PSYCHOSOCIAL IMPACTS IN POPULATIONS EXPOSED TO SOLID WASTE FACILITIES

BY

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A Thesis

Submitted to the School of Graduate Studies

in Partial Fulfilment of the Requirements

for the Degree

Doctor of Philosophy

McMaster Univeristy

June, 1992

PSYCHOSOCIAL IMPACTS IN POPULATIONS EXPOSED TO SOLID WASTE FACILITES

DOCTOR OF PHILOSOPHY (1992) MCMASTER UNIVERSITY
(Geography) Hamilton, Ontario

TITLE: Psychosocial Impacts in Populations Exposed to Solid Waste Facilities

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NUMBER OF PAGES: xiii; 316

ABSTRACT

This thesis examines psychosocial impacts in three populations exposed to solid waste disposal facilities in southern Ontario. Psychosocial impacts are defined as a complex of distress, dysfunction and disability, manifested in a wide range of psychological, social and behavioural outcomes, as a consequence of actual *or perceived* environmental contamination. The scope of this research is based on the awareness and prevalence of exposure to environmental contaminants in Ontario, the relative absence of theory and empirical evidence to explain their determinants, and uncertainty as to ways to intervene effectively to reduce their adverse effects on human health and well-being. Three research objectives are addressed within a parallel case study design using descriptive and logistic regression analyses: 1) *to determine the prevalence of psychosocial impacts among exposed individuals*; 2) *to investigate determinants of individual level psychosocial impacts*; and, 3) *to investigate the determinants of individual level actions taken in response to psychosocial impacts*. Implicit across these objectives is the development of a clearer conceptual understanding of the nature and direction of the process of psychosocial impacts. The data come from an epidemiological survey of residents (N=696) living within a prescribed radius from each of three solid waste facilities. The analytical model which guided the analysis was informed by a socioecological model of health and well-being and has three components: external

variables (e.g., individual and exposure related variables), mediating variables (e.g., social network membership and involvement, health status measures as well as measures of general psychosocial health and well-being), and outcome variables (e.g., concern, effects and actions). Results show that levels of outcome reported vary by site. This finding indicates that the process of psychosocial impacts cannot be divorced from the community context within which they occur. Further, results for a series of site specific analyses show that outcome measures can be successfully explained by a combination of external and mediating factors. However, given the number and diversity of variable types emerging, there is no single cause and effect relationship operating. The implication is that strategies aimed to address and alleviate psychosocial impacts need to be specific to the characteristics of the populations in particular settings. Contributions made by the thesis are theoretical, development of a socioecological conceptual framework within the context of environmental stress theory; methodologic, development of an epidemiologic survey designed to measure psychosocial impacts; and substantive, analysis of the prevalence and determinants of psychosocial impacts.

ACKNOWLEDGEMENTS

I would like to take this opportunity to thank the many people who contributed to the completion of this thesis. First, I would like to thank the agencies who funded and sponsored the research: Ontario Ministry of the Environment, Social Sciences and Humanities Research Council, and Canadian Mental Health Association, Ontario Division. Thanks also to the Institute for Social Research (York University) for their assistance in data collection. Many thanks to Jamie Baxter for tireless hours spent in tax assessment offices and on isolated country roads while enumerating the study sample.

A very sincere thank-you to my supervisor, Dr. Martin Taylor who always found time for me. This thesis would not have been possible without his constant support, encouragement and inspiration. Many thanks to my committee members - John Eyles and Norman White - who also made time for me in their busy schedules and taught me how to stretch my thinking. Thanks also to others who provided significant input: Stephen Walter, David Streiner, John Frank and Murray Haight.

Many thanks to my McMaster friends for their support and collegiality; special thanks to those in the International McMaster Network (Jane Pollard, Glenda Laws and Mike Hayes). Completion of this thesis would never have been possible without the support of my husband John who never once complained about my work habits.

This thesis is dedicated to my two beautiful daughters, Rebekah and Naomi, who unknowingly kept my life - and this thesis - in perspective.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

This thesis involves a geographic analysis of an environment and health relationship. Specifically, the work examines psychosocial impacts in populations living near three solid waste facilities in southern Ontario. The scope of the research is based on the awareness and prevalence of *psychosocial impacts* of exposure to environmental contaminants in Ontario, the relative absence of theory and empirical evidence to explain their determinants, and uncertainty as to ways to intervene effectively to reduce their adverse effects on human health and well-being. The research objectives stem directly from the main findings of a feasibility study of the psychosocial impacts of exposure to environmental contaminants in Ontario (Taylor et al. 1989). The final report argued for a staged research strategy to develop conceptual models and methods to guide future research. The need to examine psychosocial impacts in individuals from a socioecological perspective was emphasized giving due consideration to the role of group and community level factors. This strategy and conceptual approach require a ***combination*** of epidemiologic and qualitative methodologies to determine the relationships between (perceived) exposure and impacts and to interpret the complex environmental, social

and psychological processes underlying these relationships.

1.1 RESEARCH AGENDA

The study discussed in this thesis is situated within a larger research programme which uses a two-stage parallel case study design to investigate psychosocial impacts in populations exposed to municipal solid waste disposal facilities. The first stage of the study is an epidemiologic survey designed to determine the prevalence and determinants of individual level psychosocial impacts in populations within a prescribed area around each site. The second stage involves a series of qualitative approaches to provide in-depth analysis of the social network and community level factors influencing psychosocial impacts. This thesis describes the first stage of the research; that is, the development, administration and findings of the epidemiologic survey. The objectives of the thesis are:

> *1. To determine the prevalence of psychosocial impacts among exposed individuals.*
>
> *2. To investigate the determinants of individual level psychosocial impacts.*
>
> *3. To investigate the determinants of individual level actions taken in response to psychosocial impacts.*

Implicit across these objectives is the development of a clearer conceptual understanding of the nature and direction of relationships involved in the process of psychosocial impacts, informed by a socioecological model of health and well-being

(White 1981).

1.2 RESEARCH CONTEXT

Public concern in Ontario over the possible toxic effects of exposure to environmental contaminants is high in the wake of past highly publicized events elsewhere (e.g., Love Canal, Three Mile Island, Chernobyl, St. Basile-le-Grande). Local situations, such as the Upper Ottawa Street Landfill Site in Hamilton or the Hagersville tire fire, reinforce concerns and give them more immediacy. Recent disclosures regarding PCB disposal sites, radon gas emissions and electro-magnetic radiation also contribute to uncertainty and anxiety over health risks. Equally, the prospect of the future location of new solid and liquid waste disposal sites compounds public fears and generates community reaction (Anderson 1987; Raymond 1988).

While past research has concentrated mainly on physical health effects of exposure to environmental contaminants (e.g., cancer, adverse reproductive outcomes), increasing attention is now being turned to the psychosocial impacts of exposure. These are defined here as:

> The complex of distress, dysfunction and disability manifested in a wide range of social, psychological and behavioural impacts in individuals, groups and communities as the consequence of actual *or perceived* environmental contamination.

The research is linked to two traditional areas of geographic

enquiry: community perception of and reaction to environmental hazards (Burton, Kates and White 1978); and, exploration of perceived negative externalities associated with noxious land uses (e.g., studies of community mental health facilities (Dear and Taylor 1982) as well as pollution-producing facilities (Greenberg 1987)). Environmental perception studies have employed, with varying degrees of success, a number of theoretical approaches in attempting to explain human-environment relations (e.g., attitude-action theory, personal construct theory, personality theory). However, much of the work in this area has been viewed as being a-contextual (Fowlkes and Miller 1987; Taylor et al. 1989). Such an a-contextual approach has recently been challenged by a conceptual shift from a biomedical to a socioecological model of health and well-being (White 1981, 1987, 1989), concomitantly creating a greater role for geographers in the analysis of health issues.

The idea of a contextualized, socioecological approach to the analysis of environmental perception is consistent with recent research in social and medical geography (Eyles and Woods 1983; Eyles and Donovan, 1990; White 1981, 1987, 1989). The methods employed in this area of research have traditionally centred on quantitative measures of environmental perception (Kates 1976), although there have been recent additions on the qualitative side (e.g., Liverman and Sherman 1985). In order to truly understand the perception of environmental hazards, however, the researcher must examine how individuals, groups and communities make sense of their situations and this involves a much more concerted qualitative approach

concomitant with a quantitative approach. Again, this is consistent with recent analyses in social and medical geography (e.g., Baxter et al. 1992; Eyles and Donovan 1990).

1.3 THEORETICAL PERSPECTIVE

The theoretical framework used in the research comes from the environmental stress and coping literature (Evans 1982; Evans and Cohen 1987; Lazarus and Folkman 1984; Pearlin and Schooler 1978). Evans and Cohen (1987: 573) define environmental stress as:

> a process that occurs when there is an imbalance between demands and response capabilities of the organism.

Understanding the complex process of environmental stress therefore requires a model which goes beyond the traditional stress-response (or, stress-adaptation-response) model(s) found in the literature (Baum et al. 1982). Rather, an appropriate model must be able, in essence, to *contextualize* the stress-response relationship. This can be accomplished through the recognition of the mediating influence of social and cultural factors involved in the *determination* of 'stress'. A point of departure is the psychological model of response to environmental stress provided by Lazarus and Folkman (1984). This model contends that response to environmental stress is divided into two stages. At the stage of **primary** appraisal, the individual may appraise an environmental stressor as a threat, a harm, or a

challenge. At the stage of secondary appraisal, the individual determines how best to cope with the stressor. Feedback is provided through the process of reappraisal, where the stages of primary and secondary appraisal are repeated as the perception of the stressor or available resources changes over time.

The experience of environmental stress, the choice of a particular coping response, and the incidence of psychosocial impacts are dependent upon a number of mediating factors. These mediating factors can be categorized into four sets of mediating dimensions: (1) characteristics of the individual (Pearlin and Schooler 1978; Evans and Jacobs 1982; Lefcourt 1982); (2) characteristics of the environmental stressor (Vyner 1988; Sims and Baumann 1983; Evans and Jacobs 1982); (3) characteristics of the social network (Flynn 1979; Edelstein 1988); and, (4) characteristics of the wider community system (Petterson 1988; Sims and Baumann 1983; Buttel 1987). A key element of these mediating dimensions is that response to environmental stressors is a transactive process where these four sets of characteristics not only mediate psychosocial impacts, they mediate each other.

1.4 ORGANIZATION OF THE THESIS

The following chapter reviews the literature on psychosocial impacts firstly by setting a broader research context; secondly, by situating the research within social and medical geography; and finally, through a critical appraisal of the research literature to date. The theoretical perspective is examined in more detail. This is

followed by an explanation of the conceptual framework which guided the research.

Site and sample selection as well as survey instrument development and administration are discussed in the chapter on *Research Design*. This is followed by a series of profiles of the three communities within which the solid waste disposal facilities are situated. The profiles describe the socio-geographic context in which the facilities are located. In addition, they serve to fill some of the evidential gaps left in the absence of baseline data and/or control communities.

A discussion of the framework which guided the analysis forms the introduction to the first of two empirical chapters which document the analysis and findings of the epidemiologic survey. The first chapter focuses particularly on a description of the prevalence of psychosocial impacts among the exposed populations (objective one). A large part of the epidemiologic survey analysis was performed using logistic regression analysis to uncover the determinants of psychosocial impacts (objectives two and three). The analytical approach is consistent with the conceptual view of psychosocial impacts as outcomes within a socioecological framework of determinants (vs a biomedical model of causation). This analysis constitutes the second of the two empirical chapters.

In the final chapter, attention turns to the potential applications of the study findings as they relate to substantive, theoretical and methodological contributions. The thesis makes a contribution to the environmental stress literature where both theoretical and conceptual gaps have been identified (e.g., Taylor et al.

1989; these are outlined in Chapter 2). The empirical evidence gathered in the research process increases our power of explanation by uncovering the determinants of psychosocial impacts of exposure to environmental contaminants. Finally, through the identification of determinants, the thesis can begin to address policy issues, particularly concerning effective measures of intervention for the reduction of adverse impacts on the health and well-being of exposed individuals.

CHAPTER 2

PSYCHOSOCIAL IMPACTS OF EXPOSURE

2.1 INTRODUCTION

2.1.1 THE RESEARCH CONTEXT

Past research on the human health consequences of exposure to environmental contaminants has focused primarily on possible physical effects (e.g., cancer, adverse reproductive outcomes). Psychosocial impacts, on the other hand:

> ...involve the effects of an event or a series of events on the behaviour, the cognitions and the emotions of people exposed to the event(s) (Edelstein 1989:164).

While psychosocial impacts are receiving increasing attention, they have not yet received the recognition they merit as legitimate impacts on the human health and well-being (Lechat 1990). Recent major contamination events - Love Canal, Three Mile Island, Chernobyl, Bhopal, and so on - "...have brought to light our lack of systematic knowledge regarding the long-term psychosocial consequences of such major disasters" (Lechat 1990:196).

For the purposes of this research, psychosocial impacts are defined as:

> the complex of dysfunction, distress and disability manifested in a wide range of social, psychological and behavioural outcomes in individuals, groups and communities as a consequence of actual *or perceived* environmental contamination.

As psychosocial impacts encompass a wide range of outcomes, their etiology is inevitably complex. In addition, they may occur in conjunction with or independent of measurable physical effects. For example, a ten-year mortality study conducted by Bertazzi et al. (1989) on the physical health impacts of exposure to dioxin following a major industrial accident in 1976 in Seveso, Italy found, not surprisingly, that mortality from several cancers was elevated in the exposed vs control communities. In addition, however, they also found increased mortality from cardiovascular disease, a relationship with some but little biologic or epidemiologic plausibility. These authors suggest one plausible explanatory hypothesis "...is that in the aftermath of the accident the population of the area underwent powerful stresses...which might have precipitated preexisting conditions of cardiovascular disease..." (Bertazzi et al. 1989). Finally, because psychosocial impacts may be associated with actual *or perceived* exposure, they may occur *in advance of* a potential contaminant situation (e.g., the siting of a landfill).

2.1.2 THE GEOGRAPHIC CONTEXT

The investigation of psychosocial impacts of exposure is linked to two areas of geographic enquiry: community perception of and reaction to environmental hazards (Burton, Kates and White 1978); and, exploration of perceived negative externalities associated with noxious land uses (e.g., studies of community mental health facilities (Dear and Taylor 1982) as well as pollution-producing facilities

(Greenberg 1987)). Perception studies have employed, with varying degrees of success, a number of theoretical approaches in attempting to explain human-environment relations (e.g., attitude-action theory, personal construct theory, personality theory), particularly as they relate to the perception of environmental hazards, both natural and human-made. A common theme throughout much hazard perception research has been that impacts can be lessened through education. That is, that humans armed with information about hazards and their impacts will perceive and therefore react in the 'correct' way; the empirical evidence for this relationship, however, is not substantial (Sims and Baumann 1983; Taylor et al. 1989). It would appear that there are other forces operating within this relationship. Further, much of the work in this area has been viewed as a-contextual (Fowlkes and Miller 1987), where the relationship between an individual and an environmental stressor is taken out of the context of an individual's lifescape; that is, the framework we use to understand the world around us (Edelstein 1988). Such an a-contextual approach has recently been challenged by a conceptual shift from a biomedical to a socioecological model of health and well-being (White 1981, 1987), concomitantly creating a greater explicit role for geographers in the analysis of environment and health issues.

The idea of a contextualized, socioecological approach to perceptions of environmental exposure is consistent with recent research in social and medical geography (Eyles and Woods 1983; Eyles and Donovan 1990; Kirby 1990; White

1981, 1987, 1989). For example, Lewis and Mayer (1988) demonstrate the links between hazard perception research and medical geography in the context of "...a cross-cultural appreciation of the perceptions of and responses to disease..." (Lewis and Mayer 1988:17) at several levels of analysis (individual, social, bureaucratic) conceptualized within a human ecological model similar to the type used in much hazard perception research (e.g., Kates 1976).

Thus, there is a clear role for social and medical geographers in the investigation of (perceived) environmental exposure. Meade and others (1988) define medical geography as follows: "Medical geography uses the concepts and techniques of the discipline of geography to investigate health-related topics" (Meade et al. 1988:3). Furthermore,

> Subjects are viewed in holistic terms within a variety of cultural systems and a diverse biosphere. Drawing freely from the facts, concepts, and techniques of other social, physical, and biological sciences, medical geography is an integrative, multistranded subdiscipline that has room within its broad scope for a wide range of specialist contributions (Meade et al. 1988:3).

Research within medical geography spans a wide spectrum of topic areas. These include the determinants of health (e.g., Taylor et al. 1986), the distribution (e.g., Kabel 1990; Pyle and Rees 1971) and diffusion of disease (e.g., Lewis 1990; Pyle 1973; Shannon and Pyle 1989) and the delivery of health care services (e.g., Mayer 1990; Scarpaci 1988). Only recently have a small number of medical geographers seriously turned their attention to the health impacts of environmental

exposure (e.g., Bentham 1990; Greenberg 1987; McGlashen 1990; Taylor 1988); this number is even smaller when the focus becomes psychosocial impacts (Eyles et al. 1990; Taylor et al. 1989).

Research methods employed in medical geography have traditionally been quantitative although there have been recent additions on the qualitative side (e.g., Eyles and Donovan 1990). In order to truly understand the perception of environmental hazards, however, the researcher must examine how individuals, groups and communities make sense of their situations and this involves a much more concerted qualitative approach integrated with a quantitative approach.

In short, recent conceptual, theoretical and methodological shifts in research emphasis have enhanced the role for social and medical geographers to address the pressing environment and health issues communities are currently experiencing. A recent example is the qualitative analysis of the psychosocial impacts of the Hagersville Tire Fire (Baxter et al. 1992; Eyles et al. 1990).

2.1.3 CHAPTER ORGANIZATION

Having set the research and geographical contexts, the balance of this chapter is devoted to a review of the literature which addresses psychosocial impacts of exposure to environmental contaminants with particular emphasis on exposure to (non-hazardous) solid waste facilities. This will begin with a review of the nature and types of exposures and outcomes investigated in the research literature. This is

followed by a discussion of the conceptual frameworks used to guide these studies. A review of research methods focuses on the design implications of psychosocial research as well as the related problems of accurate exposure and outcome measurement. The section concludes with a suggested combination of quantitative and qualitative research methods. This review of the literature informs the development of both theoretical and conceptual frameworks to guide the current research as well as the selection of research methods.

2.2 REVIEW OF THE EVIDENCE

Taylor and others (1989) undertook a systematic critical appraisal of the psychosocial research literature which covered the period up to and including 1988. Literature was identified using three key sources: computerized bibliographies, manual searches and key informants. Only original research which assessed a relationship between an environmental exposure and psychosocial impacts (n=54 studies) was critically appraised. Appraisals were completed using an extensive form and user's manual developed by this research team.

2.2.1 EXPOSURES AND OUTCOMES

Of the 54 papers appraised by Taylor and others (1989), only 31 addressed a direct environmental exposure-outcome relationship while 23 examined a mediating relationship (e.g., coping abilities of exposed individuals; e.g., Bachrach and Zautra

1985). The vast majority of the studies (n=50) were conducted at the individual level. They therefore provided little, if any, evidence of the community context within which environmental exposure events occurred or impacts at other levels of social organization (e.g., the family or social network levels). With respect to study design, the majority (n=33) were cross-sectional thus providing weak evidence for causation. However, given the nature of the exposure, alternative study designs are not often feasible.

The most frequently cited hazard source examined was nuclear power (16 studies); specifically, the nuclear accident at Three Mile Island. Thus, the contribution of TMI researchers to our stock of knowledge about exposure-impact relationships has clearly been a substantial one. Further, studies of the impacts of landfills are rare. Other hazard sources studied in this review, in descending order of occurrence, were ambient exposures (e.g., lead and smog, 11 studies), hazardous waste disposal (10), heavy industry (8), **landfill sites** (5), and 'other' (e.g., power transmission lines, railway line extension; 4 studies).

Health outcomes were categorized under five headings. Even though appraisals were limited to studies which addressed an exposure-psychosocial impact relationship, the evidence remains sparse. In addition, types of impacts are spread across a wide range of outcomes. 36 papers discussed *diagnosed disease* which included stress, psychiatric somatoform outcomes, and affective disorders such as depression. Indicators of *objectively measured dysfunction* included both physical and

psychological functions assessed using clinical examination, physiological measures, laboratory tests, and psychological/behavioural measures. Psychological functions were most often measured using pre-validated existing instruments such as the Beck Depression Inventory. Site-specific measures of risk perception were used in 6 studies. *Illness stigmata* included physical, emotional or cognitive complaints. Anxiety/fear, depression and helplessness/loss of control were the most commonly assessed emotional complaints. *Illness behaviour* refers to behaviour resulting from the presence (or the belief in the presence) of disease. Only 18 of the 54 studies examined this outcome. *Disability* was investigated in only 16 studies. Outcomes assessed were related to vocational and recreational activities, activities of daily living, domestic and interpersonal relations and social activities.

Overall, therefore, a review of the literature assessing the evidence for a relationship between environmental exposure and psychosocial impacts reveals firstly, that it is not substantial and, secondly, that it is spread across a wide range of exposure-outcome relationships.

Sample designs and statistical analyses varied across studies and raised several concerns. For example, there were often (14 studies) clear differences between the sample and its population with respect to a key characteristic such as age, income or occupation. Further, in 15 studies there was insufficient information on which to judge the sample's representativeness. With respect to statistical analyses, the breakdown among this set of studies is as follows: none (1 study); descriptive (30);

bivariate (38); and, multivariate (25). The use of multivariate techniques has the advantage of controlling for confounders not eliminated in the sample design. Overall, a significant statistical relationship was established for at least one major relationship examined in 39 of the studies. However, appraisers felt that in at least 18 studies the method of analysis may have given rise to biased or invalid conclusions through the use of methods inappropriate for the data or the use of multiple testing. Overall, therefore, one may have difficulty judging the credibility of published studies assessing the relationship between environmental exposure and psychosocial impacts.

In assessing the quality of evidence for causation, appraisers employed several criteria including: exposure assessment, outcome assessment, control for confounding factors, strength of association between exposure and outcome and evaluation of the final conclusion (i.e., potential for false negative or false positive associations as well as consistency with other well-conducted studies). On the basis of these criteria, eight studies were judged to have established a strong relationship, 22 established relationships which were not clearly strong, and 21 established no relationship at all. For 21 studies, appraisers reported having serious doubts about the evidence for causation.

In the final analysis, on the basis of the critical appraisal, only 28 of the 54 studies were judged to be credible. Of these, 50% examined primary relationships between environmental exposure and psychosocial impacts while 50% examined secondary (mediating) relationships. The sources of exposure examined in these

credible studies, in descending order of occurrence, were: nuclear power (9 studies), lead (6), hazardous waste facilities (4), heavy industry (4), landfill sites (2), air pollution (1), power transmission lines (1), and, general environmental issues (1). The health outcomes studied included: dysfunction, physical complaints, emotional and cognitive problems, illness behaviour and disability. Only half of these studies showed significant results.

There are several points to be made from this review of the psychosocial impact literature. First, the amount of literature is not substantial. Second, existing evidence is scattered across a wide range of exposures and outcomes. Therefor, one must be very cautious about drawing any conclusions about relationships between a particular exposure-outcome relationship. This is especially true in the case of exposure to (non-hazardous) landfills, where thee is extremely little evidence to date. Third, it would appear from the appraisal exercise that many of the published studies addressing psychosocial impacts of exposure are methodologically and/or statistically flawed, thus reducing the pool of evidence even further.

The two landfill studies deemed credible (Taylor et al. 1989) deserve greater attention given their similarity with the exposure under study in the current research. Hertzman et al. (1987) undertook a morbidity survey of area residents affected by the Upper Ottawa Street Landfill in Hamilton, Ontario where illicit dumping of toxic liquid industrial wastes had been occurring for some time. The exposure under study in the current research clearly differs from this hazardous exposure despite the

similarity in the type (i.e., solid waste facility) of exposure. Five sets of symptoms were examined using self-report data. Psychosocial impacts were measured via mood symptoms: insomnia; frequent feelings of anxiety or depression, irritability, hyperactivity/restlessness; and, learning or memory disorders. The relationship documented between exposure and mood symptoms was both statistically ($p<0.001$) and clinically (relative odds >1.5) significant. Further, a dose-response relationship was demonstrated via a risk gradient by duration of residence and proximity to the landfill. However, two potential reductions of validity are reported: a high refusal rate among the control population (which may have introduced a bias) and significant differences in socioeconomic status between the exposed and control groups, with exposed groups being of lower status. Results may therefore be over-inflated as lower status groups may be inherently less healthy on mood indicators (Kessler and Cleary 1980; Kessler 1982) and more exposed to contaminants in the workplace and home than those of higher status.

The second landfill study appraised (Goss, Gilroy and Associates 1987) was a cross-sectional study conducted in response to the fears of residents in Whitchurch-Stouffville, Ontario about health effects stemming from exposure to a contaminated water supply adjacent to a local landfill:

> The study was comprehensive in its examination of disease outcomes, physical, emotional and cognitive complaints. The study found no evidence that residents were experiencing adverse health outcomes, when compared to control sites (Taylor et al. 1989:225).

Four studies dealing with exposure to landfill sites/solid waste facilities were uncovered in a search to update the literature appraised by Taylor and others (1989). Three of these deal with toxic disposal sites (one no longer active) and are therefore not truly comparable to the current situations under study. However, all dealt with psychosocial impacts of exposure and therefore provide some insight into outcome measurement. The fourth study examined the psychosocial impacts of a proposed solid waste incinerator and is therefore more informative than the previous three with respect to exposure. Each of these studies will be reviewed in turn.

The first study (Horowitz and Stefanko 1989) is a cross-sectional examination of "stress-related behavioral effects...associated with living near...a toxic-waste landfill" (Horowitz and Stefanko 1989:23) in Southern California. Study results are based on a telephone survey administered to 426 individuals living within 3 distance zones (1.5 miles, 1.5 to 5 miles, and 5 to 10 miles) around the landfill. The survey instrument employed a modified version of the Symptom Checklist-90 (Derogatis et al. 1973) to measure bodily effects as well as anger-hostility. This was used in addition to a modified version of the demoralization scale used at Three Mile Island (Dohrenwend et al. 1979). This study found: (a) no significant somatic effects for those living closer to the landfill; (b) high levels of demoralization but a lack of significant differences across areas; and (c) women, younger persons, less educated persons and renters "are more highly stressed" (Horowitz and Stefanko 1989:26). The authors are cautious not to attribute the findings to the landfill exposure due to

the lack of significant differences across areas.

There are several points to be made about these findings. First, the outcome of interest is 'stress', loosely translated into 'behavioral effects' through the use of three modified, pre-existing instruments found in the psychological literature. Both these constructs are ill-defined and presented in the absence of theory or a conceptual framework which would illustrate the nature and direction of their relationship to an environmental exposure. Second, outcome measures used in the survey instrument (e.g., SCL-90) may be mediating the exposure-outcome relationship as opposed to representing a measure of 'stress' *per se*. Evidence supporting the use of such measures as either mediators or outcomes is still lacking. Third, the distance zones used in the sampling design are perhaps too wide to include a sufficient 'dose-response' gradient of exposure. There is no convention in the literature which could be followed; distances range from quite narrow (Hertzman et al. 1987) to as wide as those used here (Bromet et al. 1982). The authors themselves, however, suggest using closer distances when measuring stress effects of environmental exposure (Horowitz and Stefanko 1989:26).

The second study (Lipscomb et al. 1991) involved a ten-minute telephone survey with households exposed to an inactive hazardous waste site in southern California. It was designed as a longitudinal follow-up to a health survey conducted seven years previously. The instrument consisted of questions related to perceived environmental risk and level of environmental worry, odour perception, general self-

health appraisal, a list of 22 symptoms (none of which could be considered psychosocial) and demographic information. The survey was administered to 57 high-exposure and 66 low-exposure households (determined on the basis of odour zone) as well as 70 comparison households. Essentially, the study concludes: "These findings, along with environmental data from the area, suggest that living near the waste disposal site and being very worried about the environment, rather than a toxicologic effect of chemical [sic] from the site, explain excess symptom reporting found in this follow-up study" (Lipscomb et al. 1991:15). In short, the greater the respondent's level of general environmental concern, the greater the level of symptom reporting.

This finding is not surprising given the method of instrument introduction and administration. That is, the community and respondents were sensitized to the issue and the purpose of the study itself in at least three different ways. First, a health survey had been carried out seven years earlier. While the issue of respondent mobility is not addressed in the study, many of the initial respondents were interviewed again in the follow-up. Secondly, the idea of conducting a follow-up health survey of residents living near the waste disposal site was presented at a community health workshop only two months prior to instrument administration. Finally, respondents were made aware of the full purpose of the survey both in a letter of introduction to each sampled household as well as in the telephone introduction to actual respondents. While this practice is admirable from an ethical

perspective, researchers could have withheld enough information to keep respondents at least semi-blind.

The third study (Dunne et al. 1990) involved a community health survey of residents living near a hazardous chemical waste site in Queensland, Australia. Households were sampled across two zones; within 300m (n=147) and within 300-1000m (n=110) from the site. Matched controls were taken from a community 16km away from the waste site (n=105). The survey instrument consisted of four sections: background information, awareness of environmental problems in the area, physical health details, and stress and general psychological health. This final section consisted of five pre-validated scales taken from the psychological literature including the 28-item version of the General Health Questionnaire and a 13-item Life Events Inventory. The interviews took an average of 90 minutes to complete.

The results of this study indicated increased levels of reported stress and anxiety in the exposed compared to the matched comparison community. This is despite the finding that exposed individuals were no more likely to report serious diseases, and cancer and mortality rates did not differ between the exposed and comparison groups. Exposed respondents did report poorer general health and more miscarriages than the comparison group. Further, reported poor general health was significantly correlated with measures of stress resulting from the environmental exposure and was associated with a belief in direct exposure as opposed to proximity to the site or length of residence in the area.

The fourth and final study (Wiedemann et al. 1991) addressed public concerns over a proposed solid waste incinerator in a small (West) German village. A telephone survey was conducted with a disproportionate random sample of respondents living in proximity to the proposed site. Interviews averaged 25 minutes in length and consisted of 50 closed-ended questions related to information demand about the site, objective and subjective knowledge of the site, and intentions to engage in information-gathering and participatory activities. The survey experienced a particularly low response rate (33%) leaving a total sample across three village areas of 165. The researchers explained the rate may have been higher if a letter of introduction had been sent to each of the 500 sampled households prior to instrument administration. With respect to respondents' opinions on waste incineration, a large proportion agreed that there were imminent health risks associated with this method of solid waste disposal. The paper continues with a description of an appropriate risk communication strategy based on the study results.

In short, the findings reported in studies deemed 'credible' by Taylor and others (1989) as well as those uncovered in the recent literature show a mix of significant and non-significant associations for a broad range of exposure-impact relationships. The literature pertaining specifically to landfills usually addresses hazardous exposures (as opposed to the non-hazardous exposures studied in the current research) and has been shown to be characterized by theoretical gaps and methodological shortcomings. Thus, there appears to be no clear consistency in

conclusions based on the strongest possible evidence. Further research must address the theoretical, conceptual and methodological issues.

2.2.2 CONCEPTUAL FRAMEWORKS

A fundamental limitation of past research on psychosocial impacts is the lack of conceptual clarity and the absence of well-defined conceptual models (Taylor et al. 1989). What is measured, how it is measured, and how results are interpreted are all determined by the way concepts are defined and their relation to each other. In the psychosocial literature conceptual frameworks are often left implicit (e.g., Horowitz and Stefanko 1989) and the reader has to grapple with loosely-defined terms such as 'stress' and 'depression'. The majority of studies fail to make explicit the structure and properties of concepts employed (Taylor et al. 1989).

One exception (Sorensen et al. 1987) involved an analysis of the psychosocial impacts of the proposed re-start of a second reactor on Three Mile Island which was not involved in the 1979 accident. The theoretical framework employed by these researchers was based on a transactional view of human-environment relations mediated by situational factors as well as individual traits:

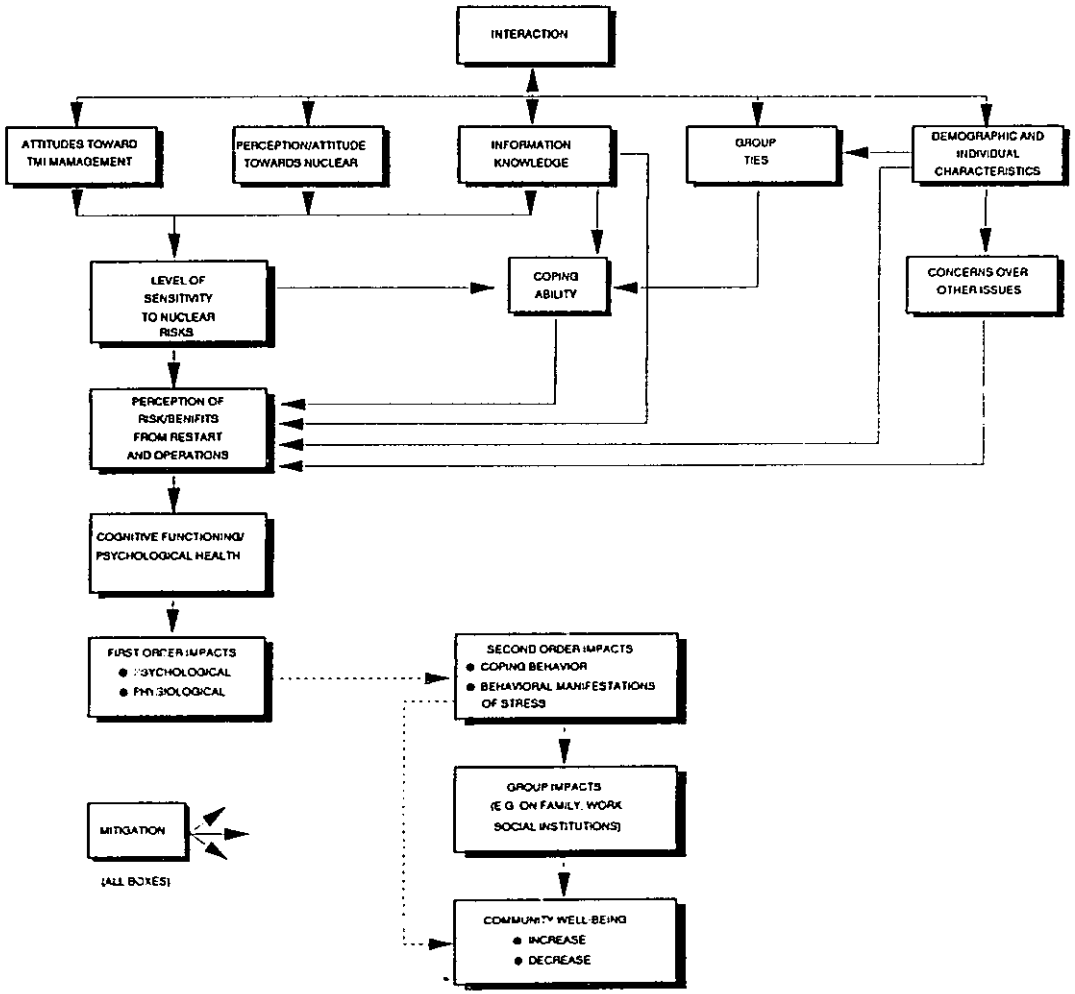
> Consequently, the representation of behaviour is one product of complex interactions among biological, personality, sociocultural, environmental, and technological factors. Given this view, separating the individual from the surrounding environment is impossible (Sorensen et al. 1987:25).

Figure 2.1 outlines the structure and process by which Sorensen and others (1987) hypothesize that impacts will occur as a result of re-starting the second TMI nuclear reactor. The key reason these authors feel psychosocial impacts will occur is that some individuals *will perceive* that they are threatened by the risks of re-start. This perception will cause psychological and physiological impacts which, through behaviour, may affect individual, group and community structures. Based on a review of previous research conducted by these authors, they further suggest that risk perceptions may be influenced by the following factors: attitudes toward risk managers, perceptions and attitudes toward nuclear power, information, demographic and individual characteristics, family and group social standards, levels of sensitivity to a disaster, ability to cope, and concern over other issues. This model can only be validated by empirical testing through new research (Sorensen et al. 1987).

While many of the general concepts in this framework may be appropriate to the current study (transactional approach, human-ecological focus, situation within a wider community context), the nature of the exposure (nuclear reactor in the context of the previous TMI accident), suggests that individual constructs/components would require significant modification/adjustment before they could be used in the current research.

A second exception to the conceptual gap within the psychosocial literature is Edelstein's (1988) examination of the social and psychological effects of residential toxic exposure. The theoretical framework which informs this analysis is based on

FIGURE 2.1: A CAUSAL MODEL OF TMI RESTART IMPACTS



Source: Sorensen et al. 1987:33.

four postulates. First:

> "*The social and psychological impacts of toxic exposure involve complex interactions among various levels of society. They also differ across time and environmental context*" (Edelstein 1988:9).

Edelstein illustrates this postulate in what he calls the 'social process model' (Figure 2.2) which recognizes that any complex event (such as toxic exposure) has impacts at various social levels both simultaneously and over time. Therefore, exposure will affect individuals, families and other relational groups (kinships and friendships), more formal groups (institutions), the community and the society. The historical dimension recognizes that groups, organizations and communities are influenced by their histories as is the individual. The environmental dimension reflects both the physical and the social. The second postulate is:

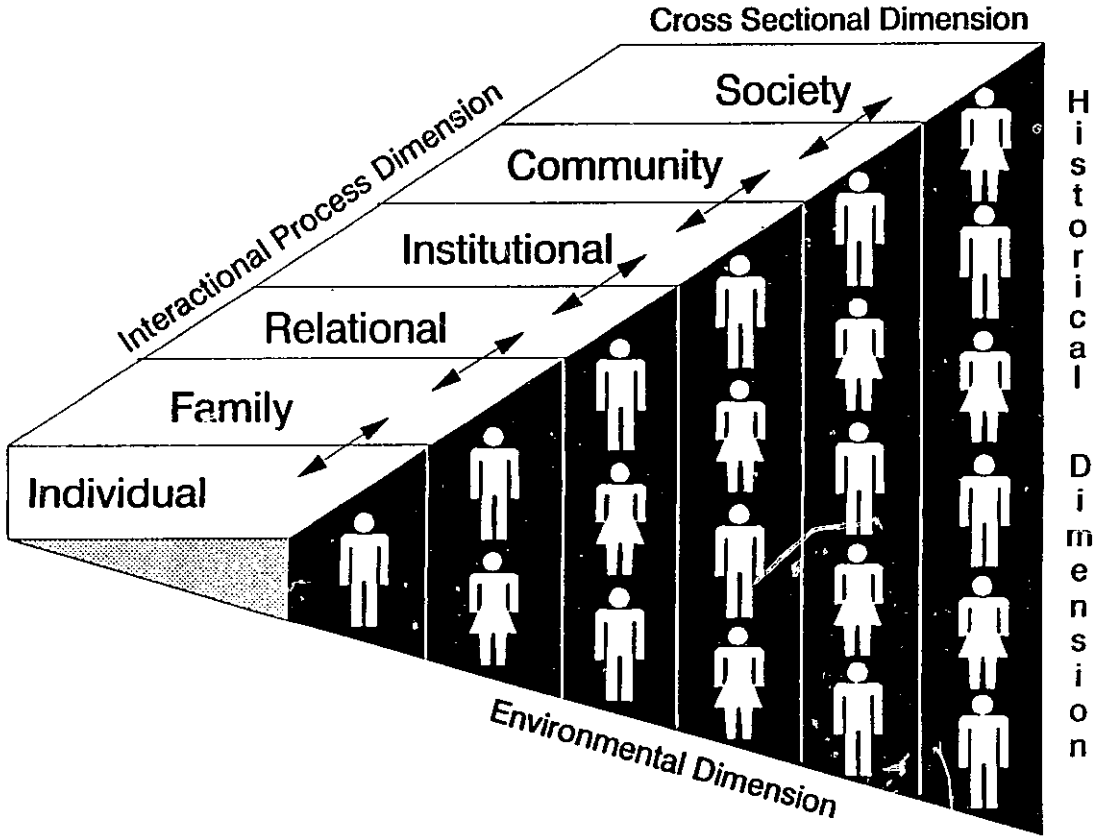
> "*These impacts not only affect how victims behave but how they perceive and comprehend their lives, in both the short and long term*" (Edelstein 1988:9).

That is, at each level of social process, one can distinguish 'lifestyle' (a normal set of behaviours) and 'lifescape' (a normal framework for understanding the world around us; i.e., the environment). Both of these may be (permanently) disrupted by a toxic exposure. The third postulate is:

> "*Toxic exposure incidents are stressful, forcing victims to adopt some form of coping response*" (Edelstein 1988:9).

Stress occurs at all levels of social process and, once recognized, is appraised to ascertain potential implications. If a threat is appraised as legitimate, the affected

FIGURE 2.2: THE SOCIAL PROCESS MODEL



Source: Edelstein 1988:10.

person or group must consider alternative coping responses. These coping responses vary, depending on whether they are aimed at controlling the disruption or at influencing the source of the threat. The final postulate is:

> "*Contamination is inherently stigmatizing and arouses anticipatory fears*" (Edelstein 1988:9).

Opposition to stigmatized facilities (e.g., waste disposal facilities) is partially a consequence of anticipatory fears.

As with Sorensen et al. (1987), parts of Edelstein's (1988) theoretical and conceptual framework may be transferrable to the current study. The recognition of the impacts of exposure at several levels of social process and the stages of appraisal for both the exposure as well as coping responses are both useful in a conceptual framework for investigating psychosocial impacts of exposure. However, Edelstein's primary unit of analysis is the community while the current study focuses primarily on the individual as the unit of analysis. Also, although the source of the exposure is similar to the current study (municipal landfill) , the type of exposure is toxic chemical contamination of the water supply due to leachate from the landfill. Therefore, while this study can be informed by Edelstein's (1988) postulates, the model cannot be borrowed wholesale.

Sorensen et al. (1987) and Edelstein (1988), along with the recent literature in behavioural medicine (White 1981, 1987, 1989), provide some conceptual guidance for the investigation of psychosocial impacts of exposure. In particular, the

development of a socioecological model of the relations between contamination events and psychosocial outcomes holds promise (Cohen et al. 1986; Taylor et al., 1989). The model shown in Figure 2.3 (from White in Taylor et al. 1989:100-101) is:

> a schematic synthesis of what the literature so far suggests about the inter-relations of community elements in the generation of psychosocial impacts from contamination events...it clearly suggests the next step of conceptual development: a social ecosystem portrayal of individual-community processes.

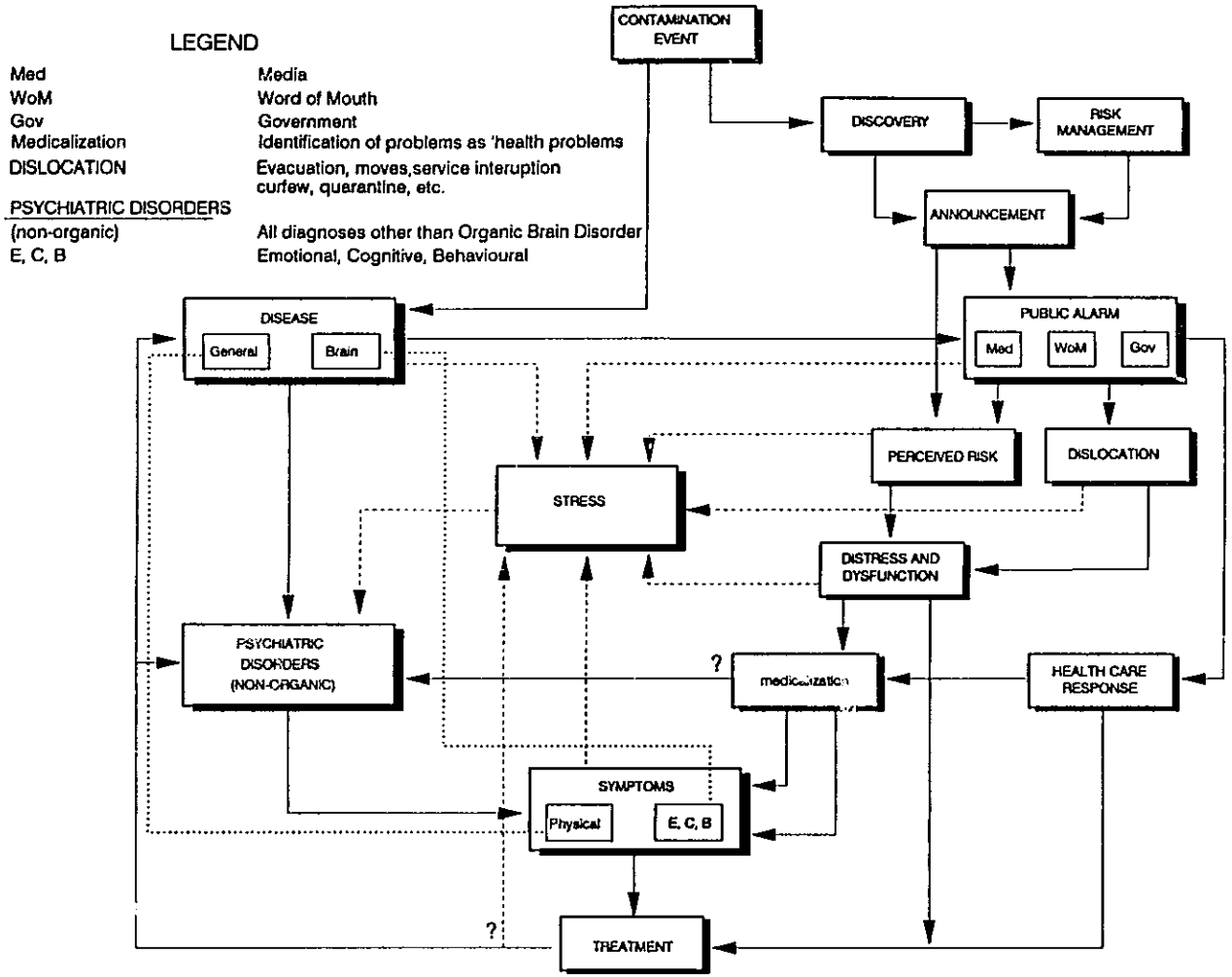
A promising theoretical point of departure for the development of such a conceptual model comes from the literature on environmental stress and coping (Evans 1982; Evans and Cohen 1987; Folkman and Lazarus 1980, 1988; Lazarus 1970; Lazarus and Folkman 1984; Pearlin and Schooler 1978). There are two general components of environmental stress: the stressor and the response. Past definitions of environmental stress have concentrated on one or the other of these components but recent work in the area of environmental psychology indicates that an interactive definition would be more useful. Baum, Fleming and Singer (in Baum and Singer 1985: 186) define environmental stress as:

> a process by which environmental events threaten, harm or challenge an organism's existence or well-being and by which the organism responds to this threat.

