UNIVERSITY STUDENTS IMMUNIZED AND NOT IMMUNIZED FOR MEASLES:
A COMPARISON OF BELIEFS, ATTITUDES,
AND PERCEIVED BARRIERS AND BENEFITS

by

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Abstract

This descriptive comparative study was designed to compare students who were immunized or not immunized during the January 1997 Simon Fraser University (SFU) measles outbreak. The study was prompted by the public health concern regarding 20% of the campus population that was thought to be susceptible to measles, but was not immunized during the outbreak. The theoretical framework guiding this study was the Health Belief Model.

The comparison between the immunized and non-immunized student samples was made in terms of age, perceived susceptibility to measles, measles severity, benefits and barriers to immunization, cues to action, health motivation, confidence, knowledge of measles, prior contact with measles, perceived threat, and student area of study at the university. The study also described what non-immunized students indicated it would have taken for them to be immunized.

In October 1997, a self-administered questionnaire was mailed to a random sample of 400 SFU students who were immunized and 400 SFU students who were not. One of the components of this questionnaire developed for the study was the "Immunization Health Belief Model Scale," based on "The Breast Self Examination-Related Health Belief Model Scales" developed by Champion (1993).

The following variables were significantly related to being immunized: student age, perceived susceptibility, severity, barriers, cues to action, and threat. Students enrolled in types of study relating to human health were significantly more likely to be immunized. Content analysis of the non-immunized students' descriptions of what it would have taken for them to be immunized reflected
themes which substantiated the influence of the variables of perceived susceptibility, barriers, cues to action, and threat. Logistic regression analysis achieved an overall correct prediction rate of 84.7% by including the contribution of the four variables of susceptibility, barriers, cues to action, and health motivation.

The study findings were consistent with ones which had been reviewed in the literature and supported the Health Belief Model. The Immunization Health Belief Model Scale was a valuable tool for ascertaining attitudes and beliefs relating to immunization decision-making. Nurses are in pivotal positions to influence immunization-seeking behaviours. Nursing interventions targetted to significant attitudes and beliefs will increase immunization coverage levels and result in improved disease prevention.
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CHAPTER I
Introduction

Background to the Problem

In January 1997, an outbreak of measles began among students attending Simon Fraser University (SFU) in Burnaby, British Columbia. The outbreak progressed rapidly, with several new cases reported on a daily basis. On January 31, 1997, eight cases of measles were reported from the SFU campus. By February 3, 1997, the measles case count had risen to 24. Communicable Disease Epidemiology Services, British Columbia Centre for Disease Control (BCCDC), was consulted and the decision was made to offer measles vaccine to all SFU students, faculty and staff. The Burnaby Health Department rapidly mobilized its resources and ran the first campus immunization clinic on February 6, 1997. Immunization clinics were held daily for one week. Clinic times and locations were widely advertised through posters, the campus radio station, and the university newsletter. Informed consent to be immunized was obtained from vaccine recipients by informing them of the benefits and risks of the vaccine, risks of measles disease, and contraindications to vaccine receipt (Ministry of Health, 1994). An estimated total of 14,906 students, faculty, and staff were deemed susceptible and eligible for measles vaccine (Dr. N. Loewen, Medical Health Officer, Burnaby Health Department, personal communication, March 4, 1997). At the completion of the initiative, a total of 12,060 people were immunized. Measles immunization coverage was determined to be 80% of the targeted population (Dr. N. Loewen, personal communication, March 4, 1997).
**Problem Statement**

The question remained why 20% of those thought to be susceptible to measles did not receive measles vaccine during the SFU measles immunization campaign. Measles is a highly contagious disease with the potential to cause serious complications such as encephalitis and pneumonia (Benenson, 1995). Even without complications, individuals with measles can be very ill. Due to the serious nature of this disease, the 20% that were not immunized presented a public health concern.

Prior to the immunization intervention, the majority of SFU students were susceptible to measles infection as they had received only one previous dose of measles vaccine (Dr. A. King, Associate Director, Communicable Disease Epidemiology Services, BCCDC, personal communication, February 3, 1997). It has been recognized for several years that two doses of measles vaccine are required for immunity (National Advisory Committee on Immunization, 1993). The public health concern regarding the 20% of the susceptible population that was not immunized during the outbreak related to the knowledge that this group remained susceptible to a highly contagious, serious disease.

There is a paucity of research related to the immunization-seeking behaviours of the university-aged segment of our population (i.e. those 19 to 30 years of age), and specifically, in response to a disease outbreak. Research has primarily examined immunization decision-making of health care workers as they pertain to the receipt of hepatitis B and influenza vaccines, the elderly and pneumococcal and influenza vaccines, and parents of children receiving the routine childhood immunization
series. For example, Weingarten, Riedinger, Burnes Bolton, Miles, and Ault (1989) surveyed physicians and nurses regarding barriers to influenza vaccine acceptance. Li and Taylor (1993) studied the factors affecting childhood uptake of measles, mumps, and rubella immunization. Pennie, O'Connor, Garvock, and Drake (1991) identified the factors influencing the intentions of health care students to accept hepatitis B vaccine. In these three studies, it was found that concerns such as perceived disease severity and personal susceptibility to the disease, vaccine cost, safety, and side effects directly influenced an individual's decision-making regarding immunization. Research was needed which would add to the body of knowledge about immunization beliefs and behaviours of the university-aged population.

**Purpose**

The purposes of this study were twofold: (a) to compare students who were immunized with those not immunized during the 1997 SFU measles outbreak in terms of age, perceived personal susceptibility to measles, measles severity, benefits and barriers to immunization, cues to action, health motivation, confidence, knowledge of measles, prior contact with measles, perceived threat, and area of study at the university, and (b) to describe what it would have taken for non-immunized students to be immunized.

**Theoretical Framework**

Preventive health behaviours have been examined using a variety of models. Montano (1986) outlined various theoretical frameworks used in an attempt to explain patient immunization-seeking behaviours. He outlined the utility of the Health Belief Model (HBM), the Fishbein Model, and the Triandis Model in predicting
immunization-seeking behaviour.

As I reviewed the literature pertaining to these models, it seemed that the HBM was the most appropriate framework with which to examine immunization-seeking behaviours. My preliminary thoughts concerning what may influence a student's decision-making were reflected in the concepts of the HBM. The beliefs and attitudes related to the concepts of the HBM seemed to explain immunization-seeking behaviours. Due to this perceived fit, it was decided that the HBM would be used as the theoretical framework for this study.

The HBM was developed by Hochbaum, Leventhal, Kegeles, and Rosenstock during the 1950s (Janz & Becker, 1984). The HBM hypothesizes that a decision to undertake a health-seeking behaviour will not be made unless the individual is psychologically ready to take action relative to the particular health threat or condition. According to Rosenstock (1974), the HBM suggests that the readiness to act is determined by the extent to which:

1. The individual feels susceptible to the condition, and the extent to which the condition is regarded as having potentially serious consequences;
2. The individual believes that there are actions which would be beneficial in reducing either his or her susceptibility to or the severity of the condition should it occur; and
3. The individual believes that the anticipated barriers to (or cost of) taking action are outweighed by the benefits.

Health-seeking behaviour is explained by the HBM as resulting from the interaction of the three components of the model: individual perceptions, modifying
factors, and variables affecting the likelihood of taking action (Pender, 1987). Individual perceptions concerning susceptibility and seriousness directly affect the predisposition to take action. Perceived susceptibility is described as a person's view of the likelihood of experiencing a potentially harmful condition; perceived severity as a person's view of how serious or threatening the condition may be to him or herself. According to Becker et al. (1977), perceived susceptibility and perceived seriousness combine to determine the individual's total perceived threat of a disease. This perceived threat then affects the probability of taking action.

Cues to action, demographic, sociopsychological, and structural variables act as modifying factors that affect the person's perception and indirectly influence the tendency to take action. A stimulus, or "cue to action," is necessary to trigger the appropriate health behaviour by making the individual consciously aware of their feelings about the health concern (Maiman, Becker, Kirscht, Haefner, & Drachman, 1977). Cues to action include mass media campaigns, advice from others, and illness of a family member or friend. Demographic variables include age, gender, race, and ethnicity. Sociopsychological variables encompass personality, social class, peer and reference-group pressure, health motivation, and confidence. General health motivation refers to the driving force of behaviours which promote wellness. The concept of confidence is described as the belief that one can successfully perform a behaviour that will then lead to a desirable outcome. Rosenstock, Strecher, and Becker (1988) equate the term confidence with Bandura's construct of self-efficacy. Bandura (1977) hypothesized that efficacy expectations are a major determinant in whether or not behaviours will be initiated,
how much effort will be expended, and how long the effort will be sustained in the face of obstacles. Structural variables include knowledge about the disease and prior contact with the disease.

Lastly, perceived benefits and barriers affect the likelihood that the individual will initiate health-seeking behaviour. Perceived benefits are described as a person's view of the effectiveness of specific behaviours in reducing the threat of the condition, and perceived barriers as a person's view of the negative aspects of the anticipated behaviours (Champion, 1984).

Thus, for behaviour change to occur, the individual must feel threatened by their current behavioural patterns (perceived susceptibility and severity), believe that change of a specific kind will be beneficial by resulting in a valued outcome at an acceptable cost (perceived benefits and barriers), and have confidence in their ability to accomplish the behaviour required to bring about the desired outcome.

The dimensions of the Health Belief Model are depicted in Figure I.
Figure 1. Basic elements of the health belief model

Janz and Becker (1984) reviewed the results of studies done during the decade of 1974 to 1984 as they pertained to the relationship of the HBM's components and health-related behaviours. The review provided strong evidence for the utility of the HBM in explaining health-related behaviours. Some of these behaviours, such as immunization and health screening, related to preventive health; others related to sick-role behaviours, such as adherence to medication, diet, or exercise regimens, and physician/clinic utilization for illness symptoms. Accordingly, it was felt that as immunization-seeking behaviour is a preventive health behaviour and the HBM has demonstrated utility in explaining health-related behaviour, it would be appropriate to use the HBM as the theoretical framework for the study.

**Research Questions**

The following research questions guided this study.

1. Is there a difference in age of those SFU students immunized and not immunized during the 1997 SFU measles outbreak?

2. What are the differences between the two groups of students (i.e. those immunized and not immunized) in terms of perceived personal susceptibility to measles, measles severity, benefits and barriers to being immunized, cues to action, health motivation, confidence, knowledge of measles, prior contact with measles, perceived threat, and area of study at the university?

3. What would it have taken for non-immunized students to be immunized?

**Significance of the Research**

As stated previously, the factor of age as it relates to immunization decision-
making, has not been adequately studied. Ascertainment of the beliefs related to immunization decision-making of this university-aged cohort will provide valuable information for the future implementation of other immunization campaigns. For example, an understanding of the relationship of age to immunization decision-making may be useful in the planning of mumps immunization programs. It is recognized that university students are in an age cohort at increased risk of contracting mumps disease, and that mumps outbreaks are expected to occur in the near future (Dr. A. Bell, Director, Communicable Disease Epidemiology Services, BCCDC, personal communication, March 14, 1997). Mumps vaccine was not routinely offered in B.C. until 1981 (British Columbia Ministry of Health, 1994). Also, in the late 1970's, mumps disease was declining in prevalence in the general population, so that for the most part, the university-age group did not acquire natural immunity to mumps (Dr. A. Bell, personal communication, March 14, 1997). Mumps disease presents a risk of complications such as inflammation of the testes or ovaries, meningitis, and nerve deafness (Benenson, 1995). The Vancouver/Richmond Health Region experienced an outbreak of mumps in April 1997, with 45 cases reported, primarily in those 20 to 30 years of age (Dr. P. Daly, Communicable Disease Consultant, Vancouver/Richmond Health Board, personal communication, May 12, 1997). In response, the intervention of mumps immunization was offered to all close contacts of cases of mumps. As this type of contact follow-up requires a substantial amount of nursing time, it needs to be done in the most effective way possible so that the maximum number of susceptible contacts are immunized.
Accordingly, the findings of this study provided needed direction for nursing practice. Nursing is in a pivotal position to influence immunization decision-making. If attitudes and beliefs related to immunization-seeking behaviours can be identified, nursing interventions can be targeted to those attitudes and beliefs. As stated by Given, Given, Gallin, and Condon (1983), "There is a growing body of evidence indicating that when these beliefs are altered, patients change their behaviours" (p. 127). In this regard, nursing efforts have the potential to result in increased levels of immunization coverage with subsequent disease prevention.

**Organization of the Thesis**

This thesis consists of five chapters. In Chapter One, the background to the problem, problem statement, purpose, theoretical framework, research questions, and significance of the research have been presented. In Chapter Two, a review of the selected literature pertinent to the identified research problem is presented. In Chapter Three, the research methods are presented, including a description of the research design, sampling procedures, data collection instrument and procedures, ethics and human rights considerations, and data analysis methods. In Chapter Four, a description of the sample, the findings, and a discussion of the results will be presented. The summary, limitations, conclusions, implications for nursing practice, theory, and education, and recommendations for future research are presented in Chapter Five.
CHAPTER II

Review of the Literature

Introduction

The review examined the literature pertaining to the Health Belief Model, primary prevention, and the factors which influence individuals to engage in preventive health behaviours. In particular, literature was reviewed regarding immunization decision-making and adolescent risk-taking behaviours concerning health issues. Sixteen studies were found to be the most useful in examining what influences preventive health behaviours. A summary of the findings, a critique of the instrumentation, and a discussion of the limitations of these 16 studies will be presented. Particular attention will be drawn to how the studies illustrated the influence of the variables of the Health Belief Model. In addition to this discussion, Appendix A presents a summary of the 16 studies in a tabular format.

Pender (1987) described primary prevention as the provision of protection against illness or injury to prevent their occurrence. Pender further stated that providing specific protection against disease to prevent its occurrence is the most desirable form of prevention. Primary preventive efforts spare the client the cost, discomfort, and threat to the quality of life that illness poses, or, at least, delay the onset of illness. Immunization is regarded as one of the most highly efficient and cost-effective methods of providing primary prevention (Plotkin & Mortimer, 1994). Global immunization initiatives have dramatically reduced the mortality and morbidity associated with vaccine-preventable diseases (Plotkin & Mortimer). The success of such initiatives is in part due to the component of program planning
which incorporates an understanding of the beliefs and attitudes of the targeted population concerning immunization (Canadian Paediatric Society, 1997).

Of the 16 more useful studies reviewed, 11 pertained to immunization-seeking behaviours. Five studies concerned other health-related behaviours such as breast self-examination, condom use, adherence to dietary regimens, and follow-up testing for bloodborne pathogens. Seven of the 16 studies used the Health Belief Model (HBM) as their theoretical framework. These studies asked about the concepts of the HBM in a similar way. Only two of the seven HBM studies examined immunization-seeking behaviours. Both of these studies indicated that perceived severity of a disease was a strong predictor of receipt of immunization (Feigelman, Stanton, Rubin, & Cartelli, 1993; Cummings, Jette, Brock, & Haefner, 1979). Moreover, these two studies ranked perceived barriers and cues to action as the components of the HBM most influencing immunization decision-making. The most frequently cited barriers were concerns about vaccine safety and side effects, and the inconvenience of being immunized. Bennett and Smith (1992) determined that misconceptions about vaccine side effects included beliefs such as the side effects of the vaccine could be worse than the disease itself and that as the likelihood of contracting the disease was lower than that of experiencing vaccine side effects, immunization was not warranted. Examples of inconveniences to being immunized were lack of transportation and difficulty in taking time from work to attend child immunization clinics. Janz and Becker's (1984) review also identified barriers and cues to action as the components most likely to significantly influence preventive behaviours. The cue to action most responsible for influencing the
decision to be immunized was the recommendation of a health care worker for immunization.

The summary of the reviewed literature will be presented under the headings of the three components of the Health Belief Model; individual perceptions, modifying factors, and variables effecting the likelihood of taking action. The information will be discussed according to each of the variables of the Health Belief Model.

**Individual Perceptions**

**Perceived Susceptibility**

Rosenstock (1974) stated that perceived susceptibility is the individual's estimated probability that they will experience a specific health problem. Each individual falls somewhere on a scale from high to low in estimating their personal probability for developing a specific illness. A person may believe that they have no possibility of contracting a particular illness, consider the chances slight, or believe strongly that the illness will occur at some point in their life.

Several studies have demonstrated the potent influence on health-related behaviours of an individual's perceived susceptibility to a condition. Pennie et al. (1991) determined that students in health care disciplines had stronger intentions to be immunized against hepatitis B if they had a higher perceived risk of contracting hepatitis B. The reliability and validity of the questionnaire used in the Pennie et al. study was established through pilot-testing with a different population of 100 part-time nursing students. Support for the construct validity of the questionnaire was established using the known groups approach when statistically significant
(p < 0.001) differences in risk perceptions and willingness to pay were found between the groups which had strong and weak intentions to be immunized. While it had a large sample size, a weakness of the Pennie et al. study was convenience sampling at two post-secondary institutions, and consequent limitation of generalizability of study findings.

Bennett and Smith (1992) found that parents who had either fully or partially vaccinated their children against pertussis reported a greater perceived risk of their child developing pertussis if not vaccinated. The study had some weaknesses, however. The investigators did not assess the validity or reliability of the questionnaire used in the participant interview. Also, convenience sampling was used to identify the sample cohort of children from one community. Thus, there was limitation to the generalizability of the study findings.

Maiman et al. (1977) found that a mother’s views about the seriousness of the threat of illness in general, and obesity in particular, were substantially associated with dietary regimen adherence and subsequent weight loss by her child. The investigators operationalized each major component of the HBM by multiple items on an interview questionnaire. Strengths of the work of Maiman et al. included the application of the HBM to behaviour related to chronic illness, and the development of measurement scales that met criteria for reliability. The scales were shown to have high internal consistency and correlation with individuals’ compliance behaviours. However, there were apparent weaknesses in the methodology. The investigators made the untested assumption that weight loss of a child reflected adherence to the recommended diet, and did not directly measure
the mother's compliance with the diet. Other factors such as illness or exercise could have caused a weight loss. Also, because the health beliefs were measured only at the initial visit, it was not possible to determine whether some portion of the decline in the regression coefficients was due to changes in health beliefs over time. Lastly, generalizability was limited by use of a non-random sample of low-income mothers attending a single ambulatory pediatric clinic at a large teaching hospital.

Mahoney, Thombs, and Ford (1995) determined that college students who were sporadic condom users, as distinguished from both consistent users and nonusers, perceived themselves as more susceptible to human immunodeficiency virus (HIV), acquired immunodeficiency syndrome (AIDS), and other sexually transmitted diseases. That is, the consistent users believed themselves to be at low risk due to their consistent condom use; while the nonusers perceived themselves to be at such a low risk that they did not need to use condoms. The investigators used two theoretical frameworks, the HBM and the Condom Use Self-Efficacy Scale (CUSES). The HBM items on the self-administered questionnaire were developed using information gathered from focus groups totaling approximately 80 college students. The HBM scales pertained to the concepts of perceived benefits, barriers, and susceptibility and were subjected to separate principal components factor analyses each using varimax rotation. The scales were shown to possess good reliability. Internal consistency reliability ranged from 0.61 to 0.89 for the barriers, susceptibility, and benefits scales. Reliability analyses (Cronbach alpha 0.91) were performed on the CUSES subscales developed in a previous study by Brien,
Thombs, Mahoney, and Wallnau (1994). The study provided additional validation of the CUES and presented new instruments for measuring HBM concepts. While the study had a large sample size, generalizability of study findings was limited by the use of convenience sampling at a single public university.

Sass, Bertolone, Denton, and Logsdon (1995) reported that the most significant factor affecting return rate for HIV testing following health care worker exposure to blood or body fluid was the worker's perception of their susceptibility. The instrument developed for the study, the HIV Follow Up Questionnaire, included the HBM variables of susceptibility, severity, benefits, barriers, and health motivation. A strength of this study was the development of a questionnaire with good reliability. Content validity for the HIV Follow-Up Questionnaire was established by expert review. The internal consistency reliability for the scales ranged from 0.68 to 0.81 for the barrier, health motivation, susceptibility, severity, and benefits scales. A limitation of the questionnaire was that it did not address the emotional issue that is so prominent with HIV. Emotions about HIV may have overridden the intellectual knowledge of the health care worker when responding to the questionnaire. Open-ended interviews could have been used to further evaluate why a health care worker chose or did not choose to return for follow-up. Also, by nature of the health care workers' profession, subjects may have been desensitized to the important issue of HIV and the relationship to self. This may have effected the return rate and was not addressed in the study.
Perceived Severity

As Pender (1987) stated, perceived severity of a given health problem can be judged either by the degree of emotion created by the thought of the disease or by the difficulties that the individual believes the health problem would pose. Feelings concerning the severity of contracting an illness include evaluations of both medical consequences (for example, pain, disability, and death) and possible implications of the health problem for work, school, family life, and social relationships (Rosenstock, 1974). Several studies have demonstrated the influence of perceived severity of a health threat in triggering health-related behaviours.

Feigelman et al. (1993) determined that compliance with recommendations for post-exposure measles immunization was related to the parents' belief that measles would make their child sick or very sick. A strength of this study was the use of logistic regression. Most studies of the HBM have only considered individual constructs of the model, rather than an integration of the model as a whole. The study had several weaknesses. There was no assessment of the validity and reliability of the questionnaire used for the telephone interview of the targeted exposed child/children. There was a major threat to internal validity because of the small number of subjects (n = 106). Due to the inability to contact all families, compliance could only be determined in 48% of the exposed families. Another weakness was the possibility that families without prior experience attending a pediatric emergency room may have had difficulty answering the barriers questions. Other parental concerns, such as perceived safety and complications of the vaccine, were not addressed. Lastly, the health beliefs were determined after the
behaviour under study (compliance) did or did not occur, and therefore responses may have been given to justify what the person had already done.

