ALCOHOL ABUSE AND ITS RELATIONSHIP WITH POVERTY AND UNEMPLOYMENT: A STRUCTURAL EQUATION MODELLING APPROACH

BY

SHAILA KHAN

A Thesis
Submitted to the Faculty of Graduate Studies
in Partial Fulfilment of the Requirements
for the Degree of

DOCTOR OF PHILOSOPHY

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Abstract

Poverty and unemployment lead to psychological stress, which results in increased alcohol abuse. Numerous studies including both cross-sectional and longitudinal designs conducted in different countries have focused on finding a relationship between unemployment and alcohol consumption. Contradictory results have been found. The researchers have not agreed on whether unemployment increases, decreases, or does not alter drinking behaviour. Most previous researchers have used correlational methods predominantly based on male samples, and measured only alcohol consumption to denote alcohol abuse. No causal relationship between unemployment and alcohol abuse was established.

The present study investigated the relationship of alcohol abuse with poverty and unemployment aiming to find a causal path between them. Other criterion measures of alcohol abuse (i.e., alcohol problems and alcohol dependence) in addition to alcohol consumption were used in a sample with equal representation of men and women. Poverty was used as an independent latent variable measured by income, number of family members, education level and employment status. The latent variables of alcohol use (measured by daily ethanol consumption averaged over a week, and drinking patterns of heavy drinking occasions and maximum drinks at a sitting), alcohol problems (measured by eight social and physical problem types), and alcohol dependence (measured by DIS-III-R, SADD and MAST scales) were considered to be dependent variables.

Two models were tested using a random sample of longitudinal data (N=1257) of community residents collected in 1989 (Wave 1) and 1991 (Wave 2) by the Winnipeg Health and Drinking Survey (WHDS), (Murray, Barnes, & Patton, 1994). Model 1 hypothesized a causal relationship between poverty, alcohol use, alcohol problems and alcohol dependence in the cross-sectional data. Model 2 hypothesized an increase in alcohol use with recent unemployment and a decrease with longer unemployment. This model also tested the longitudinal effects of the hypotheses of Model 1. The models and their variants were tested using structural equation modelling (SEM). Version 5.0 of the EQS program developed by Bentler (1995) was used for this purpose. In the secondary analysis, both of these models were tested separately on gender groups (men and women) and on age groups (younger, middle age, and older) with both Wave 1 and Wave 2 data.

The results indicate that in a cross-sectional sample, (1) increased poverty causes alcohol use and alcohol problems to increase, and (2) increased alcohol use causes increased alcohol problems and increased alcohol dependence. Results from longitudinal analysis suggest that (1) recent unemployment decreases alcohol use while longer unemployment increases it, (2) prolonged poverty increases alcohol use and, there is indirect support that prolonged poverty causes increased alcohol problems, (3) prolonged alcohol use causes increased poverty, increased alcohol problems and increased alcohol dependence. Results from the secondary analysis indicate that alcohol use, alcohol problems and alcohol dependence are more prevalent in men and in younger age group. A number of recommendations were made suggesting improvement in the model and need for further study.

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INTRODUCTION

The misuse of alcohol that results in problems or disabilities is referred to as alcohol abuse. The nature of what is characterized to be a problem is, however, dependent on the perspective of the study. From a psychological point of view, a problem is associated with personality or developmental propensities to tolerance for and dependence on alcohol, and loss of control while drinking. The relevant criteria of a problem from a medical perspective are signs of an altered reaction to alcohol, and disturbances in the individual's mental or somatic function demonstrable by clinical-physical or laboratory methods. From a social perspective, a problem due to alcohol abuse is said to have occurred when a person consumes alcohol in an amount unaccepted by social norms; or at an inappropriate time and situation; or which renders the individual to be unaware of his/her own well-being as well as the well-being of others. These problems particularly affect the employment and family life of the individual. The social perspective of problems of misuse of alcohol is considered in the present study.

The persistent problem of alcohol abuse in present society has drawn both public and scientific attention. The widespread notion that views alcohol abuse as forms of *disease* is no longer accepted. Rather, the abuser is considered as an active participant in the addiction process. Individual life-styles and personality features are thought to play important roles in the development of this addictive disorder. Each person belongs to his/her own subgroup which exposes him/her to experience different interpersonal relationships. This leads the individual to participate in a unique way in the socio-cultural environment. Depending upon the situations, different social roles and experiences can be seen as significant influences in the development of alcohol abuse. In a general sense, the North American culture is dependent on alcohol as a social lubricant and as a means of reducing tension. Numerous investigators have pointed to the role of physiological and psychological factors in the high rate of alcohol abuse and dependence among North Americans.

Various theories regarding the social causes of alcohol abuse have been developed but none has yet a complete answer as to why the disorder occurs. An in-depth knowledge of such causes is required to deal with the resulting problems effectively. It is important to identify the social problems faced by alcohol abusers in their daily lives. *Poverty* and *unemployment* are such problems which impose a constrained financial and psychological state on an individual and are believed to be potential factors affecting alcohol abuse.

Poverty is generally defined as the absence of financial resources available to an individual. Traditionally, the degree of poverty is used to classify individuals into lower, middle, or higher socio-economic classes. A poor person belongs to the lower socio-economic class and is subjected to a whole array of financial adversities including difficulties in affording basic necessities for self and the family. Such individuals are inevitably under a tremendous amount of psychological stress imposed by the miseries of life. They have less earning, hold low paying jobs or are unemployed, have constrained access to stress coping programs, and usually have less educational training. Thus, poverty signifies lack of resources on two fronts, financial and psychological.

For the poor, the lack of financial resources is self evident. On the other hand, a lack of psychological resources available to individuals under a higher degree of poverty is indirect in nature and is evident in their inability to deal with stress, the strategies adopted by them to cope with added stress, and their access to different programs. Lower or no educational training, a poor living environment, and usually unhealthy family life make these individuals vulnerable to different forms of abusive behaviour to deal with added stress. The social acceptance of alcohol as a tension reducing substance enhances the likelihood of the poor to become alcohol abusers.

Poverty brings economic hardship and renders alcohol to be less affordable. On the other hand, it induces enough stress to make a person vulnerable to more alcohol use, and eventually to alcohol abuse, in order to cope with the stress. Whether poverty increases or decreases alcohol use and abuse depends on other resources available to an individual and thus, has to be investigated further. It is likely that the simultaneous effect of factors including financial and psychological states, level of education and employment status of the individual determine the degree of alcohol abuse.

Unemployment, primarily an economic misfortune, can be defined as the absence of jobs for all who want them. The negative impact of losing one's job and being unable to find suitable employment has been common in the last decade. In almost any community one can find workers who have been laid off from jobs they had held for many years and who are facing the end of their unemployment compensation. Canada has experienced a high rate of unemployment among working age people in recent years. Accompanying the increase in unemployment was an increase in people suffering poverty.

A high rate of unemployment is usually followed by recession and inflation. These may be the sources of chronic anxiety for many people. Unemployment places a burden on a sizeable segment of population, and brings both financial hardships and self-devaluation. In fact, unemployment can be as debilitating psychologically as it is financially. Periods of extensive unemployment are typically accompanied by increases in certain types of maladaptive behaviour, such as alcohol abuse, depression, suicide, and crime. Those who are living at poverty level and are already handicapped by low education, poor nutrition, broken or unstable families, inadequate housing, feelings of helplessness, and a sense of rejection by the larger affluent society, are seriously affected by unemployment.

The mere event of becoming unemployed for a short or a long period of time can have a detrimental effect on an individual's mental well-being. At the same time, it imposes financial constraints on an individual. An unemployed person is disconnected from various social networks, which ultimately results in social isolation. With prolonged unemployment, social isolation may gradually become acute.

The long-range psychological consequences of this situation are extensive and stressful. Each person has to adapt to the situation in one way or another. Some people can deal with setbacks and can adapt without suffering long-range adjustment difficulties once the initial stressful situation has ended. For others, however, unemployment can have serious long-term effects. The impact of chronic unemployment on an individual's self-concept, sense of worth, and feeling of belongingness is shattering.

However, the extent of the effect of job loss depends upon the personal resources available to the individual. The sense of control is one of the most important personal resources that has been shown to be a critical mediator of the impact of such external stressors. In addition to an individual's personal characteristics there are additional cultural and social factors which have their own effects on the process. If a person is more committed to work it could be more strenuous for him or her to adapt to the process. Managing the stress associated with unemployment requires great coping strength, especially for people who have previously earned an adequate living.

An unemployed individual with inadequate personal and coping resources may start drinking an excessive amount to deal with the resulting stress. The vulnerability of our population's lower socio-economic segment to unemployment helps explain why this segment contributes a disproportionately high number of individuals who drink excessively. An excessive drinker usually suffers from chronic fatigue, oversensitivity and depression. This general personality disorganization and deterioration may be reflected in unemployment. Because of the associated impairment in judgement, an alcohol abuser may be unable to hold a job and generally becomes unqualified to cope with new demands that arise.

Numerous studies have been conducted in different countries focussing on the relationship between unemployment and alcohol use. The findings were inconsistent and each of the following conclusions has been supported: (1) unemployment increases alcohol use and abuse; (2) unemployment reduces alcohol use and abuse; (3) unemployment does not alter drinking behaviour; and (4) unemployment has all the above listed consequences.

The contradictory results obtained in both longitudinal and cross-sectional studies may be due to various factors. The target population and the selection of variables differ from one study to another. There may also be various mediating factors which affect the relationship between unemployment and drinking habits. It is plausible that under particular conditions some individuals increase alcohol use following unemployment. However, this is not the general pattern. For example, the financial constraint imposed by prolonged unemployment can reach a point where the individual may be forced to reduce alcohol use. The conclusion which has received strongest support in existing studies is that unemployment increases alcohol use and abuse among heavy drinkers.

Perhaps the most notable factor in obtaining this contradictory result is the lack of consensus among researchers on the measurement of alcohol abuse. This originates from the difficulty of having a complete definition of this complex construct, and a general disagreement associated with the perspective of such a definition. It should be noted that *consumption of alcohol* taken alone does not adequately describe the problem of alcohol abuse. Since alcohol abuse is the end result of the simultaneous interactions of a number of variables, these should be studied together.

It is likely that the relationship between alcohol abuse and unemployment is different for different gender and age groups, and for different education levels. Past research have demonstrated such variations. However, these variations were not well represented in some of the previous studies. It is also plausible that the relationship between unemployment and alcohol abuse is time-dependent. Not all previous studies considered such dependency in the relationship (i.e., some were cross-sectional and some longitudinal). In addition, a reduction in alcohol use associated with job loss may simply be due to the deteriorated economic situation. On the other hand, an increase of alcohol use may be due to unlimited spare time and related boredom, lack of control and unstructured use of one's time.

There is evidence in the literature that unemployment causes alcohol abuse. Also, there are studies that have shown alcohol abuse to be one of the causes of unemployment and poverty. Thus, the issue of direction of causality between unemployment and alcohol abuse is unresolved. Three hypotheses have been presented: (1) alcohol disorder results in job loss (drift hypothesis), (2) unemployment results in increased levels of alcohol use (social causation hypothesis), and (3) the relationship between job loss and alcohol use is a reciprocal process, and therefore, both alcohol abuse and unemployment can be viewed as causal factors (reciprocal causation hypothesis). The contradictory findings regarding the relationship between unemployment and drinking behaviour may suggest that the reciprocal causation hypothesis reflects reality most accurately. Further studies are therefore needed to investigate the cause and effect variables of alcohol abuse in the social context of the problem.

The present study aims at the objective of development of a model as a framework within which at least some of the major classes of influence upon alcohol abuse can be conceptualized. The model is essentially a collection of hypotheses organized around the central idea that poverty and unemployment acts as stressors resulting in alcohol abuse. The levels of such abuse are moderated by individuals through their personal resources.

The present study investigates the interrelations between alcohol abuse, poverty and unemployment. Poverty is formed as a latent variable measured by family income (corrected for members in the household), education level and employment status. Instead of taking *alcohol consumption* as the only measure, three different aspects of alcohol abuse, namely, alcohol use measured by amount and pattern of consumption, alcohol problems measured by various physical and social alcohol-related problems, and alcohol dependency measured by three standard scales are used. The basic premise is that drinking related to unemployment increases along with problems and dependency only if there are no financial constraints. In such cases of increase of alcohol abuse subsequent to unemployment, a stress reduction mechanism may be in effect. On the other hand, a deteriorated economic situation may lead to a decrease in alcohol abuse. An increase in alcohol consumption among unemployed and economically disadvantaged individuals may be explained by the fact that, overriding family income and the price of alcohol, social structural factors have greater importance for alcohol use and abuse.

As postulated in the proposed models of this study, the hypotheses are testable through the use of structure equation modelling (SEM) that permits casual analysis of covariances of variables of cross-sectional and longitudinal data sets. The power of SEM lies in its ability to estimate the simultaneous influence of many variables. Thus, it is possible to investigate both direct and indirect influences of different variables upon alcohol abuse.

The present study will take into account individual alcohol consumption among the Winnipeg Health and Drinking Survey (WHDS) participants, including both economic (income) and social indicators (employment and education status). This approach will allow for the consideration of the *net* impact that any particular social or economic indicator has on alcohol abuse. Longitudinal data with a sample interval of two years will be considered. The results will help to design and implement preventive measures against the alcohol abuse of some of the most vulnerable segments of our society.

Literature Review

The literature consulted for this study can be divided into six main parts. The first part deals with the research that has been devoted to the definition of alcohol abuse. This part provides a review of different opinions leading to general disagreement in the evolution of the term.

The second part discusses the research on different causes and theories of alcohol abuse. This includes the biological, psychological and socio-cultural factors governing alcohol use and abuse in an individual.

The third part of the review describes unemployment and its effects as a stressor contributing to the use and abuse of alcohol. Following this, the empirical and theoretical approaches to establish alcohol as a means of coping with stress in general population, particularly in unemployed individuals, are presented. Past research on the relationship between unemployment and alcohol abuse is discussed. Four different conclusions (i.e., unemployment increases alcohol abuse, unemployment decreases alcohol abuse, there is no change in alcohol use with unemployment, and there is no definitive relationship) drawn by the past research are presented in sequence. Limitations of the past research methodology and interpretations of the results are also discussed here.

The fourth part provides a discussion of previous studies on the problem of alcohol abuse and its relationship with poverty (and income). Studies on how other variables mediate the effects of poverty (or income) on alcohol abuse are also presented.

The fifth part describes the research on the effects of the demographic variables of gender and age on alcohol abuse. The differences between segments of population grouped according to these variables are presented.

Finally, a summary is presented of the findings most relevant to the research described in this report. Following this, the need for present research and its objectives are included. A set of hypotheses are presented that are aimed at improving the specificity of the relationship between alcohol abuse, unemployment and poverty. A method of simultaneous analysis of interrelated variables relevant to the problem at hand is also presented. The advantages of the proposed method relative to those adopted by previous studies, and the use of the method in psychology are also discussed. Reasons for using WHDS data are also provided.

Definitions of Alcohol Abuse

Attempts to define alcohol abuse have long been marked by uncertainty, inconsistency and conflict. For example, there is a general disagreement among alcohol epidemiologists about what they are measuring. None of the existing definitions of alcohol abuse has either entirely succeeded in expressing clearly what is meant by the term or described objectively the drinking behaviour of all alcoholics. The most plausible explanation of this difficulty is the great variability of the manifestations of alcohol consumption. It is perhaps more useful to define these various manifestations separately rather than to attempt to describe them as a single entity (Whitehead, Grindstaff & Boydell, 1973).

The definitions of disorders related to alcohol use have evolved over time from those of *alcoholism* to alcohol *abuse* and *dependence*. The diversity of the nature of related studies demanded the inclusion of more and more criteria to describe the disorders contributing to such an evolution. Simultaneously, with the progress that has been occurring in the social sciences, the perception by society in general and by researchers in particular, towards the problem has appreciably changed. This progress, and the availability of more information have imposed some restrictions on the use of terms assigned to the description of the cause or nature of the problem. For example, qualifying the disorder as a *disease* may not be acceptable to some regardless of its clinical or social connotation. To some, use of such terms is tantamount to prefixing the notion of social values and/or moral positions of the persons having such problems. Therefore, the terms used to describe the problem in question have also been diverse.

The interdependency of the social, psychological and clinical aspects of the disorder makes it necessary to present a comprehensive definition. At the same time, the presence of such an interdependency and, perhaps overlaps between variables, and associated contradictions in terminology, makes such an attempt difficult. The successive development of different criteria for either research or diagnosis has defined and redefined the problem itself.

Alcohol epidemiology started with the review article of Berry (1940) which linked driver intoxication with motor vehicle accidents, and the analysis by Schmidt (1940) of the relationship between alcoholism and mortality in the United States. At one time alcoholism was viewed primarily as a manifestation of immorality or a basic lack of will power. Some described alcoholism as a form of self indulgence or perverseness. In different definitions, alcoholism has been conceptualized as an *illness*; as a *chronic behaviour disorder*; as a *dependence on ethanol*; and as a *psycho-social physiological disorder*. With this broad range of characteristics, the only area in which there is an agreement has been the separation of *alcoholism* from other drinking related problems (Smith & Hanham, 1982).

Alcoholism refers to compulsive drinking of alcohol leading to physical and psychological addiction. The term implies, at minimum, a loss of control over the intake of alcohol or an inability to stop drinking (Olson & Gerstein, 1985). Definitions and diagnostic criteria vary beyond this core element, but they generally refer to the quantities of alcohol consumed, the recurrence of physical states such as blackouts, habits such as morning drinking or binge drinking, disruptions of life such as job absenteeism or arrest, and tolerance or withdrawal symptoms.

A definition of alcoholism should contain at least two components: the consumption of alcohol, and the damage resulting from it. Whitehead et al. (1973) defined alcoholism as any use of alcoholic beverages that causes any damage to the individual or society or both. The definition of alcoholism at least in part rests on consequences of drinking that are possible but uncertain. When a person regularly consumes alcohol the term *habituation* can be applied. Those persons who are termed abusers in a social sense may also fulfil the medical criteria. However, not all alcoholics in the medical sense are abusers from the social point of view (Bjurulf, Sternby & Wistedt, 1971). When the medical symptoms are present the condition may be characterized as biological addiction.

When mental and/or somatic disturbances have developed the condition is often termed as *chronic alcoholism* (Cull & Hardy, 1974).

There are many problems occurring with heavy drinking which are not so pervasive and damaging as alcoholism. In this regard, two other terms namely, *alcohol-related disabilities* (NIAAA, 1981) and *problem drinking* (NIAAA, 1978) are popularly used. When there are impairments in physical, mental or social functioning due to excessive alcohol consumption, disabilities are said to have occurred (Edwards, Gross, Keller et al., 1977). People experiencing such impairments are not necessarily alcoholics, but they have a high risk of becoming alcohol dependent. A problem drinker is a person who drinks alcohol in such a fashion that he/she faces some problems, but in most cases, he/she has learned to function with minor social upheavals and occasional physical symptoms.

Drinking problems can be identified empirically from scores of the dimensions: heavy alcohol consumption - the quantity of alcohol consumption per month; alcohol dependence - physical dependence and loss of control, measured by presence of 12 behavioural syndromes (e.g., skipping meals when drinking, sneak drinking, morning drinking, pre-party drinking, gulping drinks); and adverse social effects - negative consequences of drinking in four areas such as social relationships, problems with the police, automobile and other accidents and problems at work (NIAAA, 1981).