A simplified version is advocated by Evans and Cohen (1987: 573):

> a process that occurs when there is an imbalance between demands and response capabilities of the organism.

FIGURE 2.3: PSYCHOSOCIAL IMPACTS IN THE COMMUNITY



Source: N.F. White in Taylor et al. 1989:101.

The authors suggest three significant implications of this definition:

> 1) the individual's perception of environmental demands and personal coping resources is the critical variable in determining the nature of the stress response;
>
> 2) stress situations are not uniformly aversive, because personal and social mediators can ameliorate or enhance their effects;
>
> 3) stressors may affect the individual in many ways other than the physiological including symptoms, negative affect and interpersonal behaviours, and deficits in task performance.

Evans and Cohen classify four types of environmental stressor: (1) cataclysmic events (e.g., natural and technological disasters) which demand major adaptive responses by all those affected; (2) ambient stressors (e.g., air pollution), characterized by relatively continuous and stable conditions, which may pass largely unnoticed by many of those affected unless particular circumstances result in a perceived threat to well-being; (3) stressful life events (e.g., major changes in family status or economic situation) which typically demand adaptive responses; and, (4) daily hassles (e.g., interpersonal problems or annoying situations) which normally produce only short-term irritation. Environmental contaminants fall into either of the first two categories, depending upon the magnitude and extent of their potential impact.

Evans and Cohen (1987) suggest four possible effects of a stressor on human health and functioning. *Physiological* effects include not only those linked to endocrinological outcomes but also those associated with increased blood pressure,

skin conductance, respiration rates, muscle tension and heart rate (Taylor et al. 1989). *Task performance* effects include interference with tasks that require rapid detection, sustained attention, attention to multiple input sources, effects on memory, and reduced comprehension of complex information. *Affective reactions* to stressors are the most commonly documented (Taylor et al. 1989). Examples include fear, anxiety, depression, worry, and tension. *Observation effects* include various effects on verbal (e.g., speech problems) and non-verbal (e.g., body movement) behaviours.

Within the literature, there are two general models of response to an environmental stressor: physiological and psychological. Research on the physiological response to stress stems from the pioneering work of Cannon (1932) and Selye (1956). Cannon developed the notion of a Sympathetic Nervous System (SNS). When threatened by an environmental stressor, the organism would increase its production of catecholamines ('fight or flight' hormones; e.g., adrenaline) in order to respond. Selye's work on the General Adaptation Syndrome (GAS) involves the response triad of alarm, reaction, resistance and exhaustion during which the organism would increase production of corticosteroids (epinephrine, norepinephrine) in order to respond to the environmental stressor. The goal of both the SNS (Cannon) and GAS (Selye) models of physiological reaction to an environmental stressor is homeostasis.

The psychological model of environmental stress may be more useful in the study of psychosocial impacts of exposure to environmental contaminants. However,

as implied above, this does not negate the role for the physiological model as these two pathways to morbidity are seldom possible to separate. A useful psychological model of response to environmental stress is that provided by Lazarus and Folkman (1984; see also Lazarus 1970; Folkman and Lazarus 1980, 1988). As previously explained (Section 1.3), the Lazarus and Folkman model goes beyond traditional stress-response (or, stress-adaptation-response) models found in the literature (baum et al. 1982) by allowing for a contextualization of the environmental stress process through the recognition of the mediating influence of social and cultural factors. This model contends that response to environmental stress is divided into two stages. At the stage of primary appraisal, the individual may appraise an environmental stressor as a threat, a harm, or a challenge. Unless so appraised, the individual will not move on to the secondary stage of appraisal where the individual asks: "What can I do about it?" The individual has two potential avenues to pursue at this juncture; (1) do something about the environmental stressor (e.g., join a citizen's committee) in which case they would be practising problem-focused coping; or, (2) alter their feelings toward the stressor (e.g., convince themselves that things could be worse - that a solid waste facility is 'better than' a nuclear installation) in which case the individual would be practising emotion-focused coping. Edelstein (1988) finds that emotion-focused coping often takes the form of denial. With respect to a toxic exposure (e.g., Three Mile Island) denial may be related to feelings of loss of control over the situation (Baum et al. 1983). Feedback is provided through the

process of **reappraisal**, where the stages of primary and secondary appraisal are repeated as the perception of the stressor or available resources changes over time. It follows that the coping may shift back and forth between problem- and emotion-focused responses (Folkman and Lazarus 1980).

Following the definition of environmental stress cited above (Evans and Cohen 1987: 573), the stress response is not necessarily always realized in the presence of an environmental stressor. Only if one is uncertain that s/he is capable of coping with a situation that has been appraised as threat, harm or challenge, is stress experienced (Cohen et al., 1986). In addition:

> It is important to note that this process of evaluating the demands of a situation and evaluating one's ability to cope does not occur only at the onset of a stressful event but will often recur during the course of the event...Thus, an event that is initially appraised as threatening may be later reappraised as benign, and coping strategies that are initially found to be lacking may later be found to be adequate. Conversely, events that one initially evaluates as non-threatening may be later reevaluated as stressful (Cohen et al. 1986:7).

Cohen et al. (1986) also assert an 'adaptive-cost' hypothesis which suggests that the process of adaptation itself causes deleterious effects that occur either during or after exposure to a stressor, regardless of whether a coping response has been successful. Deleterious effects may occur when: (i) one engages in effortful coping (i.e., a cumulative fatigue effect similar to Selye's exhaustion stage); (ii) one persists in using a coping response in situations where the strategy is not adaptive; (iii) coping responses have deleterious side effects (e.g., smoking to reduce 'stress' causes

adverse physical health effects); and, (iv) one perceives his/her efforts at coping to be fruitless.

Essentially, therefore, one would not expect a direct cause-and-effect relationship between an environmental stressor and psychosocial impacts (Freeman 1988). Rather, as implied above, the experience of psychosocial impacts and the individual choice of a particular coping response is dependent upon a number of mediating factors. A review of salient literature identifies a substantial number of mediating factors identified by researchers working in the field of environmental stress. For ease of interpretation, these mediating factors can be categorized into four sets of mediating dimensions. The first of these is ***the characteristics of the environmental stressor***. For example, an invisible stressor (e.g., PCBs in the drinking water) may in fact lead to greater psychosocial impacts than a visible exposure (e.g., landfill) (Vyner 1988). Other sensory stimuli may also lead to greater impacts (e.g., odours; Shusterman et al. 1991). Prior experience with a stressor will usually reduce the level of impacts while the severity and acuteness of the exposure may lead to increased impacts (Sims and Baumann 1983). Perceived economic necessity of an environmental exposure will also influence the degree of psychosocial impacts experienced; communities are much more tolerant of, for example, an industrial exposure, if it provides many jobs for the community (Evans and Jacobs 1982).

The second mediating dimension which influences the experience of psychosocial impacts involves ***the characteristics of the individual***. For example, an

individual with a low degree of self-esteem/mastery over situations may experience greater impacts from an exposure than an individual with the opposite characteristics (Pearlin and Schooler 1978). In addition, an individual who feels they have some sense of control over exposure events may experience fewer impacts than an individual who feels less of a sense of control (Evans and Jacobs 1982; Lefcourt 1982). A final example is the access to/control over material resources; individuals with greater access tend to experience less stress from stressful life events and may tend toward taking action in response to a stressor more so than an individual with less access (Pearlin and Schooler 1978).

Characteristics of the social network have been shown to mediate stressful life events (Berkman and Syme 1979; Cassel 1976; Cobb 1976; Fleming et al. 1982). That is, when faced with stressful life events, people cope better when they can derive support from social relationships or social networks:

> ...the encouragement, opinion validation, and reassurance that people get from friends and family influence their response to stress and somehow make them more resistant to its effects (Fleming et al. 1982:14).

Indeed, previous research has demonstrated that social ties and relationships play a critical role in the determination of health status where individuals with more social contacts have been shown to exhibit lower mortality rates than those with fewer social contacts (Berkman and Syme 1979; Cassel 1976; House et al. 1988). It follows that psychosocial impacts of exposure may be lessened if one has an available and

supportive social network (Edelstein 1988; Eyles et al. 1990; Fleming et al. 1982; Sorensen et al. 1987). This was shown to be the case at Three Mile Island where higher levels of social support were associated with fewer psychological and behavioural symptoms of stress (Fleming et al. 1982). In addition, Edelstein (1988) found that in communities such as Love Canal, most residents were part of a relational web of family, friends and co-workers and that these relationships influenced not only the extent of environmental stress experienced but also the coping strategy. Further, individuals who are very active in their communities also experience less stress from exposures and are probably more likely to practice problem-focused coping as opposed to emotion-focused coping (Logue et al. 1981; Perry 1983).

Finally, ***characteristics of the wider community system*** can also influence the experience of psychosocial impacts as well as the selection of a coping response. These characteristics include, for example, the nature of the political and economic systems and their influence on an individual's access to institutions. The portrayal of environmental exposure events in the media is also a major factor (Eyles et al. 1990; Roht et al. 1985; Sandman et al. 1987; Sims and Baumann 1983). The media is typically the public's main source of information about an environmental exposure. Often times exposure events are sensationalized in the media so that they are made to seem more severe than they truly are. Thus, the stage of primary appraisal is made even more difficult. In addition, communities are often provided with

misinformation or conflicting information which makes decision-making (for example, the decision of whether to evacuate) an even more difficult process than it already is (Eyles et al. 1990; Sandman et al. 1987).

A key element of these mediating dimensions is that response to an environmental stressor is a transactive process influenced by the four sets of characteristics outlined above, hence the use of the term 'mediating' (as opposed to 'moderating') dimensions. That is:

> Moderators are antecedent conditions...that interact with other conditions in producing an outcome...A mediating variable, on the other hand, is generated *in the encounter* and it changes the original relationship between the antecedent and the outcome variable (Folkman and Lazarus 1988:311; emphasis added).

The nature of the relationships between psychosocial impacts and mediating dimensions is highlighted in the conceptual framework which guides the current research (Figure 2.4), where the experience of psychosocial impacts and, by extension, the choice of a coping response, is mediated by the four sets of characteristics enumerated above.

In essence, therefore, the conceptual framework which guides the current research follows a socioecological design as suggested by White (in Taylor et al. 1989) where: (a) there is no direct exposure-outcome relationship assumed; (b) the experience of psychosocial impacts and the consequent selection of a coping response (primary and secondary appraisal) are both influenced by four sets of mediating dimensions suggested in the psychosocial literature; and (c) the experience of

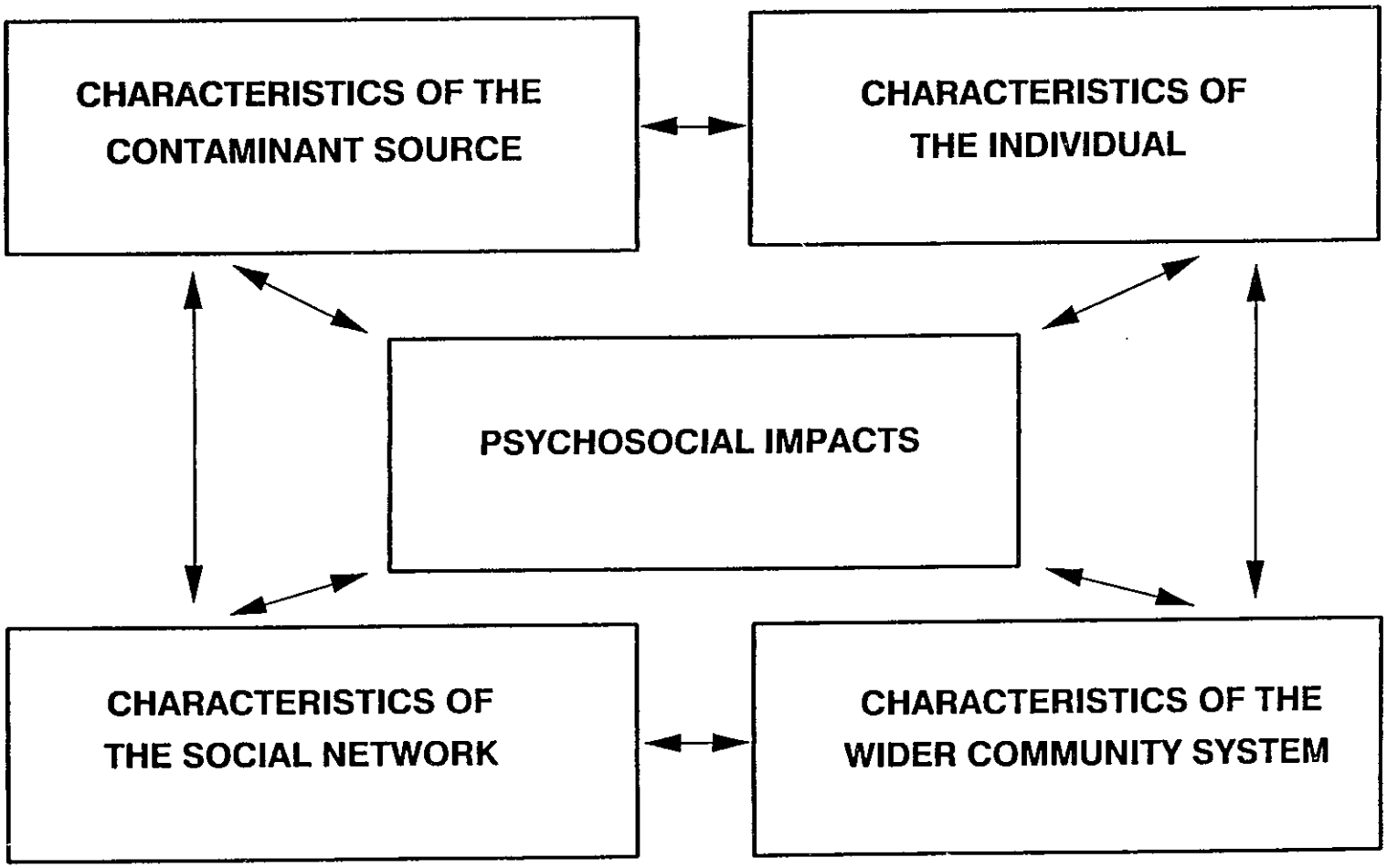


FIGURE 2.4: CONCEPTUAL FRAMEWORK

psychosocial impacts is a process (with on-going reappraisal) which cannot be divorced from the wider community context.

2.2.3 RESEARCH METHODS

Methodological issues in the psychosocial literature centre around three main themes: research design, exposure measurement, and outcome measurement. Each theme will be treated separately in the following section however due to the obvious interconnection of these research components, some overlap is inevitable.

2.2.3.1 RESEARCH DESIGN

As illustrated in Section 2.2.1, the psychosocial research literature addresses a wide range of exposure-outcome situations. In addition, there are many causal pathways potentially linking these exposures and outcomes. As explained in Section 2.2.2, investigation of the nature and direction of these pathways must first be informed by a clear conceptual framework based on a solid theoretical foundation. A conceptual framework also informs the selection of an appropriate research design as do the nature of both the exposure and the outcome of interest.

Psychosocial research designs may be of two types; epidemiologic and qualitative:

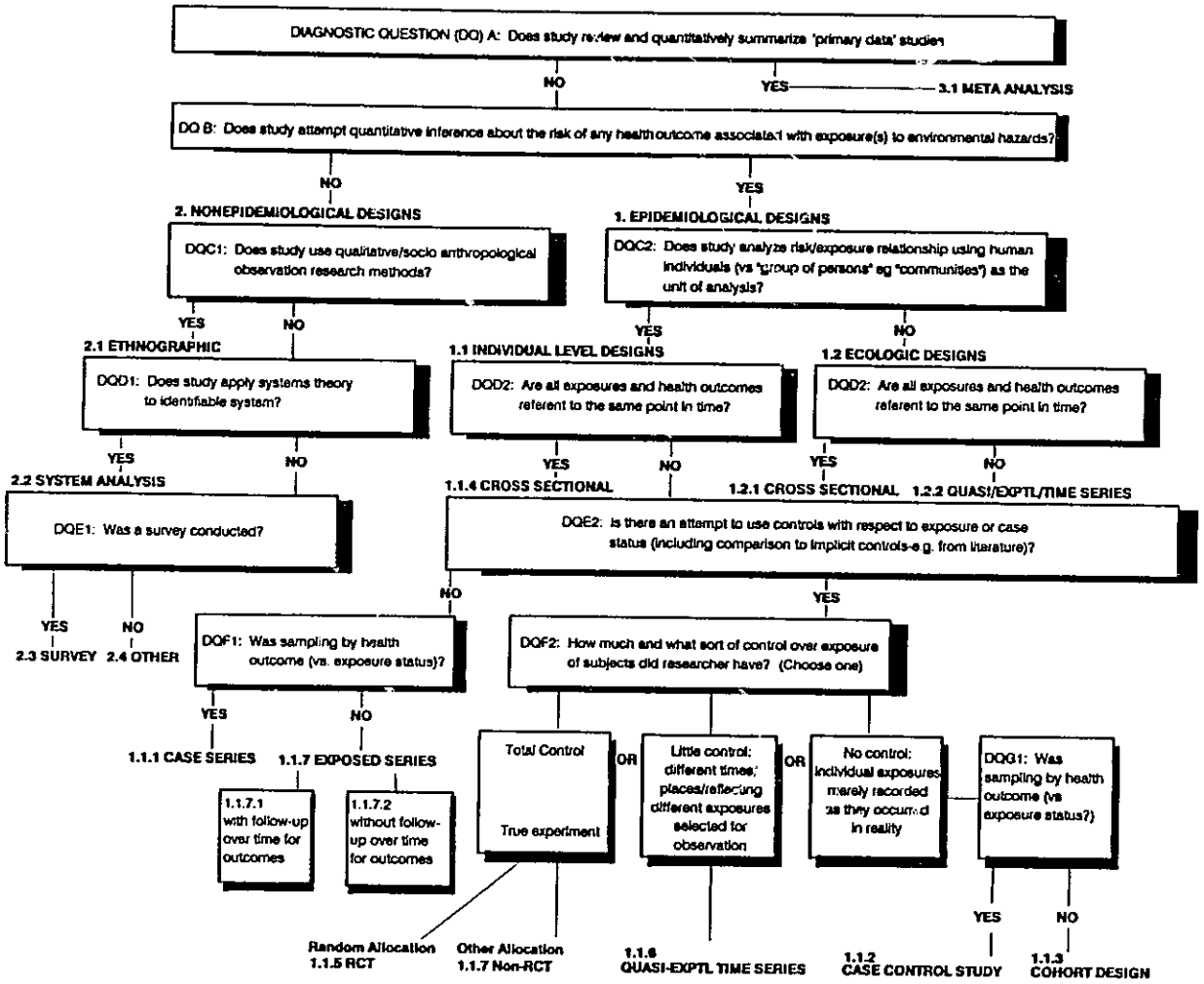
> The term 'epidemiologic' refers to designs which seek to make quantitative inferences about the increased risk of adverse health outcomes after exposure under study, largely on the basis of

> measurements made on individuals or groups of persons with different exposure histories. In contrast, qualitative methods use in-depth interviews and observational data to describe the structure and dynamics of socio-cultural phenomena and the nature of individual experience related to them (Taylor et al. 1989:107).

Both study designs have advantages and disadvantages (Frank et al. 1988; Hennekens and Buring 1987; Sackett et al. 1985; Taylor et al. 1989). While analytic epidemiologic designs can provide stronger evidence for 'causation' and greater potential for generalization, qualitative studies can provide in-depth analysis of the experience of exposure in an individual's own words. Qualitative designs can also be very useful for hypothesis generation, especially in a relatively new area of research such as psychosocial impacts of exposure.

Within the epidemiologic design category, a wide range of design architectures exist from which to choose (see Figure 2.5). The four basic categories of epidemiologic study designs include: randomized controlled trials, cohort and case-control studies and cross-sectional designs. Within the literature, there are examples of variants of these four categories (e.g., quasi-experimental time-series). The design most commonly used in the psychosocial literature is the cross-sectional design where exposure and outcome are determined at the same point in time (Phillips and Silbergeld 1985; Taylor et al. 1989). The fundamental drawback to these designs is that, because they can only show a snap-shot of the exposure-outcome experience, they obscure the temporal sequence of cause and effect, one of the more important tests for causation of an adverse health outcome (McMaster University 1981; Sackett

FIGURE 2.5: DIAGNOSTIC TREE FOR DETERMINING STUDY DESIGN



Source: Taylor et al. 1989:22.

et al. 1985; Taylor et al. 1989).

In a cohort study, groups are identified on the basis of exposure and followed through time to determine the type and onset of adverse health outcomes. Alternatively, cohort studies may be retrospective as opposed to prospective. However, cohort studies rely on the assumption that researchers can determine the exact nature and extent of exposure in order to identify exposed and not-exposed groups; this is rarely possible.

Case-control studies identify groups on the basis of the adverse health outcome of interest and compare their exposure history to that of a matched control group to look for similarities and differences. Case-control studies are especially prone to false positive causal inferences (Frank et al. 1988) given that exposure histories are better remembered by cases as opposed to controls. This is known as recall bias (Sackett 1979). This design is rarely used in exposure studies given that the outcomes of interest are typically rare (e.g., cancer). Taylor et al. (1989) did not uncover any examples of case-control study designs within the psychosocial literature.

Randomized controlled trials are true experiments in humans (Sackett et al. 1985). While randomized controlled trials are considered to provide the strongest evidence for causation, they do not offer a feasible alternative when exposures are suspected *a priori* to be harmful. The cross-sectional designs often used in environmental exposure research are considered to provide the weakest evidence.

Difficult challenges stand in the way of environmental epidemiologic studies

regardless of design architecture (Anderson 1987; Buffler et al. 1985; Draggan et al. 1987; Neutra 1985; Taylor et al. 1989). These are generally related to the nature of the exposures and outcomes themselves:

> Epidemiology provides the methodologic framework for exploring causation, but...[i]f objective measures of exposure and health outcome are not available...no degree of epidemiologic ingenuity can fill the gap...Nowhere is this more painfully obvious than in efforts to apply epidemiology to pollution-related episodes (Heath 1988:75).

2.2.3.2 EXPOSURE MEASUREMENT

Problems of contaminant exposure characterization include: determination of 'actual' vs 'perceived' exposure, current vs future exposure (Anderson 1987); difficulty in documenting type, quantity and concentration of contaminants; knowledge of the synergistic effects of contaminants (Anderson 1987; Dixon and Nadolney 1987); dependence on indirect surrogate estimates of exposure and dose; uncertain pathways of exposure; typical low-dose exposures; and, inadequate dose-response data (Heath 1988). A related complication is the coexistence of 'actual' and 'perceived' exposure and the likelihood that psychosocial impacts are both behaviourally and physiologically mediated in such a way that different etiologic pathways are difficult, if not impossible, to separate. The challenge with respect to many contamination events is to develop rigorous methods for determining perceived risk. Although a number of psychometric methods have been devised for this purpose (e.g., Bachrach and Zautra 1985; Evans and Jacobs 1982), their application

in real world situations of actual/potential exposure requires further investigation. In addition, while actual or perceived exposure may have different etiologic pathways, they are equally defined as real by individuals who experience them and are therefore real in their consequences: "The prerequisite of most lifescape effects of...exposure is that residents believe that they have been affected. Perception, not reality, is the key" (Edelstein 1988:43).

One of the most difficult challenges to epidemiologic exposure studies is the absence of any direct and/or accurate exposure measure (Anderson 1987; Taylor et al. 1989). Without accurate measures, however, the researcher may not be able to ascertain how much self-reported symptomatology is due to bodily effects and how much is due to behavioural effects of perceived exposure (Hopwood and Guidotti 1988; Roht et al. 1985). An example is a hazardous waste dump where numerous chemicals of uncertain type, quantity and concentration may have been leaching through various pathways over many years (Anderson 1987; Hertzman et al. 1987; Philips and Silbergeld 1985). As a result of the impossibility of precise exposure measures, researchers often resort to proxy measures of exposure such as distance from the exposure site (Horowitz and Stefanko 1989) or duration of residence (Hertzman et al. 1987). Of course, one problem with these proxy measures is differential migration in and out of exposed areas (Goldhaber et al. 1983; Hertzman et al. 1987; Taylor et al. 1989). Typically, after a contamination event has occurred or been discovered, the more mobile, wealthier households are able to move away

from the area, if they so choose. The corollary of this is that property values may fall as a result of exposure, drawing lower-income, less educated groups and individuals into the area. Many confounders of health status (such as smoking and adverse occupational exposures) are often found among those of lower socioeconomic status and so must be carefully controlled for in any exposure study (Hertzman et al. 1987).

Further, there is no agreed upon method in the literature of defining an 'exposed' population with respect to distance from the site. One common method is to use existing political boundaries (United States Regulatory Commission 1983). While this facilitates the collection of data, as well as comparison with many existing data sets, exposure events do not respect political boundaries. A second quite common method of defining an exposed population is to use distance-from-site criteria (Baum et al. 1983; Bromet et al. 1982; Hertzman et al. 1987; Horowitz and Stefanko 1989). Often, these boundaries are drawn arbitrarily and unless they are grounded in some social evidence, they may be just as inappropriate as political boundaries (Stoffle et al. 1981). Stoffle and others (1991) attempted an innovative method of defining an exposed population ('affected population' is the term preferred by these authors). Qualitative ethnographic techniques were employed to define the 'Risk Perception Shadow' of an affected population around a proposed low-level radioactive waste storage facility in Michigan. This study determined that those affected were those who were aware of the proposed facility; social and

cultural changes were documented in areas where two-thirds or more of the local population was aware. Further, when mapped, this risk perception shadow differed significantly from the political boundaries of the potentially affected counties.

In addition to the problems caused by inappropriate distance measures as well as migration, proxy measures of exposure may also be affected by non-uniform diffusion of exposure agents through soil, water and air as well as vast differences in personal habits (e.g., time spent out of doors or away from the home; Anderson 1987; Taylor et al. 1989).

Yet another limitation to the accurate documentation of exposure concerns the difficulty of establishing a dose-response relationship (Heath 1988). This is an essential element of epidemiologic research because if a biologically convincing and reproducible dose-response relationship can be shown, this evidence can override other deficiencies in the data, even the reliance on surrogate measures of exposure (Heath 1988:76). However, for most epidemiologic studies involving an environmental exposure, a clear dose-response relationship cannot be demonstrated because of the inability to measure 'dose' across a reasonably defined gradient.

A further impediment to the accurate measurement of an exposure-outcome relationship is recall or reporting bias. Roht and others (1985) attempted to measure these two types of bias in their study of community exposure to hazardous waste disposal sites in Louisiana. Exposure was measured using air and water quality tests as well as geologic and hydrologic testing. Health outcomes were measured using

a self-report health survey. Because the potential contamination resulting from the waste sites under study had received a great deal of media attention, these researchers were concerned about recall and reporting bias. Two potential measures of reporting bias, a hypochondriasis scale and documentation of a person's opinion toward the effects of waste disposal sites on the environment, were therefore included in the health survey for both the exposed and not-exposed communities. Exposure measures showed little evidence that hazardous concentrations of chemicals were being released from the sites. However, residents living in the 'exposed' communities did report more symptoms than residents in the control community while chronic illnesses were reported similarly from all communities. While hypochondriasis scores were associated with symptom reports regardless of location, respondents living near a site who were of the opinion that hazardous waste sites do adversely affect the environment were 2-3 times more likely to report symptoms than residents in the control community. These results do not necessarily lead one to the conclusion that no exposure took place and that respondents are 'creating' symptoms. Perhaps toxic chemicals were released intermittently from the site but samples were collected at inappropriate times; there would be no evidence of a hazardous exposure.

In essence, therefore, even when accurate exposure data do exist, documenting the relationship between exposure and outcome remains difficult. Recall bias becomes an even greater problem when the study design involves

retrospective data collection (Hopwood and Guidotti 1988). The epidemiologic challenge then becomes how to collect accurate outcome data when reporting or recall bias is suspected given the fears and concerns of area residents or media coverage of environmental issues.

When these issues are viewed in the context of psychosocial impacts of real *or perceived* exposure, the links between exposure and outcome become even more tangled. As explained above, perceived exposure is just as real in its consequences as actual exposure. In situations where perceived exposures are thought to result in psychosocial impacts, the application of traditional exposure assessment procedures is "...both unfeasible and pointless" (Taylor et al. 1989:125). Further, exposure assessment methodologies appropriate to these situations are currently lacking (Taylor et al. 1989).

2.2.3.3 OUTCOME MEASUREMENT

The accurate measure of health outcomes in environmental epidemiologic studies is also characterized by several difficulties (Buffler et al. 1985; Health 1988; Taylor et al. 1989). These are related to the substantial limitations of our knowledge of the health effects of environmental exposures (Frank et al. 1988). The majority of our knowledge stems from two sources: effects seen in animals as a result of high doses of (e.g., chemical) exposure, and relatively high occupational exposures. It is typically the case, however, that environmental exposures involve low-level chronic

exposures (Buffler et al. 1985; Frank et al. 1988; Robins et al. 1987; Heath 1988). As a result, major difficulties arise when attempting to extrapolate from one type of exposure situation to another.

Heath (1988:76) outlines in more detail some of the specific problems encountered when attempting to measure outcomes:

1. long and variable latency periods between exposure and disease diagnosis
2. etiologic nonspecificity of disease clinical features
3. small population size coupled with low disease frequency
4. observer bias in reporting illness occurrence.

First, if the health outcome under study has a long and/or variable latency period, such as cancer, the study must necessarily use an appropriate research design based on either retrospective or prospective data collection. Both of these approaches have inherent advantages and disadvantages (Hennekens and Buring 1987; Sackett et al. 1985); neither is without flaws. Second, etiologic nonspecificity means that several causes may produce the same health outcome. Again, this has implications for study design because the researcher must collect data on all competing exposures and adjust for their potential effect(s) before concluding that the environmental exposure of concern was or was not the 'cause' of the outcome. In addition, given the socioecological conceptualization of the current research problem as well as the role ascribed to mediating factors in the exposure-outcome relationship, we would not

expect etiologic specificity (see Section 2.2.2). Third, environmental exposures usually involve the search for rare disease outcomes (e.g., cancer) within a typically small exposure population. These small numbers can impede firm conclusions about causation. Finally, Heath (1988:76) suggests that: "Where acute symptoms are surveyed in persons living at different distances from a pollution site, differences in observer must be assumed."

There are additional issues to consider regarding the accurate measurement of health outcomes when the focus of attention turns from physical to psychosocial health impacts of environmental exposure. The diverse set of outcome measures used in previous studies of psychosocial impacts are of two main types: standardized, pre-validated instruments developed in other research contexts and applied with little or no modification to studies of the psychosocial impacts of contamination (e.g., Symptom Checklist-90; Beck Depression Inventory) and customized site-specific measures designed for specific contamination events (Flynn 1979). Of the 54 psychosocial studies appraised by Taylor and others (1989), 23 studies used standardized instruments for all or part of the outcome measurement while 31 used an outcome instrument designed specifically for a particular situation.

There are advantages and disadvantages associated with each avenue of outcome assessment, primarily related to issues of reliability, validity and generalizability (Taylor et al. 1989). For example, the selection of a pre-validated instrument selected from the literature (e.g., the Beck Depression Inventory) gives

the researcher the advantage of a (typically intensive) history of instrument testing in different areas at different times and therefore a variety of results against which to compare. However, in order to be reliable, the instrument must be used in the group for which it was intended. For example, while the Beck Depression Inventory has been used in several studies of psychosocial impacts of exposure in general populations (Baum et al. 1983; Flemming et al. 1982; Gibbs 1986), it was intended for use in a psychiatric population. This fact is not addressed in the three studies cited here despite fairly strong claims made on the basis of the results of its use. For example, Gibbs (1986) claimed that 44% of her exposed group appeared diagnosable as clinically depressed on the basis of their scores on the Beck Depression Inventory.

On the other hand, studies may employ instruments designed or modified for a particular situation at a particular point in time (e.g., Flynn 1979). Such instruments may or may not contain all or part(s) of pre-validated instruments taken from the literature. In any event, the reliability and validity of these instruments can be judged only on the basis of assessments included as part of the study design.

Essentially, despite the avenue chosen, relevant outcomes at the individual, group and community levels are ill-defined in the current research literature (Cohen et al., 1986). An unfortunate example is the use of 'stress' as an outcome measure in studies of psychosocial impacts of environmental exposure (Baum et al. 1983; Fleming et al. 1982; Horowitz and Stefanko 1989). Stress is a concept lacking in discriminant validity and is often poorly (if at all) operationally defined in the

literature (Levine and Scotch 1970; Taylor et al. 1989). Further, it is not particularly informative when 'high' levels are uncovered in an exposed population, especially in terms of policy response and recommendations. This is again an area where the absence of a well-developed conceptual model is a limiting factor.

2.2.3.4 COMBINING QUANTITATIVE AND QUALITATIVE METHODS

The fundamental purpose of an epidemiologic study is to produce evidence that an observed health effect was ***caused by*** a given exposure as opposed to some other factor (Taylor et al. 1989). There are established criteria for judging causation (McMaster University 1981; Sackett et al. 1985; Taylor et al. 1989) but these diagnostic tests are only suitable when using a biomedical disease model which links outcomes directly to exposures. Recent work in behavioural medicine and medical geography has moved beyond the biomedical disease model of health to the multi-factorial, socioecological model of conceptualizing health and well-being (White 1981). The diagnostic tests of causation referred to above are no longer suitable given this reconceptualization. Concomitantly, there is a necessary shift from a focus on the ***causes*** to the ***determinants*** of adverse health outcomes. This is most evident in the socioecological conceptual framework which informs the current research (see Section 2.2.2) where a direct exposure-outcome relationship is neither assumed nor anticipated given that this relationship is conceptualized to be mediated by a number of other factors. There is no similarly suitable set of diagnostic tests for judging

these types of relationships.

Well-conducted epidemiologic studies can potentially provide strong evidence for the determinants of psychosocial impacts of exposure to environmental contaminants. As illustrated above (see Section 2.2.1), however, few such studies exist in the research literature; even fewer when the source of exposure is solid waste facilities. In addition, as previously argued, qualitative studies can provide a data base for interpreting the meanings of exposure events among individuals, groups and communities. The use of qualitative methods in attempts to understand and explain the health, illness and disease experiences of population- and community-based groups is a recent but growing practice (Crabtree and Miller in press; Stoffle et al. 1991; Tudiver et al. in press). Often, qualitative studies are discredited as producing primarily descriptive and anecdotal (therefore, non-generalizable) 'results' (as opposed to 'data') collected using non-scientific, non-rigorous, unreliable methods. However, potential insight to these issues comes from recent work on the psychosocial impacts of exposure to a major tire fire (Baxter et al. 1992); this is one example of how qualitative approaches can work toward being indeed be rigorous, systematic, reliable and valid.

Essentially, qualitative methodologies involve:

> (i) deferring experientially to the phenomenon or event being studied; i.e., standing under it (understanding), recognizing biases of interpretation and explanation,

> (ii) describing the experience in terms which are phenomenologically true to the event,
>
> (iii) authentically constructing the event in terms that are socially and culturally relevant (Taylor et al. 1989:120).

In the case of the tire fire study, the qualitative technique used to determine the level of risk associated with the fire was depth interviews:

> A depth interview is a conversation that allows the informant to relate in his or her own terms the experience and attitudes that are relevant to the research problem. It allows the researcher to probe deeply, uncover new clues, open up new dimensions of a problem, and secure vivid, inclusive accounts based on personal experience (Burgess 1982, as cited in Baxter et al. 1992:215).

In other words, in order to discover the impacts of the tire fire among people potentially disadvantaged, Baxter and others felt the most vivid and valid accounts could be obtained by listening to the stories of the impacted people themselves. Of course, the reliability of qualitative data can be enhanced through the use of triangulation by examining the same phenomenon using different methods or different observers; the latter method was used in the tire fire study. The main conclusion of this study was that "Decisions about risk are value-laden and do not necessarily reflect the amount of danger, actual or potential, involved in a situation" (Baxter et al. 1992). Quite plausibly, this conclusion could not/would not have been reached in a study based solely on quantitative methods which did not account for community context or the role of social and cultural factors in mediating exposure-outcome relationships.

Therefore, both quantitative and qualitative approaches to investigating the psychosocial impacts of exposure have inherent advantages (and disadvantages). Rather than choose between these two approaches and settle for a partial analysis, the ideal would be a combination of the complementary strengths of both (Taylor et al. 1989). Environmental exposures are socially and culturally mediated events (Baxter et al. 1992; Eyles et al. 1990; Johnson and Covello 1987); qualitative ethnographic studies and group analyses (Miles and Huberman 1984; Pines 1983; Stoffle et al. 1991) could describe over time the social and cultural responses of individuals, groups and communities to environmental exposure (Edelstein 1988; Eyles et al. 1990; Stoffle 1991). An initial epidemiologic analysis placed within a community context which accounts for the mediating roles of social and cultural factors can provide baseline data on the prevalence of psychosocial impacts and point us in the right direction of appropriate questions to explore at the qualitative stage. A more complete (and innovative) approach to the research problem therefore is the combination of qualitative analyses with environmental epidemiology to broaden our understanding of psychosocial impacts of environmental exposure. That is, the use of an epidemiologic approach which includes well-validated existing research instruments modified to suit the exposure and population of interest can identify the prevalence and determinants of psychosocial impacts of (*perceived*) environmental exposure. This is the task of this thesis. A follow-up series of qualitative methods can determine *why* exposed individuals feel the way they do and *how* psychosocial

impacts are manifested in their lifescape, including impacts at the family, group and community levels (Edelstein 1988).

2.3 SUMMARY

This chapter set the research and geographic contexts for an investigation of psychosocial impacts of exposure to municipal solid waste facilities. A review of the research literature uncovered a mix of significant and non-significant associations for a broad range of exposure-impact relationships. There is no consistency in conclusions based on the strongest possible evidence. Further, no studies to date have focused on non-hazardous solid waste facilities. In addition, although bivariate associations have been shown between, for example, sociodemographic factors (gender, age, education) and psychosocial impacts, there have been no systematic attempts to profile their determinants through multivariate analysis. The few studies which do investigate impacts of exposure to (hazardous) landfills typically provide no conceptual framework of analysis and are often characterized by methodological shortcomings.

A fundamental limitation of past research on psychosocial impacts is the lack of conceptual clarity and the absence of well-defined conceptual models. A socioecological conceptual framework has been suggested (Figure 2.4) which allows an analysis of the process of psychosocial impacts at various social scales (individual, group and community) within a broader community context. Within this framework,

psychosocial impacts are seen to be influenced by four sets of concomitantly interacting sets of characteristics related to: the exposure, the individual, the social network and the wider community system.

Methodological issues in the psychosocial literature centre around the themes of: research design, exposure measurement and outcome measurement. Innovative approaches are required to address the limitations of existing methods. These become especially important when the exposure may be actual *or perceived* and when the outcomes of interest - psychosocial impacts - have no gold standard. Therefore, an initial epidemiologic analysis placed within a community context which accounts for the mediating roles of social and cultural factors can provide baseline data on the prevalence and determinants of psychosocial impacts at the individual level. This is the task of this thesis. A follow-up series of qualitative methods can then address impacts at the group and community levels. This is beyond the scope of this thesis.

The following chapter outlines the methods of site and sample selection for the current research as well as the development and administration of the epidemiologic survey instrument used.

CHAPTER 3

RESEARCH DESIGN

3.1 INTRODUCTION

The review of the literature (Chapter 2) identified several areas of methodological concern in the investigation of psychosocial impacts of exposure (e.g., accurate documentation of exposure and outcome, selection of an appropriate measure of psychosocial health and well-being, and so on). There was therefore an attempt within the design of the current research to begin to redress some of these methodological concerns.

The research reported here focuses on the first stage of a two-stage research programme, the overall design of which stemmed from the findings of the feasibility study conducted by Taylor and others (1989). The recommendations of the feasibility study suggested a staged research strategy employing a combination of quantitative and qualitative methods designed to investigate both the determinants and experience of psychosocial impacts of exposure at the individual, group and community levels. This was based on the conclusion that, regarding the relationship between environmental exposure and psychosocial impacts, there is no clear consistency in the research literature based on the strongest possible evidence (Taylor et al. 1989; Chapter 2).

Therefore, the larger study comprised a two-stage design. The first stage consisted of an epidemiologic survey, the analysis of which had two principal objectives: to establish the prevalence of psychosocial health outcomes as measured by pre-validated instruments as well as other selected responses; and to determine the associations between these measures of psychosocial outcomes and (a) distance from the site; (b) the situation-specific measures of awareness, concern and action; and, (c) socio-demographic variables.

The second stage (reported on elsewhere) involved a series of qualitative approaches - in-depth interviews, focus and discussion groups, and textual analysis - selected to provide an in-depth analysis at the social network and community levels of the environmental, social and personal factors which mediate the relationship between exposure and impacts. Their use in conjunction with epidemiologic analysis is premised on the recognition that individual and group responses to contamination events are socially and culturally mediated in complex ways which are to some degree unique to the particular study setting and cannot be divorced from context.

Concomitant with both stages of the research, community profiles were compiled (Chapter 4) for each of the study areas to provide a basic source of information on the social structure and context of the communities surrounding each site.

It must be noted that exposure measurement (as discussed in Section 2.2.3.2) was not a part of this research design. It was omitted for two reasons. First,

and most important, the definition of psychosocial impacts employed in this research ignores any potential distinction between 'real' and perceived exposure given the belief that perceived exposure is real in its consequences (see Section 2.2.3.2). Second, both existing sites have been in operation for a number of years and are regularly monitored; there is no reason to suspect an un-safe level of exposure for area residents (as defined by existing regulatory agencies).

Therefore, using a parallel case-study design, this thesis addressed the first stage of the research programme, the objectives of which were:

> *1. To determine the prevalence of psychosocial impacts among exposed individuals.*
>
> *2. To investigate the determinants of individual level psychosocial impacts.*
>
> *3. To investigate the determinants of individual level actions taken in response to psychosocial impacts.*

3.2 SITE SELECTION

Possible sites for inclusion in the study were identified by a review of the local print media over a period of twelve months and in consultation with Provincial Ministry of Environment staff. Sites were evaluated on the basis of two constraints and four criteria. The constraints were: location relative to the research base (McMaster University); and the status/stage of any environmental assessment. Candidate sites were restricted to those within reasonable commuting distance of

McMaster given the need for frequent site visits, particularly during the second stage of the research. Sites where an environmental assessment was in progress and at a stage where the research might interfere with its course and completion were excluded from the selection process. The site evaluation criteria were: type of exposure (acute vs chronic); source of exposure (point vs ambient); and, nature of contaminants (hazardous vs non-hazardous). There was also an attempt to select sites which could be placed on a continuum of community awareness, from low to high.