A study of measles vaccination in a primary school setting determined that the parents’ reasons for not giving consent for measles immunization were related to a failure to appreciate the seriousness of measles (Rao, Wilkinson, Millar, & Richards, 1988). The findings of this study were limited by the use of convenience sampling from a single community.

**Modifying Factors**

**Demographic Factors**

Demographic factors such as education, age, gender, race, ethnicity, and income are believed to influence health-related behaviour indirectly by affecting the individual’s perceptions and expectations (Janz and Becker, 1984). Gender is the demographic variable most predictive of preventive behaviours, with women demonstrating preventive behaviours more frequently than men (Pender, 1987). Race and ethnicity appear to be factors in the use of preventive services only when they are associated with socioeconomic level (Pender). Socioeconomic status appears to have an influence only when significant cost or time is required for the preventive behaviour (Pender). The literature review indicated that lower levels of immunization coverage were seen in lower socio-economic families, single parent families, families with more children, and families living in inner cities (Li & Taylor, 1993; Zimmerman et al. 1996).

**Age.**

Somewhat conflicting information was found in the review of the literature
pertaining to the demographic factor of age and how it relates to perceptions of vulnerability to health problems. Gochman (1985) stated that there was no empirical work supporting the widely held belief that adolescents perceived themselves as being invulnerable to harm as a direct result of their level of cognitive development. Gochman's research concluded that adolescents, like adults, demonstrated significant bias when asked to estimate their personal vulnerability to harm, and usually underestimated it.

In a study done by Quadrel, Fischhoff, and Davis (1993) three groups of subjects were asked to judge the probability that they and several others (i.e., a friend, an acquaintance, a parent, a child) would experience various risks. The investigators determined that the perception of relative invulnerability was no more pronounced for adolescents than for adults. These results were consistent with the findings of the United States (US) Office of Technology Assessment. After reviewing a number of studies on minors' health care decisions, the US Office of Technology Assessment (1991) concluded that there were few demonstrated cognitive differences between adolescents (over age 13) and adults.

Some research suggested that perceptions of personal susceptibility to health problems may be a stable personality trait. As specified by Tinsley, Holtgrave, Reise, Erdley, and Cupp (1995), two principal types of models have been developed to explain variations in youths' risky health behaviour: (1) personality models, which maintain that personality characteristics that persist over time are identifiable and are conducive to later risky behaviour, and (2) environmental models, which suggest that risky behaviour is a function of situational supports, controls, social
models, and expectations of the social environment. Tinsley et al. conducted a study using decision-making theory to analyze the developmental changes associated with children's and adolescents' health behaviour. The investigators determined that there were developmental differences in the sources of influence that children and adolescents perceived to effect their health behaviour decision-making. Tinsley et al. concluded that the sources of influence were dependent on the particular health issues being considered.

Morris (1993) disputed the assumption that, as children age, they become more prone to engage in risky behaviour as a result of the waning of parental control and the dominance of peer influence. He stated that such assumptions may be, at best, oversimplifications. According to Morris, research has demonstrated that parental influence on child and adolescent beliefs and behaviours was much more substantial than had been previously acknowledged.

Behrman, Kliegman, Nelson, and Vaughan (1992) stated that as the adolescent engaged in active exploration of new ideas and behaviours as a method of expanding their sense of self, the result was risk-taking behaviour, and the testing of the limits of what could and could not be done and what was and was not desirable as an expression of the self.

Cohn, Macfarlane, Yanez, and Imai (1995) suggested that harm experienced by youth may reflect a failure to perceive personal susceptibility in risky situations, rather than beliefs about personal invulnerability and the desire to pursue risks. Cohn et al. suggested that youth involvement in many health-threatening activities could be reduced by increasing youths' perception of the risks associated with
participation.

Fischhoff (1990) described children and adolescents as being less likely to systematically weigh options in risk assessment and decision-making. Children and adolescents may have a set of risk-taking propensities such as a preference for immediate rewards, higher impulsivity, heightened sensitivity to others' opinions, ambivalence concerning their decision-making autonomy, and be in transition with respect to the values, beliefs, and knowledge used to evaluate risk and make decisions (Fischhoff).

In general, support was found in the literature review for youths' belief system of perceived lower personal susceptibility to health risks. Further investigation is needed, however, regarding the demographic factor of age and how it pertains to health-related decision-making.

**Sociopsychological Variables**

Sociopsychological variables such as personality, social class, social problems, peer and reference group pressure, family functioning, health motivation, and confidence are another subset of the factors which modify an individual's perceived threat of disease and influence their likelihood of taking the recommended preventive health action (Becker, 1974).

**Social problems.**

Social problems such as parental indifference, parental illness, or children cared for by elderly grandparents have been shown to negatively influence parental consent for children to be immunized (Rao et al., 1988).
Family functioning.

Zimmerman et al. (1996) found that parents of children with late vaccinations, in comparison with parents of children with timely vaccinations, reported higher family dysfunction. A self-administered survey was used which combined measures from the Triandis model of consumer decision-making and the Family Profile, which measured family functioning. The Triandis model has high internal consistency reliability (Cronbach alpha = 0.91), and has been validated for use in explaining influenza immunization behaviour in adults (Montano, 1986). The Family Profile has also demonstrated high internal consistency reliability (Cronbach alpha = 0.95). The instrument was pilot-tested before the mail-out to study participants. Strengths of the work of Zimmerman et al. were the measurement of age at vaccination as a continuous variable, and in the regression analysis the use of the degree of lateness in receiving immunization, rather than the measurement of immunization status alone. Another strength of the study was the use of a survey instrument that was designed specifically to measure family functioning as a means to better understand the causes of delayed immunization. However, there were several limitations to the work of Zimmerman et al. The low response rate posed the possibility of response rate bias. Generalizability of the findings was limited to inner-city health centers that were receiving free vaccine supplies. Another limitation was the selection of patients who were seen in the preceding six months, since they may not have represented all patients in the practice. In particular, patients who were less likely to seek care may have been omitted by this strategy. The self-reporting of income by recipients of public assistance may have caused
underreporting because of the fear of losing benefits.

Health motivation.

Health motivation, or the desire to maintain good health by being immunized, was reflected in the finding that the more influenza vaccines a person has had, the higher their likelihood of getting another (Montano, 1986). This study used items from the Fishbein and Triandis models in an interview questionnaire which was designed to predict adherence with a health care worker's recommendation regarding flu vaccine. Two scales (i.e., affect/attitude and perceived consequences) had excellent internal consistency reliability but no information was provided for the behavioural intention, social influences, habit, or facilitating conditions scales. Another limitation of the study was the use of convenience sampling at a single health care clinic.

The influence of the sociopsychological variable of health motivation with its repeated health behaviours was also seen in the work of Dishman, Sallis, and Orenstein (1985). Past physical fitness program participation was identified as a major factor positively influencing current involvement in exercise activities. As Pender (1987) stated, previous experience with health-promoting actions increased the ability of people to carry out various behaviours to promote well-being. For example, some of the skills necessary to plan nutritious meals, maintain an exercise program, or deal with stress may have been learned previously from similar activities.

Confidence.

Confidence is another sociopsychological variable which influences health-
related behaviours. Mahoney et al. (1995) found that college students classified as sporadic condom users, as distinguished from consistent users and nonusers, were less confident in their ability to discuss and insist on condom use with a partner. This lack of confidence resulted in the students not following a recommended health practice which would have reduced their risk of disease transmission.

Champion (1993) determined that a woman's degree of confidence in performing breast self-examination predicted the frequency of its performance. The attitudinal scale used in Champion's (1993) study was the result of revision and refinement of an earlier scale (Champion, 1984). Discussion of the validity and reliability of the 1993 scale will be presented in the instrumentation section. A limitation of Champion's (1993) study was the low participation, with 41% of the questionnaires returned. This was thought to be due to the long period of time, two and one-half years, required for participation in the study.

Structural Variables

Knowledge and prior contact.

The two structural variables presumed by the HBM to influence preventive behaviour include knowledge about the target disease and prior contact with it. Heinzelmann (1962) found that continuation of penicillin prophylaxis among college students was directly related to the history of past bouts of rheumatic fever and expectations of recurrence. Becker (1974) found higher compliance rates with the treatment regimen for otitis media when a mother reported that her child was often ill, and that illness was a major threat to her child.
Cues to Action

As Rosenstock (1974) noted, a stimulus is necessary to trigger the decision-making process regarding a health-related behaviour. This so-called "cue to action" can be either internal or external. Examples of internal cues include uncomfortable symptoms or remembering how friends or relatives experienced a particular illness. External cues include mass media communications and advice from others.

An important external cue to action associated with immunization status is the recommendation from a health care worker to be immunized. Cummings et al. (1979) and the Centers for Disease Control (1988) reported this factor as having a high association with influenza and pneumococcal vaccination status. Similarly, Li and Taylor's (1993) study of the factors affecting uptake of measles, mumps, and rubella (MMR) vaccine indicated that physician recommendation for immunization was an important predictor. Li and Taylor determined that the MMR immunization coverage level in a sample of children was lower than the national target. The lower rate may have been related to three weaknesses in the study methodology. The evaluation was carried out when the study children were aged 19-21 months, rather than 24 months. Routine doses of MMR vaccine were administered at 12 and 18 months of age. Some children may have received MMR vaccine between the ages of 19-21 and 24 months. The 10 study districts included many inner city districts where immunization uptake could have been problematic. Immunization coverage data in the study districts were typically prepared at fixed dates. The investigators acknowledged that local child health staff often made particular efforts to ensure that records were as up-to-date as possible for the deadline. The
data for the study were collected at a time midway between deadlines.

Zimmerman et al. (1996) assessed family functioning and consumer decision-making about vaccinations and compared the results with age at vaccination. Parents of children with late vaccination, as compared to parents of children with timely vaccinations, reported differences in the value their physicians placed on immunization. Parents of children with late vaccination stated that their physicians perceived a lower rating of the importance of the primary immunization series of Diphtheria, Pertussis, and Tetanus (DPT) vaccine.

Perceived Threat of Disease

According to Becker et al. (1977), perceived susceptibility and perceived severity combine to determine the total perceived threat of a disease to the individual. This perceived threat then affects their probability of taking action.

Likelihood of Action

Perceived Benefits of Preventive Action

While acknowledgement of the perceived threat of a particular disease produces a force leading to a health-related behaviour, it does not define the particular course of action that is likely to be taken. The course of action is determined by the individual's beliefs regarding the benefits, feasibility and effectiveness of the various possible actions which can be undertaken to reduce the disease threat.

The perception of expected benefits to be derived from a course of action was seen in mothers' compliance with diet regimens prescribed for their obese children. Maiman et al. (1977) determined that, on a psychological level, trust or
faith in the benefits of medical care and in the efficacy of the recommended regimen increased adherence with the recommendations of health care providers.

Similarly, Cummings et al. (1979) concluded that a positive experience with immunization in the past increased the likelihood of being immunized again in the future. A telephone survey was used to study factors which predisposed individuals to receive vaccination in response to the anticipated outbreak of swine influenza in the fall of 1976. To obtain more reliable measures for the survey, indices of selected variables were constructed using cluster analysis with a minimum clusterability ratio of 0.5. A limitation to the study was the difficulty in determining the extent to which the findings may have been applicable to other immunization programs in light of the unique nature of the swine flu campaign (i.e., government sponsorship of the program and unintended side effects associated with the vaccine).

Sass et al. (1995) found that the benefit of decreasing the chance of dying from AIDS was a determining factor in the return rate for follow-up HIV testing of health care workers following a blood or body fluid exposure. Similarly, Champion (1993) determined that a woman’s perception of the benefits of performing breast self-examination (BSE) in decreasing her chances of dying from breast cancer was a strong predictor of the woman’s regular performance of BSE.

Perceived Barriers to Preventive Action

Perceived barriers, as described by Rosenstock (1974), are the potential negative aspects of a particular health action which may act as impediments to undertaking the recommended behaviour. These barriers can be perceived or real.
As stated by Janz and Becker (1984), there is substantial evidence that the concept of perceived barriers is the most likely component of the HBM to influence preventive health behaviours. Some examples of impediments are cost, safety concerns, inconvenience, unpleasantness, or extent of life change required (Pender, 1987).

For example, Weingarten et al. (1989) determined that the physicians and nurses who did not receive influenza vaccine were more concerned than their immunized peers about vaccine safety, and the pain and inconvenience of vaccine administration. Pennie et al. (1991) determined that the high cost of purchasing hepatitis B vaccine was a barrier to the immunization of health care students.

Several studies have identified concerns about vaccine side effects as a reason for not being immunized. Bennett and Smith (1992) reported that parents of children never immunized against pertussis believed that the vaccine caused side effects more serious than pertussis disease. Roberts, Sandifer, Evans, Nolan-Farrell, and Davis (1995) determined that concern about vaccine side effects was a common reason for the poor uptake of measles, mumps, and rubella (MMR) vaccine during a community outbreak of measles. Unfortunately, Roberts et al. did not report on the development of the self-administered questionnaire, or its assessment for validity and reliability.

Insufficient or incorrect knowledge is an unfortunate barrier to the receipt of immunization. Rao et al. (1988) identified that incorrect understanding of medical contraindications to measles vaccine was a reason for lack of parental consent for measles immunization. The Centers for Disease Control (1988) assessment of
knowledge, attitudes, and practices of adults regarding influenza and pneumococcal immunization indicated that misconceptions were very common. These misconceptions included the beliefs that influenza vaccine itself caused illness, did not protect against influenza disease, and was unnecessary. There were several problems, however, with the Centers for Disease Control study. The investigators did not outline the development of the questionnaire, or the assessment of its validity and reliability. Also, the data had several limitations. The questionnaire addressed only those \( \geq 65 \) years of age. Persons \(< 65\) years of age with high-risk conditions, those who did not live in residential centers, and those who lived in chronic-care facilities were not included. Of persons who were surveyed, there was a disproportionately high percentage of women compared with the percentages of women \( \geq 65\) years of age living in the reference communities. The racial distributions of respondents also differed from that of the reference populations. Selection bias may have been introduced into the survey because residential centers voluntarily participated in the survey, and randomization was not possible. Also, responses concerning immunization status were not verified.

**Summary of the Literature Review**

In conclusion, the literature review indicated there was already much known regarding the factors influencing immunization decision-making, and that a good deal of this knowledge had been obtained from studies using the theoretical framework of the HBM. The review of studies pertaining solely to immunization indicated that the major concerns influencing immunization decision-making related to the perceptions of disease severity and personal susceptibility to the disease,
vaccine cost, safety, and side effects (Weingarten et al., 1989; Li & Taylor, 1993; Pennie et al., 1991; Roberts et al., 1995). However, there likely are other influences which have not yet been adequately described. For example, the literature review did not discover specific information concerning the factor of age and its relationship to immunization decision-making. At best, there was somewhat conflicting information regarding the influence of age on health-related decision-making. For these reasons, age was considered as a variable in this study. Also, this study asked a question of the students who were not immunized. By asking the non-immunized students what it would have taken for them to be immunized, it was hoped that new insights would be obtained about other possible factors influencing immunization decision-making.
CHAPTER III

Methods

Introduction

In this chapter, a description of the research design, sample, data collection procedure, instruments for data collection, ethics and human rights considerations, and the statistical procedures used in data analysis can be found.

Research Design

A descriptive comparative design was used in this study. The theoretical framework of the Health Belief Model was used to guide the comparison for differences between students who were immunized and those not immunized during the 1997 SFU measles outbreak in terms of: age, perceived personal susceptibility to measles, measles severity, benefits and barriers to being immunized, cues to action, health motivation, confidence, knowledge of measles, prior contact with measles, perceived threat, and area of study at the university. Information was also sought about the non-immunized students' identification of what it would have taken for them to be immunized.

Sample

The study took place in Burnaby, British Columbia, in Western Canada. The SFU Office of the Registrar released copies of its computerized student database to Communicable Disease Epidemiology Services, British Columbia Centre for Disease Control, in early May 1997. To address the research questions, a random sample of 400 students who were immunized and 400 who were not immunized was obtained from the database. It was anticipated that approximately 50% would
return the questionnaire. A final sample size of approximately 400 students was based on a power analysis given that the anticipated population proportion is 0.95 for immunized students, and 0.10 for non-immunized students; and that the confidence level is 95% (Lwanga & Lemeshow, 1991).

**Data Collection Procedure**

To preserve student anonymity, administrative support staff of Communicable Disease Epidemiology Services produced two sets of mailing labels for the random sample generated through the SFU student database. Code numbers were not recorded on the mailing labels; instead, the reminder letter at three weeks was mailed to the entire sample. The investigator provided the administrative staff with the questionnaire packet in stamped envelopes. Mailing labels were applied by the administrative staff. These procedures were intended to ensure participant anonymity. The mailed packet contained a letter of introduction describing the study purpose, the time commitment required, instructions for the completion of the questionnaire, and invited the student's participation, thanking them in advance for the return of the completed questionnaire by including a coupon for a coffee (Appendix B). The data collection instrument based on the Immunization Health Belief Model Scale was also enclosed in the packet (Appendix C). A return envelope with pre-paid postage was also included. One reminder letter was sent to the entire sample three weeks after the initial mailing (Appendix D).

**Instruments for Data Collection**

A self-administered questionnaire was developed as the data collection instrument.
There are three components to the self-administered questionnaire:

(a) the 44 item “Immunization Health Belief Model Scale” (IHBMS),
(b) questions regarding demographic information, and
(c) an open-ended question for non-immunized students.

The Immunization Health Belief Model Scale

V. L. Champion (personal communication, May 20, 1997) granted written permission to the investigator to revise her 1993 "Breast Self Examination-Related Health Belief Model Scales" for this study. V. L. Champion (personal communication, May 20, 1997) also indicated that she did not recall any previous request for the use of her materials in studying immunization-seeking behaviours.

The Immunization Health Belief Model Scale consists of 44 items adapted or developed by the investigator to measure the HBM concepts of perceived susceptibility, severity, benefits, barriers, cues to action, health motivation, confidence, knowledge of measles, prior contact with measles, and perceived threat. Seven items were unchanged from Champion’s (1993) work, 27 were adapted, and 10 were new, based on theoretical and empirical literature, as well as the investigator’s experience. The major adaptations were the inclusion of twice the number of items which tapped into the concept of perceived barriers, and the addition of items which pertained to the concepts of cues to action, knowledge of disease, and prior contact with the disease. Another adaptation was the inclusion of fewer items pertaining to the concept of confidence. Champion’s scale was used to measure a woman’s confidence in performing breast self-examination. As immunization is not a self-care procedure, it does not readily allow measurements
of a vaccinee's confidence in its performance.

As the basis of the IHBMS was Champion's (1993) scale, information is provided about the development and psychometric properties of her scale. The 42 item BSE-Related Health Belief Model Scales measure perceived susceptibility (5 items), severity (7 items), benefits (6 items), barriers (6 items), health motivation (7 items), and confidence (11 items). The scale was subjected to content validity by experts in the United States, and determined to be satisfactory. Support for construct validity was provided through exploratory factor analysis. Predictive validity has been supported because breast self-examination behaviour (as measured with the scale) correlated with breast self-examination attitudes. Internal consistency reliabilities done for the subscales ranged from 0.80 to 0.93. Test-retest correlations ranged from 0.45 to 0.70 (Champion).

The IHBMS consists of 44 items and reflects the various components of the Health Belief Model:

Perceived susceptibility (4 items)
Perceived severity (4 items)
Perceived benefits (5 items)
Perceived barriers (12 items)
Cues to action (5 items)
Health motivation (7 items)
Confidence (3 items)
Knowledge (2 items)
Prior contact (1 item)
Perceived threat (1 item)

The items are balanced to produce both positively and negatively worded statements. All items are scored using a 5-point Likert scale ranging from strongly agree (1) to strongly disagree (5). To obtain a mean score for each subscale the
sum of a student's responses for each subscale is divided by the number of items included in the subscale. Use of the Likert scale is supported by the work of Cummings, Jette, and Rosenstock (1978). As stated by these investigators, "The original components of the HBM ... can be measured ... using questionnaire or interview items .... However, some methods of measurement appear to be better than others .... With the Likert scale showing some superiority" (Cummings et al., p. 402).

**Reliability estimation.**

Internal consistency estimates were calculated for each of the subscales using Cronbach's alpha. Internal consistency reliabilities for all scales indicated moderate reliability and ranged from 0.004 for knowledge of measles to 0.663 for benefits. Overall, the IHBMS had a Cronbach's alpha of 0.627. Table 1 presents Cronbach alphas for each subscale.
Table 1

Subscale Reliabilities of the Immunization Health Belief Model Scale

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susceptibility</td>
<td>0.596</td>
</tr>
<tr>
<td>Severity</td>
<td>0.487</td>
</tr>
<tr>
<td>Benefits</td>
<td>0.663</td>
</tr>
<tr>
<td>Barriers</td>
<td>0.657</td>
</tr>
<tr>
<td>Cues to Action</td>
<td>0.534</td>
</tr>
<tr>
<td>Health Motivation</td>
<td>0.651</td>
</tr>
<tr>
<td>Confidence</td>
<td>0.598</td>
</tr>
<tr>
<td>Knowledge of Measles</td>
<td>0.004</td>
</tr>
</tbody>
</table>

As can be seen in Table 1, the three subscales with the highest Cronbach alphas were benefits (α = 0.663), barriers (α = 0.657), and health motivation (α = 0.651). The subscale of knowledge of measles had the lowest Cronbach’s alpha (α = 0.004). The calculation of Cronbach’s alpha for the subscale of knowledge may have been compromised due to there being only two items in the subscale. Cronbach alphas could not be determined for the subscales of prior contact with measles and perceived threat of measles as each of these subscales had fewer than two non-zero variance items and so could not be analyzed.