Recent Definitions

The diagnostic use of the term alcoholism is over-inclusive and dependent on the value-laden concept of disease. To overcome this, the alcohol dependence syndrome was introduced by Edwards & Gross (1976). This concept is based on the more specific formulation that an occurrence of a clinical phenomenon distinct from (but not mutually exclusive of) alcohol related disabilities is recognizable and quantifiable. The alcohol dependence syndrome is characterized by narrowing of the drinking repertoire, salience of drink-seeking behaviour, increased tolerance, repeated withdrawal symptoms, relief and avoidance of withdrawal symptoms, subjective awareness of a compulsion to drink, and reinstatement (of drinking) after abstinence. The Diagnostic and Statistical Manual of Mental Disorders, Third Edition (DSM-III) of the American Psychiatric Association (1980) using this criterion divided alcoholism into *alcohol abuse* and *alcohol dependence*. The alcohol abuse category contained the social aspects of the problem while the alcohol dependence category contained the clinical aspect. This division was subsequently challenged by researchers on the ground that the term *abuse* contained many symptoms ordinarily considered to indicate dependence. To accommodate this criticism, a revision was made and *alcohol use disorder* was used. Alcohol abuse became a residual category. Before the publication of DSM-III-R (1987), the abandonment of *abuse* was challenged by the researchers and the term stayed in the revised edition. The DSM-III-R (1987) and the International Classification of Diseases Ninth Revision (ICD-9) (WHO, 1978) have emphasized the concept of *alcohol dependence* of Edwards & Gross (1976). The classification, like DSM-III-R (1987), is based on the concepts of dependence that were formulated by a WHO working party on alcohol disabilities (Edwards et al., 1977). Both the DSM-III-R (1987) and the 10th revision of the ICD include, in addition to alcohol dependence syndrome, criteria referring to persistent drinking despite adverse consequences. The DSM-III-R (1987) allows in practice sub-typing of alcohol dependence into three grades of severity. The DSM-IV (1994) was not available at the time the WHDS Wave 1 (initial) and Wave 2 (two-year follow-up) data were collected.

The DSM and ICD formulations have been criticized as superficial (Tarter, Moss, Arria et al., 1992). Neither classification was, however, intended to provide detailed assessment of patients. Both sets of criteria paved the way for more subtle instruments to measure substance use features (Ustuin & Wittchen, 1992). For example, the Alcohol Use Inventory (Addiction Severity Index), which comprises a carefully structured interview, can be employed in clinical practice to determine the severity of dysfunction (Grisson & Bragg, 1991). The Composite International Diagnostic Interview (CIDI) is an assessment instrument which has been tested internationally and found to possess a high level of reliability for disorders encountered by psychiatrists, including those associated with substance use (Cottler, Robins, Grant et al., 1991; Wittchen, Robins, Cottler et al., 1991). In addition to the alcohol dependence syndrome which aims to focus on evidence of physical dependence, the DSM-III (1980) definition also includes indicators of social dysfunction and heavy drinking. A report of a very high correlation between DSM-III-R (1987) and an early version of ICD-10 (Caetano, 1990) was not completely supported by an international study (Cottler et al., 1991). The latter research noted that the DSM schedule labelled more individuals as alcohol dependent. The Diagnostic Interview Schedule Version III Revised (DIS-III-R) (Robins, Helzer, Cottler et al., 1989) classifies alcoholics according to the diagnostic criteria of DSM-III-R (1987).

In the present study, alcohol abuse is viewed from a social perspective, and has been defined as a combination of alcohol consumption, alcohol dependency, and problems due to excessive drinking. Quantity of alcohol consumption has been measured by amount of ethanol consumption per day. Alcohol consumption by regular drinking, heavy drinking and by maximum drinking in one sitting have been considered separately. The criteria for measuring alcohol dependence includes DIS-III-R and two other measures. These are Short form of Alcohol Dependence Data Scale (SADD) and Michigan Alcoholism Screening Test (MAST). Problems due to drinking includes eight problems (e.g., problems due to binge drinking, spouse's complain, accidents; problems with controlling drinking, drinking symptoms, police, health and problems at work).

Defining alcohol abuse in this way serves two purposes. First, this definition attempts to incorporate all social aspects of alcohol abuse including the drinking pattern of the individual, and his/her behaviour resulting from excessive drinking. Second, it allows for a simultaneous consideration of the *three* separate but important characteristic components of alcohol abuse. Thus, it is recognized that although alcohol consumption is a prerequisite to alcohol abuse, consumption by itself does not necessarily constitute alcohol abuse. Other aspects of the phenomenon should be considered together with alcohol consumption.

The following discussion on the causes of alcohol abuse is derived from the available literature. The apparent variations in the theories are predominantly the reflections of the researchers' emphasis on specific aspect(s) of the problem and its stage of development.

Causes of Alcohol Abuse

Identifying causes of alcohol abuse is made difficult by the fact that the phenomenon is the result of a complex interaction of many variables. At the same time, the behaviour of an abuser and its causes are dependent on the stages of development of abuse. Another problem in the search for causal factors of alcohol abuse is to determine whether the behaviour under study is antecedent to drinking or caused by it. One approach to understanding the precursors is to study the behaviour of individuals who are at high risk for alcohol abuse but who are not yet affected by it. Accordingly, investigators have been interested in issues of differential vulnerability and the basis for the cluster of behavioural symptoms that are now grouped under the diagnosis of alcohol dependence in DSM-III-R (1987). They are also interested in the factors that could contribute to the likelihood of relapse after detoxification.

To identify the causes of addictive drinking, some researchers have stressed the role of psychological factors; some pointed to socio-cultural factors; while others have emphasized on genetic and biochemical factors. While these three groups of factors can interact with each other in complicated ways, certain known causes are specially related to each. The view of problem drinking as a maladaptive pattern of adjustment to the stress of life, points to psychological factors -such as psychological vulnerability, stress, and the desire for tension reduction. Although the existence of an *alcoholic personality type* is not well-established, personality factors apparently play a role in the development and expression of addictive disorders. The socio-cultural factors may predispose individuals to alcohol abuse. Possible social causal factors in alcohol abuse include the existence of a so-called *alcohol culture* which approves excessive drinking, and the affordability and availability of alcohol (which basically reflects income capacity) as a tension reducer. Marital and other relationships are also seen as important etiologic elements in alcohol-use disorders. Finally, although the data are not conclusive, it appears that genetic diathesis along with other biological factors, such as metabolic rates and sensitivity to alcohol may play some role in causing susceptibility. A committee of experts from the National Academy of Sciences (Institute of Medicine, 1990, reported in Carson & Butcher, 1992) recently concluded that identifying a single cause for all types of alcohol problems is unlikely.

Based on the above three groups of factors, several theories of alcohol use or abuse and alcoholism have emerged over time (see Chaudron & Wilkinson, 1988). Some of these theories are discussed below.

Theories Based on Psychological Factors

Some of the theories that are based on psychological factors of alcohol are: social learning theory, personality theory, psychoanalytic theory, classical conditioning theory, and self-awareness theory.

Social learning theory. Social learning theory of Bandura (1969; 1977), provides a comprehensive analysis of psychological principles that govern the development, maintenance, and modifications of human behaviour. Identification of the psychological determinants of behaviour and the mechanisms by which these determinants have their effects, are the major focus of this theory. The analysis of how a formerly neutral stimulus elicits anxiety when paired with an aversive experience consists of two major processes.

The first involves learning a predictive relationship between two stimuli from the experience with environmental events. The second involves a self arousal process (consciously generating anticipatory feeling) in response to an antecedent event. This theory views behaviour to be largely a function of response consequences where these consequences *do not* shape behaviour automatically (i.e., in a mechanistic manner). The influence of environmental events on behaviour is determined by cognitive processes based on prior experiences. Thus, this theory emphasizes the importance of person's active cognitive appraisal of environmental events.

A wide range of normal and abnormal behaviour has been conceptualized in light of social learning theory over the years. Alcohol use and abuse is such a behaviour which has been explained by this theory. The role of alcohol in avoiding problems and in the induction of a positive and relaxed state is the main focus in this explanation. All drinking is considered to be along a continuum from normal to abnormal and is explained by a common pool of psychological principles. Modelling (learning from others) and social reinforcement are important factors in the development and maintenance of the problem. Social learning variables are reflected in the cultural norms that define the learning contingencies governing alcohol consumption. The influence of cultural modes on drinking pattern is acknowledged.

Research inspired by social learning theory on the determinants of alcohol consumption has established that drinking is heavily influenced by different psychological variables. These include: antecedent environmental cues (which through classical conditioning may invoke the urge to drink); the behavioural consequences of drinking (which may act as positively or negatively reinforcing, or as punishing stimuli); vicarious learning (in which the person models the drinking behaviour of others); person variables (e.g., social skills or competency in coping with inter-personal conflict); self-regulatory process, and cognitive factors (e.g., learned expectations). The diverse and complex influences of these variables can cause significant variations in the effects of alcohol consumption. The person's social learning history; his/her cognitive set (e.g., expectations or beliefs about alcohol's effects); and the physical and social setting in which drinking occurs influence alcohol consumption.

Alcohol's effect on tension or stress: The view that alcohol helps to deal with the stresses by screening out intolerable realities and enhancing the feelings of adequacy and worth makes common sense and as such is widely believed. Typical alcoholics are discontented with their lives and are unable or unwilling to tolerate tension and stress. Anyone who finds alcohol to be tension-reducing is in some danger of becoming an alcoholic (Carson & Butcher, 1992). Various studies (Brown, Goldman, Inn et al., 1980; Brown, 1985a; 1985b; Deardorff, Melges, Hout et al., 1975; Edwards, 1972) showed that outcome expectations of tension-reducing effects of alcohol are associated with or can predict problem drinking. These findings are in agreement with social learning theory in which anticipated consequences are viewed as determinants of behaviour. However, Carson & Butcher (1992) pointed out that if this were true, one would find problem drinking to be far more common than it is. Also, this view does not explain why some excessive drinkers are able to maintain control over their drinking and continue to function in society while others are not.

The notion that people drink to reduce tension is based on two assumptions: (a) that alcohol consumption reduces tension; and (b) that this effect motivates drinking. Supporting evidence in favour of the first assumption is not apparent. Cappell (1975) noted that any overview of the laboratory evidence on this topic must conclude that there is no consistent pattern of alcohol's effect on tension. Alcohol has been shown to increase, decrease, or have no affect on tension in human subjects (Wilson, 1982). These seemingly contradictory data are surprising *only if* it is assumed that there is an automatic, invariant relationship between alcohol and stress reduction. However, social learning theory emphasizes that such relationships are *not* automatic. Rather, the behaviour commonly attributed to alcohol is an outcome of a complex interaction between variables that determine the effects of alcohol on tension and other emotional states. Among these are the amount of alcohol consumed, the person's prior experience with alcohol, individual differences based on physiological responses to ethanol and specific social learning histories, learned expectations about alcohol and its effects, and social setting in which drinking occurs (Marlatt, 1987; Sher & Levenson, 1983; Wilson, 1982).

The second assumption that the tension reduction effect of alcohol motivates drinking is asserted to be one of the major reasons for drinking by both social and problem drinkers. Some studies provided strong support for the notion (Higgins & Marlatt, 1975; Hull & Young, 1983) while others failed to show significant results (Higgins & Marlatt, 1973). Marlatt, Kostum & Lang (1975) indicated that heavy drinkers, if provided with an alternative means of coping with a stress that is frequently associated with drinking, will reduce alcohol consumption. These findings suggest that drinking will increase only in those individuals who expect alcohol to reduce tension, and in the situations perceived to be stressful. Again, these findings are consistent with social learning theory which emphasizes on individual assessment and the role of situationally specific influences.

The question remains why an individual continues to drink in spite of the serious negative effects on physical health, psychological well-being, and social function. Social learning theory addresses it by specifying that the person desires and expects certain consequences extending from the reduction of aversive states to the attainment of positive states (Brown, 1985a; 1985b; Marlatt, 1987; Southwick, Steele, Marlatt, et al., 1981).

Alcohol Expectancy: Beliefs about the effects of alcohol are referred to as the *alcohol expectancies*, and are likely to influence the use of alcohol to cope with negative emotions. One must first believe that alcohol reduces unpleasant emotions before using it instrumentally to regulate or reduce negative effect. Early research identified six dimensions of positive expectancies (Brown et al., 1980). Two of these were highly general indicating that alcohol is capable of *magically* transforming or enhancing a broad range of physical and social experiences. The other four are expectations for sexual enhancement, increased power and aggression, increased social assertiveness, and tension reduction. Rohsenow (1983) included two additional dimensions reflecting expectancies for the negative effects of alcohol, in particular for performance impairment and irresponsibility.

Expectancy patterns have successfully predicted drinking behaviour at all points along the continuum of drinking. It predicted subsequent patterns and levels of consumption as well as the onset of problem drinking at one and two year follow-ups among 12-14 year olds (Roehling, Smith, Goldman et al., 1987; Smith, Roehling, Christiansen et al., 1986). Among adolescent, college, and adult populations, the strength and pattern of alcohol expectancies discriminated between light and heavy drinkers, at risk and control groups, and problem and non-problem drinkers. Finally, expectancies have predicted relapse among groups of treated alcoholics (Brown, 1985a).

Experimental studies using the balanced placebo design provide further evidence that expectancies may significantly influence alcohol consumption. There is compelling evidence that expectancies precede the onset of drinking and drinking problems (Roehling et al., 1987; Smith et al., 1986). Collectively these data strongly suggest that expectancies may play a causal role in the development of alcohol abuse. However, expectations about the presumed reinforcing effects of alcohol do not have to be veridical in order to influence behaviour. They may be as powerful as actual reinforcement (Bandura, 1977). This desire for reinforcement is labelled by the alcoholic as craving for alcohol.

Healthy drinkers differ from abusive drinkers in their ability to cope with the demands of everyday life and in their beliefs about alcohol (Abrams & Niaura, 1987). According to this perspective, positive expectancies about the effect of alcohol and a deficiency in more adaptive coping skills operate independently and jointly to promote the use of drinking as a coping mechanism. Those who rely on alcohol to cope may tend to be heavier drinkers, and, over time, increase the risk of alcohol abuse (Farber, Khavari, Douglass, 1980; Mulford, 1983; Parry, Cisin, Balter et al., 1974).

Drinking to cope: The use of alcohol to escape, avoid, or otherwise regulate unpleasant emotions is defined as drinking to cope (Cooper, Russell & George, 1988).

Research that examined motives for drinking consistently revealed that a substantial percentage of drinkers (10%-25%), report drinking to regulate negative emotions (Cahalan, Cisin & Crossley, 1969; Mulford & Miller, 1963). The use of alcohol to cope with stressful situations was also found to be related to post treatment relapse. Over three-quarters of Marlatt & Gordon's (1979) sample of relapsed alcoholics reported taking their first drink while facing either an unpleasant emotional state or social pressure to resume drinking. These data provide clear support for the conceptualization of drinking as a coping response in stressful situations. They also support the idea that individuals who rely on drinking to cope are at increased risk for drinking heavily and developing problems indicative of abusive syndromes (Cooper et al., 1988).

General coping skills: Social learning theorists consider general coping skills to be critical in determining the decision to drink, and whether drinking will be normal or maladaptive (Abrams & Niaura, 1987). Thus, alcohol use is conceptualized as a general coping mechanism involved in situations where other coping responses are either unavailable or unused.

There are individual differences in coping mechanisms (Cahalan et al., 1969). People who rely mostly on others in time of stress, would use alcohol to reduce stress when there is a lack of social support. Those who rely primarily on alcohol, tobacco and medication to cope with stress, will be consistently dependent on alcohol and would show chronic symptoms. People who organize their environment to cope with stress (e.g., self-reliant people) through their own resources, are least likely to use alcohol to release their stress.

Research with alcoholic populations found a relationship between general coping skills and patterns of abusive drinking. Relapsed alcoholics were discriminated from recovered alcoholics and matched community controls by their use of *avoidance coping strategies* in response to a recently experienced stressful event (Billings & Moos, 1983). The balance of positive and negative coping strategies was found to be the strongest predictor of abstinence among a group of treated alcoholics at a 2-year follow-up (Cronkite & Moos, 1984).

The use of prayer or other religious means of coping has been related both to patterns of consumption and reliance on alcohol to cope (Stone, Lennox & Neale, 1985; Timmer, Veroff & Colten, 1985). Seeking support and avoidance coping have also been related to drinking to cope as negative and positive predictors respectively (Timmer et al., 1985). Finally, low self-esteem, which is suggestive of low level of coping resources has also been related to drinking to cope (Pearlin & Radabaugh, 1976).

Self-awareness Model: Hull (1981) proposed that alcohol *disinhibits* social behaviours by virtue of reducing an individual's level of self-awareness. This self-awareness model of alcohol use and abuse is based on experimental social psychology and hence, on the same discipline as social learning theory. Hull & Young (1983) found high self-conscious subjects who had received failure feedback to drink significantly more than those who received success feedback. This result supports the proposition that alcohol is consumed as a function of self consciousness and the quality of personal performance.

Although this model is similar to the tension reduction theory of alcohol's effects, Hull (1981), points out that alcohol does not reduce tension directly. Rather, it serves to reduce awareness of a potential source of tension and thus, it's primary personal effects are cognitive and not affective-motivational. An advantage of this model is that it recognizes individual differences (self consciousness) that might moderate alcohol's stress reducing function.

Recognizing the overlaps between Hull's self-awareness theory and social learning theory, Wilson (1988) argued in favour of the later because of its comprehensiveness, usefulness in practical sense and broader application to the self-regulation of behaviours. Thus, one can conclude that social learning theory provides a powerful framework for devising behaviour change strategies, and that the social learning approach captures the richness and uniqueness of individuals.

Classical conditioning. Classical conditioning provides a model to account for the effects of drug-associated stimuli in three alcohol-related phenomena: (a) preferences and aversions for alcohol, (b) alcohol tolerance and craving, and (c) withdrawal (Sherman, Jorenby & Baker, 1988). Although the principles involved may explain how alcohol can provide an initially neutral stimuli with these effects, they do not account for the factors that provide the context of such learning. Social factors, or expectations of drug effects, are clearly better models for describing the genesis of drinking. Drinking is co-determined by other motivationally significant conditions (including instrumental or operant contingencies) although classically conditioned responses may set the stage for drinking. Once drinking occurs, only then does the opportunity for Pavlovian learning arise.

Psychoanalytic theory. Drinking is initiated by a desire for its pleasure effects, and for some people it becomes a repetitive and a self-destructive behaviour. It is a behaviour with special relevance for psychoanalytic theory and therapy since there is a transition from pleasure to pathology (Barry, 1988). The theory considers disturbances of personality as sources of subsequent pathological behaviour of excessive drinking. Two contrasting explanations of drinking are consistent. First, the individual finds alcohol intoxication to be pleasurable, and thus continues to drink even when the effect becomes destructive. The pleasurable effect is not a direct sensuous satisfaction but a relief from anxieties and conflicts. Second, the individual is deficient in avoiding the painful consequences of drinking. This is generally attributed to a self-destructive motive, which counteracts the normal, adaptive behaviour of seeking pleasure and avoiding distress.

Several applications of psychoanalytic theory are based on the *inhibitory* effects of alcohol. Alcohol intoxication is pleasurable because it temporarily relieves conflicts and thereby relieves anxiety or frustrations.

Personality theory. The concept that alcoholics have a unique personality structure which is both necessary and sufficient for drinking to occur is referred to as *alcoholic personality*, and flourished during the 1940's and 1950's (e.g., Landis, 1945; Levy, 1958; Machover & Puzzo, 1959). The term was designed to refer to the personality characteristics common in persons who later become alcoholics. However, authors often used the term to refer to the characteristics of alcoholic individuals seeking treatment. The characteristics of personality common in individuals during their pre-alcoholic period (who later on become alcoholic) and those during their periods of treatment (after they become alcoholics) may not be the same. The use of the same term to refer to both situations has caused confusion. Whether alcoholic personality causes alcoholism or is a consequence of it, thus, remained unclear.