Three sites were selected: the solid waste incinerator in Hamilton, Ontario (SWARU); the Hamilton-Wentworth Regional Landfill in Glanbrook Township; and, the recently approved Halton Regional Landfill in Milton, Ontario (Figure 3.1). SWARU has been operating since the early 1970s. It is an incinerator for non-hazardous municipal solid waste from the City of Hamilton, operated for the Region of Hamilton-Wentworth by a private corporation. It operates 24 hours per day, five days per week. The Glanbrook Landfill has been in operation for approximately 10 years and accepts non-hazardous municipal solid waste from the Hamilton-Wentworth Region as well as ash from the incineration process at SWARU. It is a 400 acre (162 hectare) site, of which approximately 250 acres (101 hectares) are active for landfilling. Approval to develop the Milton site was given in June 1990, when an appeal to the Supreme Court of Ontario by a local residents' group was denied. This site will accept municipal solid waste from the Halton Region. While

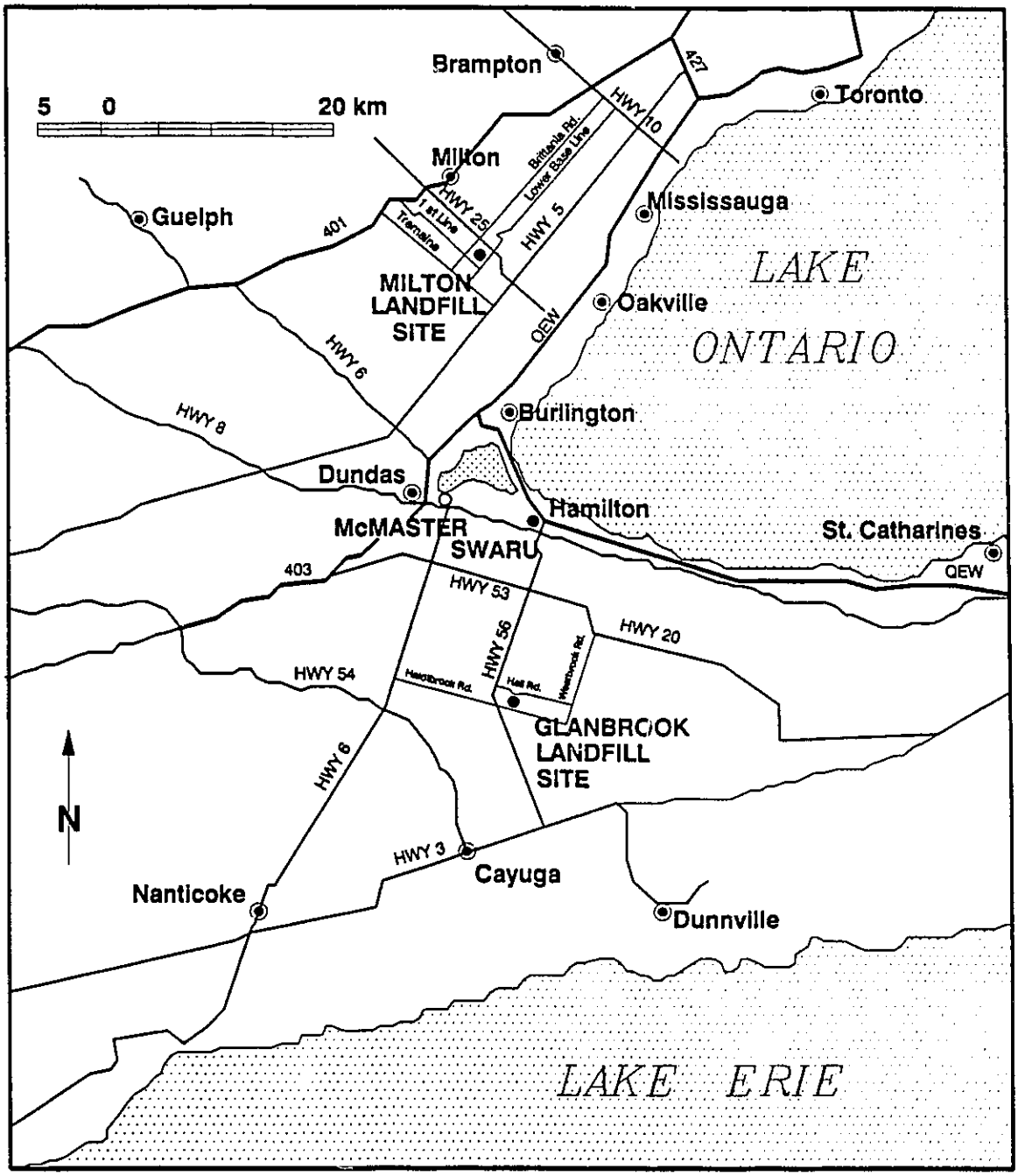


FIGURE 3.1: STUDY SITE LOCATIONS

the site is not yet operating, there are (June 1992) on-site signs of impending operation (security fences, boarded-up houses and barns, official signs indicating the site is under construction for a landfill, construction equipment and berms). Based on the current status of each site as well as length of operation and apparent level of media attention, they were judged to differ in terms of expected level of community awareness; low (SWARU), medium (Glanbrook) and high (Milton).

While these sites are similar with respect to type of contaminant source, they differ sufficiently to limit comparison between sites and the validity of across-site analyses. The project therefore follows a parallel case-study design in which each site is an independent study.

3.3 EPIDEMIOLOGIC SURVEY DEVELOPMENT

The epidemiologic survey (Appendix 1[1]) was designed to determine the psychosocial health and well-being of a representative sample of the population living in proximity to each of the three study sites and to establish the levels of awareness, concern and action with respect to the sites. Appendix 2 provides a component/construct/indicator/item breakdown of the survey. It documents the components being addressed by the survey (e.g., individual), the constructs which make-up each component (e.g., life cycle), the selected indicators of these constructs

[1] Note that this Appendix contains the final version of the instrument. As explained in the text, modifications were made on the basis of a pre-test.

(e.g., age, marital status, number and ages of children), and the actual survey items which measure them (sd1, sd3, n1a-n10a, and n1c to n10c, respectively). Essentially, indicators were selected to address the components and constructs of the conceptual framework which guided this research (Figure 2.4).

The survey instrument consists of five main sections. The first section addresses attitudes toward the area where respondents live including things they like and dislike as well as satisfaction ratings. Of particular interest was whether the site was volunteered as concerns about the area. In addition, past community involvement and neighbour-to-neighbour interactions were also documented in this section.

The second section includes measures of primary (family and friends) and secondary (neighbourhood and community) social networks as potential mediating factors in the relationship between exposure and outcome or environmental stress and psychosocial impacts. Research around the psychosocial impacts of exposure to the Three Mile Island nuclear accident has been instrumental in documenting the role that social support plays as a mediator between stress and outcome (e.g., Fleming et al. 1982). However, one of the primary criticisms of past attempts at measuring social support has been the confusion between quantity and quality (Orth-Gomer and Unden 1987). That is, "...whether or not measures of social support reflect the degree to which people *believe that they have* social support" (Fleming et al. 1982:15; emphasis added). Therefore, this section of the epidemiologic survey

includes questions which document not only the *quantity* of available social support (number of close friends and relatives; community group memberships) but also the perceived *quality* (e.g., is there someone in your family or a close friend that you can confide in or talk to freely about your problems? is there someone among your friends or in your family who can help you if you need it? level of satisfaction with social activities?)

The third section of the instrument comprises measures of psychosocial health and well-being over the two weeks prior to instrument administration. Several existing instruments were plausible candidates for inclusion in this section based on their application and appropriateness in situations involving environmental contaminants (e.g., Baum et al. 1983; Flynn 1979; Horowitz and Stefanko 1989), their previous validation and the determination of population norms against which scores obtained in this study could be compared to assess the presence of elevated rates (Baum et al. 1983).

This section began with two questions on perceived health status taken from the Ontario Health Survey (1989). Other potentially useful instruments were uncovered via a search of the relevant literature as well as in consultation with experts in this field. For example, Taylor and others (1989, Table 5.1:128) documented the uses of standardized outcome instruments in studies of psychosocial impacts of exposure. Of the eleven instruments identified by these authors, four were directed at children (Children's Behaviour Scale, Bayley Scales, Denver Scale,

WPSI and WISC-R), four were intended primarily for psychiatric populations but have been used in general populations (Beck Depression Inventory, MMPI, SADS-L and the SCL-90) and two were designed to document mediating factors in the relationship between exposure and psychosocial impacts (Ways of Coping Scale and Locus of Control Scale). The final instrument (Psychiatric Epidemiology Research Interview) is a screening device designed to detect untreated psychiatric disorder. It has been used in several, primarily toxic, exposure situations (e.g., TMI; Evans et al. 1987; Markowitz and Gutterman 1986) to measure demoralization using what may be construed as particularly severely-worded items (e.g., have you feared going crazy - losing your mind? do you feel you are a failure in life?).

The most often used instrument is the Symptom Checklist 90 (SCL-90) (Taylor et al. 1989; Horowitz and Stefanko 1989; Prince-Embury 1991) developed by Derogatis and others (1973, 1977). This scale therefore requires closer evaluation. A search of the more general health assessment literature uncovered two additional broad range instruments for review: the General Health Questionnaire (GHQ) (Goldberg 1972) and the Center for Epidemiologic Studies Depression (CES-D) scale (Devins et al. 1988). The GHQ is a 60-item self-administered screening instrument (along with several shortened versions) designed to cover four aspects of psychiatric distress: depression, anxiety, social impairment and hypochondriasis. The GHQ was developed for use in general population surveys and is designed to identify two main classes of problem: inability to carry out normal functions and the

appearance of new phenomena of a distressing nature (McDowell and Newell 1987). Emphasis is on changes in condition as opposed to absolute level of a problem, so instrument items compare the present state to the person's perceived normal situation.

The SCL-90 is a self-report rating scale oriented toward the symptomatic behaviour of psychiatric out-patients but has been used in general population surveys in the context of exposure to contamination events (Baum et al. 1983; Horowitz and Stefanko 1989; Prince-Embury 1991). The 90 items tap 9 symptom constructs: somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, perceived ideation and psychoticism. The common argument in support of a symptom checklist over using statement scales (e.g., the GHQ) is that it is more objective and more adequately conceals the intent of the measurement. This is considered necessary as respondents are expected to be reticent about reporting their true feelings (McDowell and Newell 1987).

The CES-D (Devins et al. 1988) is a 20 item self-report rating scale developed for use in the general population which measures a variety of cognitive, affective, behavioural and somatic symptoms associated with depression.

Two other candidate instruments of narrower range are the Beck Depression Inventory (BDI) (Beck et al. 1961) and the State-Trait Anxiety Inventory (STAI) (Spielberger 1970). The BDI was originally designed to measure the behavioural manifestations of depression among clinic and hospitalized psychiatric

patients, although it has been applied in general population surveys in the context of exposure to contamination events (Baum et al. 1983; Gibbs 1986). It consists of 21 categories of symptoms and attitudes expressed as self-evaluative statements. The STAI comprises self-report measures of both state and trait anxiety, scored on responses to 40 statements. State anxiety refers to a transitory emotional state that varies in intensity and fluctuates over time. It is characterized by subjective, consciously perceived feelings of tension and apprehension as well as activation of the autonomic nervous system (Spielberger et al. 1977). When an individual perceives a situation to be threatening (irrespective of the objective danger), state anxiety is high. Conversely, state anxiety is low in situations which are not perceived as threatening (Spielberger et al. 1977). Trait anxiety, on the other hand, refers to relatively stable individual differences in proneness to anxiety. That is, trait anxiety refers to differences in individual dispositions to perceive a wide range of situations as dangerous or threatening and in the tendency to respond to such threats with state anxiety reactions (Spielberger et al. 1977). In general, individuals with high levels of trait anxiety tend also to perceive a larger number of situations as dangerous or threatening, more so than individuals with low levels of trait anxiety (Spielberger et al. 1977).

Having identified this short-list of potential measures of psychosocial health and well-being, various criteria were employed to evaluate their usefulness for the epidemiologic survey. First, an instrument designed for use in the general

population was deemed more appropriate than an instrument designed for use in a morbid (typically psychiatric) population. The second criterion was time; that is, the intent was to limit the length of the instrument to a 20 minute telephone survey. The third criterion was appropriateness of the measurement items; that is, some instruments contain items which could be objectionable to the general public thereby jeopardizing response rates. Fourth, the instrument selected for the survey had to have relatively high measures of reliability and validity. Fifth, as the research does not involve the use of an explicit control group, instruments accompanied by normalized samples for purposes of comparison were felt to be most useful.

The Beck Depression Inventory was eliminated as a potential instrument because key informants judged it to be neither reliable nor well validated (D.L. Streiner, pers. comm.). In addition, it was standardized on and for a psychiatric population. Further, depression inventories in general will not tap all components/factors hypothesized to be related to exposure to environmental contaminants (e.g., somatic manifestations of psychosocial impacts).

While the STAI is a highly regarded anxiety scale, some researchers find an inordinate amount of correlation between the two scales which comprise this instrument (Chaplin 1984). In addition, as with the BDI, it may be too restrictive with respect to the full range of psychosocial impacts hypothesized to be related to exposure as the only construct this scale measures is anxiety . On these grounds, the STAI was eliminated.

In comparing the GHQ with the SCL-90, the latter is better validated but the former is more acceptable to the general public with respect to the nature of the questions. Responses to the GHQ provide the researcher with a general level of 'emotional distress' without origins while the SCL-90 is more descriptive, is tied to explicit psychiatric categories and informs the researcher of the origins of depressive symptoms. Given the objectives of the epidemiologic survey, however (Section 3.1), this level of detail is not necessary. In addition, the SCL-90 was designed for and normalized on a psychiatric population. Therefore, as a measure of general psychosocial health and well-being, the GHQ appears to be more appropriate than the SCL-90.

The most extensive version of the GHQ contains 60 items; probable cases are identified on the basis of a respondent checking any 12 or more of the 60 symptoms. The results express the likelihood of a psychiatric disorder; it is a screening instrument only. Items emphasize change in conditions as opposed to the absolute level of the problem. Items therefore compare the present state to the person's normal situation, with responses ranging from 'less than usual' to 'much more than usual'. The instrument begins with relatively general questions and ends with more overtly psychiatric ones. The GHQ is usually completed by the respondent, but this is not necessary.

Goldberg recommends the use of the 60 item GHQ whenever possible due to its superior validity (McDowell and Newell 1987). However, there are several

shortened versions available for use under appropriate circumstances (GHQ-30, -20, -12, and -28). For this research, the GHQ-28 appeared most useful. Items in this version were selected via factor analyses. They provide four scores which measure: somatic symptoms; anxiety and insomnia; social dysfunction; and, severe depression. These four factors match well with documented psychosocial impacts of exposure to environmental contaminants (Taylor et al. 1989) and provide more information than a single severity score. The GHQ-28 takes approximately 3-4 minutes to be completed (by respondent).

There are two methods for scoring response items. They may be scored using conventional 0-1-2-3 Likert scores for response categories (better than usual, same as usual, worse than usual, much worse than usual). Alternatively, a two-point score rates problems as present or absent, thus responses are coded 0-0-1-1. Goldberg found little advantage to the Likert approach and recommends the latter method of scoring (McDowell and Newell 1987). This simplified method would be more appropriate for telephone surveys. The cut-point for the GHQ-28 is 4 or 5. Goldberg recommends, however, that threshold scores may have to be altered depending on the purpose of the study: prevalence surveys versus detection of severe disorders, for example (McDowell and Newell 1987).

Reliability measures for the GHQ (all versions) have been shown to range from .75 to .95 and inter-rater reliability has been shown to be quite high (96%) (McDowell and Newell 1987). Validity measures compare quite favourably to similar

psychiatric scales; documented sensitivity ranges from 81-91% while specificity ranged from 88-94% (McDowell and Newell 1987). Goldberg summarized available data on the association between the GHQ and demographic variables: females as well as lower social class individuals tended to show higher scores while there appeared to be no correlation with age (McDoweil and Newell 1987).

While the GHQ-28 appeared to be well-suited to the purposes of this research, it contained certain items to which the general public could possibly have objected. All are found in Scale D, Severe Depression, and are as follows:

over the past few weeks, have you

(51) been thinking of yourself as a worthless person?
(52) felt that life is entirely hopeless?
(56) felt that life isn't worth living?
(57) thought of the possibility that you might do away with yourself?
(59) found yourself wishing you were dead and away from it all?
(60) found that the idea of taking your life kept coming into your mind?

Thus, the GHQ-20 was chosen over the GHQ-28 which in essence forced the use of a single measure of psychosocial health and well-being but concomitantly eliminated the awkwardness of asking most of the potentially objectionable questions (#51 remained). The match between the 28 and 20 item versions of the scale is substantial (McDowell and Newell 1987). Twelve of the items match directly; of the 16 lost, 8 were somatic items and 5 were from the objectionable list above. The constructs measured by the remaining 3 lost items are equally represented in the 7

additional items found in the 20 item version (McDowell and Newell 1987:145).

Overall:

> The General Health Questionnaire offers a leading example of how a health measurement method should be developed. It was well founded on a clear conceptual approach, the initial item selection and item analyses are fully documented, and the questions have not been revised by subsequent users. The validation studies have been thorough and extensive...and have consistently indicated a high degree of validity, markedly higher than that of rival methods. The scale has been tested in numerous countries and shows remarkably consistent validity results...(McDowell and Newell 1987:149).

The CES-D is a quick, uncomplicated instrument for determining psychosocial health and well-being in the general population. It was designed specifically for use in epidemiologic surveys and is particularly well validated. It is a self-report state measure of depressive symptomatology, experienced one week prior to interview, designed for use in epidemiologic research within a general population. It was developed for the study of depression and the testing of hypotheses relating it to other variables (e.g., stressful life events, social support; Devins and Orme 1985). It provides an index of cognitive, affective, behavioural and depressive factors as well as an indication of the frequency of these symptoms. It is intended for all adults greater than 18 years of age and takes approximately ten minutes to complete when self-administered.

The CES-D was developed by the Center for Epidemiologic Studies, an agency within the U.S. National Institute of Mental Health. Scale items were

selected from a larger pool consisting of items selected from previously validated measures of depression. Major components of depressive symptomatology included in this new scale were decided on the basis of the clinical literature as well as factor analytic studies. The following components were ultimately retained for inclusion: depressed mood, feelings of guilt and worthlessness, psychomotor retardation, loss of appetite, and sleep disturbance (Radloff 1977).

Scores on the CES-D can range from 0 to 60. Radloff (1977) suggests that a score of 16 or higher be deemed indicative of "case" depression, with one *caveat*; the CES-D has been shown to have a high false negative rate (up to 50% in some applications) (Devins and Orme 1985). In original clinical trials, 21% of the general population scored 16 or higher (Radloff 1977).

Considerable evidence exists indicating the adequate reliability and validity of the CES-D (Devins and Orme 1985). Test-retest reliability has been shown to be adequate in most cases (Radloff 1977), while falling slightly below acceptable limits in isolated cases (Devins and Orme 1985). This may be explained by the test's reliance on state depression; that is, depressive factors having occurred during the previous week only (Devins and Orme 1985). The scale's internal consistency, measured via coefficient alpha, was shown to be relatively high in the original field data (.84 to .90) (Radloff 1977) as well as subsequent applications (Devins and Orme 1985). Content validity is confirmed via comparison of the CES-D with scores for depression on similar, pre-validated scales (e.g., the SCL-90)

(Devins and Orme 1985).

Devins and Orme's (1985) review of the CES-D indicates its usefulness in the study of psychosocial impacts. Research findings suggest that the scale's focus is not limited exclusively to depressive symptomatology but, as with the GHQ, provides a useful index of the more general construct, 'emotional distress'. While such symptoms may frequently be associated with depressive syndromes, the findings that CES-D scores were highly correlated with symptoms of anxiety and other neurotic and psychotic conditions contraindicate their interpretation as solely depressive in nature.

Therefore, given the nature of the research objectives as well as the instrument selection criteria cited above, the GHQ and the CES-D were the instruments judged as having the greatest potential for use in the epidemiologic survey. Three options remained: use the GHQ-20; use the CES-D; use both instruments in combination. Given that the selection of the GHQ-20 over the GHQ-28 effectively removed any somatic items from the survey, there was some justification for using a combination of both instruments as the CES-D includes some somatic items which appear to be indicative of psychosocial impacts of exposure (e.g., sleeping and eating disorders) (Taylor et al. 1989). Still, the CES-D does not address all plausible somatic complaints potentially linked to psychosocial impacts of exposure (e.g., headaches, gastrointestinal disorders). Therefore a short symptom checklist was added to this section. While there is some overlap in the two

instruments, the wording and direction of questions were felt to be sufficiently different as to not annoy or arouse respondents. Indeed, this overlap would enable a check on the internal validity of the data. Further, a combination of instruments was not anticipated to take the survey beyond the time constraint (CES-D, 10 minutes; GHQ-20, 3 minutes) although reported times were for self- as opposed to telephone-adminstration. The measurement of actual administration times had to be made at the pre-test stage of instrument development.

With respect to the addition of a somatic component to the instrument, the most effective and efficient format was a symptom checklist. The following sources were consulted; Ontario Health Survey (1989), Canada's Health Promotion Survey (1988), Social Concepts Directory (1980) and the SCL-90 (Derogatis et al. 1973; 1977). It appeared that the last of these would prove the most useful, providing a 12 item checklist of somatic items hypothesized to be related to impacts associated with exposure to environmental contaminants (Taylor et al. 1989). The items comprising the somatization dimension reflect distress arising from perceptions of bodily disfunction. Complaints focus on cardiovascular, gastrointestinal, respiratory, and other systems with strong autonomic mediation. Headaches, backaches, and pain and discomfort localized in the gross musculature are also represented, as are other somatic equivalents of anxiety (Derogatis et al. 1973:13).

Since the original SCL-90 was developed (Derogatis et al. 1973), the instrument has been revised (SCL-90-R). A review of the revised instrument by

Tennen et. al. (1985) was very positive:

> Validation procedures revealed that the subscales have high levels of internal consistency and high convergent validity. The subscales also show adequate factorial invariance across subsamples and the results of confirmatory factor analyses demonstrated considerable correspondence between the theoretically and empirically derived factor structures ...(Tennen et al. 1985:583).

In addition, reliability scores have been shown to be more than adequate for both versions of the SCL-90 (Tennen et al. 1985).

Differences between the SCL-90 and the SCL-90-R are slight; 87 of the 90 items are identical and only one item was changed completely. Both instruments use the 5-point response scale. The revised version asks, however, 'how much were you distressed by...' while the original version asks 'how much were you bothered by...'. Despite these differences, reviewers note that the majority of published research used the original as opposed to the revised version.

Reviewers of the epidemiologic survey instrument added four additional symptoms to the original 12. The rationale for the additions was their inherent plausibility as somatically manifested psychosocial impacts of exposure. These were:

i) rashes or other skin conditions
ii) poor appetite
iii) fatigue or tiredness
iv) trouble getting up in the morning, even if had enough sleep

These four items were appended as items 13-16 so as not to confound reliability measures for the scale formed by items 1-12.

It should be noted that for both the GHQ-20 and the SCL-90 somatic sub-scale, it was necessary to revise item format to suit telephone administration. This involved presenting each item in two parts: first, to determine if respondents had experienced a certain feeling (GHQ) or symptom (SCL-90 somatic sub-scale) over the past two weeks; second, to measure the intensity of the feeling or symptom on a multi-point scale. As will be presented in Chapter 6, this modification had remarkably little effect on the reliability measures of these scales.

A potential confounder of the measurement of psychosocial health and well-being as impacted by environmental exposure is stressful life events (e.g., marriage, divorce, moving, job loss, etc). Indeed, Radloff (1977) found them to be positively correlated with levels of depression. Therefore, the experience of stressful life events was documented explicitly in the epidemiologic survey in order to control for this potential confounder. Selected items from the Critical Life Events Scale, as priorized by the authors (Holmes and Rahe 1967) were included in section three of the survey to provide a measure of stressful life events (e.g., serious illness, divorce, job loss) which potentially confound relationships between environmental exposure and psychosocial impacts (Radloff 1977).

The third section of the instrument therefore contained the following measures of psychosocial health and well-being:

i) perceived health status
ii) GHQ-20
iii) CES-D
iv) Somatic Symptom Sub-scale of the SCL-90
v) selected stressful life events

Section four was designed to document site-specific outcome measures. It contains a combination of closed- and open-ended questions to determine residents' levels of awareness, concern and action regarding the site (or more general environmental problems) as well as the nature of reported concerns. Awareness was either volunteered by respondents in answer to the survey items regarding likes and dislikes about the local area (questions a1 and a2, Appendix 1) or otherwise was elicited by a subsequent direct question (question h2, Appendix 1). Concern was determined using open-ended questions whereby aware respondents were asked if they had any concerns about the site and, if so, what they were. In determining the nature and intensity of concern, particular emphasis was given to any concerns related to health as well as the individuals in the household perceived as affected. Action taken regarding the site was documented using a series of closed questions (questions h25 to h31, Appendix 1) designed to cover a number of activities plausibly related to action-focused coping given the nature of the environmental exposure under study (e.g., have you read about the site in the newspaper? have you spoken to a local politician about your concerns? etc.).

Respondents who were not aware of the study site but were aware of a

more general environmental problem in their area were asked the same set of questions regarding concern and action. These questions were included so as not to miss an environmental issue which held some significance for community members but was not otherwise identified in the survey. In fact, a number of environmental issues were raised but frequencies were not sufficient to warrant further investigation in the context of the current project.

The final section of the survey instrument includes standard socio-demographic variables (i.e., age, gender, life-cycle status, income, education, occupation, length and tenure of residence, and so on) as a check on the characteristics of the sample and its representativeness as well as potential mediators of psychosocial impacts for inclusion in the analysis.

3.4 SAMPLE SELECTION

The goal of the study was to sample 250 households across 4 zones within a prescribed area around each site for a total of 750 households or approximately 62 households per zone. This resulted in very high sampling fractions in the rural communities of Glanbrook and Milton (46% and 72%, respectively) and a lower sampling fraction (approximately 3%) in the more densely populated urban area around SWARU (cf Table 3.1). Zone distances were not uniform across sites (Table 3.1) because of the difference in population density between the rural and urban sites. The zones at SWARU were smaller reflecting the higher population density.

TABLE 3.1: SAMPLE DESIGN

SITE	ZONE 1		ZONE 2		ZONE 3		ZONE 4		TOTAL	
	km	N	km	N	km	N	km	N	km	N
SWARU	1	244	0.5	2612	0.5	3195	0.5	1504	2.5	7555
GLANBROOK	2	73	1	124	1	170	1	171	5	538
MILTON	2	81	1	65	1	104	0.5	96	4.5	346

Households in each zone were enumerated using city directories and assessment maps and rolls. With an expected response rate of approximately 60 per cent, the original intent was to sample 100 households per zone. In fact, at Milton and Glanbrook this was not feasible given low population densities (see Table 3.1). For these areas, virtually 100% of identified households were selected in certain zones (Glanbrook, zone 1; Milton, zones 1-4). Where feasible, households were selected using a random number generating programme. Each household selected for inclusion in the sample was sent a letter of introduction to the study (Appendix 3) informing them that an interviewer would be calling in the next few days. Respondents were also given a contact name and number for follow-up in case of suspicions about the study as well as assurance of confidentiality. Households for whom no telephone number could be identified were sent an alternative letter (Appendix 4) explaining that their views were very important, and inviting them to participate by contacting investigators at no charge to themselves (using an enclosed form and stamped self-addressed envelope or calling collect). The response to this

request for phone numbers was: SWARU 6%, Glanbrook 22%, and Milton 13%.

The survey samples were not matched to any controls, either individually or as communities. Within the epidemiologic literature, the use of controls in any study - either explicitly in the design (e.g., selection of a (matched) control community) or, implicitly in the form of comparisons to expected rates of the outcomes in appropriate comparison populations - is seen as *essential*. However, a common problem in the implementation of environmental epidemiologic research designs concerns the selection of *appropriate* controls with which to compare results. The general intent of using a control community, for example, is to provide a valid contrast for the health experience of the exposed population. This allows a more meaningful interpretation of reported outcomes; that is, one can determine whether different levels of outcome are occurring in the exposed area, taking normal population rates into account.

In actuality, control communities often differ significantly from exposed areas; for instance, in the distributions of variables such as socio-economic status (Hertzman et al. 1987). Certain co-variables (e.g., socio-economic status) are known to be related to psychosocial health and well-being (Kessler and Cleary 1980; Kessler 1982) and may therefore bias or confound the comparison between exposed and control groups *unless* they are addressed at either the design stage or in the subsequent analysis. Unfortunately, however, risk factors for psychosocial outcomes are not yet that well documented (Taylor et al. 1989). This makes the selection of

appropriate control communities even more difficult.

As a result of these considerations, the design of the current study does not include a matched control community. Instead, controls are provided via two sources. First, the stratification of the sample by distance from the site allows for use of internal controls (i.e, comparing the reported outcomes of respondents who live closer to the site to those who live further away). Second, the pre-validated measures of psychosocial health and well-being used in the survey instrument (GHQ-20 and SCL-90 somatic subscale) provide controls via scores on normalized populations as well as potential comparison with other published uses of these scales in similar populations and situations.

3.5 SURVEY ADMINISTRATION

The instrument was administered by the Institute of Social Research (ISR) at York University, Toronto, Ontario. A pre-test was conducted on April 18, 1990 with 15 households selected at random across the three study sites. In general, the instrument performed very well. However, it took too long to administer with interviews on average taking over 30 minutes. Two primary considerations led to a decision to eliminate the CES-D in order to reduce the length of the instrument. First, there was a re-consideration of the overlap between the constructs measured by the GHQ-20 and the CES-D such that it was redundant to retain both. Second, respondents in the pre-test had difficulty comprehending some of the CES-D items.

This was the deciding factor for retaining the GHQ-20 in preference to the CES-D. The time saved by eliminating the CES-D allowed for the addition of items in section four to document more fully health concerns (type, intensity, individual affected, and so on) related to either the site or the general environment (Appendix 1).

Interviews were conducted from May 14th to July 22nd, 1990. The survey was introduced as a general quality of life study so as not to raise facility awareness prior to instrument administration. Eligible respondents were adult members of the household with a random selection procedure used to ensure gender representativeness. Up to ten call-backs were attempted before replacement. A total of 696 interviews were completed (Table 3.2), averaging 27 minutes in length.

TABLE 3.2: SAMPLE SIZE

SITE	ZONE 1	ZONE 2	ZONE 3	ZONE 4	SITE TOTAL
SWARU	77	55	58	64	254
GLANBROOK	52	67	71	65	255
MILTON	44	38	58	47	187

The expected 60% response rate was achieved at Glanbrook (84%) and Milton (75%) with SWARU (57%) coming very close. ISR employed several techniques to achieve these response rates including extensive interviewer training and unobtrusive monitoring by supervisors, variation on the time and number of calls, and refusal conversions. For example, all respondent refusals were re-

contacted by more experienced interviewers in order to convert them to completions; 57 (22%) of the original refusals were successfully converted. Not only do such techniques contribute to adequate response rates, they add to confidence in sample representativeness.

Sample goals were achieved for two out of three sites. There is an unavoidable shortfall in Milton because there were no more households from which to sample; it is a rural area with a very low population density. While this study area could have been expanded to include more households, these would have been qualitatively different as any radius beyond 4.5 km (the limit of zone 4) would have gone beyond the rural area into the Town of Milton.

The samples included 53% females (Table 3.3), and varied little on reported education level. Respondents at Milton tended to be older than at the other two sites. Overall, respondents at Glanbrook and Milton were quite similar and contrasted in several respects with respondents at SWARU. This is not surprising given the rural/urban contrast. Compared to respondents at SWARU, respondents at Glanbrook and Milton were more likely to: have total household incomes over $30,000, have a partner, have children in the home less than 5 years old, be employed full-time, have a higher number of persons per household, speak English at home, own their own home, and have lived longer in both the current residence and the local area. Sample profiles are similar to the census profiles for each of the three areas in which the sites are located (see Section 4.1.8 (Glanbrook),

Section 4.2.8 (SWARU) and Section 4.3.8 (Milton)).

TABLE 3.3: SAMPLE CHARACTERISTICS

CHARACTERISTIC	SWARU	GLANBROOK	MILTON	TOTAL
% FEMALE	53.5	54.1	50.8	53.0
MEAN AGE	42.7	42.8	48.2	44.2
% TOTAL HOUSEHOLD INCOME < $30,000	35.5	16.8	19.8	24.1
% PARTNER	54.7	82.0	75.9	70.4
% HIGH SCHOOL	29.1	31.0	32.4	30.6
EMPLOYMENT				
% FULL TIME	49.2	58.8	57.2	54.9
% PART TIME	11.0	10.2	10.2	10.5
% OTHER	39.8	31.0	32.6	34.6
MEAN # PERSONS/ HOUSEHOLD	2.8	3.4	3.0	3.1
% HOUSEHOLDS WITH CHILDREN < 5 YEARS	11.1	19.1	14.6	15.0
% ENGLISH AT HOME	88.6	99.2	90.9	93.1
% OWN DWELLING	53.0	98.0	90.8	79.2
MEDIAN # YEARS AT:				
CURRENT ADDRESS	6.0	10.0	10.0	8.0
AREA	13.0	16.0	22.0	17.0

3.6 SUMMARY

This chapter has described the design of the research undertaken for this thesis. A parallel case-study design was used in the administration of an epidemiologic survey to population samples living in close proximity to three solid

waste facilities in southern Ontario (Section 3.2) in order to address three specific research objectives (Section 3.1). The epidemiologic survey (Section 3.3) consisted of five sections and was developed specifically for the current research project as a composite of (modified) existing instruments taken from the literature as well as additional site-specific items. The instrument included closed questions, scaled responses, and open-ended questions (Appendix 1) with the items selected especially to match the components and constructs (Appendix 2) of the conceptual framework which guides the research (Figure 2.4). The survey was administered over a period of approximately two months with successful completion rates ranging from 57% to 84% (Section 3.5).

CHAPTER 4

COMMUNITY PROFILES

Subsequent to final site selection, detailed profiles of the communities surrounding each of the three sites were compiled using secondary sources (e.g., census data, planning documents, etc.). The purpose of the profiles was to provide a basic source of information on the social structure and context of each community as well as possible baseline information relating to psychosocial impacts and coping responses. The rationale for compiling these profiles is related to the conceptual framework which guides this research (Figure 2.4); that is, psychosocial impacts of exposure and coping responses are mediated by a number of social and cultural factors ***including*** the wider community context within which they occur. The profiles describe each community in terms of location, administration, demographics, policy plans, community amenities, interest groups, economy, media, and site history.

4.1 COMMUNITY PROFILE OF THE TOWNSHIP OF GLANBROOK

4.1.1 LOCATION

The Regional Municipality of Hamilton-Wentworth is located at the western end of Lake Ontario, approximately 67 km west of Toronto (Figure 3.1).

The Region consists of 6 Area Municipalities: the Cities of Hamilton and Stoney Creek, the Towns of Dundas, Ancaster and Flamborough, and the Township of Glanbrook. The Hamilton-Wentworth Regional Landfill is located in the southeast corner of Glanbrook which is directly south of the City of Hamilton on top of the Niagara Escarpment. The landfill is situated between Hall and Haldibrook Roads, just east of Highway 56 (Figure 3.1), approximately 15 km southeast of the Hamilton airport.

4.1.2 ADMINISTRATION

The Region is governed by a Chairman (elected at large) and 27 member Regional Council, elected every three years (last election: November, 1991). Regional Council membership consists of the 6 Area Municipality Mayors, 16 Aldermen from the City of Hamilton and 1 Council Member from each of the other area municipalities. The councils of all area municipalities are elected on a ward system. Glanbrook Council has five members elected by ward. The current Mayor of the Township is Glen Etherington.

The Region has responsibility for matters concerning waterworks, sewerage, waste disposal, policing, roads and drainage systems, transit, social services, health, planning and economic development. Each area municipality is responsible for local planning, land drainage, local streets and sidewalks, solid waste collection, fire protection, parks and recreation, tax collection and building inspection and

permits. The Economic Development Department of the Region of Hamilton-Wentworth portrays the Region in an understandably positive light:

> An ideal location, excellent transportation links, abundant skilled labour, a burgeoning economy, viable business environment, attractive vacation and convention location, reasonably priced housing, enviable recreation, and entertainment facilities makes Greater Hamilton an exciting, flourishing and safe community in which to live and do business (Regional Municipality of Hamilton-Wentworth, Economic Development Department, 1990:6).

4.1.3 POPULATION

The total population of the Region is approximately 434,000 (1989) with a projected increase to 483,000 by the year 2006 under the *most likely* scenario (Hamilton-Wentworth Planning and Development Department, Strategic Planning Division, 1989). Glanbrook contains 2% of the Region's total population (Table 4.1). This proportion is projected not to change by the year 2006 (Hamilton-Wentworth Planning and Development Department, Strategic Planning Division, 1989), but total population is projected to increase from 9,500 in 1988 to 11,800 in 2006 under the *most likely* scenario (Table 4.1).

The number of households in the Township is projected to increase from approximately 3,000 in 1988 to 4,600 is 2006 (53%). This will result from projected population growth under the *most likely* scenario and a decline in household size from 3.1 to 2.5. Much of the development required to accommodate this growth is anticipated to occur along the border between the Township of Glanbrook and the

TABLE 4.1

POPULATION PROJECTIONS, HAMILTON-WENTWORTH, 1988-2006

AREA MUNICIPALITY	BASE POPULATION (MAY, 1988)	LOW	MOST LIKELY	HIGH
ANCASTER	19,700	27,800	35,800	39,200
DUNDAS	20,600	20,500	22,000	23,400
FLAMBOROUGH	27,100	33,400	37,700	44,300
GLANBROOK	9,500	10,400	11,800	12,800
HAMILTON	307,200	300,800	310,700	315,000
STONEY CREEK	45,300	59,000	64,600	67,800

Source: Regional Municipality of Hamilton Wentworth, Planning and Development Department, Strategic Planning Division (1989) Hamilton-Wentworth Population Projections 1988-2006, Hamilton-Ontario.

City of Hamilton. The planned development of two retirement communities, with a combined capacity of almost 1,000 units, will contribute to the large declines in household size. Age-specific growth is projected to occur amongst 0-19 year olds (5%), 20-64 year olds (14%), and amongst those over 65 years (160%) (Region of Hamilton-Wentworth, Planning and Development Department, Strategic Planning Division 1989). The rapid growth of the elderly cohort is directly related to the establishment of retirement communities in Glanbrook. These facilities will attract migrants from other municipalities in Hamilton-Wentworth and the surrounding area.

4.1.4 OFFICIAL PLAN DESIGNATIONS

Under the Regional Official Plan, the Township of Glanbrook is designated as a *Rural Policy Area*, the objectives of which are:

- To provide an orderly and efficient pattern of land use which promotes a healthy agricultural economy while minimizing the impact on the rural environment and the need for Regional physical services.
- To direct rural residential development to existing and future rural settlements and to minimize impact on agricultural lands.
- To provide maximum protection to natural resources and to preserve the rural character of the area.
- To reinforce the historical relationship between rural settlements and the surrounding farm community to which these provide basic services.
- To provide a place for retirement for the rural population as well as an alternative living style to large urban places.

Further, all of Glanbrook (except the urban area of Binbrook) is designated *Rural Resource Area* indicating that agricultural soil Classes 1 to 4 (Canada Land Inventory) predominate. The following Official Plan objectives apply to any *Rural Resource Area*:

- To preserve high capability agricultural lands and specialty crop areas for food production and as a basis for the rural community and the rural way of life.
- To encourage the continuation of existing farm operations and the establishment of new viable farms.

Generally, the quality of soil in the Region is excellent and the agricultural segment of the economy has been substantial. However, the amount of farmland in the Region has declined and farms have been smaller and less productive, on average, than Provincial farms. The loss of farmland is attributed to urban development, open space activities and the high value of land in the Region which may inhibit the enlargement of farms (Economic Base Inventory, Hamilton-Wentworth Planning and Development, pp 3,4,57-76). Thus, these Official Plan objectives have been drafted in order to preserve the agriculturally-based economies of the Region's rural Area Municipalities as well as their rural way of life.

4.1.5 COMMUNITY AMENITIES

The Regional Municipality of Hamilton-Wentworth undertook a quality of life study in 1988 which solicited opinions from 1400 respondents. The study was intended to assist the Region and area municipalities in planning capital investment programs, municipal services and land development practices (Peat Marwick 1989). The survey was designed to elicit the basis of locational decisions, satisfaction with various aspects of the quality of life in the community and perceptions of other communities. In addition to the survey, quality of life was measured on the basis of objective indicators from existing data sources (Peat Marwick 1989: exhibit 12). Glanbrook was rated quite highly by respondents on features that appear typical of a rural community. For example, respondents perceived this municipality to have

relatively low levels of violent crime, property crime and traffic congestion as well as relatively low population densities. As a result, Glanbrook ranked second only to Ancaster in the overall community attractiveness index (Table 4.2).

In terms of community activities available within the Township, Glanbrook was ranked lowest of all Area Municipalities (Table 4.2). However, a recently prepared Regional inventory indicates that community amenities, while not as plentiful as in other Area Municipalities, are available (Table 4.3).

4.1.6 INTEREST GROUPS

Hamilton-Wentworth enjoys a wide range and number of citizen and interest groups (Table 4.4) (Hamilton-Wentworth Community Information Service 1989). None of these groups is headquartered in Glanbrook Township.

As late as 1986, the *Glanbrook and Binbrook Anti-Dump Group* was listed as an established community group centred in Glanbrook. It was established by Gary Birch and Sheila May (both went on to become Glanbrook Council Members) as well as other area residents to oppose the siting of the Glanbrook Landfill. Sheila May now chairs the *Glanbrook Landfill Coordinating Committee* (The Spectator, July 22, 1989; B2) which was established to monitor the operation of the Landfill. The purpose of the *Anti-Dump Group* reads:

TABLE 4.2

COMMUNITY ATTRACTIVENESS RATINGS

	ANCASTER	DUNDAS	STONEY CREEK	FLAMBOROUGH	GLANBROOK	HAMILTON
OVERALL RATING	**46.0**	**39.7**	**30.2**	**42.1**	**42.5**	**28.8**
Cultural Facilities	17.5	18.9	17.5	15.2	16.1	25.8
Schools	26.0	25.0	24.0	21.1	20.1	26.5
Community Activities	26.0	27.0	25.5	23.0	21.0	27.0
Commercial Entertainment	18.5	20.0	22.0	17.0	16.5	28.5
Community Facilities	24.5	26.0	24.5	20.4	20.4	28.1
Parks	31.3	31.3	27.5	28.1	24.8	26.5
Retail Facilities	22.4	24.6	27.4	18.5	16.8	33.6
Medical Facilities	26.7	28.4	22.6	23.3	21.5	36.0
Road Quality	28.4	25.5	26.1	24.9	23.2	20.3
Family Stability	32.4	31.2	28.8	32.4	32.4	25.2
Density	17.7	15.9	14.0	22.6	25.6	8.6
Traffic Congestion	22.0	20.7	15.9	25.6	28.7	10.4
Housing Cost	5.0	10.7	13.2	15.8	18.9	14.5
Pollution	22.4	19.2	14.7	24.3	23.7	8.3
Violent Crime	28.4	27.1	23.8	28.4	30.4	13.2
Property Crime	23.1	22.4	19.8	27.1	27.1	12.5

Source: Peat Marwick Consulting Group 1989.

TABLE 4.3

GLANBROOK COMMUNITY FACILITIES

FACILITIES	NUMBER
Arena	1
Baseball Diamond	11
Baseball League	5
Community Centre	4
Community Theatre	1
Golf Courses	5
Curling Club	1
Library	2
Museum	1
Parks	4
Tennis Court	1
Soccer Field	7
Soccer League	1

Source: Regional Municipality of Hamilton-Wentworth (1988)

> A group of citizens who oppose the establishment of landfill sites. They will help other groups to fight the establishment of a dump in their area. Membership is open to any residents in the Glanbrook area (Hamilton-Wentworth Community Information Service 1986; 28).

The *Anti-Dump* and *Landfill Coordinating* groups, according to Ms May, have made the site one of the safest operating landfills in the Province (The Hamilton Spectator, July 22, 1989:B2). An example is their role in the recent overturning of a decision to dump contaminated soil in the landfill (The Hamilton Spectator, April 28, 1992:B3).

TABLE 4.4

CITIZENS ORGANIZATIONS AND INTEREST GROUPS IN HAMILTON-WENTWORTH

ORGANIZATION	NUMBER
Abortion Information	1
Business Associations	19
Community Councils/Assoc.	18
Consumer Issues	1
Crime Prevention/Law	1
Day Care	1
Disabled	5
Disarmament/Peace	9
Environmental Groups	11
Family Life Education	1
Health Issues	5
Historical Groups	8
Human Rights	5
International Organizations	9
Labour Issues	3
Landlord and Tenant Rights	1
Monarchy	1
Mundialization Committees	3
Native People - Advocacy	1
Political Parties	29
Poverty/Anti-Poverty	2
Smoking	1
School Associations	4
Women	2

4.1.7 ECONOMY

The economy of the Hamilton-Wentworth Region has historically been based on manufacturing. Steel and steel-related industries still account for 33% of all Regional manufacturing although printing and publishing, food and beverages processing, transportation equipment, textiles and electrical machinery have all made significant contributions to the Region's economy (Regional Municipality of Hamilton-Wentworth 1988). Despite the decreasing concentration of employment in manufacturing, the local economy remains specialized in this area relative to the Province (Regional Municipality of Hamilton-Wentworth 1988).

While a large part of Glanbrook's economy is based on agriculture, other types of development are occurring/are slated to occur in designated areas of the Township (Regional Municipality of Hamilton-Wentworth 1988). *Glanbrook Industrial Park* is adjacent to the southern limit of the City of Hamilton where approximately 750 acres of commercial and industrially zoned land are available. *Glanbrook - Airport Business Park* is a privately owned area close to the Hamilton Airport which is expected to attract firms in aviation-related business. *Hamilton Mountain Industrial Park #2 - Hanbrook Estates* is 45 acres of appropriately zoned land situated between Hamilton Mountain/Rymal Industrial Estates and the Glanbrook Business Park.

All Area Municipalities experienced growth in number of business establishments from 1985 to 1988 (Regional Municipality of Hamilton-Wentworth,

Planning and Development Department 1989). However, the majority of business establishments *are* concentrated in the City of Hamilton (Table 4.5). Further, those businesses that are located in Glanbrook have relatively few employees (Regional Municipality of Hamilton-Wentworth, Economic Development Department 1990). Glanbrook's economic profile is understandable given the concentration of its economic activities in the agricultural sector.

