variables	2	2	
19. Heterogeneous Effect	—	—	

Notes:

- a. See text for an explanation of the contents of this table.
b. Chi-square statistics for the likelihood ratio test for nonlinear models.
c. Models estimated using data for Canada. See text for explanation.

tal health models. The test results for the women's blood pressure models are mixed, however. Unemployment had a significant effect on the blood pressure levels of unemployed women without high blood pressure ($F = 4,67$; $p < 3,07\%$). But, the hypothesis that no unemployment variable affected the women's probability of having high blood pressure cannot be rejected ($\chi^2 = 0,06$; $p < 80,34\%$). (In cases such as this one where the test results do not support the hypothesis that unemployment affected health, results are presented for the model which provided the «strongest» evidence of an unemployment effect.) Finally, with respect to the women's probability of having a new health problem, there is evidence of significant unemployment effects ($\chi^2 = 19,28$; $p < 0,10\%$).

For the married men, the test results are presented in Table 4. The mental health of unemployed married men was also affected by their being unemployed; for each of the three F-statistics, the p-value is less than 1,1%. The blood pressure results are again mixed. The unemployed men's probability of having high blood pressure was apparently related to their being unemployed ($\chi^2 = 15,58$; $p < 4,2\%$). But no unemployment variable affected the blood pressure levels of men without high blood pressure ($\chi^2 = 3,40$; $p < 76,0\%$). Finally, unemployment significantly affected the men's probability of having a new health problem ($\chi^2 = 10,96$; $p < 2,8\%$).

For unemployed youth, as well, there were apparently mental health effects (Table 5). For example, unemployment had a significant effect in the youth's NEGAFF model ($F = 8,33$; $p < 0,40\%$). However, unemployment had no apparent effect on either blood pressure levels ($F = 2,45$; $p < 8,72\%$) or the incidence of new health problems ($\chi^2 = 2,36$; $p < 67,0\%$).

Important Unemployment Characteristics

The models' parameter estimates for the unemployment variables are presented and discussed in detail elsewhere (Soderstrom, 1986c), but some general observations about these results are pertinent here²⁰. Most notably, these results — summarized on lines 8 and 9 and lines 18 and 19 in the 3 tables — strongly support the hypothesis that the health effects are heterogeneous. Among the 13 models for which there is evidence of significant health effects, there is only one model — the NEGAFF model for youth — for which the estimated health effects are the same for all

²⁰ Given the large number of variables used, it is quite reasonable to expect that multicollinearity would be a problem. There is also overlap between the unemployment variables and the other health determinants; age, for example, is included in both sets of variables. But when the results were checked for multicollinearity, surprisingly few serious problems were found.

unemployed. That is the only model for which there is a significant effect and for which UNEMPLOY is the only significant unemployment variable.

Only one unemployment variable appears in the final version of two other models, the model for women's blood pressure level (Table 3) and the youths' HOS model (Table 5). But in both cases the health effects are heterogeneous because in each model the unemployment variable relates to a characteristic which not all of the unemployed had. For example, among women without high blood pressure, only those who had worked in white-collar occupations experienced higher blood pressure levels.

In the other 10 models significant health effects are associated with several unemployment characteristics. For some characteristics, the effects were negative, and for others, positive. For example, in the men's incidence model (Table 4) there is a negative coefficient (i.e. a positive health effect) for the general unemployment variable UNEMPLOY and larger positive coefficients (i.e. negative effects) for 3 particular characteristics: being an unemployed assembly worker, being unemployed in the winter and not having worked much in the preceding 12 months for health reasons. Unemployed men with none of these 3 characteristics had a lower probability of a new health problem as a result of being unemployed rather than employed. But, given the relative sizes of the 4 variable's coefficients, men with at least one of the characteristics had a higher probability. The better health among many unemployed men reflects largely their lower incidence of influenza. Perhaps the unemployed men, having had more time to rest than the employed, incurred fewer cases of influenza and recovered faster when they did get it²¹.

For each demographic group the set of significant unemployment variables varies among the health measures. This is reasonable²². But there

21 There are other possible explanations. The unemployed, having more free time, could have seen their physician more readily, and thereby recovered faster. But the fraction of men who had seen a physician within the preceding 2 weeks is smaller for the unemployed than the employed, according to the CHS data. Alternatively, the employed could have reported more influenza in the CHS because they had told their employers they were sick in order to have day off. But if it were true for men, it is puzzling why the working women did not behave the same way. Finally, it is possible that the result stems from data problems; but, if true, the source is not obvious.