Subscales of the Immunization Health Belief Model Scale

The operational definitions for each subscale, as well as the items in each subscale, are provided. Following each item there is a number and a letter in brackets. The number corresponds to the numerical order of the item in the questionnaire. The letter designation of "A," "N," or "U" indicates that the item has been adapted from Champion’s (1993) scales, is new, or has been left unchanged.
**Perceived susceptibility.**

The students' views of the likelihood of experiencing the potentially harmful disease of measles, were measured by the following four items:

- My chances of getting measles are great (1-A).
- My age group makes it more likely that I will get measles (4-A).
- I believe I will get measles in the future (7-A).
- There is a good possibility I will get measles in the next few months (37-A).

**Perceived severity.**

The students' views of how serious or threatening measles may be to themselves, were measured by four items:

- Measles is a very serious disease (2-N).
- I could be very sick if I got measles (5-N).
- If I got measles, my studies could suffer (9-N).
- I am afraid to even think about being sick with measles (16-A).

**Perceived benefits.**

The students' views of the effectiveness of measles immunization in reducing the threat of measles, were measured by five items:

- Immunization will prevent me from catching measles (6-A).
- Immunization is a good idea because I don't want others to have to look after me if I get really sick with measles (12-N).
- By being immunized and not getting measles, I will avoid lost time from school and/or work (21-N).
- If I was immunized and still got measles, I wouldn't be as sick with it (23-A).
- By being immunized and not getting measles, I will be protecting others from measles (35-N).

**Perceived barriers.**

The students' views of the negative aspects of being immunized, were measured by 12 items:

- It is embarrassing for me to receive a measles shot with others watching (11-A).
**Perceived barriers (continued).**

The measles shot can be painful (14-A).
The side effects of measles immunization will interfere with my studies (15-N).
Being immunized against measles will not prevent me from getting measles (18-N).
I am scared of needles (19-N).
Measles vaccine is contraindicated for me as I am allergic to eggs (26-N).
Measles vaccine is not safe (28-N).
I have had very bad side effects from measles vaccine in the past (29-N).
I was too busy to get immunized (32-A).
I’ve had measles and therefore don’t need to be immunized (33-N).
The side effects of measles vaccine are worse than measles disease (36-N).
The measles immunization clinics were held at inconvenient times (41-N).

**Cues to action.**

Stimuli which trigger the students' receipt of immunization by making them consciously aware of their feelings about measles, were measured by five items:

- A friend/relative was very sick with measles (3-N).
- My family wanted me to get measles vaccine (10-N).
- Most of my friends got measles vaccine (20-N).
- The advertising of the need for measles immunization prompted me to get it (34-N).
- My doctor recommended that I receive measles immunization (40-N).

**Health motivation.**

The students' driving forces of behaviours which promote their wellness, were measured by seven items:

- I exercise at least 3 times a week (8-U).
- Maintaining good health is extremely important to me (22-U).
- I search for new information to improve my health (24-U).
- I want to discover health problems early (27-U).
- I feel it is important to carry out activities which will improve my health (38-U).
- I have regular health check-ups even when I am not sick (39-U).
- I eat well balanced meals (42-U).
Confidence.

The students' beliefs that immunization and the process of getting immunized will be successful, were measured by three items:

I am confident I can control any fear of needles I might have while I am being vaccinated (13-N).
I can manage or cope with any pain accompanying the vaccination (25-N).
I can hold my arm still while being vaccinated (30-N).

Knowledge of measles.

The students' knowledge of measles was measured by two items:

Measles vaccine is safe (31-N).
I have accurate knowledge about measles (43-N).

Prior contact with measles.

The students' histories of prior contact with measles disease were measured by one item:

I know someone who has had measles (44-N).

Perceived threat of disease.

The students' perceived threat of disease (i.e., the combination of their perceptions of susceptibility and seriousness) was measured by one item:

I am afraid of getting measles (17-N).

Demographic Information Data Collection Form

The following demographic information was requested for descriptive purposes: age, gender, ethnicity, faculty/department of study, and graduate vs undergraduate program.
**Question on What it Would Have Taken for Non-Immunized Students to be Immunized**

An open-ended question for non-immunized students asked them what it would have taken for them to be immunized. In addition, in order to provide opportunity for the investigator to clarify areas in students' responses, they were invited to provide their first name and phone number so that the investigator might phone if clarification was needed.

**Ethics and Human Rights Considerations**

This study protected the human rights of its participants and was conducted in an ethical manner. Prior to conducting the study, approval was obtained from the University of British Columbia Behavioural Research Ethics Board (Appendix E). Permission was granted by the Simon Fraser University Dean of Student Services and Registrar to access the addresses of a sample of SFU students (Appendix F). All of the potential participants received an introductory letter outlining the purpose of the study and the nature of their participation (Appendix B). The letter also contained a statement indicating that return of the completed questionnaire indicated their consent to participate in the study. The student’s participation in the study was voluntary. The researcher’s name and telephone number were included in the introductory letter and participants were encouraged to contact the researcher should they have any questions or concerns about the study. The sampled students were assured that their participation was anonymous, that they had the right to withdraw from the study at any time, and that they had the option of obtaining the study results.
Anonymity and confidentiality were maintained throughout this study. The names of the participants do not appear on the questionnaires. The mail labels were not coded. The study participants have remained anonymous to the investigator.

**Data Analysis**

Raw data from the questionnaires were entered into a computer file and analyzed using EpilInfo 6.0. Descriptive statistics, including mean, standard deviation and range were used to analyze the sample in terms of age, gender, ethnicity, faculty/department of study, graduate vs undergraduate program, and number immunized and not immunized. To answer Research Question 1 regarding whether there was a difference in age of those immunized and not immunized, a t-test was performed to compare the two groups of students by age. Inferential statistical analyses were done to compare the differences between the immunized and not immunized students in terms of each of the following variables separately: perceived susceptibility, severity, benefits, barriers, cues to action, health motivation, confidence, knowledge of measles, prior contact with measles, and perceived threat. A chi-square test was done on the data pertaining to student immunization status and the area of student study being more focussed on human health. Backward stepwise logistic regression was done to determine the probability that students made the decision to be immunized based on their age, the 10 variables of the Immunization Health Belief Model Scale, and their area of study. Content analysis was done on the non-immunized students' description of what it would have taken for them to be immunized (Burns & Grove, 1993).
CHAPTER IV

Presentation and Discussion of Results

Introduction

This chapter consists of three sections. In the first section, a description of the characteristics of the sample is presented. In the second section, the findings are presented, and in the third section a discussion of the results can be found.

Characteristics of the Sample

A total of 800 questionnaires were mailed and one reminder letter was sent three weeks later. Of the questionnaires mailed, 30 (3.8%) were returned due to address problems, and 42 (5.3%) were inadvertently sent to SFU faculty or staff. Of the 728 questionnaires received by SFU students, 484 (66.5%) students failed to respond for unknown reasons and 244 students returned the completed questionnaire. Thus the response rate was 33.5%. Of the 244 students comprising the final sample, 175 (71.7%) were immunized; 69 (28.3%) were not immunized.

Demographic Characteristics of the Sample

Demographic data collected from the students included age, gender, ethnicity, faculty of study, and whether they were in an undergraduate or graduate program. Table 2 summarizes the demographics and measles immunization status of the students in the sample and, as well, specifies the demographics of the SFU student population close to the time of the measles outbreak. With the exception of student ethnicity, Table 2 presents the demographics of the SFU student population in October 1997 (SFU Student Services and Registrar, 1997). The SFU Administrative Office does not collect information regarding student ethnicity.
Table 2

Demographic Characteristics of the Sample

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Frequency (%)</th>
<th>Immunized Frequency (%)</th>
<th>No Frequency (%)</th>
<th>Characteristics of SFU student body (Oct/97)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
<td>Mean age for undergraduate program: 23.7 years</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mean age for graduate program: 33.6 years</td>
</tr>
<tr>
<td>Age:</td>
<td></td>
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<tr>
<td>Mean age: 26.7 years (SD = 8.72)</td>
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<tr>
<td>Mean age for undergraduate program: 24.9 years (SD = 7.5)</td>
<td>(see Table 3)</td>
<td></td>
<td></td>
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<tr>
<td>Mean age for graduate program: 34.7 years (SD = 8.9)</td>
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<tr>
<td>Whether an undergraduate or graduate program:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate program</td>
<td>198 (81.5)</td>
<td>148 (60.7)</td>
<td>50 (20.5)</td>
<td>90%</td>
</tr>
<tr>
<td>Graduate program</td>
<td>41 (16.8)</td>
<td>23 (9.4)</td>
<td>18 (7.4)</td>
<td>10%</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>148 (60.7)</td>
<td>108 (44.3)</td>
<td>40 (16.4)</td>
<td>56%</td>
</tr>
<tr>
<td>Male</td>
<td>95 (38.9)</td>
<td>66 (27.1)</td>
<td>29 (11.9)</td>
<td>44%</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>161 (66.0)</td>
<td>110 (45.1)</td>
<td>51 (20.9)</td>
<td>Information not collected by SFU Administrative Office.</td>
</tr>
<tr>
<td>Oriental</td>
<td>60 (24.6)</td>
<td>46 (18.9)</td>
<td>14 (5.7)</td>
<td></td>
</tr>
<tr>
<td>Indo-Canadian</td>
<td>7 (2.9)</td>
<td>7 (2.9)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>11 (4.5)</td>
<td>7 (2.9)</td>
<td>4 (1.6)</td>
<td></td>
</tr>
<tr>
<td>Unspecified</td>
<td>5 (2.1)</td>
<td>5 (2.1)</td>
<td>0 (0.0)</td>
<td></td>
</tr>
<tr>
<td>Faculty</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applied Science</td>
<td>40 (16.4)</td>
<td>29 (11.9)</td>
<td>11 (4.5)</td>
<td>17%</td>
</tr>
<tr>
<td>Arts</td>
<td>99 (40.6)</td>
<td>70 (28.7)</td>
<td>29 (11.9)</td>
<td>43%</td>
</tr>
<tr>
<td>Business</td>
<td>30 (12.3)</td>
<td>27 (11.1)</td>
<td>3 (1.2)</td>
<td>16%</td>
</tr>
<tr>
<td>Education</td>
<td>24 (9.8)</td>
<td>15 (6.2)</td>
<td>9 (3.7)</td>
<td>9%</td>
</tr>
<tr>
<td>Science</td>
<td>42 (17.2)</td>
<td>28 (11.5)</td>
<td>14 (5.7)</td>
<td>14%</td>
</tr>
<tr>
<td>Other</td>
<td>2 (0.8)</td>
<td>1 (0.4)</td>
<td>1 (0.4)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Unspecified</td>
<td>6 (2.5)</td>
<td>4 (1.6)</td>
<td>2 (0.8)</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

One hundred and ninety-eight (81.5%) of the respondents were undergraduate students; 41 (16.8%) were graduate students. The mean age of students was 26.7 years (SD = 8.72), with a range of 18 years to 74 years. The mean age of the undergraduate students was 24.9 years (SD = 7.5); the mean age of the graduate students was 34.7 years (SD = 8.9). In terms of gender, 148
(60.7%) of the respondents were female; 95 (38.9%) were male. The majority of the respondents were Caucasian (66.0%), followed by Oriental (24.6%), Indo-Canadian (2.9%), and Other or Unspecified (6.6%). With regard to faculty of study, Applied Science (such as Archaeology, History, Geography, and Engineering) accounted for 16.4% of the sample, Arts 40.6%, Business Administration 12.3%, Education 9.8%, Science 17.2%, and Other or Unspecified 3.3%.

The sample was determined to be representative of the SFU student population for age, gender, and faculty of study. According to information obtained from the SFU Fact Book (1997), in October 1997 the mean age for undergraduate students was 23.7 years and for graduate students 33.6 years; the student population was comprised of 56% females and 44% males; 17% of the student population was enrolled in Applied Science, 43% in Arts, 16% in Business Administration, 9% in Education, and 14% in Science.

**Findings**

The findings of this research will be presented in relation to each of the research questions. The Epilinfo 6.0 statistical program was used to analyze the data. Descriptive statistics, including mean, standard deviation, and range were used to analyze the sample's demographics of age, undergraduate or graduate program, gender, ethnicity, faculty of study, and number immunized and not immunized. A t-test was performed to compare the immunized and non-immunized students by age. The two groups of students were compared in terms of the variables of the Immunization Health Belief Model Scale (IHBMS). A chi-square test was done on the data pertaining to student immunization status and area of study.
being more focussed on human health. Backward stepwise logistic regression was done to determine the probability that students made the decision to be immunized based on their age, the 10 variables of the IHBMS, and their area of study. The non-immunized students' responses regarding what it would have taken for them to be immunized were analyzed by means of content analysis.

**Research Question 1 re: Whether There Was a Difference in Age of Those Immunized and Not Immunized**

In terms of age and immunization status, the frequency, distribution, and means were examined. An independent t-test was used to analyze the data for differences. Table 3 presents the distribution of students by immunization status and age group. Figure II illustrates the distribution of age.

**Table 3**

**Immunization Status of Students by Age Group**

<table>
<thead>
<tr>
<th>Age group</th>
<th>Frequency</th>
<th>(%)</th>
<th>Immunized Frequency</th>
<th>(%)</th>
<th>Not Immunized Frequency</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-22</td>
<td>101</td>
<td>(41.6)</td>
<td>79</td>
<td>(32.6)</td>
<td>22</td>
<td>(9.1)</td>
</tr>
<tr>
<td>23-27</td>
<td>74</td>
<td>(30.5)</td>
<td>58</td>
<td>(23.9)</td>
<td>16</td>
<td>(6.6)</td>
</tr>
<tr>
<td>28-32</td>
<td>22</td>
<td>(9.1)</td>
<td>13</td>
<td>(5.4)</td>
<td>9</td>
<td>(3.7)</td>
</tr>
<tr>
<td>33-37</td>
<td>18</td>
<td>(7.4)</td>
<td>12</td>
<td>(5.0)</td>
<td>6</td>
<td>(2.5)</td>
</tr>
<tr>
<td>38-42</td>
<td>10</td>
<td>(4.1)</td>
<td>5</td>
<td>(2.1)</td>
<td>5</td>
<td>(2.1)</td>
</tr>
<tr>
<td>43-47</td>
<td>9</td>
<td>(3.7)</td>
<td>4</td>
<td>(1.7)</td>
<td>5</td>
<td>(2.1)</td>
</tr>
<tr>
<td>48-52</td>
<td>5</td>
<td>(2.1)</td>
<td>2</td>
<td>(0.9)</td>
<td>3</td>
<td>(1.3)</td>
</tr>
<tr>
<td>53-57</td>
<td>2</td>
<td>(0.8)</td>
<td>0</td>
<td>(0.0)</td>
<td>2</td>
<td>(0.9)</td>
</tr>
<tr>
<td>58-62</td>
<td>1</td>
<td>(0.4)</td>
<td>0</td>
<td>(0.0)</td>
<td>1</td>
<td>(0.5)</td>
</tr>
<tr>
<td>74</td>
<td>1</td>
<td>(0.4)</td>
<td>1</td>
<td>(0.5)</td>
<td>0</td>
<td>(0.0)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>243</strong></td>
<td>(100.0)</td>
<td><strong>174</strong></td>
<td>(71.6)</td>
<td><strong>69</strong></td>
<td>(28.4)</td>
</tr>
</tbody>
</table>
One student did not indicate his or her age. The mean age of the other 243 students was 26.7 years (SD = 8.72). Immunized students had a mean age of 25.8 years (SD = 9.28); the mean age of the non-immunized students was 30.1 years (SD = 10.65). As illustrated in Figure II, the highest percentage of immunized students was in the 18 to 22 year old age group (32.6%), followed by the 23 to 27 year old age group at 23.9%. Students 27 years of age or younger accounted for more than half (56.5%) of those immunized. A sharp decline in the percentage of those immunized occurred between the age groups of 23 to 27 years (23.9%) and 28 to 32 years (5.4%). It was determined that student age was significantly related to whether they were immunized or not (t = 3.10; p = 0.002), with younger
students being more likely than older students to be immunized against measles.

Research Question 2 re: Differences Between Immunized and Not Immunized Students in Terms of Perceived Personal Susceptibility to Measles, Measles Severity, Benefits and Barriers to Being Immunized, Cues to Action, Health Motivation, Confidence, Knowledge of Measles, Prior Contact with Measles, Perceived Threat, and Area of Study

The second research question related to the differences between immunized and not immunized students in terms of variables of the Immunization Health Belief Model Scale and student area of study. Prior to presenting the analysis of research question 2, the distribution of each variable will be described. Table 4 presents the distribution of the data for the total respondents and then the immunized and not immunized groups. Table 4 also indicates the mean and standard deviation for each variable, groupings of scores for each variable, the percentage that each grouping represents of the total number of respondents, and the percentage each grouping represents of those immunized and not immunized. Each variable has also been depicted graphically (Figures III, IV, V, VI, and VII). To aid interpretation, the possible range of scores is also presented for each variable. For all variables, a lower score indicates more agreement with the statements designed to measure each variable and reflects a greater level of the variable; a higher score reflects less agreement and a lower level of the variable. Hence, when a high percentage of respondents have low scores for a particular variable, it indicates that the respondents perceive a greater level of that variable.
### Table 4

**Distribution of Immunization Health Belief Model Scale Variables by Score Groups**

N.B. Low score reflects a greater level of the variable; high score reflects a lesser level.

<table>
<thead>
<tr>
<th>Variable (possible range of scores)</th>
<th>Overall Mean (SD)</th>
<th>Score Groups (low score reflects perception of a greater level of the variable)</th>
<th>Score Groups by Immunization Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>6-8 (high)</td>
<td>9-11</td>
</tr>
<tr>
<td>Susceptibility (4-20)</td>
<td>3.71 (0.70)</td>
<td>4 (1.7)</td>
<td>23 (9.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9-11</td>
<td>20 (11.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12-14 (mod.)</td>
<td>18 (26.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15-17</td>
<td>19-22</td>
</tr>
<tr>
<td>Severity (4-20)</td>
<td>2.25 (0.63)</td>
<td>4-7 (high)</td>
<td>71 (29.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8-11</td>
<td>99 (56.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12-16 (low)</td>
<td>38 (55.1)</td>
</tr>
<tr>
<td>Benefits (4-20)</td>
<td>2.02 (0.73)</td>
<td>4-6 (high)</td>
<td>75 (30.8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7-9</td>
<td>99 (56.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-12 (mod.)</td>
<td>61 (34.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13-15</td>
<td>13 (5.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16-18 (low)</td>
<td>3 (1.8)</td>
</tr>
<tr>
<td>Cues to Action (5-25)</td>
<td>3.06 (0.78)</td>
<td>7-10 (high)</td>
<td>23 (9.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11-14</td>
<td>78 (44.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15-18 (mod.)</td>
<td>19 (27.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19-22</td>
<td>8 (11.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>23-25 (low)</td>
<td>1 (0.6)</td>
</tr>
<tr>
<td>M = 3.60</td>
<td>M = 3.83</td>
<td>12-60 (low)</td>
<td>20 (8.2)</td>
</tr>
<tr>
<td>M = 2.19</td>
<td>M = 2.40</td>
<td>48-51 (mod.)</td>
<td>43 (17.7)</td>
</tr>
<tr>
<td>M = 1.96</td>
<td>M = 2.16</td>
<td>52-55 (low)</td>
<td>43 (17.7)</td>
</tr>
<tr>
<td>M = 1.96</td>
<td>M = 2.16</td>
<td>56-60 (low)</td>
<td>20 (8.2)</td>
</tr>
<tr>
<td>M = 1.96</td>
<td>M = 2.16</td>
<td>52-55 (low)</td>
<td>43 (17.7)</td>
</tr>
<tr>
<td>M = 1.96</td>
<td>M = 2.16</td>
<td>56-60 (low)</td>
<td>20 (8.2)</td>
</tr>
</tbody>
</table>
Table 4 (continued)

**Distribution of Immunization Health Belief Model Scale Variables by Score Groups**

N.B. Low score reflects a greater level of the variable; high score reflects a lesser level.

