THE PHYSICAL AND PSYCHOLOGICAL FACTORS PREDICTING THE ONSET AND SEVERITY OF ENVIRONMENTAL ILLNESS: A UNION PERSPECTIVE

A Thesis Submitted in Partial Fulfilment of the
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Saint Mary's University
Halifax, Nova Scotia

APPROVED: _____
V. Catano
Thesis Advisor

APPROVED: _____
S. Desmarais
Committee Member

APPROVED: _____
K. Kelloway
Committee Member

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Name MORRIS B. MENDELSON

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This thesis is dedicated in loving memory to my cherished grandmother, Claire Mendelson.

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Abstract

THE PHYSICAL AND PSYCHOLOGICAL FACTORS PREDICTING THE ONSET AND SEVERITY OF ENVIRONMENTAL ILLNESS: A UNION PERSPECTIVE

Morris B. Mendelson

October, 1994

Environmental Illness (EI) is thought to be precipitated by physical, psychological, social, and organizational factors. However, little research has focused on the psychological or organizational factors which may be associated with EI. The present exploratory field study examined differences in measures related to stress, social support, and physical and psychological symptoms associated with EI, among 525 hospital employees working in known EI and non-EI locations in the Metro Halifax Area. Although employees in EI locations experienced greater symptom severity, no consistent differences were found in the stress and social support measures between EI and non-EI locations. However, employees in EI locations with high symptom severity did report greater stress and lower social support than those with low symptom severity. Discriminant analyses revealed that the combined measures were relatively good at predicting group membership (EI vs non-EI locations). Structural modelling equations examining the relations among stress, social support, and symptom severity revealed that

stress negatively predicted social support within EI and non-EI locations. Stress was found to be a direct predictor of symptom severity, but only among employees in EI locations. Unexpectedly, no significant association was found between social support and symptom severity in either EI or non-EI locations. This suggest that stress is related to greater symptom severity, but only for those people with low levels of social support.

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THE PHYSICAL AND PSYCHOLOGICAL FACTORS PREDICTING THE ONSET AND SEVERITY OF ENVIRONMENTAL ILLNESS: A UNION PERSPECTIVE

In the last few years, Environmental Illness (EI), often referred to as Sick Building Syndrome (SBS), has received a great deal of media attention. EI is a condition which involves seemingly healthy individuals experiencing symptoms of physical distress in their work settings (Bauer, Greve, Besch, Schramke, Crouch, Hicks, Ware, & Lyles, 1992; Baker, 1989; Ryan & Morrow, 1992). This illness has generally been associated with newly constructed and renovated buildings designed for energy efficiency (Hodgson & Morey, 1989).

Until recently, EI was thought to be related solely to the inadequacy of mechanical ventilation systems (Hodgson & Morey, 1989). However, recent evidence suggests that other factors contribute to poor indoor air quality. Car exhaust fumes from indoor garages and heat released by laser printers, computers, and photocopiers are possible contributors to air quality problems within the workplace (Chisholm & Doyle, 1993; Hodgson & Morey, 1989).

In addition, psychological, organizational, and social factors such as stress and social support may act as moderators; increasing or decreasing the likelihood of illness and symptom severity (Baker, 1989; Cohen, Colligan, Webster, & Smith, 1978; Colligan & Murphy, 1979; Selner &

Staudenmayer, 1992). EI may be present in 20 to 30% of all buildings in North America (Woods, 1989) leading to reports of illness in millions of employees. This issue is especially relevant in Halifax, where EI-type physical symptoms have been reported by many employees of local hospitals (Butler, 1992). The high incidence of EI reports has prompted the employees' union to seek more information related to EI.

The present study was conducted in association with the Occupational Health and Safety Committee of the Nova Scotia Government Employees Union. This study compared hospital union members working in both EI and non-EI environments on a number of measures. This natural field experiment included control hospitals as well as control departments within hospitals. The first purpose of the study was to describe the incidence of EI, the range of reported symptoms, the level of knowledge people had about EI, and the perceived attitudes of others (i.e., management, the media, family members, and the general public) about EI. The second purpose was to propose and to test a model of EI based on the moderating effects of stress and social support upon EI symptomatology (Baker, 1989; Bauer et al., 1992; Colligan & Murphy, 1979).

Background

During the last 10 to 15 years, the number of health complaints related to the amount of time spent in non-industrial work setting has increased dramatically (Skov, Valbjorn, & Pedersen, 1989). Architects, engineers, psychologists, and public health officials have only recently begun to pay attention to the physical and psychological effects of working and living in environments with poor Indoor Air Quality (IAQ) (Bauer et al., 1992; Spengler & Sexton, 1983; Sterling & Sterling, 1983).

Grievances with poor indoor air quality have existed for centuries (Hodgson & Morey, 1989). However, health concerns due to IAQ problems were first recognized only 40 years ago. Originally called Multiple Chemical Sensitivity, this condition includes four groups of people: Sick building occupants, exposed industrial workers, people in contaminated communities, and isolated susceptible individuals (Marsh-Knickle, 1994).

Until recently, the symptoms attributed to poor indoor air quality were labelled "Tight Building Syndrome" because they were deemed to result solely from inadequate ventilation systems (Hodgson & Morey, 1989). Presently, other physical and psychological factors are believed to contribute to the onset and severity of these symptoms. Hence, "Tight Building Syndrome" is now referred to as Sick Building Syndrome (SBS; Baker, 1989; Bauer et al., 1992;

Norback, Michel, & Widstrom, 1990; Ryan & Morrow, 1992; Skov et al., 1989) and Sick Building Illness (SBI; Marsh-Knickle, 1992). Another commonly used term, Environmental Illness (EI) is customarily used as an umbrella term for poor health related to unsatisfactory environmental conditions. In the present study, EI will be used instead of SBS or SBI due to its common usage by the study population.

EI was defined by Ryan and Morrow (1992, p. 220) "as one of a spectrum of workplace disorders that are characterized by a variety of non-specific somatic and psychological symptoms." Others have described EI as "a building in which complaints of ill health are more common than might reasonably be expected" (Finnegan, Pickering, & Burge, 1984, p. 1573).

Effects of Environmental Illness

The effects of EI are variable and non-specific, affecting building occupants both physically and psychologically (Ryan & Morrow, 1992). Physical symptoms are numerous and can be classified into five general categories (see Molhave, 1986 for full classification, cited in Hodgson, 1989). They include mucous-membrane irritation affecting the nose, eyes, and throat; skin ailments; and unpleasant odour and taste perceptions. Other commonly reported symptoms include neuropsychiatric disturbances such as fatigue, headaches, nausea, confusion, and dizziness; as

well as asthma-like symptoms (Hodgson & Morey, 1989; Kreiss, 1989; Spengler & Sexton, 1983; Whorton, Larson, Gordon, & Morgan, 1987).

Typically, symptoms increase with exposure to the affected environment but usually dissipate once the occupant leaves the building in the evening, on weekends, and during holidays (Ryan & Morrow, 1992). In some cases symptoms do not abate. They may reoccur upon exposure to chemicals found in home products and in non-work environments (Butler, 1992). For example, formaldehyde commonly found in toothpaste may precipitate EI symptoms.

EI is principally studied from the medical, architectural, and engineering perspectives. Few studies have addressed the psychological and organizational variables related to EI. In a recent investigation, Bauer et al., (1992) found that both sick and healthy subjects working in an EI building reported higher levels of defensiveness, resentment and distrust of authority, anxiety, and confusion, compared to employees in a non-EI building. Working in an EI environment increased worker stress. In addition, management's unwillingness to remedy the problem resulted in high levels of distrust and resentment among all building occupants. Psychological stress due to lack of management support, or scepticism regarding the existence of the illness, may exacerbate symptoms contributing to its duration and severity (Baker,

1989; Ryan & Morrow, 1992).

Incidence of Environmental Illness

Although the exact prevalence of Environmental Illness (EI) in the Unites States and Canada is unknown (Kreiss, 1989), 20% to 30% of all office workers may perceive air quality problems in their office environment (Woods, 1989). This translates into approximately 1,000,000 buildings and 30 to 70 million people exposed to poor indoor air quality (Woods, 1989).

The actual figures may be considerably higher (Finnegan et al., 1984). In a study of office workers in 42 buildings in Britain, up to 80% of building occupants reported at least one work-related symptom (Woods, 1989). Unfortunately, health related complaints due to EI may go unreported out of fear of reprisal. In addition, occupant complaints may be ignored by building owners (Whorton et al., 1987; Chisholm & Doyle, 1993). This lack of support and concern from management and building owners may lead to increased levels of frustration, lowered job satisfaction, and raised symptom severity (Bauer et al., 1992; Ryan & Morrow, 1992).

Predictors of Environmental Illness

There is little agreement on the factors thought responsible for the increasing prevalence of non-specific somatic complaints among workers. Continuing scepticism regarding the existence of EI, a lack of rigorously controlled research, as well as disagreement about the role of various physical and organizational factors are responsible for the lack of consensus (Baker, 1989). There is more agreement on the role of heating and ventilation systems and organic volatile compounds. Both of these physical factors are thought to influence the prevalence of EI symptoms. However, there is little agreement on the role of psychological, social, and organizational factors.

Role of Heating and Ventilation Systems

In the early to mid 1970s, the energy crisis affected the construction of new buildings. Air tight buildings with sealed windows were constructed to save energy and to reduce the costs of heating and air conditioning (Kreiss, 1989; Spengler & Sexton, 1983; Sterling & Sterling, 1983; Whorton et al., 1987). However, the heating, ventilation, and air-conditioning (HVAC) systems in those buildings were either poorly designed, ill equipped for proper air exchange demand, or improperly maintained (Morey & Shattuck, 1989).

During this time frame, the minimum standard number of cubic feet of outdoor air per minute (cfm) per person was

dropped from 30 cfm to 5 cfm as an additional cost cutting measure (Hodgson & Morey, 1989). More recently, the minimum recommended standard has been raised to 15 cfm of outdoor air per person. Although air quality standards are now increasing, the number of building related complaints continues to rise (Hodgson & Morey, 1989).

Several studies assessed the role of HVAC systems in the onset of EI. Finnegan et al., (1984) studied nine buildings including six which were mechanically ventilated. The remaining three were naturally ventilated and served as controls. The mechanically ventilated buildings had significantly more health related complaints.

Burge, Hedge, Wilson, Bass, and Robertson (1987) obtained similar findings in the United Kingdom when they examined 42 office buildings with 47 different ventilation systems. Eighty percent of the workers had a least one work related complaint and more than 40% reported work-related nose and throat irritations and headaches. Nonetheless, there was a wide variation in the number of complaints across buildings with different ventilation systems; these could not be accounted for by other variables such as gender and job type. The buildings with humidification or air conditioning had the greatest symptom prevalence while the buildings with natural ventilation systems had the lowest. These naturally ventilated buildings with a greater number of complaints also had a greater occupant density, improper

ventilation control, and a greater number of occupants who smoked (Burge et al., 1987). Ventilation systems and the volume of fresh air appear to be strongly related to symptom prevalence and severity.

Two other studies compared EI prevalence in buildings with mechanical and natural ventilation systems (Sterling & Sterling, 1983). In one, the existence of building illness was documented by contrasting symptoms found in the suspect building with those found in a control building. A greater number of symptoms were reported in the mechanically ventilated building. Absenteeism rates were also significantly higher in the EI building. The rate of absenteeism grew from three percent before moving into a new mechanically ventilated building, to eight percent after the move. Therefore, working in mechanically ventilated buildings with reported health complaints should be seen as an organizational problem as well as a health concern. These absenteeism rates may be another indicator of organizational problems related to EI. Health concerns may translate into organizational difficulties with far reaching effects upon productivity, organizational stress, and management-employee relations (Baker, 1989).

In the second study, building complaints were monitored over time while the amount of fresh air and lighting were altered (Sterling & Sterling, 1983). The frequency of complaints decreased when more fresh air was introduced into

the building and when the fluorescent lighting was replaced. To rule out Hawthorne Effects, the previous conditions were reinstated, and occupant complaints increased (Sterling & Sterling, 1983).

Research findings linking poor ventilation to EI were not always consistent. For instance, in the Danish Town Hall Study, EI was not related to poorly designed mechanical ventilation systems (Skov & Valbjorn, 1987; cited in Hodgson & Morey, 1989). This study assessed the prevalence of EI complaints in 14 town halls and 13 control buildings. EI symptoms were related to gender, job categories, video display terminal use, and building age. Female workers in newer buildings and in lower job categories had the highest frequency of symptoms. Unlike previous studies, EI symptoms were not related to type of ventilation system in use. Thus, factors unrelated to type of ventilation systems and the volume of fresh air may play a significant role in predicting EI related symptoms. On the whole, ventilation systems are accepted as a significant contributing factor to EI. However, symptoms often persist even when ventilation problems have been remedied. Ventilation factors may explain EI in only 50% of problem buildings (unknown author, cited in Chisholm & Doyle, 1993).

Role of Volatile Organic Compounds (VOC)

Volatile Organic Compounds (VOCs) have also been

related to the onset and severity of EI (Girman, 1989; Hodgson & Morey, 1989). Exposure to VOCs results in health effects similar to those found in EI including nose, eye, and throat irritations, unpleasant taste and odour perceptions, fatigue, nausea, and concentration difficulties (Girman, 1989). Furthermore, levels of VOCs are significantly higher indoors than outdoors, especially in newly constructed or renovated buildings (Girman, 1989).

VOCs are various substances emitted from building materials and furnishings (referred to as offgassing), building occupants, cleaning products, combustion processes, and outdoor air (Girman, 1989). Formaldehyde is an example of one of these compounds related to the onset of EI (Hodgson & Morey, 1989). Mucous membrane irritation results from exposure to formaldehyde even at concentrations below current occupational health standards (Hodgson & Morey, 1989). Some disagreement still remains on the role formaldehyde plays in the etiology of EI. Nonetheless, higher concentrations of VOCs are empirically linked with a greater incidence of mucous membrane irritation, headaches, and neuropsychological dysfunction (Molhave, 1986, cited in Hodgson & Morey, 1989).

Symptoms associated with VOCs tend to decrease over time. This decrease may be due to offgassing, which over time results in lower airborne concentrations. There is some evidence to support this contention. Shortly after

relocating to a new office building, employees started reporting symptoms. Whorton et al., (1987) measured symptoms reported by employees at weekly intervals. The rate and persistence of new symptoms decreased over a five week period and ended after a four month period. A combination of HVAC problems, which was rectified, and offgassing of VOCs were identified as the main etiologic agents (Whorton et al., 1987).

A significant number of EI related incidents can be explained by physical design problems such as inadequate ventilation systems, offgassing, and VOCs. It is unlikely that the recent EI epidemic is coincidental and occurs randomly in buildings. Newer buildings with airtight designs are far more likely to have health related complaints (Finnegan et al., 1984). However, identifying a single cause of EI is virtually impossible because many of these factors are inter-related (Ryan & Morrow, 1992). For example, newer buildings are more likely to be closed, mechanically ventilated structures with modern furniture which emit high levels of VOCs. In addition, the people most prone to becoming ill are typically female clerical workers who experience higher job stress and have little perceived control over their work environments (Ryan & Morrow, 1992). This suggests that psychological and organizational factors may precipitate, in part, the increasing occurrence of EI.

Role of Psychosocial Variables

Few studies have analyzed the role of psychological, social, and organizational factors in building related health complaints (Baker, 1989; Bauer et al., 1992). Often, psychological explanations for building health complaints are proposed only after all environmental causes are ruled out (Baker, 1989). However, the significant changes in office design have been paralleled by dramatic transformations in the social dynamics and organization of office work (Baker, 1989). These social changes, which may have a significant impact upon individuals' physical and psychological health, are often ignored as plausible predictors of work related illnesses.

Explanations of building related health complaints based on engineering and medical factors may ignore the important contributions of organizational, social, and psychological variables (Baker, 1989). Psychological factors influence all aspects of day to day living (Selner & Staudenmayer, 1992). They can behave as primary or secondary contributors to health and sickness at home or at work. Furthermore, the high rates of illness among building employees is not just a medical or engineering concern but is a significant organizational problem which affects job satisfaction, motivation, and productivity (Baker, 1989; Ryan & Morrow, 1991). As a result, the role that social and

organizational dynamics play in EI must be explored.

Psychological Factors Related to EI

Many investigators doubt the existence of EI as a real medical issue (Ryan & Morrow, 1992). One reason for this is the non-specific nature of EI symptoms; another is the failure to identify physical causes of EI. As a result, some investigators point to psychological sources as the sole cause of this illness. Such is the case, for instance, when low chemical concentrations in an EI building are found and are accompanied by high levels of stress and anxiety in its workers. These psychological factors are perceived as the primary cause of the illness (Colligan & Smith, 1978).

The inability to identify any single causal factor for EI further supports psychogenic explanations for the physical complaints (Baker, 1989; Bauer et al., 1992; Ryan & Morrow, 1992). Colligan and Murphy (1979) referred to these types of physical complaints as a distinct diagnostic entity which they labelled Contagious Psychogenic Illness (CPI). CPI is defined as "the shared expression by two or more individuals of a set of physical symptoms and related beliefs in their cause in the absence of an identifiable pathogen" (Cohen et al., 1978, p. 10). Although not explicitly stated, this definition implies that EI is stress induced.

Similar to EI, symptoms related to CPI are often

subjective and non-specific. They include nausea, dizziness, headache, and weakness which tend to alleviate upon removal of the occupant from the building (Bauer et al., 1992). Symptoms are frequently attributed to some environmental work characteristic (e.g., strange odour, gas leak, glue, or solvent (Colligan & Smith, 1978) which is seldom verified by environmental testing as a health risk.