TABLE 4.5

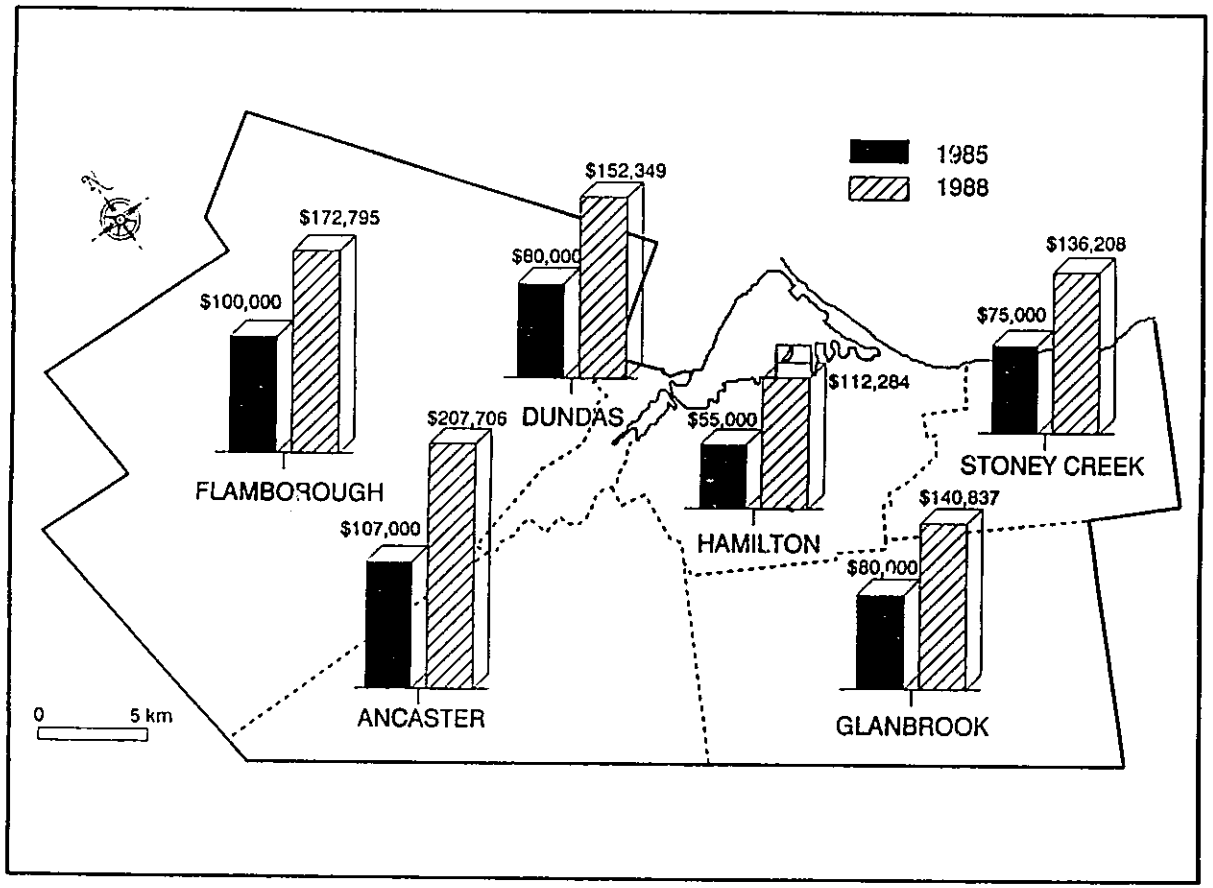
NUMBER OF BUSINESS ESTABLISHMENTS, INDUSTRIAL AND COMMERCIAL, HAMILTON-WENTWORTH AREA MUNICIPALITIES

MUNICIPALITY	1985	1988	% CHANGE
Ancaster	338	478	41.4
Dundas	521	625	20.0
Flamborough	612	789	28.9
Glanbrook	202	281	39.1
Hamilton	10,346	13,686	32.3
Stoney Creek	1,424	1,962	37.8
TOTAL	13,443	17,820	32.6

Source: Regional Municipality of Hamilton-Wentworth, Planning and Development Department, Strategic Planning Division (1989) Greater Hamilton Economic Trends, Economics Report 89-2, Hamilton, Ontario.

The average house price in Glanbrook is moderate relative to the other municipalities in the Region (Figure 4.1). Updated figures indicate the median house price in Glanbrook is $174,900.00; higher than Stoney Creek and Hamilton but lower than Dundas, Ancaster and Flamborough (The Hamilton Spectator, July 6, 1990:A10).

FIGURE 4.1: AVERAGE RESIDENTIAL PROPERTY SALES VALUE, HAMILTON-WENTWORTH AREA MUNICIPALITIES, 1985 AND 1988



Source: Regional Municipality of Hamilton-Wentworth, Planning and Development Department, Strategic Planning Division (1989).

4.1.8 CENSUS DATA

Glanbrook is a small community with a relatively high proportion of young people (< 14 years) and a relatively low proportion of older people (> 65 years) when compared to the Province (Table 4.6). The quality of life in Glanbrook

TABLE 4.6

SELECTED CENSUS (1986) CHARACTERISTICS, GLANBROOK

CHARACTERISTIC	ONTARIO	GLANBROOK
Total Population 1986	9,101,694	9592
Total Population 1981	8,625,107	9765
Proportion Male	49.1	51.4
Proportion < 14 yrs	20.5	22.8
Proportion > 65 yrs	10.9	7.8
Total # Occupied Dwellings	3,221,730	2975
% Owned Dwellings	63.6	88.7
% Single Detached	57.4	94.3
% Husband-Wife Families	88.1	94.3
% No Children at Home	33.4	31.3
Average Dwelling Value	$104,063	$99,467
Average Household Income	$38,022	$40,661
Incidence of Low Income Economic Families	11%	5.4%
Completed High School	13.3	14.5
Total Unemployment Rate	6.8	5.9

Source: Statistics Canada (1986)

in light of the census data could be characterized as good given high percentages of both owned and single detached dwellings, an average household income higher than the Provincial average, an incidence of low income economic families lower than the Provincial average, and a total unemployment rate lower than Ontario's. Glanbrook is also characterized by a large proportion of husband-wife families as well as households with children.

This profile of the census characteristics of Glanbrook compares favourably with the characteristics of the sample used in the research (Table 3.3); that is, the research sample is characterized by a high proportion of home ownership, a low proportion of low income households, a high proportion of full- and part-time employment and a high percentage of respondents with partners.

4.1.9 MEDIA

In order to respond to and cope with an environmental stressor, people require an information base. For most, this information comes from the mass media, particularly television (Eyles et al. 1990) but also newspapers (Sandman et al. 1987). The quality of the coverage of environmental issues in the media has often been found lacking (Eyles et al. 1990; Sandman et al. 1987). Despite this problem, the public is often left with no alternative source of information and may make decisions regarding primary and secondary appraisal of an environmental stressor on the basis of information which is perhaps flawed and often sensationalized.

The Region of Hamilton-Wentworth is served by several cable television channels as well as three local AM and FM stations, one daily and seven weekly newspapers, and four magazines (Regional Municipality of Hamilton-Wentworth, Economic Development Department 1990). Major national daily newspapers are also available in the Region. Only 3% of the Regional population do not have telephones.

The Region has one local television station (CHCH-TV in Hamilton) and residents can receive upwards of 29 channels through a variety of cable hook-ups and payment schemes (Regional Municipality of Hamilton-Wentworth 1988). Most of these come from the Toronto or Western New York areas. All of these channels are available to the residents of Glanbrook.

The Region has three local AM radio stations (CHAM 820, CHML 900, CKOC 1150) as well as three local FM stations (CKDS 95, CKLH FM102 and K103 FM) (Regional Municipality of Hamilton-Wentworth 1988). All these stations can be received in Glanbrook.

The Region has one daily newspaper - The Hamilton Spectator - with a daily distribution of 118,769 papers (Boyden and Krol 1990). Home delivery extends to the Township of Glanbrook (Regional Municipality of Hamilton-Wentworth, Economic Development Department 1990). Other daily newspapers available to Township residents include:

- o The Globe & Mail (national)
- o Toronto Star
- o Toronto Sun

One of the seven weekly newspapers - Stoney Creek News - is read by some residents of Glanbrook. Other periodicals available to Township residents include:

- o The New Hamilton Weekly
- o Hamilton This Month
- o Hamilton Report
- o Let's Talk Business
- o Hamilton Journal

In addition to the above, there is a privately owned newsletter/newspaper available to Township residents: The Advocate.

4.1.10 SITE HISTORY

The Hamilton-Wentworth Regional Landfill was established in 1980 with an operating life of 20 years (Table 4.7). In July of 1989, it was proposed that another *cell* be opened up; this would in actuality extend the life of the landfill by another ten years. An environmental assessment was not required as additional cells were approved in the original assessment. Cells can be opened at the Region's discretion as long as approval is received from the Environment Ministry's technical staff. By April 1990, the new cell was being excavated.

The Glanbrook site was originally selected from among others identified

Table 4.7

CHRONOLOGY OF GLANBROOK SITE HISTORY

1972 Hamilton-Wentworth Region begins search for new landfill.

1974 Glanbrook and Binbrook Anti-Dump group formed in response to Glanbrook being chosen as a potential site.

1976 Glanbrook site chosen.

Sept. 1978 Applications for re-zoning and O.P. amendments go to the OMB; approved.

April 1979 Matter sent to Environmental Assessment Board for review.

Dec. 1979 Certificate of Approval granted by EAB.

April 1980 Construction of the landfill begins; Glanbrook and Binbrook Anti-Dump Group appeal approval to district court.

Aug. 1980 Glanbrook landfill wins full court approval.

Feb. 1981 Glanbrook Landfill Coordinating Committee established.

Mar. 1983 Glanbrook identified as a potential OWMC site.

July 1984 First family awarded $67,000.00 compensation for loss of property value as well as legal and real estate fees.

July 1987 Glanbrook landfill will no longer accept used automobile tires.

Jan. 1989 Tire decision reversed for lack of a better alternative.

July 1989 Expansion of cell 6 proposed and approved.

April 1990 Expansion of cell 6 begins.

within the Region because "...it would affect the least number of people" (The Hamilton Spectator, November 6, 1976:8). The site selection was immediately opposed by:

- The Glanbrook and Binbrook Anti-Dump Group
- Chippewa Creek Watershed Association
- Niagara Peninsula Federation of Agriculture
- Niagara North Federation of Agriculture
- Township of West Lincoln
- Wainfleet
- various unaffiliated individuals

Concerns raised fall into three categories. First, farmers were concerned about contaminated well and creek water because they did not want to jeopardize the health of their livestock, crops or families. Second, non-farm area residents were concerned about their property values in general as well as expected noise, dust, litter and truck traffic from the operation of the landfill. Finally, most residents had concerns about health particularly because at one point in the siting process it was discovered that illegal dumping of toxic liquid industrial waste had been occurring at the Upper Ottawa Street landfill in Hamilton.

The Township itself was adamantly opposed to the siting until the Region offered a cash settlement that would amount to a substantial savings in the Township's annual budget (The Hamilton Spectator, April 10, 1979:7). The Region of Haldimand-Norfolk did not object to the proposal on the grounds that Hamilton-

Wentworth would control for dust pollution, drainage and ground water quality (The Hamilton Spectator, August 25, 1978:10). The landfill was granted a certificate of approval from the Environmental Assessment Board in 1979 and construction began in the spring of the following year.

Although a Regional facility, operation and management of the landfill is contracted out to Laidlaw Inc. (formerly Tricil). The landfill accepts ash from the Regional incinerator (SWARU) as well as all municipal solid waste from the Region's three transfer stations. The site covers approximately 400 acres (162 hectares), with 250 (101 hectares) of these being used for active landfilling. The landfill currently accepts about 205,000 tonnes of solid waste per year, approximately 35,000 tonnes are SWARU ash (1990 figures; Regional Municipality of Hamilton-Wentworth 1991).

Since the announcement of the landfill expansion in July 1989, only 2 complaints related to the landfill have received media attention. First, an area resident whose residential property abuts the landfill has complained, on numerous occasions, of dust, odour, debris and noise. These are a constant source of nuisance to him and his family: "If something isn't done soon, I'm going to park my car in front of the entrance and refuse to move" (The Hamilton Spectator, April 12, 1990:C2). Laidlaw officials have responded to these complaints by trying to minimize the impacts on the resident's property but feel there is no way to eliminate the problem (The Hamilton Spectator, April 12, 1990:C2). This citizen has subsequently

charged the Region under anti-littering legislation (The Hamilton Spectator, April 17, 1991:B1). A resolution seems to have been reached with a recently established *windblown waste mitigation policy* where garbage will be temporarily stored on windy days and waste deposition halted entirely on days when winds are greater than 60 km/h (The Hamilton Spectator, November 28, 1991: B2).

Second, in April 1990, the Region was charged under the Environmental Protection Act for using an unlicensed company to truck incinerator ash to the Glanbrook landfill site (The Hamilton Spectator, April 2, 1990:D1). The Region pleaded guilty and will pay a fine in the range of $1,000 to $5,000.

Other community issues have received attention since the announcement of the landfill expansion (July 1989). These include: a call for enhanced police protection (The Hamilton Spectator, January 18, 1990:C2); the siting of a new cemetery (The Hamilton Spectator, January 23, 1990:C2); and, denied expansion of Bell Canada's toll-free service area around Glanbrook Township (The Hamilton Spectator, April 14, 1990:C2). There is one issue, however, which has area residents very concerned; subsequent to the February 1990 tire fire in Hagersville, Ontario where over 14 million tires burned for 17 days causing as yet unknown degrees of environmental damage and up to $50-million in clean-up costs (The Hamilton Spectator, July 6, 1990:D2), safety at the Mount Hope tire dump (located in Glanbrook Township) became an issue of grave community concern:

> The Mount Hope tire dump is a potential Hagersville-style disaster waiting to happen - in the middle of Hamilton-Wentworth. The regional council should demand swift, no-nonsense provincial government action to eliminate the danger...Where the Hagersville fire affected hundreds, a Mount Hope fire could affect thousands (The Hamilton Spectator, March 6, 1990:A6).

The owners of the Mount Hope Tire Dump, the Musitano family, received numerous warnings from Environment Ministry officials that the dump did not comply with fire regulations and that the Ministry considered the dump illegal (The Hamilton Spectator, March 9, 1990:D14). Compliance with the Ministry's guidelines was too costly, according to the Musitanos. They applied for a $5-million grant to set up an on-site recycling process (The Hamilton Spectator, March 9, 1990:D14). This application was subsequently denied (The Hamilton Spectator, July 20, 1990:C2). In the interim, the Musitanos decided to try to remove the tires from the site in one of three ways: i) bury them in the Glanbrook landfill; ii) sell them to a New York state dump; or, iii) ship them to mainland China for use as artificial reefs. None of these alternative were favoured by the Region or the Ministry (The Hamilton Spectator, July 6, 1990:D2).

In her own bid to maintain the support of area residents and to resolve the issue once and for all, (then) Glanbrook Mayor Helen Bell wrote to (then) Ontario Environment Minister Jim Bradley suggesting that incineration of the tires was an "environmentally acceptable" solution worthy of serious consideration (The Hamilton Spectator, July 6, 1990:D2).

Eventually, the owners were put under control order to clean-up the site and to upgrade other safety aspects (fencing, security, etc). An additional order was given to remove, re-pile or shred all 800,000 tires on site (The Hamilton Spectator, July 30, 1990:D2). This order was ignored. MOE therefore began cleaning up the site fully intending to pass all costs on to the owners. In the end, the owners pleaded guilty to several counts of violating the Ontario Fire Code and operating an un-safe site (The Hamilton Spectator, May 25, 1991:B1).

The residents group *For A Safe Environment*, or FASE (co-chaired by Lynne Bamford and Larry Vanderpool and formerly known as *Citizens Against the Glanbrook Tire Dump*) was instrumental throughout the process, continually pressuring local politicians and government agencies to have the site cleaned up. In fact, some members of the group succeeded in having their property taxes reduced by 8% due to proximity to the tire dump (The Hamilton Spectator, May 15, 1991:B1). This group has gone on to lobby local and Regional governments regarding other solid waste disposal issues such as commercial dumping practices on area farms (The Hamilton Spectator, May 27, 1992:B3).

4.1.11 SUMMARY AND CONCLUSIONS

Glanbrook Township is a rural community with a mix of land uses from rural agricultural to industrial to estate residential. As in many area municipalities, local politicians are trying to enhance economic growth while maintaining the rural

character of the area. Due to the seemingly high level of quality of life as well as relatively low housing prices, residents are attracted to Glanbrook from other areas of the Region. While area residents may prefer not to have a landfill in their midst, it appears to be operating safely and most residents seem to have become accustomed to its presence; this 'acceptance' is likely tempered by residents' perceptions of quality of life relative to other area municipalities. However, given the past history of community leadership around issues of local concern, one would anticipate an organized and cohesive response in the face of any adverse circumstances arising from the landfill's operation. This was certainly the case in the recent discussions regarding the possibility of disposing of contaminated soil at the site (The Hamilton Spectator, April 18, 1992:B3).

Generally, on the basis of this profile, several factors emerge which may enhance the ability of Glanbrook residents to cope with environmental stress. For example, the stability of the population (Lazarus and Folkman 1984); the rural context, social structure and lifestyle (Fuller 1985); the conventional family structure (Eyles and Woods 1983; Hodge and Qadeer 1983); and, given the aforementioned, the potential for well-developed social and community support networks (Cebotarev and Beattie 1985). Glanbrook is a township in transition, however; given low housing prices, individuals are attracted from the surrounding urban areas who, according to long-time residents, rarely become true *members* of this rural community.

The projected aging of the population implies a decreased susceptibility to psychosocial impacts (Edelstein 1988). However, other dimensions of Glanbrook's socio-demographic profile imply greater susceptibility: the high proportion of households with children, the high proportion of home owners, and the substantial agricultural component of the local economy. Families in the early stages of the life cycle are likely to be sensitive to environmental stress due to concern for the well-being of children (Levine and Stone 1986; Richardson et al. 1986; Sorensen et al. 1987). Home owners, given a greater financial stake in their location, are also more likely to be affected by psychosocial impacts than renters (Levine and Stone 1986). Finally, families who earn their living through farming are particularly susceptible to additional stressors given that their land is the source of their livelihood (Fuller, 1985; Cebotarev and Beattie 1985).

In short, the psychosocial impacts reported in Glanbrook will reflect this diverse set of community dimensions which will in turn be associated with a range of impacts and responses.

4.2 COMMUNITY PROFILE OF THE CITY OF HAMILTON

4.2.1 LOCATION

The Solid Waste Reduction Unit (SWARU) is located in the east end of the City of Hamilton (Figure 3.1) on the eastern border of the city's industrial core, close to the shore of Lake Ontario.

4.2.2 ADMINISTRATION

Hamilton, like Glanbrook, is one of the constituent area municipalities of the Region of Hamilton-Wentworth. Hamilton's 16 municipal council members are elected by ward. The mayor, in addition to the council members, also sit on Regional Council. The present Mayor of Hamilton is Robert Morrow.

4.2.3 POPULATION

Hamilton is located in the centre of the Region and currently comprises over 70% of the Region's population. Under the *most likely* scenario, Hamilton's population is projected to increase slightly from 307,200 to 310,700 by the year 2006 (Table 4.1). The aging of the population during this period will be accompanied by decreasing numbers of births, increasing numbers of deaths, and slower overall growth (Hamilton-Wentworth Planning and Development Department, Strategic Planning Division 1989). Age specific growth under the *most likely* scenario will be concentrated in the 65+ cohort which is expected to grow by 17%. The number of children is forecasted to decline by 6% (Hamilton-Wentworth Planning and Development Department, Strategic Planning Division 1989).

The number of households in the city will increase from 121,000 to 131,200 with most new development being on top of the escarpment. Household size will decline marginally from 2.5 to 2.4.

4.2.4 OFFICIAL PLAN DESIGNATIONS

Under the Regional Official Plan most of Hamilton is designated as *Urban Policy Area*, with the area immediately surrounding SWARU characterized as *existing development*. The Official Plan of the City of Hamilton designates SWARU and its immediate environs as Industrial with Residential designations to the south, south-east and south-west. Understandably, the Region and the city are both committed to maintaining Hamilton's position as a major industrial centre in the Region through the retention of existing industries and the stimulation of new industrial growth.

4.2.5 COMMUNITY AMENITIES

Hamilton ranked lowest of all area municipalities on the community attractiveness rating scale (Table 4.2) which formed part of the recent Regional Quality of Life Survey (1989). In particular, Hamilton (as the major urban centre in the Region) scored higher on several amenities which are typically found in an urban centre (e.g., medical, retail and cultural facilities). However, survey respondents felt that Hamilton had very high rates of pollution and crime as well as high population densities.

Hamilton ranked highest (tied with Dundas) on the availability of community activities (Table 4.2), covering a wide range of amenities (Table 4.8).

TABLE 4.8

HAMILTON COMMUNITY FACILITIES

FACILITIES	NUMBER
Arena	8
Baseball Diamond	150
Soccer Field	7
Golf Courses	2
Library	22
Museum	4
Rec. Centre (with indoor pool)	12
Ski Area	3
Tennis Court	8
Theatre	3
Theatre (Professional)	1

Source: Regional Municipality of Hamilton-Wentworth (1988).

4.2.6 INTEREST GROUPS

Hamilton-Wentworth appears to have a full range of organizations and services. The vast majority of organizations and community groups in the Region (Table 4.4) are headquartered in the city of Hamilton (Hamilton-Wentworth Community Information Service 1989).

4.2.7 ECONOMY

As previously stated (Section 4.1.7), the economy of the Hamilton-

Wentworth Region has historically been based on manufacturing. Further, despite the decreasing concentration of employment in manufacturing, the local economy remains specialized in manufacturing relative to the Ontario economy (Regional Municipality of Hamilton-Wentworth 1988). The two major employers in Hamilton are Stelco Inc. Primary Steel Products (12,340 employees) and Dofasco Steel (11,500 employees) (Region of Hamilton-Wentworth 1988). Both these major manufacturers are located just west of SWARU.

As noted earlier (Section 4.1.7), the majority of Regional business establishments *are* concentrated in the city of Hamilton (Table 4.5).

The average house price in Hamilton is the lowest in the Region (Figure 4.1). Updated figures indicate the median house price in Hamilton is $129,000; still the lowest of all area municipalities (The Hamilton Spectator, July 6, 1990:A10). Hamilton's standing in the housing market relative to other area municipalities is likely due to the wide variation in housing choice available throughout the city.

4.2.8 CENSUS DATA

The census data for Hamilton reveal age and life-cycle characteristics similar to the Provincial data (Table 4.9). However, Hamilton's rate of unemployment is higher as is the incidence of low income economic families. Also, both the percentage of owned dwellings and average household income are lower. This profile is similar to that revealed by the characteristics of the SWARU sample

(Table 3.3); that is, a low percentage of owned dwellings (relative to the other two sites), a higher percentage of low income households and a lower percentage of full-time employment. However, while only 55% of the SWARU sample had a partner (Table 3.3) 85% of households in the Hamilton census area were comprised of husband-wife families.

TABLE 4.9

SELECTED CENSUS (1986) CHARACTERISTICS, HAMILTON

CHARACTERISTIC	ONTARIO	HAMILTON
Total Population 1986	9,101,694	306,728
Total Population 1981	8,625,107	306,434
Proportion Male	49.1	48.3
Proportion < 14 yrs	20.5	18.4
Proportion > 65 yrs	10.9	13.1
Total # Occupied Dwellings	3,221,730	117,930
% Owned Dwellings	63.6	56.6
% Single Detached	57.4	52.1
% Husband-Wife Families	88.1	85.4
% No Children at Home	33.4	35.6
Average Dwelling Value	$104,063	$76,878
Average Household Income	$38,022	$11,669
Incidence of Low Income Economic Families	11%	17.4%
Completed High School	13.3	12.7
Total Unemployment Rate	6.8	8.3

Source: Statistics Canada (1986)

4.2.9 MEDIA

All sources of media communication available to Glanbrook residents are also available to Hamilton residents (see Section 4.1.9).

4.2.10 SITE HISTORY

Since 1972 SWARU has operated in Hamilton as an incinerator for non-hazardous municipal solid waste (Table 4.10). SWARU now operates 24 hours per day, five days per week. At capacity, over 100,000 tonnes of waste can be incinerated annually. In addition, metals are recovered for recycling. SWARU has the potential to reduce waste volume by 95% through the incineration process. The resulting ash is disposed of in the Glanbrook landfill (Table 4.11).

SWARU's first few years of operation were plagued by breakdowns and poor equipment performances which left the plant running at less than 15% capacity (The Hamilton Spectator, November 6, 1976:8). Several hundred thousand dollars came from various levels of government to repair and up-grade the plant in an attempt to get it running safely and at or near capacity. Fires were also a common problem at the plant. In 1977, a fire caused by a welder's torch meant a ten-week shutdown and over $200,000 damage (The Hamilton Spectator, June 29, 1977:10). In addition, during the shutdown, all municipal solid waste was diverted to the Upper Ottawa Street Landfill, the subject of later controversy about the health impacts of

Table 4.10

CHRONOLOGY OF SWARU SITE HISTORY

1968 Hamilton City Council passes resolution to have an incinerator designed for consumption of 600 tons per day.

1969 Construction begins.

1972 SWARU begins operating.

1977 Ten-week shut-down due to plant fire.

1978 Tricil begins a 10 year contract with the Region to operate SWARU; they begin with a $750,000 up-grade.

1979 SWARU begins to operated near capacity.

1980 SWARU ash emissions discovered to contain dioxins.

1982 Tricil spends $350,000 up-grading pollution-control equipment at the plant in order to reduce the black soot area residents had been complaining about.

1982 Tricil begins generating energy from waste for sale to Ontario Hydro.

1983 Renewed worry about dioxins; request for health study denied.

1984-1986 $12 million retrofit to reduce emissions.

1989 two-week shut-down caused by a PCB spill.

1990 Tricil taken over by Laidlaw Technologies Inc.

1991 Environment Minister puts a moratorium on incinerators in Ontario; SWARU's performance reviewed by Ministry; $1.7 million scrubber installed as a result of review.

TABLE 4.11

MONTHLY TOTAL OF SOLID WASTE PROCESSED IN HAMILTON-WENTWORTH - 1990 (TONNES)

TO SWARU		TO GLANBROOK LANDFILL	
			PERCENT REDUCTION
January	8,998	2,729	70%
February	6,837	2,035	70%
March	8,336	2,431	71%
April	7,274	1,747	76%
May	7,363	2,399	67%
June	8,474	3,189	62%
July	8,048	2,464	69%
August	7,879	4,349	45%
September	7,851	4,043	48%
October	9,507	4,937	48%
November	7,508	4,547	39%
December	6,449	2,141	67%
TOTALS	**90,075**	**34,867**	**61%**

Source: Regional Municipality of Hamilton-Wentworth (1991) Annual Report, Solid Waste Management System. Hamilton, Ontario.

illegally-dumped liquid hazardous waste (The Hamilton Spectator, June 29, 1977:10).

In 1978, the Region signed a ten-year contract with Tricil to operate SWARU. Tricil began with a major retrofit of the plant and by late 1979, SWARU was operating close to capacity (The Hamilton Spectator, October 6, 1979).

In 1982, Tricil again spent several hundred thousand dollars on a retrofit,

this time to up-grade pollution-control equipment. Area residents had been complaining of black soot from the stack which was covering outdoor pools, patios, laundry and cars (The Hamilton Spectator, February 9, 1982). Soon after, Tricil installed a turbine at the plant which would allow the generation of energy (in the form of steam) from waste. The electricity generated was sold to Ontario Hydro for $300,000 per year which would, theoretically, permit SWARU to operate at a profit (The Hamilton Spectator, November 22, 1982:A7).

Health concerns among area residents about the emissions from SWARU date back to at least 1976 (The Hamilton Spectator, September 27, 1978:8). In general, residents living near the plant complained about chronic fall-out of black ash which they attributed to the SWARU stack. It was particularly noticeable in the summer when people spent more time out of doors and had their windows open more often. Area residents complained of black soot on cars, pools, laundry, indoor furniture, and so on. They were also concerned about children breathing in the black soot. Residents complained to their council members as well as SWARU staff until, in 1980, Council requested the Ministry of the Environment to study the situation, determine the true source of the problem, and develop a way to eliminate the soot (The Hamilton Spectator, September 9, 1980:7). It was subsequently discovered that the ash coming from the SWARU stack contained dioxins; MOE assured area residents levels would not adversely affect health (The Hamilton Spectator, April 7, 1981:7; April 14, 1981:8). Four months later, Tricil officials

admitted that SWARU was indeed the source of the ash (The Hamilton Spectator, August 11, 1981:10). Soon after, Tricil received approval from the Region to up-grade the pollution control equipment at SWARU (The Hamilton Spectator, February 9, 1982:8). One year later, the MOE reported that residents living within 2.5 km of SWARU were being exposed to levels of dioxin which were double the provincial guidelines (The Hamilton Spectator, February 23, 1983:A1). Despite Ministry assurances of little health risk, a local university professor was quoted in the newspaper as saying that a substantial number of people could suffer adverse long-term health effects because of chemicals emitted from SWARU (The Hamilton Spectator, February 25, 1983:A7). Despite pleas from area residents and local aldermen, the plant stayed open and the request for a health study was denied (The Hamilton Spectator, March 2, 1983:A7). Area residents continued to work to have SWARU closed (The Hamilton Spectator, November 15, 1983:A7). In December of 1983, Hamilton City Council voted in favour of a request to Regional Council to have SWARU closed down and to commission a health study (The Hamilton Spectator, December 14, 1983:A1). Both requests were denied, citing evidence that emissions were well within Ministry guidelines (The Hamilton Spectator, January 24, 1984:A7). Instead, the Region allocated (along with the Province) another $12 million retrofit of the plant which would allow it to operate more efficiently and would cut dioxin emissions by 65% (The Hamilton Spectator, April 23, 1984). In the mean time, residents complaints of sooty fall-out continued (The Hamilton Spectator,

August 22, 1984). The retrofit was completed by November 20, 1986 and appeared to be successful in reducing dioxins and furans to *acceptable* levels. However, emissions of soot and hydrochloric acid remained a problem (The Hamilton Spectator, December 15, 1988:C2).

In September of 1989, the plant was shut-down for two-weeks to clean up a spill of PCB-laden oil; this was the second PCB spill in the plant's history (The Hamilton Spectator, September 30, 1989:B2). Tests were also being conducted at this time to determine the safety of burning waste from scrapped automobiles (The Hamilton Spectator, August 10, 1989:C2).

In April of 1991, a newly appointed NDP Environment Minister, Ruth Grier, announced a moratorium on incinerators in the Province and a review of five existing incinerators, including SWARU (The Hamilton Spectator, April 13, 1991:B1). The Minister felt incinerators were inconsistent with a policy of recycling and wanted to make sure recyclable materials were not being incinerated. The review concluded that SWARU required a $1.7 million dollar scrubber in the stack which would decrease emissions of hydrochloric acid (The Hamilton Spectator, July 10, 1991:B1). Health concerns among area residents were raised yet again subsequent to the announcement (The Hamilton Spectator, April 30, 1991:B1). In addition, newspaper accounts of SWARU's poor performance in comparison with other incinerators continued to portray SWARU in a poor light (The Hamilton Spectator, February 8, 1991:B4; May 15, 1991:B7).

4.2.11 SUMMARY AND CONCLUSIONS

Hamilton is a medium sized city located in the Golden Horseshoe of southern Ontario. The city's economic base is largely dependent upon manufacturing, with Stelco and Dofasco (steel manufacturers) being the two largest employers. In a recent quality of life survey (Peat Marwick 1989), Hamilton ranked lowest of all area municipalities on a community attractiveness index despite the availability of numerous wide ranging community amenities. Survey respondents felt that Hamilton had very high levels of: pollution, crime and population densities.

SWARU has been operating in the east end of the city since 1972. At times, SWARU has emitted ash, dioxins, furans and hydrochloric acid. Many times, area residents fought hard to have their concerns recognized by government and SWARU officials. A recent review of SWARU's performance by the Provincial Ministry of the Environment recommended that SWARU be fitted with a stack scrubber to reduce emissions of hydrochloric acid. Newspaper accounts of the review process indicate that area residents are once again concerned about the long-term health effects of SWARU's emissions.

The conditions present in Glanbrook which tend to enhance capacity to cope with stressful situations (e.g., population stability; rural context, social structure and lifestyle; and so on) are not present in Hamilton. Hamilton is an urban community characterized by a substantial blue-collar component in the work-force as well as several indicators of lower socio-economic status (high incidence of low-

income economic families, high unemployment, low average income, low average dwelling value). The sample characteristics of residents within the area immediately surrounding SWARU indicate a similar profile (Table 3.3).

The socio-demographic profile of this population implies greater susceptibility to environmental stress. For example, individuals of lower socio-economic status are more likely than middle and upper status individuals to develop symptoms of distress at any given exposure to stressful life experiences (e.g., environmental stress) (Kessler and Cleary 1980; Kessler 1982; Sorensen et al. 1987). Furthermore, the higher the level of stress, the greater the class differences in distress. In addition, the area immediately surrounding SWARU is a particularly transient one with a high proportion of renters in multiple-family dwellings. This represents a living situation which renders few opportunities for establishing social support networks in the community.

Conversely, concern over issues other than a specific environmental stressor often affects the perception of that stressor. For instance, it is difficult to feel concern about some ill-defined risk associated with an environmental stressor when day-to-day survival or keeping a job are of more immediate concern (Richardson et al. 1987). Reported levels of psychosocial impacts in the SWARU community may indeed be influenced by other issues in Hamilton: crime, high population densities, high levels of industrial pollution (see section 4.2.5) as well as poverty and unemployment.

Therefore, as in the case of Glanbrook, the psychosocial impacts reported in this community will reflect this diverse set of community dimensions which will in turn be associated with a range of impacts and responses.

4.3 COMMUNITY PROFILE OF THE TOWN OF MILTON

4.3.1 LOCATION

The Regional Municipality of Halton is located at the western end of Lake Ontario approximately half way between Hamilton and Toronto (Figure 3.1). Halton Region is made up of four area municipalities: the City of Burlington and the Towns of Milton, Oakville and Halton Hills. The recently approved Regional landfill will be centrally located in the Town of Milton between Highway 25 and First Line, approximately .5 km south of Britannia Road (Figure 3.1). The site is approximately 185 hectares in size.

4.3.2 ADMINISTRATION

Halton Region is administered by a Chairman (elected by Council) and 24 member Regional Council. Regional Council consists of the four mayors of each municipality as well as eight council members from Burlington, six from Oakville, four from Halton Hills and two from Milton. All area municipal councils are elected on a ward system. Milton Municipal Council consists of ten councillors plus the mayor (currently Gordon Krantz).

4.3.3 POPULATION

The population of Halton Region (1986 census) is 270,291 with a projected increase to 376,000 by the year 2006 under a medium growth scenario (Regional Municipality of Halton, Planning and Development Department 1986). The Town of Milton has the lowest population of all area municipalities within the Region with 31,918 inhabitants; this is projected to increase to 39,400 by the year 2006 under the medium scenario (Table 4.12). Age-specific projections indicate a decrease in the number of young people (0-19 years) and an increase in the number of older people (55-70+ years) (Regional Municipality of Halton, Department of Planning and Development, 1986).

TABLE 4.12

POPULATION PROJECTIONS, HALTON REGION, 1986-2006

AREA MUNICIPALITY	BASE POPULATION (1986)	LOW	MEDIUM	HIGH
BURLINGTON	116,270	151,700	154,700	164,200
OAKVILLE	86,695	125,000	136,400	155,500
MILTON	31,918	39,400	39,400	45,700
HALTON HILLS	35,408	45,500	45,500	53,900

Source: Regional Municipality of Halton, Department of Planning and Development (1986) Population Projections to Year 2006, Oakville, Ontario.

4.3.4 OFFICIAL PLAN DESIGNATIONS

The Regional Official Plan for Halton designates the site *Rural*. The Official Plan of the Town of Milton designates the site *Agriculture* and *Conservation and Hazard Lands*. The Plan states that, in all cases, "...agricultural activities shall be considered the preferred land use within the agricultural designation" (Walker Wright Young Associates Ltd 1985). Small sections of the north eastern and south western portions of the site are designated *Conservation and Hazard Lands*. A landfill is not a permitted use under these designations.

Lands bordering the site to the north, west and south are designated *Agriculture* in the Town of Milton Official Plan. Lands to the east are within the Parkway Belt Planning Area (Walker Wright Young Associates 1985).

Final approval of this site for the Halton Regional landfill required several planning amendments to both the Halton Region and Town of Milton Official Plans as well as a site-specific zoning amendment to remove the *agriculture* zoning designation.

The predominant land use in the study area (as well as on-site, previous to the landfill's approval) is agriculture. According to the Canada Land Inventory, the majority of the area is class 1 agricultural land with small pockets of class 3 land subject to limitations of topography and wetness (Canada Department of Forestry and Rural Development, Agricultural and Rural Development Act 1968). A review of potential land use conflicts completed as part of an environmental assessment

(Walker Wright Young Associates 1985) concluded that a moderate to high conflict exists with the Burlington Air Park located 3.5 km south of the site. The Air Park provides a base for some 95 aircraft, a flying school and an air cadet training centre. The potential conflict arises due to the birds (e.g., gulls) which are attracted to landfills and the related increased risk of incidents involving collisions with small aircraft. Transport Canada guidelines indicate that garbage dumps should not be located within 8 km of an airport (Walker Wright Young Associates 1985).

4.3.5 COMMUNITY AMENITIES

The Region maintains numerous parks, recreational harbours and conservation areas (Regional Municipality of Halton 1990). Burlington has over 600 acres of parkland, much of which borders Lake Ontario. The recently approved Burlington Beach Waterfront Park will consist of a harbour and various recreational facilities. Regional cultural and recreational facilities appear to be concentrated in Burlington and Oakville while Milton and Halton Hills have maintained a rural, small town atmosphere. Community amenities within the Town of Milton include the Halton Region Museum, the Halton County Radial Railway Museum and the Ontario Agricultural Museum (Table 4.13). In addition, recent Provincial initiatives will enhance public transit access to Milton (as well as Burlington and Georgetown) via the GO system of commuter buses and trains (Regional Municipality of Halton 1990).

TABLE 4.13 MILTON COMMUNITY FACILITIES	
FACILITIES	**NUMBER**
Recreation Centres	2
Golf Courses (Public)	3
Skating Rinks	1
Curling Club	1
Museums	3

4.3.6 INTEREST GROUPS

Milton has many service clubs (e.g., Lions, Optimists, Rotary clubs) as well as active youth groups (e.g., YM/WCA, Boy Scouts, Girl Guides). The community also has an active Chamber of Commerce. As the Milton site history indicates (Section 4.3.10), area residents are quite willing to become involved in community issues about which they have strong feelings.

4.3.7 ECONOMY

Halton residents enjoy a relatively high standard of living; Oakville was rated as having the second highest standard of living in Canada and Burlington the sixth (Regional Municipality of Halton 1990). Almost one-quarter of the Canadian manufacturing sector is located within a 100 mile radius of the Region of Halton (The Financial Post Information Service 1990). Halton is also at a crossroads of a rich market area and an interrelated transportation system of major highways,

railways, extensive trucking support, the St. Lawrence Seaway and international airports. Halton also provides a well educated labour force with extensive manufacturing, clerical and retail experience. The majority of the male population in Milton is employed in administrative and managerial positions, while the clerical field dominates female employment.

Milton was originally incorporated as a mill town and agriculture remains a key component of the town's economy (Regional Municipality of Halton 1989). Over 80% of the Region's 9,000 businesses have less than 10 employees while most of the large industrial manufacturing firms in the Region are concentrated in Burlington and Oakville (e.g., Ford Motor Company, the Region's largest employer, is located in Oakville) (Regional Municipality of Halton 1990). Of the largest 15 private sector employers in Halton, only two are located in Milton.

4.3.8 CENSUS DATA

When compared to Provincial averages, Milton residents have higher average incomes, higher average dwelling values, a higher percentage of owned dwellings and a lower incidence of low income families (Table 4.14). The majority of households consist of husband and wife families and over 70% of households have children. Further, Milton has more young people (< 14 years) and fewer older people (> 65 years) when compared to Provincial averages. This profile compares favourably with that of the Milton research sample (Table 3.3); that is, a high

percentage of home ownership and individuals with partners, a low percentage of low income households and high percentages of full- and part-time employment.

TABLE 4.14

SELECTED CENSUS (1986) CHARACTERISTICS, MILTON

CHARACTERISTIC	ONTARIO	MILTON
Total Population 1986	9,101,694	32,037
Total Population 1981	8,625,107	28,067
Proportion Male	49.1	50.9
Proportion < 14 yrs	20.5	26.2
Proportion > 65 yrs	10.9	6.6
Total # Occupied Dwellings	3,221,730	9,735
% Owned Dwellings	63.6	78.9
% Single Detached	57.4	71.7
% Husband-Wife Families	88.1	92.1
% No Children at Home	33.4	26.2
Average Dwelling Value	$104,063	$128,256
Average Household Income	$38,022	$46,480
Incidence of Low Income Economic Families	11%	4.4%
Completed High School	13.3	15.4
Total Unemployment Rate	6.8	4.0

Source: Statistics Canada (1986)

4.3.9 MEDIA

All sources of media communication available to Glanbrook and Hamilton residents are also available to Milton residents (see Section 4.1.9). In

addition, The Canadian Champion is published twice weekly in Milton and has a circulation of 9,800 (Boyden and Krol 1990).

4.3.10 SITE HISTORY

Halton's search for a landfill site began in 1972 (Table 4.15) prompted by the imminent closure of the then-operating Regional landfills slated for some time in 1977. A consultant's report was commissioned which, when completed two years later, suggested 6 candidate sites (The Hamilton Spectator, October 9, 1975:7). In 1976, the list was shortened to two preferred sites, the one in Milton and a Burlington site. At the time of the announcement, the Tremaine-Britannia Citizens Group (TBCG; named for the streets bordering the site) was formed to oppose the proposed Milton site. This group was supported by Milton municipal council who refused permission to the Region to test the Milton site for hydrogeologic suitability (The Hamilton Spectator, October 6, 1976:7). The TBCG was very active throughout the siting process; in addition to circulating a newsletter, the group sold memberships and held fund-raisers (bake sales, auction sales, dances, and so on) to pay lawyers and other technical experts.

In March of 1977, Regional Council passed a by-law stating that the Milton site would be the new landfill (The Hamilton Spectator, March 17, 1977:7). The TBCG took legal action in response to this announcement. On the advice of an environmental lawyer from Toronto, David Estrin, area residents served a writ on

TABLE 4.15

CHRONOLOGY OF MILTON SITE HISTORY

1972 Region commissions consultant's report to identify candidate landfill sites.

1974 Consultant's report identifies 6 candidate sites.

1976 Two preferred sites emerge: Burlington and Milton.

1977 Milton site deemed by Region as sole preferred site.

1977 TBCG sues Region; Supreme Court of Ontario quashes by-law recognizing Milton as the new Regional landfill.

1979 OMB grant approval of policy plan amendments which would make the by-law legal.

1981 Siting decision over-turned by cabinet; full environmental assessment required.

1983 Halton must now export 100% of its garbage as Regional landfills close.

1985 Environmental Assessment complete; hearings begin.

1987 Hearings complete; Milton chosen as the new landfill.

1989 TBCG, backed by Town of Milton, appeals the Environmental Assessment Board hearing to the Supreme Court of Ontario.

1990 Appeal denied.

1991 Construction begins.

Regional council claiming that the by-law was in contravention of existing planning policies and that a landfill would interfere with the enjoyment of their lands (The Hamilton Spectator, April 7, 1977:7). The Supreme Court of Ontario quashed the by-law (The Hamilton Spectator, April 20, 1977:7). As a result, the Region applied for zoning and official plan amendments which would render the by-law legal. The Town of Milton rejected approvals of the planning amendments so the Region appealed to the Ontario Municipal Board (The Hamilton Spectator, January 9, 1979:11). Despite the Town's defence that the site was prime agricultural land, the OMB decided in favour of the Region allowing the Milton site to be legally designated as the new Regional landfill (The Hamilton Spectator, June 19, 1979:10).

A legislative change in 1981, however, resulted in the decision being overturned by cabinet; a decree came from then Environment Minister Harry Parrott that Halton re-conduct a landfill search under the Environmental Assessment Act (as opposed to the Environmental Protection Act) (The Hamilton Spectator, February 10, 1981:10). This would mean many more years of search and study and many more millions of dollars spent. It was too late for Halton Region, however, as existing landfills began to close; by 1983, 100% of Halton's garbage was now being exported: half to Niagara Falls, Ontario and half to Niagara Falls, New York (The Hamilton Spectator, November 10, 1983).

After a lengthy environmental assessment process, four sites were presented to the Region as potential landfills. The number one preferred site at the

time was in Burlington; the Milton site was ranked second (The Hamilton Spectator, February 4, 1985:A8). As part of the environmental assessment process, a report on public concerns and issues was published (Myra Schiff Consultants Ltd 1984). Concerns raised by Milton residents spanned a variety of categories but often centred on potential impacts to surface and groundwater quality as well as agriculture in the area. As part of the environmental assessment process, concerns of area residents related to the proposed landfill were sought regarding agricultural land uses in and around the area. It appears that the most frequently cited concerns regarded adequate mitigation, compensation or prevention of potential contamination of groundwater and surface streams from landfill leachate. The concern is particularly with respect to potential hazards to livestock, which could affect the livelihood of area farmers (Ecological Services for Planning Ltd 1985). However, a census of area farms showed no livestock operations within 800 meters of the site (Ecological Services for Planning Ltd 1985). Rather, grain seems to be the dominant agricultural activity. Further, the landfill site was ranked regarding potential impacts on agricultural land use both on and around the site; it was ranked as having a *high* impact on long-term viability of on-site agricultural use, a *moderate* impact on land quality and large contiguous blocks of agricultural land, and a *low* impact on special farm enterprises (Ecological Services for Planning Ltd 1985). In short, Milton is seen as being a relatively stable agricultural area, ranked fifth out of six potentially suitable sites for the landfill in Halton on this criterion.