<table>
<thead>
<tr>
<th>Variable (possible range of scores)</th>
<th>Overall Mean (SD)</th>
<th>Score Groups (low score reflects perception of a greater level of the variable)</th>
<th>Score Groups by Immunization Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total Respondents</td>
<td>Immunized Frequency (%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frequency (%)</td>
<td></td>
</tr>
<tr>
<td>Motivation (7-35)</td>
<td>2.22 (0.58)</td>
<td>7-9 (high)</td>
<td>9 (3.7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10-12</td>
<td>50 (20.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13-15</td>
<td>70 (28.7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16-18 (mod.)</td>
<td>62 (25.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19-21</td>
<td>31 (12.7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>22-24</td>
<td>17 (7.0)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25-27</td>
<td>4 (1.7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28-29 (low)</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M = 2.26</td>
<td></td>
</tr>
<tr>
<td>Confidence (3-15)</td>
<td>1.71 (0.67)</td>
<td>3-5 (high)</td>
<td>142 (58.2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6-8</td>
<td>86 (35.3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9-11 (mod.)</td>
<td>15 (6.2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12-14 (low confidence)</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M = 1.69</td>
<td></td>
</tr>
<tr>
<td>Knowledge of measles (2-10)</td>
<td>2.50 (0.65)</td>
<td>2-4 (high)</td>
<td>85 (34.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5-7</td>
<td>151 (61.9)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8-9 (low)</td>
<td>8 (3.3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M = 2.46</td>
<td></td>
</tr>
<tr>
<td>Prior contact with measles (1-5)</td>
<td>3.00 (1.46)</td>
<td>1-2 (high)</td>
<td>111 (45.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>18 (7.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4-5 (low)</td>
<td>115 (47.2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M = 3.05</td>
<td></td>
</tr>
<tr>
<td>Threat (1-5)</td>
<td>2.91 (1.32)</td>
<td>1-2 (high)</td>
<td>114 (46.8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>38 (15.6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4-5 (low)</td>
<td>92 (37.7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M = 2.72</td>
<td></td>
</tr>
</tbody>
</table>
Each variable will be described and analysis of whether there were significant differences presented. Table 5 presents the results of the t-test analysis.

Table 5

<table>
<thead>
<tr>
<th>Variable</th>
<th>Overall Mean (SD)</th>
<th>Immunized Mean (SD)</th>
<th>Not Immunized Mean (SD)</th>
<th>t-test</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susceptibility</td>
<td>0.71 (0.70)</td>
<td>3.60 (0.69)</td>
<td>4.00 (0.68)</td>
<td>4.04</td>
<td>*0.000</td>
</tr>
<tr>
<td>Severity</td>
<td>2.25 (0.63)</td>
<td>2.19 (0.61)</td>
<td>2.40 (0.67)</td>
<td>2.35</td>
<td>*0.020</td>
</tr>
<tr>
<td>Benefits</td>
<td>2.02 (0.73)</td>
<td>1.96 (0.66)</td>
<td>2.16 (0.87)</td>
<td>1.89</td>
<td>0.060</td>
</tr>
<tr>
<td>Barriers</td>
<td>3.98 (0.48)</td>
<td>4.04 (0.46)</td>
<td>3.83 (0.50)</td>
<td>-3.11</td>
<td>*0.002</td>
</tr>
<tr>
<td>Cues to action</td>
<td>3.06 (0.78)</td>
<td>2.87 (0.66)</td>
<td>3.54 (0.86)</td>
<td>6.57</td>
<td>*0.000</td>
</tr>
<tr>
<td>Motivation</td>
<td>2.22 (0.58)</td>
<td>2.26 (0.59)</td>
<td>2.12 (0.54)</td>
<td>-1.64</td>
<td>0.100</td>
</tr>
<tr>
<td>Confidence</td>
<td>1.71 (0.67)</td>
<td>1.69 (0.69)</td>
<td>1.74 (0.63)</td>
<td>0.55</td>
<td>0.580</td>
</tr>
<tr>
<td>Knowledge</td>
<td>2.50 (0.65)</td>
<td>2.46 (0.66)</td>
<td>2.62 (0.62)</td>
<td>1.79</td>
<td>0.070</td>
</tr>
<tr>
<td>Prior contact</td>
<td>3.00 (1.46)</td>
<td>3.05 (1.44)</td>
<td>2.90 (1.52)</td>
<td>-0.71</td>
<td>0.480</td>
</tr>
<tr>
<td>Threat</td>
<td>2.91 (1.32)</td>
<td>2.72 (1.28)</td>
<td>3.38 (1.32)</td>
<td>3.57</td>
<td>*0.000</td>
</tr>
<tr>
<td>Age</td>
<td>26.70 (8.72)</td>
<td>25.81 (9.28)</td>
<td>30.10 (10.7)</td>
<td>3.10</td>
<td>*0.002</td>
</tr>
</tbody>
</table>

*p<0.05
As can be seen in Figure III, the majority of students perceived low personal susceptibility to measles. Of the total sample, 53.7% had scores for susceptibility in the low range, 35.3% had scores in the moderate range, and 11% had scores in the high range. A greater percentage of the immunized (13.8%) than the non-immunized students (4.4%) perceived more personal susceptibility to measles. There was a significant difference between the immunized and non-immunized students for the variable of perceived susceptibility ($t = 4.04; p = 0.000$).

In relation to the variable of perceived personal severity of measles, the largest percentage (~56%) of students had scores in the moderate range. The immunized students, however, perceived higher severity than did the non-
immunized. Of the immunized students, 31.5% had high severity scores, while 23.2% of the non-immunized had high severity scores. Consistent with this difference for the high severity scores, a greater percentage of the non-immunized (21.8%) than the immunized students (12%) had low severity scores. There was a significant difference between the immunized and non-immunized students for the variable of perceived severity ($t=2.35; p=0.02$).

**Perceived benefits and barriers.**

![Diagram](image)

**Figure IV.** Perceived benefits and barriers by immunization status

As can be seen in Figure IV, both immunized and non-immunized students perceived measles immunization as highly beneficial; 80% of the immunized students had scores for benefits in the high range, while a slightly lower percentage (72.5%) of the non-immunized had scores for benefits in the high range.
Approximately the same percentage (i.e. 13%) of the immunized and non-immunized students perceived measles immunization to be moderately beneficial. With regard to the scores for low benefits, a higher percentage of the non-immunized (14.5%) than the immunized students (6.3%) perceived low benefits. There was no significant difference between the immunized and non-immunized students for the variable of perceived benefits ($t = 1.89; p = 0.06$).

The non-immunized students perceived high barriers to the receipt of measles vaccine; 37.7% of the non-immunized had scores for barriers in the high range, while 22.3% of the immunized students had scores for barriers in the high range. Consistent with the non-immunized students' perception of a greater level of barriers, a higher percentage of the non-immunized (56.6%) than the immunized students (46.4%) had scores for barriers in the low range. There was a significant difference between the immunized and non-immunized students for the variable of perceived barriers ($t = -3.11; p = 0.002$).
**Cues to action and health motivation.**

As can be seen in Figure V, the immunized students perceived a greater level of cues to action than did the non-immunized; 55.5% of the immunized had cues to action scores in the high range, while 24.7% of the non-immunized had cues to action scores in the high range. The influence of the cues to action variable in immunization decision-making was also evident in the difference between the percentage of each group which had low cues to action scores. A much greater percentage of the non-immunized (47.9%) than the immunized students (9.8%) had low cues to action scores. There was a significant difference between the student groups for the variable of cues to action ($t = 6.57; p = 0.000$).

Small inconsistent variations in the levels of health motivation made it
difficult to account for differences between the immunized and non-immunized students' perception of health motivation. At least half of the immunized and non-immunized student groups indicated high levels of motivation. A slightly greater percentage of the non-immunized (59.5%) than the immunized students (50.3%) indicated high motivation. A higher percentage of the immunized (27.5%) than the non-immunized students (20.3%) indicated a moderate level of motivation, while a greater percentage of the immunized (22.3%) than the non-immunized students (20.3%) indicated a low level of motivation. There was no significant difference between the student groups for the variable of health motivation ($t = -1.64; p = 0.10$).

**Confidence and knowledge.**

![Confidence and knowledge of measles by immunization status](image)

*Figure VI. Confidence and knowledge of measles by immunization status*
As can be seen in Figure VI, the immunized and non-immunized students had similar confidence scores. Overall, the students indicated a high level of confidence in their ability to receive measles immunization. Approximately 93% of each group had high confidence scores; while 6% of each group had moderate confidence scores. There was no significant difference between the immunized and non-immunized students for the variable of confidence ($t = 0.55; p = 0.58$).

With reference to the variable of knowledge of measles, a greater percentage of the immunized (38.9%) than the non-immunized students (24.7%) had knowledge scores in the high range. There was an unexpected variation, however, in the moderate knowledge scores. A greater percentage of the non-immunized (71.1%) than the immunized students (58.3%) had knowledge scores in the moderate range. More to be expected, a higher percentage of the non-immunized (4.4%) than the immunized (2.9%) had knowledge scores in the low range. There was no significant difference between the immunized and non-immunized students for the variable of knowledge of measles ($t = 1.79; p = 0.07$).
Prior contact with measles and perceived threat.

As can be seen in Figure VII, a greater percentage of the non-immunized (50.8%) than the immunized students (43.5%) had prior contact scores in the high range. A greater percentage of immunized (9.2%) as compared to non-immunized students (2.9%) had prior contact scores in the moderate range. Approximately the same percentage (46%) of both the immunized and non-immunized students had prior contact scores in the low range. There was no significant difference between the immunized and non-immunized students for the variable of prior contact with measles ($t = -0.71; p = 0.48$).

Concerning the variable of perceived threat, a much greater percentage of
the immunized (52%) than the non-immunized students (33.4%) had scores for threat in the high range. Consistent with this difference, a greater percentage of the non-immunized (53.7%) than the immunized students (31.5%) had scores for threat in the low range. The percentage of students having moderate threat scores was similar for both groups; 16.6% for the immunized, and 13.1% for the non-immunized. There was a significant difference between the immunized and non-immunized students for the variable of perceived threat (t = 3.57; p = 0.000).

In summary, six variables were found to be significantly related to a student's decision to be immunized. These variables were perceived susceptibility, perceived severity, perceived barriers, cues to action, threat, and age. There was no significant difference related to the variables of perceived benefits, motivation, confidence, knowledge of measles, or prior contact with measles. Hence, a student was more likely to be immunized if they were younger, believed they were highly susceptible to contracting measles, that measles would be a severe disease for them, that there were few barriers to being immunized, that certain cues to action influenced whether they were immunized, and that measles posed a threat to them.

In order to determine whether the area of student study was important to immunization decision-making, faculties were re-grouped according to the area of study being more focussed on human health. Students were re-grouped into life sciences, applied-type sciences, and sciences. Life sciences included biology, psychology, criminology, counselling psychology, kinesiology, physical education, sociology, and women's studies students. Applied-type sciences included students in computing science, archaeology, arts, economics, geography, history, liberal
studies, business, business administration, communications, linguistics, english, education, engineering, library, political science, studio art, and theatre. Sciences included mathematics, statistics, physics, and chemistry students. Of the 237 students comprising these three groups, 56 (23.6%) were in life sciences; 159 (67.1%) were in applied-type sciences; and 22 (9.3%) were in sciences. Table 6 presents summary data pertaining to students immunized or not immunized according to area of study.

Table 6

**Immunization Status by Area of Student Study**

<table>
<thead>
<tr>
<th>Area of student study</th>
<th>Immunized Frequency</th>
<th>Not immunized Frequency</th>
<th>Total Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life sciences</td>
<td>48 (85.7)</td>
<td>8 (14.3)</td>
<td>56 (23.6)</td>
</tr>
<tr>
<td>Applied-type sciences</td>
<td>111 (69.8)</td>
<td>48 (30.2)</td>
<td>159 (67.1)</td>
</tr>
<tr>
<td>Sciences</td>
<td>12 (54.5)</td>
<td>10 (45.5)</td>
<td>22 (9.3)</td>
</tr>
<tr>
<td>Total</td>
<td>171 (72.2)</td>
<td>66 (27.8)</td>
<td>237 (100.0)</td>
</tr>
</tbody>
</table>

As can be seen in Table 6, more students (85.7%) in life sciences chose to be immunized, as compared to 69.8% of applied-type sciences students, and 54.5% of sciences students. There was nearly a 50/50 split in immunization status for the students studying the sciences of physics, chemistry, mathematics, and statistics. A chi-square test was done to ascertain whether the area of student study according to re-grouped faculty was important to immunization decision-making. The chi-square test result of 8.95 ($p = 0.011$) indicated there was a statistically significant difference when faculties were re-grouped according to the area of student study being more focussed on human health. That is, students re-
grouped into life sciences and applied-type sciences were more likely to be immunized than were students re-grouped into sciences as the area of student study.

A final analysis that pulled all variables together involved backward stepwise logistic regression. Backward stepwise logistic regression was done to determine the probability that students made the decision to be immunized based on their age, the 10 variables of the Immunization Health Belief Model Scale, and their area of study (see Table 7).

Table 7

Logistic Regression of Variables on Student Immunization Status

<table>
<thead>
<tr>
<th>Variables in the Equation</th>
<th>Variable</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig</th>
<th>R</th>
<th>Exp (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Susceptibility</td>
<td>-0.62</td>
<td>0.28</td>
<td>4.92</td>
<td>1</td>
<td>0.03</td>
<td>-0.10</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td>Barriers</td>
<td>0.98</td>
<td>0.37</td>
<td>6.86</td>
<td>1</td>
<td>0.01</td>
<td>0.13</td>
<td>2.66</td>
</tr>
<tr>
<td></td>
<td>Cues to action</td>
<td>-1.12</td>
<td>0.25</td>
<td>20.49</td>
<td>1</td>
<td>0.00</td>
<td>-0.26</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>Health motivation</td>
<td>0.51</td>
<td>0.30</td>
<td>2.98</td>
<td>1</td>
<td>0.08</td>
<td>0.06</td>
<td>1.67</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>1.88</td>
<td>1.89</td>
<td>0.98</td>
<td>1</td>
<td>0.32</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variables Not in the Equation</th>
<th>Variable</th>
<th>Score</th>
<th>df</th>
<th>Sig</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Severity</td>
<td>0.33</td>
<td>1</td>
<td>0.57</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Benefits</td>
<td>0.06</td>
<td>1</td>
<td>0.81</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Confidence</td>
<td>0.25</td>
<td>1</td>
<td>0.62</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Knowledge</td>
<td>0.60</td>
<td>1</td>
<td>0.44</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Prior contact</td>
<td>0.98</td>
<td>1</td>
<td>0.32</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Threat</td>
<td>1.45</td>
<td>1</td>
<td>0.23</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>0.48</td>
<td>1</td>
<td>0.49</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Area of student study</td>
<td>1.39</td>
<td>1</td>
<td>0.24</td>
<td>0</td>
</tr>
</tbody>
</table>
The best logistic regression model included the four variables of perceived susceptibility, perceived barriers, cues to action, and health motivation. It is noteworthy that while the variable of health motivation was not significant on its own, it did add to the prediction. Use of the four variables resulted in a considerable improvement over the accuracy of prediction that could be achieved simply by using the majority category approach. That is, since 71.7% were immunized, the majority category approach would be to predict "yes" for every student in the sample, in which case, one would be correct 71.7% of the time. An overall correct prediction rate of 84.7% was achieved in the logistic regression analysis by including the extra information from the variables of perceived susceptibility, perceived barriers, cues to action, and health motivation. Together, these four variables contributed to the highest prediction rate pertaining to a student's decision to be immunized.

**Research Question 3 re: What it Would Have Taken for Non-immunized Students to be Immunized**

In terms of what it would have taken for non-immunized students to be immunized, content analysis was done on the 79 responses received from 66 of the 69 respondents who were not immunized. Table 8 categorizes the student responses.
Table 8

**What it Would Have Taken for Non-immunized Students to be Immunized**

<table>
<thead>
<tr>
<th>Response Category</th>
<th>Frequency</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saw Little or No Risk or Need</td>
<td>53</td>
<td>67.1</td>
</tr>
<tr>
<td>Accessibility</td>
<td>9</td>
<td>11.4</td>
</tr>
<tr>
<td>Needed More Information, Awareness, or Direction</td>
<td>8</td>
<td>10.1</td>
</tr>
<tr>
<td>Misconceptions</td>
<td>4</td>
<td>5.1</td>
</tr>
<tr>
<td>Immunization Clinic Environment</td>
<td>3</td>
<td>3.8</td>
</tr>
<tr>
<td>Contraindicated Due to Pregnancy</td>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>79</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

As can be seen in Table 8, the majority of the responses (67.1%) related to the perception of little or no risk or need. Of the remaining 32.9% of the responses, 11.4% related to the accessibility of the immunization clinics; 10.1% to the students' need for more information, awareness, or direction; 5.1% to misconceptions about vaccines and immunization; 3.8% to the immunization clinic environment; and 2.5% to immunization being contraindicated due to pregnancy.

Of the 67.1% (n = 53) of the responses related to the perception of little or no risk or need, 28.3% (n = 15) related to being on campus infrequently as they were attending night school, distance education, or on practicum; 20.8% (n = 11) indicated a measles vaccine booster had been received in the previous year in Grade 12 as part of the 1996 Provincial Measles Elimination Campaign; 15.1% (n = 8) gave a history of measles disease as a child or a history of prior contact with measles, not contracting it, and therefore believing they already had measles immunity; 13.2% (n = 7) stated they were too old to be in the risk group for getting
measles; 11.3% (n = 6) indicated a second dose of measles vaccine had been received prior to Grade 12 due to other circumstances; and 11.3% (n = 6) indicated they would need to feel a greater risk of getting measles. This last subgroup of 11.3% wrote comments such as: "I would actually have to be exposed to the risk of contracting it," "To hear of some really bad cases of people who got the measles," and "I would need a sense that I was at risk and that getting vaccine would have protected me and others."

Responses related to the accessibility of immunization clinics included statements such as: "More clinics should have been done," "Hours should have been longer," "Convenient location and time," and "Some clinics could have been held at the Harbour Centre Campus of SFU."

Student responses related to the need for more information, awareness, or direction included comments such as: "Advice from the public health department in the city where I live;" "More publicity at SFU. I heard about the immunization program on the news, but not much on campus;" "Health professional telling me that I should and giving me the reasons why and why not;" "Informations on what measles really is and seriousness of having it;" and "Free information package made available to student via mail."

Responses which reflected misconceptions about vaccines and immunization included statements such as: "The side effects of the vaccine are more serious than the disease;" "It would be better to get immunity naturally by getting the disease," and; "The incidence of measles has been on a steady decline, and this decline started decades before vaccinations were available. Perhaps by vaccinating, we are
increasing the incidence of measles?"

Suggestions for an improved immunization clinic environment included comments such as: "More privacy while being immunized, like in a separate room, or having curtains used during the vaccination process;" "Friendlier and more informative clinic staff (was a dehumanizing experience);" and "Shorter lines in the clinics."

Discussion of the Results
The discussion of the results is organized under the following headings: characteristics of the sample, level of each of the variables, and comparison of students immunized and not immunized.

Characteristics of the Sample
The response rate was 33.5% which although low, represents a usual response rate for mailed questionnaires without personal contact (Burns & Grove, 1993). However, this response rate resulted in a lower than desired sample size. Based on the performed power analysis, the objective had been for a final sample of approximately 400 students. One of the reasons for this lower response rate may have been related to the Canada Post strike which occurred two days after the reminder letter was sent.

The low response rate presents a limitation to the study. A selection bias could have been introduced if the students who did not return a completed questionnaire were different from the students who did, and if the differences were due to variables that were significantly related to a student's decision to beimmunized or not immunized. If selection bias did occur, the study's external
validity will have been compromised (Sackett, 1979). As the mailed questionnaires were not coded prior to mailing, it was not possible to examine the demographics of the students who did not return a completed questionnaire. However, the low response rate presents less of a concern given that the demographics of the student sample were representative of the demographics of age, gender, and faculty of study of the SFU students close to the time of the measles outbreak.

**Level of Each of the Variables**

**Susceptibility.**

While the majority of students perceived low personal susceptibility to measles, the immunized students perceived much greater personal susceptibility. The percentage of immunized students who perceived high susceptibility was 13.8%, approximately three times the 4.4% of the non-immunized students who perceived high susceptibility.

Possible explanations for the non-immunized students' perception of lower susceptibility to measles will be discussed first. Two reasons were reflected in their written responses to the question regarding what it would have taken for them to be immunized. One reason related to their personal circumstances and past history in terms of measles disease; the other related to the timing of the SFU measles outbreak.

With regard to their personal circumstances and past history in terms of measles disease, a large percentage of the non-immunized students related that they were on campus infrequently and therefore saw no need for immunization, had a history of measles disease as a child, a history of prior contact with measles but
not contracting it and therefore believing they already had measles immunity, or that they believed they were too old to be in the risk group for getting measles. For the most part, however, these were invalid reasons for not receiving measles immunization. Due to the high communicability of measles, the campus media messages encouraged all students of all ages to be immunized, irrespective of the length of time spent on campus (Dr. N. Lowen, Medical Health Officer, Burnaby Health Department, personal communication, March 4, 1997). A history of measles disease is accepted as a valid exemption from measles immunization only when the disease has been laboratory confirmed (National Advisory Committee on Immunization, 1993). The students did not indicate that their childhood measles disease was even diagnosed by a physician, let alone by laboratory confirmation. The mass immunization campaign was also seen as an opportunity to protect a population of young adults with a second dose of measles vaccine. According to the National Advisory Committee on Immunization, two doses of measles vaccine are required for immunity.

The other possible reason for the non-immunized students' perception of lower susceptibility to measles (i.e., the timing of the measles outbreak) was related to the B.C. Ministry of Health's 1996 measles immunization catch-up campaign. During the 1996 immunization campaign, a second dose of measles vaccine was offered to all British Columbians aged 19 months to 18 years (Vicki Anderson, Program Manager, Communicable Disease Control, Public Health Nursing, personal communication, December 9, 1997). The responses of a large percentage of the non-immunized students indicated that the reason they were not
immunized during the SFU outbreak was that they had already been immunized, most of them in the previous year in Grade 12.