To resolve this confusion, later authors (e.g., Barnes, 1979) suggested that alcoholic personality be differentiated into *pre-alcoholic personality* and *clinical alcoholic personality*. Personality characteristics shared by nonalcoholic individuals who later become alcoholics may be referred to as *pre-alcoholic personality*. On the other hand, the personality characteristics common in individuals who are either seeking treatment for alcoholism or meet the diagnostic criteria for alcoholism may be referred to as *clinical alcoholic personality*. Attempts to identify a distinctive personality organization that characterizes pre-alcoholics or clinical alcoholics have not been very successful. However, a number of different traits can be assigned to each of these groups. For example, personality characteristics often found in clinical alcoholics are stimulus augmenting, field dependence, weak ego and anxiety (Barnes, 1980). These individuals tend to be more dependent, passive, impulsive, sensation seeking, psychopathic and depressed (Cox, 1985). On the other hand, pre-alcoholics are more impulsive, nonconforming, independent (Cox, 1985), uncontrolled (Barnes, 1983), antisocial, active and aggressive (Williams, 1976). Young nonalcoholics who are at high risk of alcoholism are more aggressive, antisocial and impulsive than those who are at low risk (Sher, 1991).

Although the past research dealing with the personality correlates of drinkers found personality to be a significant contributor to the onset and development of excessive drinking, it is, however, difficult to assign specific personality characteristics to those who drink. Many people with similar characteristics do not become alcoholics, while others with dissimilar ones do. The only common characteristic to most problem drinkers is personal maladjustment. Personality may be as much a result as a cause of an alcoholic's dependence on alcohol. The current view, however, is that various personality dimensions interact with biological, environmental, and other psychological factors to cause excessive drinking (Cox, 1988). There is evidence of a genetic basis of personality (e.g., Jang, Livesley & Vernon, 1996) which should also be looked into in order to identify specific personality characteristics of alcoholics.

Using the basis of family history of alcoholism to define risk of alcoholism, Martin & Sher (1994) found that familial risk of alcoholism was positively associated with openness and negatively associated with conscientiousness. This suggests that individuals with familial risk of alcohol use disorders have a tendency toward higher level of callousness, nonconformity, hedonism, more difficulty delaying gratification and stronger interest in sensual and sexual experience (McCrae & Costa, 1987). They are more unconventional, more willing to consider novel ideas, and are sensitive to their own emotional experiences. Martin & Sher (1994) also reported that alcohol use disorders were positively associated with neuroticism and negatively associated with agreeableness and conscientiousness, suggesting a tendency to experience higher levels negative affective states (e.g., anger, anxiety, disgust and sadness), and to experience more difficulty in coping with stress. Higher levels of egocentrism, mistrustfulness, nonconformity, impulsivity and uncooperativeness are also suggested by this pattern of traits (McCrae & Costa, 1987).

The *personalty/motivational* analysis of alcohol consumption developed by Cox & Klinger (1988) considers three categories of variables that determine an individual's decision to drink or not to drink at any particular moment in time. These are: biochemical reactivity to alcohol, personality characteristics, and socio-cultural/environmental factors. Each of these variables acts to promote drinking or not drinking. People who use alcohol habitually develop conditioned appetitive reactions to alcohol, which in turn increases the likelihood of current *affirmative* decisions about drinking. Of the two current variables that influence such decisions, the first includes situational factors related to the availability of alcohol and the degree to which the situation and the environment promote drinking. The second is the strength of current positive and negative affect, which are determined by the quantity and quality of their current incentives and their expectations of acquiring or losing social incentives in the future. Historical (and current) factors give rise to cognitive mediating events that lead to specific expectancies about the effects that drinking will have on affect. The ultimate decision to drink or not to drink is made on the basis of whether the expected positive affective consequences of drinking outweigh those of not drinking.

Theories Based on Socio-cultural Factors

Alcohol consumption is sometimes initiated by social situations such as peers' insistence, requirement by tradition, or social cues acting as discriminative stimuli to prompt drinking. Also, people are sometimes personally motivated to achieve the drug state that alcohol induces. The reinforcing effects of social drinking in North America in promoting gaiety and pleasant social interaction was noted by Pliner & Cappell (1974). They concluded that if much of the early drinking experience takes place in social settings associated with positive affective experience, then for some individuals this may play a crucial role in the etiology of pathological patterns of alcohol consumption.

Following is a brief discussion of some of the theories that are based on socio-cultural factors of alcohol use. These are: systems theory, availability theory, anthropological theory, and economic theory of alcohol consumption.

Systems theory. Systems theory views an individual as a social being rather than as primarily a psychological being. The theory proposes that behaviour is determined and maintained by the ongoing dynamics and demands of the key interpersonal system(s) within which the individual interacts. The term *system* refers to a hierarchical organization of interacting elements with a stable and predictable relationship between them. Any change in one element of a system induces compensatory changes or reactions in all elements, as well as in the system as a whole (von Bertalanffy, 1968). Thus, behaviour is viewed as being more a response to systems, and less a reflection of unique personality and psychological variables. The family is seen as one of the critically important systems impacting on the individual.

System theory views drinking as a behavioural pattern that is initiated and maintained by current forces. Drinking is related to a subset of environmental cues and consequences, such as marital, family or larger system dynamics. While behavioural approaches focus on the alcoholic individual for the development of the problem, systems theory views the individual as the *identified patient* in a system. Abusive drinking thus, becomes a problem of systems with primary emphasis on system-level changes for its promotion, enhancement, or maintenance. However, changes in drinking behaviour must precede changes in systematic functioning within the family. Thus, an integrative approach, instead of a *pure* systems approach, combined with other perspectives may enable the therapists to focus on intrapsychic factors.

Availability theory. Availability theory proposes that the greater the accessibility of alcohol in a society, the greater the prevalence and severity of alcohol-related problems. Alcohol *availability* refers to physical accessibility (e.g., number of outlets and purchase restrictions), and economic accessibility (e.g., price and affordability). It should be noted that the theory does not hold access to alcoholic beverages as the soul or even the primary determinant of alcohol-related problems.

Alcohol availability influences a wide variety of problems, including alcohol-related violence, drinking and driving, industrial absenteeism, low productivity, and clinical alcoholism such as cirrhosis (Single, 1988). The developmental sequence is that, increased availability increases consumption by moderate or social drinkers, who then influence heavy drinkers to consume more. Heavier drinking is in turn related to increased incidence of acute and chronic health and social problems. The causal direction of the relationship between alcohol availability and alcohol-related problems is not simply one-way. The incidence of adverse consequences can affect alcohol control measures and hence the availability. This is because "controls are elaborate network of cultural, economic and political structures which are both a response to and a determinant of the magnitude of alcohol-related problems" (Single, Morgan & de Lint, 1981, p. 22).

An individual's risk of experiencing adverse effects from drinking can be broken down into elements of exposure and vulnerability (WHO, 1980). There are differences in vulnerability according to age, gender, occupational status, and even heredity which cannot be accounted for by availability. However, availability can be presumed to be a key factor in establishing and maintaining the climate of drinking. Thus, one may contend that availability theory should be a key component of any comprehensive system theory.

The *ecological model* considers availability in its emphasis that drinkers interact within an environment of motivating and constraining forces. Drinkers' behaviours determine and are determined by the environmental contexts in which drinking occurs. How the motivational and constraining forces are mediated through the actions of individuals to shape drinking behaviours thus becomes the fundamental question for this approach. From an ecological point of view, an increase in physical availability of alcohol leads to increases in alcohol consumption and alcohol related problems (Gruenewald, Miller & Treno, 1993). On the other hand *environmental models* focus on the social and economic constraints that discourage people from drinking (e.g., limits on availability, price of alcohol). Forces which motivate a person to drink are counterbalanced by social and economic constraints on drinking. The active role of the drinker is not considered in either perspective. Drinkers are passive recipients of the forces and pressures that modify drinking, unable to modify these forces and pressures by their own choices.

Anthropological theory. Although there is no unitary anthropological theory, several models of alcohol use and alcoholism have been derived from anthropology and sociology. The emphasis on cultural and social factors of alcohol use and its effects can be considered as the contribution of anthropology. Researchers have found it helpful to refer to *sociocultural models* to include different beliefs and attitudes that exist in various cultures about alcohol, its use, the environment of drinking, and nature and frequency of resulting problems (Heath, 1988).

Bales (1946) identified three cultural factors governing the incidence of alcohol abuse in a given society. These are: (a) the degree of stress and inner tension produced by the culture (*stress hypothesis*); (b) the attitudes towards drinking fostered by the culture (*normative hypothesis*); and (c) the degree to which the culture provides substitute means of satisfaction and other ways of coping with tension and anxiety (*functional alternative*). Some studies demonstrated effects of these three factors by comparing the alcohol related behaviours of different cultural groups. Bales emphasizes that a combination of stressful conditions and certain culturally approved attitudes toward drinking, result in high rates of alcoholism. Linsky, Straus & Colby (1985), however, found that stress alone accounts for some variation in level of alcoholism without reference to normative control. Both *stressful events* (e.g., divorce, plant closing) and *stressful conditions* were related with all indicators of alcoholism.

A pioneering study combined ethnographic data from around the world to demonstrate that a drunken component (or other forms of pattern behaviour) is learned in ways that fit with the expectation of the population, and is subject to societal constraint (MacAndrew & Edgerton, 1969). Over the course of socialization, people learn what their society *knows* about drunkenness and act upon the understanding thus implanted to them.

Normative Model: Norms are the *rules of game* that predominate within a given population, and do not necessarily consist of the full range of beliefs and attitudes that can be found in the population. Variation of these norms are studied in relation to variation of rates and types of alcohol-related problems. There are six ways of looking at alcohol use that are normative. These are: deviance, labelling, reference group, anomie, *time-out* hypothesis, and ambivalence. Following is a brief discussion of anomic model.

Anomic Model The term *anomie* refers to the occasional disjuncture between the norms held by an individual and those of the dominant society. This was originally proposed with reference to socio-cultural systems that were assumed to be relatively homogeneous. Members of minority population can be viewed as anomic for different reasons. If they hold to *minority norms*, they differ from those with majority norms. Even if they embrace the majority norms, they are frustrated (by lack of training, job, education or other reasons) in their attempts to change their behaviour.

According to Merton (1957), anomie develops due to a discrepancy between culturally shared goals and the means for achieving them. Four types of adaptation to the problems of the discrepancies were suggested. These are conformity, ritualism, retreatism, and rebellion. Drinking represents either retreatism or rebellion. This view very well represents the conflict experienced by large groups of people during economic recessions. Merton's formulation is almost the precise situation of economic recession which is different from the ordinarily expected sequence of continued long-term economic advancement.

Other models proposed by anthropological theory are: the single distribution model, the anxiety model, the social organization model, conflict-over-dependency model, the power model, and the symbolic interactionist model. Only the anxiety model is briefly described in the following.

Anxiety Model: The anxiety model is one of the earliest anthropological models relating to alcohol use, and was based on the idea that "the primary function of alcoholic beverages in all societies is the reduction of anxiety" (Horton, 1943, p. 223). It was proposed that the strength of the drinking response in any society tends (a) to vary directly with the level of anxiety, and (b) to vary inversely with the strength of counter anxiety in that society.

Subsequently, several authors have characterized anxiety, stress, and tension as major etiological factors of differential rates of problem drinking in individuals and among populations. Anxiety which accompanies socio-cultural deprivation is often cited with respect to alcohol related problems. Socio-cultural deprivation and anomic depression (Jilek, 1981) develops in a group because their values are brought into question by members of another society, typically one that is politically and/or economically dominant. Such deprivation is a disjuncture which accounts for the occurrence of alcohol-related problems in certain individuals or the occurrence of a high rate of such problems among a population. It may be noted that social and cultural factors must be considered in combination with biological and psychological factors to understand patterns and consequences of drinking.

Economic theory. The economic research emphasizes the social costs of excessive drinking and related government policies. These models cannot test the theories of behaviour and hence, have to be designed to take into account the simultaneous effects and relationships that occur due to alcohol consumption and abuse. Economic models investigate (using available data) the factors influencing alcohol consumption and how alcohol-related problems are linked to consumption levels. Such models have two principal elements: (a) modelling of alcohol consumption, and (b) linking alcohol consumption with socio-demographic variables (Godfrey & Maynard, 1988).

Models of alcohol consumption: For most consumers, buying one good (say beer) requires sacrificing the consumption of some other goods. Given the prices of available goods, consumers decide upon the quantities to be purchased to maximize satisfaction subject to the limit imposed by their income. A consumer's demand for any good is thus related to its price, the prices of other goods, the level of income, and possibly other factors. Individual behaviours are aggregated in a model to form relationships that can be tested against the observed consumption habits of groups of consumers. For example, some estimates of the relationship between the consumption of alcohol and its price can be obtained. Although the principal elements of the economic theory of consumption are not specific to a particular good, special characteristics of alcohol such as the possibility of habit formation and the effect of advertising are included in some models.

Socio-demographic variables: Few studies have described in detail how sociological and demographic variables affect consumption. The selection of such variables is based on subjective criteria of plausibility. Also, it is often difficult to interpret the result of the inclusion of such factors as unemployment or tourism in models. For example, unemployment causes a fall in income, and increase in unemployment may result in lower per capita alcohol consumption. This effect would in general be captured by the income term, although the unemployment rate may act as a proxy for a change in the distribution of income (Kennedy, Ebrill & Walsh, 1973). However, Kitchen (1983) suggests that unemployment is a *stress variable*, and an increased level of stress may result in increased alcohol consumption. This alternative explanation of the effect of an unemployment variable in a demand equation makes the interpretation of coefficient estimates difficult.

Other economic issues related to alcohol abuse require additional information. For example, cost/benefit analysis of treatment programs requires epidemiological information. Thus, links between economic and other theories should be explored to improve models of alcohol consumption.

Theories Based on Biological Factors

Most of the research on biological factors of alcohol abuse addressed the possibility that a genetically transmitted alteration in some biological process serves as a predisposition for excessive drinking. Some of the theories that emphasize biological factors are briefly discussed. These are: genetic theory, neurobiological theory, and neurobehavioural theory.

Genetic theory. Models based on genetic theory study the possible hereditary nature of alcoholism to illustrate the biological mechanisms responsible for the development of excessive drinking. Studies of family history of alcoholism (Cotton, 1979; Dawson, Harford & Grant 1992; Goodwin, 1979a; 1979b), concordance of alcoholism between twins (McGue, Pickens & Svikis, 1992; Prescott, Hewitt, Truett et al., 1994a; 1994b) and studies of the influence of adoption and environment on alcoholism (Cloninger, Bohman & Sigvardsson, 1981; Schuckit, 1990) all suggest that development of drinking can be related to genetically transmitted predisposing factors.

The evidence for a genetic determinant of drinking is, however, inconsistent. Data from other studies (e.g., Cadoret & Gath, 1978) do not fully support a genetically based vulnerability to alcoholism. Instead, an influence of environment is also recognized. For example, Prescott et al. (1994a) found both genetic and environmental factors influencing the use of alcohol. However, among drinkers, the degree of resemblance of consumption behaviour between twins was reported to be regulated by shared genes rather than by shared environments. Prescott et al. (1994b) reported that 38.5% of variance in alcohol problems in older twins could be attributed to genetic factors, while 15.5% to environmental factors.

Vernon, Lee, Harris et al. (1996) studied the influence of genetic and environmental factors on alcohol expectancies in a sample of adult twins through factor analysis. Their basic assumption of alcohol expectancy to be related to drinking behaviour has been reported by other researchers (e.g., Brown, Goldman & Christiansen, 1985). It was found that eight out of nine factors of alcohol expectancies had a significant genetic component. For a majority of the factors, 28% to 36% of the variance was accounted for by genetic effects. The remaining non-genetic variance was entirely attributable to non-shared environmental factors.

Schuckit (1994) presented a clinical model of genetic influences in alcohol dependence. Highlighting the debates surrounding genetic influences in alcoholism (e.g., what characteristics are inherited, how are they transmitted, what stage of alcohol history is vital), it was argued that sensitivity to moderate doses of alcohol is a continuum in which a lower sensitivity is an important risk factor. It is possible that genetic predisposition may subject an individual to a decreased reaction to alcohol and hence to a higher risk of alcohol dependence. However, the final level of alcoholism risk is determined by the combination of environmental and genetic factors.

Neurobiological theory. The neurobiological theory deals with the role of neurobiological reinforcement, tolerance, and physical dependence in the development of excessive drinking (Tabakoff & Hoffman, 1988). It proposes that biological individuality is an important factor in the etiology of problem drinking since it is related to initial sensitivity to ethanol, and responsible for developing tolerance. Three factors are assumed to determine the consumption and the effects of ethanol. These are: (a) generating motivation to consume ethanol, (b) neuroadaptive consequences of consumption (the ability to alter physiology in response to ethanol) and, (c) whether these consequences form positive feedback to promote excessive intake. It is assumed that ethanol is consumed for its pharmacological effects, and that some of these effects are reinforcing, which maintains consumption.

It was suggested that some ethnic groups (e.g., Orientals and American Indians), have abnormal physiological reactions to alcohol. The relatively lower rates of drinking among the Oriental/Asian groups may be because of their physiological intolerance to alcohol (Fenna, 1971). However, such interpretation of cultural differences in rates of drinking has been questioned (Schaefer, 1978).

Neurobehavioural theory. This theory recognizes the association between early neuropsychological anomalies and later alcoholics. Neurobehavioural theory accommodates a variety of behavioural phenomena that are functionally integrated within the neuroanatomical system of the brain. The proponents of the theory point out that for the development of excessive drinking, alcohol must be reasonably accessible in society (Tarter, Alterman & Edwards, 1988). Other facilitative influences which affect drinking behaviour are: ambivalence about drinking by parents and peers, and socio economic and cultural macro systems. Thus, addictions can be viewed as the end point in a chain of events involving the interaction between environmental factors and a genetically vulnerable organism. Conceptualizing drinking etiology from a diathesis-stress perspective gives the opportunity to investigate etiology as a multi factorial phenomenon.

It is apparent from the above discussion that there is no single theory which can totally explain all aspects of alcohol abuse. A combination of concepts of different theories would likely better explain the phenomenon. It is also apparent that no single variable can be identified as the sole cause of alcohol abuse. It is, however, certain that socio-economic factors affect alcohol abuse. Perhaps the most important social factor affecting alcohol abuse is *unemployment*. Many previous studies on the social effects of joblessness have noted the increased incidence of alcohol abuse. The problem of unemployment, its psychological consequences and effect on alcohol abuse are discussed.

Unemployment

Unemployment touches every aspect of family and community life. The underlying causes of increased unemployment include demographic factors, economic changes and educational and training factors. Unemployed workers may turn to alcohol to deal with depression and to alleviate the boredom from having no structured work. As the most severe consequences of mass scale unemployment, poverty and despair may ultimately lead to an increase in alcoholism in a society. Also linked to long-term unemployment are spouse and child abuse, higher divorce rates and crime. This can intensify depression, anxiety, and feelings of despair that inspired misuse in the first place (Riegle, 1982). Some evidence exists that alcohol abuse and dependence decrease the probability of being employed, especially the probability of being employed full time (Benham & Benham 1982; Mullahy & Sindelar, 1992).