22 Available theory and empirical evidence certainly do not predict that the same variables should appear in all the models. Moreover, if the identical variables were in all models for a demographic group, it would imply the implausible: to have one problem would be to have all problems.

are some systematic effects, too²³. For example, 2 variables — UNEMPLOY and UFAM — appear in the 3 mental health models for married men. In each model their combined effect implies that the negative mental health effects of unemployment tend to be more severe among unemployed men with low family incomes than unemployed men with high incomes²⁴.

Blood Pressure Effects

Unemployment is not a significant cause of high blood pressure, these results imply. For the women, none of the unemployment variables had a statistically significant effect on their probability of having high blood pressure. For the men, there is a statistically significant relationship. But the causal ordering underlying it is ambiguous because there is not a statistically significant relationship between unemployment and blood pressure levels of men without high blood pressure. As explained earlier, these results for the men's two blood pressure equations can be explained as easily by the hypothesis that hypertension causes unemployment as by the hypothesis that unemployment causes high blood pressure. Moreover, even if one accepts the latter hypothesis, the modelling results suggest that the unemployment effect is only a transitory one, stemming from the men's initial reaction to their loss of work²⁵.

However, though these results do not support the hypothesis that unemployment is a significant cause of high blood pressure, they do not provide strong evidence against it, either, particularly the results for the married men. Because the CHS gathered blood pressure data for only a

23 Among the control variables the most striking result is the apparent systematic effect of education on health. The better educated, for example, systematically have better mental health scores. Income, on the other hand, has no apparent effect on the scores. When education and income effects are estimated simultaneously by including both variables in the regression equation, the education effects are significant and the income effects are not. The same thing happens when education, income and occupation are estimated simultaneously (Soderstrom, 1986e).

24 The men's POSAFF and HOS models contain other unemployment characteristics as well, so the full effect of unemployment in these models depends on more than this income related effect.

25 The men's probability of having high blood pressure, according to the unemployment variables in the model, was higher only for the men recently unemployed, not for the long-term unemployed. This result suggests that it may be the initial reaction to the loss of work (i.e. the change in work status), not unemployment *per se*, which causes the increased probability of high blood pressure; and that after some period of adjustment to unemployment, the blood pressure of unemployed men apparently returns to its former level.

limited number of adults, useful data were available for only 38 unemployed men (line 17, Table 4). With more observations significant unemployment effects *might* be found.

Additional Reliability Tests

These Québec models have been evaluated using not only conventional goodness-of-fit statistics, but also 3 additional criteria. First, the Québec mental health models were compared to the other regional models. If the models really do reflect behavioral relationships, then the Québec results should at least resemble those for the other regions. Detailed comparisons of these models are available elsewhere (Soderstrom, 1986c), but some summary observations are pertinent here.

There are, in fact, some important similarities among the regional models. Most notably, they all imply that unemployment affects mental health and that the mental health effects are heterogeneous. But there is variation among the sets of unemployment characteristics appearing in the final 3 regional models for each mental health measure and demographic group. The sets in the 3 NEGAFF models — particularly the 3 models for married men — are generally more similar than the POSAFF or HOS models.

One possible reason for these regional differences is that the health effects of unemployment do vary among the regions; certainly labour market conditions vary regionally²⁶. Another is a data problem. Few unemployed workers had some of the unemployment characteristics considered in this analysis. For example, the dataset used to estimate the NEGAFF model for Québec women included only 6 unemployed women who had been assembly line workers. The reliability of modeling results involving such characteristics are obvious open to question, particularly results for characteristics whose apparent health effects vary considerably among the regional models.

However, the key conclusions of this analysis regarding the existence and heterogeneity of unemployment's mental health effects appear insensitive to this data problem. These conclusions are supported by the results for the mental health models estimated for Canada — models for which this data problem is less serious. The heterogeneous effects, moreover, are not associated only with unemployment characteristics for which there are few observations. For example, as noted above, the mental health effects for unemployed Québec men vary with their family incomes.

²⁶ While the unemployment rate was 10.9 percent in Québec in 1978, it was 12.5 in the Atlantic Provinces, 7.2 in Ontario, 5.2 in the Prairie Provinces and 8.3 in British Columbia.

Equally important, the results are not dependent on the inclusion in the models of characteristics for which there are few observations. To see if the existence and heterogeneity of the effects implied by the regional models were dependent on such characteristics, all models containing variables for which there are less than 10 unemployed with the characteristic were re-estimated, first omitting such variables, and then deleting the few observations for which the workers had the particular characteristic. The results generally did not change much when this was done.