Proponents of CPI explanations argue that a typical worker or workers manifesting EI symptoms may be experiencing anxiety. Feelings of anxiety often manifest physically, producing symptoms such as shortness of breath, dizziness, and nausea. Often, these symptoms are attributed to a physical source in their work environment. As a result, other workers become anxious and experience various physical and psychological symptoms, ascribing them to an attribute in their physical work environment (Boxer, 1990; Colligan & Murphy, 1979; Olkinuora, 1984; Selner & Staudenmayer, 1992).

The CPI hypothesis is illustrated by Cohen et al., (1978). A group of female workers experienced non-specific symptoms which they attributed to an unidentified odour at work. This assumption was not supported by environmental testing nor by medical evaluations of the affected workers. Affected workers had less education and reported greater work pressure and job role ambiguity. However, feelings of control, and physical comfort scores were significantly

higher for the non-affected workers. The combination of varied psychological stressors experienced by subjects may have increased their susceptibility to CPI. Therefore, the odour may have served as an objective physical stressor acting as an outlet which provided justification for physical complaints severe enough to require a doctor's attention (Cohen et al., 1978).

Several factors weaken CPI explanations. Although there is a failure to find toxicant in many CPI studies, this may not be sufficient to exclude air quality explanations. The required air quality standards have been substantially reduced in the last few decades. As a result, measured toxins may fall within acceptable levels but still be high enough to cause a real physical reaction (Morey & Shattuck, 1989). Furthermore, complaints of EI have been predominant in mechanically ventilated, sealed buildings which are most prone to the onset of EI (Finnegan et al., 1984; Lyles, Greve, Bauer, Ware, Schramke, Crouch, & Hicks, 1991).

There are important differences between CPI and EI. Following a triggering event, the social dynamics in EI-affected buildings tend to occur over a period of months and years (Baker, 1989). Conversely, a typical case of CPI affects a work site within hours or days (Boxer, 1990; Colligan & Murphy, 1979; Olkinuora, 1984). As well, during an outbreak of CPI, individuals usually exhibit affective

reactions including anxiety, hyperventilation leading to nausea, dizziness, weakness and headache. Normally, individuals working in an environment with EI show concern about the safety of their environment, whether or not they have symptoms. This largely cognitive reaction differentiates it from the affective responses common during a case of CPI. Furthermore, symptoms in an environment with EI are not explained by hyperventilation and acute anxiety reactions (Baker, 1989). Finally, the pattern of symptomatology found in a building differs between these two illnesses. In CPI, the spread of symptoms develops quickly and usually occurs along visual sight lines among employees. In EI, employees may recognize that they are experiencing similar symptoms, but the symptoms do not necessarily spread to those in contact with the affected employee.

Many cases of EI may be misdiagnosed as CPI because of a failure to conduct proper investigations of the workplace. Some episodes of CPI may occur among office workers, but they probably constitute a very small percentage of the buildings with health related problems (Baker, 1989). Even if psychosocial aspects become a principal focus of EI, there is little likelihood that these factors are the sole cause of the problems. Primarily, psychosocial factors appear to modify the individual's reaction to physical, chemical, social, and organizational changes of his or her work environment (Baker, 1989).

Organizational Factors Related to EI

Although CPI explanations have not been strongly supported, they illustrate some of the possible organizational, social, and psychological factors related to EI. There is increasing evidence that EI is a real illness with physical causes, although some individuals may be more vulnerable due to high work stress, a lack of social support (Baker, 1989; Colligan & Murphy, 1979; Olkinuora, 1984; Ryan & Morrow, 1992) or deficient coping skills (Carver, Scheier, & Pozo, 1992). Several EI studies report a sense of management employee conflict among affected workers (Baker, 1989; Colligan & Murphy, 1979; Olkinuora, 1984). For example, in reviewing CPI related studies, Colligan and Murphy (1979) noted some evidence suggesting that the relationships among affected workers and their supervisors were strained or ambivalent.

Work Stress. Stress can arise because demands exceed an individual's capabilities or because the work environment does not satisfy the individual's motives (Baker, 1989). Other major sources of stress include the job structure, work task, organizational factors, and extra-organizational factors (Baker, 1989). Organizational factors, including role ambiguity, role conflict, and a lack of respect from management are important contributors to the health of workers in office buildings (Baker, 1989), and so is a lack

of recognition (i.e., promotion, praise, pay raise) and autonomy (i.e., people encouraged to solve problems by themselves) (Michela & Lukaszewski, 1986, cited in Baker, 1989).

It has been suggested that stressful life events can change one's physical and psychological susceptibility to poor environmental conditions (Evans, Jacobs, Dooley, & Catalano, 1987; Lazarus & Folkman, 1984; Taylor, 1986). High levels of stress may increase one's vulnerability to physical illness. Previous research has suggested that physical illness is often the result of exposure to stressful objects and events in both work and non-work settings. The harmful effects of prolonged noise and smog (Cohen, Evans, Stokols, & Krantz, 1986), divorce (Wortman, Sheedy, Gluhoski, & Kessler, 1992), and death of a loved one (Lazarus & Folkman, 1984) are just several of the many stressors found to increase susceptibility to mental and physical illness.

Skov et al. (1990) investigated the influence of personal characteristics, job-related and psychosocial factors on environmental illness. Sex was the best predictor of EI symptoms, with women at a greater risk than men. Also, job category was significantly related to symptom prevalence, with lower end jobs (i.e., clerk) showing the highest incidence. Both dissatisfaction with superiors and a belief that the amount of work reduces job

satisfaction affected work-related mucosal irritation. Moreover, office workers who found their workpace too fast and who believed they had little influence on the organization had a greater risk of manifesting symptoms. However, while work-related mucosal irritation and other general symptoms were related to psychosocial, work-related, and personal factors, building type was the strongest predictor of symptomatology. CPI explanations were ruled out since the symptom pattern did not correspond to those typically found in cases of CPI. In addition, organizational stressors (e.g., lack of influence on the organization, work load, workpace) influenced symptom prevalence.

Recently, Norback et al. (1990) investigated the relationship between EI symptoms, exposure to environmental factors, and personal factors. EI related symptoms were associated with sick leave due to airway illness, psychosocial dissatisfaction, smoking, and reported exposure to static electricity. The only physical characteristic related to symptoms was the total indoor hydrocarbon concentration. Unlike previous studies, sex of respondent did not account for differences in symptom prevalence. EI appeared to be a result of poor indoor air quality, but was precipitated by job stress, smoking, and psychosocial dissatisfaction.

Stress appears to be a major factor contributing to the

onset of EI. However, the physical characteristics of buildings (i.e., ventilation) and worker habits (i.e., smoking) are better predictors of EI. In other words, stress may help trigger EI, but only for individuals who are routinely exposed to real environmental dangers such as indoor air pollution.

Stress may not only plays a role in predicting EI, it can also be a result of working in an affected environment. Bauer et al., (1992) provided evidence for the interactive effects of EI and stress. Self-report measures of psychopathology failed to differentiate workers with symptoms from those without symptoms within the same building. However, they did discriminate between affected workers and controls. The measured stress was seen as a consequence of working in a contaminated environment rather than the cause of symptoms, as would be predicted by CPI model. The symptoms were exacerbated by the stress associated with working in a contaminated environment and by having complaints of those symptoms dismissed by management.

In sum, stress may result from EI, may contribute to EI related symptoms, or play a dual role increasing both the symptoms and the source of the stress (Baker, 1989; Cohen et al., 1978; Colligan & Murphy, 1979). In any event, what can be expected is higher levels of stress in EI environments compared to non-EI ones.

Individual differences in coping may determine whether

stress will have a negative impact upon the physical and psychological health of a person (Carver et al., 1992; Cohen et al., 1986; Lazarus & Folkman, 1984). Seeking social support from family, friends, and co-workers is one coping mechanism. Another is being attentive to information which may increase awareness of the situation and possible methods of dealing with the stressor in question (Carver et al., 1992). In the case of EI, those who seek out information to clarify its prevalence, symptoms, and possible causes may be attempting to cope with a potentially hazardous stressor. Therefore, employees in environments thought to be most affected by poor air quality, should be more knowledgeable of EI. One reason would be the greater saliency of EI related information in such an environment. Another, may reflect an attempt to cope with a stressor perceived to be particularly harmful (Lazarus & Folkman, 1984).

Social Support. Close personal relations with others whom one can confide in and receive support from may affect ones physical health. Some have argued that this is a direct effect and would be independent of stressful life events (e.g., La Rocco & Jones, 1978), while others have suggested that social support buffers the effects of stressful life events on illness (Haines, Hurlbert, & Zimmer, 1991; Lin & Ensel, 1989). In fact, social support is considered by some to be the most crucial modifying

influence upon stress, acting as a buffer against physical and psychological illness (Baker, 1989; Bauer et al., 1992; Cohen et al., 1978; Haines et al., 1991; La Rocco & Jones, 1978; Mor-Barak, 1988; Ryan & Morrow, 1992; Srivastava, 1991).

Social support has been defined as "a flow of emotional concern, instrumental aid, and/or appraisal between people" (House, 1981, p. 26). Lin and Ensel (1989) defined social support as "the process by which resources in the social structure are brought to bear to meet the functional needs (e.g., instrumental and expressive) in routine and crisis situations" (p. 383).

Social support from an organization is composed of three components (Cobb, 1976; Mor-Barak, 1988). Emotional support refers to how valued employees feel and whether they have a sense of belonging to a group. Informational support alludes to how clear and effective the communication patterns are within an organization. Finally, instrumental support refers to the adequacy of available resources to complete a job. These components can combine to buffer the worker against stress.

The "Buffer Hypothesis" was supported in numerous studies (Haines et al., 1991; Kumari & Sharma, 1990; Srivastava, 1991). It is suggested that social support may be an important coping mechanism, reducing the effects of stress and thereby improving health (Cohen et al., 1986;

Lazarus & Folkman, 1984; Taylor, 1986). As a result, those with high levels of stress will experience physical and psychological strain if they also perceive a lack of social support (Haines et al., 1991). For example, if an organization promotes open communication and is perceived as being supportive of its employees, stress may be reduced due to the buffering effects of social support. This may result in less strain and more resistance to illness. Unfortunately, the lack of management support and support of co-workers may keep organizational stress at higher levels. For instance, when management does not listen to employees' concerns, or does not inform them of what is being done about a building's air quality problem, employees may perceive this as a lack of social support on the part of the organization (Baker, 1989). In addition, fellow co-workers may be unsympathetic to those suffering with EI related symptoms if their own health has not been affected by poor air quality. The perception that the conditions in the work environment are uncontrollable and unacknowledged by others can lead to even greater stress and a sense of social isolation (Taylor, 1986). As a result, stress levels may be increased, and new symptoms may appear while existing ones worsen.

Little research has focused on the effects of union and public support on physical and psychological health. In light of the findings of other studies, it is expected that

support from these sources would buffer the deleterious effects of stress. Nevertheless, working in an environment which is perceived to pose health concerns would likely reduce the amount of perceived support from one's union and the public in general, especially if little attention has been given to this problem. Many people doubt the existence of EI as a real medical issue due to the non-specific nature of EI symptoms, a failure to identify physical causes of EI, and an inability to identify any single causal factor for EI (Baker, 1992; Ryan & Morrow, 1991). As a result, employees affected with EI and those in EI locations would be expected to have lower levels of perceived support from the organization, co-workers, the public, family members, and the employees' union.

Research suggests that stress and social support interact to help increase health problems (Haines et al., 1991; Kumari & Sharma, 1990). When stress is high, social support tends to be low. When social support is high, stress is typically reduced. Few studies have addressed the relationship of these factors in helping predict work related disorders such as EI. Social support should be relevant to EI; workers in EI buildings should have lower levels of organizational and co-worker social support than those in non-EI environments. Lower levels of social support in EI locations may also result in higher levels of stress, increasing susceptibility to EI related symptoms.

The lack of controlled research makes it difficult to understand the causes and predictors of environmental illness. Neither psychological nor physical factors appear to be solely responsible for this problem. More likely, the complex interaction of these factors determines the onset and severity of this often debilitating illness. The present study seeks to rectify this lack of understanding by explaining both the frequency and correlates of EI in the context of a well-controlled field study. Based on the previous analysis, the following hypotheses will be addressed:

Hypothesis 1

Levels of symptom severity will be higher among workers in known EI locations compared to non-EI locations.

Hypothesis 2

Working in environments known to have EI related problems is expected to be associated with greater levels of stress due to the perceived dangers to one's health and the lack of control over work conditions.

Hypothesis 3

Levels of social support are expected to be lower among participants in EI locations due to their perceived lack of concern on the part of the organization and their co-workers

regarding the welfare of employees. Union support will also be addressed in the present study due to the important role the union has in reducing the impact of EI on the employees.

Hypothesis 4

Participants working in EI locations will have greater knowledge of EI related concerns than their co-workers in non-EI areas.

Hypothesis 5

The model presented in Figure 1 shows the relationships between symptom severity, social support, and stress. This model should work equally well for employees in EI and non-EI environments. A direct negative relationship is hypothesized to exist between stress and social support. For example, if stress is high, social support is expected to be low. It is also expected that stress will positively predict symptom severity. Social support is expected to negatively predict symptom severity.

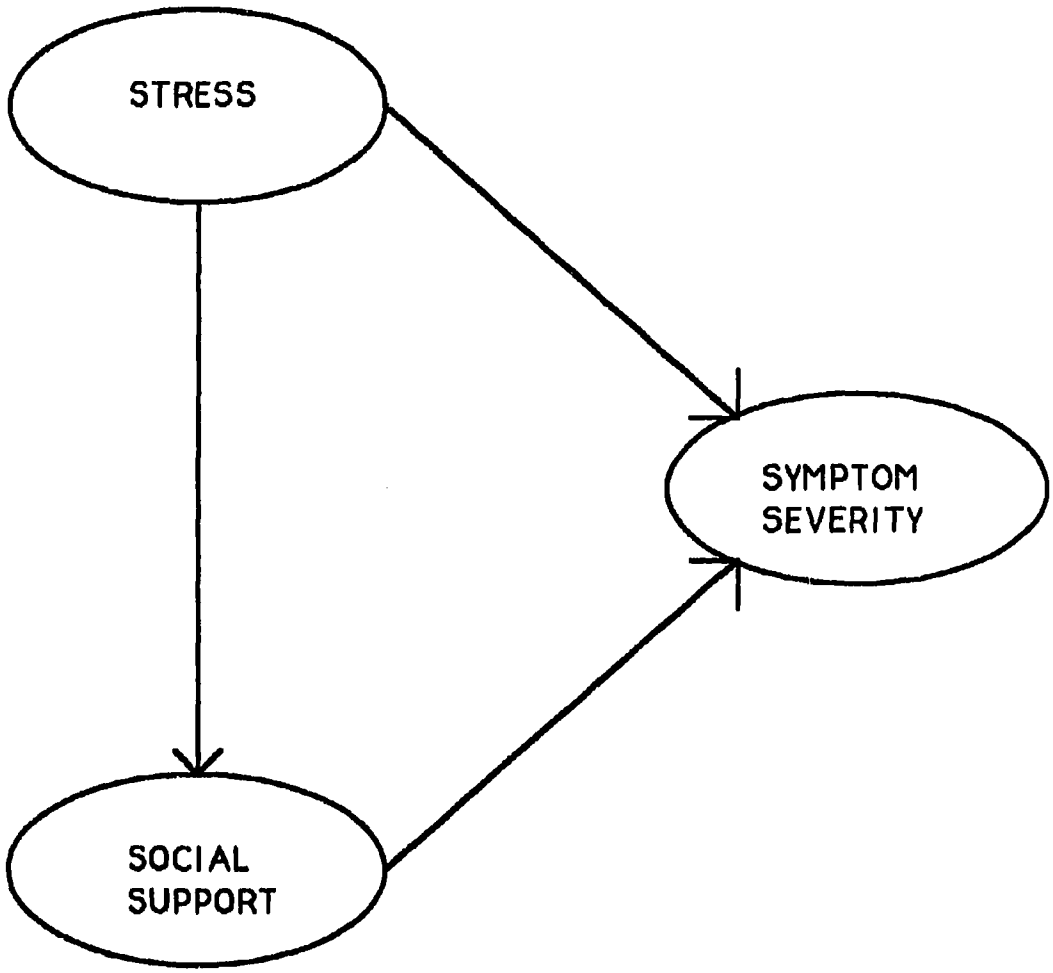

Figure 1. Theoretical structural equation model of stress, social support, and symptom severity.

Method

Setting

The present study was conducted in 10 locations within five hospitals in the Metro Halifax Area. Each hospital is housed in a separate building and unconnected to any other hospital. The Union's Occupational Health and Safety Committee defined each of the hospital locations as an EI or non-EI environment. This was accomplished on the basis of repeated requests from employees in those areas with a high frequency and long duration of health related complaints to investigate the problems.

Hospital #1 is a general care facility principally serving an adult population. This facility contains five locations which were defined as EI environments, and a control location (non-EI) composed of a random sample of participants working in non-EI locations within Hospital #1. Hospital #2 and #3 are under the same administrative structure but are housed in separate buildings. Hospital #2 is a general care facility and was defined by the union as a control hospital (non-EI) even though several cases of EI have been reported. However, the cases were not widespread enough to be considered an EI location. Hospital #3, defined as an EI location, provides medical services to war veterans and psychiatric patients. Hospital #4 is a general care facility for children under 18 years of age and is

considered by the union to be an EI location. Finally, Hospital #5 is a general psychiatric care facility and has had no reported cases of EI. Therefore, it was defined as a non-EI location. Table 1 shows the number of union members surveyed within each hospital location and the response rates for each location.