Residents reported that their concerns caused them a great deal of stress, anxiety and worry about the future. After 2 years of hearings which cost over $10m and saw over 50,000 pages of evidence (including presentations by twelve citizens groups), Milton was chosen as the preferred site for the Regional landfill.

The Tremaine-Britannia citizens group, backed by Milton Municipal Council, appealed this decision one last time to the Supreme Court of Ontario, hoping that the alternative Burlington site would be chosen; this appeal was denied in June of 1990. The site is now under construction and is scheduled to begin operating in the fall of 1992.

4.3.11 SUMMARY AND CONCLUSIONS

Milton is a small, rural community with a local economy based largely in agriculture. Halton Region enjoys a fairly high standard of living, as does Milton (evidenced in the Town's census characteristics). Despite the organized opposition of Milton Municipal Council, the Tremaine-Britannia Citizens Group, and their lawyers, the recently approved Halton Region landfill *will* be located in the Town of Milton.

Milton's rural character as well as its socio-demographic profile have potential implications for explaining how residents reacted to this environmental stressor and how they may react in future. As in the case of Glanbrook, the stability of the population; the rural context, social structure and lifestyle; and the

conventional family structure all lead to the potential for well-developed social and community support networks and therefore an enhanced capacity to cope with an environmental stressor.

Also similar to Glanbrook, the projected aging of the population may lead to decreased susceptibility to psychosocial impacts while other dimensions of the socio-demographic structure imply greater susceptibility: the high percentage of households with children, the high proportion of home owners, and the large role agricultural land use plays in the local economy. While low socioeconomic status is typically associated with increased levels of distress (Kessler and Cleary 1980; Kessler 1982), the strong and cohesive response to the proposed landfill in Milton may have been sparked by area residents who could well afford to retain lawyers and consultants and had enough education to organize and understand the process.

4.4 CONCLUSIONS

The conceptual framework which guides this research (Figure 2.4) postulates that psychosocial impacts are mediated by the wider community context within which they occur. This assertion is supported in the literature (Edelstein 1988; Eyles et al. 1990; Johnson and Covello 1987; Sorensen et al. 1987). The community profiles presented in this chapter point toward some of the implications of community context for the experience, prevalence and determination of psychosocial impacts. For example, in Glanbrook people are attracted to the area

by low housing prices (relative to most of the Region), the perceived quality of community life, and the rural environment. For newer residents, these amenities may overshadow potential psychosocial impacts while long-time residents present at the time of the siting may experience higher levels of impacts. In Hamilton, and particularly in the east-end community around SWARU, there are strong employment and economic ties to the manufacturing industries in the area. Residents may therefore be more accustomed to and tolerant of noxious land uses and pollution. In the case of Milton, a large part of the economy is based on agriculture. This, in addition to the traditional family structure of the community and the generally high socioeconomic profile, implies potential susceptibility to psychosocial impacts.

The information contained in these community profiles therefore has implications for the interpretation of the empirical findings of the research. This applies to both the description of the prevalence of psychosocial impacts (Chapter 5) and the analysis of the determinants of impacts and actions (Chapter 6).

CHAPTER 5

PREVALENCE OF PSYCHOSOCIAL IMPACTS

5.1 INTRODUCTION

The next two chapters present the results of the epidemiologic survey. The analysis is organized to address each of the research objectives in turn. This chapter uses descriptive statistics to address the first objective:

> ***1. To determine the prevalence of psychosocial impacts among exposed individuals.***

Recall that for the purposes of this research, *psychosocial impacts* have been defined as:

> the complex of dysfunction, distress and disability manifested in a wide range of social, psychological and behavioural outcomes in individuals, groups and communities as a consequence of actual *or perceived* environmental contamination.

Four specific indicators of general psychosocial health and well-being were used in the survey instrument (Section 3.3; Appendix 2). The construct *general health status* was measured via indicators of perceived health status and satisfaction. *Emotional distress* was measured via the GHQ-20. Emotional distress as manifested

in *somatic complaints* was measured via the somatic symptom checklist (modified as per Section 3.3) from the SCL-90. Finally, the potential confounder, *stressful life events* was measured via selected items from the Holmes and Rahe (1967) scale.

Three site-specific constructs were used within the epidemiologic survey to measure the component *psychosocial impacts* (Appendix 2). As previously explained (Section 3.3), all outcomes except *action* were determined using open-ended questions. This allowed respondents to report site-related experience(s) in the context of their everyday lives. The first construct measured was *concern*, with a particular emphasis on health-related concern. Indicators of concern included: whether measures of concern were solicited or not; type of concern mentioned; intensity of concern (slight, moderate, extreme); and effects of concern(s) on everyday life. Questions related to conern were asked only of respondents aware of the site (Section 3.3). Not all aware respondents reported site-related concerns (Section 5.3.1). This is consistent with the theoretical framework which guides the research (Section 2.2.2). That is, at the stage of primary appraisal, an individual appraises an environmental stressor in order to determine whether ***or not*** it poses a threat, harm or challenge. It follows, therefore, that awareness does not *necessarily* result in concern.

The second construct used was *effects*. Indicators of effects included: effects of concerns on everyday life and reported site-related health effects.

The third construct used was *actions* taken in response to site-related

concerns. As an outcome variable, actions moves the analysis beyond the realm of **impacts of** exposure to **responses to** exposure and may be considered an indicator of action-focused coping (Section 2.2.2). The indicators used to measure actions included: intention to move from the area because of the site and any actions taken toward moving; and, actions taken in response to site concerns.

5.2 PSYCHOSOCIAL HEALTH AND WELL-BEING

Within the psychosocial impact literature, the exposures typically examined have been hazardous/toxic in nature; for example, Three Mile Island, hazardous waste disposal sites, chemically polluted water supplies, and so on (Taylor et al. 1989). Furthermore, measures of general psychosocial health and well-being used in these studies (e.g., SCL-90) have consistently been used as *outcome* measures (Fleming et al. 1982; Gibbs 1986; Horowitz and Stefanko 1989; Prince-Embury and Rooney 1991). The exposures examined in the current research are atypical in that they are chronic, non-hazardous and represent both actual and perceived exposures. The role for measures of general psychosocial health and well-being in this situation is less clear; that is, whether they should be considered as outcomes *per se* or as mediators of the relationship between exposures and more site- and situation-specific psychosocial outcomes (e.g., concern, health concern, effects, actions). These issues will be re-visited in Section 5.2.5, subsequent to a discussion of the evidence from the epidemiologic survey.

5.2.1 GENERAL HEALTH STATUS

Respondents were asked two questions regarding their general health status. First, when asked to compare themselves with other people their own age, the majority of respondents at each site rated their health as very good or excellent (Table 5.1). These self-ratings of health are similar to those obtained in a national health survey (25% 'excellent' and 36% 'very good'; Health and Welfare Canada 1987).

TABLE 5.1

PERCEIVED HEALTH STATUS

RATING	SWARU (n=254)	GLANBROOK (n=255)	MILTON (n=187)
Excellent	28%	36%	37%
Very good	38%	36%	37%
Good	24%	20%	18%
Fair	6%	7%	6%
Poor	4%	1%	2%
TOTAL	100%	100%	100%

Second, when asked about satisfaction with health in general, a large percentage of the sample at each of the three sites rated themselves as 'very satisfied' while a very small percentage rated themselves as 'not at all satisfied' (Table 5.2).

Overall, therefore, the samples at each of the three sites have relatively high ratings of perceived health status and are generally satisfied with their health.

TABLE 5.2

SATISFACTION WITH HEALTH

RATING	SWARU (n=254)	GLANBROOK (n=255)	MILTON (n=187)
Very satisfied	45%	53%	51%
Somewhat satisfied	42%	38%	41%
Not too satisfied	10%	7%	5%
Not at all satisfied	3%	2%	3%
TOTAL	100%	100%	100%

5.2.2 EMOTIONAL DISTRESS

Emotional distress was the construct measured by the GHQ-20 (Appendix 1, Section D). The response categories on the GHQ items (better than usual, same as usual, worse than usual, much worse than usual, over the two weeks prior to the survey) were scored 0-0-1-1 as recommended by Goldberg (1972) and McDowell and Newell (1987). The alpha reliability coefficient for this scale was .85. Original published reliability for the self-administered GHQ-20 is .90 (McDowell and Newell 1987). A score of 4 or more on the GHQ-20 indicates a probable case of emotional distress (Goldberg, 1972; Ford et al. 1989, Malt 1989, Shapiro et al. 1985). The percentage of the population at each site with a score of 4+ is highest at SWARU (17%), next highest at Glanbrook (13%), and lowest at Milton (9%) (Table 5.3).

TABLE 5.3

PERCENTAGES OF SAMPLE GROUPS WITH GHQ-20 SCORES ABOVE THE CUT-POINT (4+)

SITE	ZONE 1	ZONE 2	ZONE 3	ZONE 4	BY SITE
SWARU	16	27	14	11	17
GLANBROOK	14	12	11	15	13
MILTON	7	3	12	13	9
BY ZONE	13	15	12	13	13*

* % above the cut-point for the total sample

Shapiro and others (1985) found a prevalence for probable emotional distress of 16% (n=550) in a general population in Eastern Baltimore using the GHQ-20. Ford and others (1989) found 24.9% prevalence of probable emotional distress in a similar general population (n=531). Malt (1989) found a prevalence rate of 45%. However, this was in a population of accidentally injured adults (n= 110) where one would naturally expect a higher rate of emotional distress.

Prevalence rates found using longer versions of the instrument in the general populations range from 10% (Stanley and Gibson 1985) to 30% (Huppert et al. 1988). McFarlane's (1987) study of a natural disaster in an Australian sample using the GHQ-12 found a prevalence rate of about 23%.

This comparison with other studies suggests that these results are towards the lower end of the range reported for general population samples. To further investigate these results, bivariate relationships were analyzed with sociodemographic

characteristics plausibly related (on the basis of the literature) to levels of emotional distress at each site. As indicated by the shaded cells in the tables, few significant relationships were uncovered (Tables 5.4, 5.5, 5.6). Only 9 of 72 relationships were significant ($p < 0.05$) when 3 or 4 would be expected due to chance alone. At SWARU, GHQ score decreased with age and length of residence. At Glanbrook, for the cut-point measure only, GHQ was higher for those who were separated, those who had no children, and those in other or part-time employment. This finding may point to the interrelationship between social support and emotional distress. At Milton, GHQ scores decreased with age and length of residence in the area (MRS) and at current address (cut-point).

Notice that 'zone' (an indicator of exposure as measured by distance from the site) was not related in the bivariate analyses to either measure of GHQ score at any of the sites. A stronger test for a zone effect comes from the logistic regression analysis reported in Chapter 6.

Overall, therefore, it would appear that levels of emotional distress among the three populations sampled for this study, as measured by the GHQ-20, are not above normal when compared to other uses of this instrument in general populations. Further, there are very few statistically significant relationships between sociodemographic factors and GHQ scores.

TABLE 5.4

RELATIONSHIPS[1] BETWEEN SOCIODEMOGRAPHIC CHARACTERISTICS AND GHQ-20 (MEAN RAW SCORE (MRS) AND ABOVE/BELOW THE 4+ CUT-POINT) AT SWARU

	MRS	4+	COMMENTS
GENDER	K-S=.97[2]	X^2=.72	
AGE	tau=-.08[3]	t=2.83**	**as age increases, GHQ score decreases**
MARITAL STATUS	K-W=3.06[4]	X^2=5.05	
CHILDREN < 5 yrs	K-S=1.07	X^2=1.49	
INCOME	tau=.05	U=4353.5	
EDUCATION	tau=.01	U=2793.0	
EMPLOYMENT	K-W=1.58	X^2=4.79	
DWELLING TYPE	K-W=2.32	X^2=1.00	
DWELLING TENURE	K-S=.97	X^2=2.07	
LENGTH OF RESIDENCE AT CURRENT ADDRESS	tau=-.10*	t=1.70	**as length increases, GHQ score decreases**
LENGTH OF RESIDENCE IN THE AREA	tau=-.04	t=1.00	
ZONE	K-W=4.19	X^2=6.4	

notes:

[1] * $p < .05$
** $p < .01$
*** $P < .001$

[2] when the sociodemographic variable was dichotomous (e.g., gender: male/female), the Kolmogorov-Smirnov test was used (as opposed to a t-test) given that the distribution of the MRS for the GHQ was significantly skewed toward the lower end.

[3] when the sociodemographic variable was continuous (e.g., age), tau was selected as the test statistic (over a Pearson Correlation) for the reason cited in note 2, above.

[4] when the sociodemographic variable was polychotomous (e.g., marital status), the Kruskal-Wallis test statistic was used (as opposed to an F statistics for the reason cited in note 2, above.

TABLE 5.5

RELATIONSHIPS[1] BETWEEN SOCIODEMOGRAPHIC CHARACTERISTICS AND GHQ-20 SCORE (MEAN RAW SCORE (MRS) AND ABOVE/BELOW THE 4+ CUT-POINT) AT GLANBROOK

	MRS	CUT-POINT	COMMENTS
GENDER	K-S=.34[2]	X^2=.64	
AGE	tau=-.01[3]	t=.17	
MARITAL STATUS	K-W=5.61[4]	X^2=11.70*	% above cut-point: separated = 100% divorced = 25% never married = 24% widowed = 17% married = 11%
CHILDREN < 5 yrs	K-S=.87	X^2=4.00*	% above cut-point: no = 15% yes = 4%
INCOME	tau=-.04	U=3541.5	
EDUCATION	tau=-.05	U=2968.5	
EMPLOYMENT	K-W=6.68	X^2=15.87**	% above cut-point: other = 34% part-time = 23% homemaker = 15% retired = 9% full-time = 8%
DWELLING TYPE	K-W=.09	X^2=.51	
DWELLING TENURE	K-S=.41	X^2=.76	
LENGTH OF RESIDENCE AT CURRENT ADDRESS	tau=.01	t=-.09	
LENGTH OF RESIDENCE IN THE AREA	tau=.02	t=.19	
ZONE	K-W=1.31	X^2=.59	

notes:

[1] * $p < .05$
** $p < .01$
*** $P < .001$

[2] when the sociodemographic variable was dichotomous (e.g., gender: male/female), the Kolmogorov-Smirnov test was used (as opposed to a t-test) given that the distribution of the MRS for the GHQ was significantly skewed toward the lower end.

[3] when the sociodemographic variable was continuous (e.g., age), tau was selected as the test statistic (over a Pearson Correlation) for the reason cited in note 2, above.

[4] when the sociodemographic variable was polychotomous (e.g., marital status), the Kruskal-Wallis test statistic was used (as opposed to an F statistics for the reason cited in note 2, above.

TABLE 5.6

RELATIONSHIPS[1] BETWEEN SOCIODEMOGRAPHIC CHARACTERISTICS AND GHQ-20 (MEAN RAW SCORE (MRS) AND ABOVE/BELOW THE 4+ CUT-POINT) AT MILTON

	MRS	CUT-POINT	COMMENTS
GENDER	K-S=1.02[2]	X^2=.03	
AGE	tau=-.11[3]	t=.94	**as age increases, GHQ score decreases**
MARITAL STATUS	K-W=2.45[4]	X^2=3.93	
CHILDREN < 5 YRS	K-S=.60	X^2=1.01	
INCOME	tau=-.01	U=1209.5	
EDUCATION	tau=.09	U=913.5	
EMPLOYMENT	K-W=4.02	X^2=8.68	
DWELLING TYPE	K-W=2.65	X^2=.95	
DWELLING TENURE	K-S=.24	X^2=.25	
LENGTH OF RESIDENCE AT CURRENT ADDRESS	tau=-.04	t=2.12*	**as length increases, GHQ score decreases**
LENGTH OF RESIDENCE IN THE AREA	tau=-.10*	t=.94	**as length increases, GHQ score decreases**
ZONE	K-W=.23	X^2=3.58	

notes:

[1] * $p < .05$
** $p < .01$
*** $P < .001$

[2] when the sociodemographic variable was dichotomous (e.g., gender: male/female), the Kolmogorov-Smirnov test was used (as opposed to a t-test) given that the distribution of the MRS for the GHQ was significantly skewed toward the lower end.

[3] when the sociodemographic variable was continuous (e.g., age), tau was selected as the test statistic (over a Pearson Correlation) for the reason cited in note 2, above.

[4] when the sociodemographic variable was polychotomous (e.g., marital status), the Kruskal-Wallis test statistic was used (as opposed to an F statistics for the reason cited in note 2, above.

5.2.3 SOMATIC COMPLAINTS

The 12-item symptom checklist taken from the SCL-90 was used to measure distress as manifest in somatic symptoms. Four items relating to sleeping and eating disorders as well as rashes and other skin conditions were appended to the sub-scale. Respondents rated how bothered they had been by a symptom over the past 2 weeks on a 5-point scale from 0, 'not at all bothered' to 4, 'extremely bothered'. The alpha reliability coefficient was .78 for the original 12-item scale and .81 for the 16-item expanded scale as compared to an original alpha of .86 (Derogatis et al. 1973).

Mean scale scores on the 16 item version were calculated (Table 5.7) for purposes of comparison with population norms. Derogatis (1977) generated a normalized mean score of .36 for non-patient normals (both sexes) on the somatic sub-scale. Derogatis' normalizing sample was similar to the sample groups used in this study with respect to both age and sex (mean age, 46 years; 51% male, 49% female). The shaded cells in the table indicate values above the .36 cut-point.

Clearly, the majority of the sample groups in this study scored below the normalized cut-point. However, all four zones at the SWARU site scored above the cut-point. This may be explained by the lower levels of socioeconomic status which characterize this sample group when compared with Glanbrook and Milton (e.g., lower levels of income, education, full-time employment, home ownership; cf Table 3.3) as individuals of lower socioeconomic status have been shown to experience

TABLE 5.7

RAW MEAN SCALE SCORES ON THE (MODIFIED) SCL-90 SOMATIC SUB-SCALE

SITE	ZONE 1	ZONE 2	ZONE 3	ZONE 4	BY SITE
Swaru	0.37	0.44	0.40	0.38	0.39
Glanbrook	0.28	0.27	0.31	0.32	0.30
Milton	0.46	0.30	0.29	0.22	0.31
BY ZONE	0.36	0.34	0.33	0.32	.34*

* grand mean for total sample

greater levels of emotional distress and poor physical health (Cassel 1976; Kessler 1982; Kessler and Cleary 1980). In addition, individuals at SWARU are less likely than those at the other two sites to have partners and/or young children; perhaps the inverse relationship shown between emotional distress (as measured by the GHQ-20) and these characteristics (cf Section 5.2.2) holds true in this instance.

At Milton, the sample group which lives in zone 1, closest to the (proposed) site, also scored above the cut-point. Later results indicate whether this higher level of emotional distress corresponds with high levels of site-specific psychosocial impacts (Section 5.3).

An alternative method of investigating the prevalence of emotional distress as measured in this manner is to examine the percentage of the sample groups which scored above the .36 cut-point, broken down by site and zone (Table 5.8). While the overall prevalence remains highest at SWARU, the prevalence

across zones remains fairly consistent both here and at Glanbrook; that is, no pattern emerges from the data. At Milton, however, almost one-half (48%) of the sample in the closest zone scored above the cut-point. In addition, there is a clear gradient in the data as one moves from zone 1, through zone 2 (32%) and zone 3 (31%) to the furthest zone, 4 (21%).

TABLE 5.8

PERCENTAGES OF SAMPLE GROUPS ABOVE THE CUT-POINT (.36) ON THE (MODIFIED) SOMATIC SUB-SCALE OF THE SCL-90

SITE	ZONE 1	ZONE 2	ZONE 3	ZONE 4	BY SITE
SWARU	38	38	40	38	38
GLANBROOK	31	25	37	29	31
MILTON	48	32	31	21	33
BY ZONE	38	31	36	30	34*

* % high score for total sample

Uses of the somatic sub-scale of the SCL-90 in the general population are rare in the published literature. Buckelew and others (1986) reported the following mean scores for alternative population sub-groups: pain patients, 1.44; psychiatric in-patients, .92; hospital employees, .47. Melick and Logue (1985-86) found high mean scores (1.6) for women over 65 years of age who had been exposed to an environmental disaster (flood). The comparison of these sample groups with such alternative cut-points would (indeed, did) reveal little additional information.

Uses of the somatic sub-scale within the psychosocial literature are also rare. When the SCL-90 is used, it is often reported as the global symptom measure of all nine constructs (e.g., Prince-Embury and Rooney 1991). Further, when the somatic sub-scale is used explicitly, raw data are not reported (e.g., Horowitz and Stefanko 1989) making comparison with the current sample impossible. One useful study within the psychosocial literature is that by Baum, Gatchel and Schaeffer (1983) who use all nine sub-scales but report group means for each one. Individuals living within five miles of the Three Mile Island nuclear power plant three years after the accident had a mean score of **.55** on the somatic sub-scale of the SCL-90. This is in comparison with a control group living approximately 20 miles away with a mean score of **.24**, a control group living in a community exposed to a coal-fired electricity generating plant (**.29**) and a community living in the vicinity of an undamaged nuclear plant (**.30**). Thus, the sample groups in the current study have mean scores not dissimilar to the control group scores in the study by Baum, Gatchel and Schaeffer (1983). The only sub-group which has a score approaching that of the sub-group exposed to TMI is Milton, zone 1 (Table 5.7). This comparison is particularly interesting given the significant difference in the nature of the two exposures.

Overall, therefore, the scores for *most* groups in this sample are below normalized scores. To further investigate these findings, a series of bivariate analyses was generated at each site with sociodemographic variables plausibly related (on the

basis of the literature) to this emotional distress construct. As with the GHQ, very few significant relationships emerged from this analysis (cf the shaded cells in Tables 5.9, 5.10 and 5.11). The only significant relationship at Glanbrook was between both measures of the SCL-90 (Mean Raw Score (MRS) and the cut-point measure) and education (Table 5.10) such that, as education increases, SCL-90 score decreases. This is consistent with Horowitz and Stefanko's (1989) findings in a population sample exposed to a toxic waste landfill in California.

Gender was significantly related to MRS and the cut-point measure at SWARU and the cut-point measure only at Milton, with females having higher scores. This is again consistent with Horowitz and Stefanko's (1989) findings. Employment was significantly related to the cut-point measure at Milton (Table 5.11); homemakers had the highest scores, followed by part-time then full-time employees, other and then retired, in that order. Dwelling type and tenure were both related to the cut-point measure at SWARU (Table 5.9). Apartment dwellers had the highest percentage above the cut-point followed by those living in attached housing followed by those living in detached housing. Further, renters scored above the cut-point more often than owners. At Milton (Table 5.11), the likelihood of scoring above the cut-point decreased with increased length of residence.

5.2.4 STRESSFUL LIFE EVENTS

A potential confounder of the measurement of psychosocial health and

TABLE 5.9

RELATIONSHIPS[1] BETWEEN SOCIOCEMOGRAPHIC CHARACTERISTICS AND SCL-90 SOMATIC SUB-SCALE SCORE (MEAN RAW SCORE (MRS) AND ABOVE/BELOW THE .36 CUT-POINT) AT SWARU

	MRS	CUT-POINT	COMMENTS
GENDER	K-S=1.84**[2]	X^2=7.05**	MRS, female > male % above cut-point: female = 46% male = 30%
AGE	tau=-.05[3]	t=.47	
MARITAL STATUS	K-W=4.13[4]	X^2=5.18	
CHILDREN < 5 YRS	K-S=.80	X^2=1.70	
INCOME	tau=-.04	U=5156.5	
EDUCATION	tau=-.07	U=6720.0	
EMPLOYMENT	K-W=2.29	X^2=3.33	
DWELLING TYPE	K-W=5.73	X^2=7.68*	% above cut-point: apartment = 52% attached = 40% detached = 31%
DWELLING TENURE	K-S=1.30	X^2=4.96*	% above cut-point: rent = 46% own = 32%
LENGTH OF RESIDENCE AT CURRENT ADDRESS	tau=-.07	t=1.58	
LENGTH OF RESIDENCE IN THE AREA	tau=-.07	t=1.48	
ZONE	K-W=.43	X^2=.13	

notes:

[1] * $p < .05$
** $p < .01$
*** $P < .001$

[2] when the sociodemographic variable was dichotomous (e.g., gender: male/female), the Kolmogorov-Smirnov test was used (as opposed to a t-test) given that the distribution of the MRS for the SCL-90 was significantly skewed toward the lower end.

[3] when the sociodemographic variable was continuous (e.g., age), tau was selected as the test statistic (over a Pearson Correlation) for the reason cited in note 2, above.

[4] when the sociodemographic variable was polychotomous (e.g., marital status), the Kruskal-Wallis test statistic was used (as opposed to an F statistics for the reason cited in note 2, above.

TABLE 5.10

RELATIONSHIPS[1] BETWEEN SOCIODEMOGRAPHIC CHARACTERISTICS AND SCL-90 SOMATIC SUB-SCALE SCORES (MEAN RAW SCORE (MRS) AND ABOVE/BELOW THE .36 CUT-POINT) AT GLANBROOK

	MRS	CUT-POINT	COMMENTS
GENDER	K-S=1.04[2]	X^2=2.50	
AGE	tau=-.04[3]	t=1.25	
MARITAL STATUS	K-W=6.09[4]	X^2=4.18	
CHILDREN < 5 YRS	K-S=.76	X^2=.16	
INCOME	tau=-.03	U=5227.0	
EDUCATION	tau=-.08*	U=5756.5*	**as education increases, SCL-90 score decreases**
EMPLOYMENT	K-W=2.66	X^2=.36	
DWELLING TYPE	K-W=.11	X^2=.00	
DWELLING TENURE	K-S=.66	X^2=2.06	
LENGTH OF RESIDENCE AT CURRENT ADDRESS	tau=-.01	t=1.12	
LENGTH OF RESIDENCE IN THE AREA	tau=-.06	t=1.22	
ZONE	K-W=.10	X^2=2.13	

notes:

[1] * $p < .05$
** $p < .01$
*** $P < .001$

[2] when the sociodemographic variable was dichotomous (e.g., gender: male/female), the Kolmogorov-Smirnov test was used (as opposed to a t-test) given that the distribution of the MRS for the SCL-90 was significantly skewed toward the lower end.

[3] when the sociodemographic variable was continuous (e.g., age), tau was selected as the test statistic (over a Pearson Correlation) for the reason cited in note 2, above.

[4] when the sociodemographic variable was polychotomous (e.g., marital status), the Kruskal-Wallis test statistic was used (as opposed to an F statistics for the reason cited in note 2, above.

TABLE 5.11

RELATIONSHIPS[1] BETWEEN SOCIODEMOGRAPHIC CHARACTERISTICS AND SCL-90 SOMATIC SUB-SCALE SCORE (MEAN RAW SCORE (MRS) AND ABOVE/BELOW THE .36 CUT-POINT) AT MILTON

	MRS	CUT-POINT	COMMENTS
GENDER	K-S=1.23[2]	X^2=6.24*	% above cut-point: female = 41% male = 24%
AGE	tau=-.05[3]	t=.74	
MARITAL STATUS	K-W=4.34[4]	X^2=3.72	
CHILDREN < 5 YRS	K-S=.51	X^2=.14	
INCOME	tau=-.08	U=2286.0	
EDUCATION	tau=-.02	U=3526.0	
EMPLOYMENT	K-W=8.2	X^2=11.96*	% above cut-point: homemaker = 67% part-time = 53% full-time = 29% other = 27% retired = 24%
DWELLING TYPE	K-W=3.26	X^2=1.99	
DWELLING TENURE	K-S=.73	X^2=.05	
LENGTH OF RESIDENCE AT CURRENT ADDRESS	tau=-.03	t=1.57	
LENGTH OF RESIDENCE IN THE AREA	tau=-.07	t=2.15*	as length increases, SCL-90 decreases
ZONE	K-W=5.58	X^2=7.4	

notes:

[1] * $p < .05$
** $p < .01$
*** $P < .001$

[2] when the sociodemographic variable was dichotomous (e.g., gender: male/female), the Kolmogorov-Smirnov test was used (as opposed to a t-test) given that the distribution of the MRS for the SCL-90 was significantly skewed toward the lower end.

[3] when the sociodemographic variable was continuous (e.g., age), tau was selected as the test statistic (over a Pearson Correlation) for the reason cited in note 2, above.

[4] when the sociodemographic variable was polychotomous (e.g., marital status), the Kruskal-Wallis test statistic was used (as opposed to an F statistics for the reason cited in note 2, above.

well-being as impacted by environmental exposure is stressful life events (e.g., marriage, divorce, job loss, and so on). Indeed, Radloff (1977) found them to be positively correlated with levels of depression. Therefore, the experience of stressful life events was documented explicitly in the epidemiologic survey in order to control for this potential confounder. These were documented through the inclusion of selected items from the Critical Life Events Scale (Holmes and Rahe 1967).

Respondents were asked whether they had experienced any of these stressful life events in the 12 months prior to survey adminstration (Table 5.12). Clearly, the most often reported event at all three sites was being worried about anyone close, for any reason. This is not surprising given the very general nature of the item. And, as noted, this item was not part of the original Holmes and Rahe (1967) scale.

The event reported with the next highest frequency, at all three sites, was the death of anyone close other than a spouse/partner. Again this is not surprising given the generality of the item and the potential pools of relatives/acquaintances upon which people could draw when responding.

In general, the highest percentages of occurrence for all but the final event were reported at the SWARU site; Glanbrook and Milton percentages were not only lower but comparable, relative to SWARU. As previously reported, measures of emotional distress were also highest at SWARU (Sections 5.2.2 and 5.2.3). Given the relatively high percentages of reported stressful life events,

TABLE 5.12

PERCENTAGES OF SAMPLE GROUPS REPORTING STRESSFUL LIFE EVENTS IN THE 12 MONTHS PRIOR TO SURVEY ADMINISTRATION

EVENT	SWARU (n=254)	GLANBROOK (n=255)	MILTON (n=187)
Job loss	9%	5%	3%
Divorce/separation from spouse/partner	8%	2%	4%
Serious illness	11%	7%	9%
Death of spouse/partner	3%	2%	2%
Death of anyone close, other than above	30%	25%	17%
Worry over anyone close[1]	51%	50%	51%

notes:

[1] this final item, "is there anyone close to you who you have been worried about, for any reason, over the past twelve months?" was not taken from the Holms and Rahe (1967) scale but was added by the reviewers of the epidemiologic survey instrument as an item deserving of inclusion.

therefore, one must be cautious about attempting to link reported levels of emotional distress with exposure to the study site. Conversely, the relatively low percentages of reported stressful life events at Glanbrook and Milton indicate less of a potential confounding role at these two sites.

5.2.5 ROLE FOR GENERAL PSYCHOSOCIAL HEALTH AND WELL-BEING

Overall, for all three sites, scores on the general psychosocial health and well-being measures are similar to those reported for 'normal' populations. The highest levels of emotional distress, as measured by the GHQ-20, were reported by

the SWARU sample (Table 5.3). The highest levels of emotional distress as measured by the (modified) SCL-90 somatic sub-scale were also reported by the SWARU sample (with one exception; Table 5.7). As previously discussed, however, the SWARU sample also reported the highest percentages of stressful life events occurring in the twelve months prior to the survey. Therefore, caution is necessary in linking reported emotional distress with exposure to the study site.

The one exception to this general pattern of reported emotional distress is the high raw mean scale score on the (modified) SCL-90 somatic sub-scale in zone one at Milton. This may be indicative of a true exposure-outcome relationship, particularly given the clear gradient of decreasing prevalence of SCL-90 scores above the normalized cut-point as one moves away from this study site (Table 5.8). This is an important finding given the nature of the (perceived) exposure at the Milton site. A stronger test of the zone effect is however provided by the logistic regression analysis (Chapter 6).

More generally, the reported levels of psychosocial health and well-being among these samples may be explained in two (inter-related) ways. The first is related to the period of reporting. That is, for both the GHQ and the SCL-90, respondents are asked to report feelings and symptoms which occurred in the ***two weeks prior to the survey***. In the cases of SWARU and Glanbrook, where the sites have been operating for 20 and 10 years, respectively, there is little reason to expect elevated levels of emotional distress for the period of reporting. This, in turn, may

be related to population mobility; that is, those who were residents at the time of the siting (who may have indeed experienced higher levels of emotional distress) may have already moved away from the area and those who have subsequently moved in have done so with the full knowledge of the site's operation and have therefore learned to cope with its existence. While the siting process at Milton has been on-going for almost 20 years, there is little reason to suspect great population mobility until the very recent past when the site received final approval. The survey was conducted very soon after approval was granted and this may be why we see slightly higher levels of distress at this site (although not as high as SWARU).

The second reason may be related to the characteristics of the sites themselves. They are non-hazardous, unlike the typical exposures found investigated in the psychosocial literature (e.g., Three Mile Island, Love Canal, etc.). As previously discussed (Section 5.2), when these exposures have been investigated via the use of standardized measures of distress like the ones used here, they have typically been used as *outcome* measures. The different type of exposure under study in combination with the generally low levels of emotional distress uncovered in these samples may point to the usefulness of measures of psychosocial health and well-being not as *outcome* measures but as mediators of the relationship between exposures and more site- and situation-specific psychosocial outcomes (e.g., concern, health concern, effects, actions). This is how they have been operationalized in the multivariate analyses which follow in Chapter 6. Of course, it remains to be seen,

with respect to cause-and-effect linkages, whether psychosocial health and well-being mediate site- and situation-specific outcomes *or* if site- and situation-specific outcomes mediate psychosocial health and well-being. At this point in the analysis, either is possible. This question will be re-visited in the following chapter.

5.3 SITE- AND SITUATION-SPECIFIC PSYCHOSOCIAL IMPACTS

As previously outlined, three site-specific constructs were used within the epidemiologic survey to measure the component *psychosocial impacts* (Appendix 2): *concern*, with a particular emphasis on health-related concern; *effects*; and *actions* taken in response to site-related concerns. As an outcome variable, actions moves the analysis beyond the realm of **impacts of** exposure to **responses to** exposure and may be considered an indicator of coping. The prevalence of each of these outcome measures will be discussed in turn.

5.3.1 CONCERN

Several measures of *concern*, both solicited and unsolicited, were employed in the survey (Appendix 2). These are related to the level, type and intensity of concern reported. The prevalence of each measure will be reported in turn. In addition, correlations between measures of concern and sociodemographic variables were examined as a first step toward understanding the determinants of site-specific psychosocial impacts.

At the outset, respondents were asked what they like and dislike about the area where they live. Up to three mentions were allowed. The data on dislikes provide a measure of *unsolicited site concern* as the interviewer had not yet made any mention of the site. If any dislike mentioned was related to the site, a respondent was deemed to have expressed *unsolicited site concern.* Frequencies (Table 5.13) indicate relatively low levels of site-related concerns when measured this way, implying perhaps that site does not figure as sufficient an issue in the local area to be volunteered.

There is evidence of variation in concern by site and zone. Site mentions are highest for Glanbrook (14%) followed by Milton (10%) and SWARU (5%). This may reflect one of a number of factors: the visibility of the sites (landfills vs incinerator); the amount of media coverage each site has received in the recent past; the setting (rural vs urban); and/or the substantial variation in housing tenure between sites (i.e., a much higher proportion of renters at the SWARU site who therefore have less of a stake in their area). There is also some evidence of a distance gradient of unsolicited site concern. The clearest example of this is at the Milton site with 18% of respondents in the closest zone reporting the site as a dislike about the area where they live; 11% of the respondents in zone 2; 7% in zone 3 and 4% in zone 4.

When 'site' is ranked with respect to other characteristics of the local area volunteered by respondents as 'major' dislikes (i.e., the first mention only), a

TABLE 5.13

UNSOLICITED SITE CONCERN

SWARU

Zone	1	2	3	4	Total
Frequency	10	1	1	1	13
Total	77	55	58	64	254
Percent	13	2	2	2	5

GLANBROOK

Zone	1	2	3	4	Total
Frequency	10	16	8	2	36
Total	52	67	71	65	255
Percent	19	24	11	3	14

MILTON

Zone	1	2	3	4	Total
Frequency	8	4	4	2	18
Total	44	38	58	47	187
Percent	18	11	7	4	10

different profile emerges (Table 5.14) indicating that respondents allocated a higher priority to site-related concerns than previously thought. That is, site is ranked number one at Glanbrook and second only to 'access to amenities' at Milton (Table 5.14). At SWARU, site did not rank in the top six major dislikes mentioned. This is consistent with the data in Table 5.13. Further, SWARU is located in an urban-industrial area flanked on the west by Hamilton's two largest employers (Stelco and Dofasco; Section 4.2.7). Thus, concerns about SWARU may be folded into other categories in the table which could be linked to the presence of industry more generally (e.g., traffic, physical characteristics, noise, general pollution, air quality).

TABLE 5.14

MAJOR DISLIKE ABOUT LOCAL AREA

RANK	SWARU (n=254)	GLANBROOK (n=255)	MILTON (n=187)
1	TRAFFIC 16%	SITE 17%	ACCESS TO AMENITIES 21%
2	PHYSICAL CHARACTERISTICS 9%	COST OF LIVING 13%	SITE 13%
3	NOISE 8%	ACCESS TO AMENITIES 12%	TRAFFIC 13%
4	SOCIAL CHARACTERISTICS 7%	DISTANCE FROM CITY 11%	URBAN ENCROACHMENT 6%
5	POLLUTION, GENERAL 6%	TRAFFIC 8%	DISTANCE FROM CITY 5%
6	AIR QUALITY 5%	PHYSICAL CHARACTERISTICSS 2%	COST OF LIVING 4%
	[SITE] [3%]		

A second *unsolicited* measure of concern stems from responses to the question: "If you could change just one thing about the area where you live, what would it be?" (Table 5.15). 'Site' ranked number one at Milton and second only to 'access to amenities' at Glanbrook, indicating again that respondents allocated a high priority to site-related concerns in evaluating their local area. Consistent with the

TABLE 5.15

WHAT WOULD YOU CHANGE ABOUT YOUR AREA?

RANK	SWARU (n=254)	GLANBROOK (n=255)	MILTON (n=187)
1	ACCESS TO AMENITIES 12%	ACCESS TO AMENITIES 21%	SITE 17%
2	TRAFFIC 11%	SITE 17%	ACCESS TO AMENITIES 16%
3	PHYSICAL CHAR'S 9%	COST OF LIVING 8%	TRAFFIC 9%
4	SOCIAL CHARACTERISTICS 6%	REGIONAL POLITICS 6%	URBAN ENCROACHMENT 7%
5	POLLUTION, GENERAL 5%	TRAFFIC 5%	COST OF LIVING 3%
6	DWELLING CHARACTERISTICS 4%	URBAN ENCROACHMENT 4%	SETTING 2%
	[SITE] [3%]		

previous measure of concern, site did not rank in the top six mentions at SWARU. As previously mentioned, this may be due to one of a number of factors plausibly related to area evaluation: an urban-industrial vs rural area (traffic, physical characteristics, general pollution), low proportion of home ownership and residency

in detached dwellings (dwelling characteristics) and lower income households along with higher levels of unemployment (cf Table 4.9) (social characteristics). That is, in general, SWARU respondents may have less of a stake in their area than those at Glanbrook or Milton.

Respondents who had not mentioned the site in any previous questions related to unsolicited site concern were subsequently asked whether they were aware of the site in their area. These respondents were added to those already aware for a global measure of site awareness across the samples. Not surprisingly, this elicited response yielded a much higher level of awareness than had been volunteered (Table 5.16). Consistent with unsolicited measures, the highest levels of awareness were reported at Glanbrook and Milton (93% and 92%, respectively) with only 61% of the sample at SWARU reporting awareness. Further, with a couple of minor exceptions, there are gradients of awareness away from each study site. Again, the relatively low levels of awareness at SWARU may be linked to the community context within which SWARU is situated. That is, being located in the midst of other urban industrial land uses (Section 4.2.7), area residents may find it difficult to differentiate between sources of environmental exposure/concern whereas an operating landfill in a rural-agricultural area such as Glanbrook is much more visible.

Solicited site concern was measured by asking aware respondents if they had any concerns about the site (Table 5.17). The obvious discrepancy between reported levels of awareness and concern may appear surprising at first glance. One

TABLE 5.16

SITE AWARENESS

SWARU

Zone	1	2	3	4	Total
Frequency	57	35	30	36	158
Total	77	55	58	64	254
Percent	74	64	52	56	62

GLANBROOK

Zone	1	2	3	4	Total
Frequency	52	61	66	57	236
Total	52	67	71	65	255
Percent	100	91	93	88	93

MILTON

Zone	1	2	3	4	Total
Frequency	44	37	52	40	173
Total	44	38	58	47	187
Percent	100	97	90	85	92

TABLE 5.17

SOLICITED SITE CONCERN

SWARU					
Zone	1	2	3	4	Total
Frequency	29	16	9	16	70
Total	77	55	58	64	254
Percent	38	29	16	25	28

GLANBROOK					
Zone	1	2	3	4	Total
Frequency	36	50	47	37	170
Total	52	67	71	65	255
Percent	69	75	66	57	67

MILTON					
Zone	1	2	3	4	Total
Frequency	40	31	39	29	139
Total	44	38	58	47	187
Percent	91	82	67	62	74

might expect awareness of an environmental exposure to necessarily lead to concern about same. However, this is not the case. There are those individuals who complete the primary stage of appraisal of an environmental exposure by concluding that the exposure poses no threat, harm or challenge and, therefore, have no concerns. Consistent with the levels of reported awareness, higher levels of concern are reported for Milton and Glanbrook than for SWARU. The relatively high level of concern for the Milton site is an important finding given that, at the time of the survey, the site was not yet operating. Therefore, perceived future (as opposed to 'actual') exposure yielded levels of concern equal to and exceeding those reported at existing sites. This level of reported concern may be linked to a number of factors. First, Milton residents have been exposed to (or involved in) a very high profile siting process for about 20 years (Section 4.3.10). Area residents have therefore had ample opportunity to be made aware of the potential impacts of the landfill proposed for their area. Second, the socio-demographic characteristics for the census area (Table 4.14) and the sample (Table 3.3) reveal a high percentage of husband-wife families with children as well as a high percentage of home ownership. These characteristics indicate potentially greater susceptibility to psychosocial impacts of exposure. Third, agriculture remains a key component of the Town's economy (Section 4.3.7). Lands surrounding the Milton site on the north, west and south are designated for agricultural use only (Section 4.3.4). It is therefore not suprising that respondents are concerned about the potential agricultural impacts of the site,

particularly because existing policy plans restrict alternative land uses.

The levels of concern reported at Glanbrook indicate that concern does not necessarily decrease over time. This is despite the fact that the landfill has been operating for over 10 years virtually without incident (Section 4.1.10). Again, characteristics of the Glanbrook population (Table 4.6) and sample (Table 3.3) may be linked to greater susceptibility to psychosocial impacts (e.g., high percentages of traditonal husband-wife families with children as well as home ownership). Seemingly persistent levels of concern may also be linked to the community's attempts to preserve agricultural land use (Section 4.1.4) and a rural way of life (Section 4.1.5).

The relatively low levels of concern reported at SWARU more than likely reflect the fact that Hamilton has long been recognized as a major industrial centre. Indeed, Regional policy plans are geared toward maintaining and enhancing that role (Section 4.2.4). Therefore, there is a major economic reliance on manufacturing establishments (particularly in the immediate area around SWARU) for local employment (Section 4.2.7). Individuals are generally more tolerant of pollution-producing facilities if they provide some economic benefit to the community (Evans 1982).

Respondents were asked to specify their concerns and were again allowed up to three mentions. The data for 'major' site concern reflect the complex of site- and situation-specific characteristics of the three study areas (Table 5.18). For

TABLE 5.18

MAJOR SITE CONCERN

RANK	SWARU (N=254)		GLANBROOK (N=255)		MILTON (N=187)	
1	AIR POLLUTION	10%	SITE OPERATION	17%	WATER POLLUTION	22%
2	ODOURS	4%	WATER POLLUTION	14%	TRAFFIC	9%
3	POLLUTION, GENERAL	3%	PROXIMITY	6%	PROXIMITY	6%
4	SITE OPERATION	3%	POLLUTION, GENERAL	5%	SITE OPERATION	4%
5	WATER POLLUTION	2%	ENVIRON. DEGRADATION	4%	AGRIC. IMPACTS	4%
6	ENVIRON. DEGRADATION	1%	POLLUTION, LITTER	3%	PROPERTY VALUES	3%

example, at the SWARU incinerator, the most frequently mentioned concern was air pollution. This is not surprising given that, historiacally, residents in the area of SWARU have reported air pollution (in addition to black sooty fall-out) as a major concern (Section 4.2.10). More generally, Hamilton residents rated their city as having high levels of pollution, compared to other municipalities in the Region (Section 4.2.11).

At Glanbrook, the major site concern was site operation (e.g., type and nature of wastes being disposed of, safety concerns). These concerns may be related to at least three factors. First, this landfill is closed to public access; this may arouse the suspicions of area residents. Second, the old landfill in nearby Hamilton (the

Upper Ottawa Street Landfill) was closed due to the discovery of the illegal disposal of hazardous industrial waste at the site. This incident occurred soon after the Glanbrook site began operating and would be remebered by long-time residents. Third, Glanbrook was once considered a potential site for the Ontario Waste Management Corporation site for the disposal of hazardous industrial waste (Section 4.1.10). As the siting process for this facility is still on-going, Glanbrook residents may remain suspicious.