Stages of Unemployment

There are at least three stages that an individual goes through in the course of unemployment. These stages involve different psychological reactions of the individual. Alcohol consumption is expected to vary with these stages (Warr, Cook & Wall, 1979). First, there is the shock of becoming unemployed, followed by an active hunt for a job. The individual retains his occupational identity and looks on unemployment as a temporary condition. As a result of this optimism, following the initial shock, many view the experience as an extra holiday (Marsden & Duff, 1985). Hill (1977) noted the initial phase to last for some weeks to two months or more.

In the second stage, the individual is faced with the dilemma of maintaining a balance between the time spent looking for work and the time devoted to leisure. This responsibility for organizing their own daily life is one which many people find difficult to cope with (Harrison, 1976). Leisure interests begin to lose their attractiveness or become too expensive. The person may consider taking a job with lower wages, giving up his/her skills or perhaps developing new ones. Such constructive views are dependent on the individual's initiative. The enthusiasm for constructive use of time diminishes as the period of unemployment increases and applications for jobs continue to be unsuccessful. The second stage lasts for some months after the first.

In the third stage, as the duration of unemployment increases, the individual adapts to the new state but with a narrow scope and a broken attitude. Apathy begins to replace feelings of anxiety and struggle, and the person becomes increasingly tolerant of the situation (Hill, 1977). This third phase of unemployment, therefore, is characterised by a sense of futility. The person begins to adapt to a reduced standard of living and increasing social isolation.

In the initial stages of unemployment, when financial considerations are not too critical and attitudes are reasonably positive, one might expect alcohol consumption to increase. However, increasing financial constraints will tend to reduce alcohol consumption of many. During the second stage, psychological stresses become most pronounced and any stress-related use of alcohol is likely to reach a peak. The third stage may lead to a decrease in alcohol consumption. However, alternatives, such as home brewing, may be tried to reduce the cost of drinking (Winton, Heather & Robertson, 1986). This may not reduce alcohol consumption.

Psychological Consequences of Unemployment

A job helps people to clarify their perception of identity. No matter what kind of job one is doing most people are highly motivated to work, even in the less attractive ones. Motivation to work may be seen as a function of both social pressures and psychological needs. According to Jahoda (1982), employment is believed to (1) impose a time structure on the working day, (2) imply regularly shared experiences and contacts with people outside the nuclear family, (3) link an individual to goals and purposes which transcend his/her own, (4) define aspects of personal states and identity and, (5) enforce activity. Employment provides a highly valued relationship with society and is often regarded as a moral duty (Hartley, 1980; Marsden & Duff, 1985). Consequently, the unemployed may be subjected to social disapproval and stigmatization (Harrison, 1976).

Past research on the psychological consequences of unemployment indicated that unemployment causes a decrease in happiness and present life satisfaction, and an increase in emotional strain and stress (Liem & Raymans, 1982), a lowering of self-esteem (Donovan & Oddy, 1982), an increase in depression (Eales, 1988), anxiety, psychological distress, ill-health, minor psychiatric conditions (Warr, 1983; 1984), and a change in expectations. Even the process that precedes unemployment includes a series of psychological crises (Joelson & Wahlquest, 1987). This process can be divided into four phases: (1) the anticipatory phase, (2) notice of termination, (3) termination phase, and (4) short term unemployment insurance phase. Each phase is associated with different psychological consequences. For example, the anticipatory phase is characterized by a threat of impending unemployment, and there is anxiety whether to change jobs or what kind of strategy should be taken. The most vulnerable individual seeks psychiatric help.

Unemployed individuals generally indicate greater stress compared to those who are working. Elevated depression, anxiety and somaticism develop as initial and brief responses for some unemployed individuals. For others, the emotional strain does not subside even when unemployment ends (Kasl & Cobb, 1979). These persons' psychiatric symptoms are chronic and perhaps, reflect the length of unemployment rather than the response to it. Other studies used a quantitative approach by using measures of depression, anxiety, life satisfaction, minor psychiatric morbidity, self-esteem and positive and negative affect and demonstrated impairment for the unemployed (e.g., Hepworth, 1980; Kasl, Gore & Cobb, 1975; Stafford, Jackson & Bank, 1980; Warr, 1978; 1982). Banks & Jackson (1982) found a strong association between the risk of psychiatric morbidity assessed by the General Health Questionnaire (GHQ), and unemployment.

Cross-sectional studies showed a significant positive association of unemployment and reduced psychological well being. This association was demonstrated with respect to happiness, life satisfaction, satisfaction with self, anxiety and positive and negative affect, negative self esteem, minor psychiatric morbidity and probability of being identified as a psychiatric case (review in Jackson, Stafford, Banks et al., 1983). By using a present Life Satisfaction Scale, Warr (1987) found that unemployed men had significantly lower scores on the measure.

The economic difficulties and the effect on mental health due to unemployment result in increased general stress. Cumulative social stressors play a role in *precipitating* and *predisposing* individuals to impaired physical and social health (Dohrenwend & Dohrenwend, 1981). Negative job-related events such as unemployment are commonly among the stronger predictors of health strain (Coates, Moyer & Wellman, 1969). If it is assumed that people drink more to cope with the stress of unemployment, a relationship between unemployment and ill-health could then be considered as indirect support for the hypothesized stress-related use of alcohol. Thus, the available evidence for the stress-related health effects of unemployment my be considered in studies of alcohol abuse.

The most adequate data in this area are provided by Kasl, Cobb & their associates in a series of papers (reported in Winton et al., 1986). Workers from two factories that permanently closed down were assessed through different stages (anticipation of job loss, termination of employment, unemployment, probationary reemployment, and stable reemployment). Blood pressure levels were used to relate to feelings of stress and *well-being* measures on scales of depression, inhibition, and self-esteem. Stressful consequences of unemployment were found to be immediate, and to largely disappear with reemployment. Similar results were found for cholesterol levels.

A growing body of research has been devoted to finding a relationship between unemployment and ill-health (Cook, 1985; Fagin & Little, 1984; Hayes & Nutman, 1981; and Stern, 1983). The health consequences of unemployment are considered to be the result of the stresses inherent in the unemployment experience. The consensus is that job loss is associated with deterioration in psychological well being (Bakke, 1940; Hill, 1977; Marsden & Duff, 1985; Mullen, 1985; Sinfield, 1981; Swinburne, 1981). Young unemployed people are found to have problems in health, low self-esteem, and a high frequency of nervous problems (Banks & Jackson, 1982; Furnham, 1985; Jackson et al, 1983; Warr, Jackson & Banks, 1988).

All these psychological effects of unemployment are moderated by a number of variables such as work involvement, age, length of unemployment, use of leisure time, gender, occupational status and proportion of time unemployed. Other features that may have an impact on the experience of unemployment include a person's activity level, social support, other recent negative life events, socio-economic status, financial resources, and personal vulnerability to stress. Some of the earlier surveys done on the unemployed indicate common reactions to unemployment but they also point to the heterogeneity of responses (Harrison, 1976; Hill, 1977). Systematic differentiation of the unemployed population on the basis of variables of this type should help isolate those sections likely to suffer the most.

Psychological stress and self-esteem were found to be correlated with the duration of unemployment. Under long term unemployment people depend on social welfare and thus there is a loss of power to support him/herself. This has a detrimental effect on one's entire identity. For longer unemployment (two and a half years), Banks & Jackson (1982) found a positive relationship between unemployment and morbidity. It also increased psychological symptoms. Significant duration of unemployment effects was also studied. Financial strain has been found to increase with greater length of unemployment (Warr & Jackson, 1983).

The association between well being and length of unemployment may differ between age groups. Older people with more commitments may experience greater distress (Jackson et al., 1983). There may be gender differences on longer unemployment effects. It was found that women appeared to be better adjusted the longer they were unemployed, apparently because of their reduced commitment to the labour market along with a stronger personal involvement in family matters (Jackson et al., 1983).

In view of the above discussion, it is clear that unemployment causes serious psychological, social and economic stresses in an individual. Dealing with these stresses may eventually lead an individual to alcohol abuse. Why people would subject themselves to drinking (and subsequently to alcohol abuse) to deal with the effects of unemployment is explained by various studies on different theoretical premises, discussed below.

Plant's (1979) suggestion that people will drink more when they become unemployed as a means of coping with stress or boredom is a commonly held one. The anguish and tension due to such stresses are reduced by alcohol consumption which initially provides a feeling of relief, thus the use of alcohol is functional (Groeneveld, Shain & Simon, 1990). However, it is important to distinguish a *stress hypothesis* of increased drinking during unemployment from a *leisure boredom hypothesis*. Thus, some people may drink more when unemployed as a means of self-medication to cope with stress whereas others may drink more because they have more leisure time to spend in drinking settings.

Social, psychological and health effects of unemployment suggest great variation in individual susceptibility to the inherent stresses and frustrations. Also, the availability and type of coping responses to the stress of unemployment will vary markedly between individuals. Thus, the identification of those most likely to use alcohol as a coping mechanism requires that we differentiate the unemployed on both psychological and demographic variables. The use of alcohol to cope with stress as a result of unemployment will probably increase if other coping strategies and support from close friends are not available (Cahalan et al. 1969).

Anxiety reduction is not the only function served by alcohol. However, such a function would help to explain why alcohol for some people is more important than food, shelter, clothing, and even repaying debts (Groeneveld et al., 1990). If this is even partly correct, it points again to unemployment as a breeding ground for alcohol abuse. For problem drinkers who do not use alcohol as a coping strategy, other socio-cultural factors may contribute to their heavy drinking patterns.

One possible explanation of the causal effect of unemployment on alcohol disorder may be obtained from the *reservoir* analogy (Norstrom, 1987). This analogy states that at any point in time, members within the population may vary according to the different stages of the alcohol process (reservoirs). Some do not drink heavily, others do but still can function in their social and work roles, while some drink so much that they are close to the critical point of death from cirrhosis. With some social stressors (e.g., unemployment) impinging on these reservoirs, some individuals try to change the levels of alcohol consumption. This leads to a polarization with some drinking more and others drinking less (Warr, 1987). As a result, the most vulnerable cross the threshold and step into the next diagnostic stage of an alcohol disorder.

The association of an alcohol disorder with unemployment has been explained in different ways. Rowntree & Lasker (as cited in Dooley, Catalano & Hough, 1992), emphasized the *drift hypothesis* i.e the behavioural disorder (e.g., alcohol abuse) is the cause of job loss. People with a prior history of alcohol disorder are more vulnerable to relapse because they presumably have more troubled work histories. Dooley et al. (1992) found that prior alcohol disorders predicted later unemployment. No interaction between lifetime diagnosis and aggregate unemployment rate was found. The support of the drift hypothesis may not, however, imply that this relationship between job loss and alcohol disorder is only due to the adverse effects of a pre-existing disorder of employability.

On the other hand, the customary form of the social causation hypothesis emphasizes the stressfulness of unemployment pointing out that job loss causes a behavioural disorder. However, there are certain kinds of jobs that are psychologically destructive that may also result in alcohol disorder (Jahoda, 1982; 1987).Also, an alcohol disorder normally develops in stages from excessive consumption to deterioration in social and work roles to physical dependence. This process usually takes more than a few months.

It is possible that social causation and drift explanations operate sequentially. Stressful or unfulfilling jobs may lead an individual to an alcohol disorder which in turn leads to job loss and downward drift. A longitudinal study is needed to investigate the triggering event of job loss provoking the full symptoms of an alcohol disorder.

Research on Unemployment and Alcohol Abuse

The literature on the effect of unemployment upon alcohol use and abuse is somewhat inconclusive. However, four conclusions are generally supported. These are: (1) unemployment increases alcohol use, (2) unemployment decreases alcohol use, (3) unemployment does not alter drinking behaviour, and (4) some drink more, some less and some do not alter their drinking behaviour due to unemployment. A brief description of studies under these categories is given below.

Unemployment increases alcohol use and abuse. The studies that reported an increase in alcohol use due to unemployment can be viewed to follow an *integrative* approach of analysis. Brenner (1975) argued that alcohol consumption increased during economic recessions, when unemployment was rising, and that this increase occurred within months of the onset of recession. Brenner (1979) claimed that variations in the business cycle had a profound effect upon the *social health* of industrialized nations. The effects of unemployment were found to be lagged with an average lag of 2-3 years between the peak of unemployment and the peak of the death rate. It was suggested that high unemployment was associated with increased alcohol consumption (and in turn, with increased mortality), and with a decline in real income for the employed as well as the unemployed.

Critics questioned Brenner's interpretation of such macro-social data and/or accused the study of *economic opportunism*, of statistically manipulating raw data without providing a theoretical rationale (Crawford, Plant & Kreitman et al., 1987). Gravelle, Hutchinson & Stern (1981) used Brenner's (1979) time series analysis of mortality rates in relation to the business cycle in England and Wales from 1936 to 1976 and pointed out that in the 1930's, and since 1978, high unemployment was associated with increases in real per capita disposable income. No evidence of a positive effect of unemployment on alcohol consumption could be found when other influences, such as real income and relative prices, were controlled for. They suggested that a number of other variables such as income, occupational structure, educational levels, consumption patterns, and housing were associated with mortality, and were strongly correlated with unemployment rates. They also pointed out that multiple collinearity is a major problem in this type of analysis. Kasl (1979) argued that the results from this type of study are opaque, unhelpful, and potentially misleading. Also, economic trend data from different countries may not be directly comparable since there are cultural variations in alcohol consumption. Some of the arguments used to criticize Brenner's results are not beyond question. For example, the statement that high unemployment is associated with an increase in real per capita disposable income may not be valid. Indeed, a reduction in disposable income is one of the major causes of unemployment. Reduced disposable income causes reduced consumer spending which results in less production and more unemployment. Also, a proper statistical adjustment of data does not necessarily mean distortion of basic data.

Groeneveld et al. (1990) found that young men increased their alcohol use during unemployment. Some maintained the pre-unemployment levels of alcohol use during the jobless period even when their debts could not be paid and basic necessities were harder to afford. However, some participants reduced the use of alcohol possibly because of their view of the affordability of alcohol relative to other necessities.

The unemployment rate had a positive and significant impact on the consumption of distilled spirits in both the cross-sectional and pooled analysis (McCornac & Filante, 1984). Midanik & Clark (1995) used two US national alcohol surveys and assessed the rates of drinking problems from 1984 to 1990. Three subgroups were found that reported the proportion of two or more social consequences of drinking to be higher in 1990 compared to 1984. These were individuals who were unemployed, between 18 to 29 years, and were never married. Further, the proportion reporting three or more dependence symptoms was also higher for the unemployed group in 1990 compared to 1984. The study used difference of proportion tests and logistic regressions to respectively test the difference between subgroups and the significance of year of survey.

A study by Crawford et al. (1987) considered the relationship between unemployment and alcohol use by providing a detailed comparison of the drinking habits of fully-employed and unemployed males drawn from a population survey of three areas of Britain. Alcohol consumption data were elicited during an interview by means of a retrospective seven day diary technique (Dight, 1976; Wilson, 1981). The Crawford et al. (1987) study considered the possibility that differences (or similarities) between the employed and unemployed men in drinking habits will depend on the reported consumption measure. Results showed that the unemployed were particularly likely to binge drink and to report adverse effects from consuming alcohol.

The unemployed sample in the Crawford et al. (1987) study was very small (N=87). This reduced the likelihood of obtaining statistically significant differences. Secondly, the use of the cross-sectional design does not permit a test of whether the hazardous drinking habits of the unemployed respondents either caused, or resulted from, job loss. The study took place during a period when increasing levels of mass unemployment in Britain occurred. Thus, a high proportion of the sample might have lost their jobs due to that fact rather than because of their drinking. Thirdly, the unemployed sub-sample was not homogeneous in terms of length of unemployment.

In a review, Forcier (1988) has noted that populations of problem drinkers tend to have high unemployment rates. Conversely, increased drinking and alcohol abuse have been shown to occur among the unemployed, in both developed and developing nations (Levenman, 1981). Several population surveys of drinking have found higher rates of unemployment among heavy drinkers, problem drinkers, and alcoholics admitted for treatment. The Harris surveys (as cited in Armor, Polich & Stambul, 1978) found that among males the problem drinker is three times more likely to be unemployed than the average male, while the alcoholic seeking treatment is 15 times more likely to be unemployed. Among females, 13% of the general population was unemployed, compared to 30% of problem drinkers and 45% of treated alcoholics.

Armor et al. (1978) noted that the strongest predictors of problem drinking were the stability factors of unemployment and marital status, and the drinking context factors of household drinking and drinking in bars. The problem drinker was more likely to be male, unemployed, have someone in the household drinking frequently, to drink in bars, and be unmarried. However, they emphasized that none of the factors associated with problem drinking in their study could be established with certainty as existing prior to the onset of problem drinking. Cultural, demographic and social class factors were not found to be important in differentiating the male problem drinker from the normal population.

Wilson (1980) found in a survey of drinking in England and Wales that 20% of unemployed males were drinking more than the safe limit recommended by the Royal College of Psychiatrists (50 units a week), compared to 6% of males in the general population. Meaningful interpretation of the survey by Wilson (1980) is difficult. The consumption figures used in this survey are based on the previous week's consumption and there is no indication of how typical this consumption was. The actual number of unemployed men are not mentioned but referred to as *a small group*.

Other population surveys showed that compared to fully employed, unemployed men in the Lothian region of Scotland experienced more adverse consequences from their drinking in the past year (Ritson, Roumanic & Kendrick, 1981). Unemployed Finnish men were found to consume three times as much alcohol as employed men during intoxicating drinking occasions (Simpura, 1978). Also, Weeks & Drengacz (1982) found that sudden lay-offs in a small American town led to a marked increase in liquor sales.

Cahalan & Room (1974) found that the strongest predictors of tangible consequences of drinking (problems with wife, friends, neighbours, at work, with the police, or health or financial problems) were variables indicating disadvantaged status. These were under-employment, unemployment, low socio-economic status, and belonging to a disadvantaged ethnic group.

Clinical research documented an increase in consumption of alcohol as a consequence of unemployment in those who had drinking problems prior to job loss (Crawford et al., 1987; Forcier, 1988; and Smart, 1979). A stronger impact of unemployment is therefore expected in young people with exceptionally high alcohol consumption.

In another Finnish study, the drinking habits and consequences of alcohol use were found to vary in a consistent manner among men by employment status as well as by the duration of unemployment (Mustonen, Paakkanen & Simpura, 1994). Intoxication frequency was found to be higher for unemployed than for employed men, and to increase with duration of unemployment. Average annual consumption as well was found to increase with duration of unemployment. This pattern was related to differences in the average consumption levels of heavy drinkers. The extremes in the consumption distribution are exceptionally well represented among those men who had been unemployed for 27-52 weeks. The proportion of abstainers as well as of infrequent drinkers was large. However, heavy drinkers were found to consume twice as much as those classified as heavy drinkers in the other employment status categories. Women's drinking habits were found not to vary by their employment status category or by the duration of unemployment. Thirty seven to thirty nine percent of men unemployed for 27-52 weeks reported that alcohol use had resulted in financial difficulties, arrest for drunkenness, or absence from work at some time during their lifetime. Men who had been unemployed had more difficulties in controlling drinking during their lifetime compared to those who were employed. The longer the duration of unemployment the more common the difficulties were. Among women the association between consequences of alcohol use and employment status was found to be much less conspicuous.

With the cross-sectional study by Mustonen et al. (1994), it is not possible to conclude whether the differences between the employed and unemployed men are due to an increase in alcohol use during unemployment, or if they are results of a selection process in the labour market. Also, the hypothesis that unemployed men increase their alcohol consumption cannot be confirmed as the same authors reported that unemployed men decreased their use of alcohol more frequently than the employed. A core group among the jobless people could have been the problem drinkers, and they would be found among the unemployed even during periods of more fortunate economic circumstances. The sample selection was done during the periods of mass unemployment and those individuals were selected among the unemployed who had a tendency to drink until intoxicated, and whose drinking was above average consumption levels. The unemployed sample was over-represented by young and unskilled workers. And finally, the sample size was too small to control various group characteristics. The question remains what the result would have been if the survey had been done in September 1994 instead of 1992. Mass unemployment would have continued for more years and the social problems related to it would have had time to intensify.