It was not possible to take any physical measurements of air quality in the present study. However, previous research has uncovered air quality problems and toxic effects among many employees at the Camp Hill Complex in Halifax (Robb, 1993) which is one of the sites included in this study. It was shortly after the completion of the Hospital complex that kitchen staff complained of headaches, skin and eye irritation (Ross, Johnson, & Rea, 1993 as cited in Marsh-Knickle, 1994). Sulphuric Acid, Hydrochloric Acid, and Sodium Hydroxide were discovered to be re-entering the building through the air intake. In addition, harmful levels of Phenol and Formaldehyde were found in the hospitals cleaning solutions (Robb, 1993). Cleaning solutions and additional toxic substances are likely used in other hospitals resulting in health complaints related to poor air quality. As Spengler & Sexton (1983) noted, hospitals have been a target for substantial energy savings. In addition, hospitals have many air contaminants (i.e., bacteria, viruses, radiation, chemicals, etc.). As a result, a greater number of reported air quality problems

often occur in hospitals than other types of office buildings (Lyles et al., 1991). Therefore, hospitals represent an ideal site to investigate this issue.

Though physical measurements could not be taken, a proxy measurement of employees' perception of the environmental air quality were made with the Occupational Environment Scale (OES; Osipow & Spokane, 1983). If the Committee's assessment of EI and non-EI locations is correct, the EI locations should be rated differently on the OES than the non-EI locations.

Participants

Questionnaires were sent to all union members working in the selected locations, except for location #6 in Hospital #1. In this latter case, surveys were sent to a random sample of union members who worked in non-EI locations. Overall, 567 completed and returned the questionnaires (30.6% response rate). Thirty-one questionnaires were dropped due to format errors and a further 11 questionnaires were excluded because participants failed to complete most items. The numbers of respondents in each department and hospital is presented in Table 1. The final sample consisted of 525 participants with 297 of those working in an EI environment and 228 working in a non-EI environment. There were proportionally more females (N = 430, 81.9%) than males (N = 69, 13.1%). In addition, 416

(79.2%) respondents were employed full-time with a majority of the sample classified into the following job categories: Hospital technicians (N = 169, 32.2%), Nurses (N = 110, 21.0%), and Hospital Assistants (N = 47, 9.0%). Other demographic characteristics of the present sample are presented in Table 2.

Table 1

Numbers of union members surveyed within each department and hospital and number of respondents for each location.

Hospital Location	# Surveyed	# responded	%
Hospital #1	**717**	**246**	**34.3**
Location #1	249	100	40.1
Location #2	37	16	43.2
Location #3	95	33	34.7
Location #4	117	30	25.6
Location #5	19	7	36.8
Location #6 (Control)	200	60	30.0
Hospital #2 (Control)	**220**	**68**	**30.9**
Hospital #3	**129**	**50**	**38.8**
Hospital #4	**167**	**61**	**36.5**
Hospital #5 (Control)	**620**	**100**	**16.1**
Total	**1853**	**525**[1]	**30.5**

[1] This actual number of returned questionnaires was 567 but some were not included in the analyses due to format errors or because few questionnaire items were completed.

Table 2

Summary of Demographic Variables for the Sample.

VARIABLE	N	%
BUILDING CLASSIFICATION		
EI	297	56.6
Non-EI	228	43.4
SEX		
Male	69	13.1
Female	430	81.9
No response	26	4.9
AGE		
24 years and less	15	2.9
25 to 34	171	32.6
35 to 44	215	41.0
45 to 54	95	18.1
55 to 64	21	4.0
No response	8	1.5
EMPLOYMENT		
Full-time	416	79.2
Part-time	95	18.1
No response	14	2.7
POSITION		
Technicians	169	32.2
Nurses	110	21.0
Hospital Assistants	47	9.0
Secretarial	43	8.2
General Workers	24	4.6
Physiotherapists	22	4.2
Instructors	12	2.3
Psychologists/Social Workers	11	2.1
Dieticians	6	1.1
Unit Heads	4	.8
Other	2	.4
No response	75	14.3

Table 2 (continued)

Summary of Demographic Variables for the Sample.

VARIABLE	N	%
EDUCATION[2]		
Secondary	5	.9
Grade 12/Vocational	135	25.7
College	116	22.1
University	149	28.4
Graduate School	48	9.1
Technical Training	58	11.0
No response	14	2.7

[2] For simplicity and ease of interpretation, "Educational Background" was collapsed from 13 categories to five.

Procedure

The union members selected for inclusion in the study received a package of materials (see Appendix A) which included a cover letter from their union president urging participation and indicating that the study was being conducted under the auspices of the union's Occupational Health and Safety Committee in conjunction with university researchers. Participants were asked to complete the survey on an anonymous and confidential basis. Participants were encouraged to complete the questionnaire, however, they were not required to do so and were informed that they could discontinue their participation at any time. Participants were informed that they would receive feedback on the study results through an article in their union newsletter.

Design

The present study used a quasi-experimental design. Participants were selected based on the incidence of EI in certain hospitals and departments within hospitals. The study included control hospitals, that is buildings where no incidents of EI have been reported, as well as control departments within hospitals which had experienced EI. The entire population of union members working in the EI and non-EI environments were surveyed, with the exception of Location #6 in Hospital #1 where a random sample of employees were sent the questionnaires.

Survey Instrument

A multivariate research instrument was developed to assess the variables of interest. This instrument included measures related to symptom severity, perceptions of one's health and the health of others, social support, and stress. In addition, the instrument included measures to assess participants knowledge of EI and various demographic characteristics. The instrument included both standard rating scales and some developed for the study. With the cooperation of the Union's Occupational Health and Safety Committee, the instrument was reviewed to ensure its relevance. The Committee tested earlier versions of the survey to ensure that the measures reflected accurately their situation and concerns (see Appendix A). Unless otherwise stated, a composite score was computed for each measurement scale by averaging the responses to the scale items. Scale items were reversed coded, when required, to ensure accurate reliability coefficients.

Measurement of Symptoms

Neurobehavioural Symptoms. The Neurobehavioural Symptom Checklist (NSC; Bauer et al., 1992) is a 46 item self-report instrument designed to measure physical and psychological symptoms. The NSC assesses the existence and severity of a range of symptoms rated on a five point Likert-type scale (0 = have not experienced in the last two years; 4 = have

experienced, extremely severe). In addition, participants indicated whether each of the symptoms started at work (1 = Yes; 2 = No) (see Appendix A). The NSC had high internal consistency (alpha = .95). This measure was used to assess the prevalence of EI-related symptoms.

Identification of Health Concerns. Nine items assessed whether the employees felt that their health, or that of their colleagues, had been affected by the building in which their work took place. Participants responded on a five point Likert-type scale (1 = strongly disagree; 5 = strongly agree) to statements such as: "I am close friends with individuals who have experienced work related illness.", "I know people at work who have become ill for no apparent cause." and "I believe my long-term health may be adversely affected by working in this building." The complete inventory is presented in Appendix A. Two items reflected perceptions that one's own health had been affected by the work environment (alpha = .89) and were included in a subscale called Perceptions of My Health (PMH). The other seven items, the Perceptions of Others' Health Sub-scale (POH) also showed high internal consistency (alpha = .93). These sub-scales were also used as an indicator of EI-related effects. The two sub-scales combined were significantly correlated with the NSC measure, $r = .51$, $p < .01$, indicating that symptom severity was related to the

perceptions of one's own health, and the health of others, being affected by the employees' work environment.

Perceived Environmental Conditions

Environmental Work Conditions. The Occupational Environment Scale (OES; Osipow & Spokane, 1983) is a 10 item self-report instrument designed to measure perceptions of the physical work environment. All scale items were rated on a five point Likert-type scale (1 = strongly disagree, 5 = strongly agree). The scale included statements such as: "On my job I am exposed to high levels of dust." and "On my job I am exposed to hazardous materials.". Three new statements were added to reflect conditions commonly found in hospital environments (i.e., "On my job I am exposed to radiation) and in buildings with reported cases of EI (i.e., "On my job I don't breath enough fresh air.") The internal consistency of this 13 item scale was high (alpha = .85). This measure was used as a proxy for actual physical measurements of environmental air quality and toxicity, as well as a validity check in the differentiation of EI and non-EI locations.

Social Support Measures

Four social support measures were used in the present study.

Organizational Support. The Perceived Organizational Support Scale (POS; Eisenberger, Huntington, Hutchison, &

Sowa, 1986) addresses social support issues in an organizational context. It consists of 16, Likert-type items (1 = strongly disagree; 7 = strongly agree) which measure the perceived amount of support employees receive from their employer and the organization as a whole (e.g., "The employer values my contribution to its well-being.", and "The employer fails to appreciate any extra effort from me"). The POS demonstrated high internal consistency (alpha = .94). This measure was included to assess the social support provided by the organization.

Union Support. To address the issue of support received from the employees union, 15 of the 16 items on the POS were modified. To do so, the wording was slightly altered to reflect union concerns. For example, on the original POS, the statement, "The employer fails to appreciate any extra effort from me" was changed to, "The union fails to appreciate any extra effort from me." One POS item was not included in the newly created Perceived Union Support Scale (PUS) because it did not reflect union activities in general. The reliability of the PUS was virtually unchanged from the POS (alpha = .92). This measure was used to assess the social support provided by the workers' union.

Psychological Sense of Community. The Psychological Sense of Community scale (PSC; Perkins, Floris, Rich, Wandersman,

& Chavis, 1990) consists of 12 items rated on a 5 point Likert-type scale (1 = strongly disagree; 5 = strongly agree) addressing the perceived level of support received by co-workers and the amount of psychological comfort experienced within the office/department. The scale includes statements such as: "My fellow workers and I want the same things from the job.", and "I think my office/department is a good place for me to work.". The scale had moderately high internal consistency (alpha = .78). This measure was used to assess the perceived social support received from co-workers.

Attitudes of Significant Others. Nineteen Likert-type items (1 = strongly disagree; 5 = strongly agree) were developed into a scale called Perceived Attitudes of Significant Others (PASO) to assess how employees think significant others (e.g. management, the media, family members, general public) perceive EI. Statements included : "My family is concerned with air quality in my place of work.", "The media have been one-sided in their coverage of Environmental Illness.", "Management views Environmental Illness as a set of symptoms faked by employees to get off work.", and "The general public is sympathetic with people suffering from Environmental Illness." Items worded negatively were reversed scored to ensure that higher scores reflected greater support from others. The PASO scale items

showed moderately high internal consistency (alpha = .77).

Stress Measures

Four measures were used to assess work-related stress.

Role Ambiguity. The Role Ambiguity Scale (RAS; Rizzo, House, Lirtzman, 1970) refers to the uncertainty of knowing what behaviour is expected in a job. It includes six items such as: "I feel secure about how much authority I have.", "I know that I have divided my time properly.", and "I know what my responsibilities are." (see Appendix A) rated on a 5 point Likert-type scale (1 = strongly disagree; 5 = strongly agree). It had high internal consistency (alpha = .83). This measure was included to assess employees' level of ambiguity regarding their work roles.

Role Conflict. The Role Conflict Scale (RCS; Rizzo et al., 1970) refers to conflicts between the time, resources, or capabilities of the focal person or conflicting expectations from others. It includes eight items (e.g. "I have to do things that should be done differently.", and "I receive incompatible requests from two or more people.") rated on a 5 point Likert-type scale (1 = strongly disagree; 5 = strongly agree). It had high reliability (alpha = .87).

Role Overload. The Role Overload Scale (ROS; Beehr, Walsh, & Taber, 1976) measures the degree to which employees feel

overworked in any given time frame. It includes three items: "I am given enough time to do what is expected of me on my job.", "It often seems like I have too much work for one person to do." and "The performance standards on my job are too high.", rated on a five point Likert-type scale (1 = strongly disagree; 5 = strongly agree). While the ROS had a marginal reliability (alpha = .59), it was consistent with previously reported alphas. Beehr, Walsh, and Taber (1976) reported a reliability of .56 for this scale.

Organizational Stress. The Organizational Stress Scale (OSS; Sarason & Johnson, 1979) contains 31 descriptions of events which may have occurred in the last two years (e.g., "Promotion.", "Suspended from job.", "Work related death of co-worker.") Each statement is rated as positive or negative on a 7 point Likert-type scale (-3 = experienced, had an extremely negative impact; 0 = have not experienced the event; +3 = experienced, had an extremely positive impact). The more negative the score, the higher the organizational stress of the employee. The internal consistency of the scale was moderately high (alpha = .74).

Knowledge of EI

Employees Knowledge of EI. Participants indicated their agreement with 16 true and false statements developed to test employees' knowledge of EI related issues (e.g.,

Environmental Illness may occur in the workplace (True); "The incidence of Environmental Illness is the same for men and women." (False)). Employees indicated the degree to which they agreed or disagreed with each statement on the Employees Knowledge of EI Scale (EKEI) using a five point Likert-type scale (1 = strongly disagree; 5 = strongly agree). Some scale items were reversed scored to ensure that higher scores reflected greater knowledge of EI. The EKEI showed moderate internal consistency (alpha = .61). This measure was used as a manipulation check to assess whether those working in EI environments are more concerned and attentive to stories in the media about EI.

Analyses

Place of employment, EI vs non-EI location, was the independent variable for all reported analyses. The PMH was used as a covariate in many of the analyses to control for employees' perceptions of their own health. The other variables (e.g., role ambiguity, role conflict, organizational support, etc.) were treated as dependent variables unless otherwise stated. Means and standard deviations of variables for each study locations are presented in Appendix B).

Due to the small samples sizes in several of the 10 hospital locations, data were collapsed into six meaningful groups. This resulted in three EI and three non-EI groups:

1. EI Hospital #1 2. non-EI Hospital #1 3. non-EI Hospital #2 4. EI Hospital #3 5. EI Hospital #4 6. non-EI Hospital #5. The sample sizes for these six groups are given in Table 1.

The first four research questions were examined using either MANOVA, MANCOVA, or Discriminant Analysis programs included in SPSS. The model proposed in Hypothesis 5 was tested using the LISREL VII package incorporated into SPSS. For all analyses, the data were examined for normality, outliers, linearity, homogeneity of regression, and multicollinearity (Tabachnick & Fidell, 1989).

Results

To address the first four hypotheses, a between-subjects multivariate analysis of covariance was performed on 12 dependent variables (DVs) in the following order of entry: symptom severity, perceived health of others, role ambiguity, role conflict, role overload, organizational stress, psychological sense of community, organizational support, union support, perceived attitudes of significant others, perceived environmental working conditions, and knowledge of EI. Adjustment was made for the covariate perceptions of one's health being affected by their place of work (PMH). The independent variable was hospital location.

SPSS MANOVA was used for the analyses with the sequential adjustment for nonorthogonality. The total N of 525 was reduced to 521 due to deletion of four univariate outliers (one in each of four of the six groups); one of which was also a multivariate outlier. Moderate skewness was evident in some of the dependent variables (i.e., symptom severity). However, variables such as symptom severity would not expected to be normally distributed within most populations with overall symptom severity generally being low for the majority of the population. Therefore, no variable transformation was computed. In addition, with sample sizes greater than 20 in each group, the assumption of normality is robust against violation (Tabachnick & Fidell, 1989). Results of evaluation of

homogeneity of variance-covariance matrices, linearity, and multicollinearity were satisfactory. The covariate was considered to be adequately reliable for analysis.

Pillai's criterion indicated that the combined DVs were significantly related to the covariate, approximate $F(12,477) = 64.94$, $p<.001$. There was a significant association between DVs and the covariate, with $eta^2 = .62$.

To investigate more specifically the power of the covariate to adjust dependent variables, separate multiple regressions were run for each DV, with the covariate acting as a predictor. The covariate provided significant adjustment to 10 of the 12 dependents. The covariate did not adjust for perceived attitudes of significant others nor union support (see Table 3 for the effect of the covariate on each DV separately).

Effects of hospital location on the DVs after adjustment for the covariate was investigated in univariate and stepdown analysis. Heterogeneity of regression occurred for the variables role ambiguity and union support. However, the assumption was robust to the violation. Separate ANCOVAs were run on these two dependent variables showing no significant differences in results from the MANCOVA including all the DVs. All DVs were judged to be sufficiently reliable to act as covariates.

Special contrasts were computed to assess differences between EI and non-EI locations on the dependent

Table 3

Univariate, and Stepdown Tests of Significance of Within Cells Regression of DVs with Perceptions of One's Health Affected by Place of Work as Covariate.

Effect	DV	Univariate F	df	Stepdown F	df
Covariate	NSC	203.64[a]	1/488	203.64***	1/488
	POH	483.81[a]	1/488	338.26***	1/487
	RAS	24.82[a]	1/488	12.20**	1/486
	RCS	25.30[a]	1/488	0.04	1/485
	ROS	42.46[a]	1/488	0.94	1/484
	OSS	50.67[a]	1/488	4.58*	1/483
	PSC	43.73[a]	1/488	2.42	1/482
	POS	67.34[a]	1/488	6.80**	1/481
	PUS	0.09	1/488	.60	1/480
	PASO	1.39	1/488	2.60	1/479
	OES	136.97[a]	1/488	10.24**	1/478
	EKEI	41.54[a]	1/488	4.32*	1/477

[a] Significance level cannot be evaluated but would reach $p < .05$ in univariate context.

* $p < .05$
** $p < .01$
*** $p < .001$

Note. NSC = NEUROBEHAVIOURAL SYMPTOM CHECKLIST; POH = PERCEPTIONS OF OTHER PEOPLES' HEALTH; RAS = ROLE AMBIGUITY SCALE; RCS = ROLE CONFLICT SCALE; ROS = ROLE OVERLOAD SCALE; OSS = ORGANIZATIONAL STRESS SCALE; PSC = PSYCHOLOGICAL SENSE OF COMMUNITY SCALE; POS = PERCEIVED ORGANIZATIONAL SUPPORT SCALE; PUS = PERCEIVED UNION SUPPORT SCALE; PASO = PERCEIVED ATTITUDES OF SIGNIFICANT OTHERS; OES = OCCUPATIONAL ENVIRONMENT SCALE; EKEI = EMPLOYEES KNOWLEDGE OF ENVIRONMENTAL ILLNESS

measures. The first planned comparison was between participants in EI and non-EI locations. With Pillai's criterion, the combined DVs significantly differed between these two types of locations, approximate $F(12, 477) = 3.98$, $p < .001$, $eta^2 = .09$. After adjusting for differences on the covariate, four of the 12 dependents significantly differed between EI and non-EI locations.