At Milton, the most frequent concern was water pollution. This is not surprising given the importance of agriculture in the local economy as well as the reliance of most Milton residents on private wells for domestic water supply. Further, these concerns are consistent with those documented at the time of environmental assessment of the site (Section 4.3.10). That is, the most frequently cited concern at the time regarded adequate mitigation, compensation or prevention of potential contamination of groundwater and surface streams from landfill leachate.

In order to determine *how* concerned respondents were about the factors mentioned, those reporting a major site concern were asked to rate their intensity of concern for each mention (slightly, moderately, extremely). 59% of respondents at Milton who reported a 'major site concern' rated their intensity of concern as 'extreme' (Table 5.19). On the other hand, the majority of respondents at SWARU and Glanbrook who reported a major site concern rated it only 'moderate' (49% and 53%, respectively).

TABLE 5.19

INTENSITY OF MAJOR SITE CONCERN

INTENSITY	SWARU (n=70)	GLANBROOK (n=170)	MILTON (n=139)
Slightly	17%	9%	10%
Moderately	49%	53%	31%
Extremely	34%	38%	59%
Total	100%	100%	100%

Respondents were asked whether they considered any of their concerns to be health-related. The results (Table 5.20) strongly indicate that health-related concerns form a major component of site-related concerns (cf Table 5.17). Again, these data are consistent with other measures of site-related concerns (both solicited and unsolicited) where the lowest level of reporting is at SWARU (21%) and the highest is at Milton (52%). This is an important finding; that is, that levels of health-related site concerns reported are highest at Milton even though the facility there had yet to be constructed at the time of the survey. There are two plausible explanations for this finding. First, these concerns may be related to the siting process itself as the exposure. Second, health-related concerns may be latent in nature; that is, concerns about *future* health states during the period of site operation and beyond.

The relatively low level of reported health-related concern at SWARU is surprising in the context of the site's history (Section 4.2.10). That is, in the early

TABLE 5.20

SITE CONCERNS RELATED TO HEALTH

SWARU					
Zone	1	2	3	4	Total
Frequency	21	13	7	12	53
Total	77	55	58	64	254
Percent	27	24	12	19	21

GLANBROOK					
Zone	1	2	3	4	Total
Frequency	28	33	36	28	125
Total	52	67	71	65	255
Percent	54	49	51	43	49

MILTON					
Zone	1	2	3	4	Total
Frequency	28	25	24	20	97
Total	44	38	58	47	187
Percent	64	66	41	43	52

1980s, area residents, along with the Region, fought long and hard for a study to examine the health impacts of exposure to emissions from SWARU. This happened in the context of admissions from Tricil and the Ministry of the Environment that SWARU was emitting unacceptable levels of dioxins and furans. There are at least two plausible explanations for the current low levels of reported health concern. First, because the Region's request for a health study was denied despite the evidence, area residents may have lost confidence in government officials in general and decided simply to go on with their lives. Alternatively, there may have been a great deal of residential turn-over (plausible, given the large proportion of rental housing in the area) whereby newer residents would not recall earlier events.

Correlations between various measures of concern and sociodemographic variables were investigated as a first step toward uncovering the determinants of site-specific psychosocial impacts. Two solicited measures of concern were selected for use in this part of the analysis. First, existence of concern (yes/no) was selected given the higher response frequencies for this variable compared to frequencies of unsolicited concern. 'Intensity of concern' was selected as the second measure given that it goes beyond the existence of concern to provide some indication of *how concerned* respondents were. For the purposes of these analyses, 'intensity of concern' was created by deriving a score across all mentions of concern (up to three) where 'slightly concerned' was scored as one, 'moderately concerned' was scored as two, and 'extremely concerned' was scored as three. Therefore, the range of scores

for this variable was from zero (no concerns mentioned) to nine (respondent extremely concerned about three mentions).

The bivariate correlates of concern at SWARU (Table 5.21) indicate that concern was associated with higher income and education, single family dwelling, home ownership and proximity to the site. At Glanbrook (Table 5.22) the correlates were: greater length of residence in the area and at the current address. At Milton (Table 5.23), concern was associated with higher income, length of residence at current address and closer proximity to the site.

It is somewhat surprising that neither gender nor the presence of young children in the home were related to either measure of concern. The psychosocial literature indicates that women, particularly mothers of young children, experience greater impacts. This may be explained by the differences in the type of exposure under study. That is, as previously discussed, situations examined in much of the psychosocial literature involve toxic, hazardous exposures (e.g., Three Mile Island) as opposed to the non-hazardous sites studied here.

5.3.1.1 SUMMARY OF CONCERN

The reported frequencies show higher levels of concern at Milton and Glanbrook compared with SWARU. At Milton, the results indicate that impacts are experienced in advance of site operation and may be related to the siting process itself. At Glanbrook, where the site has been operating for more than ten years,

TABLE 5.21

RELATIONSHIPS[1] BETWEEN SOCIODEMOGRAPHIC CHARACTERISTICS AND CONCERN AT SWARU

	YES/NO	INTENSITY[2]	COMMENTS
GENDER	X^2=.06	t=1.19	
AGE	t=-1.15	PC=-.07	
MARITAL STATUS	X^2=2.76	F=1.06	
CHILDREN < 5 YRS	X^2=.03	t=-.69	
INCOME	U=3317.5*	tau=.12*	as income increases, concern increases
EDUCATION	U=5281.0*	tau=.13**	as education increases, concern increases
EMPLOYMENT	X^2=4.66	F=1.47	
DWELLING TYPE	X^2=6.93*	F=2.00	concerned, yes: detached = 34% attached = 27% apartment = 16%
DWELLING TENURE	X^2=4.13*	t=.95	concerned, yes: own = 35% rent = 22%
LENGTH OF RESIDENCE AT CURRENT ADDRESS	t=.33	PC=.03	
LENGTH OF RESIDENCE IN THE AREA	t=.06	PC=-.03	
ZONE	X^2=9.03*	F=2.76*	concerned, yes: zone 1 = 39% zone 2 = 29% zone 3 = 16% zone 4 = 25%

notes:

[1] * p < .05
** p < .01
*** p < .001

[2] intensity refers to a summed score for 'intensity of concern' across all mentions (up to 3) where the items were scored as follows: slightly=1, moderately=2 and extremely=3 for a range of 0 (if no concerns mentioned) to 9 (a respondent extremely concerned about three mentions).

TABLE 5.22

RELATIONSHIPS[1] BETWEEN SOCIODEMOGRAPHIC CHARACTERISTICS AND CONCERN AT GLANBROOK

	YES/NO	INTENSITY[2]	COMMENTS
GENDER	X^2=.27	t=-.77	
AGE	t=1.16	PC=.03	
MARITAL STATUS	X^2=5.21	F=.62	
CHILDREN < 5 YRS	X^2=.02	t=.29	
INCOME	U=7019.5	tau=.01	
EDUCATION	U=5609.5	tau=.02	
EMPLOYMENT	X^2=1.12	F=.36	
DWELLING TYPE	X^2=.02	F=.22	
DWELLING TENURE	X^2=.39	t=-.33	
LENGTH OF RESIDENCE AT CURRENT ADDRESS	t=2.89**	PC=.09	**as length increases, concern increases**
LENGTH OF RESIDENCE IN THE AREA	t=3.03**	PC=.09	**as length increases, concern increases**
ZONE	X^2=4.91	F=.41	

notes:

[1] * $p < .05$
** $p < .01$
*** $p < .001$

[2] intensity refers to a summed score for 'intensity of concern' across all mentions (up to 3) where the items were scored as follows: slightly=1, moderately=2 and extremely=3 for a range of 0 (if no concerns mentioned) to 9 (a respondent extremely concerned about three mentions).

TABLE 5.23

RELATIONSHIPS[1] BETWEEN SOCIODEMOGRAPHIC CHARACTERISTICS AND CONCERN AT MILTON

	YES/NO	INTENSITY[2]	COMMENTS
GENDER	X^2=.58	t=.52	
AGE	t=.98	PC=.10	
MARITAL STATUS	X^2=7.54	F=1.71	
CHILDREN (0-4 YRS)	X^2=.77	t=.41	
INCOME	U=1806.5*	tau=.11*	as education increases, concern increases
EDUCATION	U=3140.0	tau=.01	
EMPLOYMENT	X^2=3.66	F=.55	
DWELLING TYPE	X^2=1.84	F=.76	
DWELLING TENURE	X^2=.00	t=1.19	
LENGTH OF RESIDENCE AT CURRENT ADDRESS	t=1.19	PC=.17*	as length increases, concern increases
LENGTH OF RESIDENCE IN THE AREA	t=1.17	PC=.12	
ZONE	X^2=12.47**	F=6.14***	concerned, yes: zone 1 = 91% zone 2 = 82% zone 3 = 67% zone 4 = 62%

notes:

[1] * $p < .05$
** $p < .01$
*** $p < .001$

[2] intensity refers to a summed score for 'intensity of concern' across all mentions (up to 3) where the items were scored as follows: slightly=1, moderately=2 and extremely=3 for a range of 0 (if no concerns mentioned) to 9 (a respondent extremely concerned about three mentions).

concern persists at quite a high level even though the site has not been a high profile issue in the recent past. This implies that concern does not necessarily decrease over time. The much lower levels of concern at SWARU, which has been operating for over 20 years, suggests counter-evidence. However, it is very doubtful whether the SWARU situation is comparable given that it is a very different type of facility (incinerator vs landfill), situated in a very different setting (urban industrial vs rural) among respondents who have a very different sociodemographic profile (Table 3.3).

The types of concern most frequently reported at the three sites indicate the importance of both site and community characteristics and thereby the need to carefully consider the specifics of the local situation in any effort to address and alleviate community concerns.

5.3.2 EFFECTS

Measures of effects used in the survey focused primarily on two areas: effects of site-related concerns on everyday life and site-related effects on health. Effects were measured using a combination of open-ended (e.g., how has your concern about the site affected your everyday life?) and closed-ended (e.g., has the site increased, decreased or not changed your satisfaction with this area as a place to live?) questions.

When respondents aware of the site were asked whether it had altered their satisfaction with the area as a place to live, the majority at each site reported

that their level of satisfaction had not changed (Table 5.24). This may indicate that there are other characteristics of the local area, the positive aspects of which overshadow the negative aspects of the site. For example, at Glanbrook area residents responding to a quality of life survey ranked Glanbrook second of six area municipalities in the Region with respect to community attractiveness (Table 4.2). Further, Glanbrook was ranked highest on a number of individual factors: family stability, low population density, little traffic congestion, low housing costs and levels of crime, and low levels of pollution (ranked just below Flamborough).

TABLE 5.24

CHANGES IN AREA SATISFACTION DUE TO SITE[1]

RESPONSE	SWARU (n=158)	GLANBROOK (n=236)	MILTON (n=173)
Increased	3%	3%	1%
Decreased	11%	37%	46%
Not changed	81%	58%	51%
Don't know	5%	2%	2%
TOTAL	100%	100%	100%

[1] note that only respondents aware of the site were asked this question.

In the case of SWARU, area evaluations may not have changed because of the site due to the urban-industrial characterization of the area in which it is located (Section 4.2.7) and the potentially high levels of tolerance for pollution in general (Sections 4.2.7 and 4.2.5).

It must be noted, however, that there are substantial minorities at Glanbrook and Milton (37% and 46%, respectively) who reported that the site had decreased their satisfaction with the local area. Again, it is important to point out that the highest level of reporting for decreased satisfaction is at Milton. Although the site had not been constructed at the time of the survey, respondents were already experiencing negative impacts with respect to area evaluation.

Another measure of *effect* was obtained by asking respondents if their site concerns had any effects on their everyday life. The number of respondents reporting effects was low (15 at SWARU and 26 each at Glanbrook and Milton). At SWARU, the most frequently mentioned effects were related to physical health (n=5) and the environment (n=7); for example:

physical health:

- *a lot harder to breath with windows open in hot weather*
- *odour affects breathing when it's damp*
- *harmful to my health*
- *have mucus and coughing which may be due to SWARU dust*
- *tonsillitis probably related*

environment:

- *can smell and feel the pollution ash is on my car*
- *more environmentally aware*
- *smell keeps you indoors*
- *black soot falls on freshly washed car or laundry*

Some respondents mentioned the interaction between environmental exposure, health and economic factors:

- *lost time at work because of sore throat/infected ears*

Others reported obvious psychosocial impacts (n=2); for example:

- *it upsets and worries me*

At Glanbrook, the most frequently mentioned effects on daily life were related to the environment (n=12); more specifically, water quality:

- *don't drink the well water*
- *contaminated well; replaced by cistern*
- *can no longer use the cistern for drinking water*
- *must purify the water before using*
- *use of water purifier*
- *had to get rid of dairy herd*

Psychosocial health effects were also reported (n=5):

- *worry*
- *anger*
- *stress; worried about the pollution and noise*
- *think about the problems there and they bother me*
- *fear of long-term health hazard*

At Milton, the most frequently mentioned effect on daily life was psychosocial (n=10); for example:

- *attend meetings and evaluate the situation; caused depression*
- *constant worry at back of my mind*
- *makes me angry; have lived here 20 years*
- *stress; worried about the pollution and the noise*
- *makes me upset and nervous*
- *angina; health problems; stress*
- *contaminated water; stress about quality of life*

At this site, psychosocial impacts such as stress were often related to the decision to move:

- *depressed; pressure of moving from the site*
- *sale of house; absorption of monetary loss*

Overall, therefore, the percentage of sample groups reporting effects on daily life is low. However, those individuals who are experiencing effects feel very strongly that they are attributable to the site (or, in the case of Milton, to the siting process and the impending site). Further, the prevalence of psychosocial effects is highest at Milton. Again, the Milton finding is an important one given the status of the site at the time of the survey.

While a number of daily life effects were health related, respondents were subsequently asked if the site had affected their own health or the health of any member of their household. Again, up to three mentions were obtained. The data (Table 5.25) indicate that the prevalence of health effects in the sample is low. At both Glanbrook and Milton, the highest frequency of reported effects is for the closest zone (almost one-quarter of zone one Milton respondents). In general, health concerns cited include worry, anxiety, sleeping and eating disorders, upper respiratory ailments, headaches, and general 'stress'. The relatively high frequency of health effects reported at the Milton site is particularly noteworthy given the status of the site. This implies that the reported effects are primarily psychosocial, associated with the siting process as well as concerns about potential future exposure. For example, some of the effects reported by Milton respondents were:

TABLE 5.25

SITE-RELATED HEALTH EFFECTS

SWARU

Zone	1	2	3	4	Total
Frequency	4	1	0	4	9
Total	77	55	58	64	254
Percent	5	2	0	6	4

GLANBROOK

Zone	1	2	3	4	Total
Frequency	5	1	1	0	7
Total	52	67	71	65	255
Percent	10	2	1	0	7

MILTON

Zone	1	2	3	4	Total
Frequency	10	1	6	1	18
Total	44	38	58	47	187
Percent	23	3	10	2	10

- *anxiety; worried about health, property value*
- *too much stress; contributed to the death of my wife*
- *headaches and nervousness*
- *irregular heartbeat due to stress*
- *always worried about it; takes its toll*
- *mental health*
- *lost peace of mind because of anxiety about the future*
- *much stress and strain on respondent and her husband*
- *worry*
- *nerves, high blood pressure*

5.3.2.1 SUMMARY OF EFFECTS

The prevalence of effects on daily life and/or on health among these sample groups is generally low which is not surprising given the nature of the exposures under study. There is an exception, perhaps, in zone one at Milton with respect to the reporting of site-related health effects. However, low frequencies of reporting of effects does not negate the importance that individuals ascribe to them. Further, there is no question that these individuals attribute the effects to the sites. Reported effects on daily life were often related to physical health and the environment although psychosocial effects were more prevalent at both Glanbrook and Milton. Site-related health effects at the Milton site were primarily psychosocial in nature indicating the effects of the siting process itself as well as concern for the future. The prevalence of psychosocial effects at Milton and Glanbrook may be explained by community profile factors which could increase susceptibility; e.g., high percentages of husban-wife families with children, high percentages of home ownership and low incidence of low income families (Tables 3.3, 4.6 and 4.14). In

addition, Glanbrook residents rated their community as one with a good quality of life (Table 4.2); respondents may see the landfill as a threat to their lifestyle. Milton respondents, as previously reported, may feel the landfill is a threat to the agricultural viability of the area as well as the rural way of life.

5.3.3 ACTIONS

Several measures of *action* taken in response to site concerns were included in the survey. As an outcome variable, *actions* moves the analysis beyond the realm of **impacts of** exposure to **responses to** exposure and may be considered an indicator of action-focused coping.

The first set of action measures discussed is related to residential moves. Specifically, respondents aware of the site were asked: "over the past two years, have you considered moving because of the site"? The data (Table 5.26) indicate that the great majority of aware respondents had not considered moving. This may perhaps be explained by the fact that, for these respondents, the positive aspects of the community outweigh the negative aspects of the site. Alternatively, the restrictive time frame used in the question may eliminate, at SWARU and Glanbrook at least, those who considered moving at the time of the siting decision or who had moved into the area subsequent to the site being established with full knowledge of its existence. Indeed, the highest percentage of respondents who had considered moving because of the site were at Milton (27%) where, at the time of the survey,

the site had only recently been approved.

TABLE 5.26

CONSIDERED MOVING BECAUSE OF SITE?[1]

	SWARU (n=158)	GLANBROOK (n=236)	MILTON (n=173)
Yes	11%	11%	27%
No	88%	88%	72%
Don't know/refused	1%	1%	1%
TOTAL	100%	100%	100%

[1] note that only respondents aware of the site were asked this question.

Aware respondents were also asked: if they were to move, would they stay in, or move outside of, the area (as defined by the respondent). The majority of those who had considered moving reported they would prefer to move outside of the area (SWARU 83%, Glanbrook 58%, Milton 58%).

Of those respondents who had considered moving because of the site, very few actually took action. At SWARU, only 7 of the 18 respondents who had considered moving actually took steps toward moving (e.g., looked for other housing (n=2); contacted a real estate agent (n=2); tried to rent or sell (3)). At Glanbrook, 9 of 27 respondents took steps toward moving (e.g., looked (1); contacted an agent (5)). At Milton, 25 of the 47 respondents who had considered moving because of the site took any action (e.g., contacted an agent (9); looked (3); tried to rent or sell (5)). Despite the fact that some respondents had considered moving because of the

site, many felt, for a number of reasons, that it would be difficult to do so. Reasons cited were related to the slow real estate market, finances, and roots in the community.

Subsequent analyses of the characteristics of respondents who had considered moving and who had actually taken concrete steps toward this end (Tables 5.27, 5.28 and 5.29) indicate a statistically significant relationship with distance at all three sites; in fact, it was the only significant relationship at Glanbrook. With one exception (SWARU), those in the closest zones were more likely to consider moving because of the site and to have taken steps toward moving.

At SWARU, age was statistically significantly related to moving such that as age increased, the likelihood of considering or taking steps toward moving decreased. The same relationship was seen for both measures of length of residence, indicating a lack of desire to move, despite the site, possibly due to the strength of community ties. Higher education at SWARU was also related to the consideration of moving. In addition, renters were more likely to consider moving than owners. At Milton, consideration of moving was associated with being separated or married, having young children, higher income, home ownership, and closer proximity to the site.

In addition to questions about intention to move, respondents were also asked whether or not they had participated in any of a series of actions specifically related to the site:

TABLE 5.27

RELATIONSHIPS[1] BETWEEN SOCIODEMOGRAPHIC CHARACTERISTICS AND MOVING-RELATED THOUGHTS AND ACTIONS AT SWARU

	CONSIDERED MOVING	STEPS TAKEN	COMMENTS
GENDER	X^2=.18	X^2=.19	
AGE	t=-3.23**	t=-2.64*	as age increases, moving-related thoughts and actions decrease
MARITAL STATUS	X^2=3.30	X^2=2.69	
CHILDREN < 5 YRS	X^2=1.21	X^2=.75	
INCOME	U=1952.0	U=1431.0	
EDUCATION	U=3114.5*	U=1677.5	thoughts of moving decrease with increased education
EMPLOYMENT	X^2=9.09	X^2=6.26	
DWELLING TYPE	X^2=3.34	X^2=2.38	
DWELLING TENURE	X^2=7.66**	X^2=2.34	considered moving, yes: rent = 21% own = 9%
LENGTH OF RESIDENCE AT CURRENT ADDRESS	t=-2.23*	t=-1.61	thoughts of moving decrease as length of residence increases
LENGTH OF RESIDENCE IN THE AREA	t=-2.31*	t=-1.96*	thoughts of moving decrease as length of residence increases
ZONE	X^2=8.96*	X^2=4.56	considered moving, yes: zone 1 = 11% zone 2 = 27% zone 3 = 12% zone 4 = 11%

notes:

[1] * p < .05
** p < .01
*** p < .001

[2] for the purposes of this analysis, 'steps taken' was dichotomized to yes/no with no consideration for the nature of the action.

TABLE 5.28

RELATIONSHIPS[1] BETWEEN SOCIODEMOGRAPHIC CHARACTERISTICS AND MOVING-RELATED THOUGHTS AND ACTIONS AT GLANBROOK

	CONSIDERED MOVING	STEPS TAKEN[2]	COMMENTS
GENDER	X^2=.15	X^2=.15	
AGE	t=-.22	t=.84	
MARITAL STATUS	X^2=2.35	X^2=.79	
CHILDREN < 5 YRS	X^2=.12	X^2=.00	
INCOME	U=2509.5	U=1081.5	
EDUCATION	U=2806.0	U=1050.5	
EMPLOYMENT	X^2=5.18	X^2=4.66	
DWELLING TYPE	X^2=1.02	X^2=.25	
DWELLING TENURE	X^2=.46	X^2=.21	
LENGTH OF RESIDENCE AT CURRENT ADDRESS	t=.31	t=.17	
LENGTH OF RESIDENCE IN THE AREA	t=-.66	t=-1.71	
ZONE	X^2=13.10**	X^2=10.33*	**considered moving, yes:** **zone 1 = 25%** **zone 2 = 8%** **zone 3 = 9%** **zone 4 = 6%** **steps taken, yes:** **zone 1 = 12%** **zone 2 = 3%** **zone 3 = 1%** **zone 4 = 1%**

notes:

[1] * $p < .05$
** $p < .01$
*** $p < .001$

[2] for the purposes of this analysis, 'steps taken' was dichotomized to yes/no with no consideration for the nature of the action.

TABLE 5.29

RELATIONSHIPS[1] BETWEEN SOCIODEMOGRAPHIC CHARACTERISTICS AND MOVING-RELATED THOUGHTS AND ACTIONS AT MILTON

	CONSIDERED MOVING	STEPS TAKEN	COMMENTS
GENDER	X^2=.12	X^2=2.63	
AGE	t=-1.00	t=-1.22	
MARITAL STATUS	X^2=10.02*	X^2=6.54	considered moving, yes: separated = 33% married = 31% never married = 11% widowed = 0% divorced = 0%
CHILDREN < 5 YRS	X^2=6.17*	X^2=11.24***	considered moving, yes: yes = 44% no = 22% steps taken, yes: yes = 33% no = 10%
INCOME	U=1856.5*	U=1394.5	thoughts of moving increase as education increases
EDUCATION	U=2929.5	U=1651.0	
EMPLOYMENT	X^2=3.72	X^2=3.34	
DWELLING TYPE	X^2=3.20	X^2=1.47	
DWELLING TENURE	X^2=3.76*	X^2=.93	considered moving, yes: own = 27% rent = 6%
LENGTH OF RESIDENCE AT CURRENT ADDRESS	t=-.88	t=-.62	
LENGTH OF RESIDENCE IN THE AREA	t=-1.05	t=-1.34	
ZONE	X^2=15.65**	X^2=17.30***	

notes:

[1] * p < .05
** p < .01
*** p < .001

[2] for the purposes of this analysis, 'steps taken' was dichotomized to yes/no with no consideration for the nature of the action.

1) have you read about the site in the newspaper?

2) have you read books/reports about facilities like the site and their potential effects?

3) have you discussed your concerns about the site with friends and neighbours?

4) have you attended a meeting organized by a local citizens groups at which the site was discussed?

5) do you belong to a local citizens group which deals with the site?

6) have you telephoned, written or spoken to politicians and/or government staff about your concerns regarding the site?

7) have you spoken to staff at the site about your concerns?

The percentages of sample groups reporting actions taken in response to site concerns are not surprising (Table 5.30) given the trends already seen in the data; that is, the highest percentages of action were reported at the Milton site. The next highest percentage of actions reported are at Glanbrook. This may reflect one of two things. Since Glanbrook respondents have typically lived in the area for many years, the actions being reported may have taken place at the time of the siting process, as in the Milton case. Conversely, it may be that Glanbrook respondents have remained active because concern does not necessarily decrease over time.

TABLE 5.30

PERCENTAGES OF SAMPLE GROUPS REPORTING ACTIONS TAKEN IN RESPONSE TO SITE CONCERNS[1]

ACTION	SWARU (n=158)	GLANBROOK (n=236)	MILTON (n=173)
Read newspaper	40%	59%	84%
Read books/reports	12%	37%	47%
Discussed concerns	32%	62%	76%
Attended meeting	3%	23%	47%
Citizens group	1%	5%	27%
Telephoned/written/spoken	7%	21%	35%
Spoken to staff	0%	2%	2%

[1] note that only respondents who were aware of the site were asked if they had taken any actions.

A series of bivariate analyses was conducted (Tables 5.31, 5.32 and 5.33) to determine if any sociodemographic characteristics were related to taking action in response to site concern. At SWARU, action taken was associated with having no young children (Site Action), higher income and education (Information Seeking and Total Actions), home ownership (Information Seeking) and length of residence at current address (Site Action). At Glanbrook, action is related to being older (Site Action and Total Action), having no young children (Site Action), length of residence at current address (all three indices) and in the area (Total Action). At Milton, action is related to being older, having no partner, living closer to the site (all three indices), higher income (Information Seeking and Total Action), home

TABLE 5.31

RELATIONSHIPS[1] BETWEEN SOCIODEMOGRAPHIC CHARACTERISTICS AND ACTIONS TAKEN IN RESPONSE TO SITE CONCERNS AT SWARU

ACTIONS	TOTAL ACTIONS INDEX (H25-H31)	INFO. SEEKING INDEX (H25-H27)	SITE ACTION INDEX (H28-H31)	COMMENTS
GENDER	t=.85	t=.73	t=.67	
AGE	PC=.01	PC=-.01	PC=.06	
MARITAL STATUS	F=.78	F=.65	F=1.14	
CHILDREN < 5 YRS	t=.85	t=.54	t=3.49***	mean # actions, no children = .1 mean # actions, children = .00
INCOME	tau=.15**	tau=.15**	tau=-.04	as income increases, the action indices increase
EDUCATION	tau=.13**	tau=.13**	tau=.07	as education increases, the action indices increase
EMPLOYMENT	F=1.82	F=2.09	F=1.19	
DWELLING TYPE	F=2.50	F=2.31	F=1.36	
DWELLING TENURE	t=1.70	t=2.12*	t=-.19	mean # actions, owners = .63 mean # actions, renters = .40
LENGTH OF RESIDENCE AT CURRENT ADDRESS	PC=.11	PC=.08	PC=.14*	as length of residence increases, the action index increases
LENGTH OF RESIDENCE IN THE AREA	PC=.11	PC=.08	PC=.11	
ZONE	F=1.72	F=1.89	F=.52	

notes:

[1] * $p < .05$
** $p < .01$
*** $p < .001$

TABLE 5.32

RELATIONSHIPS[1] BETWEEN SOCIODEMOGRAPHIC CHARACTERISTICS AND ACTIONS TAKEN IN RESPONSE TO SITE CONCERNS AT GLANBROOK

ACTIONS	TOTAL ACTIONS INDEX (H25-H31)	INFO. SEEKING INDEX (H25-H27)	SITE ACTION INDEX (H28-H31)	COMMENTS
GENDER	t=-1.2	t=-.97	t=-1.3	
AGE	PC=.16*	PC=.10	PC=.19**	as age increases, the action indices increase
MARITAL STATUS	F=.17	F=.30	F=.48	
CHILDREN < 5 YRS	t=1.41	t=.19	t=3.88***	mean # actions, no children = .5 mean # actions, children = .2
INCOME	tau=.04	tau=.04	tau=.03	
EDUCATION	tau=.07	tau=.08	tau=.06	
EMPLOYMENT	F=.01	F=.15	F=.10	
DWELLING TYPE	F=.07	F=.29	F=.03	
DWELLING TENURE	t=.15	t=-.30	t=.73	
LENGTH OF RESIDENCE AT CURRENT ADDRESS	PC=.20*	PC=.16*	PC=.20**	as length increases, the action indices increase
LENGTH OF RESIDENCE IN THE AREA	PC=.19**	PC=.12	PC=.24	as length increases, the action index increases
ZONE	F=1.06	F=.44	F=1.82	

notes:

[1] * $p < .05$
** $p < .01$
*** $p < .001$

TABLE 5.33:

RELATIONSHIPS[1] BETWEEN SOCIODEMOGRAPHIC CHARACTERISTICS AND ACTIONS TAKEN IN RESPONSE TO SITE CONCERNS AT MILTON

ACTIONS	TOTAL ACTIONS INDEX H25-H31	INFO. SEEKING INDEX H25-H27	SITE ACTION INDEX H28-H31	COMMENTS
GENDER	t=.77	t=.63	t=.55	
AGE	PC=.23**	PC=.18*	PC=.25**	as age increases, the action indices increase
MARITAL STATUS	F=4.03**	F=3.77**	F=3.3*	STATUS BY MEAN # ACTS: TAI ISI SAI divorce 4.0 2.8 1.7 widowed 3.8 2.1 1.3 partner 3.1 2.0 1.1 sep'ted 1.7 1.7 0.4 never m 1.6 1.2 0.0
CHILDREN < 5 YRS	t=.01	t=-.28	t=.37	
INCOME	tau=.13*	tau=.15*	tau=.08	as income increases, the action indices increase
EDUCATION	tau=.03	tau=.05	tau=.02	
EMPLOYMENT	F=2.02	F=1.73	F=2.09	
DWELLING TYPE	F=1.78	F=1.60	F=1.37	
DWELLING TENURE	t=3.02**	t=1.48	t=4.79***	mean # acts, TAI: 3.0 (own); 1.9 (rent) mean # acts, SAI: 1.1 (own); 0.4 (rent)
LENGTH OF RESIDENCE AT CURRENT ADDRESS	PC=.20**	PC=.13	PC=.23**	as length increases, the action indices increase
LENGTH OF RESIDENCE IN THE AREA	PC=.19*	PC= .14	PC=.21**	as length increases, the action indices increase
ZONE	F=6.6***	F=5.42***	F=5.55***	MEAN # ACTS: TAI ISI SAI zone 1 3.4 2.4 1.6 zone 2 3.1 2.1 1.0 zone 3 2.5 1.7 0.8 zone 4 2.2 1.6 0.7

notes:

[1] * $p < .05$
** $p < .01$
*** $p < .001$

ownership and length of residence (Site Action and Total Action).

It would appear that factors associated with having a greater stake in the area (e.g., home ownership, length of residence) as well as personal characteristics related to ability to act (e.g., level of education and/or income) are positively related to action-focused coping activities. In addition, available time (e.g., no young children at home) also appears to be related.

5.3.3.1 SUMMARY OF ACTIONS

The data indicate that a small number of respondents had considered moving because of the site. Further, only a small percentage of these actually took concrete steps toward moving. The highest percentage was at the Milton site. Various sociodemographic variables were related to moving-related thoughts and actions across the three sites (Tables 5.27, 5.28 and 5.29). The only relationship consistent across the three sites was distance where those in the closest zones were more likely to consider moving because of the site and to have taken steps toward moving.

Frequencies of site-related actions taken in response to site concerns varied across the three sites with consistently lower levels of reporting at SWARU and higher levels at Milton. For the most part, respondents took part in what may be considered information-seeking actions (e.g., reading the newspaper or books and reports, discussing concerns with friends and neighbours). Fewer respondents

participated in more direct actions (e.g., attending meetings, joining groups, contacting politicians or staff about the site).

Again, various sociodemographic variables were related to action indices across the three sites (Tables 5.31, 5.32 and 5.33). The only consistent relationship seen across sites was between one or both measures of length of residence and one or more indices of action.

5.4 SUMMARY AND CONCLUSIONS

This chapter has used descriptive statistics to address the first research objective:

> ***1. To determine the prevalence of psychosocial impacts among exposed individuals.***

In order to measure prevalence in the epidemiologic survey, four constructs related to general psychosocial health and well-being were used: *general health status, emotional distress, somatic complaints,* and *stressful life events.* Three site-specific constructs were also used: *concern, effects,* and *actions.*

Overall, respondents at all three sites rate their health status as good and are generally satisfied with their health. Further, levels of emotional distress among the three populations, as measured by the GHQ-20, are not above normal when compared with findings of other studies in which this instrument has been used with general populations. In addition, there are very few significant relationships between

GHQ scores and sociodemographic characteristics.

The prevalence of somatic complaints for most sample groups is below that for normalized scores. However, almost one-half the respondents in zone one at Milton had SCL-90 scores above the cut-point. In addition, there is a gradient of decreasing prevalence away from the site suggesting a relationship with anticipated exposure. SCL-90 scores showed few significant relationships with sociodemographic factors.

Higher levels of stressful life events were reported at SWARU than at Glanbrook or Milton. This may perhaps account for the high raw mean scores on the SCL-90 at the SWARU site. The relatively low frequency of stressful life events reported at Glanbrook and Milton implies less of a confounding role for this measure of psychosocial health and well-being at these two sites.

On the basis of the findings, measures of general psychosocial health and well-being were used as mediating variables in the relationship between exposures and more site- and situation-specific psychosocial outcomes (e.g., concern, health concern, effects and actions) in the subsequent multivariate analysis.

Levels of unsolicited site concern (Table 5.13) were relatively low although the site figured quite high in terms of priorities for area evaluation by respondents at Glanbrook and Milton (Tables 5.14 and 5.15). Levels of solicited awareness and site concern were much higher (Tables 5.16 and 5.17) and major site concerns varied by site and situation (Table 5.18). Further, a large proportion of

concerned respondents at all three sites reported that their concerns were health-related (Table 5.20). A particularly significant finding was the level of concern reported at Milton given that this site was undeveloped at the time of the survey. In addition, Milton respondents also reported the highest intensity of concern for 'major site concern' (Table 5.19). Various sociodemographic factors were related to concern (Tables 5.21, 5.22 and 5.23).

The reported prevalence of effects on daily life and/or on health is generally low. There is an exception in zone one at Milton with respect to site-related health effects. Further, there is no question for these individuals that effects experienced are attributed to the study sites. This includes Milton indicating, once again, that anticipated exposure is linked to psychosocial impacts.

The data indicate that a small number of respondents had considered moving because of the site. Further, only a small percentage of these actually took any actions. The highest percentage taking action was at the Milton site. Various sociodemographic variables were related to moving-related thoughts and actions across the three sites (Tables 5.27, 5.28 and 5.29).

Site-related actions taken in response to site concerns varied across the three sites. Frequencies were lowest at SWARU and highest at Milton. For the most part, respondents took part in what may be considered information-seeking actions (e.g., reading the newspaper or books and reports, discussing concerns with friends and neighbours). Fewer respondents participated in more direct actions (e.g.,

attending meetings, joining groups, contacting politicians or staff about the site). Again, various sociodemographic variables were related to action indices across the three sites (Tables 5.31, 5.32 and 5.33).

The wider community context forms the basis of one of four sets of mediating dimensions involved in the process of psychosocial impacts (Section 2.2.2). Therefore, in examining the prevalence of psychosocial impacts at the three study sites, an attempt was made to situate site-specific outcomes within a broader community context as per the conceptual framework which guides this research (Figure 2.4). For example, the broader context within which the Glanbrook site is situated (Section 4.1) can be characterized as a rural, agricultural community with a relatively stable population of traditional husband-wife families with children and a high perceived quality of life. In combination, these factors may help to explain the relatively high levels of concern and action reported by Glanbrook respondents.

In contrast, the context at SWARU (Section 4.2) is an urban-industrial area with a strong reliance on employment based in manufacturing. Further, the sociodemographic characteristics of both the census area and the sample indicate low percentages of home ownership, and relatively high incidence of low income families and unemployment. This combination of factors may help to explain the relatively low levels of reported concern, effects and action at the SWARU site.

Milton's profile is similar to that of Glanbrook with respect to economic and sociodemographic characteristics (Section 4.3). Thus, the relatively high levels

of site-specific outcomes reported is not surprising. Levels of reporting are even higher at this site most likely due to higher levels of awareness as a result of the recency of the controversial siting process.

What these findings point to is that the experience of psychosocial impacts indeed cannot be divorced from the wider community context within which they occur (cf Figure 2.4). The recognition of this fact has obvious implications for both the applications of the thesis findings (Section 7.3) as well as directions for future research (Section 7.4).

Having established the prevalence of psychosocial impacts at the three study sites on the basis of the evidence from the epidemiologic survey, the next step involves addressing research objectives two and three:

> *2. To investigate the determinants of individual level psychosocial impacts.*
>
> *3. To investigate the determinants of individual level actions taken in response to psychosocial impacts.*

This will be done in the following chapter where logistic regression modelling is used to profile the characteristics of respondents more likely to report psychosocial impacts as well as those most likely to take action in response to impacts.

CHAPTER 6

DETERMINANTS OF PSYCHOSOCIAL IMPACTS

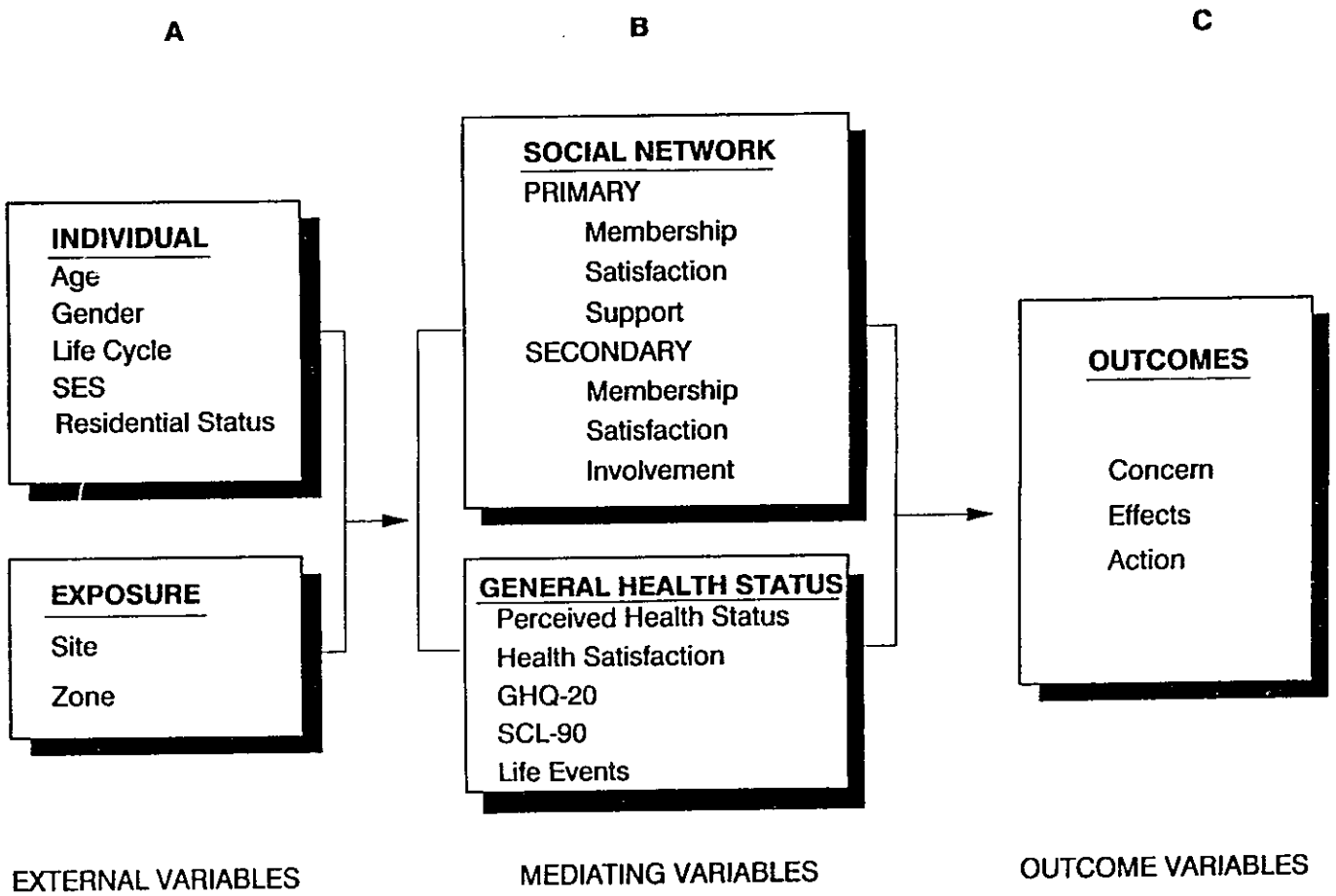
6.1 INTRODUCTION

The previous chapter described the prevalence of psychosocial impacts among the populations sampled at the three study sites. The majority of published psychosocial literature rarely goes beyond this descriptive type of analysis (see Chapter 2). This thesis attempts to go beyond the descriptive stage by profiling the characteristics of respondents more likely to report psychosocial impacts as well as those more likely to take action in response to impacts.

6.2 LOGISTIC REGRESSION ANALYSIS

The model which guided the analysis has three components: external variables (e.g., individual and exposure-related variables); mediating variables (e.g., social network membership and involvement, general health status measures); and outcome variables (e.g., concern, effects and action) (Figure 6.1). This model is informed by a socioecological conceptual framework (Figure 2.4) which suggests that psychosocial impacts are influenced by a number of mediating factors. Linking the analytical model with a socioecological conceptual framework is a useful process with respect to the operationalization of the research objectives. That is, the

FIGURE 6.1: ANALYTICAL MODEL



socioecological model of health and well-being (White 1981) accommodates not only broadly-defined determinants of health outcomes (e.g., characteristics of the exposure, individual, social network and wider community system) but also broadly-defined health outcomes themselves (e.g., psychosocial impacts, operationally defined here as concern, effects and action (Figure 6.1)). However, the analytical model differs from the conceptual framework in that it is recursive; that is, the relationships between the independent and dependent variables are unidirectional. This apparent inconsistency points up the difficulty of translating a complex conceptual framework into an operational model suitable for statistical analysis. Thus, while the conceptual framework which guides this analysis (Figure 2.4) shows the four sets of mediating dimensions interacting not only with *psychosocial impacts* but also with each other, the following analysis (Section 6.3) does not - and can not - address the reciprocity of these relationships empirically. This has obvious implications for the interpretation of the findings. That is, variables hypothesized to be mediating the relationship between exposure and psychosocial impacts are indeed revealed in the results of the analysis (Section 6.3). The *direction* of some of the relationships uncovered, however, remains in question.

Logistic regression was chosen as the method of analysis for three reasons: (1) the outcomes of interest are dichotomous; (2) the external and mediating factors are a mix of continuous and categorical variables; and (3) the relationships between the explanatory and outcome variables are sensibly described

by a logistic function.

Logistic regressions were calculated for a series of outcome variables. For each outcome, a model was constructed sequentially whereby each block of variables shown in the analytical model (labelled: exposure, individual, health and well-being, and social network; see Figure 6.1) was entered in an additive fashion (i.e., first the 'exposure' block, then the 'individual' block, and so on), keeping only those variables which made a contribution to the model before adding the next block of variables. Models were run using a stepwise backward elimination algorithm. Variables were judged to contribute to the model if: (a) the significance level for the Wald inclusion test statistic was 0.10 or lower; or, (b) the significance level was greater than 0.10 but a contribution to the model was indicated via a partial correlation greater than zero and/or an improvement in the percentage of respondents correctly classified. Due to their *a priori* importance, age, gender and zone were forced into every model regardless of their contribution. Once all explanatory variables were identified (Table 6.1), their first-order interaction terms were entered using forward-stepwise selection. These interaction terms took two forms: (1) age, gender and zone by each remaining independent variable, and (2) each remaining independent variable with all others.