It is more difficult to account for the immunized students' perception of low personal susceptibility to measles than it is to account for the non-immunized students' perception of low susceptibility. The immunized students' perception of low susceptibility may have reflected their belief system about personal vulnerability. The review of the literature found somewhat conflicting information about the risk-taking behaviours of youth and their perceptions of vulnerability to health problems. Some of the literature supported society's widely held belief that young people view themselves as being more invulnerable to harm and that they choose to take more risks. This affirmation of the belief that young people perceive greater invulnerability to health threats was found repeatedly in the HIV literature. Several of the HIV studies used the framework of the Health Belief Model and included the variable of perceived personal susceptibility as a predictor of HIV prevention behaviour. Ahia (1990) used the Health Belief Model and Protection Motivation Theory to assess compliance with safer-sex guidelines among adolescent males. Ahia determined that perceived susceptibility and perceived self efficacy, or confidence, were the two factors that least explained compliance at a significant level. Three other studies that measured the effect of the Health Belief Model variables on safer sex intentions among youth concluded that there was a personal perception of low susceptibility to HIV infection (Hingson, Strunin, Berlin, & Hecren, 1990; Wilson, Lavelle, & Hood, 1990; Petosa & Jackson, 1991). These three studies found that self-efficacy, perceived severity, and perceived barriers
were the most significant predictors of safer-sex behaviours.

In contrast to the findings which pertained to HIV and safer-sex intentions, Cohn et al. (1995) presented a different way of viewing youths' perception of vulnerability to health problems. These investigators suggested that harm experienced by youth may reflect a failure to perceive personal susceptibility in risky situations, rather than beliefs about personal invulnerability and the desire to pursue risks. Cohn et al. suggested that youth involvement in many health-threatening activities could be reduced by increasing youths' perception of the risks associated with participation. As stated by these investigators:

It is important to identify additional factors that influence perceived risk during adolescence. For example, occasional risk-taking does not typically result in injury, and this may lead teenagers to mistakenly interpret the risk of harm as cumulative across situations when it may actually be independent across situations. Notably, individuals take more risks when health hazards are viewed as cumulative rather than noncumulative. (Cohn et al., p. 222).

In general, information found in the literature review supported the belief that youths perceive lower personal susceptibility to health risks. This belief system about personal vulnerability may have been associated with both the immunized and non-immunized students' perception of low personal susceptibility to measles.

Severity.

The largest percentage (~56%) of students in both the immunized and non-immunized groups perceived moderate personal severity. The immunized students did, however, perceive slightly higher severity than did the non-immunized; 31.5%
of the immunized versus 23.2% of the non-immunized students had severity scores in the high range.

The influence of the variable of perceived severity was illustrated in a study by Feigelman et al. (1993). These researchers assessed parental compliance with the recommendation that their children receive post-exposure measles immunization following close contact with an infectious case of measles. Compliant parents perceived measles to be severe and thought that it would make their child sick or very sick. The multiple logistic regression analysis determined that the only variable which significantly contributed to the model was that of perceived severity. As compared to the Feigelman et al. study, in which the parents perceived high measles severity, most of the SFU student sample perceived only moderate measles severity. This difference in perception may have been related to the students' knowledge about measles. Both immunized and non-immunized students indicated moderate to high levels of knowledge about measles. The students may have known that measles disease attacks different age groups in different ways. The very young are usually more ill with measles and experience a greater risk of complications from the disease (Benenson, 1995). This knowledge of the different age-related effects of measles disease may have been associated with the finding that similar percentages of the immunized and non-immunized students perceived moderate severity, and that only a slightly greater percentage of the immunized than the non-immunized students perceived high measles severity.

**Benefits.**

Both immunized and non-immunized students perceived measles
immunization as highly beneficial in reducing the threat of measles; 80% of the immunized students perceived high benefits, while only a slightly lower percentage (72.5%) of the non-immunized perceived high benefits. Approximately the same percentage (13%) of each of the student groups perceived measles immunization to be moderately beneficial. These similar perceptions of the benefits of measles immunization may be related to the homogeneous level of cognitive functioning of the study population. As students attending a university must meet certain academic entrance criteria, most students are probably informed critical thinkers. When presented with information about immunization and disease prevention, it is likely that these students would perceive measles immunization as being highly beneficial. The similarity between the immunized and non-immunized students' perception of high benefits may have stemmed from their similar critical thinking skills. Consequently, the impact of the perceived benefits variable on immunization decision-making was diluted and no statistically significant difference was found between the immunized and non-immunized students for the variable of benefits.

The question remains why the non-immunized students chose not to be immunized, even though they perceived high benefits of immunization. It may have been that the non-immunized students' decision to be immunized required other factors in combination with their perception of high benefits. That is, on its own, the perception of high benefits did not trigger the decision to be immunized. For example, the perception of high benefits of measles immunization may have required a concomitant perception of high personal severity of measles in order for the student to decide to be immunized.
Contrary to the study results for the perceived benefits variable, the review of the literature found several studies which demonstrated statistically significant differences between study groups for the perceived benefits of various health-related behaviours. Sass et al. (1995) examined the factors associated with non-compliance in follow-up HIV testing among health care workers after a blood and/or body fluid exposure. The most significant factors effecting the return rate for follow-up testing were the perception of high benefits and high severity and the intention of decreasing the chance of dying from acquired immunodeficiency syndrome (AIDS). Similarly, Champion (1993) determined that a strong predictor of the regularity with which women performed breast self-examination was their perception of its benefits in decreasing their chances of dying from the severity of breast cancer.

The differences between the SFU measles study findings and those of the studies of Sass et al. (1995) and Champion (1993) pertaining to the variables of perceived benefits and perceived severity provide added strength to the possible explanation for the finding that there was no significant difference between the immunized and non-immunized students for the variable of benefits. The non-immunized students' perception of only moderate measles disease severity may have been inadequate in combination with their perception of high benefits to trigger the decision to be immunized.
Barriers.

To be expected, the non-immunized group had the greatest percentage of students who perceived high barriers to the receipt of measles vaccine. Of the non-immunized students, 37.7% perceived high barriers, whereas 22.3% of the immunized students perceived high barriers. It is interesting, however, that such a sizeable proportion (~1/4) of immunized students perceived high barriers. This finding may be the result of two possibilities: the design of the self-administered questionnaire, or the students' high level of motivation to be immunized and protected from measles disease.

The design of the questionnaire will be addressed first. Items for the subscale of perceived barriers were intended to assess the students' view of the more qualitative negative aspects of being immunized, as well as the more quantitative negative circumstances which could interfere with the student being immunized. The more qualitative barriers included statements reflecting personal beliefs such as being scared of needles or embarrassed to receive a measles shot with others watching, believing the measles shot could be painful, or that they were too busy to get immunized. Other more qualitative barriers related to misconceptions about measles vaccine and immunization. For example, one misconception related to the side effects of measles vaccine being worse than measles disease itself.

The other aspect of the design of the questionnaire had to do with subscale items which pertained more to the quantitative negative situations which could circumvent the intention to be immunized. These statements referred to circumstances such as the measles immunization clinics being too infrequent or
held at inconvenient times. Approximately 11% of the non-immunized students' responses were related to this barrier of accessibility. The students stated that there was a need for more convenient clinic times and locations, and that there should have been a forced break from classes as they were concerned about missing class time to get immunized.

In spite of the sizeable proportion of immunized students perceiving high barriers, there was a statistically significant difference between the immunized and non-immunized students for the variable of perceived barriers. While the immunized students placed lower scores on the more qualitative barriers, indicating they perceived a greater level of these qualitative barriers, it was possible that the more qualitative barriers had less impact on the immunization decision than did the more quantitative ones. That is, even though the immunized students perceived high barriers to immunization, the barriers were not of the particular nature to circumvent the immunization decision.

Returning to the students' level of health motivation being the second possibility for the finding that a sizeable proportion of immunized students perceived high barriers, at least half of each student group indicated high motivation to maintain good health. Support was found in the literature review for this second possibility that a high level of health motivation can overcome perceived barriers. Brock and Beazley (1995) used the Health Belief Model to study parents' involvement in at-home sexuality education activities with their grade nine children. Perceived barriers correlated most strongly with the lack of parental motivation to be involved in the at-home educational activities. Barriers experienced
by the noninvolved parents included less confidence that their children wanted to do the activities with them, less surety that their children wanted to talk with them about sex-related issues, and less certainty that their AIDS-related facts were current. Champion (1984) determined that the variables of perceived barriers and health motivation were the most predictive of the frequency of breast self-examination. Champion's multiple regression analysis found that barriers followed by health motivation accounted for the largest portions of variance on the dependent variable of breast self-examination. Thus, it may have been that the immunized students' high level of health motivation may have overcome their perception of high barriers to measles immunization.

The barrier of misconceptions about immunization warrants further discussion. Misconceptions were evident in 5% of the responses of the non-immunized students. These responses reflected misconceptions such as the side effects of vaccines were worse than the diseases they were meant to prevent, that better immunity came from actually catching the disease and not from immunization, and that the incidence of vaccine-preventable diseases had been on a decline which started decades before vaccinations were available.

Similar misconceptions were apparent in several studies examined in the literature review. Bennett and Smith (1992) reported that parents of children never immunized against pertussis believed that the vaccine caused side effects more serious than pertussis disease and that their child would have a greater risk of developing pertussis if they were immunized. The Centers for Disease Control (1988) assessment of knowledge, attitudes, and practices of adults regarding
influenza and pneumococcal immunization indicated that misconceptions were very common. Examples of misconceptions cited in the findings of the Centers for Disease Control were the belief that influenza vaccine itself caused illness, did not protect against influenza disease, and was unnecessary.

The barrier of misconceptions about immunization, and the extent to which it can result in non-immunization or under-immunization, is a growing public health concern (British Columbia Provincial Health Officer, 1999). The nursing practice implications of this barrier will be discussed in Chapter V.

**Cues to action.**

The immunized students perceived a greater level of cues to action than did the non-immunized. Slightly more than twice the percentage of the immunized as compared to the non-immunized students perceived high cues to action: 55.5% of the immunized versus 24.7% of the non-immunized students. The strong influence of the cues to action variable in immunization decision-making was also evident in the difference between the percentage of students in each immunization group which indicated low cues to action. The percentage of non-immunized students (47.9%) having low cues to action was approximately five times that of the immunized students (9.8%).

As the measles immunization campaign was conducted as an urgent intervention to stop the measles outbreak, the SFU campus was flooded with media messages informing students of the situation, and advising them to be immunized. Printed material was distributed which contained information about measles disease, its risks, and the benefits of immunization. On-campus TV screens
repeatedly announced the information, and articles were written for the campus newsletter. The immunization blitz had to occur within the shortest time period possible in order to most efficiently stop the spread of measles. For the students who chose to be immunized, the influence of cues to action may have been accentuated by the immediacy of the situation and the compressed time period within which the clinics were offered.

The powerful influence of cues to action was clearly demonstrated in the literature even when there was no need for such immediate immunization decision-making as was required of the SFU students. Cummings et al. (1979) studied factors which predisposed individuals to receive immunization in response to the anticipated outbreak of swine flu in the fall and winter of 1976. One important finding was the high correlation between a physician's recommendation for immunization and an individual's decision to be immunized. Similarly, in the Centers for Disease Control (1988) assessment of adult knowledge, attitudes, and practices regarding influenza and pneumococcal immunizations, it was found that a health care provider's recommendation for immunization markedly influenced the decision to be immunized, even among those with negative attitudes toward immunization.

It is interesting that in the midst of the SFU measles outbreak and the widely broadcast information about the risks of measles disease, approximately 10% of the non-immunized students' responses indicated a felt need for even more information, awareness, or direction. Most frequently, comments related to the students' desire to have had health care providers offer more information about the need for measles immunization and more encouragement to be immunized. This
finding may reflect a characteristic of a university student population which is accustomed to obtaining and synthesizing information in a very comprehensive manner. Furthermore, it is possible that this characteristic may have been more prominent in the non-immunized student group.

**Motivation.**

Small inconsistent variations in the levels of motivation made it difficult to account for differences between the immunized and non-immunized students' perception of health motivation. At least half of each student group indicated a high level of motivation to maintain good health. Only a slightly greater percentage of the non-immunized (59.5%) than the immunized students (50.3%) had high motivation scores. A slightly higher percentage of the immunized (27.5%) than the non-immunized students (20.3%) indicated moderate motivation, while a slightly greater percentage of the immunized (22.3%) than the non-immunized students (20.3%) indicated low motivation.

Another look at the reviewed literature provided some insight into possible reasons for the inconsistent variations between the immunized and non-immunized students' perception of health motivation. In Becker and Maiman's (1975) discussion of the sociopsychological determinants of compliance with health care recommendations, the authors described the Health Belief Model's variable of health motivation as being relatively nonspecific and stable across situations. They viewed the degree to which an individual engaged in health-promoting and illness-preventing behaviours as a customary behavioural approach to a variety of situations. From this perspective of the concept of health motivation, it is easier to
account for the small differences between the immunized and non-immunized students' perceptions of health motivation. Both student groups had moderate to high levels of health motivation. Only a slightly greater percentage of the non-immunized than the immunized students had high motivation scores. This small difference may have been due to some of the non-immunized students having been immunized the previous year in the provincial measles immunization catch-up campaign. The SFU students were informed that if they had received a measles booster in Grade 12 they did not require another measles vaccine during the campus immunization campaign (Dr. N. Lowen, Medical Health Officer, Burnaby Health Department, personal communication, March 4, 1997). Given the high motivation scores of the non-immunized students, it is reasonable to expect that, had they not been immunized the previous year, they likely would have been immunized during the SFU measles outbreak. This reasoning is supported by the work of Montano (1986). He investigated the usefulness of the Fishbein and Triandis models as predictors of the behavioural intention of receiving influenza immunization. Montano determined that regardless of intention, the more flu shots a person has had recently, the higher his or her likelihood of getting another. Montano also discussed the existence of an inertia effect. That is, persons who had previously received a flu shot no longer needed to overcome the critical motivational level connected with a new behaviour. Thus, the perspectives obtained from the work of Becker and Maiman, and Montano help to account for some of the small inconsistent variations found between the two student groups for their levels of health motivation.
Confidence.

Overall, the students indicated a high level of confidence in their ability to receive measles immunization. Approximately 93% of each student group had high confidence scores, while 6% of each group had moderate confidence scores. It is not surprising that the students indicated high levels of confidence. The confidence subscale items pertained to beliefs such as feeling confident they could control any fear of needles they might have while being vaccinated or that they could manage or cope with any pain accompanying the vaccination. These confidence items, as well as the behaviour of receiving an immunization, are quite passive in comparison to other health-protecting behaviours. For example, Mahoney et al. (1995) investigated the confidence levels of college students in relation to their ability to discuss and insist on condom use with a partner. The passive confidence felt while being immunized contrasts sharply with the assertive confidence needed to discuss condom use with a prospective partner.

Knowledge.

A greater percentage of the immunized (38.9%) than the non-immunized students (24.7%) had high knowledge scores. There was an unexpected variation, however, in the moderate knowledge scores. A greater percentage of the non-immunized (71.1%) than the immunized students (58.3%) had moderate knowledge scores. This variation may have been associated with the very nature of behavioural change. The multi-faceted nature of behavioural change was repeatedly acknowledged in the reviewed literature. That is, knowledge of a particular disease or health risk was not thought to be sufficient on its own to result in behavioural
change. This concept was very evident in Ahia's (1990) examination of adolescent males' compliance with safer-sex guidelines. The results of Ahia's study indicated that while the respondents had an accurate and up-to-date understanding of the causes and prognosis of AIDS, this knowledge did not significantly influence compliance with safer-sex guidelines. For Ahia's study population, knowledge about the epidemiology of AIDS was a necessary, but not sufficient starting point for compliance with safer-sex guidelines. In acknowledging the multi-faceted nature of behavioural change, it is understandable that a large percentage of the SFU students who had moderate or high knowledge scores, still chose not to be immunized. On its own, adequate knowledge about measles may not trigger the decision to receive measles immunization. Other factors may be required, as was discussed for the variable of perceived benefits.

**Prior contact.**

A greater percentage of the non-immunized (50.8%) than the immunized students (43.5%) had high prior contact scores. This unexpected difference may, in part, have been due to the history related by some of the non-immunized students regarding their past exposure to someone with measles. As they did not get the disease, they subsequently thought they must already have been immune to measles and so did not think it necessary to be immunized. A higher percentage of immunized (9.2%) as compared to non-immunized students (2.9%) had moderate prior contact scores. This finding was more in line with information found in the literature, i.e., that prior contact with a disease usually increases compliance with the means to prevent it (Becker & Maiman, 1975). A somewhat puzzling finding
was that approximately the same percentage majority (46%) of both the immunized and non-immunized students had low prior contact scores. The last epidemic of measles in B.C. occurred in 1986, when 7,000 cases of measles were reported (Peck, 1997). The highest incidence of disease was in children under the age of 10 years (Peck). Given that the mean age of the SFU students in the study sample was 27 years, most of the SFU students were around 16 years old at the time of the 1986 outbreak. One would expect 16-year-olds who were residing in BC at that time, to remember if they had contact with a case of measles during the 1986 outbreak. Considering that a minimum of 7,000 cases of measles occurred, the odds would have been favourable for an exposure or, at least, for some memory of the media-hype related to the epidemic. The students' poor recall of prior contact with measles may reflect their perception of low personal susceptibility and moderate personal severity of measles disease.

**Threat.**

Immunized students perceived a much greater threat of measles disease than did the non-immunized; 52% of the immunized versus 33.4% of the non-immunized students perceived high threat. Consistent with this difference, a greater percentage of the non-immunized (53.7%) than the immunized students (31.5%) perceived low threat. The percentage of students having moderate threat scores was similar for both groups of students. According to Becker et al. (1977), perceived susceptibility and perceived severity combine to determine the total perceived threat of a disease to the individual. This perceived threat then affects the probability of taking action. Accordingly, the study results were consistent with
the findings of Becker et al. The immunized students perceived more personal
susceptibility and severity than did the non-immunized, and consequently made the
decision to be immunized.

**Comparison of Students Immunized and Not Immunized**

Student age was significantly related to whether they were immunized or not
immunized, with younger students being more likely than older students to be
immunized against measles. The variables of cues to action, susceptibility, threat,
barriers, and severity were determined to be significantly related to the student's
decision to be immunized. The three variables in the study which had the highest
levels of significance were, respectively: cues to action \( p = 0.000000 \),
susceptibility \( p = 0.000056 \), and threat \( p = 0.000435 \). This was reasonable,
considering that an outbreak of a highly communicable disease was occurring on
the campus and that great efforts were being made to inform the students about
the disease, its associated risks, the recommendation to be immunized, and where
and when immunization clinics were going to be held. The variables having the next
highest levels of significance were barriers \( p = 0.001653 \) and severity
\( p = 0.022542 \).

The chi-square test result of 8.95 \( p = 0.011 \) indicated there was a
statistically significant difference when faculties were re-grouped according to the
area of student study being more focussed on human health. That is, students
involved in life sciences and applied-type sciences were more likely to be
immunized than were students re-grouped into sciences as the area of study. If one
assumes that students are involved in life sciences such as biology or psychology
or in applied-type sciences such as communications or education because they have a greater interest in health issues, it is understandable that they would be more likely to make the decision to be immunized in order to protect their health and the health of others. Students involved in life sciences and applied-type sciences may also have perceived more susceptibility to measles related to greater exposure to other people and the inherent increased risk of exposure to a communicable disease. Due to the nature of their chosen field of work, these students would be more likely to interact with others as a part of their student practicums. They may also have anticipated the greater frequency of contact with communicable diseases that they would experience in such future careers as teachers, librarians, psychologists, or criminologists.

Pennie et al. (1991) had a similar finding in their study of the factors which influenced the intentions of health care students to accept hepatitis B vaccine. Pennie et al. found significant variability among student groups in their perceptions of the risk of acquiring hepatitis B and determined that when students viewed themselves at higher risk of exposure to hepatitis B, they had a greater desire to be immunized. The occupational and physiotherapy students in the Pennie et al. study appropriately considered themselves as having the lowest hepatitis B risk, and indicated the weakest intention to be immunized, while the medical students justifiably had stronger intentions to be immunized due to their having the highest risk of exposure.

The logistic regression determined that the inclusion of the four variables of perceived personal susceptibility, perceived barriers, cues to action, and health
motivation resulted in an overall correct prediction rate of 84.7% regarding the decision to be immunized. That is, the variables of susceptibility, barriers, cues to action, and health motivation were the most predictive of the decision to be immunized. These four variables have previously been ranked as the components of the Health Belief Model most influencing immunization decision-making (Feigelman et al., 1993; Cummings et al., 1979; & Janz & Becker, 1984). Thus, the study findings were consistent with ones which had been reviewed in the literature and supported the Health Belief Model and the use of the Immunization Health Belief Model Scale as a valuable tool in ascertaining beliefs relating to the decision to be immunized.
Summary

The characteristics of the sample, the findings, and a discussion of the results have been presented in this chapter. The sample consisted of 244 SFU students who returned the completed questionnaire. Of the 244 students, 71.7% were immunized; 28.3% were not immunized. The mean age of the immunized students was 25.8 years and the mean age of the non-immunized students was 30.1 years. Younger students were significantly more likely to be immunized against measles than were older students.