Overall, workers in EI locations showed greater symptom severity (adjusted mean = .80) than those in non-EI locations (adjusted mean = .62), stepdown $F(1, 488) = 4.59$, $p < .04$, $eta^2 = .01$. Participants in EI locations perceived the health of others' to be more adversely affected by their place of work (adjusted mean = 3.72) than those in non-EI locations (adjusted mean = 3.25), stepdown $F(1, 487) = 15.17$, $p < .05$, $eta^2 = .03$. Levels of perceived union support was higher for participants in EI locations (adjusted mean = 4.38) than for participants in non-EI locations (adjusted mean = 4.21), stepdown $F(1, 480) = 4.97$, $p < .02$, $eta^2 = .01$. Perceptions of environmental conditions at work also differed in the EI and non-EI locations, after adjustment for the covariate, stepdown $F(1, 478) = 16.96$, $p < .001$, $eta^2 = .04$. Perceptions of poor environmental work conditions were higher among participants in EI locations (adjusted mean = 2.93) than those in non-EI locations (adjusted mean = 2.87). There were no other significant differences between the two groups on the other

dependent measures (see Table 4).

The second special contrast was computed to assess differences between Hospital #2 (non-EI) and Hospital #3 (EI); although housed in separate buildings, both hospitals are under the same administrative structure. Pillai's Criterion revealed overall multivariate significance, $F(12, 477) = 2.26$, $p < .009$, $eta^2 = .05$ between these two hospitals on the combined DVs. After adjusting for the covariate, the two locations differed on three of the 12 dependent variables. Greater symptom severity was reported among participants in the EI location (adjusted mean = .85) than the non-EI location (adjusted mean = .55), stepdown $F(1, 488) = 5.59$, $p < .02$, $eta^2 = .01$. Unexpectedly, after adjustment for the covariate, perceived environmental working conditions were given a significantly lower rating in the non-EI location (adjusted mean = 2.96) than in the EI location (adjusted mean = 2.48), stepdown $F(1, 478) = 5.84$, $p < .02$, $eta^2 = .01$. Accurate knowledge of EI was also greater among participants in the non-EI location (adjusted mean = 3.75) than in the EI location (adjusted mean = 3.44), stepdown $F(1,) = 9.37$, $p < .003$, $eta^2 = .02$ (see Table 5).

The final special contrast compared EI locations in Hospital #1 with the random sample taken from non-EI locations in Hospital #1. With the use of Pillai's criterion, the EI and non-EI locations differed on the combined effect of the DVs, approximate $F(12, 477) = 3.09$,

Table 4

Univariate and Stepdown Contrasts among all EI and Non-EI Locations.

Effect	DV	Univariate F	df	Stepdown F	df
Hospital Location	NSC	4.59[a]	1/488	4.59*	1/488
	POH	15.25[a]	1/488	15.17***	1/487
	RAS	0.25	1/488	0.87	1/486
	RCS	0.34	1/488	1.30	1/485
	ROS	0.39	1/488	0.50	1/484
	OSS	0.16	1/488	0.04	1/483
	PSC	0.01	1/488	0.01	1/482
	POS	1.54	1/488	1.00	1/481
	PUS	4.82[a]	1/488	4.94*	1/480
	PASO	1.61	1/488	1.25	1/479
	OES	16.30[a]	1/488	16.96***	1/478
	EKEI	0.42	1/488	0.06	1/477

[a] Significance level cannot be evaluated but would reach $p < .05$ in univariate context.

* $p < .05$
*** $p < .001$

Note. NSC = NEUROBEHAVIOURAL SYMPTOM CHECKLIST; POH = PERCEPTIONS OF OTHER PEOPLES' HEALTH; RAS = ROLE AMBIGUITY SCALE; RCS = ROLE CONFLICT SCALE; ROS = ROLE OVERLOAD SCALE; OSS = ORGANIZATIONAL STRESS SCALE; PSC = PSYCHOLOGICAL SENSE OF COMMUNITY SCALE; POS = PERCEIVED ORGANIZATIONAL SUPPORT SCALE; PUS = PERCEIVED UNION SUPPORT SCALE; PASO = PERCEIVED ATTITUDES OF SIGNIFICANT OTHERS; OES = OCCUPATIONAL ENVIRONMENT SCALE; EKEI = EMPLOYEES KNOWLEDGE OF ENVIRONMENTAL ILLNESS

Table 5

Univariate and Stepdown Contrasts between Hospital #2 (Non-EI) and Hospital #3 (EI).

Effect	DV	Univariate F	df	Stepdown F	df
Hospital Location	NSC	5.59[a]	1/488	5.59*	1/488
	POH	2.57	1/488	2.58	1/487
	RAS	0.74	1/488	0.31	1/486
	RCS	0.04	1/488	0.43	1/485
	ROS	1.46	1/488	1.73	1/484
	OSS	0.05	1/488	0.09	1/483
	PSC	0.18	1/488	0.04	1/482
	POS	0.02	1/488	0.64	1/481
	PUS	0.19	1/488	0.19	1/480
	PASO	0.09	1/488	0.02	1/479
	OES	5.39[a]	1/488	5.84*	1/478
	EKEI	11.21[a]	1/488	9.37**	1/477

[a] Significance level cannot be evaluated but would reach $p < .05$ in univariate context.

* $p < .05$
** $p < .01$

Note. NSC = NEUROBEHAVIOURAL SYMPTOM CHECKLIST; POH = PERCEPTIONS OF OTHER PEOPLES' HEALTH; RAS = ROLE AMBIGUITY SCALE; RCS = ROLE CONFLICT SCALE; ROS = ROLE OVERLOAD SCALE; OSS = ORGANIZATIONAL STRESS SCALE; PSC = PSYCHOLOGICAL SENSE OF COMMUNITY SCALE; POS = PERCEIVED ORGANIZATIONAL SUPPORT SCALE; PUS = PERCEIVED UNION SUPPORT SCALE; PASO = PERCEIVED ATTITUDES OF SIGNIFICANT OTHERS; OES = OCCUPATIONAL ENVIRONMENT SCALE; EKEI = EMPLOYEES KNOWLEDGE OF ENVIRONMENTAL ILLNESS

$p < .001$, $eta^2 = .07$. Subsequent univariate and stepdown F tests revealed differences between EI and non-EI locations on five of the 12 dependents after adjustment for the covariate.

As expected, symptom severity was higher among those working in the EI location (adjusted mean = .85) than the non-EI location (adjusted mean = .68), stepdown $F(1, 488) = 4.35$, $p < .04$, $eta^2 = .01$. Participants in the EI location were also more likely to have the perception that others' health had been affected by their place of work (adjusted mean = 3.44) than those in the non-EI location (adjusted mean = 3.18), $F(1, 487) = 3.85$, $p < .05$, $eta^2 = .01$. Significantly lower levels of role conflict were also reported in the EI location (adjusted mean = 2.88) than in the non-EI location (adjusted mean = 3.00), stepdown $F(1,485) = 13.02$, $p < .001$, $eta^2 = .03$. In addition, slightly less organizational stress was reported in the EI location (adjusted mean = 3.97) than in the non-EI location (adjusted mean = 4.01), $F(1, 484) = 4.07$, $p < .05$, $eta^2 = .01$. Participants in the EI location reported greater perceived support from significant others (adjusted mean = 3.16) than those in the non-EI location (adjusted mean = 3.12), $F(1, 479) = 4.97$, $p < .02$, $eta^2 = .01$ (see Table 6). Pooled within-cell correlations among dependent variables are shown in Table 7.

Table 6

Univariate and Stepdown Contrasts between EI and Non-EI Locations in Hospital #1.

Effect	DV	Univariate F	df	Stepdown F	df
Hospital Location	NSC	4.35[a]	1/488	4.35*	1/488
	POH	3.84[a]	1/488	3.85*	1/487
	RAS	1.09	1/488	1.80	1/486
	RCS	7.41[a]	1/488	13.02***	1/485
	ROS	3.32	1/488	0.52	1/484
	OSS	2.12	1/488	4.07*	1/483
	PSC	0.44	1/488	0.21	1/482
	POS	0.03	1/488	2.72	1/481
	PUS	0.99	1/488	0.67	1/480
	PASO	5.65[a]	1/488	4.90*	1/479
	OES	2.36	1/488	1.08	1/478
	EKEI	0.02	1/488	0.35	1/477

[a] Significance level cannot be evaluated but would reach $p < .05$ in univariate context.

* $p < .05$
*** $p < .001$

Note. NSC = NEUROBEHAVIOURAL SYMPTOM CHECKLIST; POH = PERCEPTIONS OF OTHER PEOPLES' HEALTH; RAS = ROLE AMBIGUITY SCALE; RCS = ROLE CONFLICT SCALE; ROS = ROLE OVERLOAD SCALE; OSS = ORGANIZATIONAL STRESS SCALE; PSC = PSYCHOLOGICAL SENSE OF COMMUNITY SCALE; POS = PERCEIVED ORGANIZATIONAL SUPPORT SCALE; PUS = PERCEIVED UNION SUPPORT SCALE; PASO = PERCEIVED ATTITUDES OF SIGNIFICANT OTHERS; OES = OCCUPATIONAL ENVIRONMENT SCALE; EKEI = EMPLOYEES KNOWLEDGE OF ENVIRONMENTAL ILLNESS

Table 7

Pooled Within-Cell Correlations Among 12 DVs with Standard Deviations on the Diagonal

	NSC	POH	RAS	RCS	ROS	OSS
NSC	.50					
POH	.01	.75				
RAS	.08	-.07	.75			
RCS	.11	.06	.45	.87		
ROS	.10	.11	.27	.52	.84	
OSS	.10	.04	.33	.33	.25	.30
PSC	-.09	-.01	-.43	-.34	-.25	-.33
POS	-.13	.03	-.46	-.43	-.26	-.39
PUS	.02	-.03	-.12	-.03	.01	-.06
PASO	-.02	.05	-.25	-.19	-.15	-.08
OES	.14	.15	.17	.29	.21	.18
EKEI	-.01	.15	-.07	-.05	-.01	.01

	PSC	POS	PUS	PASO	OES	EKEI
PSC	.54					
POS	.53	1.10				
PUS	.05	.14	.95			
PASO	.17	.30	.19	.44		
OES	-.24	-.22	-.03	-.07	.70	
EKEI	.06	-.03	.06	.07	-.05	.34

Note. NSC = NEUROBEHAVIOURAL SYMPTOM CHECKLIST; POH = PERCEPTIONS OF OTHER PEOPLES' HEALTH; RAS = ROLE AMBIGUITY SCALE; RCS = ROLE CONFLICT SCALE; ROS = ROLE OVERLOAD SCALE; OSS = ORGANIZATIONAL STRESS SCALE; PSC = PSYCHOLOGICAL SENSE OF COMMUNITY SCALE; POS = PERCEIVED ORGANIZATIONAL SUPPORT SCALE; PUS = PERCEIVED UNION SUPPORT SCALE; PASO = PERCEIVED ATTITUDES OF SIGNIFICANT OTHERS; OES = OCCUPATIONAL ENVIRONMENT SCALE; EKEI = EMPLOYEES KNOWLEDGE OF ENVIRONMENTAL ILLNESS

Discriminant Function Analysis (EI vs Non-EI)

A direct discriminant function analysis, using the 12 dependent variables, predicted group membership in two groups (combined EI and non-EI locations). Predictors were symptom severity, perceptions of others health being affected by the work place, role ambiguity, role conflict, role overload, organizational stress, psychological sense of community, organizational support, union support, support of significant others, environmental working conditions, and knowledge of EI.

Of the original 525 cases, four univariate outliers were dropped from analysis, two from each group. For the remaining 521 cases, evaluation of assumptions of linearity, normality, multicollinearity, singularity, and homogeneity of variance-covariance matrices were satisfactory.

A Canonical Discriminant Analysis resulted in one function (eigenvalue = .21, $X^2(12) = 91.13$, $p < .001$. The canonical correlation ($r = .413$) indicated that approximately 17.1% of the variance was shared by the two groups and the predictors on this function.

The loading matrix of correlations between predictors and the discriminant function indicates that perceptions of others health being affected by the work location, perceptions of environmental conditions, and symptom severity were the best predictors for distinguishing between EI and non-EI locations. The correlation of variables

within the function were ordered by size and are displayed in Table 8.

Due to the different sample sizes in the two groups, the prior probabilities of each group were not equal (EI = .56; non-EI = .44). Overall, 356 participants (68.33%) were classified correctly, compared to 260.5 that would be correctly classified by chance alone. Participants in EI locations were more likely to be correctly classified (78.5% correct classifications) than non-EI participants (55.3% correct classifications). Rates of classification were significantly better than chance (see Table 9). The pooled within-group correlations among predictors is presented in Table 10.

Table 8

Pooled Within-Groups Correlations Between Discriminating Variables and Canonical Discriminant Functions, and Univariate F tests.

Predictor Variables	Correlations of predictor variables with discriminant Function	Univariate F(1,520)
POH	.880	78.382***
OES	.401	16.543***
NSC	.317	10.219**
PASO	.214	4.660*
PUS	.195	3.871*
EKEI	.094	0.900
POS	.090	0.840
RCS	.086	0.763
RAS	-.035	0.126
PSC	-.009	0.008
ROS	.005	0.003
OSS	.003	0.001
Canonical R	.413	
Eigenvalue	.206	

* p < .05
** p < .01
*** p < .001

Note[1]. POH = PERCEPTIONS OF OTHER PEOPLES' HEALTH; OES = OCCUPATIONAL ENVIRONMENT SCALE; NSC = NEUROBEHAVIOURAL SYMPTOM CHECKLIST; PASO = PERCEIVED ATTITUDES OF SIGNIFICANT OTHERS; PUS = PERCEIVED UNION SUPPORT SCALE; EKEI = EMPLOYEES' KNOWLEDGE OF EI; POS = PERCEIVED ORGANIZATIONAL SUPPORT SCALE; RCS = ROLE CONFLICT SCALE; RAS = ROLE AMBIGUITY SCALE; PSC = PSYCHOLOGICAL SENSE OF COMMUNITY SCALE; ROS = ROLE OVERLOAD SCALE; OSS = ORGANIZATIONAL STRESS SCALE

Note[2]. Variables are ordered by size of correlation within the function.

Table 9

Discriminant Function Analysis Classification Results.

ACTUAL GROUP	NO. OF CASES	PREDICTED GROUP MEMBERSHIP	
		EI	NON-EI
EI	293	230 78.5%	63 21.5%
NON-EI	228	102 44.7%	126 55.3%
PERCENT OF "GROUPED" CASES CORRECTLY CLASSIFIED:			68.33%

Table 10

Pooled Within-Group Correlations Among Predictors.

	NSC	POH	RAS	RCS	ROS	OSS	PSC	POS	PUS	PASO	OES	EKEI
NSC	1.00											
POH	.38	1.00										
RAS	.16	.07	1.00									
RCS	.19	.17	.46	1.00								
ROS	.25	.27	.31	.56	1.00							
OSS	.22	.22	.38	.37	.31	1.00						
PSC	-.21	-.18	-.47	-.41	-.33	-.40	1.00					
POS	-.25	-.20	-.51	-.49	-.34	-.46	.59	1.00				
PUS	.03	-.02	-.10	-.04	-.01	-.05	.05	.14	1.00			
PASO	.04	.10	-.24	-.21	-.14	-.07	.17	.28	.22	1.00		
OES	.34	.39	.25	.37	.35	.29	-.35	-.36	-.02	-.06	1.00	
EKEI	.11	.30	.01	.02	.07	.11	-.04	-.13	.07	.08	.09	1.00

Note. NSC = NEUROBEHAVIOURAL SYMPTOM CHECKLIST; POH = PERCEPTIONS OF OTHER PEOPLES' HEALTH; RAS = ROLE AMBIGUITY SCALE; RCS = ROLE CONFLICT SCALE; ROS = ROLE OVERLOAD SCALE; OSS = ORGANIZATIONAL STRESS SCALE; PSC = PSYCHOLOGICAL SENSE OF COMMUNITY SCALE; POS = PERCEIVED ORGANIZATIONAL SUPPORT SCALE; PUS = PERCEIVED UNION SUPPORT SCALE; PASO = PERCEIVED ATTITUDES OF SIGNIFICANT OTHERS; OES = OCCUPATIONAL ENVIRONMENT SCALE; EKEI = EMPLOYEES KNOWLEDGE OF ENVIRONMENTAL ILLNESS

Post-Hoc Explanatory Analysis of Within-group differences

The comparisons between participants working in EI and non-EI locations, after controlling for perceptions of one's health, suggest symptom severity is uniformly higher in EI locations. In addition, perceptions of others' health being affected by the work place and the perception of poor environmental work conditions were more evident among participants in EI locations. However, planned comparisons between various EI and non-EI locations failed to show consistent differences on stress and social support variables.

Several significant differences revealed lower levels of role conflict and higher levels of union and organizational support in EI locations. This suggested that people working in EI areas seek social and informational support as a means of reducing levels of stress due to the presence of EI (Baker, 1989). Nonetheless, these analyses do not provide information which help to distinguish people with a high levels of symptom severity from those with low levels of symptom severity within EI departments and hospitals.

Post-hoc analyses were computed to address the factors that may differentiate people with low and high symptom severity within EI locations. The three EI locations were collapsed into one group and divided into two sub-groups through a median split on the Neurobehaviourial Symptom

Checklist (NSC; Bauer et al., 1992). Participants with an overall symptom severity score less than .72 were placed in the low symptom severity (NSC-) group and those with a score equal to or greater than .72 were placed in the high symptom severity (NSC+) group. All dependent measures except the NSC were entered into a MANOVA.