In a longitudinal study of 1083 young men in Sweden, Hammerstrom, Janlert &Theorell (1988) found that unemployment led to an increase of both psychological and health problems, and also an increase in alcohol consumption. However, the study is not representative of general population. First, the entire sample of this study consisted of young students leaving compulsory schools. They were all 16 years of age in the initial phase of the study (and were 18 at the time of follow-up study). Alcohol consumption (and its increase) of these young people might not have been a consequence of unemployment. When separated by gender, girls in all groups (i.e., motivated, non-motivated, working in Youth Opportunity Programs, and unemployed) were found to decrease their average yearly alcohol consumption in the 2-year follow-up, while boys in all groups were found to increase it. Even the *employed* boys almost doubled their alcohol consumption. The unemployed group (both girls and boys) had a very high level of alcohol consumption before they were unemployed (i.e., at the time of leaving compulsory schools). Similar results were found for narcotics use. Therefore, it is difficult to conclude whether unemployment had caused the reported increase in alcohol consumption. Furthermore, the meaning of unemployment for these subjects is somewhat different from that for the general population. For example, the schools had the responsibility to arrange studies or activities for all young people until they were 18. Obviously, the unemployed group did not want to continue studies in high schools, and could not find work. Also, a sizeable portion of the subjects (516 out of 1083) who would have preferred to work rather than to study, were in high school. Some students in this group might have had the same behaviour in terms of alcohol consumption as those of the unemployed group. Moreover, only consumption of alcohol was used to represent alcohol abuse as a consequence of unemployment. Although the study had a longitudinal design, the identified direction of causality is not necessarily representative of general population because of the above reasons.

The data provided by these studies show a relationship between unemployment and drinking but cannot reliably indicate the nature of this relationship. It is not known whether problem drinking is the result of becoming unemployed or vice versa. However, one would expect this relationship to be dependent upon overall rates of unemployment. When the overall rate of unemployment is low or declining, the proportion of problem drinkers among the unemployed might be higher as they represent a hard core of *unemployables*. At times when the overall rate of unemployment is high or rising, this relationship may be weakened. Consequently, meaningful interpretation of these data is further complicated by the need to consider overall unemployment rates and their influence on the incidence of problem drinking among the unemployed (Winton et al., 1986).

Neither the direct nor the indirect studies conducted earlier provide adequate data to show a causal relationship between unemployment and drinking behaviour. This is mostly because of the weak methodology adopted in these studies and the oversimplification made of the unemployment experience.

Unemployment reduces alcohol use and abuse. Reductions in alcohol consumptions following job loss have been observed to occur in Scottish men (Cook, & Allan 1983) and Norwegian men (Iverson & Klausen, 1981, reported in Crawford et al., 1987; Iverson & Klausen, 1986). In Iverson & Klausen's (1981) study at a 4-month follow up, with a response rate of 97%, workers experiencing the most unemployment showed a decrease in alcohol consumption. An improvement in bronchitis, heart trouble and tiredness, but a worsening of psychological problems were noted. At the 3-year follow up, with a response rate of 87%, the use of medicine had dropped to the level prior to unemployment and the decrease in alcohol consumption had continued. They suggested that a decrease in alcohol consumption may be partly explained by the drop in income (approximately 30%).

The study had a number of limitations which make any meaningful interpretation of its results difficult. The authors simply reported a decrease in alcohol consumption at 4-month and 3-year follow ups without offering any figures showing the extent of this decrease. Moreover, the decrease in alcohol consumption referred to changes in the unemployed group as a whole and not at the individual level. The number of subjects in this group was not mentioned, neither was there any information about the level of alcohol consumption prior or after the closure of shipyard. Reference to the alcohol questions used in the study was not clear. It did not indicate the number or nature of questions asked regarding alcohol consumption. Nothing was mentioned in the paper about the reliability and validity of the questionnaire. Overall, therefore, this study was somewhat inconclusive about the effect of unemployment on drinking behaviour. Though this study had the most adequate research design, it had the least adequate assessment measure of drinking behaviour (Crawford et al., 1987).

Iversen & Klausen (1986) reported that the unemployed workers were more likely to reduce their alcohol consumption than the reemployed workers in the same population, controlling for age. The study had a sample of only 88 subjects which consisted mostly of skilled male workers. Furthermore, the majority of the workers had been permanently employed for many years by the shipyard. It therefore may be very difficult to generalize the findings to other groups of unemployed people. Since the sample was small and restricted, more detailed analysis of subgroups was not possible. The authors suggested that the decrease in alcohol consumption may be partly explained by a drop in income. The study however, offers no supporting evidence. The study provided no evidence of the common assumption of a causal and direct association between unemployment and use of alcohol. The close-knit social collective of workers of the shipyard was highly developed with norms and habits which regulated the daily lives of the working place. These norms and habits may have influenced to some extent the use of alcohol.

Two British surveys (Warr, 1984; Warr & Payne, 1983) found that unemployed British men reduced their visits to pubs and clubs for a drink, in addition to reducing their drinking at home. These alterations in drinking behaviour were most pronounced in working-class and in middle-class men. Barnes, Welte & Dintcheff (1991) found that among both men and women, people who were employed had the highest rate of overall drinking compared with their respective counterparts in the various unemployed categories.

The considerable reduction in income which frequently follows job loss (Iversen & Klausen, 1986; Plant, Peck & Samuel, 1985; Townsend, 1979; Warr, 1983; Warr, 1984) is thought to account for a lowering of alcohol intake (e.g., Fagin & Little, 1984; Plant, 1979; Warr, 1984; Winton et al., 1986). Circumstantial support for this contention is provided by a number of studies which have shown that in several countries alcohol consumption levels and liver cirrhosis rates increase whenever the cost of alcohol is lowered (Grant, Plant & Williams, 1983).

More specific support is provided by Kendell, Roumanie & Ritson (1983) who found 18% reduction in alcohol consumption and 16% reduction in adverse consequences from drinking alcohol among the unemployed. They noted that the main cause of this fall in consumption was probably the rising cost of alcoholic beverages relative to the cost of living and average incomes during the 3 year period of survey. Heavy drinkers and suspected dependent drinkers both reduced their consumption at least as much as light or moderate drinkers, and suffered considerably fewer adverse effects as a result. Factors related to rising unemployment were responsible for about 20% of the overall reduction in consumption. The effect of economic recession was largely restricted to its effect on unemployment rates.

The Kendell et al. (1983) study noted that the consumption of beer was reduced more than the consumption of other alcoholic beverages, and that those who reduced their consumption did so mainly in 1981, the year of the follow-up study. The 18% reduction in the sample is an overestimate of the overall reduction in consumption in the region. This may be because only heavy and dependent drinkers were reinterviewed while none of the 233 occasional drinkers from the 1978-79 survey was included in the follow-up. Thus, any alcohol these occasional drinkers happened to consume during the 1981-82 survey week was excluded.

Unemployment does not alter drinking behaviour. Williams, Sherwood & Singh (1986) reported that unemployment during the previous years was not strongly correlated with self admitted excessive use of alcohol. In a longitudinal study (with a follow-up 3 years later) of 1063 young people leaving school, Plant et al., (1985) found no significant relationship between alcohol consumption and unemployment. The employed and the unemployed did not differ in their total weekly alcohol consumption. Duration of unemployment among males aged 19-20 was, however, modestly associated both with current consumption and with drinking experiences while at school (aged 15-16 years). Unemployed respondents were particularly likely to engage in illicit drug use.

Studies which found unemployment not to alter the drinking pattern were done in Scotland (Plant et al., 1985) and England (Department of Education & Science, 1983) and combined male and female drinking. The amount of drinking by the employed and unemployed may have been biased by the proportion of men and women in these studies since the evidence from other studies consistently suggests that women drink less than men. The study of Department of Education and Science (1983) claimed that those who were unemployed drank less often than those who were employed, but closer inspection of the data revealed that the difference was not statistically significant.

The Cook, Cummins, Bartley et al. (1982) study attempted to find a relationship between unemployment and health in a sample of middle-aged men. Men, reporting more than 6 drinks per day, either daily or on weekends, were defined as heavy drinkers. Heavy drinking was apparently more common among the unemployed. However, the difference disappeared when the data were standardized for age, social class and town of residence. The unemployed had far more chronic physical illness than the employed. Their sample included both the ill unemployed and the not-ill unemployed. The ill-health might have kept the ill-unemployed away from drinking. Thus, the data of the ill-unemployed may have masked any differences between the employed and unemployed level of drinking.

There is evidence that anticipation of job loss may be particularly stressful (Kasl, 1982; Owens, 1966) and that withdrawal of redundancy noticeably reduces psychological distress (Jenkins, MacDonald, Murray et al., 1982). One might therefore conclude that alcohol consumption increases when workers are faced with impending redundancy. Jenkins et al., (1982) surveyed a group of journalists over a six month period during which they were served redundancy notices; then the newspaper was sold and the redundancy notices subsequently cancelled. Alcohol consumption was surveyed during each of these three phases and no changes were observed during this period. This may, however, be explained by the fact that (a) the newspaper had already undergone a prolonged period of industrial unrest and uncertainty, and (b) the journalists were a relatively heavy drinking group. The effect of anticipated job loss upon alcohol consumption remained unclear.

Some drink more, some less and some do not change. Fagin & Little (1984), in a study of unemployment in Britain, found that although alcohol consumption generally decreased following job loss, there was one instance of an increase in consumption. A review (Regional Working Party on Problem Drinking, 1983) of local unemployment research projects in Britain concluded that though the unemployed generally reduce their alcohol intake, young single men with little or no financial responsibility were likely to purchase more alcohol when they became unemployed. Some when faced with fewer resources moderate their drinking and improve in general terms. Others maintain their level of drinking, or even increase it under unemployment over a long period of time. The proportions of individuals in these two categories are not yet known (Regional Working Party on Problem Drinking, 1983).

In a study conducted in two British towns, Yates, Hebblethwaite & Thorley (1984) concluded that though "unemployment is associated with an increased intake for regular drinkers" there was evidence that in one of the towns "a significant proportion of younger unemployed men may not take up or choose to maintain any regular drinking routine" (p. 168-169). Moreover, there was evidence of a *polarization of drinking patterns* (a greater likelihood of reporting either abstinence or heavier drinking over the preceding seven days) among older unemployed groups. This polarization was observed to occur in British General Household Surveys (Office of Population Census and Surveys, 1980; 1982; 1984).

Data from the Scottish Heart Health Study showed appreciable differences in both frequency and quantity of reported alcohol consumption between the full-time employed (N=4170) and unemployed men (N=479). A higher percentage of the unemployed reported to be non-drinkers (Lee, Crombie, Smith, et al., 1990). Nevertheless, the unemployed drinkers drank more alcohol than those in employment (27.9 units versus 20.7 units per week), even after standardization for age and social class. Binge drinking was common in both groups, but the proportion was higher among the unemployed (58.8% of the unemployed reported drinking more than 8 units in any day in the previous week compared to 33.5% among the full-time workers). Among the drinkers, a higher percentage of the unemployed group exceeded the level of serum gamma-glutamytransferase (GGT) (which is largely influenced by heavy drinking) reference values than did the employed group. The unemployed also had higher overall serum GGT levels than the full-time workers.

Most of the higher mean level of serum GGT in this study was contributed by the unemployed heavy drinkers. However, alcohol-induced liver cirrhosis only develops in those drinking excessively for a long time. Thus, it may be a consequence for either the long-term unemployed drinkers or for those who had lost their jobs through drinking-related problems. Thus, there is a need for more longitudinal surveys incorporating details of alcohol consumption, and it's health consequences to establish cause and effect relationships .

Smart (1979), in a general population survey found that currently unemployed male Canadians were most likely to report serious drinking problems. Respondents who had three or more alcohol problems (54%) reported increased alcohol consumption following job loss, whereas the majority of those who had less than three alcohol problems drank the same amount or less when unemployed. Serious drinking problems were most common among shift workers and the unemployed. Twenty one percent of the unemployed had three or more problems with alcohol compared to only 6% among the employed. The study suggested that males with serious drinking problems are most likely to increase their alcohol consumption when unemployed. Males without problems and females are relatively likely to drink less when unemployed.

The direct investigation of the relationship between unemployment and drinking behaviour of Smart (1979) had a number of difficulties. First, the estimates of drinking during unemployment were obtained retrospectively after quite a long interval of time, and therefore are of questionable validity. Second, it is impossible to conclude from these data whether unemployment leads to problem drinking since workers with serious drinking problems are more likely to have trouble being reemployed. Third, the actual alcohol consumption was not measured. Fourth, data on length of unemployment and the number of times the person was previously unemployed were not collected. Fifth, no reasons were suggested for people's changes in drinking behaviour during periods of unemployment. Sixth, the study is cross-sectional. The design may not be suitable for finding any causal relationship between unemployment and alcohol consumption. However, respondents who had ever been unemployed were also asked whether they were drinking more, less or about the same when unemployed. The large majority with less than three alcohol problems were drinking the same amount or less when unemployed. More than 50% of those with three or more alcohol problems reported drinking more during unemployment. Thus, unemployment may give rise to alcohol use for special risk groups but not for unemployed in general.

Plant (1979) compared the drinking habits of workers who were employed in alcohol production with those of workers from control industries. It was found in a one-year follow-up that the unemployed workers of alcohol industries had reduced their alcohol consumption by 40.3%. In contrast, the unemployed workers from control industries had increased their average consumption by 92.2%. Plant argued that the decline in the former probably resulted from (a) their having left a high risk occupation, and (b) their reduction in income, and that the increase in consumption by controls arose from increased stresses associated with unemployment. At a 2-year follow-up, 8 workers from the alcohol industry were unemployed and they had slightly increased their average week's consumption by 4.4%. Seventeen control workers were unemployed and they had increased their week's consumption by 54.5%, compared to a 37.2% increase in the average week's consumption among those still employed in control industries.

In Plant's (1979) study the small sample size and reported percentage of increase or decrease without specifying the consumption or its variability limits any statistical inference. No consumption figures are given for the unemployed control sample. Thus, no meaningful comparisons between the two unemployed samples can be made. The unemployed control sample may have increased their average consumption, but it was still less than that of the unemployed alcohol production workers. Given the small samples, it would have been more meaningful to detail the changes in individual consumption. The percentage changes in consumption are based on estimates of the previous week's consumption. These estimates may not be reliable as no indication is given as to how typical these consumption values were. It is impossible to say in what way the drinking habits of these individuals changed with unemployment. Some of them may have reduced their total week's consumption but drank more on fewer occasions per week. It is also unclear whether the same unemployed respondents were interviewed in both follow-ups.

Summary. From the above review it may be concluded that unemployment either affects alcohol use and abuse or it does not. This confusion in existing literature may partly be explained by different methodological considerations made in different studies.

First, among the studies which showed an increase in alcohol consumption due to unemployment, only three studies (Cobb & Kasl, 1977; Hammerstrom et al., 1988; Mustonen et al., 1994) were based on a longitudinal design. On the other hand, of studies which showed a decrease in drinking levels following job loss, five (Iversen & Klausen, 1981; 1986; Kendell et al., 1983; Plant 1979; Plant et al., 1985) had a longitudinal design. Only two of these studies which showed a decrease in alcohol (Plant et al., 1985; and Kendell et al., 1983) had long sampling intervals. Although a cross sectional design has some obvious practical advantages, such a design is limited in its capacity to make causal statements about the effects of unemployment upon drinking behaviour. Questions of causality are better addressed by determining levels of alcohol consumption both before unemployment and at several points thereafter. Only two studies showing a decrease in alcohol use had data before and after job loss (Iversen & Klausen, 1986; Winton et al., 1986). It may, however, be necessary, if somewhat difficult, to establish base-line levels of drinking prior to announcement of job loss.

Secondly, the contradictory result of increase and decrease in drinking may be due to the fact that no standard measure of consumption was used. Instead, in previous studies a diverse and possibly incompatible range of consumption measures were taken. Most of the studies took retrospective accounts of total alcohol consumption in the seven days prior to interviews. These include two studies showing an increase in consumption (Ritson et al., 1981; Wilson, 1980); four studies showing a decrease in consumption (Cook & Allan, 1983; Kendell et al., 1983; Plant, 1979; Plant et al.,1985); and one study showing both an increase and a decrease in consumption (Yates et al., 1984). Most of the researchers who found both an increase and a decrease in alcohol consumption took only quantity-frequency estimates of present consumption (Office of population census and surveys 1980, 1982, 1984). Cook et al. (1982) who reported no change in alcohol consumption also took present quantity-frequency estimates. Most of the studies had a few retrospective items related to perceived changes in consumption following job loss. These include three which showed a decrease (Fagin & Little, 1984; Warr & Payne, 1983; Warr 1984); one which showed both an increase and a decrease (Smart, 1979); and one in which no change in consumption was reported due to unemployment (Department of Education and Science, 1983). The economic trend study which showed an increase included aggregate national problem drinking data (Brenner, 1975; 1979). There is evidence that the choice of a consumption variable may affect the outcome of research in this area.

Thirdly, the research has been conducted in a number of countries with populations differing in age, sex, social class and duration of unemployment. Lastly, the definitions of unemployment which are deployed for a particular study may limit the generality of its findings. The criterion for registering as unemployed changes from time to time depending on the government policies. For example, such changes occurred in Britain on 18 occasions between 1979-1986 (Huhne, 1986). Sometimes, these changes eliminate many of the claimants for unemployment benefits, mothers caring for relatives or children and young persons engaged in government sponsored schemes from the unemployment register.

The population chosen and the variables selected are different for each study. The mediating factors which affect the relationship between unemployment and drinking may vary. It is not a general pattern that individuals will increase their alcohol consumption following unemployment under certain particular conditions. It can be concluded from the review that there is a strong agreement among researchers that unemployment increases alcohol use and abuse only among heavy drinkers (Crawford et al., 1987; Dooley et al., 1992; Winton et al., 1986).

Since it has been found in several studies that there may be either an increase or a decrease of alcohol consumption after job loss, it has been suggested that moderate drinkers may decrease while heavy drinkers may increase (Crawford et al., 1987; Janlert & Hammerstrom, 1992). The relationship between unemployment and alcohol use varies greatly between women and men (Plant, 1979). Most studies showed greater alcohol consumption (Hammer, 1993) among unemployed men. It is important to consider men and women separately while studying the relationship between unemployment and drinking problems (Janlert & Hammerstrom, 1992).

The immediate consequence of unemployment is economic hardship. This causes additional stress on the individual. At the same time, the buying power of the unemployed is significantly reduced, at least in the long run. This change may eventually affect (reduce or increase) the alcohol use of the individual. Simultaneously, employed people with lower income may behave (in terms of alcohol use) in a way similar to the unemployed to cope with the stress of being poor. Therefore, an economic indicator should be considered while studying the relationship between unemployment and alcohol use. Poverty is such a relative economic indicator that might affect the alcohol use of the unemployed individual. This is briefly described below.

Poverty

Poverty is mainly a subjective state and its definition for the purpose of measurement is also subjective. Stages of well-being or ill-being are essentially personal and depend on individual preferences, expectations, and self-image characteristics which are in turn determined by environmental and biological variables. Poverty implies the absence of basic necessities. It suggests misery, discomfort, and an unsatisfactory standard of living. Poverty is an important social and economic problem (Danziger, Sandefur & Weinberg, 1994; Harp & Hofley, 1971).