6.3 RESULTS

Results for the site-specific analyses are reported for outcomes *concern*,

TABLE 6.1
EXPLANATORY VARIABLES IN FINAL LOGISTIC REGRESSION MODELS

VARIABLE	TYPE	CODING (REFERENCE CATEPORY IS UNDERLINED)
INDIVIDUAL VARIABLES		
AGE	CONTINUOUS	OLDER VS YOUNGER
GENDER	CATEGORICAL	FEMALE VS MALE
MARITAL STATUS	CATEGORICAL	NO PARTNER VS PARTNER
CHILDREN < 5 YEARS	CATEGORICAL	NO VS YES
EDUCATION	CATEGORICAL	LESS VS MORE
EMPLOYMENT STATUS	CATEGORICAL	OTHER VS FULL-TIME
INCOME	CATEGORICAL	LESS VS MORE
DWELLING TENURE	CATEGORICAL	RENT VS OWN
DWELLING TYPE	CATEGORICAL	ATTACHED VS DETACHED
# YRS AT CURRENT ADDRESS	CONTINUOUS	MORE VS LESS
# YRS IN THE AREA	CONTINUOUS	MORE VS LESS
EXPOSURE VARIABLES		
SITE (COMBINED MODELS ONLY)	CATEGORICAL	SWARU VS GLANBROOK VS MILTON
ZONE	CATEGORICAL	CLOSER VS FURTHER
SOCIAL NETWORK VARIABLES		
# CLOSE FRIENDS	CONTINUOUS	MORE VS LESS
# CLOSE RELATIVES	CONTINUOUS	MORE VS LESS
SATISFACTION, SOCIAL ACTIVITIES	CATEGORICAL	NO VS YES
PRESENCE OF A CONFIDANT	CATEGORICAL	NO VS YES
SOMEONE TO COUNT ON FOR HELP	CATEGORICAL	NO VS YES
FREQUENCY TALK WITH NEIGHBOURS	CATEGORICAL	LESS VS MORE
ASK HELP FOR/FROM NEIGHBOURS	CATEGORICAL	LESS VS MORE
FREQUENCY OF ABOVE	CATEGORICAL	MORE VS SAME VS LESS
GROUP MEMBERSHIP(S)	CATEGORICAL	NO VS YES
# GROUP MEMBERSHIPS	CONTINUOUS	MORE VS LESS
AREA SATISFACTION	CATEGORICAL	VERY VS SOMEWHAT/NOT
FRIENDLINESS RATING	CATEGORICAL	MORE VS LESS
PAST COMMUNITY INVOLVEMENT	CONTINUOUS	MORE VS LESS
PERCEIVED COMMUNITY INVOLVEMENT	CATEGORICAL	MORE VS LESS
HEALTH & WELL-BEING		
GHQ SCORE	CATEGORICAL	BELOW VS ABOVE CUT-POINT
SCL-90 SCORE	CATEGORICAL	BELOW VS ABOVE CUT-POINT
HEALTH SATISFACTION	CATEGORICAL	NOT VS SATISFIED
HEALTH RATING	CATEGORICAL	FAIR/POOR VS GOOD/EXCELLENT
STRESSFUL LIFE EVENTS	CATEGORICAL	NO VS YES

health concern and *actions*. In addition, combined models using data from all three sites were run for outcomes *concern* and *actions* to illustrate the influence of 'site' as an explanatory variable. Though included in the analytical design, effects on health and daily life are not included in this analysis because their reported frequencies were too low to provide stable multivariate risk estimates (Section 5.3.2). The low frequencies are not surprising given the non-hazardous nature of the three sites. They may also be an artifact of the narrow way in which respondents conceptualized the survey questions on these effects.

6.3.1 WITHIN SITE MODELS

Concern

The logistic regression model of *concern* at SWARU (Table 6.2) had a ρ^2 of .16 where ρ^2 measures goodness of fit for logistic regression. It is defined as one minus the ratio of the maximized log likelihood values of the fitted and constant-only-term models (Wrigley 1985). ρ^2 ranges from zero to one; values ranging from .2 to .4 represent a very good fit of the model (McFadden 1979, as cited in Wrigley 1985). The positive predictive value of this model (i.e., the percentage of those respondents who were predicted as concerned who actually reported concern) was low (28%) but the negative predictive value (i.e., the percentage of respondents predicted as not concerned who actually reported no concern) was high (95%). The model had good specificity (i.e., the percentage <u>not</u> concerned who were correctly

TABLE 6.2

RESULTS OF LOGISTIC REGRESSION FOR OUTCOME: CONCERN

SWARU		GLANBROOK		MILTON	
VARIABLE	R.O. (C.I.)	VARIABLE	R.O. (C.I.)	VARIABLE	R.O. (C.I.)
AGE	1.00(.99;1.02)	AGE	.99(.96;1.02)	AGE *	1.04(1.01;1.08)
GENDER	1.37(.71;2.64)	GENDER	.29(.05;1.62)	GENDER	.51(.20;1.30)
ZONE		ZONE **		ZONE *	
ZONE 1	2.57(.93;7.11)	ZONE 1	2.30(.90;5.88)	ZONE 1	5.18(1.07;25.09)
ZONE 2	2.35(.79;6.99)	ZONE 2	3.88(1.56;9.68)	ZONE 2	3.90(.96;15.91)
ZONE 3	1.92(.53;6.93)	ZONE 3	2.18(.93;5.10)	ZONE 3	1.37(.49;3.87)
DWELLING TENURE	1.13(.27;4.68)	# YRS AT CURRENT ADDRESS	.97(.92;1.02)	EDUCATION < HIGH	1.22(.34;4.33)
HEALTH SATISFACTION **	.14(.04;.53)	# YRS IN THE AREA	1.03(1.00;1.04)	COMP. HIGH	3.38(.94;12.17)
WORRIED ABOUT ANYONE	.56(.29;1.07)	# CLOSE FRIENDS *	1.05(1.01;1.09)	SOME COLL.	.29(.05;1.61)
GHQ SCORE *	.40(.17;.95)	SATISFACTION, SOCIAL ACTIVITIES *	4.35(1.17;16.11)	COMP. COLL.	1.15(.20;6.70)
MEMBER, LABOUR UNION/ COMMERCIAL GROUP **	.35(.17;.71)	MEMBER, ENVIRONMENTAL GRP **	.14(.03;.60)	SCL-90 SCORE *	.30(.09;.97)
ZONE X DWELLING TENURE * ZONE 1 X RENT	.75(.13;4.38)	FREQUENCY, ASK FOR/ RECEIVE HELP *** MORE	.21(.04;1.04)	WORRIED ABOUT ANYONE	.47(.18;1.21)
		SAME	.05(.01;.24)		
ZONE 2 X RENT	.16(.02;1.23)	GENDER X ENVIRONMENTAL GRP MEMBER	4.36(.68;27.82)	CONFIDANT	.16(.02;1.12)
ZONE 3 X RENT	.09(.01;.88)	# YRS CURRENT ADDRESS X FREQUENCY, HELP MORE *	1.10(1.01;1.20)	PAST COMMUNITY INVOLVEMENT **	11.49(2.25;58.6)
		SAME **	1.18(1.09;1.28)	AGE X PAST COMMUNITY INVOLVEMENT	.97(.94;.99)
ρ^2	.16	ρ^2	.20	ρ^2	.33
SENSITIVITY	68%	SENSITIVITY	79%	SENSITIVITY	88%
SPECIFICITY	77%	SPECIFICITY	71%	SPECIFICITY	79%
% CORRECTLY CLASSIFIED	76%	% CORRECTLY CLASSIFIED	77%	% CORRECTLY CLASSIFIED	86%

predicted) at 77% but lower sensitivity (i.e., the percentage concerned who were correctly predicted) at 68%. The model correctly classified 76% of respondents.

The significant explanatory variables in the model (the shaded cells in Table 6.2) included those from the health and well-being and social network blocks (Figure 6.1) with characteristics of the individual included in the interaction terms. Non-significant variables (the non-shaded cells in Table 6.2) remained in the model for the reasons cited above. The Relative Odds (R.O.) and Confidence Intervals (C.I.) associated with each variable are also reported in the table. Relative odds (exponent β) is the factor by which the odds of having the outcome variable will change when the independent variable increases by one unit (or, in the case of categorical variables, changes from one category to another) (Norusis 1990). If β is positive, the relative odds are greater than 1, which means that the odds are increased. If β is negative, the relative odds are less than 1 meaning that the odds are decreased. Using health satisfaction as an example, the relative odds was .14 indicating that an individual not satisfied with health status was less likely to be concerned about the site than someone who was satisfied. Perhaps this level of health satisfaction may take the focus off self and direct it toward wider issues (e.g., SWARU). The 95% confidence interval shows that the best estimate of the relative odds was between .04 and .53.

Based on the significant single effects in the model (Table 6.2), SWARU respondents were more likely to be concerned if they: were satisfied with current

health status, had a score on the GHQ-20 above the cut-point for normal (Goldberg 1972), and belonged to a labour union or commercial group. The variables age, gender and zone contributed little to the model. The GHQ-20 scores for the SWARU sample were the highest of the three sites but would not be considered high on the basis of comparison with the literature (Section 5.2.2). Further, higher levels of emotional distress at the SWARU site may be linked to: (a) high levels of reported stressful life events (Section 5.2.2); and/or, (b) community profile characteristics linked (in the literature) to higher levels of emotional distress (Section 4.2). The fact remains, however, that this indicator of general psychosocial health and well-being appears to be mediating the relationship such that higher levels of emotional distress (as measured by the GHQ-20) were related to concern about SWARU. The industrial nature of the city and the immediate area surrounding SWARU (Section 4.2) means that a high proportion of respondents more than likely belong to labour unions/commercial groups. The relationship between this variable and concern is therefore not surprising.

Further, the significant interaction effects in the model indicated that respondents were more likely to be concerned if they: owned a dwelling and lived closer to the site (as opposed to renting and living closer to the site). These factors, in combination, could understandably be linked to higher levels of reported concern.

The model of *concern* at Glanbrook (Table 6.2) had a ρ^2 of .20. The positive predictive value was high (89%), but the negative predictive value was low

(52%). The model had relatively good specificity (71%) and sensitivity (79%). This model correctly classified 77% of respondents.

The significant explanatory variables in this model (the shaded cells in Table 6.2) included those from the exposure and social network blocks (Figure 6.1). Based on the significant single effects in the model, Glanbrook respondents were more likely to be concerned if they: lived in zone 2 as opposed to zone 4, had more close friends, were not satisfied with social activities, belonged to an environmental group, and participated in fewer helping behaviours with neighbours than previously. These factors indicate the important role distance from the site (i.e., zone) plays in the process of psychosocial impacts as well as the mediating role played by social network factors (cf Section 2.2.2 and Figure 2.4). The significant interaction effects in the model indicated that respondents were more likely to be concerned if they: had lived longer at current address **and** participated in neighbourly helping behaviours with more or the same frequency as previously. These factors in combination illustrate the important role social support/social network factors play in the relationship between exposure and concern. These findings are consistent with what we would expect on the basis of Glanbrook's profile as a stable rural/agricultural community conducive to strong primary and secondary social support networks (cf Section 4.1).

The model of *concern* at Milton (Table 6.2) had a ρ^2 of .33. The positive predictive value of the model was (95%) while the negative predictive value was low

(59%). Specificity and sensitivity were 79% and 88%, respectively. 86% of respondents were correctly classified.

The significant explanatory variables which entered this model (the shaded cells in Table 6.2) come from all blocks in the model (Figure 6.1) illustrating the usefulness of a socioecological conceptual framework in profiling the determinants of psychosocial impacts of exposure. Based on the significant single effects in the model, Milton respondents were more likely to be concerned if they: were older, lived in zone 1 as opposed to zone 4, had a score on the SCL-90 somatic symptom checklist above the normal cut-point (Derogatis et al. 1973), and had greater past community involvement. These findings are not surprising; they profile a respondent who has a substantial stake in the siting process and has perhaps, given the significance of SCL-90 scores in the model, been substantially affected by it. Indeed, SCL-90 scores for this sample were high for zone one respondents, even in comparison to scores obtained for individuals exposed to the Three Mile Island nuclear accident (Section 5.2.2). The significant interaction effects in the model indicated that respondents were more likely to be concerned at Milton if they: were younger and had less past community involvement.

There are several points to be made from these analyses. The first is to acknowledge the heterogeneity of the models between sites despite using the same outcome and the same independent variables in the same fashion. This indicates differences in site and population characteristics (cf Chapter 4) and their influence

on psychosocial impacts of exposure. This issue is examined directly in the combined analyses presented later (Section 6.3.2). Second, the evidence confirms that psychosocial impacts occur whether exposure is actual *or perceived*. The highest levels of concern reported were at Milton (Table 5.17), a site which has only recently been approved and was not yet under construction at the time of the survey. Further, the logistic regression model at Milton had better fit than at the other two sites. Third, social network factors were stronger predictors of concern in the rural study areas (Glanbrook and Milton) than in the urban area (SWARU). Fourth, the results illustrate that there is no simple cause and effect relationship between exposure and concern. While distance from the site was a significant variable at two of the sites, numerous other variables from various blocks of the analytical model also contributed significantly. Finally, as previously discussed (Section 5.2.5), measures of general psychosocial health and well-being are used in this analysis as mediating variables. These measures have been shown to be significant in two of the concern models (GHQ-20 at SWARU and SCL-90 at Milton; Table 6.2). However, with respect to cause-and-effect linkages, the question remains: does psychosocial health and well-being mediate concern or vice versa? The terms of reference of this analysis render this question unanswerable. This is due to the operationalization of a socioecological conceptual framework (Figure 2.4) into a necessarily linear (for the purposes of this analysis) analytical model (Figure 6.1). It may be possible to address such unanswered questions under the terms of the larger research program

using qualitative methods. Regardless, this situation has obvious implications for future research (Section 7.4).

Health Concern

The logistic regression model of *health concern* at SWARU (Table 6.3) had a ρ^2 of only .11. The negative predictive value was high (98%) but the positive predictive value was low (25%). Sensitivity was low (71%) relative to specificity (85%). Overall, 84% of respondents were correctly classified.

Few significant explanatory variables contributed to this model (the shaded cells in Table 6.3). SWARU respondents were more likely to report that their site concerns were health related if they: belonged to an environmental group and had a household income in the $60-$70,000 range. The poor performance of this model was perhaps a result of the low levels of reported health-related concern at this site (Table 5.20).

The model of *health concern* at Glanbrook (Table 6.3) had a ρ^2 of.22. The positive and negative predictive values were high (75% and 80%, respectively) as were specificity (77%) and sensitivity (80%). The model correctly classified 77% of respondents.

The significant explanatory variables in this model (the shaded cells in Table 6.3) came from all blocks (Figure 6.1) indicating once again the utility of the socioecological conceptual framework. Based on the significant single effects in the

TABLE 6.3

RESULTS OF LOGISTIC REGRESSION FOR OUTCOME: HEALTH CONCERN

SWARU		GLANBROOK		MILTON	
VARIABLE	R.O. (C.I.)	VARIABLE	R.O. (C.I.)	VARIABLE	R.O. (C.I.)
AGE	1.00(.98;1.03)	AGE	1.15(1.00;1.33)	AGE	.99(.97;1.01)
GENDER	1.17(.54;2.55)	GENDER	.38(.02;7.36)	GENDER	1.84(.92;3.68)
ZONE		ZONE *		ZONE *	
ZONE 1	.98(.37;2.58)	ZONE 1	.19(.03;1.10)	ZONE 1	2.06(.80;5.30)
ZONE 2	.80(.27;2.34)	ZONE 2	.10(.01;.63)	ZONE 2	2.96(1.12;7.86)
ZONE 3	.51(.15;1.68)	ZONE 3	.26(.05;1.26)	ZONE 3	.86(.36;2.02)
INCOME * < $20,000	1.21(.23;6.42)	# YRS CURRENT ADDRESS	.99(.94;1.09)	PAST COMMUNITY INVOLVEMENT	1.65(1.27;2.15)
$20 - 30,000	2.68(.55;12.96)	CHILDREN < 5 YRS	18.1(.11;2935.9)	GENDER X DWELLING TENURE	.10(.01;1.06)
$30 - 40,000	1.50(.32;6.99)	SCL-90 SCORE **	.07(.02;.32)		
$40 - 50,000	1.32(.27;6.50)	SERIOUS ILLNESS	.95(.15;6.12)		
$50 - 60,000	1.93(.39;9.65)	MEMBER, ENVIRONMENTAL GRP	.22(.09;.51)		
$60 - 70,000	8.16(1.63;40.65)	MEMBER, OTHER GRP	.51(.10;2.53)		
HEALTH RATING	.18(.02;1.59)	AGE X CHILDREN < 5	.88(.76;1.02)		
MEMBER, ENVIRONMENTAL GRP	.25(.07;.86)	# YRS CURRENT ADDRESS X OTHER GRP	1.07(1.00;1.17)		
		GENDER X SERIOUS ILLNESS	45.25(2.44;838.67)		
		GENDER X OTHER GRP **	.05(.01;.40)		
		ZONE X SCL-90 SCORE ** ZONE 1 X BELOW	25.2(3.17;203.79)		
		ZONE 2 X BELOW	28.72(3.29;250.76)		
		ZONE 3 X BELOW	3.60(1.36;24.17)		
ρ^2 .11		ρ^2 .22		ρ^2 .13	
SENSITIVITY 71%		SENSITIVITY 80%		SENSITIVITY 71%	
SPECIFICITY 85%		SPECIFICITY 77%		SPECIFICITY 69%	
% CORRECTLY CLASSIFIED 84%		% CORRECTLY CLASSIFIED 77%		% CORRECTLY CLASSIFIED 70%	

model, Glanbrook respondents were more likely to report that their site concerns were health related if they: lived in zone 2 as opposed to zone 4, had an SCL-90 score above the cut-point, and belonged to an environmental group. These are all factors which make sense; however, the question of direction of relationship may be raised yet again (Section 6.2). The significant interaction effects in the model indicated that Glanbrook respondents more likely to have health concerns: were female **and** had not had a recent serious illness, were female **and** belonged to a community group not named by the respondent, lived in zone 1 or 2 **and** had a score on the SCL-90 below the cut-point. This is the first indication of a significant role for gender. Much of the literature suggests that women are more likely to experience psychosocial impacts of exposure than men. In this instance, it appears that gender is significant only in combination with other factors (e.g., a stressful life event, belonging to a community group). The final interaction term echoes the significance of its lower order relatives. However, the change in category for SCL-90 score begs an explanation. While acting separately, distance from the site (i.e., zone) and high SCL-90 score are significantly related to levels of reported health concern. However, in combination, SCL-90 appears to have less of an effect than distance in the context of this model.

The model of *health concern* at Milton (Table 6.3) had a ρ^2 of only .13. Positive and negative predictive values were 75% and 64%, respectively. Similar measures of specificity and sensitivity were achieved (69% and 71%, respectively).

The model correctly classified 70% of respondents. However, there were only two significant variables in the model. First, respondents at Milton were more likely to report that their site concerns were health related if they lived in zone 2 as opposed to zone 4 indicating once again the important role that distance plays. The second significant variable was 'past community involvement' (more vs less). This is a summary measure of the number of activities respondents may have taken part in regarding a local community issue. Its significance in this model had two potential interpretations: (1) respondents in Milton were very active regarding community issues; or, (2) due to the recency of the Milton siting, the issue respondents were involved in **was** the study site and they were therefore very aware of the potential health implications of a landfill.

As for *concern*, the models for *health concern* were very different for the three sites, indicating the uniqueness of each of the case studies. On the other hand, a common feature of the three models was the consistent significant effect of variables related to involvement in community and community issues.

Actions

As previously discussed (Section 5.3.3), respondents were asked if they had participated in one or more of a variety of site-related actions. For the purposes of the logistic regression modelling, the actions included only those which were truly action-oriented (as opposed to information-seeking such as reading newspapers).

The lowest frequency of actions taken was at SWARU (21%), the highest at Milton (71%), with Glanbrook in the middle (60%) (Table 6.4). In addition, there was clear evidence of a gradient of actions with distance from each of the three sites, with the highest levels of reporting in the closest zones.

The model of *actions (one or more)* at SWARU (Table 6.5) had a ρ^2 of only .17. The negative predictive value was 96% but the positive predictive value was only 23%. Sensitivity was only 63% but specificity was 82%. As before, the poor performance of this model was likely related to the low frequency of actions taken at this site (Table 5.4). Overall, 80% of respondents were correctly classified.

The significant explanatory variables in this model (the shaded cells in Table 6.5) included those from the exposure, individual and social network blocks (Figure 6.1). SWARU respondents were more likely to take at least one action in response to site concerns if they: lived in zone 1 as opposed to zone 4, owned a dwelling, were not employed full-time, were not satisfied with the area in which they lived, and did not belong to a children's group but belonged to more community groups than someone less likely to take action. These variables indicate yet again the importance of distance from the site, stake in the neighbourhood and community connectedness. As will become apparent, the latter factor shows up in a number of action-related models suggesting a relationship between community connectedness and action-focused coping.

The model of *actions (one or more)* at Glanbrook (Table 6.5) had a ρ^2 of

TABLE 6.4

FREQUENCY OF SITE-RELATED ACTIONS (1+)[1]

SWARU

Zone	1	2	3	4	Total
Frequency	23	14	5	12	54
Total	77	55	58	64	254
Percent	30	26	9	19	21

GLANBROOK

Zone	1	2	3	4	Total
Frequency	35	43	45	31	154
Total	52	67	71	65	255
Percent	67	64	63	48	60

MILTON

Zone	1	2	3	4	Total
Frequency	42	29	35	26	132
Total	44	38	58	47	187
Percent	96	76	60	55	71

[1] note: the following actions were included in this index:

- discussed site concerns with friends/relatives
- attended meeting at which site was discussed
- belong to a local citizens group which deals with site
- contacted politicians/government agency re: site
- spoken to staff at site about concerns

TABLE 6.5

RESULTS OF LOGISTIC REGRESSION FOR OUTCOME: ACTIONS (1*)

SWARU		GLANBROOK		MILTON	
VARIABLE	R.O. (C.I.)	VARIABLE	R.O. (C.I.)	VARIABLE	R.O. (C.I.)
AGE	1.00(.98;1.03)	AGE	1.02(.99;1.05)	AGE	1.00(.98;1.03)
GENDER	1.44(.69;2.99)	GENDER	.98(.51;1.88)	GENDER	.91(.41;1.98)
ZONE **		ZONE ***		ZONE ***	
ZONE 1	3.59(1.43;9.05)	ZONE 1	7.06(2.56;19.44)	ZONE 1	13.98(2.82;69.25)
ZONE 2	1.44(.54;3.86)	ZONE 2	5.15(2.03;13.06)	ZONE 2	2.72(.89;8.29)
ZONE 3	.56(.15;2.08)	ZONE 3	2.51(1.05;5.98)	ZONE 3	1.08(.44;2.63)
DWELLING TENURE *	.43(.20;.90)	# YRS CURRENT ADDRESS	1.01(.98;1.07)	FREQUENCY,TALK WITH NEIGHBOURS **	
				NEVER	.02(.002;.31)
EMPLOYMENT STATUS *	.42(.01;25.84)	# YRS IN AREA	1.01(.99;1.05)	SELDOM	.37(.09;1.51)
AREA SATISFACTION *	.43(.20;.91)	# CLOSE RELATIVES *	.97(.94;.99)	SOMETIMES	.42(.13;1.40)
CONFIDANT	3.95(.97;16.02)	# CLOSE FRIENDS *	1.04(1.00;1.08)	OFTEN	.33(.10;1.09)
MEMBER, CHILDREN'S GRP	8.41(2.00;35.17)	MEMBER,ENVIRONMENTAL GRP **	.26(.10;.69)	MEMBER, ENVIRONMENTAL GRP	.37(.11;1.26)
GROUP INVOLVEMENT **	1.60(1.18;2.17)	PAST COMMUNITY INVOLVEMENT	1.89(.78;4.59)	MEMBER, OTHER GRP *	.15(.03;.78)
		PERCEIVED COMMUNITY INVOLVEMENT ***			
		VERY	.42(.12;1.47)		
		SOMEWHAT	.27(.10;.74)		
		NOT TOO...	.72(.28;1.87)		
ρ^2	.17	ρ^2	.23	ρ^2	.23
SENSITIVITY	63%	SENSITIVITY	94%	SENSITIVITY	81%
SPECIFICITY	82%	SPECIFICITY	69%	SPECIFICITY	56%
% CORRECTLY CLASSIFIED	80%	% CORRECTLY CLASSIFIED	73%	% CORRECTLY CLASSIFIED	74%

.23. The negative predictive value was 64% while the positive predictive value was 75%. Sensitivity and specificity were 94% and 69%, respectively. The model correctly classified 73% of respondents.

The significant explanatory variables in this model (the shaded cells in Table 6.5) included those from the exposure and social network blocks only (Figure 6.1). Based on the significant single effects in the model Glanbrook respondents were more likely to take one or more actions in response to site concerns if they: lived in zone 1, 2 or 3 as opposed to zone 4, had fewer close relatives and more close friends, perceived themselves as being somewhat involved in their community as opposed to not at all involved, and belonged to an environmental group. These significant variables echo those of the previous model with respect to the importance of distance from the site and community connectedness.

The model of *actions (one or more)* at Milton (Table 6.5) had a ρ^2 of .23. Specificity was low (56%) but sensitivity was high (81%). While the positive predictive value was high (85%), the low negative predictive value (49%) may be related to the fact that frequencies of action at this site were relatively high (Table 6.4). Overall, 74% of respondents were correctly classified.

The few significant explanatory variables in this model were again related primarily to distance from the site and community-connectedness (the shaded cells in Table 6.5). Milton respondents were more likely to take at least one action if they: lived in zone 1 as opposed to zone 4, talked with neighbours very often as

opposed to never, and belonged to a community group.

The frequencies of site related actions at Milton were high enough that a cut-point of *two or more actions* could be used in a subsequent model (Table 6.6). This model had a ρ^2 of .28. Sensitivity decreased (75%) but specificity increased (78%). The overall percentage correctly classified increased slightly to 77%.

Milton respondents were more likely to take 2 or more actions in response to site-related concerns if they: lived in zone 1 as opposed to zone 4, had lived longer at the current address, had some university education, had a score on the GHQ-20 above the normal cut-point, were satisfied with social activities, and belonged to a children's group (Table 6.6). These variables indicate again the importance of distance from the site as well as community connectedness. Further, it would appear that, despite the low prevalence of high GHQ-20 scores at this site (Table 5.3), Milton respondents more likely to take two or more actions also experience higher levels of emotional distress.

Since the higher cut-point for actions proved useful at Milton, it was attempted at Glanbrook (at SWARU, responses above this cut-point were too few to be useful). The ρ^2 increased to .35 (Table 6.6). The positive predictive value decreased from 79% to 64%, which reflects the reduced frequency of reported outcomes. The negative predictive value increased substantially to 94%. Sensitivity (76%) and specificity (86%) were both relatively high. Overall, this model correctly classified 86% of respondents (compared to the previous 73%).

TABLE 6.6

RESULTS OF LOGISTIC REGRESSION FOR OUTCOME: ACTIONS (2+)

MILTON		GLANBROOK	
VARIABLE	R.O. (C.I.)	VARIABLE	R.O. (C.I.)
AGE	1.02(.99;1.05)	AGE	1.02(.98;1.06)
GENDER	.64(.30;1.39)	GENDER	1.20(.54;2.68)
ZONE ***		ZONE **	
ZONE 1	11.85(3.63;38.66)	ZONE 1	4.53(1.48;13.84)
ZONE 2	2.74(.84;8.97)	ZONE 2	1.91(.65;5.60)
ZONE 3	1.57(.57;1.26)	ZONE 3	1.13(.36;3.58)
# YRS CURRENT ADDRESS *	1.03(1.01;1.06)	MARITAL STATUS *	.21(.05;.88)
EDUCATION ** < HIGH	.17(.05;.53)	CHILDREN < 5 YRS *	4.18(1.27;13.83)
COMP. HIGH	.30(.11;.83)	# YRS IN AREA *	1.03(1.01;1.07)
SOME COLL.	.13(.03;.66)	PAST COMMUNITY INVOLVEMENT ***	1.86(1.29;2.67)
COMP. COLL.	.08(.02;.34)	MEMBER, LABOUR UNION/COMMERCIAL GRP	.46(.21;1.02)
GHQ SCORE *	.27(.08;.96)	MEMBER, CHURCH/RELIGIOUS GRP *	.40(.16;.97)
RECENT DEATH OF SOMEONE CLOSE	.40(.14;1.20)	MEMBER, ENVIRONMENTAL GRP	.73(.19;.2.74)
SATISFACTION, SOCIAL ACTIVITIES **	.05(.01;.48)	MEMBER, SOCIAL RECREATIONAL GROUP	2.27(.45;11.52)
MEMBER, CHILDREN'S GROUP **	.04(.08;.73)	SOCIAL/RECREATIONAL X ENVIRONMENTAL GRP *	.14(.02;.92)
ρ^2	.28	ρ^2	.35
SENSITIVITY	75%	SENSITIVITY	76%
SPECIFICITY	78%	SPECIFICITY	86%
% CORRECTLY CLASSIFIED	77%	% CORRECTLY CLASSIFIED	84%

Significant explanatory variables in this model (shaded cells in Table 6.6) reflect a slightly different profile but one which remains dominated by distance and social network variables. That is, Glanbrook respondents were more likely to take 2 or more actions in response to site concerns if they: lived in zone 1 as opposed to zone 4, had a spouse/partner, did not have children under 5 years old, had lived in the area longer, had greater past community involvement, and belonged to a church/religious organization. In addition, the significant interaction effects indicated that the respondent more likely to take 2 or more actions at Glanbrook: belonged to a social/recreational group **and** an environmental group. The results of this model echo those of other action-related models regarding the importance of social support and community connectedness factors in determining action-focused coping.

There are two general points to be made from these analyses. First, the models of *actions (two or more)* more accurately reflect determinants of active respondents; one action could be incidental, 2 or more actions were more likely deliberate. Second, the models were dominated by social network variables which indicated an individual's connectedness to both primary and secondary social networks as well as their wider community system. This was most evident in the two rural communities of Glanbrook and Milton. These findings are consistent with what would be expected in such stable rural communities (cf Chapter 4).

6.3.2 MODELS COMBINING DATA FROM ALL THREE SITES

Although the parallel case study design made within site modelling the primary analytical approach, there was good reason to explore the direct effects of site on psychosocial outcomes. This is consistent with the conceptual framework which includes characteristics of the contaminant source as determinants of psychosocial outcomes (Figure 2.4). To this end, two combined models were developed for *concern* and *actions (one or more)* using data from all three sites simultaneously, and including site as a three category independent variable.

The combined logistic regression model of *concern* (Table 6.7) had a ρ^2 of .28. The negative predictive value was 69% and the positive predictive value was 80%. Sensitivity and specificity were both high (76% and 74%, respectively). This model correctly classified 75% of respondents.

Site was a significant explanatory variable in combination with several others (shaded cells in Table 6.7). Respondents were more likely to report being concerned if they: lived in zone 1 or 2 as opposed to zone 4, lived in Milton as opposed to Glanbrook or SWARU, had lived longer in the area, were employed full-time, had an SCL-90 score above the normal cut-point, had suffered a recent death of spouse/partner, talked to neighbours very often, rated neighbours as friendly or very friendly, helped or received help from neighbours less often than previously, and belonged to more community groups. These significant variables come from each of the blocks with the analytical model indicating that characteristics of the site are

TABLE 6.7

RESULTS OF COMBINED LOGISTIC REGRESSIONS

CONCERN		ACTIONS (1*)	
VARIABLE	R.O. (C.I.)	VARIABLE	R.O. (C.I.)
AGE	.98(.96;1.00)	AGE	1.00(.98;1.02)
GENDER	.97(.63;1.48)	GENDER	.99(.66;1.48)
ZONE ***		ZONE ***	
ZONE 1	2.86(1.61;5.07)	ZONE 1	3.87(2.20;6.80)
ZONE 2	2.42(1.36;4.30)	ZONE 2	2.73(1.57;4.75)
ZONE 3	1.25(.72;2.14)	ZONE 3	1.21(.71;2.05)
SITE *** SWARU	.24(.11;.53)	SITE *** SWARU	.22(.11;.44)
GLANBROOK	1.09(.53;2.24)	GLANBROOK	.74(.38;1.45)
# YRS IN AREA **	1.02(1.01;1.04)	# YRS IN AREA **	1.02(1.01;1.03)
DWELLING TYPE	.70(.18;2.77)	EMPLOYMENT STATUS	.67(.44;1.01)
EMPLOYMENT STATUS **	.12(.03;.55)	SCL-90 SCORE *	.63(.42;.96)
EDUCATION		COUNT ON FOR HELP *	5.93(1.05;33.52)
< HIGH	.98(.51;1.92)	PAST COMMUNITY INVOLVEMENT ***	2.16(1.43;3.27)
COMP. HIGH	1.55(.81;2.95)	PERCEIVED COMMUNITY INVOLVEMENT ** VERY	1.75(.68;4.47)
SOME COLL.	.46(.19;1.12)	SOMEWHAT	2.22(1.24;3.96)
COMP. COLL.	1.02(.46;2.24)	NOT TOO..	1.84(1.16;2.93)
SCL-90 SCORE **	.56(.36;.87)	MEMBER,CHURCH/RELIGIOUS GRP	.69(.46;1.03)
RECENT DEATH,SPOUSE/PARTNER **	.14(.03;.61)	MEMBER, CHILDREN'S GRP	1.69(.99;2.88)
AREA SATISFACTION	.70(.44;1.12)	MEMBER, ENVIRONMENTAL GRP **	.43(.23;.79)
FREQUENCY,TALK WITH NEIGHBOURS *NEVER	.48(.14;1.66)	SITE X PAST COMMUNITY INVOLVEMENT ** SWARU	.46(.27;.76)

TABLE 6.7

RESULTS OF COMBINED LOGISTIC REGRESSIONS

CONCERN		ACTIONS (1+)	
VARIABLE	R.O. (C.I.)	VARIABLE	R.O. (C.I.)
SELDOM	1.22(.58;2.55)	GLANBROOK	.65(.40;1.05)
SOMETIMES	.58(.32;1.03)		
OFTEN	.56(.34;.93)		
FRIENDLINESS RATING * VERY FRIENDLY	3.92(1.07;14.37)		
FRIENDLY	5.00(1.39;18.09)		
FREQUENCY HELP FOR FROM NEIGHBOURS MORE	.41(.12;1.44)		
SAME	.20(.06;.61)		
PAST COMMUNITY INVOLVEMENT	1.11(.52;2.37)		
# GROUP MEMBERSHIPS *	1.23(.24;1.45)		
AGE X PAST COMMUNITY INVOLVEMENT *	1.02(1.00;1.03)		
SITE X PAST COMMUNITY INVOLVEMENT WARU	.50(.29;.87)		
GLANBROOK	.50(.30;.85)		
EMPLOYMENT STATUS X HELPING * MORE	2.18(.48;9.91)		
SAME	5.48(1.45;20.74)		
DWELLING TYPE X HELPING MORE	.18(.03;1.09)		
SAME	1.06(.25;4.52)		
ρ^2	.28	ρ^2	.28
SENSITIVITY	76%	SENSITIVITY	75%
SPECIFICITY	74%	SPECIFICITY	74%
% CORRECTLY CLASSIFIED	75%	% CORRECTLY CLASSIFIED	75%

indeed important in determining psychosocial impacts, **but** only in combination with characteristics of the individual, the social network and psychosocial health and well-being. It is also important to note that the Milton site appears to be the greatest determinant of psychosocial impacts with respect to the site variable. This is an important finding given that, at the time of the survey, the site had only recently been approved and was not yet operating. The significant interaction effects in the model indicated that respondents were more likely to be concerned if they: were older **and** had greater past community involvement; lived at Milton **and** had less past community involvement; were employed other than full-time **and** helped or received help from neighbours with the same frequency as previously. These interaction effects illustrate again the important role played by social support/ community connectedness factors (e.g., past community involvement, interaction with neighbours) in combination with factors related to awareness (e.g., the Milton site, where exposure to the siting issue has been very high; respondents employed other than full-time who would then by extension spend more time in their immediate area).

The combined model of *actions (one or more)* (Table 6.7) had a ρ^2 of .28. The positive and negative predictive values were both high (72% and 78%, respectively) as were specificity and sensitivity (74% and 75%, respectively). Overall, 75% of respondents were correctly classified.

Site was again a significant explanatory variable along with several others

(the shaded cells in Table 6.7). Based on the significant single effects in the model, respondents were more likely to take one or more actions in response to site concerns if they: lived in zone 1 or 2 as opposed to zone 4, lived in Milton, had lived longer in the area, had an SCL-90 score above the normal cut-point, did not have anyone they could count on for help, had greater past community involvement, rated themselves as being somewhat or not too involved with the community as opposed to not at all involved, belonged to an environmental group, and lived in Milton and had less past community involvement. This set of variables is similar to that uncovered in the previous model (Table 6.6).

The results for the combined models indicated the explanatory power of site-related characteristics. Site was a significant explanatory variable and appeared in significant interaction terms in both models. At the same time, site did not dominate in either model. The number and diversity of variables which were significant are further evidence of the socioecological determination of psychosocial impacts.

6.4 DISCUSSION AND CONCLUSIONS

Theoretical, substantive and applied issues arise from the results: the utility of the socioecological conceptual framework and analytical model; the variables which did and did not emerge as significant in the models; and the potential applications of the findings to policy and future research. First, this

analysis has demonstrated the utility of a socioecological conceptual framework in identifying the determinants of psychosocial impacts. All the models contain explanatory variables from several (if not all) of the blocks contained in the model. A direct exposure-outcome relationship is not supported especially in light of the results of the models combining data from all three sites (Section 6.3.2). At the same time, however, analytical problems arise in the translation of the conceptual framework into an analytical model whereby theoretically reciprocal relationships are necessarily reduced to unidirectional ones for the purposes of analysis (Section 6.2). This has implications for the interpretation of findings whereby questions remain about the direction of certain relationships (e.g., the role of GHQ-20 and SCL-90 in determining concern). These issues can be further investigated within the context of the larger research program by the qualitative stage of the research.

Several points arise in relation to the second, substantive issue. Zone was an important explanatory variable in several of the models. This points to the importance that distance from the site plays in the process of psychosocial impacts and confirms the distance gradients observed in the frequency distributions of the outcome variables. However, given the number and diversity of explanatory variables in all the models, a simple cause and effect relationship due to exposure is not supported. Comparison of these results with the psychosocial literature is difficult given the differences between studies in their definition of zonal distances for sampling 'exposed' respondents. While this study used fairly narrow zones (.5, 1 or

2 km in width), some studies used exposure zones of up to 5 or 10 km (Sorensen et al. 1987; Horowitz and Stefanko 1989).

Second, a substantial role was attributed to social network factors in the conceptual framework. This is consistent with the psychosocial literature which indicates that social support (kinship and friendship networks) and community participation are key factors influencing both the experience of environmental stress as well as the coping response (Edelstein 1988; Eyles et al. 1990; Logue et al. 1981; Perry 1983; Sorensen et al. 1987). The results indicate that social network variables had important effects in all the models and dominated the action models. This was especially true for Glanbrook and Milton which is not surprising given the profiles of these two communities (Sections 4.1 and 4.3, respectively). Respondents connected to the community in other ways (e.g., interact frequently with neighbours, belong to community groups, have a number of close friends, have had community involvement with local issues in the past, and so on) are also taking action related to the sites.

Third, variables related to general health status were included as potential mediators of site-specific impacts. Items from the Holmes and Rahe stressful life events scale (1967) were significant in only two models (concern in the combined model and as part of an interaction term in the model of health concern at Glanbrook). The GHQ-20 was related to concern at SWARU and actions (2^{+}) at Milton. The SCL-90 was related to concern (Milton and combined model), health

concern (Glanbrook) and action (combined model only). Perceived health status was significant only in the model of concern at SWARU. As previously discussed a fundamental difficulty in interpreting these results is the uncertain cause and effect linkages. Although this research has suggested a role for general health status as a mediator of site-specific impacts, it is plausible that site-specific impacts mediate general health status.

Fourth, age and gender were deemed to be of *a priori* importance given their significance in the environmental stress literature and were therefore forced into each model. However, as a single term, age achieved statistical significance only once (concern at Milton). Gender also proved to be of little importance despite the findings of other studies which report higher levels of psychosocial impacts among women (Taylor et al. 1989). Related to this, the presence of young children in the home emerged only once as a significant explanatory variable; individuals in Glanbrook who had children in the household less than five years old were much less likely to take 2 or more actions in response to site concerns. This may be due to the fact that parents of young children rarely have spare time to devote to community issues. More generally, when comparing these results with those previously reported, it is important to recognize that the exposure situations typically investigated in the psychosocial literature are acute and hazardous (e.g., Three Mile Island, Love Canal). In contrast, the sites investigated here are characterized by low-level, chronic exposures to non-hazardous solid waste. Differences between these results and those

found in the research literature are therefore not surprising.

Finally, individual level variables rarely emerged as significant explanatory variables with the exception of length of residence (both 'in the area' and 'at the current address'). Dwelling tenure and type were important variables in understanding concern around other noxious facilities (Dear and Taylor 1982). Little difference in reported levels of these variables at two sites (Table 3.3) could perhaps explain their absence from the models. The same argument could account for the lack of effect of socioeconomic status (measured as income, education and occupational status).

Results of the logistic regression analyses confirm that a combination of factors are significantly associated with concern and action but that the specific factors involved vary by outcome and site. This latter finding is consistent with previous studies which show no strong consistency in the characteristics of individuals and groups reporting psychosocial impacts (Taylor et al. 1989). The implication is that strategies aimed to address and alleviate psychosocial impacts need to be specific to the characteristics of the populations in particular situations.

These findings also raise a number of interesting questions. For instance, given that determinants of psychosocial impacts vary by outcome and site, more needs to be known of the contexts (community, cultural, social, technological, political) within which the process of psychosocial impacts occur. Further, given the difficulties inherent in the translation of a conceptual framework into an analytical

model, more investigation must be carried out into the limitations of our methodologies and the development of innovative approaches including the integration of quantitative and qualitative methods. These issues will be further addressed in the final chapter (Section 7.4).

CHAPTER 7

CONCLUSIONS

This thesis described a geographic analysis of an environment and health relationship. Specifically, psychosocial impacts in three populations exposed to solid waste disposal facilities in southern Ontario were examined. The scope of this research was based on the awareness and prevalence of psychosocial impacts of exposure to environmental contaminants in Ontario, the relative absence of theory and empirical evidence to explain their determinants, and uncertainty as to ways to intervene effectively to reduce their adverse effects on human health and well-being. Three objectives were addressed:

> *1. To determine the prevalence of psychosocial impacts among exposed individuals.*
>
> *2. To investigate the determinants of individual level psychosocial impacts.*
>
> *3. To investigate the determinants of individual level actions taken in response to psychosocial impacts.*

In addressing these objectives, the research has made theoretical, methodologic and substantive contributions. The substantive contributions are linked to the potential applications of the research findings and directions for future research. The thesis

findings pose several challenges for future research which can also be categorized under the headings of theory (e.g., what has the thesis achieved conceptually and how can this be taken further?), substance (e.g., has the research employed the most appropriate outcome measures? what might alternative outcome measures look like?), and method (e.g., how to translate concepts into empirically measurable indicators through the development of innovative methodological approaches).

7.1 THEORETICAL CONTRIBUTIONS

A review of the evidence on psychosocial impacts of exposure points to the relative absence of theory and/or conceptual frameworks used to guide research (Section 2.2). What is measured, how it is measured, and how results are interpreted are all determined by the way concepts are defined in and of themselves as well as in relation to each other. Often in the psychosocial literature, conceptual frameworks are left implicit and the reader is left to grapple with loosely-defined terms such as 'stress' and 'depression'. With a couple of exceptions in some of the more recent qualitative research (Edelstein 1988; Sorensen et al. 1987), the majority of studies fail to make explicit the structure and properties of concepts employed and/or the theoretical tenets by which they are guided.

Using the literature on environmental stress and coping as a theoretical point of departure, this research was guided by the psychological model of response to environmental stress provided by Lazarus and Folkman (1984). As this model

suggests, the relationship between an environmental stressor and psychosocial impacts is not one of direct cause-and-effect. On the contrary, a review of the literature reveals a substantial number of mediating factors identified by researchers working in the field of environmental stress. The author has categorized these into four sets of mediating dimensions which form the basis of the socioecologically-based conceptual framework used to guide the current research (Figure 2.4). The utility of a socioecological framework is demonstrated by its ability to accommodate broadly-defined determinants of (psychosocial) health (e.g., characteristics of the individual, the environmental exposure, the social network and the wider community system) as well as broadly-defined health outcomes themselves (e.g., psychosocial impacts, operationally defined here as concern, effects and action).

The idea of a contextualized, socioecological approach to issues of environment and health is consistent with recent research in social and medical geography (Eyles and Woods 1983; Eyles and Donovan 1990; Eyles et al. 1990; Kirby 1990; Taylor et al. 1989; White 1981, 1987, 1989). The analysis in Chapter 6 has demonstrated the utility of a socioecological conceptual framework in identifying the determinants of psychosocial impacts given the number and diversity of explanatory variables which emerged in each of the models. At the same time, however, analytical problems arise in the translation of the conceptual framework into an analytical model whereby theoretically reciprocal relationships are necessarily reduced to unidirectional ones for the purposes of analysis (Section 6.2). This has

obvious implications for the interpretation of findings with respect to the direction of cause-and-effect relationships as well as areas for future research.

In short, the theory of environmental stress posited by Lazarus and Folkman (1984) was contextualized within a socioecological conceptual framework (Figure 2.4) which was, in turn, translated into an analytical model used to guide the multivariate analyses (Figure 6.1). While a useful process, the challenge remains to develop an analytical model capable of accommodating the inherently transactive nature of the socioecological model of health and well-being from which it stems. This may best be done in the context of the development of innovative methodologies (e.g., the integration of quantitative and qualitative methods).

7.2 METHODOLOGIC CONTRIBUTIONS

The review of the literature identified several areas of methodological concern (Section 2.2.3) in the investigation of psychosocial impacts of exposure (e.g., accurate documentation of exposure and outcome, selection of an appropriate measure of psychosocial health and well-being, and so on). There was therefore an attempt within the design of the current research to begin to redress some of these concerns. In so doing, the thesis made several methodological contributions.