A between-subjects multivariate analysis of variance was performed on the remaining 11 dependent variables in the following order of entry: perceived health of others, role ambiguity, role conflict, role overload, organizational stress, psychological sense of community, organizational support, union support, perceived attitudes of significant others, perceived environmental working conditions, and knowledge of EI. The independent variable was the median-split on the NSC (low and high).

SPSS MANOVA was used for the analyses with the sequential adjustment for nonorthogonality. The total *N* of 285 was reduced to 283 due to deletion of two univariate outliers. Results of evaluation of normality, homogeneity of variance-covariance matrices, linearity, and multicollinearity were satisfactory.

With the use of Pillai's criterion, the combined DVs were significantly affected by symptom severity, approximate $F(11, 265) = 5.06$, $p<.001$. A moderate association was found between DVs and NSC scores (low, high), $eta^2 = .17$.

A stepdown analysis was performed on the prioritized DVs to examine the relationship of each one with

participants grouped low and high on the symptom severity variable. All DVs were adequately reliable for the stepdown analysis. In the stepdown analysis, each DV was analyzed with the higher priority DVs treated as covariates and with the higher priority DV tested in a univariate ANOVA. Homogeneity of regression was achieved for all elements of the stepdown analysis (see Table 11).

Perceptions of others health being affected by the work environment uniquely differed between those scoring low and high on the symptom severity measure (NSC), stepdown $\underline{F}(1, 275) = 27.44$, $\underline{p} < .001$, $eta^2 = .10$. Participants with low symptom severity (NSC-) perceived fewer problems with other peoples' health (mean = 3.52) than those with high symptom severity (NSC+) (mean = 4.13). Additional stepdown analyses revealed group differences on role ambiguity $\underline{F}(1, 274) = 6.66$, $\underline{p} < .01$, $eta^2 = .02$. Participants with low symptom severity reported less role ambiguity (adjusted mean = 2.17) than those with high symptom severity (adjusted mean = 2.41). Role conflict, adjusted by role ambiguity and perceptions of others health also made a unique contribution to the composite DV, stepdown $\underline{F}(1, 273) = 11.27$, $\underline{p} < .001$, $eta^2 = .04$. Those with low symptom severity reported less role conflict (adjusted mean = 2.61) than those with high symptom severity (adjusted mean = 2.96).

Table 11

Univariate and Stepdown Contrasts Between Participants High and Low on Symptom Severity within EI Locations.

IV	DV	Univariate F	df	Stepdown F	df
Symptom Severity	POH	27.44[a]	1/275	27.44***	1/275
	RAS	7.52[a]	1/275	6.65**	1/274
	RCS	19.76[a]	1/275	11.27***	1/273
	ROS	15.83[a]	1/275	0.58	1/272
	OSS	13.77[a]	1/275	1.42	1/271
	PSC	5.34[a]	1/275	0.01	1/270
	POS	20.98[a]	1/275	5.35*	1/269
	PUS	1.46	1/275	0.85	1/268
	PASO	0.43	1/275	0.03	1/267
	OES	13.88[a]	1/275	0.68	1/266
	EKEI	4.78[a]	1/275	0.04	1/265

[a] Significance level cannot be evaluated but would reach $p < .05$ in univariate context.

* $p < .05$
*** $p < .001$

Note. POH = PERCEPTIONS OF OTHER PEOPLES' HEALTH; RAS = ROLE AMBIGUITY SCALE; RCS = ROLE CONFLICT SCALE; ROS = ROLE OVERLOAD SCALE; OSS = ORGANIZATIONAL STRESS SCALE; PSC = PSYCHOLOGICAL SENSE OF COMMUNITY SCALE; POS = PERCEIVED ORGANIZATIONAL SUPPORT SCALE; PUS = PERCEIVED UNION SUPPORT SCALE; PASO = PERCEIVED ATTITUDES OF SIGNIFICANT OTHERS; OES = OCCUPATIONAL ENVIRONMENT SCALE; EKEI = EMPLOYEES KNOWLEDGE OF ENVIRONMENTAL ILLNESS

Participants with high symptom severity reported more role overload, univariate $F(1, 275) = 15.83$, and more organizational stress, univariate $F(1, 275) = 13.77$ All these differences were already accounted for in the composite DV by higher-priority DVs. In addition, high symptom severity was associated with lower scores on the psychological sense of community scale, univariate $F(1, 275) = 5.33$. Organizational support, adjusted by perceptions of others health, role ambiguity, role conflict, role overload, organizational stress, and psychological sense of community also made a unique contribution to the composite DV, stepdown $F(1, 269) = 5.35$, $p < .05$, $eta^2 = .02$. Participants with low symptom severity reported greater organizational support (adjusted mean = 4.37) than those with high symptom severity (adjusted mean = 4.12). Participants with high levels of symptom severity also perceived worse environmental working conditions, univariate $F(1, 275) = 13.88$, and had more knowledge of EI related issues, univariate $F(1, 275) = 4.78$, differences that were already accounted for in the composite DV by higher priority DVs. Pooled within-cell correlations among DVs are shown in Table 12.

Table 12

Pooled Within-Cell Correlations Among 11 DVs with Standard Deviations on the Diagonal.

	POH	RAS	RCS	ROS	OSS	PSC
POH	.97					
RAS	.01	.76				
RCS	.02	.40	.87			
ROS	.15	.30	.57	.86		
OSS	.16	.37	.31	.30	.29	
PSC	-.03	-.46	-.40	-.28	-.37	.56
POS	-.04	-.51	-.46	-.30	-.42	.61
PUS	.04	-.09	.04	.08	.02	-.01
PASO	.14	-.31	-.20	-.17	-.09	.19
OES	.24	.28	.34	.29	.26	-.31
EKEI	.30	.01	-.03	.03	.15	-.07

	POS	PUS	PASO	OES	EKEI
POS	1.14				
PUS	.04	.97			
PASO	.23	.20	.43		
OES	-.35	.01	-.08	.74	
EKEI	-.13	.04	.10	.22	.35

Note. POH = PERCEPTIONS OF OTHER PEOPLES' HEALTH; RAS = ROLE AMBIGUITY SCALE; RCS = ROLE CONFLICT SCALE; ROS = ROLE OVERLOAD SCALE; OSS = ORGANIZATIONAL STRESS SCALE; PSC = PSYCHOLOGICAL SENSE OF COMMUNITY SCALE; POS = PERCEIVED ORGANIZATIONAL SUPPORT SCALE; PUS = PERCEIVED UNION SUPPORT SCALE; PASO = PERCEIVED ATTITUDES OF SIGNIFICANT OTHERS; OES = OCCUPATIONAL ENVIRONMENT SCALE; EKEI = EMPLOYEES KNOWLEDGE OF ENVIRONMENTAL ILLNESS

Discriminant Function Analysis (NSC+ vs NSC-)

A direct discriminant function analysis using 11 dependent variables, predicted low and high symptom severity among participants within EI locations. Predictors were perceptions of others health being affected by the work place, role ambiguity, role conflict, role overload, organizational stress, psychological sense of community, organizational support, union support, support of significant others, environmental working conditions, and knowledge of EI.

Of the original 295 cases, two univariate outliers were dropped from analysis, one from each group. For the remaining 293 cases, evaluation of assumptions of linearity, normality, multicollinearity, singularity, and homogeneity of variance-covariance matrices were satisfactory.

A Canonical Discriminant Analysis computed one function (eigenvalue = .21, $X^2(11) = 51.43$, $p < .001$. The caronical correlation ($r = .417$) indicated that approximately 17.4% of the variance was shared by the two groups and the predictors on this function.

As seen in Table 13, the loading matrix of correlations between predictors and discriminant function suggests that the best predictor for distinguishing between low and high symptom severity was the perception of other peoples' health being affected by the work place, followed by organizational support, and role conflict. Only, union support and

perceived attitudes of significant others were not strong predictors of symptom severity. As expected, participants with high symptom severity are more likely to perceive others health as being affected by their work location (mean = 4.13) than those with low symptom severity (mean = 3.52). Unlike differences found between EI and non-EI locations, organizational support was greater for participants with low symptom severity (mean = 4.56) than those with high symptom severity (mean = 3.93). Role Conflict was also greater among those with high symptom severity (mean = 3.02) than those with low symptom severity (mean = 2.55). The correlation of variables within the function were ordered by size and are displayed in Table 13.

The prior probabilities of each group were approximately (NSC- = .502; NSC+ = .498). Overall, 197.01 participants (67.24%) were classified correctly, compared to 146.5 that would be correctly classified by chance alone. Participants with low and high symptom severity had similar rates of correct classification (68.02% correct classification for NSC- ; 66.4% correct classification for NSC+). Overall, rates of classification were significantly better than chance (see Table 14). The pooled within-group correlations among predictors is presented in Table 15.

Table 13

Pooled Within-Groups Correlations Between Discriminating Variables and Canonical Discriminant Functions, and Univariate F tests.

Predictor Variables	Correlations of predictor variables with discriminant Function	Univariate F(1,520)
POH	.689	27.441***
POS	-.602	20.980***
RCS	.585	19.762***
ROS	.523	15.828***
OES	.489	13.879***
OSS	.488	13.781***
RAS	.361	7.522**
PSC	-.304	5.338*
EKEI	.288	4.781*
PUS	.159	1.464
PASO	-.086	0.430
Canonical R	.417	
Eigenvalue	.210	

* $p < .05$
** $p < .01$
*** $p < .001$

Note[1]. POH = PERCEPTIONS OF OTHER PEOPLES' HEALTH; POS = PERCEIVED ORGANIZATIONAL SUPPORT SCALE; RCS = ROLE CONFLICT SCALE; ROS = ROLE OVERLOAD SCALE; OES = OCCUPATIONAL ENVIRONMENT SCALE; OSS = ORGANIZATIONAL STRESS SCALE; RAS = ROLE AMBIGUITY SCALE; PSC = PSYCHOLOGICAL SENSE OF COMMUNITY SCALE; EKEI = EMPLOYEES' KNOWLEDGE OF EI; PUS = PERCEIVED UNION SUPPORT SCALE; PASO = PERCEIVED ATTITUDES OF SIGNIFICANT OTHERS

Note[2]. Variables are ordered by size of correlation within the function.

Table 14

Discriminant Function Analysis Classification Results.

ACTUAL GROUP	NO. OF CASES	PREDICTED GROUP MEMBERSHIP	
		NSC-	NSC+
NSC-	147	100 68.1%	47 31.9%
NSC+	146	49 33.6%	97 66.4%
PERCENT OF "GROUPED" CASES CORRECTLY CLASSIFIED:			67.24%

Table 15

Pooled Within-Group Correlations Among Predictors.

	POH	RAS	RCS	ROS	OSS	PSC	POS	PUS	PASO	OES	EKEI
POH	1.00										
RAS	.01	1.00									
RCS	.02	.40	1.00								
ROS	.15	.30	.57	1.00							
OSS	.16	.37	.31	.30	1.00						
PSC	-.03	-.46	-.40	-.28	-.37	1.00					
POS	-.04	-.51	-.46	-.30	-.42	.61	1.00				
PUS	.04	-.09	.04	.08	.02	-.01	.04	1.00			
PASO	.14	-.31	-.20	-.17	-.09	.19	.22	.20	1.00		
OES	.24	.28	.34	.29	.26	-.31	-.35	.01	-.08	1.00	
EKEI	.30	.01	-.03	.03	.14	-.07	-.13	.04	.10	.22	1.00

Note. POH = PERCEPTIONS OF OTHER PEOPLES' HEALTH; RAS = ROLE AMBIGUITY SCALE; RCS = ROLE CONFLICT SCALE; ROS = ROLE OVERLOAD SCALE; OSS = ORGANIZATIONAL STRESS SCALE; PSC = PSYCHOLOGICAL SENSE OF COMMUNITY SCALE; POS = PERCEIVED ORGANIZATIONAL SUPPORT SCALE; PUS = PERCEIVED UNION SUPPORT SCALE; PASO = PERCEIVED ATTITUDES OF SIGNIFICANT OTHERS; OES = OCCUPATIONAL ENVIRONMENT SCALE; EKEI = EMPLOYEES KNOWLEDGE OF ENVIRONMENTAL ILLNESS

Causal Modelling Analysis

EI Locations

To address the model proposed in hypothesis #5 (Figure 1), LISREL causal modelling procedures (Joreskog & Sorbom, 1985) were used to examine the relations between the constructs of stress, social support, and illness, separately within the EI and non-EI locations. Table 16 contains the correlation matrices and standard deviations which served as LISREL input for the EI group. The structural model proposed in Figure 1 was tested against the observed data to explain the relations among the three latent variables. Model 1 specified that stress would negatively predict social support and that higher levels of stress would positively predict symptom severity. Conversely, lower levels of social support would also predict greater symptom severity.

As presented in Table 17, Model 1 for the EI group did not fit well with the observed data but did represent an improvement over the Null model, which specified no pathways between the latent variables ($p. < .001$), X^2 (18, N = 273) = 80.75, $p < .001$). Nonetheless, the large sample size may have unduly influenced the Goodness of Fit Test (GFT) resulting in an artificially large X^2 value.

Table 16

Correlation matrix and standard deviations used for LISREL input for the EI group (n=293).

Measure	1	2	3	4	5	6	7	8
1. RAS	--							
2. RCS	.434	--						
3. ROS	.348	.618	--					
4. OSS	.327	.273	.253	--				
5. PSC	-.504	-.420	-.334	-.314	--			
6. POS	-.516	-.486	-.364	-.401	.614	--		
7. PUS	-.089	.051	.086	.034	-.011	.016	--	
8. NSC	.086	.236	.256	.245	-.153	-.287	.078	--
SD	.796	.940	.910	.340	.580	1.18	.980	.630

Note. RAS = ROLE AMBIGUITY SCALE; RCS = ROLE CONFLICT SCALE; ROS = ROLE OVERLOAD SCALE; OSS = ORGANIZATIONAL STRESS SCALE; PSC = PSYCHOLOGICAL SENSE OF COMMUNITY SCALE; POS = PERCEIVED ORGANIZATIONAL SUPPORT SCALE; PUS = PERCEIVED UNION SUPPORT SCALE; NSC = NEUROBEHAVIOURAL SYMPTOM CHECKLIST

Table 17

Chi-Square Fit Values, Fit Indices, and Model Comparisons Models (EI Locations).

Model	X^2(N=293)	df	GFI	AGFI	X^2/df	RMSR	BBI
Null Model	614.02***	28	.566	.442	21.93	.292	
Full Model 1	80.75***	18	.929	.859	4.49	.061	.868
Full Model 2	35.64**	17	.970	.936	2.10	.045	.942
Full Model 3	20.46	16	.983	.962	1.28	.033	.967
Model Comparisons							
Null vs Model 1	533.27***	10					
Model 1 vs Model 2	45.11***	1					
Model 2 vs Model 3	15.18***	1					

Note. GFI = Goodness of Fit Index; AGFI = Adjusted Goodness of Fit; Index RMSR = Root Mean Square Residual; BBI = Bentler Bonnett Normed Index

** $p < .01$
*** $p < .001$

The Goodness of Fit Index (GFI), representing the relative amount of variance and covariance jointly explained by the model (Byrne, 1989), was reasonably high (GFI = .929). However, when degrees of freedom were taken into account, the Adjusted Goodness of Fit Index (AGFI = .859 < .900) was somewhat reduced. In addition, the Root Mean Square Residual (RMSR = .061 > .05) indicated that the model could be further improved. Due to the sensitivity of the X^2 likelihood ratio test to sample size (Byrne, 1989), the X^2/df ratio was calculated as a subjective indicator of the model fit. The X^2/df index was 4.49 > 2.00 which suggests that the model did not represent an adequate fit to the data (Byrne, 1989). Therefore, only one indicator, the GFI, was considered acceptable suggesting that the model could be improved upon.

Given the exploratory nature of the present study, the model was adjusted to reflect the changes recommended in the modification indices. According to Byrne, Shavelson, & Muthén (1989), post hoc model fitting can be substantively meaningful as long as the researcher is aware of the exploratory nature of their analyses. The modification indices produced for Model 1 suggested a new path from the error term for the Role Conflict and Role Overload scales be added to improve the model fit. This correlated error can be important in revealing minor, sample-specific data covariation not explained by the model (Byrne, 1989). This

covariation often results from non-random error originating from a specific method of measurement (Byrne, 1989). The value shown in the modification index represents the expected drop in X^2 of 49.54 ($p < .01$) if the recommended modification is computed. Model 2 for the EI group was re-estimated including this pathway (see Table 17).

Each of the fit indices improved in Model 2 except $X^2(17, N = 293) = 35.64$, $p. < .05$ was still significant, indicating that the model still did not sufficiently fit the data. Again, it is important to interpret this result carefully. With a large sample size such as this one, it is not uncommon to have a significant X^2 value even though the model accurately fits the data (Byrne, 1989). Therefore, the other fit indices must be carefully examined in order to come to an accurate conclusion. Each indicator demonstrated a satisfactory fit except for the X^2/df ratio index = 2.09 which was slightly above the suggested cutoff (2.00) for this indicator. The modification indices suggested a direct link between the observed variable (LY) role ambiguity and the endogenous variable (ETA) symptom severity. The expected drop in the X^2 value with this modification is approximately 14.56. Model 3 was tested with this additional modification.

Each of the fit indices improved in Model 3 and indicated a good model fit to the data, $X^2(16, N = 293) = 20.46$, $p. > .19$, GFI = .98, AGFI = .96, X^2/df index = 1.28,

RMSR = .03, and BBI = .97. No further model re-specifications were recommended.

The present results of the proposed model for participants in EI locations show that stress negatively predicts social support. Furthermore, stress positively predicts symptom severity which is not reliably predicted by levels of social support (see Figure 2 for full model).