Two standard definitions of poverty are available in the literature. These are the *absolute* and the *relative* definitions (Miller, 1965). The term *absolute poverty* relates to the lack of all basic physical necessities, whereas, the term *relative poverty* conveys the impression of the lack of both physical and *social* needs. All operational definitions of poverty are, to some extent, relative.

Relative poverty is said to occur when a person's income, even though adequate for survival, falls behind that of the community. Supporters of the relative approach argue that the definition of poverty that refers to subsistence is too narrow. Poverty should mean having significantly less than others, standing out in the community and not being able to enjoy a normal living standard. In this approach, having relatively low income qualifies an economic unit as poor even though it may have all of the necessities.

In Canada, the standard relative poverty line is that developed by Canadian Council for Social Development (CCSD). They argue that a family of three is *poor* if its income is less than one half the Canadian average for a family that size. Adjustments for this base are used to determine the poverty lines for families of different sizes.

The relative approach to defining and measuring poverty, however, may not be a proper way to deal with social and economic problems because it does not convey properly the understanding of what it means to most people to be poor. An alternative definition of poverty is based on the cost of providing essential goods and services (*absolute* approach) and is a far more reliable and satisfactory way of addressing this issue. An economic unit is defined as poor if it can, at best, afford only the basic necessities. Income rather than consumption is used as an indicator of poverty. Social amenities may not be considered as equivalent to basic physical necessities. Thus, the poverty line should not be an index of inequality.

Measuring poverty involves additional problems. For example, it must be decided whether poverty is a problem of low consumption or is a problem of low income. Usually, income is used as a proxy indicator of the level of well-being. An income cut-off, below which the household is judged to be poor, is determined and is referred to as a *poverty line*. Society is divided into two groups - those with incomes below the line (the poor) and those whose incomes take them above the line (non-poor). The National Council of Welfare (the federal government's advisory body on poverty and social policy) publishes annual reports on poverty in Canada. It uses both the terms *poverty line* and *low income line* (National Council of Welfare, 1994).

Statistics Canada provides Low Income Cut-offs (LICO) as the poverty lines. Although LICO are universally accepted and commonly referred to as official poverty lines, they have no officially recognized status nor does Statistics Canada promote their use as poverty lines. The low income cut-offs vary by the family size and the population of the area of residence. There are seven categories of family size, and five community sizes (ranging from rural areas to cities with 500,000 or more residents). The result is a set of 35 cut-offs. The entire set of these cut-offs for 1991 is shown in Table 1 (technically known as the 1986 base cut-offs, because of the year in which spending on food, shelter and clothing was last surveyed (National Council of Welfare, 1993).

Table 1

Statistics Canada's Low Income Cut-offs (1986 base) for 1991

Family Size	Community Size				
	Cities of 500,000+	100,000 - 499,999	30,000 - 99,999	Less than 30,000	Rural Area
1	$ 14,951	$ 13,132	$ 12,829	$ 11,695	$ 10,179
2	20,266	17,802	17,390	15,852	13,799
3	25,761	22,626	22,103	20,149	17,539
4	29,661	26,049	25,449	23,200	20,192
5	32,406	28,462	27,805	25,347	22,062
6	35,177	30,893	30,180	27,512	23,957
7+	37,833	33,230	32,463	29,593	25,757

The low income cut-offs are a useful tool for defining and analysing the significantly large portion of the Canadian population with low incomes. Although these are not the only measures of poverty used in Canada, they are the most widely accepted and are roughly comparable to other alternative measures.

The poverty rate is higher among the unemployed. For example, among families whose head experienced no unemployment in 1988, the incidence of poverty (3.2%) was less than half the rate (7.9%) for families whose head experienced some unemployment during the year (Sarlo, 1992). Also, those outside the labour force have the highest poverty rates and account for a majority of poor persons.

As the poverty profile reveals, some of the poor are elderly, some are single parents and some are disabled. There are people who work continuously in full time jobs but receive income insufficient to cover all the basic necessities (the so-called *working poor*). For example, at the minimum wages, the income was sufficient to support only two persons in a family in 1988 in all provinces in Canada. Any family of three or more persons where the sole source of income was earnings from one full-time minimum wage job was poor. An employable individual with at least two dependents would thus be better off financially going on welfare than taking a minimum wage job in the absence of a good probability of advancement.

The more general phenomenon of poverty is related to lack of education, income, unemployment, lack of low cost housing and social service cutbacks (Welte & Barnes, 1992). Perhaps the most striking example of poverty can be found in the homeless.

Stress Due to Poverty

Life problems and the ability to deal with the problems are unequally distributed among social groups. Members of the lower socio-economic status (the poor) are exposed to more stress and are more vulnerable to stress (Eron & Peterson, 1982). Pearlin & Schooler (1978) noted that the less educated and poorer are less likely to have adequate access to coping methods. It was also suggested that low education and low income (general characteristics of the poor) are associated with ineffective coping styles. Additionally, self-esteem is also lower for the subjects of low socio-economic status (Dohrenwend, 1973).

Based on financial and physical status and life events, poor subjects were found to be exposed to stressful experiences more than those of the upper socio-economic class (Kessler, 1979). When stressful events in the two were compared, the lower socio-economic group was found to have more impact on emotional functioning (Pearlin & Schooler, 1978). The effects of economic factors and chronic stress are different for different socio-economic groups. One should emphasize on the combined effect of individual differences and the status structure (rather than individual abilities) to deal with stress (Liem & Liem, 1978).

Heavy drinking is prevalent among the poor and the homeless. For example, Fischer (1987) noted that the alcoholism ratio (from the late 1970's and the 1980's) in the homeless exceeded that of the general population by a factor of at least 2 and as much as 12. Perhaps the abundance of life stresses and absence of other coping methods lead the poor to alcohol abuse. On the other hand, it is also possible that heavy drinking is a contributing cause of their status.

As noted before, income is frequently used by researchers as a proxy for poverty. As a result, exclusive studies on poverty and alcohol abuse are relatively scarce. Studies on the relationship between alcohol abuse and income found in the literature will provide further insight into the direction of causality. Some of these studies are briefly described below.

Income and Alcohol Abuse

Income includes earnings from jobs, third party payments (i.e., welfare, social security, alimony), and asset income (i.e., dividends, interest), and can be measured in two ways: personal or family income. The studies which showed a direct relationship between unemployment and drinking did not consider the income from sources other than jobs.

Research examining the effect of alcohol use on income revealed two conflicting results. The most common (and perhaps the least surprising) finding is that the households in which problem drinkers reside have lower incomes than the households with no problem drinkers (Berry & Boland 1977; Cahalan & Room, 1974; Harwood, Napolitano, Kristiansen et al., 1984; Heien & Pittman, 1989; Mullahy & Sindelar, 1989; 1992). Estimates of alcohol's impact on income have ranged from close to zero to a 32-percent reduction in income, when controlling for other factors. In a sample of Puerto Rican men who were predominantly poor (85% with income under $15,000) and unemployed (33% looking for a job, and 17% had part time employment), the majority (80%) reported high alcohol consumption (Singer, Valentin, Barr et al., 1992). Thirty one percent indicated that they drink at least once a week, 53% had at least 3 drinks per drinking occasion and 20%

had 8 drinks per drinking occasion at least three times per month.

The notion that drinking is more prevalent in lower socio-economic groups is not always true. This was substantiated by a number of studies. For example, a relationship between low income and high rates of abstention was reported by Cahalan et al. (1969), and Hilton (1988a). Rates of heavy drinking were also not found to be appreciably higher in this group than in the general population (Welte & Barnes, 1992) or in other drinking surveys (Clark & Midanik, 1982). In Canada, abstainers and persons with relatively low levels of alcohol consumption tend to belong to a low income group, are older, poorly educated, women, and members of religious sects. In contrast, people with high alcohol consumption tend to be males, young, belong to high socio-economic status and are agnostic (Single & Giesbrecht, 1978).

Workers who use alcohol were found to have higher wages than those who do not (Berger & Leigh 1988). Students from families with higher family income were found to be more frequent alcohol users (Martin & Pritchard, 1991). Other studies have also shown a positive association between socio-economic status and frequency of drinking (Cahalan et al., 1969: Clark & Midanik, 1982; Johnson & Oksanen, 1974). People with more income or education are more likely to drink rather than to abstain, and to drink more frequently. A simple explanation for this behaviour may be provided from the availability perspective. The poor and less powerful are subject to economic and social restraints and are more likely to limit their drinking. On the other hand, people with high socio-economic status enjoy the social and economic privileges and can afford to drink more (Knupfer & Room, 1964).

Problem drinking and alcoholism often occur in the middle and upper classes, among the employed, the successful and sometimes in prominent citizens (Cull & Hardy, 1974). In all cultures and societies only a small fraction of the people exposed to alcohol become alcoholics. Moreover, the highest rates of alcoholism are not found among people with the highest per capita intake of alcohol.

A consistent finding from cross-sectional studies has been that the more affluent people typically drink more than the less affluent people (Cahalan, Cisin, Kirsch et al., 1965; Clark & Midanik, 1982; Knupfer & Room, 1964; Mulford, 1964; Riley & Marden, 1948; and Wechsler, Demone & Gottlieb, 1978). Further, in a number of studies income has been found to be a consistent predictor of alcohol consumption (Levy & Sheflin, 1985; McGuinness, 1983; Ornstein & Levy, 1983). Socio-economic indicators are very important in predicting overall drinking rates (Knupfer, 1967; Mulford & Miller, 1959; 1963).

Barnes et al. (1991) considered family income as the most significant predictor of drinking (out of the ten major socio-economic factors). Education and employment status were the next most significant split in separating drinkers from abstainers. Higher family incomes were found to be generally associated with higher rates of overall drinking. For instance, 46% of respondents with up to $7,000 family income were classified as drinkers, whereas 88% of those with $50,000 or over family income as occasional or more frequent drinkers. Heavier drinking was also lowest (10%) in the lowest income bracket and highest in respondents with yearly incomes of $100,000 or more (24%). The proportion of drinkers is 85% for those with the family income of above $25,000 and 62% for those with a family income equal to or below $25,000.

Mullahy & Sindelar (1991) found a significant gender difference in the effects of alcoholism on income. It was estimated that women's alcoholism has greater overall impact on household income than men's alcoholism, because alcohol abuse tends to affect certain pathways that predict income differently for women and men. Midanik & Clark (1992) found that the percentage of current drinkers who reported drinking last year was associated with higher status, particularly for women. No clear pattern by income for daily drinking or drinking 60 or more drinks a month was found. Respondents with lower incomes were more likely to drink five or more drinks per occasion regularly.

Some studies devoted substantial efforts to find a relationship between aggregate alcohol consumption and affordability (price of alcohol and real income of consumers). A variation in consumption level due to fluctuations in the price of alcohol and real income of consumers has been reported in most of these studies (Ornstein & Levy, 1983). However, a consistent decline in alcohol consumption was found for the decade of 1980's when prices were relatively stable and real income was increasing (Treno, Parker & Holder, 1991). Thus, economic conditions may not be the only important determinant of changes in alcohol consumption, and a number of social, structural and economic indicators should be considered for a better understanding of the process.

To explain the variation of alcohol consumption, both economic and non-economic variables were included in most of the studies. Differences in US drinking patterns between income, age, gender, education and religion groups, and between geographical regions are clearly evident from various studies that used national drinking data (e.g., Cahalan & Cisin, 1968; Cahalan et al. 1969; Cahalan & Room, 1974; Clark & Midanik, 1982; Hilton 1988b; 1988c; Mulford, 1964), as well as from those that used data from communities (Cahalan et al., 1965; Knupfer & Room, 1964; Room, 1972; Wechsler et al., 1978).

The effects of income on drinking behaviour vary by race. Herd (1990) observed that African American men at low or moderate income levels had high rates of heavier drinking compared to those in the highest income group. Southern black men (30 - 59 years) with income between $6,000 - $20,000 had a proportion of heavier drinking that is over twice as high as that of white men in the same sub group. White young men in the high income group were more strongly associated with heavier drinking than black men. Blacks with high income had low rates of heavier drinking, whereas for whites income by itself had little bearing on heavier drinking.

Black young male drinkers who were mostly single, had low income and low education, reported a significantly higher average rate of alcohol related problems (Herd, 1994). However, whites and blacks did not differ significantly on heavier drinking, drunkenness or liberalism of drinking norms. They considerably differed on social characteristics that may have affected the level of problem experiences. Blacks, being more likely to be impoverished, under-educated and unemployed, were more vulnerable to social and health consequences of heavier drinking. Other studies (Cahalan & Room, 1974) also showed low social status as a major predictor of high risk drinking and alcohol related problems. When social class was taken into account, the differences in rates of problematic drinking among three groups (black, Caribbean and white men) diminished considerably.

White males (20-21 years of age) with higher socio-economic backgrounds (wealthy family orientation) living in urban or suburban areas and having an external locus of control tended to drink more frequently and consumed larger quantities of alcohol per drinking episodes (Martin & Pritchard, 1991).

Riley & Marden (1948) reported that 70% of respondents having at least a high school education sometimes drank alcohol while 62% of those who did not graduate from high school did so. Both educated respondents (18%) as well as less educated respondents (17%) were classified as regular drinkers. The percentage of drinkers increased from a low to high economic level.

A limited number of studies have included both social and cultural factors. Johnson & Oksanen's (1977) analysed cross-section and time series Canadian data and found that ethnicity and lagged consumption affect alcohol consumption as does price. Ornstein & Hanssens (1985), also using pooled cross-section and time series data, found similar effects for tourism, minimum age laws and alcohol outlet density. Nelson (1988), using cross-sectional data, found outlet density and tourism as major factors determining alcohol consumption.

The most detrimental effect of alcohol abuse and dependence seems to occur in the young age group (Mullahy & Sindelar, 1992). Long lasting effects of alcoholism may also depend upon how early the onset of alcoholism occurs (Mullahy & Sindelar, 1989; 1990). Some evidence shows that the onset of alcoholism before the age of 18, or alcohol consumption in high school, retards educational achievement. Education has important and positive effects on marital and health status which, in turn, can enhance earnings

(Layne & Whitehead, 1985). Also, a lower educational attainment can potentially reduce earnings throughout an individual's life. Thus, it may be suggested that there is an indirect effect of education on alcohol use. That is, alcoholism's most important impacts on income may occur via its impact on such factors as education, marital stability, and health.

Level of drinking between high and low income people can vary according to various social settings. Single & Wortley (1993) found the low income group (under $10,000) to drink more (16%) when they are in bars and taverns, and at parties or social gatherings, or when visiting someone else, compared to 9.9% for moderate income group ($40,000 - $60,000) and 11.9% for high income group (over $60,000). On the other hand, the overall proportion of total consumption was greater for the high income group in restaurants (16.7%) compared to the low income group (8.9%).

Limitations. Although studies on the effect of income on alcohol abuse seem to have yielded conflicting results, there are some noticeable differences in the characteristics of these studies that could explain the differences in findings. These features make comparison of results between studies difficult. The conflicting nature of relationships between alcohol use and income found in different studies may be attributed to the difference in survey design, the variables used, and the composition of the samples, and sometimes to improper consideration of broader issues such as drinking patterns. For example, some studies used only male subjects while others used both males and females, some used only workers while others used adults. Also, the different definitions of alcohol use adopted in different studies may have contributed to the conflicting results. Many of the studies which found a negative correlation between alcohol use and income, used a general population sample including both workers and non-workers, and defined alcohol use as *alcoholism* (Berry & Boland 1977; Harwood et al. 1984; Heien & Pittman, 1989) or diagnosis of alcohol abuse and dependence (Mullahy & Sindelar 1989; 1991). In contrast, two studies (Berger & Leigh, 1988; Cook, 1991) showing a positive association between alcohol use and income, used data sets composed of workers only, and defined alcohol use as alcohol consumption.

The relationship between income and problem drinking may be affected by the employment status of a person. In one study the impact of *alcohol abuse and dependence* was found to be greater on the earnings of a sample of working and non-working males than that on the earnings of a workers-only sample (Mullahy & Sindelar, 1992). On the other hand, alcohol use had a positive relationship with income in a general population sample, when it was defined as *alcohol consumption*. In the same general population sample, a significantly negative impact on income was found when another indicator of diagnosis was used. This indicates that measures taken to define alcohol abuse are important determinants of its relationship with unemployment.

The above studies raised a number of observations that must be taken into account while comparing results obtained from different studies, or in the design of a new one. First, it is difficult to determine whether alcohol use *causes* reduced income, or it is mainly one of the symptoms of reduced income. It is commonly believed that alcohol use causes a reduction in income by reducing productivity, worker reliability, hours worked and the ability to obtain or retain a job, and by increasing absenteeism. Such a causal link has not been well established. It is possible that low income creates stresses that increase the propensity to abuse alcohol, or that a third factor causes alcohol use and lower income (e.g., it is possible that a painful health problem could cause lower income and also alcohol abuse to relieve the pain). Second, different studies used different definitions of alcohol use. Therefore, the statement that alcohol use decreases income may imply different meanings depending on whether *use* is defined as *alcohol consumption*, or *alcoholism*, or *alcohol abuse* or *alcohol dependence*. Third, the data itself can affect the results of research. For example, a worker-only sample eliminates people who are not actively participating in the labour market (i.e., unemployed, homemakers, retired persons) and thus, allows easy comparisons of income. On the other hand, a general population sample which includes the unemployed, will allow examination of such adverse outcomes as job loss. Fourth, studies that included both social and cultural variables used either cross-sectional data or pooled data covering relatively short time spans. These studies do not, however, explain the observed consumption patterns over time at an aggregate level. A better understanding of the aggregate consumption over time may be obtained by simultaneous inclusion of a number of factors that have been found to influence it.

Research on Demographic Variables and Alcohol Abuse

The general view supported in the literature is that there is a considerable variation in the proportion of drinkers across categories of major social differentiations - such as gender, age, ethnicity, religious affiliation, and region and urbanicity of residence. Social differentiation predicts who drinks frequently or heavily (Knupfer, 1966) sometimes even more strongly than other differentiations. The following discussion refers to the studies of variations in alcohol use with *gender* and *age*.

Gender and Alcohol Abuse

Various aspects of alcohol use and abuse were investigated in the studies that reported differences across gender groups. These were alcohol dependence, regularity of drinking, drinking related problems, lifetime abuse, and effects on stress and employment. A number of studies had further classified the gender groups into subgroups according to socio-economic status, employment, marital status and age to identify any possible variations in alcohol use among these subgroups.

Brady, Grice, & Dustan et al. (1993) found men to be more likely to be alcohol dependent compared to women. Using data from a 1990 national survey of drinking by adult Americans, Midanik & Clark (1992) reported that men are more likely to drink, to drink frequently and heavily compared to women. In most of the community surveys carried out in the UK and the USA, it was found that substantially more men are regular drinkers than women (Clark & Midanik, 1982; Edwards, Hensman & Peto, 1972; Wilson, 1980). Men, in two general population surveys, were found to increase their alcohol use and abuse after job loss (Smart, 1979; Wilson, 1980). Brenner (1975) had a similar conclusion.

In a homogeneous population of employed men and women, Jenkins (1986) found that men were heavier drinkers than women. A study of 398 Puerto Rican men aged 18-48 years (Singer et al., 1992) found that the heaviest and most problematic drinking occurred among men who lived in rented apartments in a high density, low income, inner-city neighbourhood, and were unemployed. Several studies that reported an increase of alcohol consumption during unemployment, found such increases in men but had a less clear finding in women (Hammerstrom et al., 1988; Winton et al., 1986). Hammer (1993) found that unemployed young men had a higher alcohol consumption while unemployed women had a lower consumption than those in employment.