The second reliability test indicates that the mental health results are not sensitive to the estimation procedure used to develop the models. On theoretical grounds the use of the OLS estimator can be challenged. But the results obtained using it are similar to those obtained using two alternative estimators²⁷.

Finally, the models' residuals were analyzed. Observations were identified for which there were unusually large residuals or for which there was an apparent pattern in the residuals. Then, the sensitivity of the modeling results to them was determined by deleting such observations and re-estimating the models. This test casts doubt on the reliability of at least some models for the POSAFF and HOS scores, particularly those for the married women. There was a pattern in the models' residuals,²⁸ and it was not possible to re-estimate more reliable versions of these models. Thus, one cannot be very confident that unemployment does affect these 2 aspects of mental health, particularly for the married women, for whom none of the regional HOS or POSAFF models performed very well. The Québec HOS and POSAFF models for men and POSAFF model for youth performed reasonably well in these tests, though even these results are questionable because the comparable models for the other regions did not perform very well.

²⁷ Two alternative estimators were used for the mental health models. One is the «seemingly unrelated regression model» of Zellner (1962), which allows for the possibility that the disturbance terms might be correlated in the models for the 3 mental health measures. The 3 models for married women in Québec were re-estimated using this procedure, but the qualitative results are not appreciably different from those obtained using the simpler OLS estimator. The second procedure allows for the technical fact that the mental health measures are sets of ordered integers rather than continuous variables. Theoretically, the ordered multivariate logit estimator, based on a nonlinear maximum likelihood model, seems more appropriate (Amemiya, 1981). When mental health models were re-estimated using this estimator, however, the results were quite similar to those obtained using the OLS estimator.

²⁸ The lowest HOS scores, for example, tended to be associated with negative residuals and the highest HOS scores with positive residuals.

NET HEALTH EFFECTS

Estimating the net health effects of unemployment was the last step in the analysis²⁹. Calculations were made for a health measure only if its model provided evidence of statistically significant unemployment effects and appeared reliable based on the evaluation of its residuals. One result of these calculations is estimates of the fractions of the workers whose health was affected positively or negatively by their being unemployed.

The probability of having a new health problem was reduced for many women and men. As indicated on line 7 of Table 6, 46,2% of the women and 62,2% of the men had reduced probabilities because of their unemployment. But unemployment also increased this probability for sizable minorities in both groups, 25,6% of the women and 38,0% of the men (line 5). And for 23,1% of the women and 11,4% of the men, this probability was increased by more than 20% (line 5c).

The mental health of many unemployed was also adversely affected by their unemployment, judging by the effects of unemployment on NEGAF scores (line 5). A sizable majority of the unemployed women, a large minority of the men, and all youth had lower NEGAF scores. A majority of the unemployed men also experienced negative POSAF and HOS effects (line 15). Relative to the number of workers with negative effects, very few workers had positive mental health effects (lines 7 and 17). While 81,4% of the women had lower NEGAF scores, none had higher scores. Among the men, 40,4% had lower scores, and only 15,4% higher scores.

The net health effects for the other two regions are similar to those for Québec in several respects³⁰. The regional distributions of the net effects of unemployment on the probability of having a new health problem are similar. And all the regional NEGAF mental health results imply widespread negative effects. In total, there are 9 sets of regional NEGAF

29 To calculate the net effects for incidence, the estimated coefficients for the national models were used, but the data for unemployment variables used in these calculations were only for Québec's unemployed married men and women. For the 3 mental health measures, however, both the estimated coefficients from the Québec models and the data for the unemployment characteristics of the Québec unemployed were used. In addition, only those coefficients which seemed reliable were used to calculate the net mental health effects reported here. Excluded were unemployment characteristics whose regression coefficients proved quite unstable in the analysis of residual tests. Coefficients for several other characteristics were also excluded because very few people had the characteristics. Calculations were also made using all unemployment variables in the final models; the results are quite similar to those presented here.