The following variables were found to be significantly related to being immunized: student age, perceived susceptibility, perceived severity, perceived barriers, cues to action, perceived threat, and area of student study. Hence, a student was more likely to be immunized if they were younger, believed they were highly susceptible to contracting measles, that measles would be a severe disease for them, that there were few barriers to being immunized, that certain cues to action influenced whether they were immunized, that measles posed a threat to them, and if their area of study was more focussed on human health. The logistic regression model achieved an overall correct prediction rate of 84.7% by including the contribution of the four variables of perceived personal susceptibility, perceived barriers, cues to action, and health motivation.

The non-immunized students' description of what it would have taken for them to be immunized was analyzed by means of content analysis. The themes substantiated the influence of the variables of perceived susceptibility, perceived barriers, cues to action, and threat which the study had determined to be
significantly related to immunization decision-making.

The results of this study corroborated those of the studies examined in the literature review. The findings of the study were discussed in relation to the theoretical framework, other research studies, and methodological problems.
CHAPTER V

Summary, Limitations, Conclusions, Implications, and Recommendations

Introduction

This study was designed to compare students who were immunized and those not immunized during the 1997 Simon Fraser University (SFU) measles outbreak. The comparison was made in terms of age, perceived personal susceptibility to measles, measles severity, benefits and barriers to immunization, cues to action, health motivation, confidence, knowledge of measles, prior contact with measles, perceived threat of measles, and area of student study. The study was also intended to identify what non-immunized students indicate it would have taken for them to be immunized. This chapter will include a summary of the study, followed by a discussion of the limitations of the study, conclusions, implications for nursing practice, theory, and education, and recommendations for future research.

Summary

A review of the literature indicated that there was a paucity of research related to the immunization-seeking behaviours of the university-aged segment of our population (i.e. those 19 to 30 years of age), and specifically, in response to a disease outbreak. Research has primarily examined the immunization decision-making of health care workers as it relates to hepatitis B and influenza vaccines, the elderly and pneumococcal and influenza vaccines, and parents of children receiving the routine childhood immunization series. Such concerns as perceived disease severity and personal susceptibility to the disease, vaccine cost, safety, and
side effects have been determined to directly influence an individual's decision-making regarding immunization. The investigator believed that research was needed which would add to the body of knowledge about immunization attitudes and beliefs of the university-aged cohort of our population.

The theoretical framework for the study was the Health Belief Model (HBM). Health-seeking behaviour is explained by the HBM as resulting from the interaction of the three components of the model: individual perceptions, modifying factors, and variables affecting the likelihood of taking action (Pender, 1987). Individual perceptions concerning susceptibility and seriousness directly affect the predisposition to take action. Perceived susceptibility is described as a person's view of the likelihood of experiencing a potentially harmful condition; perceived severity as a person's view of how personally serious or threatening the condition may be. According to Becker et al. (1977), perceived susceptibility and perceived seriousness combine to determine the individual's total perceived threat of a disease. This perceived threat then affects the probability of the person taking action.

This study was undertaken to: (a) compare students who were immunized with those not immunized during the 1997 SFU measles outbreak in terms of age, perceived personal susceptibility to measles, measles severity, benefits and barriers to immunization, cues to action, health motivation, confidence, knowledge of measles, prior contact with measles, perceived threat of measles, and area of student study, and (b) identify what non-immunized students indicate it would have taken for them to be immunized.
This descriptive comparative study was conducted in Burnaby, British Columbia, in Western Canada. A self-administered questionnaire was mailed to a randomly selected sample of 800 SFU students: 400 who were immunized and 400 who were not immunized. The questionnaire had three components: (a) a 44 item "Immunization Health Belief Model Scale" based on "The Breast Self Examination-Related Health Belief Model Scales" developed by Champion (1993); (b) questions regarding demographic information; and (c) an open-ended question for non-immunized students about what it would have taken for them to be immunized.

The final sample consisted of 244 students who returned the completed questionnaire. This represented a response rate of 33.5%. Of the 244 students, 175 (71.7%) were immunized; 69 (28.3%) were not immunized. The mean age of the sample was 26.7 years (SD = 8.72), with a range of 18 to 74 years. The mean age of the immunized students was 25.8 years (SD = 9.28); the mean age of the non-immunized students was 30.1 years (SD = 10.65). The sample was comprised of 81.5% undergraduate and 16.8% graduate students; 60.7% female and 38.9% male; 66% Caucasian, 24.6% Oriental, 2.9% Indo-Canadian, and 6.6% other or unspecified.

It was determined that student age was significantly related to whether or not they were immunized (t = 3.10; p = 0.002), with younger students being more likely to be immunized against measles than older students. The following variables were found to be significantly related to being immunized: perceived susceptibility (t = 4.04; p = 0.000), perceived severity (t = 2.35; p = 0.020), perceived barriers (t = -3.11; p = 0.002), cues to action (t = 6.57; p = 0.000), and threat (t = 3.57;
p = 0.000). To ascertain whether the area of student study was important to immunization decision-making, faculties were re-grouped according to the area of student study being more focused on human health. The chi-square test result of 8.95 (p = 0.011) indicated there was a statistically significant difference. Hence, students were more likely to be immunized if they were younger, believed they were highly susceptible to contracting measles, that measles would be a severe disease for them, that there were few barriers to being immunized, that certain cues to action influenced whether they were immunized, that measles posed a threat to them, and if their area of study was more focused on human health.

Logistic regression analysis achieved an overall correct prediction rate of 84.7% by including the extra information from the four variables of perceived personal susceptibility, perceived barriers, cues to action, and health motivation as to whether or not a student was immunized.

The non-immunized students' description of what it would have taken for them to be immunized was analyzed using content analysis. The majority of the responses (67.1%) related to the perception of little or no risk or need. Of the remaining 32.9% of the responses, 11.4% related to the accessibility of the immunization clinics; 10.1% to the students' need for more information, awareness, or direction; 5.1% to misconceptions about vaccines and immunization; 3.8% to the immunization clinic environment; and 2.5% to immunization being contraindicated due to pregnancy.

Of the 67.1% (n = 53) of the responses related to the perception of little or no risk or need, 28.3% (n = 15) related to being on campus infrequently as they
were attending night school, distance education, or on practicum; 20.8% (n = 11) indicated a measles vaccine booster had been received in the previous year in Grade 12 as part of the 1996 Provincial Measles Elimination Campaign; 15.1% (n = 8) gave a history of measles disease as a child or a history of prior contact with measles, not contracting it, and therefore believing they already had measles immunity; 13.2% (n = 7) stated they were too old to be in the risk group for getting measles; 11.3% (n = 6) indicated a second dose of measles vaccine had been received prior to Grade 12 due to other circumstances; and 11.3% (n = 6) indicated they would need to feel a greater risk of getting measles.

The findings of which variables were significantly related to immunization decision-making were consistent with the findings of other studies examined in the literature review. These variables were susceptibility, severity, barriers, cues to action, and threat. These variables have previously been ranked as the components of the HBM most influencing immunization decision-making (Feigelman et al., 1993; Cummings et al., 1979; & Janz & Becker, 1984). Thus, the study findings supported the Health Belief Model and the use of the Immunization Health Belief Model Scale as a valuable tool in ascertaining beliefs relating to the decision to be immunized.

Limitations

The following discussion presents the limitations of the study. The study's limitations were related to the issues of small sample size, characteristics of the university student population, study design, and problems inherent to the questionnaire.
The low response rate and consequent smaller than desired sample size presented a major limitation to the study. The small sample size limited generalizability of study findings. Also, a selection bias could have been introduced if the students who did not return a completed questionnaire were different from the students who did, and if the differences were due to variables that were significantly related to a student’s decision to be immunized or not immunized. If selection bias did occur, the study’s external validity will have been compromised (Sackett, 1979). As the mailed questionnaires were not coded prior to mailing, it was not possible to examine the demographics of the students who did not return a completed questionnaire. However, the low response rate presents less of a concern given that the demographics of the student sample were representative of the demographics of age, gender, and faculty of study of the SFU students close to the time of the measles outbreak.

Several characteristics of the SFU student population also posed limitations to the study findings. The SFU students likely comprised a more homogeneous group of young adults than would have been found in the same age cohort of the general population which was not attending a university. Due to this homogeneity, the student sample was probably not representative of the diversity of the same age cohort within the general population. Thus, the homogeneity of the student sample limited the generalizability of the study findings to the general public. It is reasonable, however, to generalize the findings of the study to other university populations. Also pertaining to the characteristics of the sample, some of the students may have had English as their second language and had difficulty
understanding the wording of the questionnaire. Another consideration related to 
the sample’s characteristics was that completion of the questionnaire required 
thought and time. Students willing to commit this time may have possessed 
attributes not held by the students who did not return a completed questionnaire. If 
this was the case, it would have affected the representativeness of the sample, and 
been a potential cause of selection bias.

The retrospective design of the study was problematic. As the data were 
collected retrospectively, history and maturation effects may have influenced the 
internal validity of the study. The retrospective method of data collection also 
presented a limitation to the study findings in that attitudes and beliefs about 
measles disease may have differed before, during, and after the measles outbreak. 
For example, perceptions of measles severity may have been attenuated for 
immunized students who came to believe that, if they were to contract measles, 
the effects of the disease would not have been as severe because of the protection 
provided by the vaccine (Janz & Becker, 1984). Similarly, this perception of lower 
measles severity may have been shared by the students who were not immunized 
during the outbreak but were immunized the previous year in Grade 12. Also, the 
measles “crisis” had passed, and non-immunized students may not have felt 
threatened any more. As the students’ health beliefs were measured after the 
immunization decision-making behaviour under study did or did not occur, the 
student responses may have been given to justify the decision they had already 
made. Also, the urgency and immediacy of the outbreak situation may have limited 
the extent to which the study findings can be applicable to routine scheduled
immunization programs.

The design of the Immunization Health Belief Model Scale also presented a limitation to the study findings. According to Kerlinger (1979), the variables comprising data collection instruments should be measured by at least three items to provide proper resolution of dimensionality of the measured variables. Three variables of the Immunization Health Belief Model Scale were not measured in accordance with that criterion. The variable of knowledge of measles was measured by two items, prior contact with measles by one item, and perceived threat by one item. The insufficient number of items pertaining to these three variables compromised the study findings. The significance of the three variables to immunization decision-making was not fully assessed either individually or through logistic regression modelling. The findings, however, for the variable of perceived threat require clarification. While there was a statistically significant difference between the immunized and non-immunized students for the variable of perceived threat, this finding may have reflected the Health Belief Model's depiction of perceived threat. That is, perceived susceptibility and perceived severity combine to determine the total perceived threat of a disease to the individual (Becker et al., 1977). Both perceived susceptibility and perceived severity were significantly related to the student's decision to be immunized. The strength of the influence of the variables of susceptibility and severity may have compensated for the variable of perceived threat being measured by only one item.

Another limitation was that the data collection instrument had not been used previously. Moreover, the Immunization Health Belief Model Scale was based on
Champion's (1993) Breast Self-Examination-Related Health Belief Model Scales which had never been used to examine immunization decision-making (V.L. Champion, personal communication, May 20, 1997). Previous use of the Immunization Health Belief Model Scale would have offered information concerning the reliability and validity of the instrument. This information could then have been used to refine the instrument for more effective data collection.

The Immunization Health Belief Model Scale did, however, expand upon Champion's (1993) Breast Self-Examination-Related Health Belief Model Scales. The study investigator adapted Champion's (1993) scale to examine the factors which influenced the SFU students to be immunized for measles. One adaptation was the inclusion of the variables of cues to action, knowledge, and prior contact which Champion had not studied. This further refinement of Champion's tool enabled a more accurate assessment of client attitudes and beliefs related to immunization decision-making.

Conclusions

The findings of this study are weakened by the small sample size caused by a low response rate. The small sample size may be less concerning, however, as the sample was determined to be representative of the demographics of age, gender, and faculty of study of the SFU student population at that time. This study provides relevant and needed information regarding the variables which can influence the immunization decision-making of university students. It was determined that age was significantly related to whether the student was immunized or not, with younger students being more likely to be immunized against
measles than the older students. The following variables were significantly related to the student's decision to be immunized: perceived susceptibility, perceived severity, perceived barriers, cues to action, perceived threat, and the student's area of study being more focussed on human health. The logistic regression analysis determined that, together, the four variables of perceived susceptibility, perceived barriers, cues to action, and health motivation contributed to the highest prediction rate pertaining to the student's decision to be immunized. An overall correct prediction rate of 84.7% was achieved in the logistic regression analysis by including the extra information from these four variables. It is anticipated that the implementation of immunization promotion strategies directed at these variables will influence decision-making in favour of being immunized. With an increase in immunization coverage levels, there will be improved disease prevention.

Implications for Nursing Practice, Theory, and Education

The findings of this study suggest several important implications for nursing practice, theory, and education. In order to deliver effective immunization programs, nurses must have knowledge of the factors which influence immunization decision-making. Moreover, the continued success of Canadian immunization programs requires that all nurses have this knowledge, whether they be working as nurse educators, policy makers, program administrators, or direct service providers. While today's population only infrequently experiences the devastating effects of vaccine-preventable diseases, there are remaining issues of concern. For example, Yuan et al. (1997) conducted a serosurvey of a sample of healthy adult blood donors in five centres across Canada. It was determined that 13% to 32% of the sample had
levels of diphtheria antitoxin below the minimum protective level. Concern was expressed regarding the possibility of diphtheria resurfacing in Canada. The potential for diphtheria disease re-emergence, if immunization levels are allowed to fall and adults do not receive booster doses, has been demonstrated most recently in the former Soviet Union. Tens of thousands of diphtheria cases with substantial mortality have been reported (National Advisory Committee on Immunization, 1998).

Nurses must become cognizant of the variables of the Immunization Health Belief Model Scale and the influence these variables have on immunization decision-making. If nurses integrate this knowledge and apply it in their practice, the result would likely be improved immunization coverage levels. These higher levels of immunization coverage would give our population a greater degree of protection against vaccine-preventable diseases.

Implications for Nursing Practice

The discussion of the study's implications for nursing practice is presented in relation to the variables of the Immunization Health Belief Model Scale (IHBMS) which were determined to be significantly related to the decision to be immunized. An example of an application of the IHBMS variables in nursing practice is also presented.

Variables of perceived susceptibility, perceived severity, and perceived threat.

Standards for the nursing practice of obtaining informed consent prior to immunization could be improved by incorporating the framework of the
Immunization Health Belief Model Scale into the guidelines for practice. Information contained in the guidelines could target the variables of the Immunization Health Belief Model Scale determined in this study to be significantly related to the decision to be immunized. Furthermore, each guideline could be vaccine specific, so that the nurse would provide information pertaining to the vaccine antigen(s), the particular disease(s), the individual's susceptibility to the disease(s), and the severity and threat of the disease(s) as compared to the risks and benefits of the specific vaccine. Use of such guidelines would help to ensure that nurses provide their clients with accurate, standardized, and up-to-date information when obtaining informed consent for immunization. Furthermore, the information could be aimed at the variables determined in this study to be the most predictive of a person's decision to be immunized.

**Variable of barriers.**

Nurses involved in immunization program planning and administration must consider local contextual information when planning immunization interventions. It is vital to choose interventions that are well-matched to local needs and capabilities. Program planners must have an appreciation of the impact of the variable of perceived barriers on the immunization decision (British Columbia Provincial Health Officer, 1999). For example, clinics must be held at convenient times and in easily accessible locations for the specific population being served. To meet the needs of working adults or students, clinics may have to be open during earlier morning, lunch time, evening, or weekend hours. The options of scheduling an appointment or dropping into a clinic may also need to be made available. In
some communities, there may be a need for volunteers to drive clients to a clinic or to provide child care at the clinic while parents or guardians are receiving counselling about their child's immunization. In other situations, it may be more effective to bring the immunization service to the clients by offering immunization in non-medical community settings, or in the client's home, school, or workplace. In short, nurse immunization program administrators must consider possible barriers to the receipt of immunization and problem-solve the means to overcome them so that the highest possible immunization coverage levels can be achieved in their health regions.

**Variable of cues to action.**

This study determined that when a health care provider recommends immunization, the client more likely decides to be immunized. The many clinical contacts a nurse has with clients present opportunities to apply the influence of this variable of cues to action. At each clinical contact, the nurse should review the client's immunization status and discuss indications of missing or overdue immunizations. This screening for up-to-date immunization status should be done with every hospital admission and visit to a public health clinic, physician office, or employee health or student health centre. Before discharge from the hospital, or while in attendance at these other types of health care facilities, the nurse should obtain informed consent and immunize individuals with the required vaccines.

The need for review of adult immunization status was reflected in the 1998 Canadian Immunization Guide: "The delivery and implementation of adult immunization programs have not matched the successes achieved in the pediatric
population . . . . Immunization status should be considered an integral part of the health assessment of any adult. Opportunities to provide vaccines to adults are being missed" (p.54). The concern regarding most adults lacking complete and up-to-date immunization records was also expressed in the British Columbia Provincial Health Officer's (1999) report on immunization. In the report, the Provincial Health Officer stresses the point that BC Health Regions do not know what proportions of their adult populations have even received the recommended vaccines.

Nurses have a key role in reducing missed opportunities to immunize adults. For example, nursing has demonstrated much success in the influenza immunization of the population at high risk from the complications of influenza. When influenza immunization programs have been delivered as independent nursing functions not requiring a physician's order, influenza immunization coverage levels have shown improvement over previous levels (Scarbrough & Landis, 1997; Crouse, Nichol, Peterson & Grimm, 1994; Landis & Scarbrough, 1995; & Fedson, 1995). In these nursing driven programs, nursing staff use their points of contact to immunize at risk clients, whether it be prior to the client's discharge from an acute care setting, or while they are attending another type of health care facility.

Nurses could also collaborate with non-health care providers in their health regions to develop public education materials about immunization. Intersectoral collaboration between a variety of stakeholders interested in supporting immunization activities could maximize the influence of the cues to action variable. For example, public education grants could be obtained from other sectors in the health region such as vaccine manufacturers or distributors or service organizations
such as the Rotary Club. These financial grants would offset the high cost of developing educational materials which normally would be beyond the budgets of the health region. Public education materials of a higher caliber and more engaging format are needed to attract and hold the public's attention. These materials must also be written in a culturally sensitive manner, and in the appropriate language and literacy level for the target population (British Columbia Provincial Health Officer, 1999). The production of such public education materials is expensive and time-consuming and requires an expertise that is beyond the resources being provided by today's health care sector. By using their knowledge of the variables of the Immunization Health Belief Model Scale and of the populations they serve, nurses can collaborate with non-health care sectors to produce more effective communication tools for individuals to consider in their immunization decision-making.

**Variable of health motivation.**

The logistic regression analysis determined that the variable of health motivation was one of the four variables most predictive of the decision to be immunized. The assumption which flows from this finding is that individuals would likely decide to be immunized when they are given correct and non-biased immunization information. With the decline of vaccine-preventable diseases in Canada, there is a growing complacency about the need to maintain up-to-date and timely immunizations (Canadian Paediatric Society, 1997; National Advisory Committee on Immunization, 1998). More importantly, this complacency is allowing the growth of an anti-immunization movement. More and more questions
are being asked about the vaccines being offered. These questions relate to alleged dangers or lack of effectiveness of vaccines. Vaccine providers are increasingly challenged by the growing complexity of the process of obtaining informed consent. It seems that the public is confronted by many more media messages about the dangers of immunization than it is about the safety and effectiveness of immunization in controlling diseases. As stated in the 1998 Canadian Immunization Guide:

The main difficulty immunization providers face in trying to respond to misconceptions is that the proponents of these myths are not only fully convinced of their position but have little difficulty advancing it zealously in the absence of any supporting data, or even with obvious data to the contrary. Vaccine advocates, on the other hand, tend to be less dogmatic, appreciating that these issues are complex. Therefore, when providers are faced with some difficult questions that do not have ready answers, people will tend to equate this uncertainty with lack of evidence to the contrary, and thus will lend more credence to the arguments against vaccination --- not because they are correct, but because they are delivered with such blind conviction. (National Advisory Committee on Immunization, 1998, p.39)

As advocates of immunization, nurses must voice as much conviction, or more, than that which is expressed by those opposed to immunization. The nursing profession has a responsibility to enhance and maintain the public's perception of immunization as a highly effective preventive health measure. Individual nurses have a responsibility to listen to and try to understand a client's concerns, fears,
and beliefs about immunization. By responding with accurate information, nurses can not only ease their client's specific concerns, but may discourage them from accepting other anti-vaccine information at face value.

The study finding that the majority of students indicated a high level of health motivation probably reflects a similar degree of health motivation in the general public. If one accepts that a majority of people are motivated to maintain good health, one would expect the public to respond to nursing efforts advocating immunization. The public's response would likely be more conscientious attention to the maintainance of an up-to-date immunization status.

An example of application of the Immunization Health Belief Model Scale variables in nursing practice.

To illustrate how nurses can direct immunization promotion strategies in accordance with significant Immunization Health Belief Model Scale variables, I will use the example of a new immunization program for varicella which may be introduced in BC in the near future (Dr. A. King, Acting Director, Communicable Disease Epidemiology Services, BC Centre for Disease Control, personal communication, December 2, 1998). The public erroneously views varicella as a benign childhood disease; however, it is now recognized as the most common cause of vaccine-preventable deaths in children (Bentsi-Enchill, 1998). Nurses will need to be educated about the morbidity and mortality associated with varicella in our province. Nurses will also need to be informed about the safety, side effects, and efficacy of this new varicella vaccine so that they can fully communicate this information to their clients. Recognizing the strong cue to action of a nurse's
recommendation to be immunized, nurses must receive this education so that they can promote varicella immunization. Higher varicella immunization coverage levels will be attained through such a nursing strategy.