Men consistently have reported higher levels of alcohol consumption and a greater number of drinking related problems than women (Caetano, 1984; Corbett, Mora & Ames, 1991; Gilbert, 1985; Gilbert & Cervantes, 1987; Holck, Warren, Smith et al., 1984; Martin & Pritchard, 1991; Riley & Marden, 1948). The current and lifetime prevalence rates of alcoholism were found to be much higher among men (Leung, Kinzie, Boehnlien, et al., 1992). Alcohol disorders were much less prevalent among women. These differences probably reflect the different drinking styles between men and women. A small percentage of women than men consumed alcohol regularly or in large quantities (Cahalan et al., 1969; Fillmore, Hartka, Johnstone et al., 1991; Gomberg, 1990; Hilton, 1988a; Room 1990).

Women become intoxicated with less alcohol due to lower body weight. Therefore, it is possible to have a gender difference in quantities consumed for the same intoxication level. The male predominance of heavy drinking may disappear when consumed quantities are corrected for body weights (Brennan, Walfish & Aubuchon, 1986; Ratcliff & Burkhart, 1984). York & Welte (1994) reported that although women consumed less alcohol than men, the values were closer when amount of consumed alcohol was expressed as a function of total body water. Such analysis on data from other studies (e.g., Dawson & Archer, 1992; Mercer & Khavari, 1990) indicated that the predicted functional impact of alcohol intake of women may be closer to that in men than previously believed.

Barnes et al. (1991) found that for higher income individuals, drinking was a fairly universal norm for both men and women. This finding is fairly consistent with that reported by Hilton (1988a) for a national US sample. When the family income was low, there was a substantial difference in drinking rates of men and women. Very low proportions of heavy drinkers were observed among low income women with less than a high school education. However, as family income increased, these differences decreased. For a family income of $50,000 or more, rates of drinking were the same (88%) for men and women.

The finding that women and men do not differ much in their drinking rates at high economic status but do so when family income is low may be explained within the context of *sex-role theory* as related to social class. Compared to lower class families, the upper middle class families (who are typically professionals with higher education) have a blurred pattern of traditional sex-role differentiation (Langman, 1987). They also have more social roles and are more active in professional, business, community and leisure activities which are often not sex-specific. As social drinking is often an accompaniment to these activities, the upper middle class women have similar high rates of overall drinking as men. Women with multiple role involvement were found to drink in high proportion even if they belonged to religious groups with conservative norms about alcohol use or to ethnic groups where women's drinking was uncommon (Keil, 1978). Socio-economic factors were of critical importance in distinguishing between abstainers and drinkers, but they are of relatively minor importance in determining the level of consumption among women drinkers (Treno et al., 1991).

Women alcoholics were somewhat more likely to be employed than women in the general population, and their level of education was higher than that of nonalcoholic women (Schuckit & Morrissey, 1976). Even though the rate of overall drinking of unemployed women was lower than that of the employed, the rate of heavier drinking among unemployed women looking for work was the highest (10%) of any of the women's employment groups. Women who were employed part-time or women who were home makers or retired had the lowest rates of heavier drinking (5%). However, Mustonen et al. (1994) found no apparent association between drinking habits and employment status among women. Employed women were not significantly different from those who were jobless, even under prolonged unemployment. It was suggested that alcohol does not have a significant role to play in women's lives irrespective of their employment status. Women are more organized in their everyday lives and therefore, when unemployed, they either spend their time on home-making or increase their pursuits and educational activities more frequently than men. Employed women share their time between a greater number of activities than men and their time use is not necessarily as strictly divided by work and spare time activities (Pentilla, 1993, reported in Mustonen et al., 1994).

Some studies in United States reported an increase in drinking among women (Gomberg, 1982; Hingson, Mangione &Barrett, 1981; Leland, 1982; Smith, 1981). Such evidence was also found for the UK (Shaw, 1980). Several factors may be cited as causes of such increase. These are: removal of constraints upon women's drinking, higher discretionary spending power, less social stigma to women who drink regularly

(Camberwell Council of Alcoholism, 1980), and most importantly, the role conflicts for working women to meet their domestic, family and occupational commitments. Hard and fast sex role distinctions are breaking down in some parts of society (Gagnon & Simon, 1973).

Some researchers believe that erosion of rigid sex roles is causing gender differences in drinking to disappear. With increasing success in their work and recreational spheres, women are moving into more traditional male domains of work and social environments, and are being less constrained by feminine stereotypes. The result is a changed environment in which women are encouraged to participate in traditionally male drinking patterns, and thus are exposed to a higher risk of alcohol abuse. Proponents of this *convergence hypothesis* believe that the traditional roles of men and women are converging and so is the gender difference of alcohol use. Women in management and professional positions were found to use alcohol more (94.6%) than men (88.3%) (Fortin & Evans, 1983). Also, more women (96.6%) reported at least infrequent consumption than men (93.6%). However, only 1.4% of the women and 3.1% of the men rated their drinking as heavy or too heavy. Drinking rates were very high among women in professional, technical, managerial and clerical jobs, and among the self employed (ranges from 47 - 50%) (Hingson et al., 1981). There is, however, little support for this in the general population (Ferrence, 1980; Kaestner, Frank, Marel et al., 1986; Robins, 1989; Wilsnack, Wilsnack & Klassen, 1984) or more specifically on the college campus (Berkowitz & Perkins, 1987; Temple, 1987).

Single & Wortley (1993) reported that women consumed more alcohol in some social situations such as parties and social gatherings (18.4%), having friends or relatives visit (17.1%), when spending time at someone else's home (15.6%) and at restaurants (14.6%). For men, these percentages were 13.7%, 14.1%, 13.9%, 11% respectively. However, men consumed more alcohol in bars and taverns or when spending a quiet evening at home.

Plant, Peck & Stuart (1982) found an increase in mean alcohol consumption over time (from 1972 to 1982) among female Scottish teenagers who were *regular drinkers*. This evidence may be taken to indicate that the magnitude of gender differences in alcohol consumption and drinking problems is diminishing over time. However, this increase was obtained by a comparison of women's consumptions only. Whether there was an increase relative to men cannot be concluded. In a trend study of alcohol intake of the southern German population, Doring, Filipak, Stieber et al. (1992) found that during 1984-85 alcohol intake was high (36 g/day in men; 11 g/day in women) compared to those during 1989-90 (32 g/day in men; 9 g/day in women). While a trend to lower intake was observed for both men and women, the rate of such changes were different. However, in a national survey, no evidence of any major recent increase or any unusually heavy drinking among working wives were found (Wilsnack et al., 1984). Women who were between 21-34, unmarried, divorced, separated, or had frequent drinkers as spouses or companions showed adverse drinking consequences and episodes of extreme drinking.

There is a significantly high proportion of heavy drinking among single, divorced and separated women (Cahalan et al., 1969; Johnson, 1982; Shore, 1985; Wechsler et al., 1978). Single and unemployed women were found to face a greater risk of developing alcoholism (Fortin & Evans, 1983). It is possible that being unmarried may have a negative effect on the self image of women. The traditional feminine role was reported to be important to women problem drinkers (Jones, 1971), and alcoholics (Kinsey, 1966; Wilsnack, 1974).

For women, excessive drinking often begins during personal crises leading to hurt and self-devaluation, or with changes in marital or other intimate relationships. The changes in their roles as wives or mothers, such as divorce, menopause, or children leaving home (the so-called *empty-nest* syndrome) contribute to drinking problems. Many women appear to begin their immoderate drinking during their late thirties and early forties when such life-situation changes are common.

While alcoholic women used alcohol to manage stress and anxiety and to relieve depression more frequently than alcoholic men, non alcoholic women did so less frequently than alcoholic men. Alcoholic women are thus more *escapist drinkers* compared to alcoholic men and non problem drinking women (Cahalan et al., 1969). Female alcoholics drank more in response to mood changes and marital difficulties compared to alcoholic males (Lisansky, 1957; Olenick & Chalmers, 1991).

Consequences of drinking also vary according to gender. Perkins (1992) found that male college students had more negative consequences of drinking (e.g., property damage, injury to others, fighting, behaviour offending others and impaired driving) compared to women. Other problems (e.g., alcohol related problems with academic work, unintended sexual activity and damaged friendships and/or relationships) were more skewed towards women. The rates of affective disorders were much higher among women (Gavaler, 1982; Hill, 1982). Female alcoholics experienced a greater number of medical problems (particularly liver disease) than male alcoholics, even though female alcoholics generally consumed less alcohol over their shorter drinking careers. Moreover, rate of mortality was also significantly higher for females than for males (Gavaler, 1982; Wilkinson, 1980).

The *stress-dampening response perspective* proposes that higher personal distress causes an increase in alcohol consumption (Pelham & Lang, 1993; Sher, 1987). Stress process models for fathers and mothers differ. Family relationships do not appear to play a significant mediational role for fathers whereas they do for mothers. Problem drinking was found to influence only fathers, it had no influence on family stress or marital adjustment (Dumka & Roosa, 1994). The effects of stress on fathers' well being appear to be extensive. Alcohol has higher stress-dampening characteristics particularly for men.

Age and Alcohol Abuse

Studies on the effect of age on alcohol use and abuse that were found in the literature mainly compared younger age, middle age and older age groups. Some studies classified these three groups into a number of subgroups depending on gender, employment and socio-economic status. The general consensus of these studies is that there is a difference in alcohol use across age groups, and that younger people tend to drink more. This is again moderated by gender, employment and economic status. Findings from some of these studies are briefly described below.

A decrease in alcohol consumption with increasing age has been reported over the years in many studies (e.g., Cook & Allan, 1983; Hingson, Scotch, Barrett et al., 1981).

While more of the younger age group (68%) were found to have more than four drinks per week (46% in older age group), more of the older age group (24%) were found to be non drinkers, former drinkers or very infrequent drinkers (8% in younger group) (Glyn, LoCastro, Hermos et al., 1983). The percentage of regular drinkers who reported problems in the younger age group was far greater than those in the older age group.

Alcoholism tends to disappear with increasing age (Drew, 1968). Age was reported to be positively associated with alcohol consumption throughout most of the teenage years with the highest drinking in early twenties (Canada Health Survey, 1981; Canadian Gallop Poll Ltd., 1982; Whitehead, 1984). However, drinking declines in mid and late twenties. Younger people were found to be at greater relative risk of dying from alcohol related causes than older people (Klatsky, Armstrong & Freedman, 1992).

Doctors often fail to diagnose alcohol misuse among the elderly although they are more vulnerable to its adverse effects than younger people (Blazer & Pennybacker, 1984). Elderly are more likely to hide their drinking. The prevalence of alcoholism among the elderly in England and Wales were reported to be approximately 0.5% (Moss, 1967). In a random population sample it was found that 2.2% of those aged 65 to 74 years, and 1.2% of those aged 75 or more were excessive drinkers (Bailey, Haberman & Alksne, 1965). The decline in drinking in old age may be due to economic constraints, changed social setting following retirement, or a decline in desire for alcohol (Rosin & Glatt, 1971). However, Naik & Jones (1994) did not find a significant relationship between excessive drinking and age, gender, or social class. They reported that alcohol history of people with increasing age and of higher social class was significantly less likely to be recorded by health care workers.

National surveys of community-dwelling individuals consistently found more young people to be drinkers. They were also heavier and more problematic drinkers than elderly people (Clark & Midanik, 1982). In these national surveys, the prevalence of problem drinking was found to be the highest among men between 21-34 with a rate about 2.5-3.0 times that of men aged 65 and over. Loss of control and symptomatic drinking were also most common in younger subjects, especially among unmarried men in their 20's (Cahalan & Room, 1974). People admitted for treatment of alcoholism were mostly found to be between ages 40-49, with a rate 3 to 4 times greater than those aged 61-70 (Drew, 1978). However, the pattern of drinking by age may vary for other measures of alcohol use. Midanik & Clark (1992) reported the proportion of daily drinkers to increase with age. On the other hand, the measures describing heavier-drinking occasions showed declining rates with increasing age; drinking eight or more drinks in a day was found to be prevalent only among younger men.

Alcohol consumption and its effect on mortality may be related to both gender and age. Every general population survey found younger people to drink more. After a specific age, people generally drink less as they get older. Men were found to drink more than women at any age level. However, the difference decreases substantially during the age of 30. Men in their twenties face drinking problems and are heavier consumers of alcohol (Fillmore et al., 1991). The data from 1984 US national survey also found that men aged 23 -29 were less often abstainers and were more in the highest consumption categories compared to men aged 40 (Hilton & Clark, 1991).

Eighty three percent of the younger age group (21-34 years) were found to be occasional drinkers compared to 55% for people aged 65 and older. The rates of heavy drinking were also highest among 21-34 years old (18%) followed by 18-20 year old (15%). These rates for age groups between 35-49, 50-64, and 65 and over are 12%, 13% and 12% respectively. For every age group men were found to drink more heavily. Alcohol problems were highest among younger men and women, although the highest prevalence of alcohol dependence was in age group 34-40 (Parker, Kaelber, Harford et al., 1983).

Data from the Canadian fitness survey of 1981 showed that 14.8% of men aged 15-29 were heavy drinkers. The proportion for age groups of 18-21, 22-25 and 26-29 years were 19.2%, 16.4% and 11.2% respectively (Layne & Whitehead, 1985). The predominance of men alcoholics over women appeared to recede in later years (Moss, 1967). Also, elderly women were found to be more likely to have drinking problems than men.

The normative aging study carried out in 1973 and in 1992 did not find any tendency for men to decrease their consumption levels over time although older men were found to drink less than younger men at both times (Glynn, Bouchard, LoCastro et al., 1985).

There are studies which show differences of drinking across age and employment status. Layne & Whitehead (1985) reported that among employed men between ages 18-21, 22-25 and 26-29, the percentages of heavy drinkers were 21%, 17% and 11% respectively. For unemployed men, these values were 27%, 22% and 18%. Seventeen percent of employed people between ages 15-17 were found to be heavy drinkers. Rate of heavy drinking for younger (ages 15-21) unemployed men was twice that for students of the same age group. Older (aged 22-29) married unemployed drank more than older single unemployed.

Other studies show differences of drinking between age and race, and age and marital status. Younger whites exhibit considerably higher rates of heavy drinking than do middle aged or older whites. In contrast, young blacks drink less heavily than do middle aged blacks (Hilton & Clark, 1991). Rates of frequent heavy drinking between the ages of 18-29 were found only among whites, while they were found to be low for blacks. Rates of frequent heavy drinking among black men are fairly stable during the ages of 18-49, the peak for men occurs between the ages of 50-59, after which it drops off considerably. For whites the high rates among youth decline sharply for men in their thirties and gradually decrease throughout middle age. At age 60 they abruptly drop off (Herd, 1990).

The percentage of heavy drinkers among married men aged 18-21 was 21 while among single men in the same age range it was 19. Only 11% of single men aged 26-29 were heavy drinkers. Divorced and separated men (aged 22-29) had the highest proportion (27%) of heavy drinkers (Layne & Whitehead, 1985).

Age was found to be strongly related to both venue and level of consumption within particular venues (Single & Wortley, 1993). Younger persons reported higher rates of drinking in all social situations. Total consumption for young persons was more in bars and taverns (27.3%), and at parties. However, older people (65 or older) consume more at home (24.7%) than younger people (6.1%). Male, gender, young age, and not being married were all positively related to both the level of consumption and the frequency of heavy drinking occasions. High education and high income were related to a higher level of consumption but not to a higher frequency of heavy drinking occasions. Young unmarried males tend to have a higher number of problems with their drinking while high education and income were significantly related to a lower level of problems.

Older men and men with higher socio-economic status were less likely to report problem drinking. Subjects who drank for salutary reasons and in social settings were less likely to report alcohol related problems than those drinking equal quantities to reduce negative affect, for social enhancement or in context of masculine activities (Glynn et al., 1983).

Concluding Remarks on Literature Review

Some concluding remarks that can be made from the literature review are presented here. These include remarks on the present status of the definition and causes of alcohol abuse; the relationships between alcohol abuse, poverty and unemployment; and the effects of demographic variables on these relationships.

No single definition of alcohol abuse could be found in the literature that can completely describe the phenomenon. It was concluded that instead of using only one criterion (e.g., alcohol consumption or alcohol problems, as often used in previous studies), the definition should include more than one measure.

None of the existing theories provides a complete and satisfactory explanation of the causes of alcohol abuse although each theory is well-reasoned in its foundations. There is empirical evidence partially supporting the three categories of theories (i.e., biological, psychological and socio-cultural). Perhaps a combination of background factors of these three categories provides a better explanation of the underlying causes of alcohol abuse.

There has been substantial progress in identifying certain common background factors, often called *risk factors* of maladaptive behaviour. For example, individuals born to alcohol abusing parents may be at a quantifiable risk for becoming alcohol abusers. However, the mechanisms accounting for the increased probability of becoming an alcoholic are not well identified. A genetic connection may be only one of several possibilities. Moreover, if we did have such knowledge, it would be of limited help in understanding the alcohol abusers with no history of abuse in their family, and the non-abusers born to abusing parents. Similar conclusions can be made on psychological and socio-cultural predispositions to alcohol abuse. Evidently, there is more than one causal pathway that can lead to alcohol abuse, and this situation appears to be the rule rather than the exception. Thus, there is rarely any precise, reliable knowledge about how the person arrived *here* from *there*. Even the cases in which true primary causes have been established can leave us baffled when observing diverse outcomes. Not every person fulfilling the criteria become abusers.

The level of alcohol consumption may perhaps be explained in two separate ways. When the biological, psychological and social forces motivate people to drink, it is likely that there is an *increase* in alcohol consumption. Genetic predisposition for alcoholism, physiological and psychological tolerance for alcohol, reduced impulse control, and social norms that encourage alcohol use may be the possible factors contributing to the increase. On the other hand, a *decrease* in alcohol consumption may be due to constraints that discourage people from drinking. These constraints may include social norms that discourage alcohol use or abuse, and limits on income or on the physical availability or price of alcohol.

Although the circumstantial evidence for alcohol as an anxiolytic substance appears to be quite strong, the effect of unemployment on alcohol abuse remained inconclusive in terms of its extent (i.e., whether it increases or decreases alcohol abuse) mostly because of the differences in the definitions and designs used in the studies. However, the existence of an effect of unemployment on alcohol abuse is overwhelmingly acknowledged, irrespective of its magnitude. No direct investigation on the effect of poverty on alcohol use could be found in the literature. Most studies done in this area compared the different income and employment levels at different degrees of alcohol consumption.

The central argument of the proponents who conclude that unemployment reduces alcohol abuse, is that unemployment is followed by a reduction in real income leading to a lowering of alcohol consumption. On the other hand, studies showing an increase of alcohol use argued that alcohol serves as an instrument of coping with additional stress induced by unemployment and hence, consumption increases with unemployment. However, it is not necessarily true that the unemployed suffer reduced income. They may suffer less financially than people with low income because of their savings, severance payments, unemployment insurance, or other family income. Therefore, it is imperative that poverty measures and other variables be considered together with unemployment in order to study drinking behaviour and related social problems.

Certain prescribed roles and status appear to be more predisposing to disorder than others. Low socio-economic status or poverty seems to be associated with greater risk for alcohol abuse. Poverty in turn seems to be related with lower education level and employment status. There is a variation in alcohol use depending on gender and age. Men tend to drink more than women. People tend to drink less as they grow older. Additionally, certain roles that have evolved by given cultures may in themselves be maladaptive, and certain large scale cultural trends, such as rapid technological advance, may increase stress among high income groups by lessening the effectiveness of traditional coping resources.