30 These regional results are presented and discussed in detail elsewhere (Soderstrom, 1986a, 1986b, 1986d).

TABLE 6
Net Health Effects of Unemployment
Married Women, Married Men and Youth^a

	Incidence		NEGAFF Scores		
	<i>Probability of Incurring New Health Problem</i>				
	<i>Married Women</i>	<i>Married Men</i>	<i>Married Women</i>	<i>Married Men</i>	<i>Youth</i>
	<i>25-64</i>	<i>25-64</i>	<i>25-64</i>	<i>25-64</i>	<i>15-24</i>
1. Total Unemployed	78	79	70	52	163
2. Percent of Unemployed Affected	71,8%	100,0%	81,4%	55,8%	100,0%
3. Mean Value of Measure for U'ed	1,3%	5,1%	11,0	11,8	11,2
4. Mean Health Effect for Unemployed Affected					
a. Percent Difference	-56,7%	-125,7%			
b. Absolute Difference	+ 1,60	-0,4%	-1,74	-0,25	-0,54
5. Worse Health: Total (%)	25,6%	38,0%	81,4%	40,4%	100,0%
a. More than 5% worse	25,6	38,0			
b. More than 10% worse	25,6	11,4			
c. More than 20% worse	23,1	11,4			
6. No Significant Effect (%)	28,2%	0,0%	18,6%	44,2%	0,0%
7. Better Health: Total (%)	46,2%	62,2%	0,0%	15,4%	0,0%
a. More than 5% better	46,2	48,1			
b. More than 10% better	35,9	48,1			
c. More than 20% better	34,6	48,1			
	POSAFF Scores		HOS Scores		
	<i>Married Men</i>	<i>Youth</i>	<i>Married Men</i>		
11. Total Unemployed	57	168	50		
12. Percent of Unemployed Affected	78,9%	32,7%	88,0%		
13. Average Mental Health Score	9,0	9,0	40,2		
14. Average Net Effect for People Affected	-0,46	+ 0,03	-1,3		
15. Percent with Worse Health	52,6%	18,5%	74,0%		
16. Percent with No Significant Effect	21,1	67,3	12,0		
17. Percent with Better Health	26,3	14,3	14,0		
18. Total Unemployed	100,0	100,0	100,0		

Note:

a) See text for an explanation of this table. If the absolute value of the change in the health measure is less than 0,5, the change is set to zero.

results, one set for each of the 3 demographic groups in each of the 3 regions. In each of the 9 sets at least 40% of the unemployed workers apparently experienced negative NEGAFf effects, and in 7 of the 9 sets over 50% of the workers did.

The most striking difference among the regional results is that women in Québec apparently experienced much more substantial mental health effects than women elsewhere. A larger fraction of the Québec women had negative NEGAFf effects. And the average size of their negative effects was larger. Among unemployed Québec women whose scores were affected by their being unemployed, the average effect was -1.74 points, which is twice as large as the average effect in the other two regions³¹.

Importance of the Health Effects

Thus, unemployment apparently did affect the health of an important fraction of Québec's unemployed. But are the effects they experienced large enough to be considered important?

Certainly the negative effects with respect to the incidence of new health problems seem important. A 20% increase in the probability of incurring a new problem is a substantial increase, and 23.1% of the unemployed married women and 11.4% of the married men experienced increases exceeding 20% (line 5c). Equally noteworthy, this probability was reduced by more than 20% for 34.6% of the unemployed women and 48.1% of the men (line 7c).

The mental health results are more difficult to interpret. However, the NEGAFf effects for many of the women seem important. Although it is not indicated in Table 6, the scores of 49% of the women who experienced negative effects were reduced by 2 points, and the scores of 12% by 3 points. The maximum possible reduction is 10 points; but it would arise only if the few unemployed women having the minimum score of 5 would have had the maximum score of 15 if they had been employed.

³¹ This regional difference stems from different health effects associated with the variable UFAM in the regional models. Although UFAM is included in all 3 regional models, in only the Québec model does this variable have a negative coefficient. This result implies that the negative effect of unemployment for a Québec women is larger the higher is her family income. In the other 2 regional models this variable's coefficient is positive, implying that the negative effect is smaller the higher is the family's income. But the reason for this difference is not clear; as suggested earlier, it may reflect regional differences in long-term labour market conditions.

The literature does not provide a norm indicating what reductions in NEGAFF scores, or scores for the other 2 measures, represent important health effects. However, one way to gauge these reductions is to compare them with the negative health effects of some other variables in the models. These comparisons imply that there was a notable deterioration in the mental health of unemployed women whose scores were reduced by at least 2 points. Employed women who reported having mental health problems which had existed for either 1 to 12 months or more than 12 months had an average score 2 points lower than otherwise comparable women. Moreover, employed women with a major activity limitation of more than 12 months duration also had an average NEGAFF score 2 points lower, *ceteris paribus*. And employed women with another stressful life event in the preceding 12 months had an average score 0,2 points lower than comparable women who had not experienced such events, though this effect appears low³².