Questionnaires based on the Immunization Health Belief Model Scale could be developed to obtain information from focus groups of the general public about the factors which would influence their decision to receive or have their children receive varicella vaccine. Publicity initiatives could then be developed which would emphasize the variables which the focus groups indicated to be significant to the varicella immunization decision. For example, it may be determined that public information materials need to be created which emphasize the high communicability, severity, and risk of complications from varicella disease.

Nursing will also have to plan ways to overcome possible barriers to the receipt of varicella immunization by offering convenient times, locations, and accessibility to immunization clinics. Such implementation strategies will maximize the success of the varicella immunization program. Nurses can have a very powerful role within such a planned approach.

Implications for Nursing Theory

In a practice discipline such as nursing, the purpose of nursing theory is not merely to describe particular phenomena or to predict results, but as stated by Greenwood (1961) to "... achieve controlled changes in natural relationships by means of procedures that are scientifically based" (p.74). Conant (1967) stated that nursing theories must isolate and describe pertinent factors, and that the relationships of these factors must be specified and ordered to prescribe nursing
activity that will lead to a specified desired goal. The findings of this study provide nursing theory such as that described by Conant. Knowledge of the influence of the variables of the Immunization Health Belief Model Scale contributes to nursing theory in that a prescribed application of the knowledge in nursing practice will bring about the desired goal of improved immunization coverage levels. Thus, the expected outcome of nursing activities based on theory derived from the IHBMS findings will be a population health benefit of increased protection from vaccine-preventable diseases.

The Immunization Health Belief Model Scale also offers a framework within which other types of nursing theory could be developed. For example, the framework could be modified to study other health-seeking behaviours. The study investigator adapted Champion’s (1993) Breast Self-Examination Related Health Belief Model Scale to examine the factors which influenced the SFU students to be immunized for measles. One adaptation was the inclusion of the variables of cues to action, knowledge, and prior contact which Champion had not studied. This further refinement of Champion’s tool enabled a more accurate assessment of client attitudes and beliefs related to immunization decision-making. Thus, nursing theory was advanced by the extension of Champion’s work to study other components of the Health Belief Model. Additional nursing theory could be developed by expanding upon the work done in this study with the Immunization Health Belief Model Scale.

**Implications for Nursing Education**

Both nursing students and practicing nurses must be educated about the factors, or variables, which can influence an individual’s decision to be immunized.
The Immunization Health Belief Model Scale provides a theoretical framework within which these variables can be studied and understood. The framework offers a tool by which nurses can refocus their attention to the wholeness of the individual making the immunization decision. The Immunization Health Belief Model Scale does so by articulating the influence of an individual's beliefs, attitudes, and perceived barriers and benefits regarding immunization. Nurses have an ethical responsibility to their clients to employ such a holistic approach during the process of obtaining informed consent for immunization.

Nurses must also be educated in the skill of risk communication so that they can most effectively convey immunization information to their clients. Nurses need to learn how to discuss vaccine specific information in an objective, non-biased, and factual manner which presents both the risks and benefits of the vaccine. Moreover, nurses must continue to acknowledge and demonstrate respect for the clients' right to make their own decisions regarding immunization. I believe that this acknowledgement demonstrates the highest level of effective risk communication. It has been my experience that nurses often think they have failed somehow if the client ends up deciding not to be immunized. Rather, the purpose of immunization risk communication is to objectively discuss the benefits and risks of immunization, and to ensure that clients have accurate information with which they can make an informed decision.

A planned outcome of immunization education programs for undergraduate and practising nurses should be the belief that immunization and its promotion is a core nursing function in all practice settings. With appropriate education,
immunization practice can expand outside the domain of community health nurses and into that of nurses in all health care settings. Being front-line health care providers having frequent contact points with clients, nurses are in an ideal position to address client immunization status. Such generalized nursing knowledge and skill is also vital to repudiate the incorrect messages increasingly being voiced by those opposed to immunization (Canadian Paediatric Society, 1997).

In conclusion, it is not adequate for nurses to receive immunization education which only offers training in immunization techniques and practices and knowledge pertaining to immunization products and programs. Nurses need to be educated regarding their influence on immunization decision-making, and the impact they can have on both maintaining and increasing immunization coverage levels. Moreover, this education must assist nurses to appreciate that their impact on immunization coverage extends beyond the level of an individual client's health to the level of a population's health.

**Recommendations for Future Research**

Findings of this study stimulate suggestions for further research. One of the limitations of this study was its retrospective design. For example, perceptions of measles severity may have been attenuated for immunized students who came to believe that, if they were to contract measles, the effects of the disease would not have been as severe because of the protection provided by the vaccine. In order to obtain information which is not limited by a retrospective study design, a cross-sectional survey could be done during the course of a disease outbreak. Given the demonstrated value of the Immunization Health Belief Model Scale, the scale could
be administered to a sample of the susceptible population having ongoing exposure during the disease outbreak. It would be very useful to obtain a description of the immunization beliefs and attitudes of a sample of a population currently being exposed to a disease. Such a cross-sectional survey design may provide information about the factors influencing the decision to be immunized which are different from the findings of the retrospective design of the SFU measles study. The determination of the variables most predictive of the decision to be immunized could be used to strategize and target interventions which would curtail the disease outbreak most efficiently.

The Immunization Health Belief Model Scale could also be used to study the factors which influence the decision to be immunized, or have one's child immunized when there is no obvious threat from the disease(s) for which immunization is being offered. Studies such as this could examine possible variances in the significance of the IHBMS variables when the presence of a disease outbreak is not factored into immunization decision-making. Any newly acquired knowledge could then be applied to program planning relating to the delivery of routine scheduled vaccines or vaccines new to the marketplace. Given the concern that there is a growing number of people opposed to immunization, the application of this information to immunization program planning would be very pertinent to the continued success of our immunization programs.

A variable of the Immunization Health Belief Model Scale which warrants further research is the cues to action variable. This variable had the highest level of significance related to the students' decision to be immunized. According to Becker
et al. (1977) cues to action include mass media campaigns, advice from others, reminder postcards, illness of a family member or friend, and newspaper or magazine articles. In order to maximize the effects of the cues to action variable, a descriptive comparative study could be undertaken to compare the relative effectiveness of each of these different types of cues to action. If it was possible to determine the most significant cue to action, immunization program initiatives could then be planned which would maximize its influence. The anticipated outcome would be higher levels of immunization coverage delivered through more cost-effective targeted programs.

In conclusion, it is this researcher's hope that further research will be conducted which contributes to an expanded body of nursing knowledge about the variables which influence immunization decision-making and the role of the nurse in implementing immunization programs which are directed at these variables.
References


### Appendix A
**Summary of Literature Review**

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<tbody>
<tr>
<td>PURPOSE</td>
<td>To develop an effective immunization program by estimating influenza immunization rates among hospital personnel, and by describing the attitudes and behaviour of Health Care Workers (HCW) concerning influenza and influenza immunization.</td>
</tr>
<tr>
<td>DESIGN</td>
<td>Descriptive-comparative</td>
</tr>
</tbody>
</table>
| SAMPLE | N = 180 doctors (all doctors in medicine, surgery, obstetrics, gynecology, & pediatrics)  
N = 283 nurses (a 25% random sample of full-time nurses) |
| VARIABLES | Demographics  
Occurrence of influenza-like illness (ILI)  
Influenza vaccine compliance  
Amantadine use  
Reasons for working with ILI  
Reasons for refusing the influenza vaccine  
Suggestions for improving future immunization compliance |
| INSTRUMENTS | Questionnaire, developed for the specific study |
| RESULTS | Comparison of responses of those immunized and non-immunized:  
- the non-immunized were more concerned with vaccine safety and the pain and inconvenience of vaccine administration.  
- the non-immunized would be more receptive to receiving the vaccine in the future if informed that immunization was a national policy.  
- of the factors which influenced nurses and doctors to work while sick with an ILI, nurses were more concerned with conserving allotted sick leave than were doctors. Both groups were motivated to work while ill because the work otherwise would be performed by co-workers in their absence. |
| WEAKNESSES | • Convenience sampling of the physician group limited generalizability of the study findings.  
• Only house staff members, fellows, and full-time nursing personnel were included in the sample. Attitudes and behaviour of attending physicians and part-time nurses may have differed from those of the study participants.  
• Investigators relied on self-reported estimates of influenza-like illness and immunization acceptance rates.  
• The survey was cross-sectional: Attitudes and behaviour about influenza may have differed before, during, and after the flu season.  
• Questionnaire was not pilot-tested or assessed for reliability and validity. |
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Summary of Literature Review

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<tbody>
<tr>
<td>PURPOSE</td>
<td>To investigate the utilities of the Fishbein and Triandis models as predictors of behavioural intention and behaviour, using obtaining vs not obtaining an influenza vaccination as the health behaviour.</td>
</tr>
<tr>
<td>DESIGN</td>
<td>Descriptive-comparative</td>
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<tr>
<td>SAMPLE</td>
<td>N = 439 randomly selected patients at high risk for flu complications, registered at a Veteran Affairs (VA) clinic. Stratification was used according to risk group and past flu shot behaviour.</td>
</tr>
</tbody>
</table>
| VARIABLES | Behavioural intention  
Affect or attitude.  
Fishbein’s and Triandis’ measures of perceived consequences  
Social influences  
Habit  
Facilitating conditions |
| INSTRUMENTS | Two-wave longitudinal survey: Interview questionnaire sent out 4 months before the flu season; questionnaire sent out after the flu shot was no longer available. |
| RESULTS | • Both models were quite good predictors of behavioural intention.  
• Regardless of intention, the more flu shots a person had recently the higher their likelihood of getting another. |
| WEAKNESSES | • Convenience sampling from one VA clinic limits generalizability of study findings.  
• While a Cronbach alpha was produced for the variables of affect/attitude and perceived consequences, one was not produced for the other variables. |
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<tbody>
<tr>
<td>PURPOSE</td>
<td>To develop valid and reliable scales to test the Health Belief Model as related to breast self-examination.</td>
</tr>
<tr>
<td>DESIGN</td>
<td>Descriptive</td>
</tr>
<tr>
<td>SAMPLE</td>
<td>A convenience sample of 301 women was obtained from the membership of organizations and businesses throughout a large metro area.</td>
</tr>
</tbody>
</table>
| VARIABLES | Frequency of breast self-examination  
Perceived susceptibility, seriousness, benefits, barriers, and health motivation |
| INSTRUMENTS | Questionnaire |
| RESULTS | • Evidence was obtained for the ability of the revised scales to reliably and validly measure the constructs.  
• The variables of perceived barriers and health motivation were more predictive of behaviour than were susceptibility, seriousness, and benefits. |
| WEAKNESSES | • Convenience sampling, and the degree of homogeneity of the sample limited generalization to a larger population.  
• Low participation; 41% of questionnaires returned, probably due to the long period of time of 2.5 years required for participation in the study. |
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<tbody>
<tr>
<td>PURPOSE</td>
<td>To study factors affecting uptake of measles, mumps, and rubella (MMR) immunization.</td>
</tr>
<tr>
<td>DESIGN</td>
<td>Cohort</td>
</tr>
<tr>
<td>SAMPLE</td>
<td>n = 7891 children born in January to March 1990 and resident in the 10 health districts in North East Thames and North West Thames regions up until the end of October 1991.</td>
</tr>
</tbody>
</table>
| VARIABLES | Record of MMR immunization.  
Type of district of residence: categorized on geographic criteria and Jarman score into low deprived rural and suburban districts and high deprived inner city districts.  
Birth order.  
Immunization location (Dr. or community child health clinic).  
Maternal age.  
Birth weight.  
Type of resident (from birth or moved into area after birth).  
Primary immunization status.  
Type of family.  
Gender of child.  
Type of child health computer system. |
| INSTRUMENTS | Child health computer system containing immunization records of the children |
| RESULTS | • Birth weight and gender of children did not influence uptake of MMR.  
• Maternal age, type of resident, and type of child health computer system were not included in the final logistic regression model.  
• The most important predictors for uptake were primary immunization status, and attending Dr. for immunization.  
• The predictors of lower uptake were birth order (children from larger families), living with one parent, and residing in an inner city. |
| WEAKNESSES | • The evaluation was carried out when the study children were ages 19-21 months rather than 24 months (some children receive MMR between 19-21 & 24 months).  
• Immunization coverage data were routinely prepared at fixed dates. Local child health staff often made particular efforts to ensure that records were as up-to-date as possible for these deadlines. The data for the study were collected at a time midway between these deadlines.  
• Source of the data was computerized child health records which may not have been up-to-date as the population was transient in inner-city areas.  
• The 10 study districts included many inner-city districts where immunization uptake could have been problematic. |
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<tr>
<td>PURPOSE</td>
<td>To determine the immunization prevalence and identify the factors influencing the intentions of health care students to accept hepatitis B (HB) vaccine.</td>
</tr>
<tr>
<td>DESIGN</td>
<td>Descriptive</td>
</tr>
<tr>
<td>SAMPLE</td>
<td>n = 435 university and community college students in health care disciplines in Ottawa where there was no HB immunization program.</td>
</tr>
</tbody>
</table>
| VARIABLES                                                             | HB immunization status  
Intention to be immunized at the retail price of $175  
Perceived HB risk with and without immunization  
Value tradeoffs between HB risk and cost of immunization  
Intentions to be immunized at a nominal cost of $15 |
| INSTRUMENTS                                                           | Self-administered questionnaire                                                                                                 |
| RESULTS                                                                | • 14% of the 435 students had already received the vaccine.  
• Students had stronger intentions to be immunized if they were in medicine or respiratory technology, had a higher perceived HB risk without immunization, or had a greater willingness to pay.  
• The year of study and perceived HB risk if immunized were not significantly correlated to the intentions to be immunized. |
| WEAKNESSES                                                            | • Convenience sampling at two post-secondary institutions, and consequent limitation of generalizability of study findings |

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## Summary of Literature Review

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<tbody>
<tr>
<td>PURPOSE</td>
<td>To investigate the effectiveness of a measles notification strategy and the compliance of the exposed population with recommendations for post-exposure prophylaxis.</td>
</tr>
<tr>
<td>DESIGN</td>
<td>Descriptive</td>
</tr>
<tr>
<td>SAMPLE</td>
<td>n = 106 families with children eligible for prophylactic immunization following an exposure to measles in two pediatric medical facilities</td>
</tr>
</tbody>
</table>
| VARIABLES | Compliance with the recommendation to receive prophylactic measles immunization  
Contracts of the HBM: perceived susceptibility, severity, barriers, and benefits |
| INSTRUMENTS | Telephone questionnaire |
| RESULTS | • Compliant parents thought that measles would make their child sick or very sick.  
• The proportion of parents who perceived that their child was susceptible to measles, that a vaccine was beneficial, and that there were effective home measures that would protect against measles disease did not differ significantly between the compliers and non-compliers. |
| WEAKNESSES | • There was no assessment of the validity and reliability of the questionnaire used to telephone the targeted exposed children.  
• There was a major threat to internal validity because of the small number of subjects. Due to the inability to contact all families, compliance could only be determined in 48% of the exposed families.  
• The possibility that families without prior experience attending a pediatric emergency room may have had difficulty answering the barriers questions.  
• Health beliefs were determined after the behaviour under study (compliance) did or did not occur, and therefore responses may have been given to justify what the person had already done.  
• The parental concerns of perceived safety and complications of the vaccine were not addressed.
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<tr>
<td>PURPOSE</td>
<td>To present data from a study of mothers' compliance with a diet regimen prescribed for their obese children in order to illustrate the HBM's applicability to long-term behaviour.</td>
</tr>
<tr>
<td>DESIGN</td>
<td>Descriptive</td>
</tr>
<tr>
<td>SAMPLE</td>
<td>n = 199 mothers of children newly diagnosed as obese by physicians in an ambulatory pediatric clinic at a large teaching hospital</td>
</tr>
<tr>
<td>VARIABLES</td>
<td>Change in child's weight over a two-month period Compliance with clinic appointment keeping General health motivation Special health practices Perceived susceptibility, severity, benefits, and barriers</td>
</tr>
<tr>
<td>INSTRUMENTS</td>
<td>Personal interview</td>
</tr>
</tbody>
</table>
| RESULTS | The following were found to be substantially associated with subsequent weight loss by the child:  
- The mother's perceptions of her child's vulnerability to illness.  
- The mother's views about the seriousness of the threat of illness in general and obesity in particular.  
- The mother's faith in the benefits of medical care and in the efficacy of the regimen.  
- The mother's belief that the diet was safe. |
| WEAKNESSES |  
- Convenience sampling.  
- Study did not state whether the mothers were interviewed by one dietitian, or different ones. If interviewed by different dietitians, was there an assessment of interrater reliability?  
- Investigators used weight change to represent dietary compliance, whereas other factors (illness, exercise) could also result in weight loss.  
- Authors did not obtain self-reports of dietary adherence from mothers.  
- Generalizability was limited by use of non-random sample of low-income mothers at a single clinic.  
- As the health beliefs were measured only at the initial visit, it was not possible to determine whether or not some portion of the decline in the regression coefficients was due to changes in health beliefs over time. |
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<tbody>
<tr>
<td>PURPOSE</td>
<td>To test the ability of the HBM dimensions of self-efficacy, various behavioural variables, and demographic measures to distinguish between three condom user groups (nonusers, sporadic users, and consistent users).</td>
</tr>
<tr>
<td>DESIGN</td>
<td>Descriptive comparative</td>
</tr>
<tr>
<td>SAMPLE</td>
<td>Convenience sample of n = 366 college students, aged 18 to 24 years, from a public university in western New York State.</td>
</tr>
<tr>
<td>VARIABLES</td>
<td>Frequency of condom use. Behavioural variables of: • number of sexual partners in the past 12 months • frequency of drunkenness during sexual intercourse • number of diagnosed sexually transmitted diseases. HBM concepts of perceived susceptibility, severity, barriers, and benefits.</td>
</tr>
<tr>
<td>INSTRUMENTS</td>
<td>Self-administered questionnaire, including the Condom Use Self-Efficacy Scale</td>
</tr>
<tr>
<td>RESULTS</td>
<td>Sporadic condom users were best distinguished from both consistent users and nonusers by: • having had more sexual partners in the past year • being drunk more often during sexual intercourse • perceiving themselves to be more susceptible to HIV/AIDS and other sexually transmitted diseases • having less confidence in their ability to discuss and insist on condom use with a sexual partner.</td>
</tr>
<tr>
<td>WEAKNESSES</td>
<td>• Convenience sampling</td>
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<tr>
<td>PURPOSE</td>
<td>To examine the factors associated with non-compliance in follow-up HIV testing among HCWs after a blood and/or body fluid exposure.</td>
</tr>
<tr>
<td>DESIGN</td>
<td>Descriptive</td>
</tr>
<tr>
<td>SAMPLE</td>
<td>n = 45 HCWs who did not return for recommended follow-up HIV testing post-blood and/or body fluid exposure at three urban hospitals.</td>
</tr>
<tr>
<td>VARIABLES</td>
<td>HBM concepts of perceived susceptibility, seriousness, benefit, barriers, and health motivation.</td>
</tr>
<tr>
<td>INSTRUMENTS</td>
<td>Questionnaire</td>
</tr>
<tr>
<td>RESULTS</td>
<td>• The most significant factor determined to affect return rate for follow-up testing was related to benefits and susceptibility (i.e. decreasing the chance of dying from AIDS).</td>
</tr>
</tbody>
</table>
| WEAKNESSES | • The small sample size limited generalization of study findings.  
• The study did not address the emotional issues of HIV. These emotions may have overridden the intellectual knowledge of the health care worker when responding to the questionnaire.  
• Use of a qualitative study design with open-ended interviews would have more precisely determined why a health care worker chooses to return for follow-up testing.  
• By nature of the health care workers' profession, the subjects may have been desensitized to the important issue of HIV and the relationship to self. This may have affected the return rate and was not addressed in the study. |
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<tr>
<td>PURPOSE</td>
<td>To assess family functioning and consumer decision-making about vaccinations and to compare the results with age at vaccination.</td>
</tr>
<tr>
<td>DESIGN</td>
<td>Descriptive</td>
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<tr>
<td>SAMPLE</td>
<td>n = 167 families attending two inner-city health centers in Pittsburgh, Pa. Sample was obtained from the billing computer records of parents whose children were aged 2 to 4 years as of July 2, 1993.</td>
</tr>
</tbody>
</table>
| VARIABLES | Age at 3rd Diphtheria, Pertussis, and Tetanus (DPT) vaccine  
Age at 1st Measles, Mumps, and Rubella (MMR) vaccine.  
The Triandis Model variables of:  
• perceived consequences of vaccinations (i.e. consequences of receiving the vaccines and of contracting measles or pertussis, and severity of both).  
• attitude about vaccinations (i.e. safety and value).  
• social influences (i.e. perceptions of how friends or family and their physician rate the vaccines).  
• facilitating conditions (e.g. ease of obtaining an appointment, making time, getting to the clinic, knowledge of vaccine side effects and benefits).  
• habit (i.e. age of the patient at 1st DPT).  
The Family Profile variables of:  
• family concordance/discordance.  
• religious influence.  
• active involvement. |
| INSTRUMENTS | Self-administered survey which used simplified versions of the Family Profile and the Triandis Model of Consumer Decision-making. |
| RESULTS | • Parents of children with late vaccination, in comparison with parents of children with timely vaccinations, reported:  
• higher family dysfunction  
• lower income  
• perceived lower ratings by their physician of the value of DPT.  
• Knowledge about vaccines was not associated with vaccination status. |
| WEAKNESSES | • Low response rate (i.e. of 395 families, 167 responded) and the consequent possibility of response rate bias.  
• Generalization was limited to inner-city health centers that were receiving free vaccine supplies.  
• Patients were selected who were seen in the preceding six months, and therefore, they may not have represented all patients in the practice. In particular, patients who were less likely to seek care may have been omitted by this strategy.  
• Self-report of income by recipients of public assistance who may have underreported income because of the fear of losing benefits. |
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<tr>
<td>PURPOSE</td>
<td>To investigate the reasons for poor uptake of immunization and the possible side effects of Measles, Mumps, and Rubella (MMR) vaccine in a catch-up immunization campaign during a community outbreak of measles.</td>
</tr>
<tr>
<td>DESIGN</td>
<td>Descriptive</td>
</tr>
<tr>
<td>SAMPLE</td>
<td>Random cluster sample of the parents of 500 children targeted, but not immunized, and a randomised sample of 2866 of the children targeted.</td>
</tr>
</tbody>
</table>
| VARIABLES | Reasons for non-immunization  
Symptoms among immunized and non-immunized children |
| INSTRUMENTS | Self-administered questionnaire |
| RESULTS | • The most common reasons cited for non-immunization were:  
• previous measles infection  
• previous immunization against measles  
• concern about side effects  
• Symptoms were equally common among immunized and non-immunized subjects. However, significantly more immunized boys than non-immunized boys reported fever, rash, joint symptoms, and headache. |
| WEAKNESSES | • No report on the development of the self-administered questionnaire, or its assessment for validity and reliability. |
### Appendix A