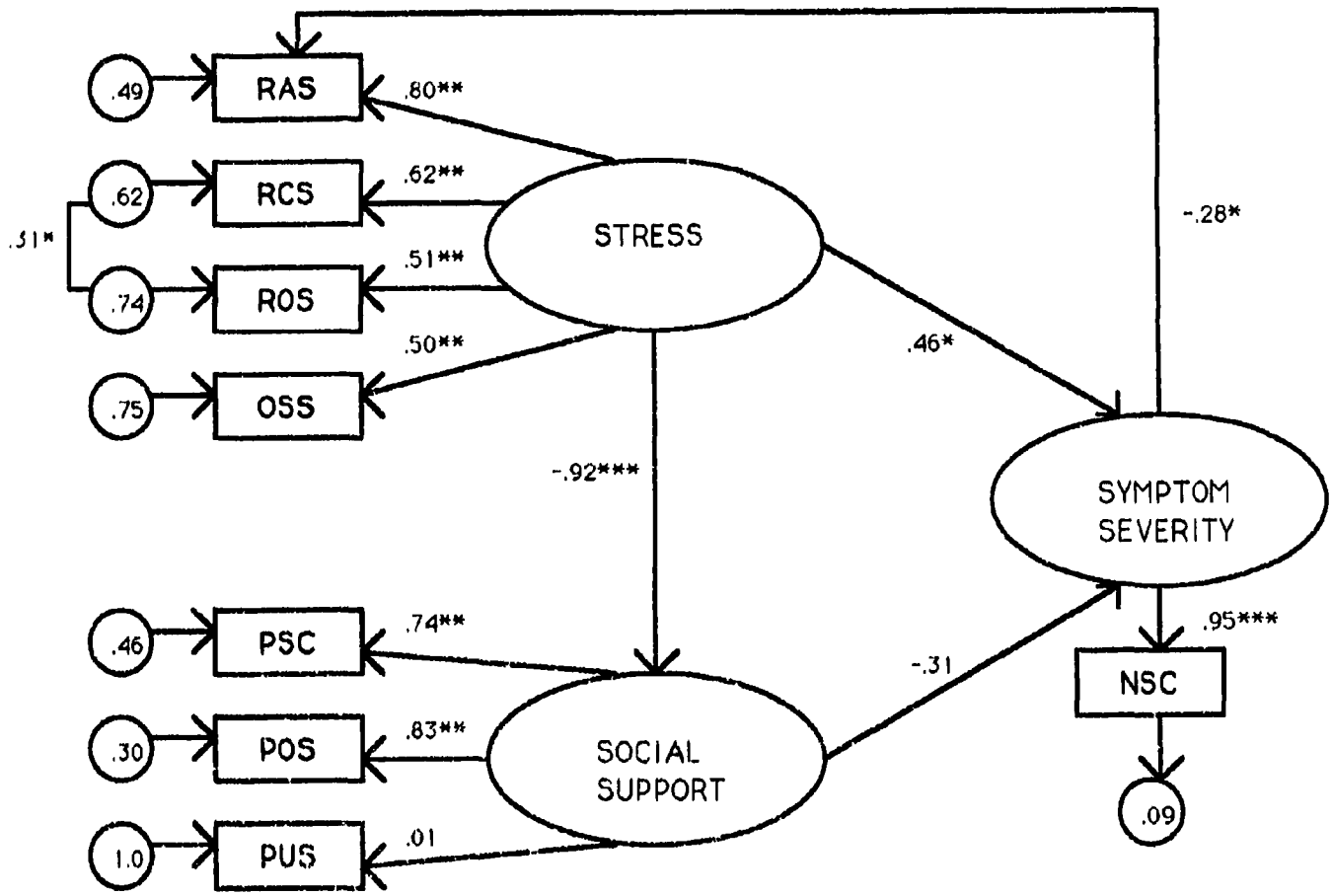

Figure 2. Full model 3: Obtained structural equation model of stress, social support, and symptom severity in EI locations. (Parameter estimates are standardized; significance levels are determined by critical ratios. **NSC**=Neurobehavioural Symptom Checklist; **RAS**=Role Ambiguity Scale; **RCS**=Role Conflict Scale; **ROS**=Role Overload Scale; **OSS**=Organizational Stress Scale; **PSC**=Psychological Sense of Community Scale; **POS**=Perceived Organizational Support Scale; **PUS**=Perceived Union Support Scale; *=p <.05; **=p <.01; ***=p <.001.)

Non-EI Locations

Table 18 contains the correlation matrices and standard deviations which served as LISREL input for the non-EI group. The structural model presented in Figure 1 was re-examined in relation to the observed data for the non-EI locations to explain the associations among three latent variables.

As shown in Table 19, Model 1 for the non-EI group (N = 227) did not adequately fit the data but it did represent a significant improvement over the Null Model, ($p. < .001$), X^2 (18, N = 227) = 42.10, $p. < .001$. In addition, it represented a better fit than found initially for the EI sample. All other indices except X^2/df ratio = 2.34 indicated a satisfactory model fit (see Table 19).

The only modification index indicated was the covariance between the Role Conflict and Role Overload Scales. As suggested by the modification index, Model 2 was computed with the new error pathway between Role Conflict and Role Overload. As presented in Table 19, Model 2 made a significant improvement over Model 1 ($p. < .001$), $X^2(17, N = 227) = 25.41$, $p. > .05$. All indices including the GFI = .973, the AGFI = .942, the X^2/df = 1.49, the RMSR = .034, and the BBI = .944 indicated a satisfactory fit of the model to the sample data (see Table 19). The modification indices did not suggest additional model alterations (see Figure 3).

Table 18

Correlation matrix and standard deviations used for LISREL input for the Non-EI group (n = 227).

Measure	1	2	3	4	5	6	7	8
1. RAS	--							
2. RCS	.514	--						
3. ROS	.350	.586	--					
4. OSS	.412	.399	.280	--				
5. PSC	-.480	-.397	-.350	-.395	--			
6. POS	-.512	-.532	-.360	-.471	.524	--		
7. PUS	-.155	-.199	-.069	-.114	.161	.261	--	
8. NSC	.295	.216	.324	.274	-.303	-.239	-.015	--
SD	.813	.918	.911	.335	.605	1.22	.986	.665

Note. RAS = ROLE AMBIGUITY SCALE; RCS = ROLE CONFLICT SCALE; ROS = ROLE OVERLOAD SCALE; OSS = ORGANIZATIONAL STRESS SCALE; PSC = PSYCHOLOGICAL SENSE OF COMMUNITY SCALE; POS = PERCEIVED ORGANIZATIONAL SUPPORT SCALE; PUS = PERCEIVED UNION SUPPORT SCALE; NSC = NEUROBEHAVIOURAL SYMPTOM CHECKLIST

Table 19

Chi-Square Fit Values, Fit Indices, and Model Comparisons Models (Non-EI Locations).

Model	X^2(N=227)	df	GFI	AGFI	X^2/df	RMSR	BBI
Null Model	457.72***	28	.553	.425	16.35	.300	
Full Model 1	42.10***	18	.958	.915	2.34	.045	.908
Full Model 2	25.41	17	.973	.942	1.49	.034	.944
Model Comparisons							
Null vs Model 1	415.62***	10					
Model 1 vs Model 2	14.69**	1					

Note. GFI = Goodness of Fit Index; AGFI = Adjusted Goodness of Fit; Index RMSR = Root Mean Square Residual; BBI = Bentler Bonnett Normed Index

** $p < .01$
*** $p < .001$

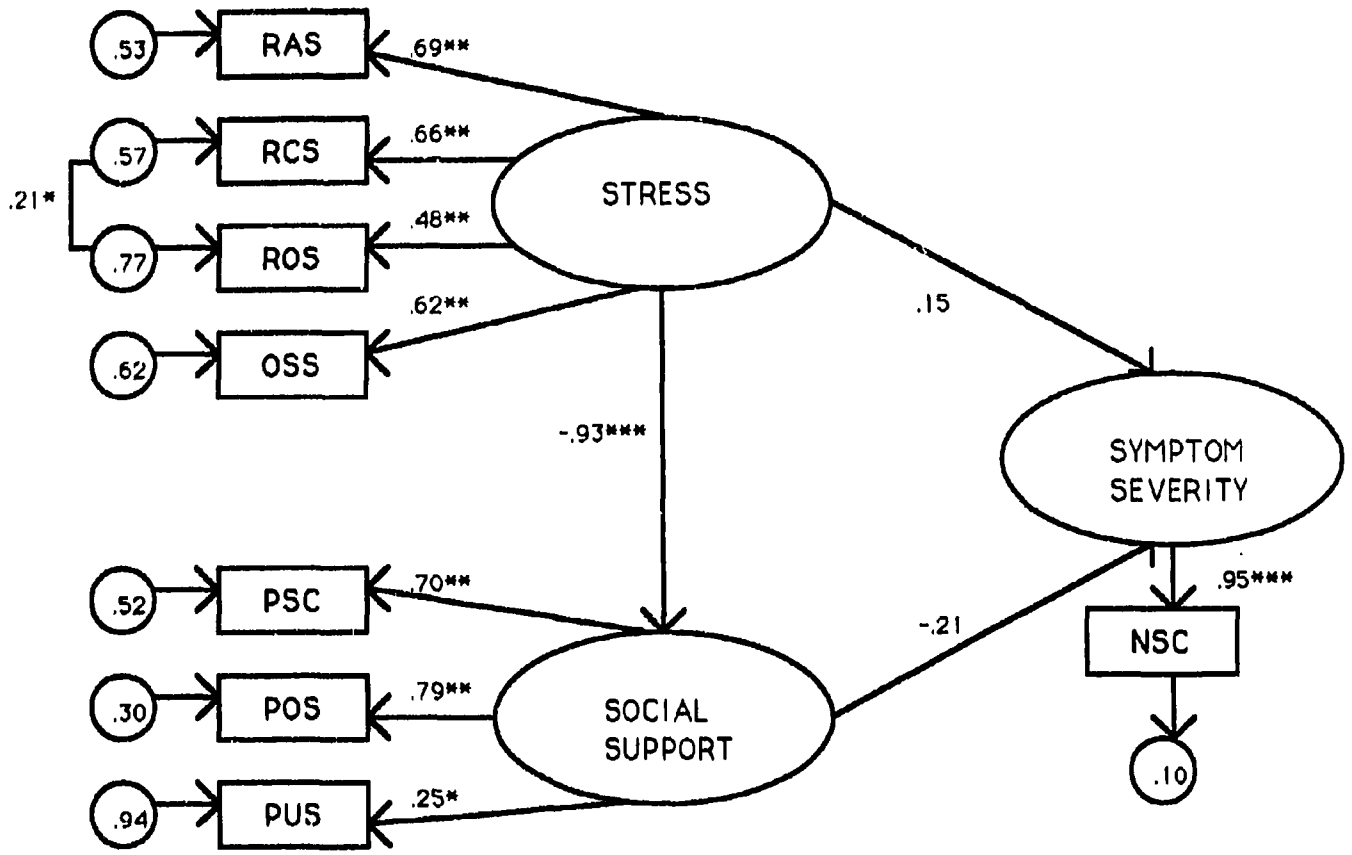

Figure 3. Full model 2: Obtained structural equation model of stress, social support, and symptom severity in non-EI locations. (Parameter estimates are standardized; significance levels are determined by critical ratios. NSC=Neurobehavioural Symptom Checklist; RAS=Role Ambiguity Scale; RCS=Role Conflict Scale; ROS=Role Overload Scale; OSS=Organizational Stress Scale; PSC=Psychological Sense of Community Scale; POS=Perceived Organizational Support Scale; PUS=Perceived Union Support Scale; *=$p < .05$; **=$p < .01$; ***=$p < .001$.)

Discussion

The results of the present study indicate that symptom severity differed between EI and non-EI locations. This suggests that more people are suffering from more severe symptoms in EI locations. It also indicates that the symptom measures were sensitive to these differences and that the categorization of buildings as EI or non-EI locations was satisfactory. No physical measurements of air quality were taken in the present study, which may have more accurately defined EI and non-EI locations. Nevertheless, the study included a proxy measure of air quality and environmental work conditions. Employees in EI locations perceived significantly poorer physical environmental conditions than those in non-EI locations. In addition, previous air quality testing in one of the hospitals revealed high levels of toxic agents (Ross et al., 1993 cited in Marsh-Knickle, 1994).

Few differences were found in stress and social support measures taken in EI and non-EI locations. Within a location, individual differences were not considered. For example, differences in job title, family relations, and other personal characteristics might have helped explain the lack of differences in stress and social support. The measures used to assess stress and social support may not have been sensitive to differences in the EI and non-EI environments. However, the measures used in the present

study had high reliability and had been validated in previous research.

Significant differences were found between employees with high and low levels of symptom severity within EI locations on most stress and social support measures, confirming the results of previous studies (Bauer et al., 1992; Kumari & Sharma, 1990; Norback et al., 1990; Skov et al., 1989). Higher stress was related to lower levels of social support, which corresponded to higher levels of symptom severity.

The model tested in the present study examined possible causal relations between stress and social support within EI and non-EI locations. It proposed that high levels of stress, combined with low levels of social support were predictive of high symptom severity. Within EI locations, high levels of stress predicted symptom severity. There was a high negative association between stress and social support in both EI and non-EI locations. However, social support measures were not reliably associated with symptom severity. The following is a more detailed discussion of the results of the present study with each hypothesis considered in turn.

Hypothesis 1:

As expected, levels of symptom severity were uniformly higher among employees in EI locations than those

in non-EI locations. Overall, employees in EI locations perceived their co-workers to have been more adversely affected by their workplace. In addition, they perceived poorer environmental working conditions than those employees in non-EI locations. This latter finding suggests that the categorization of locations as EI or non-EI was done correctly by the employees' Union. These findings are consistent with those of previous research (Bauer et al., 1992; Norback et al., 1990, Skov et al., 1989).

Hypothesis 2:

Based on previous research (Bauer et al., 1992; Norback et al., 1990; Skov et al., 1989), stress was expected to be greater among employees working in EI locations due to their knowledge of working in environments with known health problems. In the present study, there were few significant differences between EI and non-EI locations on any of the stress measures. Only the special contrast between the EI and non-EI locations in Hospital #1 found role conflict and organizational stress higher among employees in non-EI locations. Because both EI and non-EI locations were in the same building, employees in non-EI locations may have had exposure to similar environmental and social stressors as those in EI locations. Generally, it appears that stress levels did not reliably differ between those working in EI and non-EI locations. This finding is important; it

suggests that having the knowledge that one is working in an EI environment is not associated with greater levels of stress as suggested by Bauer et al. (1992).

Within-group differences in EI locations revealed that employees with high symptom severity reported greater levels of stress, similar to the findings of previous research on the relationship of social support, stress, and illness (Haines, Hurlbert, & Zimmer, 1991; Kumari & Sharma, 1990; La Rocco & Jones, 1978; Lin & Ensel, 1989; Srivastava, 1991;) and of studies conducted on the relationship of stress and EI (Bauer et al., 1992; Norbak et al., 1990; Skov et al., 1989). Greater symptom severity appears to be associated with higher levels of role ambiguity, role conflict, role overload, and organizational stress. The greater symptom severity associated with EI may be exacerbated by higher levels of stress. In addition, having symptoms may also work to increase stress resulting in even less resistance to illness.

Hypothesis 3:

Levels of social support were expected to be lower among employees in EI locations due to a perception that their organization, their union, and their co-workers had less concern for the state of their health. In contrast, union support was higher among employees in EI locations. The union had shown great concern for the health and welfare

of its members and had recently urged the organization to remedy EI related problems. Union support has not been examined in previous EI research. It was an important factor in this study, given the strong involvement of the union and its desire to understand the factors related to EI. This finding should help direct the union's efforts towards an agreeable solution to health related matters, organizational climate, and worker compensation.

Levels of organizational and co-worker support did not significantly differ between employees in EI and non-EI locations. Nonetheless, higher levels of organizational and co-worker support were found among employees with low levels of symptom severity. Those with more severe EI symptoms may perceive to have less support from the organization and their co-workers. The greater perceived organizational and co-worker support levels among employees with low symptom severity, combined with the lack of differentiation between EI and non-EI locations on these measures, suggest that regardless of location, employees with EI related symptoms feel less organizational and co-worker support. The lack of perceived support and greater stress may exacerbate symptoms (Bauer et al., 1992). On the other hand, greater symptom severity may result in employees perceiving lower levels of organizational and co-worker support.

Union support within EI locations did not differ among employees. The union was perceived similarly within EI

locations regardless of individual differences in symptom severity. However, employees in EI locations perceived greater support by their union than their co-workers in non-EI locations. It is likely that the union is perceived as supportive among employees in EI locations regardless of their level of symptom severity and is perceived as attempting to improve work conditions.

Perceived attitudes of significant others (family members, the media, public, and management) differed between EI and non-EI locations in Hospital #1. Employees in EI locations perceived greater support than those in non-EI locations. These employees may have actively sought and subsequently found support from significant others as a coping mechanism to ward of the harmful effects of working in a potentially dangerous environment (Baker, 1989; Cohen et al., 1986; Taylor, 1986).

Hypothesis 4:

Employees working in EI locations were expected to have greater knowledge of EI related concerns than their co-workers in non-EI areas. This hypothesis was based on the assumption that working in a potentially harmful environment (stressor) would motivate employees to seek informational support, considered to be a powerful coping mechanism (Baker, 1989; Carver et al., 1992; Cobb, 1976; Cohen et al., 1986; Lazarus & Folkman, 1984; Mor-Barak, 1988; Taylor,

1986).

Overall, employees in EI and non-EI locations did not differ in their knowledge of EI. However, EI related knowledge was unexpectedly greater among employees in Hospital #3 (non-EI) than those in Hospital #2 (EI). This result may reflect a lack of clarification of the real physical and psychological factors associated with or predictive of EI. Hospital #2 has received extensive media coverage due to their considerable EI related problems. This coverage may have been somewhat exaggerated and possibly inaccurate. Because EI is an emotionally charged issue in this particular hospital, employees may have had a reduced ability to differentiate between the facts and the myths surrounding EI.