For unemployed men the negative mental health effects also seem important. All the men who had negative NEGAFF effects had score reductions of one point. Although this reduction is smaller than the reductions experienced by most women, the health effects of some other variables in the men's NEGAFF model suggest it is still a noteworthy effect³³. In addition, 30% of the men with negative POSAFF effects had scores 2 or 3 points lower; the rest had POSAFF scores one point lower. The maximum possible POSAFF reduction is 10 points. Finally, 15% of the men with negative HOS effects had scores 3 points lower; and the rest had scores 2 points lower. The maximum possible reduction is 32 points. Again, the modelling results suggest that these HOS effects are noteworthy³⁴.

32 Although «other life events» has the same effect in all NEGAFF models, the estimate of this effect probably is biased towards zero. Such other events may not affect all women the same way; some may be affected, others not. The model, however, is based on the assumption of homogeneous effects. The bias may also stem from the definition of the variable, which refers to stressful events during the preceding 12 months. But a woman's mental health today is probably more influenced by a death yesterday than by a death 12 months ago. The effect for «other life events» would provide a better yardstick for judging the importance of the unemployment effects if the «other events» only referred to those which had occurred in the very recent past.

33 Employed men who had taken a tranquilizer within two days of their CHS interview had NEGAFF scores one point lower than otherwise comparable men who had not taken such a drug. And the results suggest that unemployed men also experienced larger effects than the average employed men with another stressful life event in the preceding 12 months. Men with such life events had an average score 0,2 points lower than comparable men who had not experienced such events, though, as with the comparable estimate for the women, this estimate seems low.

34 Employed men reporting chronic health problems which limited their activities had HOS scores two points lower than comparable men without such chronic problems. Men with other chronic, nonmental health problems had scores which averaged one point lower. And men with other stressful life events had an average score 0,3 points lower than comparable men who did not experience such events, though again this estimate seems low.

For unemployed youth the NEGAFF results are the most reliable. All the unemployed youth had scores one point lower as a result of their unemployment³⁵. Although the health effects of some other variables in the youth's NEGAFF model suggest this is a noteworthy effect, there is more uncertainty about its significance than the effects for the women or men³⁶.

DISCUSSION

Thus, with respect to the first question raised at the beginning of this paper, the answer is yes, the health of some unemployed Québec men, women, and youth was affected by their being unemployed rather than employed. The effects, as predicted, varied considerably among the unemployed in this analysis, there being positive, null and negative effects.

With respect to the second question, the answer is again yes, these health effects do appear important, at least for the women and men. Certainly the health of large fractions of the unemployed women and men was affected. And the negative effects many of these workers experienced seem significant, too. Being unemployed substantially increased the probability of having a new health problem for minorities of both groups. It also, of course, significantly reduced this probability for many men and women. In addition, the negative mental health effects seem substantial for a majority of the women and a small minority of men. Most of the men had small score reductions, though even a one point reduction in a NEGAFF or POSAFF score seemingly implies noteworthy «discomfort»³⁷. However, finding a yardstick with which to gauge the importance of these mental health effects remains a problem.

The importance of the health effects for the youth is less clear. Only their mental health was apparently affected, which is plausible³⁸. These ef-

³⁵ The coefficients on the unemployment variable was -0.54 . When a confidence interval two standard deviations on either side of this estimate is constructed, the minimum value is -0.94 , which is close to -1.0 .

³⁶ As in the NEGAFF models for the women and the men, employed youth with other stressful life events had an average score 0.3 points lower than comparable youth who did not experience such events. But, as in the other models, this estimate seems low. Similarly, employed youth reporting a nonmental health problem of more than 12 months duration had an average score 0.2 points lower, *ceteris paribus*. But this, too, is puzzlingly low.

³⁷ This conclusion is re-enforced by consideration of the questions used to construct the mental health measures. For example, here are two NEGAFF questions. «During the past few weeks, how often have you felt very lonely or remote? how often have you felt depressed or very unhappy? A man's NEGAFF score is one point lower if he answered «sometimes» rather than «never» — or «often» rather than «sometimes» — to either question.

³⁸ That unemployment has no effect on the youths' blood pressure is plausible. Hypertension is an important health problem for older workers, not for youth. So, unemployment having had no significant discernible effect on the blood pressure of the older unemployed workers, there is no compelling reason to expect that it should have had a significant effect for youth.

fects are important in the sense that they were widespread. But it is less clear whether these are serious negative effects. The size of the NEGAFF effects is small, and the yardstick used to gauge their importance is the least convincing of the yardsticks used in this analysis. Moreover, the reliability of these mental health estimates is questionable, in part because of a data problem. Some youth who are counted as unemployed, in fact, were probably not seriously interested in working, so the estimated health effects for at least some youth are probably biased towards zero.