**Summary of Literature Review**

<table>
<thead>
<tr>
<th><strong>STUDY</strong></th>
<th><strong>Parents attitudinal and social influences on childhood vaccination. Bennett &amp; Smith. (1992).</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PURPOSE</strong></td>
<td>To examine the beliefs and attitudes towards pertussis and other vaccinations in three groups of caregivers: those who had fully vaccinated a target child against pertussis (FV), those whose child partially completed the course (PV), and those who refused to have their child receive the pertussis vaccination (NV).</td>
</tr>
<tr>
<td><strong>DESIGN</strong></td>
<td>Descriptive-comparative</td>
</tr>
<tr>
<td><strong>SAMPLE</strong></td>
<td>FV: n = 85; PV: n = 70; NV: n = 73. Children aged between 2 and 2.5 years were identified from the Welsh Health Common Services Authority childcare database.</td>
</tr>
</tbody>
</table>
| **VARIABLES** | Socio-economic status  
Perceived benefits of immunization  
Perceived costs of immunization  
Social influences related to immunization |
| **INSTRUMENTS** | Structured interview questionnaire |
| **RESULTS** | • The NV group reported more concern over their child having long-term health problems as a result of pertussis vaccination than those who either completed or agreed to pertussis immunization.  
• The NV group reported a greater perceived risk of their child developing pertussis if they were vaccinated than those who fully vaccinated their child.  
• The NV group reported a lower risk of disease if not vaccinated than did either of the other groups.  
• Advice against vaccination by other family members occurred as frequently among those who did and those who did not vaccinate their child. |
| **WEAKNESSES** | • Did not assess the validity or reliability of the questionnaire used in the participant interview.  
• Convenience sampling was used to identify the sample cohort of children from one community. Thus, there was a limitation to the generalization of the study findings. |
### Study

**Purpose**
To determine the feasibility of a schools vaccination program to eliminate measles in the primary school population of the Colchester School District.

**Design**
Descriptive

**Sample**
Five primary schools in Colchester with a total of 1,201 children were selected for the study.

**Variables**
- Children whose parents gave consent for vaccination
- Children whose parents refused to give consent for vaccination
- Nonresponders to the mailed out questionnaire

**Instruments**
Questionnaire designed to identify the children susceptible to measles who would benefit from vaccination, mailed together with vaccination consent forms.

**Results**
- 81 children (6.7% of the sample) were susceptible to measles.
- Parental consent for vaccination was given for 51 of the susceptible children, who were later vaccinated in the school.
- 70% of the total sample had received measles vaccination previously.
- 20% of the sample had previously had measles disease.
- Reasons for not giving consent related to a failure to appreciate the seriousness of measles, anxiety regarding vaccine safety, and incorrect understanding of what constituted a contraindication to measles immunization.
- The nonresponders lack of response was related to parental indifference (about 30% of all nonresponders).
- Social problems such as parental illness, or children cared for by elderly grandparents accounted for the non-response in 12% of the children.

**Weaknesses**
- Convenience sampling from a single school district limited generalization of study findings.
## Appendix A
### Summary of Literature Review

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PURPOSE</td>
<td>To assess knowledge, attitudes, and practices regarding influenza and pneumococcal immunizations.</td>
</tr>
<tr>
<td>DESIGN</td>
<td>Descriptive</td>
</tr>
<tr>
<td>SAMPLE</td>
<td>716 residents 65 years of age or older of Dekalb and Fulton Counties. Sample was selected from independent-living housing communities for older adults in these two counties which had volunteered to participate; telephone numbers for interviews were selected from a reverse telephone directory.</td>
</tr>
</tbody>
</table>
| VARIABLES | Age  
Gender  
Awareness of influenza and pneumococcal vaccines  
History of immunization with either vaccine  
History of HCW recommendation to receive either vaccine  
Attitudes about influenza and pneumococcal vaccine effectiveness and safety. |
| INSTRUMENTS | Questionnaire - administered by telephone or in person |
| RESULTS | • 90% of the respondents reported that they were aware of influenza vaccine. Of these, 55% reported receiving it within the past year.  
• The most important factor associated with influenza vaccination status was a recommendation for vaccination by a HCW: 75% of persons to whom immunization had been recommended reported being vaccinated within the last year, compared with 7% of those who had not had a recommendation for vaccination.  
• Of the respondents who were aware of the influenza vaccine, 73% reported negative attitudes toward it (i.e. that influenza vaccine itself causes illness, does not protect against influenza, or is unnecessary).  
• 50% of those with a negative attitude, who responded to the question, reported being vaccinated within the last year.  
• 70% of respondents with positive attitudes reported being vaccinated.  
• 53% of respondents were aware of pneumococcal vaccine; 38% of these respondents reported having received it.  
• The most important factor associated with pneumococcal vaccination status was vaccine recommendation by a HCW.  
• 36% of the respondents who were aware of the pneumococcal vaccine reported negative attitudes toward it (i.e. that the vaccine would not prevent pneumonia or the vaccine would make them sick).  
• 33% of respondents with negative attitudes, who answered the question, and 44% of those with positive attitudes reported being vaccinated. |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| **WEAKNESSES**     | No report of the development of the questionnaire, or the assessment of its validity and reliability. Selection bias: communities volunteered to participate. Lack of randomization: the survey included only those 65 years of age or older and did not include those less than 65 years of age who had high-risk conditions for which the vaccines were also recommended; also not included were those living outside of residential communities for older adults, and those living in chronic care facilities.  
• Of persons surveyed, 85% were women, a disproportionately high percentage compared with the percentages of women 65 years of age or older living in the two counties.  
• The racial distributions of respondents from the two counties also differed from that of the reference populations.  
• Responses concerning immunization status were not verified. |

<table>
<thead>
<tr>
<th>STUDY</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>To study factors which predisposed individuals to receive vaccination in response to the anticipated outbreak of swine influenza in the fall and winter of 1976.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DESIGN</th>
<th>SAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptive</td>
<td>The study population included all households served by currently working telephone numbers in Oakland County, Michigan. Telephone numbers were selected using a random digit dialing procedure. n = 374 adults in the initial survey. n = 286 adults in the follow-up survey. There were no significant differences in the sociodemographic characteristics of those who did not participate in the follow-up survey as compared with those who did.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>INSTRUMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Received vaccination</td>
<td>Telephone questionnaire</td>
</tr>
<tr>
<td>HBM concepts of perceived susceptibility, severity, benefits, and barriers</td>
<td></td>
</tr>
<tr>
<td>Measures of behavioural intention, social influence, physician's advice, socioeconomic status and past experience with flu shots</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RESULTS</th>
<th>WEAKNESSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The HBM variables, including an individual's perceptions of susceptibility, severity, and efficacy were important in influencing an individual's behavioural intention, and in this manner, indirectly affected vaccination behaviour.</td>
<td>• Difficulty determining the extent to which the findings may be applicable to other immunization programs, in light of the unique nature of the swine flu campaign (i.e. government sponsorship of the program and unintended side effects associated with the vaccine).</td>
</tr>
<tr>
<td>• Measures of social influence, physician recommendation and the individual's past experience with flu shots also showed substantial direct effects on vaccination behaviour.</td>
<td></td>
</tr>
<tr>
<td>• Behavioural intention was strongly related to subsequent behaviour.</td>
<td></td>
</tr>
<tr>
<td>• Behavioural intention and subsequent behaviour could be influenced by efforts directed at changing relevant health beliefs (i.e. perceived susceptibility and severity of a health threat, effectiveness of a specific health recommendation).</td>
<td></td>
</tr>
</tbody>
</table>
Appendix A
Summary of Literature Review

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PURPOSE</td>
<td>To refine an instrument to measure the Health Belief Model concepts of susceptibility, seriousness, benefits, barriers, health motivation, and confidence, using the context of breast cancer and breast self-examination.</td>
</tr>
<tr>
<td>DESIGN</td>
<td>Descriptive</td>
</tr>
<tr>
<td>SAMPLE</td>
<td>A random sample of 581 women from the greater metropolitan area of a large midwestern city.</td>
</tr>
<tr>
<td>VARIABLES</td>
<td>Health Belief Model concepts of perceived susceptibility, seriousness, benefits, barriers, health motivation, and confidence.</td>
</tr>
<tr>
<td>INSTRUMENTS</td>
<td>The BSE-Related Health Belief Model Scales that were originally reported by Champion (1984) were re-evaluated for the study, and a new scale to measure confidence was developed.</td>
</tr>
</tbody>
</table>
| RESULTS | • The subscales of susceptibility, seriousness, benefits, barriers, confidence, and health motivation met the criteria for valid and reliable measures of the constructs specified by the HBM.  
• With few exceptions, all scales were found to exhibit acceptable content, construct, and predictive validity, as well as internal consistency and test-retest reliability.  
• The instrument was a major improvement over Champion’s (1984) earlier work. |
| WEAKNESSES | • Other components of the HBM were not studied (i.e. demographic variables, sociopsychological variables, and cues to action). |
Appendix A
Summary of Literature Review

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PURPOSE</td>
<td>To test the adolescent invulnerability hypothesis (i.e. that adolescents are markedly less proficient than adults in estimating risk or in other decision-making skills).</td>
</tr>
<tr>
<td>DESIGN</td>
<td>Descriptive-comparative</td>
</tr>
<tr>
<td>SAMPLE</td>
<td>For the adolescent-adult comparison: 86 pairs of low-risk teens and parents. For the risk-behaviour comparison: added 95 high-risk teens. Low-risk subjects recruited from organizations at public high schools. High-risk teens recruited from group homes for teens with legal and chemical abuse problems.</td>
</tr>
<tr>
<td>VARIABLES</td>
<td>Eight possible adverse events were evaluated by subjects for themselves, as well as for 2 or 3 other individuals in terms of: Probability Controllability Preventive effort Experience with the event</td>
</tr>
<tr>
<td>INSTRUMENTS</td>
<td>Quantitative scale by which the subjects assessed the probabilities of various bad events occurring to themselves and to several others.</td>
</tr>
<tr>
<td>RESULTS</td>
<td>• The most common response pattern was to see no difference between the subject’s risk level and that faced by others. • Where subjects distinguished the two risk levels, they were twice as likely to see the other person as facing greater risk. • The perception of relative invulnerability was no more pronounced for adolescents than for adults. • The parents were viewed as less vulnerable than their teenage children by both the adults and those teens.</td>
</tr>
<tr>
<td>WEAKNESSES</td>
<td>• The experimental setting insulated subjects from the social pressure that accompanies actual decision-making and isolated them from the attendant social support. These experimental conditions could have either enhanced or compromised performance. Also, these situational factors may affect adults and adolescents differently. • Convenience sampling of the low-risk subjects from a single public high school limited generalizability of study findings. • Sampling of high-risk subjects from one type of treatment center also limited generalizability. • There was no description of the assessed validity or reliability of the scale.</td>
</tr>
</tbody>
</table>
## Appendix A
### Summary of Literature Review

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PURPOSE</td>
<td>To examine two aspects of children’s and adolescents’ predecisional processes: how the sources of influence on children’s health-related decision making change as they age, and as well, as a function of gender.</td>
</tr>
<tr>
<td>DESIGN</td>
<td>Descriptive-comparative</td>
</tr>
<tr>
<td>SAMPLE</td>
<td>286 middle and lower class Euro-American elementary and high school students from two school districts in the eastern half of the U.S.</td>
</tr>
</tbody>
</table>
| VARIABLES | Source of influence variables:  
• Social agents such as mother, father, friends, or teachers  
• Information sources such as TV, radio, magazines  
• Perceptions of habit and enjoyment  
• Health value and worry  
Frequency with which subjects engaged in the health behaviours of toothbrushing, nutrition, exercise, seat belt use, alcohol, and cigarette use |
| INSTRUMENTS | Self-report rating scales |
| RESULTS | • The significance of gender and developmental differences, as well as sources of influence, appeared to be differentially dependent on which preventive or risky health-related behaviours were under consideration.  
• Social agents and health value and worry were negatively related to risky behaviours and positively related to preventive behaviours.  
• Perceptions of habit and enjoyment were positively related to the frequency of both risky and preventive behaviours. |
| WEAKNESSES | • Sample was not representative of current demographics of American society: only data collected from Euro-American students were used because too few of the parents of African-American students agreed to allow their children to participate in the study; lower socio-economic group was not sampled. |
Appendix B
Letter of Introduction
(original was on UBC School of Nursing letterhead)

October 17, 1997

Dear SFU student:

My name is Karen Pielak, and I am a Registered Nurse. I need your help: probably around twenty minutes of your time. The time it takes to drink a cup of coffee, and I will buy the coffee!

Last February, you may have met one of my nursing colleagues giving measles immunizations because of the outbreak of measles on the SFU campus. A lot of time and effort went into the immunization clinics. It was important that as many students as possible were immunized. I need your help to understand the reasons why some students were immunized and others were not. I am doing this as my thesis for a Masters of Science in Nursing. The thesis title is “Students Immunized and Not Immunized for Measles: A Comparison of Beliefs, Attitudes, Barriers, and Benefits.” The topic is especially important as there is a lack of information about university students’ beliefs and attitudes pertaining to immunization. The information that is obtained will be very useful for the planning and implementation of future mass immunization programs targeted to university students.

You were randomly sampled by systems support staff in the department of Communicable Disease Epidemiology Services at the BC Centre for Disease Control Society, who are independent of me. In that way, you will remain anonymous to me. They have labelled and mailed the enclosed questionnaire packet. Your answers will be kept confidential. If you would like a summary of the study findings, please indicate your name and address in the space provided and I will send it to you. This letter will be separated from your questionnaire when I get it, in order to maintain your anonymity.

Your return of the completed questionnaire indicates your consent to participate in the study. However, you have the right not to participate and your class standing will not be influenced in any way. If you have any further questions, you can contact me at (604) 660-6061, or you can contact my thesis supervisor, Dr. Ann Hilton, UBC School of Nursing, at (604) 822-7498.

A stamped pre-addressed return envelope is included for your convenience. As my thanks to you, please enjoy a coffee!

Sincerely,

Karen Pielak, RN, BSN

I would like a summary of the study findings
Yes___ No___

You can mail it to me at (Name):

(Address):
Appendix C
Data Collection Instrument

DIRECTIONS: I am interested in how you felt about each of the following statements. To the right of each statement you will see five columns labelled from 1 - Strongly agree to 5 - Strongly disagree. Please circle the number in the column which best represents your degree of agreement with the statement at the time of the SFU outbreak of measles and before the vaccinations were available.

1) Strongly agree
2) Agree
3) Undecided
4) Disagree
5) Strongly disagree

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>My chances of getting measles are great</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2.</td>
<td>Measles is a very serious disease</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3.</td>
<td>A friend/relative was very sick with measles</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>My age group makes it more likely that I will get measles</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5.</td>
<td>I could be very sick if I got measles</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>Immunization will prevent me from catching measles</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7.</td>
<td>I feel I will get measles in the future</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8.</td>
<td>I exercise at least 3 times a week</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9.</td>
<td>If I got measles, my studies could suffer</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10.</td>
<td>My family wanted me to get measles vaccine</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11.</td>
<td>It is embarrassing for me to receive a measles shot with others watching</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12.</td>
<td>Immunization is a good idea because I don’t want others to have to look after me if I get really sick with measles</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13.</td>
<td>I am confident I can control any fear of needles I might have while I am being vaccinated</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14.</td>
<td>The measles shot can be painful</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15.</td>
<td>The side effects of measles immunization will interfere with my studies</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16.</td>
<td>I am afraid to even think about being sick with measles</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>17.</td>
<td>I am afraid of getting measles</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>18.</td>
<td>Being immunized against measles will not prevent me from getting measles</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>19.</td>
<td>I am scared of needles</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>20.</td>
<td>Most of my friends got measles vaccine</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>21.</td>
<td>By being immunized and not getting measles, I will avoid lost time from school and/or work</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>22.</td>
<td>Maintaining good health is extremely important to me</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
23. If I was immunized and still got measles, I wouldn't be as sick with it .......................................................... 1 . 2 . 3 . 4 5
24. I search for new information to improve my health .......................................................... 1 . 2 . 3 . 4 5
25. I can take deep breaths while getting the needle so that I will feel less pain and anxiety .......................................................... 1 . 2 . 3 . 4 5
26. Measles vaccine is contraindicated for me as I am allergic to eggs .......................................................... 1 . 2 . 3 . 4 5
27. I want to discover health problems early .......................................................... 1 . 2 . 3 . 4 5
28. Measles vaccine is not safe .......................................................... 1 . 2 . 3 . 4 5
29. I have had very bad side effects from measles vaccine in the past .......................................................... 1 . 2 . 3 . 4 5
30. I can hold my arm still while being vaccinated .......................................................... 1 . 2 . 3 . 4 5
31. Measles vaccine is safe .......................................................... 1 . 2 . 3 . 4 5
32. I was too busy to get immunized .......................................................... 1 . 2 . 3 . 4 5
33. I could not be bothered to get measles immunization .......................................................... 1 . 2 . 3 . 4 5
34. The advertising of the need for measles immunization prompted me to get it .......................................................... 1 . 2 . 3 . 4 5
35. By being immunized and not getting measles, I will be protecting others from measles .......................................................... 1 . 2 . 3 . 4 5
36. The side effects of measles vaccine are worse than measles disease .......................................................... 1 . 2 . 3 . 4 5
37. There is a good possibility I will get measles in the next few months .......................................................... 1 . 2 . 3 . 4 5
38. I feel it is important to carry out activities which will improve my health .......................................................... 1 . 2 . 3 . 4 5
39. I have regular health check-ups even when I am not sick .......................................................... 1 . 2 . 3 . 4 5
40. My doctor recommended that I receive measles immunization .......................................................... 1 . 2 . 3 . 4 5
41. The measles immunization clinics were held at inconvenient times .......................................................... 1 . 2 . 3 . 4 5
42. I eat well-balanced meals .......................................................... 1 . 2 . 3 . 4 5
43. I have accurate knowledge about measles .......................................................... 1 . 2 . 3 . 4 5
44. I know someone who had measles .......................................................... 1 . 2 . 3 . 4 5

▲ Question #23 was deleted from the data analysis due to an error in its typing which was not detected before the questionnaire was mailed out. As question #23 was one of the five items designed to measure the variable of perceived benefits, four items were used in the data analysis for the variable of perceived benefits.
Directions: I also need to have some information about you. Please check the most appropriate answer or write in your answer.

How old are you? ___

Are you? female ___ male ___

Are you?
   ___a. Caucasian ___b. Oriental ___c. Indo-Canadian
   ___d. Black ___e. Native Indian
   ___f. Other (please specify): ____________________________

Faculty/department of study_________________________________________

Are you an undergraduate student? ___ OR a graduate student? ___

If you did not receive measles immunization during the 1997 SFU measles outbreak, what would it have taken for you to have been immunized?

Would you be willing to talk further about this over the telephone with the researcher?
   Yes ___ Phone number: ___________________ First name: _________________
   No ___

Your participation in this study is appreciated.

As my thanks to you, please enjoy a coffee!
November 13, 1997

Dear SFU Student:

Thank you for taking the time to complete and return the questionnaire for the Measles Study. There has been a very good response rate.

If you have not yet returned the completed questionnaire, I would really appreciate it if you could do so as soon as possible, as a postal strike may be upon us.

Once again, thank you for your participation in my thesis research.

Sincerely,

Karen Pielak
Nurse Epidemiologist, RN, BSN
Communicable Disease Epidemiology Services
B.C. Centre for Disease Control Society
Appendix E
The University of British Columbia
Behavioural Research Ethics Board
Certificate of Approval

Please refer to the next page to view the UBC Behavioural Research Ethics Board Certificate of Approval.
Appendix F
Simon Fraser University
Dean of Student Services and Registrar
Letter of Permission

Please refer to the next page to view the SFU Dean of Student Services and Registrar's letter of permission to access the addresses of the randomly selected sample of students who attended SFU in February 1997.