Employees with greater symptom severity in EI locations had more knowledge of EI which supports the hypothesis that seeking informational support is a method of coping with a stressor such as symptom severity (Carver et al., 1992; Cobb, 1976; Cohen et al., 1986; Lazarus & Folkman, 1984; Taylor, 1986). It also suggests that having EI related symptoms increases the saliency of EI related information and knowledge. Employees with high levels of symptom severity appear motivated to understand better the causes and effects of EI. It also suggests that this motivation to better understand EI may be an attempt to cope with a stressor which is objectively uncontrollable. Future

research will need a greater focus on individual variations in coping styles, and how coping interacts with stressful events.

Hypothesis 5:

The LISREL analyses for EI and non-EI locations supported the proposed model which predicted that social support would be negatively predicted by stress. Higher levels of stress and lower levels of social support were expected to predict greater symptom severity. As expected, higher levels of stress were significantly related to lower levels of social support. Stress was predictive of symptom severity for employees in EI locations but not for those in non-EI locations. However, symptom severity was not reliably associated with differing levels of social support in either EI nor non-EI locations.

EI Locations. The original model for the EI group was only partially supported by the data. Two modifications were necessary to obtain a satisfactory model fit. The first required a correlation of two error terms for stress (i.e., Role Conflict and Role Overload). Although the Role Conflict and Role Overload measures were significantly associated with the endogenous variable (ETA) stress, they shared more variance with each other than could be explained by this variable. This correlated measurement may have been

a result of method variance. Method variance states that the scores of Role Conflict and Role Overload share more in common with each other than they do with the other stress variables, Role Ambiguity and Organizational Stress. Or, Role Conflict and Role Overload may be measuring similar factors. For example, Role Overload may be a type of Role Conflict in that having too many tasks may create a conflict between the tasks and the time frame in which they are to be accomplished. The correlation of these error terms was permitted for a better model fit and it allowed the associations of these variables to exist outside the structural model in question.

A second modification required the loading of observed variable (LY) Role Ambiguity onto the endogenous variable (ETA) Symptom Severity to ensure a satisfactory model fit to the data. However, contrary to the hypothesis, Role Ambiguity was negatively associated with symptom severity; a greater score on the Role Ambiguity Scale was related to lower levels of symptom severity. It is possible that low scores on the Role Ambiguity Scale may have reflected perceptions in some employees that their role was so well defined, that it limited their sense of autonomy. Having a lack of autonomy may be a stressful (Baker, 1992; Mor-Barak, 1988). As a result, very low scores on the Role Ambiguity Scale may reflect a lack of perceived autonomy rather than high role clarity.

The final model indicated that stress was negatively predictive of social support. In addition, stress was positively associated with greater symptom severity. However, social support did not directly predict symptom severity. The strong negative relationship between stress and social support and the relationship of stress to symptom severity does suggest that social support acts as a mediating variable. This implies that stress is related to greater symptom severity, but only for those people with low levels of social support. Social support may cushion an individual from the negative effects of stress upon her physical and psychological well-being (Haines et al., 1991; Kumari & Sharma, 1990; Lin & Ensel, 1989; Srivastava, 1991). In previous studies, social support was not directly associated with physical and/or psychological illness. It did, however, buffer the effects of stress. When low levels of social support were found, stress was found to have a more negative effect upon the health of the individual. Conversely, individuals with high levels of social support were less likely to suffer the deleterious effects of stress upon their physical and psychological well-being.

The results of the present study indicate that stress has a direct influence upon the formation of EI related symptoms for employees working in EI locations (Bauer et al., 1992). Social support does not directly influence symptom severity but may help to reduce the negative effects

of stress upon health (Cohen et al., 1986; Lazarus & Folkman, 1984; Taylor, 1986; Wortman et al., 1992). This supports the within group MANOVA result which showed higher levels of stress and lower levels of social support among employees with high levels of symptom severity. Stress and social support may help to predict which individuals would be most susceptible to EI related symptoms. This does not mean that only stress and social support determine the severity of symptoms. Based on the high airborne chemical concentrations in previous air quality investigations (Robb, 1993), the real physical causes of EI are evident. Higher levels of stress and lower levels of social support may be a psychological consequence of working in an environment in which EI is present or of having ones symptoms dismissed by significant others (Bauer et al., 1992).

Non-EI Locations. Similar to EI locations, high levels of stress were significantly associated with lower levels of social support (Cohen et al., 1986; Lazarus & Folkman, 1984; Taylor, 1986; Wortman et al., 1992). However, neither stress nor social support were reliably associated with EI. One modification was necessary to obtain a satisfactory model fit. The non-EI model required a correlation of two error terms for stress (i.e., Role Conflict and Role Overload). This correlated measurement may have been a result of method variance or an indication that both scales

measured similar factors. The correlation of these error terms was permitted for a better model fit and it allows the associations of these variables to exist outside the structural model in question.

Full Model 2 indicated that stress was negatively associated with social support. Although there was no significant association between stress and social support with EI related symptom severity, the relationships were in the expected direction. Symptom severity may not be reliably associated with greater stress nor low levels of social support. Few or no EI related problems existed in the non-EI locations, as identified by the Union Committee and by the significant differences between EI and non-EI locations on the NSC measure. The spread of scores on the NSC may have been too low within non-EI locations to indicate significant relationships to the stress and social support measures. In this case, the lack of apparent differences would be an artifact caused by the low score variability on the NSC measure.

The location of work (EI vs non-EI) may be important in determining the relationships between stress, social support, and EI. Working in a known EI environment may increase symptom severity due to higher levels of stress associated with this knowledge. Individuals in EI environments may develop physical symptoms as a result of having greater susceptibility to strain which might be

partially explained by higher levels of stress and lower levels of social support. Or, those susceptible to having symptoms may have more stress and perceive less social support as a result of working in an EI environment (Bauer et al., 1992).

These findings do not support Contagious Psychogenic Illness (CPI) explanations for EI (Cohen et al., 1978). In CPI, no known pathogens are evident. Previous air quality investigations of some of the hospital locations revealed several airborne toxic substances (Robb, 1993). In addition, stress and social support did not differ between EI and non-EI locations. In a case of CPI, stress and social support should be greater in locations thought to have an objective physical stressor (i.e., glue, solvent, strange odour; Cohen et al., 1978) . A typical case of CPI affects a work site within hours or days (Boxer, 1990; Colligan & Murphy, 1979; Olkinuora, 1984). In the present study, symptoms developed over a period of years. In CPI, the spread of symptoms develops quickly, occur along visual sight lines among employees, and tends to dissipate upon the removal of the occupant from the building. In EI, employees may recognize that they are experiencing similar symptoms, but the symptoms do not necessarily spread to those in contact with the affected employee. Employees in both locations did not develop symptoms along visual sight lines. In addition, many employees maintained a great number and

severity of symptoms even though they have had long leaves of absence from the offending building.

Implications:

The results of this study suggest that high symptom severity is related to higher levels of stress and lower levels of social support. It is possible that higher levels of role conflict, role overload, and role ambiguity not only affect employees health, they may impact upon their level of job satisfaction and productivity. Higher levels of stress and lower levels of social support may lead to greater illness vulnerability resulting in absenteeism.

It is important that management act quickly and decisively in health related concerns such as EI. Without aggressive action to remedy this problem, greater mistrust and lower worker morale are likely (Baker, 1992; Lyles et al., 1991; Ryan & Morrow, 1991). As the results of the present study show, the organization is seen to be less supportive by employees with high symptom severity in EI locations. Perceived organizational support may be largely dependent upon the health of the individual.

The present study is one of the few large scale projects undertaken with a union and worker perspective. The results suggest that the union is perceived to be more supportive by employees with greater symptom severity. This is likely due to the active role the union has taken in

assisting their members in EI locations. The information gained from this study may assist the union in formulating policy with regard to EI. With the evidence of greater organizational stress and lower levels of co-worker and organizational support among employees with illness, management may be motivated to remedy the problem. Their first goal should be to improve the air quality in EI locations. The second goal should be to ensure adequate compensation and medical care to those employees most affected by EI. Third, training should be required for all employees to educate them concerning the facts and myths of EI. This action may result in greater levels of perceived organizational and co-worker support. In turn, the negative effects of stress would be diminished, speeding up the psychological and physical healing process of those with EI. Increased productivity, worker morale, and job satisfaction would be probable consequences. Furthermore, lower levels of illness, absenteeism, and turnover would make up for the costs of correcting the EI problem (Baker 1992; Mor-Barak, 1988).

Research Limitations:

It was not feasible to manipulate air quality, thereby limiting the ability to demonstrate the direction of relationships between variables. Even if it were possible, it would be unethical to manipulate air quality,

symptomatology, and levels of stress or social support. The purpose of the present study was to describe existing conditions and to shed some light on the relationships among these variables. The use of structural modelling techniques did allow for causal predictions. LISREL analysis is the strongest statistical method of testing a model within a non-experimental design. Although it does not allow for causal conclusions, its results should be viewed as tests of the associations among a set of variables.

Also, it was not possible to make objective physical measurements of environmental conditions in the hospitals. Instead, a proxy self-report measure was included to assess employees perceptions of their work environment. In addition, recent air quality measurements were conducted in one of the EI locations indicating a high degree of airborne chemical toxins (Robb, 1993).

The findings of the present study may have been due to demand characteristics. Employees in EI locations may have reported higher levels of symptom severity, more negative perceptions of their physical work environment, and perceptions that their own health and the health of others had been adversely affected by their work location than what would have been found if participants had been blind to condition. These perceptions may be attributable to employees' knowledge that they worked in a problem building and not to real physical symptoms or work conditions.

However, significant differences in the levels of stress and social support should be expected as a result of demand characteristics. The lack of differences on these measures weaken the demand characteristics argument.

Future research should evaluate psychological factors at the point at which employees enter a suspected EI building for the purposes of determining which psychological and organizational variables predict eventual development of EI symptoms. In addition, ongoing research should assess the impact of changing air quality, management policy, and stressful life events on illness, stress, and social support in the work place.

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Appendix A

Questionnaire Package

Using the scale presented below, please rate the extent to which you have experienced any of the following in the past two years and indicate whether or not these symptoms start at work:
0 = Have not experienced in the past two years (HN); 1 = Have experienced, mildly;
2 = Have experienced, moderately (M); 3 = Have experienced, severely;
4 = Have experienced, extremely severe (ES)

	HAVE EXPERIENCED					SYMPTOMS START AT WORK	
	HN		M		ES		
1. Headache	0	1	2	3	4	YES	NO
2. Muscle cramps	0	1	2	3	4	YES	NO
3. Lack of motivation	0	1	2	3	4	YES	NO
4. Trouble remembering recent events	0	1	2	3	4	YES	NO
5. Loss of taste or smell	0	1	2	3	4	YES	NO
6. Feelings of choking	0	1	2	3	4	YES	NO
7. Blurred vision	0	1	2	3	4	YES	NO
8. Fatigue	0	1	2	3	4	YES	NO
9. Excessive sweating not due to exertion	0	1	2	3	4	YES	NO
10. Temporary disorientation or confusion	0	1	2	3	4	YES	NO
11. Losing/misplacing things	0	1	2	3	4	YES	NO
12. Bruising easily	0	1	2	3	4	YES	NO
13. Loss of coordination	0	1	2	3	4	YES	NO
14. Changes in color vision	0	1	2	3	4	YES	NO
15. Trouble calculating	0	1	2	3	4	YES	NO
16. Involuntary movements	0	1	2	3	4	YES	NO
17. Trouble following directions or instructions	0	1	2	3	4	YES	NO
18. Distorted sense of time	0	1	2	3	4	YES	NO
19. Increased sex drive	0	1	2	3	4	YES	NO
20. Trouble remembering events from distant past	0	1	2	3	4	YES	NO
21. Dropping things	0	1	2	3	4	YES	NO
22. Changes in handwriting	0	1	2	3	4	YES	NO
23. Getting temporarily lost in familiar places	0	1	2	3	4	YES	NO
24. Numbness of the face or mouth	0	1	2	3	4	YES	NO
25. Trouble understanding written or spoken language	0	1	2	3	4	YES	NO
26. Feeling of being separate from your own body	0	1	2	3	4	YES	NO
27. Trouble finding words to express your thoughts	0	1	2	3	4	YES	NO
28. Feeling irritable	0	1	2	3	4	YES	NO
29. Rapid heart beat	0	1	2	3	4	YES	NO
30. Forgetfulness or absent-mindedness	0	1	2	3	4	YES	NO
31. Rash/redness of face or body	0	1	2	3	4	YES	NO
32. Dry eyes, eye pain or problems with contact lenses	0	1	2	3	4	YES	NO
33. Elevated blood pressure	0	1	2	3	4	YES	NO
34. Food cravings	0	1	2	3	4	YES	NO
35. Stuffy nose	0	1	2	3	4	YES	NO
36. Chest tightness	0	1	2	3	4	YES	NO
37. Changes in speech	0	1	2	3	4	YES	NO
38. Irregular menses (women only)	0	1	2	3	4	YES	NO
39. Trouble recognizing familiar people	0	1	2	3	4	YES	NO
40. Decreased sex drive	0	1	2	3	4	YES	NO
41. Anxiety	0	1	2	3	4	YES	NO
42. Fear	0	1	2	3	4	YES	NO
43. Repeated infections	0	1	2	3	4	YES	NO
44. Marked weight change	0	1	2	3	4	YES	NO
45. Breathing difficulties	0	1	2	3	4	YES	NO
46. Problems during pregnancy	0	1	2	3	4	YES	NO

Please rate your agreement or disagreement with the following items by circling a number from 1 to 5 where 1 = Strongly Disagree (SD); 2 = Disagree; 3 = Neutral or don't know (N); 4 = Agree; and 5 = Strongly Agree (SA)

The following statements concern whether you or someone you know has had their health affected in the work setting.

	SD		N		SA
1. My health has been affected by the building I work in.	1	2	3	4	5
2. I am close friends with individuals who have experienced work related illness.	1	2	3	4	5
3. Some (or all) of the people I work with have experienced work-related illness.	1	2	3	4	5
4. People doing the same type of work as me have experienced work related illness.	1	2	3	4	5
5. People working in the same building as I do have experienced work related illness.	1	2	3	4	5
6. I have seen people become ill at work for no apparent cause.	1	2	3	4	5
7. I know people at work who have become ill for no apparent cause.	1	2	3	4	5
8. I have heard about people at work becoming ill for no apparent cause.	1	2	3	4	5
9. I believe my long-term health may be adversely affected by working in this building.	1	2	3	4	5

The following statements concern how you feel about your responsibilities at work and the expectations that others have of you on the job.

	SD N SA
1. I feel secure about how much authority I have.	1 2 3 4 5
2. Clear, planned goals and objectives exist for my job.	1 2 3 4 5
3. I know that I have divided my time properly.	1 2 3 4 5
4. I know what my responsibilities are.	1 2 3 4 5
5. I know exactly what is expected of me.	1 2 3 4 5
6. Explanation is clear of what has to be done.	1 2 3 4 5
7. I have to do things that should be done differently.	1 2 3 4 5
8. I receive an assignment without the manpower to complete it.	1 2 3 4 5
9. I work with two or more groups who operate quite differently.	1 2 3 4 5
10. I have to buck a rule or policy to carry out an assignment.	1 2 3 4 5
11. I receive incompatible requests from two or more people.	1 2 3 4 5
12. I do things that are apt to be accepted by one person and not accepted by others.	1 2 3 4 5
13. I receive an assignment without adequate resources and materials to execute it.	1 2 3 4 5
14. I work on unnecessary things.	1 2 3 4 5
15. I am given enough time to do what is expected of of me on my job.	1 2 3 4 5
16. It often seems like I have too much work for one person to do.	1 2 3 4 5
17. The performance standards on my job are too high.	1 2 3 4 5

The following statements are things people might say about the office or department where they work.

	SD N SA
1. I think my office/department is a good place for me to work.	1 2 3 4 5
2. People in my office/department do not share the same values.	1 2 3 4 5
3. My fellow workers and I want the same things from this job.	1 2 3 4 5
4. I can recognize most of the people in my office/department.	1 2 3 4 5
5. I feel at home in this office/department.	1 2 3 4 5
6. Very few of my fellow workers know me.	1 2 3 4 5
7. I care about what my fellow workers think of my actions.	1 2 3 4 5
8. I have no influence over what my office/department is like.	1 2 3 4 5
9. If there is a problem in my office/department the people who work can get it solved.	1 2 3 4 5
10. It is very important for me to work in this office/department.	1 2 3 4 5
11. People in this office/department generally do not get along with each other.	1 2 3 4 5
12. I expect to work in this office/department for a long time.	1 2 3 4 5

The following statements are about the physical environment of the office or department in which you work, each of which you may agree or disagree with depending on your own personal evaluation.