In Québec — as well as elsewhere — the NEGAFF effects of unemployment are larger for the married women than for the men. Could it be that the women's reactions to unemployment *per se* have been exaggerated? Certainly few unemployed women had been employed very much during the previous year. Only 12% of the unemployed women reported that «work» had been their primary activity during the preceding 12 months; 85% reported that «housework» was their main activity³⁹. Thus, it is tempting to view these women as people attempting to change their social roles — from homemaker to «worker» — and experiencing some (unavoidable) anxiety as a result, as opposed to people suffering because they could not readily find work.

But doing housework does not imply a lack of interest in employment. Even though a woman reported «housework» as being her main recent activity, she may have desired work outside her home. Unable to find «work» or at least thinking that none was available, such women would correctly report their ever-present second job, housework, as their primary activity, whereas men who were unable to find work would indicate, again correctly, that they were «not working» because they had no such second job. Thus, long frustrated that they could not find work, it is plausible that the unemployed women experienced substantially lower NEGAFF scores⁴⁰.

These results for Québec workers imply that the relationship between health and unemployment is weaker and more complicated than the results of D'Arcy and Siddique (1986) for Canadian workers. They also used data

39 In contrast, 34 percent of the unemployed married men indicated that «work» was their main activity in the previous 12 months, and 56 percent that «not working for nonhealth reasons» was. Not surprisingly, none of the men indicated that «housework» was their main activity.

40 Moreover, the modeling results for the women do not support the «role change» interpretation. If it were correct, a key variable in the models should be UHOUSE because it identifies the women who had been doing housework during the preceding 12 months — the women whose role was changing. But, though it was always included in the initial set of unemployment variables, UHOUSE did not have a statistically significant effect on either the incidence of new problems or NEGAFF scores.

from the Canada Health Survey, but there are problems with the way they analyzed the data⁴¹. First, they grouped together the youth, men and women when they estimated their models. But these results imply that the health effects are quite different for each group.

Second, D'Arcy and Siddique did not use the same health measures. But, because of the time frame of many of their measures, the causal ordering underlying many of the relationships they report is ambiguous⁴². Third, their analysis included fewer unemployment characteristics. And they apparently did not estimate the health effects of the different characteristics simultaneously. Finally, they did not analyze the importance of the health effects — neither the number of unemployed workers affected nor the seriousness of the negative effects they experienced.

Additional research is needed to identify the important characteristics of the unemployed who experience important health effects. As explained earlier, larger samples are needed to assess reliably the effects of some characteristics considered here. Consideration should also be given to the effects of other characteristics, including the workers' unemployment histories and their social situations⁴³.

These results place only a lower bound on the extent of the health problems caused by unemployed. Consider, for example, the unemployed who apparently experienced no net health effects. That finding only means that being unemployed for them was as unhealthy as being employed. Some of them might well have worked, if employed, in unhealthy jobs; the occupational health and safety literature abounds with evidence that working is unhealthy for many of the employed. For those who would have worked in unhealthy jobs, their unemployment as well as their employment are unhealthy. Similarly, for some unemployed who experienced «positive» net effects, their unemployment may have only been less unhealthy than their employment would have been.

41 They used data for all of Canada, not just Québec. But this cannot account for the different results because my Canada-wide results are still quite different from theirs.

42 For example, they find a strong correlation between the number of physician visits in the past year and current unemployment status. But is it plausible that current unemployment caused more visits during the preceding year? It would be much more appropriate to relate the probability of a physician visit within the preceding two weeks to current employment status.

43 The former includes the length and cause of the current spell of unemployment as well as the worker's past experiences with unemployment. The latter includes the existence of stress inducing problems when last employed (e.g. related to conflicts with supervisor or the type of work), the existence of family problems, and the availability of social support, formal and informal.

APPENDIX A

**Preliminary Set of Other Health Determinants
Negaff Model, Married Women, 25-64**

Listed below are the preliminary set of other health determinants included in the initial version of the NEGAFF model for married women. As explained in the text, some preliminary experimentation was done to derive this set of variables. The number of people with each of the characteristics and the fraction that these people represent of the total number of Québec married women included in the model are indicated in parentheses beside each variable. An asterik (*) indicates that the variable was included in final version of the NEGAFF model for the married women.