Perhaps the most significant contribution was the development of an epidemiologic survey instrument designed to address psychosocial impacts of exposure. The use of a combination of general measures of psychosocial health and

well-being and site-specific questions re: impacts suggests that the instrument has the potential for wide-spread use as site-specific questions can be altered to suit. Further, the instrument was designed to be administered over the telephone in a relatively short period of time thus allowing for fairly large sample sizes. It is interesting to note that the literature review (Chapter 2) uncovered three studies which used telephone surveys to assess impacts of exposure (Horowitz and Stefanko 1989; Lipscombe et al. 1991; Wiedemann et al. 1991). As previously discussed, however (Section 2.2.1), each of these studies suffered from various weaknesses (e.g., very wide distance zones (Horowitz and Stefanko); biased/leading questions (Lipscombe et al. 1991); low response rate (Wiedemann et al. 1991).

One of the areas of methodologic concern identified in the literature review (Section 2.2.3) was the selection of an appropriate measure of psychosocial impacts. In much of the literature, emotional distress scales (such as the GHQ and SCL-90) are used as outcome measures. This is because the exposures typically studied are toxic or hazardous and often acute. The scores on the GHQ-20 and SCL-90 scales in this analysis were used as mediating factors as opposed to outcomes given that the exposures were non-hazardous and chronic. The primary psychosocial outcome measures used were site- and situation-specific (i.e., concern, effects and action). This points to a gap in the literature with respect to a more general outcome measure which could be appropriately used across sites/exposures. Such a measure would perhaps be based on an assessment of *quality of environmental life*.

This measure could include site- and situation-specific indicators of psychosocial impacts (i.e., concern, effects and action) but would also include a quality of life component.

The survey instrument used in this research appears to have been relatively successful in addressing the objectives. However, a stronger test of its validity will come from future uses. The instrument has already been administered in two additional study populations: residents exposed to the Smithville, Ontario PCB incinerator and a follow-up study of the Milton respondents.

It should also be noted that there was no detailed reference in the literature to the use of the GHQ-20 or the SCL-90 over the telephone. Despite the minor modifications made in the instrument to the original format of the items, internal validity was comparable to previous self-administered versions (see Sections 5.2.2 and 5.2.3, respectively).

Secondly, the literature review (Chapter 2) did not uncover any studies which addressed psychosocial impacts of (chronic) exposure to non-hazardous solid waste facilities such as Glanbrook and SWARU. Indeed, the vast majority of psychosocial research involves the study of impacts resulting from (often acute) hazardous exposures (e.g., Love Canal, Three Mile Island, and so on). In addition, only one study addressed impacts of a *proposed* facility, such as in the Milton example. Wiedemann and others (1991) studied public concerns over a proposed solid waste incinerator in a small (West) German village. Unfortunately, the

reliability of the study is questionable because of a low response rate (Section 2.2.1).

Thirdly, while some studies did address bivariate relationships between psychosocial impacts and various sociodemographic factors, few if any went beyond this stage to multivariate analyses in an attempt to profile the determinants of psychosocial impacts and/or actions taken in response to impacts.

Finally, the quantitative methods used in this research form the initial stage of a larger research programme which involves a combination of quantitative and qualitative methods to address the issue of psychosocial impacts of exposure. The initial epidemiologic survey analysis placed within a community context (provided by the baseline community profiles found in Chapter 4) which accounts for the mediating roles of social and cultural factors provides the baseline data which forms the point of departure for the qualitative stage of the research. At the second stage, which was beyond the scope of this thesis, psychosocial impacts are addressed at the family, social network and community levels.

7.3 SUBSTANTIVE CONTRIBUTIONS AND POTENTIAL APPLICATIONS

Potential applications of the research findings are linked to the purpose of the larger research program: to determine the impacts of exposure to environmental contaminants on human health and welfare and to develop strategies to reduce their adverse impacts. Three issues can be addressed from the results. These are related to: the levels of concern, effects and action reported at each of the

three sites (Tables 5.17, 5.20 and 6.37), the types of concern (Table 5.18), and the determinants of concern and action (Tables 6.35, 6.36, 6.38, 6.39 and 6.40).

The reported frequencies show higher levels of concern and action at Milton and Glanbrook compared with SWARU. This confirms that the recent controversy and debate over the introduction of the Milton site has generated widespread reaction throughout the community. At Glanbrook, where the site has been operating for over ten years, concern persists at quite a high level even though the site has not been a high profile issue in the recent past. This implies that concern does not necessarily decrease steadily over time. The much lower levels of concern and action at SWARU, which has been operating for over 20 years, suggests counter-evidence. However, it is very doubtful whether the SWARU situation is comparable given that it is a very different type of facility (incinerator vs landfill) and is situated in a very different setting (urban industrial vs rural).

The types of concern most frequently reported at the three sites indicate the importance of both site and community characteristics and thereby the need to carefully consider the specifics of the local situation in any effort to address and alleviate community concerns. That is, consistent with the conceptual framework, psychosocial impacts must be seen within the wider community context within which they occur. This was done in this thesis through the compilation of community profiles for each of the study areas (Chapter 4). These were drawn upon in the interpretation of the both the descriptive (Chapter 5) and multivariate (Chapter 6)

analyses. At the SWARU incinerator, the most frequently mentioned concern was air pollution. At Glanbrook, it was site operation (e.g., type and nature of wastes being disposed of and safety concerns). These concerns may be related to the fact that this landfill is closed to public access which may rouse the suspicions of area residents. At Milton, the most frequent concern was water pollution which reflects the importance of agriculture in the local economy and the reliance on private wells for domestic water supply. For the majority, these concerns were linked to worry about health implications demonstrated by the high proportion of concerns reported as health related. Further, given that these results have shown that determinants of psychosocial impacts vary by outcome and site, more needs to be known of the other contexts within which psychosocial impacts occur (e.g., cultural, social, technological, political). While these may be seen as component parts of a 'wider community context', they need to be addressed more explicitly than has been done in this thesis. This may be the task of the second stage of the larger research program of which this thesis is a part.

With respect to the bivariate relationships investigated, there were no consistent significant relationships between sociodemographic variables and the indices of general psychosocial health and well-being. This is not surprising given that the prevalence of these measures was generally low for all sample groups. On the other hand, site related concern was associated with higher incomes (SWARU and Milton), more education (SWARU), home ownership (SWARU), length of

residence (Glanbrook and Milton) and proximity to the site (SWARU and Milton). Thoughts and actions related to moving because of the site were associated with proximity to the site. Again, this is not surprising given the greater potential for impacts for those living closer to the sites. Site-related actions were associated with length of residence (all sites), income, home ownership (SWARU and Milton) and proximity to the site (Milton).

Few respondents reported site-related effects on everyday life (Section 5.3.2). Psychosocial effects and reduced area satisfaction were reported most at Milton and least at SWARU. In addition, few respondents reported site-related health effects. These were predominant and most frequent at Milton and least frequent at SWARU. The relatively low frequencies of these outcomes, however, does not negate the importance individuals ascribe to them. Further, there is no question that these individuals attribute the effects to the sites.

The consistently high levels of reported impacts among Milton respondents is a particularly interesting finding given that the site had not yet begun operating (nor had construction even begun) at the time of the survey. This finding is consistent with the operational definition of psychosocial impacts used in this thesis (Section 1.1) as occurring as a consequence of actual *or perceived* environmental contamination. In this instance, the siting process itself may be the perceived contamination event. Further, the particularly high levels of reported effects on daily life and health at the Milton site (relative to the other two) is

consistent with Edelstein's (1988) suggestion that perceived exposures will indeed be real in their consequences.

With respect to the determinants of concern and action, results of the logistic regression analyses confirm that a combination of factors are significantly associated with these outcomes but that the specific factors involved vary by outcome and site. This latter finding is consistent with previous studies which show no strong consistency in the characteristics of individuals and groups reporting psychosocial impacts (Taylor et al. 1989). The implication is that strategies aimed to address and alleviate psychosocial impacts need to be specific to the characteristics of the populations in particular situations.

This finding underlines the limits to generalization for research in this area. However, several patterns did emerge from the logistic regression analyses. For example, proximity to the site was significant in several of the models. In addition, while indices of general psychosocial health status were significant mediating factors in several models of site-related concern, social network variables were significant mediating factors in models of site-related action. Finally, life cycle (age, marital status, presence of young children in the home) and socio-economic (income and education) variables were not significant factors in the models.

7.4 FUTURE RESEARCH

While the thesis does fill some gaps in the literature on psychosocial

impacts of exposure at the individual level, the research agenda in this area remains a challenging one. This agenda can be categorized under the headings of theory, substance and method.

Two key theoretical areas for future research come out of the thesis findings. The first is related somewhat to method; that is, the development of an analytical model capable of addressing the theoretically reciprocal relationships found within a transactive socioecological model of health and well-being. The second involves a step back from the conceptual stage to environmental stress theory and involves an examination of the human-environment relations which influence risk perception in the first instance. For instance, what is it about social networks which increase or decrease one's susceptibility to psychosocial impacts of exposure? Broader theoretical questions arise from the institutional response(s) to psychosocial impacts. For example, at what point does community involvement become community co-optation? Further, at a meta level, what sorts of theories would be useful in addressing these questions?

Two key substantive areas for future research arise out of the findings of this thesis. The first involves the development of a general outcome measure appropriate to psychosocial impacts research. Such a measure would perhaps take the form of an indicator of *environmental quality of life*. The second substantive area involves the collection and analysis of longitudinal data. In this vein, two important research questions immediately arise in light of the current study. First, this thesis

has looked at two sites which have been operating for a number of years and one site that had only recently been given final approval at the time of the epidemiologic survey. With respect to the time continuum of site operations, two data points are conspicuous by their absence. First, a follow-up study at the Milton site would provide a unique opportunity to address the question of whether or not the high levels of psychosocial impacts reported at this site persist once the site becomes operational. Conversely, one may find that the anticipation of the event had greater impact than the event itself, resulting in a decreased reporting of psychosocial impacts. In the same regard, it would be desirable, though difficult, to collect baseline psychosocial data in a population ***prior to*** the community's knowledge of an impending solid waste facility. This research context would be much more difficult to operationalize, however.

In addition to the collection and analysis of longitudinal data, further testing of the epidemiologic survey instrument is also called for in order to establish its validity in similar situations elsewhere. Once established, administration of the instrument could be broadened to examine alternative types of exposures (e.g., acute, hazardous).

Methodologically, there is at least one very important area for future research which arises from this thesis. This is related to the limitations of quantitative methods *vis a vis* the development of an analytical model appropriate to a transactive socioecological conceptual framework. The answer may lie in the

integration of quantitative with qualitative methods. This integration could also take the analysis beyond the level of the individual (the focus of this thesis) to the levels of social network and community (cf Edelstein 1988).

While these issues can be further investigated within the context of the larger research project by the qualitative stage, several challenges remain: a closer examination of the potential insights to be gained from such an integration of methodologies, the operationalization of the integration process, the acceptance of qualitative analyses within the academic community and beyond, and, finally, the development of the skills necessary for employing both quantitative and qualitative methodologies.

APPENDIX 1

PSYCHOSOCIAL IMPACTS OF EXPOSURE TO ENVIRONMENTAL CONTAMINANTS

FINAL QUESTIONNAIRE FOR STAGE ONE EPIDEMIOLOGIC SURVEY

May 1990

INTRODUCTION

Hello--my name is [fill name] and I'm calling from York University's Research Centre. We are conducting a study about the quality of life in communities in southern Ontario. You may recall that a few days ago you or someone in your household got a letter describing the study. We would greatly appreciate your views or the views of someone in your household. Before I start, I want to make sure I dialed the correct number...

Is this...

Would you please tell me if you are 18 years of age or older?

In order to determine who to interview, I have to ask a few questions about the adults living there...

[proceed with respondent selection]

[INTERVIEWER: Record respondent's gender]

Do you still live on...?
[address verification for site and zone assignment]

SECTION A - ATTITUDES TOWARD THE AREA WHERE YOU LIVE

(a1) I'd like to begin by asking you about the things you like about the area where you live. First, what is the most important thing you LIKE about the area where you live?

- mention
- no mention
- mentions site
- don't know
- refused

And what is the second most important thing you LIKE about the area where you live?

- mention
- no mention
- mentions site
- don't know
- refused

What is the third most important thing you LIKE?

- mention
- no mention
- mentions site
- don't know
- refused

(a2) Now I'd like to ask you about the things you DON'T LIKE about the area where you live. First, what is the most important thing you DON'T LIKE about the area where you live?

- mention
- no mention
- mentions site
- don't know
- refused

And what is the second most important thing you DON'T LIKE about the area where you live?

- mention
- no mention
- mentions site
- don't know
- refused

What is the third most important thing you DON'T LIKE?

- mention
- no mention
- mentions site
- don't know
- refused

(a3) In general, how satisfied are you with your area as a place to live?
- very satisfied
- somewhat satisfied
- not too satisfied
- not at all satisfied
- don't know
- refused

(a4) If you could change just one thing about this area, what would it be?

- mention
- no mention
- don't know
- refused

(a5) If you were to move from your present address, would you stay in this area?

- yes
- no
- don't know
- refused

If 'no', why not?

- mention
- no mention
- don't know
- refused

(a6) Would you tell me if you've been involved in any of these local activities in the last two or three years:

(a6a) ....attended meetings of the city council or school board?

- yes
- no
- don't know
- refused

(a6b) ....signed a petition for or against a local issue?

- yes
- no
- don't know
- refused

(a6c) ....worked with others or joined an organization in your community to do something about some community problem?

- yes
- no
- don't know
- refused

(a6d) ....spoken to or written to an official about some local issue?

- yes
- no
- don't know
- refused

(a7) How often do you talk with your neighbours?

- never
- seldom (once a year)
- sometimes (1 or 2 times a month)
- often (1 or 2 times a week)
- very often (daily)
- don't know neighbours
- don't know how often
- refused

(a8) How often do you help any neighbour or ask for help from any neighbour for such things as borrowing tools or food, watching each other's houses while away, or helping each other in home repairs, etc.?

- never
- seldom (once a year)
- sometimes (1 or 2 times a month)
- often (1 or 2 times a week)
- very often (daily)
- don't know
- refused

(a9) Are you helping neighbours or being helped by neighbours MORE or LESS frequently or ABOUT THE SAME as you were a few years ago?

- MORE than a few years ago
- LESS than a few years ago
- ABOUT THE SAME as a few years ago
- don't know
- refused

(a10) In general, how would you describe the people in your area? Would you say they are:

- very friendly
- friendly
- unfriendly
- very unfriendly
- don't know
- refused

SECTION B - SOCIAL AND COMMUNITY NETWORKS

(b1) How many relatives do you feel close to, NOT COUNTING the people you live with?

- no relatives
- __ # of relatives
- don't know
- refused

(b2) Not counting the people you live with or your relatives, how many close friends do you have? (By close friends, we mean for example, people whose homes you visit, people that you feel at ease with, can talk to about private matters and can call upon for help).

- no close friends
- __ # close friends
- don't know
- refused

(b3) How satisfied are you with your social activities?

- very satisfied
- somewhat satisfied
- not too satisfied
- not at all satisfied
- don't know
- refused

(b4) Do you belong to any of the following groups?

- social or recreatioal grp
- labour union, commercial grp or professional org.
- church or religious grp
- grp concerned with children such as boy scouts/girl guides or home and school association
- grp concerned with community service, charity or neighbourhood improvement
- grp concerned with the environment
- any others (specify) _____

(b5) How involved have you been in local community events?

- very involved
- somewhat invloved
- not too involved
- not at all involved
- don't know
- refused

(b6) Is there someone in your family or a close friend that you can confide in or talk to freely about your problems?
[e.g., personal, family, community]

- yes
- no
- don't know
- refused

(b7) Is there someone among your friends or in your family who can help you if you

need it?

- yes
- no
- don't know
- refused

SECTION C - GENERAL HEALTH STATUS

To help us understand the quality of life in a community, we like to find out how people have been feeling lately and to ask about their health in general.

(c1) Compared to other people your age, would you say your health is...

- excellent
- very good
- good
- fair
- poor
- don't know
- refused

(c2) How satisfied are you with your health in general? Would you say you are...

- very satisfied
- somewhat satisfied
- not too satisfied
- not at all satisfied
- don't know
- refused

SECTION D - GENERAL HEALTH QUESTIONNAIRE

Now I'd like to know how you've been feeling over the past two weeks.

(d1) First, over the past two weeks, have you:

...lost much sleep over worry?

- yes
- no
- don't know
- refused

[IF YES]
...Would you say MORE THAN USUAL or the SAME AS USUAL for you?

- more than usual for you
- same as usual for you
- don't know
- refused

(d2) ...felt constantly under stress?

- yes
- no
- don't know
- refused

[IF YES]
...Would you say MORE THAN USUAL or the SAME AS USUAL for you?

- more than usual for you
- same as usual for you
- don't know
- refused

(d3) ...felt you couldn't overcome your difficulties?

- yes
- no
- don't know
- refused

[IF YES]
...Would you say MORE THAN USUAL or the SAME AS USUAL for you?

- more than usual for you
- same as usual for you
- don't know
- refused

(d4) ...been feeling unhappy and depressed?

- yes
- no
- don't know
- refused

[IF YES]
...Would you say MORE THAN USUAL or the SAME AS USUAL for you?
- more than usual for you
- same as usual for you
- don't know
- refused

(d5) ...been losing confidence in yourself?
- yes
- no
- don't know
- refused

[IF YES]
...Would you say MORE THAN USUAL or the SAME AS USUAL for you?
- more than usual for you
- same as usual for you
- don't know
- refused

(d6) ...been thinking of yourself as a worthless person?
- yes
- no
- don't know
- refused

[IF YES]
...Would you say MORE THAN USUAL or the SAME AS USUAL for you?
- more than usual for you
- same as usual for you
- don't know
- refused

(d7) ...been taking things hard?
- yes
- no

- don't know
- refused

[IF YES]
...Would you say MORE THAN USUAL or the SAME AS USUAL for you?
- more than usual for you
- same as usual for you
- don't know
- refused

(d8) ...found everything getting on top of you?
- yes
- no
- don't know
- refused

[IF YES]
...Would you say MORE THAN USUAL or the SAME AS USUAL for you?
- more than usual for you
- same as usual for you
- don't know
- refused

(d9) ...been feeling nervous and tense all the time?
- yes
- no
- don't know
- refused

[IF YES]
...Would you say MORE THAN USUAL or the SAME AS USUAL for you?
- more than usual for you
- same as usual for you
- don't know
- refused

(d10) ...found that at times you couldn't do anything because your nerves were too bad?
- yes
- no
- don't know

- refused

[IF YES]
...Would you say MORE THAN USUAL or the SAME AS USUAL for you?
- more than usual for you
- same as usual for you

- don't know
- refused

Over the past two weeks, have you

(d11) ...felt that you are playing a useful part in things?
- yes
- no
- don't know
- refused

[IF NO]
...Would you say you've been feeling this way MORE THAN USUAL for you, or the SAME AS USUAL for you?
- more than usual for you
- same as usual for you
- don't know
- refused

(d12) ...felt capable of making decisions about things?
- yes
- no
- don't know
- refused

[IF NO]
...Would you say you've been feeling this way MORE THAN USUAL for you, or the SAME AS USUAL for you?
- more than usual for you
- same as usual for you
- don't know
- refused

(d13) ...been able to enjoy your normal day-to-day activites?

- yes
- no
- don't know
- refused

[IF NO]
...Would you say you've been feeling this way MORE THAN USUAL for you, or the SAME AS USUAL for you?

- more than usual for you
- same as usual for you
- don't know
- refused

(d14) ...been able to face up to your problems?

- yes
- no
- don't know
- refused

[IF NO]
...Would you say you've been feeling this way MORE THAN USUAL for you, or the SAME AS USUAL for you?

- more than usual for you
- same as usual for you
- don't know
- refused

(d15) ...been feeling reasonably happy, all things considered?

- yes
- no
- don't know
- refused

[IF NO]
...Would you say you've been feeling this way MORE THAN USUAL for you, or the SAME AS USUAL for you?

- more than usual for you
- same as usual for you
- don't know

- refused

(d16) ...been managing to keep yourself busy and occupied?
- yes
- no
- don't know
- refused

[IF NO]
...Would you say you've been feeling this way MORE THAN USUAL for you, or the SAME AS USUAL for you?
- more than usual for you
- same as usual for you
- don't know
- refused

(d17) ...been getting out of the house as much as usual?
- yes
- no
- don't know
- refused

[IF NO]
...Would you say you've been feeling this way MORE THAN USUAL for you, or the SAME AS USUAL for you?
- more than usual for you
- same as usual for you
- don't know
- refused

(d18) ...been satisfied with the way you've carried out your tasks?
- yes
- no
- don't know
- refused

[IF NO]
...Would you say you've been feeling this way MORE THAN USUAL for you, or the SAME AS USUAL for you?

- more than usual for you
- same as usual for you
- don't know
- refused

(d19) ...been able to concentrate on whatever you're doing?
- yes
- no
- don't know
- refused

[IF NO]
...Would you say you've been feeling this way MORE THAN USUAL for you, or the SAME AS USUAL for you?
- more than usual for you
- same as usual for you
- don't know
- refused

(d20) ...felt on the whole you were doing things well?
- yes
- no
- don't know
- refused

[IF NO]
...Would you say you've been feeling this way MORE THAN USUAL for you, or the SAME AS USUAL for you?
- more than usual for you
- same as usual for you
- don't know
- refused

SECTION E - SOMATIC COMPLAINTS

Now I'm going to list some general health problems. For each, please tell me if it has bothered you over the past two weeks.

(e1) First, have you been bothered by headaches in the past two weeks?

- yes
- no/not at all bothered
- don't know
- refused

[IF YES]
Have they bothered you a little bit, moderately, quite a bit, or have you been extremely bothered?

- a little bit
- moderately
- quite a bit
- extremely bothered
- don't know
- refused

(e2) ...faintness or dizziness

- yes
- no/not at all bothered
- don't know
- refused

[IF YES]
Have they bothered you a little bit, moderately, quite a bit, or have you been extremely bothered?

- a little bit
- moderately
- quite a bit
- extremely bothered
- don't know
- refused

(e3) ...pains in the heart or chest

- yes
- no/not at all bothered
- don't know
- refused

[IF YES]
Have they bothered you a little bit, moderately, quite a bit, or have you been extremely bothered?
- a little bit
- moderately
- quite a bit
- extremely bothered
- don't know
- refused

(e4) ...pains in the lower back
- yes
- no/not at all bothered
- don't know
- refused

[IF YES]
Have they bothered you a little bit, moderately, quite a bit, or have you been extremely bothered?
- a little bit
- moderately
- quite a bit
- extremely bothered
- don't know
- refused

(e5) ...nausea or upset stomach
- yes
- no/not at all bothered
- don't know
- refused

[IF YES]
Have they bothered you a little bit, moderately, quite a bit, or have you been extremely bothered?
- a little bit
- moderately
- quite a bit
- extremely bothered

- don't know
- refused

(e6) ...soreness of your muscles
- yes
- no/not at all bothered
- don't know
- refused

[IF YES]
Have they bothered you a little bit, moderately, quite a bit, or have you been extremely bothered?
- a little bit
- moderately
- quite a bit
- extremely bothered
- don't know
- refused

(e7) ...trouble getting your breath
- yes
- no/not at all bothered
- don't know
- refused

[IF YES]
Have they bothered you a little bit, moderately, quite a bit, or have you been extremely bothered?
- a little bit
- moderately
- quite a bit
- extremely bothered
- don't know
- refused

(e8) ...hot or cold spells
- yes
- no/not at all bothered
- don't know

- refused

[IF YES]
Have they bothered you a little bit, moderately, quite a bit, or have you been extremely bothered?
- a little bit
- moderately
- quite a bit
- extremely bothered
- don't know
- refused

(e9) ...numbness or tingling in parts of your body
- yes
- no/not at all bothered
- don't know
- refused

[IF YES]
Have they bothered you a little bit, moderately, quite a bit, or have you been extremely bothered?
- a little bit
- moderately
- quite a bit
- extremely bothered
- don't know
- refused

(e10) ...a lump in your throat
- yes
- no/not at all bothered
- don't know
- refused

[IF YES]
Have they bothered you a little bit, moderately, quite a bit, or have you been extremely bothered?
- a little bit
- moderately
- quite a bit
- extremely bothered

- don't know
- refused

(e11) ...weakness in parts of your body
- yes
- no/not at all bothered
- don't know
- refused

[IF YES]
Have they bothered you a little bit, moderately, quite a bit, or have you been extremely bothered?
- a little bit
- moderately
- quite a bit
- extremely bothered
- don't know
- refused

(e12) ...heavy feelings in your arms or legs
- yes
- no/not at all bothered
- don't know
- refused

[IF YES]
Have they bothered you a little bit, moderately, quite a bit, or have you been extremely bothered?
- a little bit
- moderately
- quite a bit
- extremely bothered
- don't know
- refused

(e13) ...rashes or other skin conditions
- yes
- no/not at all bothered
- don't know

- refused

[IF YES]
Have they bothered you a little bit, moderately, quite a bit, or have you been extremely bothered?
- a little bit
- moderately
- quite a bit
- extremely bothered
- don't know
- refused

(e14) ...poor appetite
- yes
- no/not at all bothered
- don't know
- refused

[IF YES]
Have they bothered you a little bit, moderately, quite a bit, or have you been extremely bothered?
- a little bit
- moderately
- quite a bit
- extremely bothered
- don't know
- refused

(e15) ...fatigue or tiredness?
- yes
- no/not at all bothered
- don't know
- refused

[IF YES]
Have they bothered you a little bit, moderately, quite a bit, or have you been extremely bothered?
- a little bit
- moderately

- quite a bit
- extremely bothered
- don't know
- refused

(e16) ...trouble getting up in the morning, even if you've had enough sleep?
- yes
- no/not at all bothered
- don't know
- refused

[IF YES]
Have they bothered you a little bit, moderately, quite a bit, or have you been extremely bothered?
- a little bit
- moderately
- quite a bit
- extremely bothered
- don't know
- refused

SECTION G - IMPORTANT LIFE EVENTS

Sometimes major events in our life can affect our quality of life, so I'd like to ask you about some of the important things that have happened to you in the past twelve months.

(g1) First, over the past twelve months, did you lose your job?
- yes
- no
- don't know
- refused

(g2) Were you divorced or separated from your spouse (or partner)?

- yes
- no - includes not married
- don't know
- refused

(g3) Did you have a serious illness?

- yes
- no
- don't know
- refused

(g4) Did your husband, wife or partner die?

- yes
- no - includes not married
- don't know
- refused

(g5) Did anyone else very close to you die?

- yes
- no
- don't know
- refused

(g6) Is there anyone close to you who you have been worried about, for any reason, over the past twelve months?

- yes
- no
- don't know
- refused

SECTION H - AWARENESS, CONCERN, ACTIONS

Now I'd like to ask you a little bit more about the area you live in.

(h1) When we talked about the things you like and don't like about your area, one of the things you mentioned was **SITE**. I'd like to ask you more about that.

OR

(h2) When we talked to some people about the things they like and don't like about your area, one of the things that was mentioned was environmental problems; specifically one of these was **SITE**. Are you aware of **SITE**?

- yes
- no
- don't know
- refused

(h3) Do you have any concerns about **SITE**?

- yes
- no
- don't know
- refused

(h4a) What is your major concern about **SITE**?

- mention
- no mention
- don't know
- refused

(h4b) Would you say you are SLIGHTLY concerned, MODERATELY concerned or EXTREMELY concerned about this:

- slightly concerned
- moderately concerned
- extremely concerned
- don't know
- refused

(h4c) Do you have any other concerns about **SITE**?

- mention
- no mention
- don't know
- refused

(h4d) Would you say you are SLIGHTLY concerned, MODERATELY concerned or EXTREMELY concerned about this:

- slightly concerned
- moderately concerned

- extremely concerned
- don't know
- refused

(h4e) Any other concerns about SITE?

- mention
- no mention
- don't know
- refused

(h4f) Would you say you are SLIGHTLY concerned, MODERATELY concerned or EXTREMELY concerned about this:

- slightly concerned
- moderately concerned
- extremely concerned
- don't know
- refused

[INTERVIEWER: IF YOU ARE NOT SURE OF THE ANSWER, ASK THE FOLLOWING QUESTION]

(h5) Do you consider any of the concerns you just mentioned to be HEALTH related?

- yes
- no
- don't know
- refused

(H6) Have any of these concerns you mentioned affected your daily life in any way?

- yes
- no
- don't know
- refused

[IF YES]
(h7) How have these concerns affected your daily life?

(h8) [ASKED ONLY OF THOSE RESPONDENTS UNAWARE OF SITE] Do you have any concerns about environmental problems in your area?

- yes
- no
- don't know
- refused

(h9a) What is your major environmental concern?

- mention
- no mention
- don't know
- refused

(h9b) Would you say you are SLIGHTLY concerned, MODERATELY concerned or EXTREMELY concerned?

- slightly concerned
- moderately concerned
- extremely concerned
- don't know
- refused

(h9c) Do you have any other environmental concerns?

- mention
- no mention
- don't know
- refused

(h9d) Would you say you are SLIGHTLY concerned, MODERATELY concerned or EXTREMELY concerned?

- slightly concerned
- moderately concerned
- extremely concerned
- don't know
- refused

(h9e) Do you have any other environmental concerns?

- mention
- no mention
- don't know
- refused

(h9f) Would you say you are SLIGHTLY concerned, MODERATELY concerned or EXTREMELY concerned?

- slightly concerned
- moderately concerned
- extremely concerned
- don't know
- refused

[INTERVIEWER: IF YOU ARE NOT SURE OF THE ANSWER, ASK THE FOLLOWING QUESTION]

(h10) Do you consider any of the concerns you just mentioned to be HEALTH related?

- yes
- no
- don't know
- refused

(h11) Have any of the concerns you mentioned affected your daily life in any way?

- yes
- no
- don't know
- refused

(h12) How have these concerns affected your daily life?

I'd like to ask you in a little more detail about whether **SITE** has affected the health of any member of your household.

(h13b) Has **SITE** affected your health or the health of any members of your household?

- yes

- no
- don't know
- refused

(h13c) Would you please tell me whose health has been affected by **SITE**?

(h13d) In what way do you think it has affected [individual]'s health?

(h13e) Would you say you were SLIGHTLY concerned, MODERATELY concerned or EXTREMELY concerned about this?

- slightly concerned
- moderately concerned
- extremely concerned
- don't know
- refused

(h13f) Has the health of anyone else in your household been affected by **SITE**?

- yes
- no
- don't know
- refused

(h13g) Who would that be?

(h13h) In what way do you think it has affected [individual]'s health?

(h13i) Would you say you were SLIGHTLY concerned, MODERATELY concerned or EXTREMELY concerned about this?

- slightly concerned
- moderately concerned
- extremely concerned
- don't know
- refused

(h13j) Has the health of anyone else in your household been affected by **SITE**?

- yes
- no
- don't know

- refused

(h13k) Who would that be?

(h13l) In what way do you think it has affected [individual]'s health?

(h13m) Would you say you were SLIGHTLY concerned, MODERATELY concerned or EXTREMELY concerned about this?

- slightly concerned
- moderately concerned
- extremely concerned
- don't know
- refused

(h16) Has **SITE** increased, decreased or not changed your satisfaction with this area as a place to live?

- increased
- decreased
- not changed
- don't know
- refused

(h17) Over the past two years, have you considered moving because of **SITE**?

- yes
- no
- don't know
- refused

(h18) Have you taken any steps toward moving such as contacting a real estate agent or putting your house up for sale?

- yes
- no
- don't know
- refused

(h19) If yes, what steps have you taken?

(h20) If you were to move, would you move:

- to another location in this area
- to a location outside this area
- don't know
- refused

(h21) Are there any reasons why it would be difficult for you to move?

- yes
- no
- don't know
- refused

(h22) If 'yes', what are the reasons?

(h24) What was your MAIN source of information about **SITE**?

(DO NOT READ LIST)

TV or radio
Newspapers
Doctor or other health professional
Local or community government agency
Friends or neighbours
Other, please specify
Don't know
Don't remember

(h25) Have you read about **SITE** in the newspaper?

- yes
- no
- don't know
- refused

(h26) Have you read books/reports about these types of facilities and their potential effects?

- yes
- no
- don't know

- refused

(h27) Have you discussed your concerns about **SITE** with friends and neighbours?

- yes
- no
- don't know
- refused

(h28) Have you attended a meeting organized by a local citizens' group at which **SITE** was discussed?

- yes
- no
- don't know
- refused

(h29) Do you belong to a local citizens group which addresses **SITE** as part of its mandate?

- yes
- no
- don't know
- refused

(h30) Have you telephoned, written or spoken to politicians and/or government staff about your my concerns regarding
SITE?

- yes
- no
- don't know
- refused

(h31) Have you spoken to staff at **SITE** about your concerns?

- yes
- no
- don't know
- refused

(h32) In your opinion, are there positive things about **SITE**?
- yes
- no
- don't know
- refused

(h33) [IF YES] What are the positive things?

SECTION SD - SOCIO-DEMOGRAPHIC QUESTIONS

Now I'd just like to ask a few final questions about your background.

(sd1) In what year were you born?

(sd2) What is the highest level of education you have completed?

(sd3) At present, are you married, living with a partner, widowed, divorced, separated, or have you never been married?

(sd4) Are you presently working for pay in a full-time or in a part-time job, are you unemployed, retired, a homemaker, a student, or something else?

(sd5) What is your main occupation?

(sd6) Is your spouse or partner presently working for pay in a full-time or in a part-time job, is s/he unemployed, retired, a homemaker, a student, or something else?

(sd7) What is your spouse's or partner's occupation?

(sd8) Could you please tell me how much income you and other members of your household received in 1989? Be sure to include income from all sources such as savings, pensions, rent, and unemployment insurance as well as wages.

(sd9a) What language do you usually speak at home?

(sd9b) To what ethnic or cultural group did you, or you ancestors, belong to on first coming to this continent?

(sd11) How many years have you lived at your current address?

(sd12) How long have you lived in your area?

(sd13) Is your dwelling OWNED or being BOUGHT by you or a member of this household?

(sd14) Is your dwelling part of a condominium or cooperative?

(sd15) Is your dwelling:

- single family detached
- single family, attached (e.g., townhouse, semi)
- duplex, triplex or quad. or apartment building < 5 stories.
- apartment building, >5 stories
- other
- don't know
- refused

(sd16) Was this property owned/rented by another member of your family before you moved here?

(sd17) Is your house or property used for any business activity?

(sd18) [IF YES] What type of business?

(sd19) [IF YES] How long has it been used for a business activity?

(nper) Including yourself, how many people live in your household?

(n1a) In order to get a better picture of your household, we would like to ask you a couple of questions about each person in your household. This information will allow us to compare different types of households.

Starting with the oldest person in your household (remember to include yourself) what is their relationship to you?

(n1b) What is their gender?

(n1c) How old is...?

THIS CONTINUES FOR UP TO 10 HOUSEHOLD MEMBERS

(sd20) In general, would you say these questions were VERY interesting, SOMEWHAT interesting, or NOT VERY interesting?

(sd21) Can you tell me how many minutes you think it took to complete this questionnaire?

(sd22) Would you like to add anything about this topic that we have not covered?

(sd23) A researcher from McMaster University may be contacting you in the future to ask you to participate in a face-to-face interview so you can talk more about the quality of life in your area.

Would you be interested?

- yes
- no
- don't know
- refused

END

APPENDIX 2

COMPONENT/CONSTRUCT/INDICATOR/ITEM BREAKDOWN

OF THE EPIDEMIOLOGIC SURVEY

COMPONENT/CONSTRUCT/INDICATOR/ITEM BREAKDOWN OF THE EPIDEMIOLOGIC SURVEY		
COMPONENT - INDIVIDUAL		
CONSTRUCT	INDICATOR	ITEM
gender	gender	sex; n1b-n10b
life cycle	age marital status # children ages of children	sd1; n1c-n10c sd3 n1a-n10a n1c-n10c
socioeconomic status	income occupation education	sd8; sd9 sd4; sd5; sd5b; sd6; sd7a; sd7b sd2
residential status	length of residence housing type housing tenure	sd10; sd15 sd14; sd16-sd18 sd12;sd13
awareness	re: site	a1; a2; h2
information	source(s)	h24
neighbourhood satisfaction	likes/dislikes satisfaction rating ? change intention to move friendliness	a1/a2 a3 a4 a5; a5a; h17-h22 a10
COMPONENT - EXPOSURE		
site	exposure characteristics	a1; a2; h4a; h4c; h4e
zone	distance from site	address (pre-determined)
COMPONENT - SOCIAL NETWORK		
membership	# relatives # friends	b1 b2
satisfaction	satisfaction	b3
neighbourhood involvement	local activities neighbours groups involvement rating	a6 a7-a9 b4 b5
available support	re: problems re: need	b6 b7

COMPONENT - (PSYCHOSOCIAL) HEALTH AND WELL-BEING		
general health status	perceived health health satisfaction	c1 c2
emotional distress	GHQ-20	Section D
somatic complaints	SCL-90	Section E
stressful events	life events	Section G
concern	any concerns what are they degree of concern	a2; a4; a5a; h3; h5 h4a; h4c; h4e h4b; h4d; h4f
effects	health effects for whom what are they degree of concern effects on everyday life	h13b; h13f; h13j h13c; h13g; h13k h13d; h13h; h13l h13e; h13i; h13m h16; h6; h7
action	re: moving re: the site	h17-h22 h25-h31

APPENDIX 3

LETTER OF INTRODUCTION TO THE SURVEY

McMaster University

1280 MAIN STREET WEST
HAMILTON, ONTARIO
CANADA L8S 4K1

Department of Geography

PHONE: (416) 525-9140, EXT. 4535
TELEX: 061-8347
FAX: (416) 528-5030

7 May 1990

1~
2~
3~
4~

Dear 5~:

Your household has been randomly chosen to participate in a study of public attitudes towards quality of life in communities in southern Ontario. The study is being conducted by McMaster University and is funded by a Provincial research grant.

An interviewer from the Institute of Social Research at York University will phone you in the next few days and will ask a selected person in your household to complete a 20 minute telephone survey. A range of questions will be asked dealing with attitudes towards the local area, the environment, health and quality of life.

All information will be strictly confidential. The data will be recorded, analysed and reported in ways that guarantee anonymity.

The results will be used to increase understanding of factors affecting our quality of life. These are issues of growing importance for all of us. The findings will also have practical value to government and other agencies responsible for planning and policy decisions.

Thank you in advance for your cooperation and participation in this important study.

Yours sincerely,

S. Martin Taylor,
Professor of Geography

APPENDIX 4

TELEPHONE NUMBER REQUEST

McMaster University

1280 MAIN STREET WEST
HAMILTON, ONTARIO
CANADA L8S 4K1

Department of Geography

PHONE: (416) 525-9140, EXT. 4535
TELEX: 061-8347
FAX: (416) 528-5030

3 May 1990

1~
2~
3~
4~

Dear 5~:

Your household has been randomly chosen to participate in a study of public attitudes towards quality of life in communities in southern Ontario. The study is being conducted by McMaster University and is funded by a Provincial research grant.

The results will be used to increase understanding of factors affecting our quality of life. These are issues of growing importance for all of us. The findings will also have practical value to government and other agencies responsible for planning and policy decisions.

All information will be strictly confidential. The data will be recorded, analyzed and reported in ways that *guarantee* anonymity.

This study will be conducted using telephone interviews. We have been unable to locate a telephone number for your household at the above address. In order that we may hear your views on the quality of life in your community, we would appreciate it if you could let us know your telephone number. You can do this simply by calling **collect** Darlene Watson at McMaster University 525-9140, extension 3533 OR by completing the enclosed sheet and mailing it in the envelope provided.

We will have an interviewer from the Institute of Social Research at York University call you a few days later who will ask a selected person in your household to complete a 20 minute telephone survey. A range of questions will be asked dealing with attitudes towards the local area, the environment, health and quality of life.

Remember, all information will be strictly confidential and after the study, the questionnaires will be destroyed.

Thank you in advance for your cooperation and participation in this important study.

Yours sincerely,

S. Martin Taylor
Professor of Geography

Encl.

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NEWSPAPER ARTICLES CITED

THE HAMILTON SPECTATOR

October 9, 1975:7 *Halton follows landfill orders.*

October 6, 1976:7 *Test ban amazes Sutherland.*

November 6, 1976:8 *Uneasy stalemate centres around Glanbrook site.*

March 17, 1977:7 *Region delays buying land for dump site.*

April 7, 1977:7 *Halton dump fight moves into court.*

April 20, 1977:7 *Dump by-law thrown out by court.*

June 29, 1977:10 *Damage to SWARU assessed.*

September 27, 1977:10 *Committee wraps up garbage pact.*

April 25, 1978:10 *Glanbrook dump hearings September 5.*

July 19, 1978:10 *Landowners fear foul water.*

August 4, 1978:10 *Farmers fight dump plan.*

September 27, 1978:8 *SWARU blamed for soot fallout.*

October 3, 1978:10 *Farmers oppose dump plan.*

November 27, 1978:10 *Region dump approved by OMB.*

January 9, 1979:11 *Halton dump battle opens.*

March 7, 1979:6 *Proposed Glanbrook dump raises ire of residents.*

April 10, 1979:7 *Glanbrook gets $1-million for surrendering on landfill.*

April 20, 1979:7 *Lincoln confirms site opposition.*

June 19, 1979:10 *Halton wins battle for garbage dump.*

October 6, 1979:8 *Incinerator working at record rate.*

June 24, 1980:7 *SWARU heads for a record.*

August 20, 1980:10 *Glanbrook dump wins full court approval.*

September 9, 1980:7 *SWARU smoke to be probed.*

February 10, 1981:7 *SWARU hold-up burns politicians.*

February 10, 1981:10 *Parrott approves Milton hearing.*

April 7, 1981:7 *Dioxins in garbage 'not a health threat'.*

April 14, 1981:8 *No danger from dioxins.*

August 11, 1981:10 *SWARU official admits plant source of soot.*

February 9, 1982:8 *Improvements to SWARU may ease soot problems.*

September 7, 1982:6 *Still against Glanbrook dump.*

November 22, 1982:A7 *Region begins to use garbage to generate electricity.*

February 23, 1983:A1 *Toxic levels too high, tests at SWARU show.*

February 25, 1983:A7 *Expert fears long-term health effects from SWARU.*

March 2, 1983:A7 *Council won't close incinerator or launch health study.*

November 10, 1983:A11 *Garbage export risky: official.*

November 15, 1983:A7 *Meeting urges SWARU closing.*

December 14, 1983:A1 *Council asks region to shut down SWARU.*

January 24, 1984:A7 *Residents unhappy, SWARU stays open.*

April 4, 1984:A7 *$12m SWARU system proposed.*

August 22, 1984:A7 *SWARU cutbacks pondered.*

August 28, 1984:A7 *Landfill fight winds down as pair's costs paid.*

February 4, 1985:A8 *Halton eyes new dump site.*

February 15, 1986:A8 *They're still 'down in the dumps': Binbrook residents have waited five years for compensation.*

December 15, 1988:C2 *SWARU still polluting air despite $12m upgrading.*

January 18, 1989:B2 *Tires on their way to Glanbrook dump.*

July 22, 1989:B2 *Neighbors hold noses over dump expansion.*

July 25, 1989:D10 *Milton appeals garbage action.*

August 10, 1989:C2 *Scrapyard waste gets test burn.*

September 30, 1989:B2 *Garbage burner may be fired up early next week if tests show spilled PCBs gone.*

January 18, 1990:C2 *Mayor wants police presence in Glanbrook.*

January 23, 1990:C1 *Glanbrook cemetery plan may be buried.*

April 12, 1990:C2 *Fred hates trash blowin' in the wind.*

April 14, 1990 *Glanbrook's toll-free request turned down by Bell Canada.*

March 6, 1990:A6 *Mount Hope's tire dump: Make it safe.*

March 9, 1990:D14 *Mount Hope tire dump to feel the heat.*

March 21, 1990:B2 *Musitano ordered to stack Mt Hope tires.*

March 23, 1990:C3 *New rules coming for P&L tire dump: Certificate requires Musitanos to meet safety, security needs.*

April 2, 1990:D1 *Region faces charges for ash violation.*

April 3, 1990:C1 *Glanbrook demands tire dump hearing.*

April 4, 1990:B1 *Region plans to admit guilt.*

May 4, 1990:D3 *Residents seek hearing over Musitano tires: Ministry passing buck: neighbors.*

July 6, 1990:A10 *Area house sales plunge but most prices steady.*

July 6, 1990:D2 *Firm asks $1m to take tires at Mt Hope dump.*

July 6, 1990:D2 *Bell lobbies province to allow tire burning.*

July 20, 1990:C2 *Ministry is guilty of hoax P&L says.*

July 30, 1990:D2 *MOE orders P&L to reduce the number of tires at its dump.*

February 8, 1991:B4 *SWARU a loser: study.*

February 12, 1991:C2 *Ministry begins Mount Hope tire dump cleanup.*

April 13, 1991:B1 *Minister calls for review of SWARU unit.*

April 17, 1991:B1 *Dumped on: residents' serene rural life marred by flyaway landfill trash.*

April 30, 1991:B1 *SWARU emissions worry constituents: alderman.*

May 15, 1991:B1 *Homeowners near tire dump win property tax cut.*

May 15, 1991:B7 *Incinerators 'dangerous'.*

May 25, 1991:B1 *Tire dump slapped with $70,000 in fines.*

July 10, 1991:B1 *Getting the toxins out of SWARU.*

November 28, 1991:B1 *Windblown waste policy may solve trash problems for dump's neighbours.*

April 28, 1992:B3 *Contaminated HSR soil stays out of Glanbrook.*

May 27, 1992:B3 *Group to FASE in its own anti-dumping bylaw for Glanbrook.*