	SD N SA
1. On my job I am exposed to high levels of noise.	1 2 3 4 5
2. On my job I am exposed to high levels of wetness.	1 2 3 4 5
3. On my job I am exposed to high levels of dust.	1 2 3 4 5
4. On my job I am exposed to high temperatures.	1 2 3 4 5
5. On my job I am exposed to bright light.	1 2 3 4 5
6. On my job I am exposed to low temperatures.	1 2 3 4 5
7. On my job I have an erratic work schedule.	1 2 3 4 5
8. On my job I am exposed to personal isolation.	1 2 3 4 5
9. On my job I am exposed to unpleasant odours.	1 2 3 4 5
10. On my job I am exposed to poisonous substances.	1 2 3 4 5
11. On my job I don't breathe enough fresh air.	1 2 3 4 5
12. On my job I am exposed to hazardous materials.	1 2 3 4 5
13. On my job I am exposed to radiation.	1 2 3 4 5
14. Environmental Illness refers to any illness that is related to a specific environment.	1 2 3 4 5
15. Environmental Illness may occur in the workplace.	1 2 3 4 5
16. There are many known causes of Environmental Illness.	1 2 3 4 5
17. The physical symptoms associated with Environmental Illness are the same in work settings.	1 2 3 4 5
18. There are more cases of Environmental Illness in newer buildings (those built within the last 10 years) than older buildings (those over 10 years old).	1 2 3 4 5
19. Environmental Illness is found in 20 % to 30 % of all buildings.	1 2 3 4 5
20. Environmental Illness is more likely to occur in air conditioned buildings.	1 2 3 4 5
21. Environmental Illness related to a work setting may continue for days, weeks, and even months after an individual leaves the setting.	1 2 3 4 5
22. Environmental Illness may be due to poor ventilation systems.	1 2 3 4 5
23. Environmental Illness may be due to gases coming from new furniture and carpeting.	1 2 3 4 5
24. The incidence of Environmental Illness is the same for men and women.	1 2 3 4 5
25. The incidence of Environmental Illness is the same for "white collar" and "blue collar" workers.	1 2 3 4 5
26. Environmental Illness affects everyone in the same work setting.	1 2 3 4 5
27. Environmental Illness symptoms are easy to fake.	1 2 3 4 5
28. Environmental Illness may be related to workplace stress.	1 2 3 4 5
29. Many workers report symptoms of Environmental Illness to get time off from work.	1 2 3 4 5

The following statements describe what attitudes <u>you</u> think management, the media, and the general public have concerning environmental illness.

		SD			N	SA
1.	My family is concerned with the air quality in my place of work.	1	2	3	4	5
2.	The media have accurately portrayed the problems associated with Environmental Illness	1	2	3	4	5
3.	The general public is sympathetic with people suffering from Environmental Illness.	1	2	3	4	5
4.	Management is very concerned about Environmental Illness.	1	2	3	4	5
5.	My family is aware of the problems relating to Environmental Illness.	1	2	3	4	5
6.	Management supports any changes which need to be made to improve the air quality at work.	1	2	3	4	5
7.	The media have been one-sided in their coverage of Environmental Illness.	1	2	3	4	5
8.	Members of my family understand my concerns about Environmental Illness.	1	2	3	4	5
9.	In general, the public is aware of the problems associated with Environmental Illness.	1	2	3	4	5
10.	The general public is concerned about problems related to Environmental Illness.	1	2	3	4	5
11.	Management does take employees suffering from Environmental Illness seriously.	1	2	3	4	5
12.	Management is ready to take steps to remedy the problems due to Environmental Illness	1	2	3	4	5
13.	My family has a negative attitude towards people suffering from Environmental Illness.	1	2	3	4	5
14.	Management views Environmental Illness as a set of symptoms faked by employees to get off work.	1	2	3	4	5
15.	The media has exploited the issue of environmental illness.	1	2	3	4	5
16.	The general public wants to learn more about Environmental Illness.	1	2	3	4	5
17.	The media provides enough coverage of Environmental Illness.	1	2	3	4	5
18.	The media has been sympathetic in their portrayal of Environmental Illness.	1	2	3	4	5
19.	My family is very sympathetic towards those suffering from Environmental Illness.	1	2	3	4	5

Please indicate the degree of agreement or disagreement with each of the following items by circling a number from 1 to 7 where: 1= Strongly Disagre (SD); 2 = Disagree; 3 = Mildly Disagree; 4 = Neither Agree nor Disagree (N); 5 = Mildly Agree; 6 = Agree; and 7 = Strongly Agree (SA).

The following statements are about the organization for which you work, each of which you may agree or disagree with depending on your own personal evaluation.

		SD			N			SA
1.	The employer values my contribution to its well-being.	1	2	3	4	5	6	7
2.	If the employer could hire someone to replace me at a lower salary it would do so.	1	2	3	4	5	6	7
3.	The employer fails to appreciate any extra effort from me.	1	2	3	4	5	6	7
4.	The employer strongly considers my goals and values.	1	2	3	4	5	6	7
5.	The employer would ignore any complaint from me.	1	2	3	4	5	6	7
6.	The employer disregards my best interests when it makes decisions which effect me.	1	2	3	4	5	6	7
7.	Help is available from my organization when I have a problem.	1	2	3	4	5	6	7
8.	The employer really cares about my well-being.	1	2	3	4	5	6	7
9.	Even if I did the best possible job, the organization would fail to notice.	1	2	3	4	5	6	7
10.	The employer is willing to help when I need a special favor.	1	2	3	4	5	6	7
11.	The employer cares about my general satisfaction at work.	1	2	3	4	5	6	7
12.	If given the opportunity the organization would take advantage of me.	1	2	3	4	5	6	7
13.	The employer shows very little concern for me.	1	2	3	4	5	6	7
14.	The employer cares about my opinions.	1	2	3	4	5	6	7
15.	The employer takes pride in my accomplishments at work.	1	2	3	4	5	6	7
16.	The employer tries to make my job as interesting as possible.	1	2	3	4	5	6	7

The following statements are about the union you belong to, each of which you may agree or disagree with depending on your own personal evaluations.

		SD			N			SA
1.	The union values my contribution to its well-being.	1	2	3	4	5	6	7
2.	The union fails to appreciate any extra effort from me.	1	2	3	4	5	6	7
3.	The union strongly considers my goals and values.	1	2	3	4	5	6	7
4.	The union would ignore any complaint from me.	1	2	3	4	5	6	7
5.	The union disregards my best interests when it makes decisions which affect me.	1	2	3	4	5	6	7
6.	Help is available from my union when I have a problem.	1	2	3	4	5	6	7
7.	The union really cares about my well-being.	1	2	3	4	5	6	7
8.	Even if I did the best possible job, the union would fail to notice.	1	2	3	4	5	6	7
9.	The union is willing to help when I need a special favor.	1	2	3	4	5	6	7
10.	The union cares about my general satisfaction at work.	1	2	3	4	5	6	7
11.	If given the opportunity the union would take advantage of me.	1	2	3	4	5	6	7
12.	The union shows very little concern for me.	1	2	3	4	5	6	7
13.	The union cares about my opinions.	1	2	3	4	5	6	7
14.	The union takes pride in my accomplishments at work.	1	2	3	4	5	6	7
15.	The union tries to make union duties as interesting as possible.	1	2	3	4	5	6	7

Listed below are a number of events sometimes experienced by individuals employed in various occupations. Please circle the number corresponding to your experience in the last two years where:

0. = I have not experienced this event (N)
+3. = Experienced, had an extremely positive impact (EP)
- 3. = Experienced, had an extremely negative impact (EN)

		EN			N			EP
1.	New Supervisor	-3	-2	-1	0	1	2	3
2.	Promotion	-3	-2	-1	0	1	2	3
3.	Conflict with Coworker	-3	-2	-1	0	1	2	3
4.	New Office	-3	-2	-1	0	1	2	3
5.	Change in work responsibilities	-3	-2	-1	0	1	2	3
6.	More employees under your supervision	-3	-2	-1	0	1	2	3
7.	Being demoted	-3	-2	-1	0	1	2	3
8.	Change in close work associate(s)	-3	-2	-1	0	1	2	3
9.	Conflict with supervisor	-3	-2	-1	0	1	2	3
10.	Suspended from job	-3	-2	-1	0	1	2	3
11.	Fewer employees under your supervision	-3	-2	-1	0	1	2	3
12.	Work layoff	-3	-2	-1	0	1	2	3
13.	Being put on probation	-3	-2	-1	0	1	2	3
14.	Salary increase	-3	-2	-1	0	1	2	3
15.	More dangerous working conditions	-3	-2	-1	0	1	2	3
16.	Reduction in Pay	-3	-2	-1	0	1	2	3
17.	Job training program	-3	-2	-1	0	1	2	3
18.	Change in working hours	-3	-2	-1	0	1	2	3
19.	Failure to get expected promotion	-3	-2	-1	0	1	2	3
20.	Change to new type of work	-3	-2	-1	0	1	2	3
21.	Failure to get expected pay raise	-3	-2	-1	0	1	2	3
22.	Dismissal of coworker	-3	-2	-1	0	1	2	3
23.	Injury to coworker	-3	-2	-1	0	1	2	3
24.	Work related personal injury	-3	-2	-1	0	1	2	3
25.	Transfer	-3	-2	-1	0	1	2	3
26.	Strike	-3	-2	-1	0	1	2	3
27.	Conflict with subordinates	-3	-2	-1	0	1	2	3
28.	Change in work rules/regulations	-3	-2	-1	0	1	2	3
29.	Work related death of coworker	-3	-2	-1	0	1	2	3
30.	Contract negotiations	-3	-2	-1	0	1	2	3
31.	Citation for outstanding work performance	-3	-2	-1	0	1	2	3

Please answer the following questions by circling the response which best reflects what has occured within the last two years.

1. Has your worksite been renovated in the last two years? Yes No
   If you circled yes to this question, please indicate how many renovations have taken place.
   (a) 1 (b) 2 (c) 3 (d) 4 or greater (e) don't know

2. Have you moved into a new building in the last two years? Yes No
   If you circled yes to this question, please indicate how many renovations have taken place.
   (a) 1 (b) 2 (c) 3 (d) 4 or greater (e) don't know

3. Approximately how often have you been off work sick in the last two years?
   (a) 0 days (b) 1 to 14 days (c) 15 to 30 days (d) 2 to 6 months (e) 6 months to a year (f) more than a year
4. Has the health of your family members or people you live with been affected since you started working at the hospital?
   (a) yes (b) no (c) don't know

5. If you circled yes to this question, please indicate what types of problems membersof your family or people you live with have experienced?
   (a) allergies (b) asthma (c) headaches (d) repeat infections (e) other; please specify

_____

_____

6. If you indicated that other members of your household have developed allergies since you began working at your present job, please specify below what allergies they suffer from.

(i) _____ (iv) _____ (vii) _____

(ii) _____ (v) _____ (viii) _____

(iii) _____ (vi) _____ (ix) _____

It is important that you fill out the next section, remember, your answers will be mixed with those of other employees at your hospital and other hospitals and you can in no way be identified. If you are uncomfortable giving any of the requested information, feel free to omit that item. Please keep in mind that the more information you provide, the more your union will be able to help you.

Gender (Please Circle) (1) Male (2) Female

Please indicate from what age group you are presently in (Please circle).

(1) 24 years and under
(2) 25 to 34 years
(3) 35 to 44 years
(4) 45 to 54 years
(5) 55 to 64 years
(6) 65 years and older

What is the highest level of education you have completed?
(Please circle highest grade obtained)

(1) Less than Grade 6
(2) Less than Grade 9
(3) Less than Grade 12 and Vocation and Training
(4) Grade 12
(5) Grade 12 and Vocational Training
(6) Community College (didn't graduate)
(7) Community College (graduated)
(8) University (didn't graduate)
(9) University Degree
(10) Honours University Degree
(11) Post-Graduate study
(12)Post-Graduate Degree
(13) Other (Please specify) _____

Marital Status (Please circle)

(1) Single (never married/living alone)
(2) Single (living with partner)
(3) Married
(4) Divorced/Seperated
(5) Widowed

Are you working full-time or part-time? (Please circle)

(1) Full-time
(2) Part-time

Please fill in the blank for each of the following:

What is your position at the hospital? _____

What is your Organizational tenure? _____

Which Department do you work in? _____

What is your Departmental tenure? _____

Which Local do you belong to? _____

Which Bargaining Unit do you belong to? _____

Thank You for your cooperation

Appendix B

Means and Standard Deviations for All Variables.

Appendix B

Means and Standard Deviations of Variables Overall and Within EI and Non-EI Locations.

Location	Variables	$\bar{X}$	SD
All Locations			
N=525	NSC	0.73	0.62
	POH	3.41	1.16
	RAS	2.30	0.79
	RCS	2.75	0.92
	ROS	2.73	0.89
	OSS	4.03	0.31
	PSC	3.70	0.57
	POS	4.16	1.18
	PUS	4.35	0.97
	PASO	3.21	0.46
	OES	2.98	0.84
	EKEI	3.63	0.38
Hospital #1 (EI)			
N=187	NSC	0.86	0.63
	POH	3.71	1.12
	RAS	2.33	0.84
	RCS	2.91	0.93
	ROS	2.87	0.89
	OSS	4.03	0.28
	PSC	3.63	0.56
	POS	4.08	1.20
	PUS	4.46	0.96
	PASO	3.19	0.45
	OES	3.25	0.71
	EKEI	3.68	0.37

Note. NSC = NEUROBEHAVIOURAL SYMPTOM CHECKLIST; POH = PERCEPTIONS OF OTHER PEOPLES' HEALTH; RAS = ROLE AMBIGUITY SCALE; RCS = ROLE CONFLICT SCALE; ROS = ROLE OVERLOAD SCALE; OSS = ORGANIZATIONAL STRESS SCALE; PSC = PSYCHOLOGICAL SENSE OF COMMUNITY SCALE; POS = PERCEIVED ORGANIZATIONAL SUPPORT SCALE; PUS = PERCEIVED UNION SUPPORT SCALE; PASO = PERCEIVED ATTITUDES OF SIGNIFICANT OTHERS; OES = OCCUPATIONAL ENVIRONMENT SCALE; EKEI = EMPLOYEES KNOWLEDGE OF ENVIRONMENTAL ILLNESS

Appendix B (continued)

Location	Variables	$\bar{X}$	SD
Hospital #1 (Non-EI)			
N=60	NSC	0.67	0.57
	POH	2.95	1.20
	RAS	2.25	0.85
	RCS	2.92	0.92
	ROS	2.94	0.90
	OSS	3.99	0.33
	PSC	3.64	0.55
	POS	4.06	1.12
	PUS	3.91	0.84
	PASO	3.03	0.44
	OES	3.07	0.86
	EKEI	3.47	0.40
Hospital #2 (Non-EI)			
N=67	NSC	0.58	0.51
	POH	3.39	0.97
	RAS	2.20	0.74
	RCS	2.61	0.92
	ROS	2.67	0.82
	OSS	4.03	0.32
	PSC	3.80	0.50
	POS	4.25	1.17
	PUS	4.36	0.86
	PASO	3.28	0.40
	OES	2.83	0.82
	EKEI	3.75	0.39

Note. NSC = NEUROBEHAVIOURAL SYMPTOM CHECKLIST; POH = PERCEPTIONS OF OTHER PEOPLES' HEALTH; RAS = ROLE AMBIGUITY SCALE; RCS = ROLE CONFLICT SCALE; ROS = ROLE OVERLOAD SCALE; OSS = ORGANIZATIONAL STRESS SCALE; PSC = PSYCHOLOGICAL SENSE OF COMMUNITY SCALE; POS = PERCEIVED ORGANIZATIONAL SUPPORT SCALE; PUS = PERCEIVED UNION SUPPORT SCALE; PASO = PERCEIVED ATTITUDES OF SIGNIFICANT OTHERS; OES = OCCUPATIONAL ENVIRONMENT SCALE; EKEI = EMPLOYEES KNOWLEDGE OF ENVIRONMENTAL ILLNESS

Appendix B (continued)

Location	Variables	$\bar{X}$	SD
Hospital #3 (EI)			
N=50	NSC	0.97	0.67
	POH	4.10	0.85
	RAS	1.97	0.65
	RCS	2.55	1.02
	ROS	2.42	0.84
	OSS	3.96	0.26
	PSC	3.93	0.65
	POS	4.74	1.23
	PUS	4.35	1.19
	PASO	3.42	0.41
	OES	2.60	0.83
	EKEI	3.52	0.38
Hospital #4 (EI)			
N=61	NSC	0.57	0.45
	POH	3.87	0.89
	RAS	2.41	0.69
	RCS	2.51	0.78
	ROS	2.57	0.88
	OSS	4.06	0.36
	PSC	3.72	0.48
	POS	4.27	0.96
	PUS	4.43	0.87
	PASO	3.37	0.41
	OES	3.18	0.65
	EKEI	3.67	0.35

Note. NSC = NEUROBEHAVIOURAL SYMPTOM CHECKLIST; POH = PERCEPTIONS OF OTHER PEOPLES' HEALTH; RAS = ROLE AMBIGUITY SCALE; RCS = ROLE CONFLICT SCALE; ROS = ROLE OVERLOAD SCALE; OSS = ORGANIZATIONAL STRESS SCALE; PSC = PSYCHOLOGICAL SENSE OF COMMUNITY SCALE; POS = PERCEIVED ORGANIZATIONAL SUPPORT SCALE; PUS = PERCEIVED UNION SUPPORT SCALE; PASO = PERCEIVED ATTITUDES OF SIGNIFICANT OTHERS; OES = OCCUPATIONAL ENVIRONMENT SCALE; EKEI = EMPLOYEES KNOWLEDGE OF ENVIRONMENTAL ILLNESS

Appendix B (continued)

Location	Variables	$\bar{X}$	SD
Hospital #5 (Non-EI) N=100	NSC	0.63	0.64
	POH	2.65	1.14
	RAS	2.45	0.79
	RCS	2.67	0.90
	ROS	2.60	0.90
	OSS	4.05	0.34
	PSC	3.68	0.64
	POS	4.09	1.28
	PUS	4.29	1.02
	PASO	3.16	0.51
	OES	2.61	0.96
	EKEI	3.59	0.36

Note. NSC = NEUROBEHAVIOURAL SYMPTOM CHECKLIST; POH = PERCEPTIONS OF OTHER PEOPLES' HEALTH; RAS = ROLE AMBIGUITY SCALE; RCS = ROLE CONFLICT SCALE; ROS = ROLE OVERLOAD SCALE; OSS = ORGANIZATIONAL STRESS SCALE; PSC = PSYCHOLOGICAL SENSE OF COMMUNITY SCALE; POS = PERCEIVED ORGANIZATIONAL SUPPORT SCALE; PUS = PERCEIVED UNION SUPPORT SCALE; PASO = PERCEIVED ATTITUDES OF SIGNIFICANT OTHERS; OES = OCCUPATIONAL ENVIRONMENT SCALE; EKEI = EMPLOYEES KNOWLEDGE OF ENVIRONMENTAL ILLNESS