<i>Variable Name</i>	<i>Definition of Variable</i>
AGE 7 (n = 75; 21%)	30-34 years
AGE 10 (n = 46; 13%)	45-49 years
AGE 12 (n = 16; 5%)	55-59 years
EDPH (n = 78; 22%)*	Had some post-secondary education
EDUN (n = 30; 8%)*	Had received a university degree
FAMINC (Aver = 7,317)	Total family income per family member during preceding 12 months
PRINEARN (n = 63; 18%)	Principal income earner in the economic family
CLER (n = 173; 49%)	Worked in clerical, sales or service occupation
ASSEM (n = 38; 11%)*	Did assembly type work
PROF (n = 114; 32%)	Worked in professional, technical or managerial occupation
HOUSE (n = 89; 25%)	Housework was primary activity during preceding 12 months
SUM (n = 55; 16%)	Interviewed in July or August 1978
LIFEVNTS (Aver = 0,78 per woman)	Number of stressful life events other than unemployment during preceding 12 months
LONER (n = 31; 9%)*	Spent «almost all» or «a lot» of leisure time during past 2 weeks by herself
EXERMED (n = 190; 53%)	Moderate level of exercise during preceding 2 weeks
EXERHI (n = 112; 32%)	High level of exercise during preceding 2 weeks
CURSMOK (n = 123; 35%)	Current smoker
MENT3 (n = 5; 1%)*	Had mental disorder for between 1 and 12 months
MENT4 (n = 16; 5%)*	Had mental disorder for more than 12 months
LIMLG (n = 12; 3%)*	Had activity limitation for more than 12 months

APPENDIX B

**Form of Health Models
and Formula for Calculating New Health Effects**

The general form of the models is indicated by equation (1). The models' coefficients indicate the health effects associated with each variable, the π 's for the other health determinants and the β 's for the unemployment variables.

$$(1) H_{ij} = \pi_{0j} + \sum_{k=1}^{m(j)} \pi_{kj} X_{ki} + \beta_{uj} \text{UNEMPLOY}_i + \sum_{l=2}^9 \sum_{k=1}^{p(l,j)} \beta_{lkj} UC_{ilk} + e_{ij}$$

$i = 1, \dots, N_j$ observations for j^{th} model

$j = 1, \dots, 19$ health models

where H_{ij} is the health of i^{th} person in j^{th} model

X_{ki} is the value of k^{th} other health determinant for i^{th} person

$m(j)$ is the number of other health determinants in j^{th} model

UNEMPLOY_i is the dummy variable indicating whether i^{th} person is employed (=0) or unemployed (=1)

UC_{ilk} is the value of k^{th} unemployment characteristic in l^{th} group for i^{th} person (=0 if the person was employed)

$p(l,j)$ is the number of unemployment variables in l^{th} set for j^{th} model

e_{ij} is the disturbance term for i^{th} observation in j^{th} model

$\pi_{0j}, \{\pi_{kj}\}, \beta_{uj}, \{\beta_{lkj}\}$ are the regression coefficients for the j^{th} model

The formula used to calculate the net health effects can be derived using equation (1). It implies that the actual value of the j^{th} health measure for the i^{th} unemployed person is

$$(2) HU_{i'j} = \pi_{0j} + \sum_{k=1}^{m(j)} \pi_{kj} X_{ki'} + \beta_{uj} + \sum_{l=2}^9 \sum_{k=1}^{p(l,j)} \beta_{lkj} UC_{i'lk} + e_{i'j}$$

But if this worker had been employed — so that $\text{UNEMPLOY}_{i'} = 0$ and all $UC_{i'lk} = 0$ — it follows from equation (1) that this worker's health would have equaled

$$(3) HE_{i'j} = \pi_{0j} + \sum_{k=1}^{m(j)} \pi_{kj} X_{ki'} + e_{i'j}$$

The net health effect of unemployment then equals

$$(4) NH_{i'j} = HU_{i'j} - HE_{i'j} = \beta_{uj} + \sum_{l=2}^9 \sum_{k=1}^{p(l,j)} \beta_{lkj} UC_{i'lk}$$

$i' = 1, \dots, NU_j$ unemployed workers for j^{th} model

$j = 1, \dots, 8$ final Québec health models

To estimate the net health effects using equation 4, the estimates of the unemployment variables' coefficients in the j^{th} final model were substituted into it. (The coefficients of variables not appearing in the final model were equated to zero.) Then, the net health effect was calculated for each unemployed worker by substituting into the right hand side of the equation the values of the unemployment characteristics for him.

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Quelques effets du chômage sur la santé des travailleurs sans emploi au Québec

L'idée que le chômage est nocif pour la santé des gens en est une qui est très répandue. La recherche sur ce sujet est à l'origine du présent article. Pour estimer les conséquences du chômage sur la santé des travailleurs sans emploi au Québec, on a comparé l'état de santé d'un certain nombre de salariés sans travail à celui d'un groupe de personnes qui détenaient un emploi en utilisant cinq mesures destinées à apprécier leurs conditions de santé tant physiques que mentales.

Les statistiques proviennent de l'Enquête Santé Canada, une enquête-maison effectuée en 1978 et en 1979. On a évalué l'état de la santé des travailleurs en recourant à trois indicateurs différents de la santé mentale, à la possibilité d'hypertension et à la probabilité d'éprouver de nouveaux problèmes de santé dans les deux semaines précédant l'entrevue de l'enquête. On a procédé à des analyses distinctes pour les hommes mariés de 25 à 64 ans, pour les femmes mariées de 25 à 64 ans, de même que pour les jeunes de 15 à 24 ans.

L'analyse effectuée pour chaque groupe démographique est fondée sur une série de modèles de santé à variables multiples et on a mis un modèle au point pour chaque mesure de santé. Chacun contient deux ensembles de variables, celles relatives au chômage et les autres déterminants de la santé. Un certain nombre de variables concernant le chômage ont été utilisées, non seulement en vue de distinguer les chômeurs des personnes au travail, mais aussi pour établir des différenciations entre les sans-travail eux-mêmes. Une des idées maîtresses à la base de cette analyse est que les effets du chômage sur la santé ne sont pas les mêmes pour tous les sans-travail. Le chômage peut exercer une influence défavorable sur la santé de certains travailleurs, mais il peut améliorer celle d'un certain nombre d'autres, qui, s'ils avaient un emploi, auraient travaillé dans des conditions insalubres. De plus, l'importance des conséquences du chômage sur la santé peut varier d'un individu à l'autre selon leurs caractéristiques personnelles et socio-économiques tout aussi bien que selon les conditions de leur santé.

La forme générale de chaque modèle en est un de régression linéaire. Les coefficients de régression mesurent les effets de l'état de santé comparés aux caractéristiques des personnes en chômage, tout comme les déterminants de la santé. Plusieurs techniques différentes d'estimation multivariée ont été utilisées pour jauger les différents modèles.

Une fois celles-ci au point, on s'est servi des modèles afin de répondre à deux questions. Premièrement, la santé des travailleurs en chômage est-elle touchée par le fait d'être en chômage? Les résultats indiquent qu'on a remarqué une influence sur l'état de santé des personnes sans travail significative d'un point de vue statistique. La santé mentale était atteinte dans les trois groupes démographiques. Pour les hommes et les femmes mariés, être en chômage affectait leur probabilité d'éprouver un nouveau problème de santé. On n'y décelait, cependant, aucun signe d'hypertension. De plus, comme on l'avait présumé, les effets sur leur santé variaient beaucoup. Il y avait indication de réactions tant positives que négatives, et l'importance de celles-ci changeaient d'une personne à l'autre parmi les sans-travail.

La deuxième question a consisté à se demander si ces effets sont importants à la fois quant à la proportion de chômeurs dont la santé a été affectée et quant à l'ampleur des problèmes de santé éprouvés. La réponse à pareille question est complexe. Bien qu'un nombre considérable d'hommes, de femmes et de jeunes aient apparemment ressenti des problèmes de santé, les effets ont semblé peu notables dans la plupart des cas. En réalité, les résultats obtenus laissaient entendre qu'aucun des jeunes en chômage n'avait subi des réactions marquées. Il est possible, toutefois, que des problèmes se rapportant aux données mêmes soient responsables de ce résultat étonnant chez les jeunes sans emploi.

Quelques hommes en chômage et le quart des femmes sans travail ont vu leur santé mentale fortement ébranlée. Et une minorité significative tant chez les hommes que chez les femmes couraient le risque d'avoir de nouveaux problèmes de santé à cause de leur situation de chômeurs. Par ailleurs, pour beaucoup d'hommes et de femmes sans emploi, ce danger était réduit du fait même qu'ils étaient sans travail. Cette dernière constatation souligne la diversité apparente des conséquences du chômage sur l'état de santé.

Ces résultats que l'on a notés au Québec ressemblent à ceux obtenus d'analyses comparables touchant les effets du chômage sur l'état de la santé constatés dans les provinces de l'Atlantique, en Ontario et dans l'Ouest. Partout le chômage engendre certaines conséquences négatives considérables sur l'état de santé de certains sans-travail tout comme il peut avoir quelques effets positifs ou bénéfiques chez d'autres individus.

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