The review does not provide any clear and conclusive demonstration of causal effects of unemployment on alcohol abuse. What is required is a careful identification of the links between unemployment, poverty and alcohol abuse. Causal analysis has been difficult in part because of the dependence on essentially *correlational* methods. The mere association of one variable with another as found in the research on unemployment and alcohol abuse, cannot by itself establish a causal connection between them. Even the full use of *experimental* methods on etiological questions is difficult to do, and may not be an assured way of gaining the needed information.

Need for the Present Research

It was concluded from the review that there is substantial evidence supporting the importance of poverty and employment status as independent predictors of alcohol use and abuse. It is imperative that these variables are integrated into a conceptual framework to test simultaneously their contribution to alcohol abuse to enhance our understanding of the complex relationships. Components of the problems that need to be addressed in finding this relationship are listed below:

1. The evidence suggests that there should be a relationship between unemployment and alcohol abuse. Indirect theoretical support for this evidence comes from theories which advocate that people turn to alcohol use to cope with stress. It is widely accepted that unemployment is a stressor. Following this, it may seem plausible that unemployment increases alcohol abuse. Also, without having to work in a structured time frame, an unemployed individual (especially a heavy drinker) may take the opportunity to spend the extra time drinking. However, the nature of the relationship is not yet clear.
2. Unemployment brings economic hardship causing the individual's buying power to be reduced. This reduction in buying power, in turn, may reduce the availability of alcohol to the unemployed individual. This reduction may, however, take some time to be effective. The economic consequence of unemployment seems to work in the opposite direction to the stress factor. To establish this and to account for its moderating effect, an economic indicator (i.e., poverty) should be included in the study of relationship between alcohol abuse and unemployment.
3. The initial stress of unemployment may result in an increase of alcohol use. However, with prolonged unemployment, it is likely that economic reality will set in and the individual may reduce alcohol use. Also, as the unemployed status is prolonged, the individual may get used to the changed situation and therefore, return to the pre-unemployed level of drinking (or even may reduce drinking). To capture these effects,

the study of alcohol abuse and unemployment should be longitudinal.

4. There is evidence that the history of alcohol use in the pre-unemployment period affects the behaviour of the unemployed individual (in relation to alcohol use). Heavy drinkers may tend to drink more following job loss. On the other hand, moderate drinkers may reduce alcohol use following job loss. Therefore, individual's history of alcohol use should be taken into account in such a study.
5. The three distinct and complimentary aspects of alcohol abuse namely, alcohol consumption, alcohol dependence and alcohol problems should be considered together to measure alcohol abuse. This is necessary in order to have the best possible description of the term, and eventually reduce measurement error.
6. There is evidence that the extent of alcohol abuse varies between different demographical groups (e.g., between male and female; between different age groups). Young males are more likely to increase their alcohol use following job loss. Proper consideration or these groups should be accommodated in the study of alcohol abuse and unemployment.
7. Alcohol abuse is the result of simultaneous interaction of a number of variables and constructs. To identify any relationship, simultaneous consideration of these variables and constructs is imperative.
8. A suitable statistical method capable of handling simultaneously all the variables and constructs should be used. At the same time the method should be capable of handling longitudinal data, categorical variables and measurement errors.

Proper consideration of all of the above points in a model is necessary to establish a causal relationship between poverty, unemployment and alcohol abuse. Unfortunately, none of the studies in the literature that were devoted to finding such a relationship considered these points simultaneously. The only common factor in the previous studies is that of general agreement that there is a relationship between alcohol abuse and unemployment (point 1). Therefore, it is not surprising that the results of the previous studies are contradictory (and inconclusive).

The limitations of specific studies have been described in the previous sections. A description of the general difficulties inherent to the previous studies that might have resulted in contradictory conclusions follows.

1. Most of the previous studies are cross-sectional in nature. There is general agreement that the nature of the relationship between alcohol abuse and unemployment is time dependent. As discussed above, it is plausible to assume that the increasing nature of the relationship may be reversed with prolonged unemployment. Since the studies were not done at a common time-point of unemployment, and since no economic indicator was considered to account for the moderating effect of economic constraints, it is unlikely that these studies would produce similar results. This makes comparison of results from different cross-sectional studies difficult.
2. Only a few studies had longitudinal designs. Even these studies produced contradictory results. The longitudinal studies that found decrease in alcohol abuse with unemployment, all had their follow-up measurements made at a longer time interval than those longitudinal studies which found an increase. This observation may, again,

suggest a moderating effect of poverty on the relationship. Also, all of these longitudinal studies suffered from some of the other limitations.

3. Some studies had considered the effects of variation due to demographic groups by separate analysis by group, while others did not. Comparison of results within the same category of studies (e.g., studies which considered demographic groups) is not possible simply because they were not carried out at the same time-point in unemployment.
4. All of these studies were correlational in nature and thus failed to identify any causal direction between unemployment, poverty and alcohol abuse.
5. All of these studies suffered from measurement errors (and did not take care of such errors in analysis) in not considering a more complete description of alcohol abuse. Most of the studies used alcohol consumption as the measure of alcohol abuse.

Note that these difficulties are in addition to those described before.

Objectives of the study

The objective of the present study is to investigate the relationship between alcohol abuse and unemployment and poverty (income used as one of the components of poverty) through a longitudinal study. The aim is to identify any differential changes in alcohol abuse that may (or may not) occur because of unemployment or poverty experienced by the individuals. Irrespective of the causes that triggered an individual to belong to the pre-existing state (e.g., prior to unemployment) of alcohol abuse, changes due to poverty or unemployment is likely to be captured (if any) in a longitudinal design of study. For example, if a moderate drinker (before unemployment) becomes a heavy drinker after unemployment while other conditions remain the same, one may conclude that unemployment increases alcohol abuse. The pre-existing level of drinking for this individual may have been caused by any (or all) of the three groups of factors (biological, psychological or socio-cultural) that are thought to cause drinking. These pre-existing factors are assumed to be prevailing after job loss and are not considered separately in this study. It may be mentioned that the assumption of *other conditions remaining the same* may not hold for some individuals and situations, and would introduce errors. However, most of these factors (e.g., biological, cultural) do not often change.

Poverty and unemployment are socio-economic variables that have psychological consequences. The basic premise of this study is that increased poverty (or decreased income) and unemployment induce psychological stress which the individual has to cope with. The prevalent acceptance of alcohol as a coping mechanism in Canadian society makes a person vulnerable to drinking. Whether an individual will increase alcohol consumption (with respect to the existing level) because of a poverty or unemployment experience will ultimately depend on other moderating factors. For example, a reduction in income due to unemployment may make alcohol difficult to afford for the individual. The question of availability appears to have no impact on the individual since the purchase and consumption of alcohol is not restricted for the adult Canadian population. Depending on his/her predisposition the individual will decide whether to increase alcohol use or not. Evidently, there would be variations in individual decisions regarding such matters. However, a general tendency will emerge from the statistical analysis (which is designed to consider individual variations) of this study. Therefore, it can be argued that the theoretical basis for the procedure and hypotheses of this study are drawn from psycho-social factors which provide support for the use of alcohol as a coping mechanism for dealing with psychological stress in different psychological, social or economic conditions.

The present research tests a causal model relating stress and alcohol abuse due to unemployment and poverty in a survey with cross-sectional and longitudinal samples. It is expected that alcohol is used as a generalized coping mechanism and that the use of alcohol to cope with the stress due to unemployment and poverty will promote an increase in drinking and alcohol abuse and dependency for heavier drinkers. On the other hand, economic constraints followed by unemployment will induce moderate drinkers to reduce their drinking habits. These changes in drinking pattern will vary among genders and ages. Some people may not change their drinking habits provided they have other coping strategies to deal with the stress of unemployment and poverty.

The following proposed relationships, based on the literature, form the basis of the models that are tested in the present study.

1. Short-term unemployment creates stress in the individual. This stress causes increased alcohol use.
2. Long-term unemployment leads to increased poverty. This, in turn, causes the individual to reduce alcohol use.
3. Economic constraints resulting from unemployment cause reduced alcohol use in most people. Unemployment does not reduce alcohol use.

4. There are three distinct aspects of alcohol abuse. These are alcohol consumption, alcohol dependence and alcohol problems.
5. Increased alcohol consumption causes increased alcohol dependence in some people.
6. Increased alcohol consumption causes increased alcohol problems in some people.
7. Poverty creates stress in the individual causing increased alcohol use in some people.
8. The demographic variables of gender and age affect the nature of relationship between unemployment and alcohol abuse.

Simultaneous analysis of variables and constructs related to the above relationships is made by using structural equation modelling (SEM) technique, a statistical tool of multivariate analysis. The empirical evidence and theoretical basis for these assumptions (except theories on SEM) are discussed in preceding sections. The basis for application of SEM in this study is discussed in a later section. The technical details of SEM are provided in the method section of this report.

Poverty in the present study is used as a latent construct measured by its major contributors, namely, family income, the number of family members, education level and employment status. Using it as a latent construct has some advantages. For example, with the application of structural equation modelling, it is possible to study the indirect effect of unemployment and income through poverty as well as the direct effect of unemployment and income on alcohol abuse. It is worthwhile to investigate whether unemployment or poverty alone cause alcohol abuse or whether unemployment and poverty are the joint causes of alcohol abuse.

This study uses alcohol consumption, alcohol problems and alcohol dependence simultaneously to describe alcohol abuse. This provides a broader perspective of the term and helps reduce the contradiction as noted in the literature. Alcohol consumption is measured by the amount of ethanol consumed reflecting patterns of drinking behaviour. Alcohol problems provides the social and physical alcohol related problems experienced by the individual. Alcohol dependence is measured by three standard scales (DIS-III-R, SADD and MAST). The use of all these measures will provide additional knowledge about the extent of any relationship that may exist between alcohol use, alcohol problems, and alcohol dependence with unemployment and income (i.e., poverty in a latent sense). Relationships found with any one specific criterion measure may thus be interpreted to have an impact on alcohol abuse in a more general sense than is the case with the term used in previous studies.

Demographic variables of age and gender are considered in this study. These variables may directly or indirectly influence the unemployed to be alcohol abusers. The study investigates possible differences or similarities that may exist between the drinking habits of men and women, and between the drinking habits of young, middle and older age groups.

Structural equation modelling is used to conduct simultaneous analysis of the contributions of these diverse set of explanatory variables in a longitudinal design. The Winnipeg Health and Drinking Survey (WHDS) provides such longitudinal data for this study. The reasons for using this particular data set are discussed in a later section.

This research advances a step further than previous work done in this area as the complex problem of causality has not been well addressed. With the use of structural equation modelling, the present study aims at finding causal patterns in individuals supposedly sharing the problems of alcohol abuse. Previous research has aided in gaining a considerable knowledge of the general factors by correlating with one or another disorder at the group level. These provided some clues about causal influences in individual cases, but a large array of *unexplained* influences is still present. With the help of this new analysis the present study will move beyond this position.

The present study will be helpful in structuring programs designed to reduce social problems due to alcohol abuse or to prevent unemployment and poverty. Also, it will help to determine what kinds of therapy to apply to those who already have major social problems; and to know better how to intercept and deal with those who are on their way to such problems.

Hypotheses

The hypotheses that are tested in this study are given below. These are presented in two groups: primary hypotheses, and hypothesis on demographic variables. The primary hypotheses include hypotheses based on cross-sectional design (Model 1) and those based on longitudinal design (Model 2). A longitudinal data base collected from a community sample is used to test these hypotheses. The data are described in the method section. A structural equation modelling approach is followed for this purpose.

Primary Hypotheses

1. A positive effect will be found between poverty measures and alcohol use - showing that poverty causes alcohol use (Model 1).
2. A positive effect will be found between poverty measures and alcohol problems - showing that poverty causes alcohol problems (Model 1).
3. A positive effect will be found between alcohol dependence and poverty - showing that alcohol dependence causes poverty (Model 1).
4. A positive effect will be found between alcohol use and alcohol problems - showing that alcohol use causes alcohol problems (Model 1).
5. A positive effect will be found between alcohol use and alcohol dependence - showing that alcohol use causes alcohol dependence (Model 1).
6. Unemployment at wave 2 (recent unemployment) will show an increase in alcohol use in Wave 2 (Model 2).
7. Unemployment at Wave 1 (longer unemployment) will show a decrease in alcohol use in Wave 2 (Model 2).
8. Poverty at Wave 1 will cause alcohol use and alcohol problems in Wave 2 (Model 2).
9. Alcohol use and alcohol dependence at Wave 1 will cause poverty in Wave 2 (Model 2).
10. Alcohol use at Wave 1 will cause alcohol problems and alcohol dependence in Wave 2 (Model 2).

Hypotheses on Demographic Variables

Alcohol use, alcohol problems and alcohol abuse/dependence will be more prevalent for men and for the younger age group. Both of the models (1 and 2) will be tested separately on gender and age.

Structural Equation Modelling and Latent Variables

Structural Equation Modelling is a statistical methodology that takes a confirmatory approach (i.e., hypothesis - testing) to the multivariate analysis of a structural theory bearing on some phenomenon (Byrne, 1994). A structural model specifies the causal relations of the constructs one to another as posited by the theory under study. The confirmatory approach requires the pattern of inter-variable relations to be specified a priori. This helps the procedure to analyse data for inferential purposes. The approach also provides explicit estimates of the measurement error which traditional multivariate procedures are incapable of estimating. It is a useful tool for studies related to alcohol abuse.

It is important to ensure that in any research dealing with the problem of identifying the cause or effect of alcohol abuse on social behaviour, the factors influencing the occurrence of alcohol abuse are well represented. It is possible that the results of such investigations may be misinterpreted because of imprecision in the measurement or estimation of the factors, or variables, involved. For example, in a study to determine whether heavy alcohol consumption increases the probability of becoming unemployed, the *predictor variable*, in this case is the level of alcohol consumption. This is subject to measurement error because survey respondents may under-report their level of drinking. A similar problem might arise in the attempt to measure alcohol dependence (alcoholism). This variable cannot be observed directly, and is estimated through observation of related variables. The *true* value of the predictor variable is said to be latent, or hidden.

The latent variables are the variables that represent theoretical constructs. These constructs are abstract concepts. They are measured indirectly by assuming that they underlie particular groups of observed measurements according to some theory. This is done by linking the unobserved variables to those that are observable. The latent variable, thus, in essence is defined in terms of some behaviour that is believed to represent it. The need for the use of latent variables occurs when a given variable cannot be observed directly including situations where the variable must be estimated from a number of related variables, or when it contains measurement error. Measurement error does not always give rise to attenuation, but may inflate relationships when there is more than one predictor. For example, measurement error in one predictor may give rise to overestimation of the effect of a second predictor (Fuller 1991). *Latent variable modelling* is a useful technique for avoiding such distortions.

In the present study, alcohol use, alcohol problems and alcohol dependence are used to represent the three distinct aspects of alcohol abuse. These criteria are the multiple indicators (unobserved), and alcohol abuse is the unobserved latent variable, the status of which we want to infer from the status of the criteria. Again, DIS-III-R, SADD and MAST are the set of diagnostic criteria for measuring the unobserved latent variable *dependence*.

DIS-III-R might include any number of diagnostic criteria for alcoholism, such as giving up important activities in favour of drinking or having fits or seizures after stopping or cutting down on alcohol. These criteria are multiple indicators, and alcohol dependence is the unobserved latent variable. In order to formulate a reliable statistical model of how well the indicators measure the latent variable, it is necessary to translate theory into a statistical measurement model and then test how well the statistical model fits the observed data (Muthen, 1992). The ability of using latent variables in the SEM procedure provides considerable flexibility in selecting indicators of a psychological construct.

Such an approach was used by Edwards (1986) in the conceptual model of the alcohol dependence syndrome, traditionally designated as *alcoholism*. The syndrome *occurs with graded intensity*- that is, the manifestations of alcoholism can be ranked according to increasing severity. Thus, there is a single underlying continuum, or dimension, along which alcohol dependence becomes more severe. The syndrome may be recognized by the clustering of certain *elements*. These elements can be interpreted to represent the diagnostic criteria. Not all of the criteria need to be present, or present in the same degree, to establish the diagnosis. However, the syndrome tends to manifest itself with greater clarity as the criteria that are present increase in number and severity. This concept of a single underlying dimension along which alcohol dependence becomes more severe is reflected in the DSM-III-R (1987), where severity modifiers of *mild*, *moderate* and *severe* are applied to diagnoses of alcohol dependence, based on the number of criteria fulfilled.

Generally, the measurement of the latent variable is improved when more criteria are used and when the relationship between each criterion and the latent variable is strong (Muthen, 1992). In the present study, the appropriateness of latent variable model are tested against real data.

The values of the latent variables representing alcohol abuse are estimated in the present study from subjects' responses to questions related to diagnostic criteria. The scores of the latent variable are related to variables such as the respondent's alcohol use, alcohol problems and poverty level. The analysis is carried out by extending the model to include covariates, observed variables that are assumed to be related to the criteria and their latent variables. This approach has the advantage of not forcing a choice of cutoff point on the sum of the criteria and classifying all subjects as either *nondependent* or *dependent* individuals, or individuals as having *problems* or *no problems*. Thereby, the misclassification problems mentioned earlier can be avoided.

Latent variable models can be used to study the classification and causes of alcohol disorders, to analyse the progression of alcohol problems, to study the co-occurrence of alcohol dependence and depression, and to study the genetic susceptibility to alcohol dependence (Breckler, 1990). Phenomena under the present study, i.e., alcohol abuse and poverty, are abstract concepts and cannot be directly observed, and as such there is a need of multiple indicators to describe various aspects of these phenomena.

The software package of EQS (short for *equations*), which is a leading structural equation modelling program, is used in this study. This program is widely used by scientists and professionals in fields ranging from social and behavioural sciences to management, medicine, and market research. It has a simple and comprehensive approach to the specification, estimation, and testing of models for means and covariance structures. In addition to the many scientific innovations offered by this program, EQS has many user-friendly features that allow it to be used with different computer systems and operating environments. EQS Version 5.0 for Windows (Bentler & Wu, 1995) has been used in this study. This version allows the user to prepare a raw data set, impute missing values, visually inspect the data, and plot and print graphs. It automatically helps to construct the set of specifications and equations necessary to run the EQS structural equations program. This version has a substantial improvement in the modelling procedure that includes improvements in several tests used for model identification, and improvements in automatic model modification. Most importantly, categorical variables in addition to the continuous variables are handled by the current version.

Advantages of using SEM

Structural equation modelling is a multivariate analysis technique that can be used to verify a structural relation hypothesized from theory involving multiple variables. This technique has certain advantages that are perhaps more evident when compared with the other two widely used methods namely, the exploratory factor analysis and the multiple regression analysis. Although these two methods have been successfully applied in a wide variety of situations, certain questions on statistical inference that can be successfully addressed by SEM cannot be answered following these methods. Dealing with latent constructs and measurement errors are the two most important areas where SEM has a clear advantage over the other two methods.

Structural equation models can handle both observed and unobserved (latent constructs) variables. Multiple regression method in which all the variables have to be observed cannot handle latent constructs. While the traditional exploratory factor analysis uses latent constructs, it is limited in the applicability and the basis of formulating the constructs because of its descriptive nature. The exploratory factor analysis seeks factors from observed variables while these are hypothesized a priori in SEM from theoretical grounds. Thus, SEM allows testing the construct validity of the factors while it is difficult to do in the other method. The traditional factor analysis does not provide sufficient evidence on construct validity, and it deals with structures of the relations between variables only in terms of common factors. Thus, inclusion of the indicator variables into a factor in the traditional method relies heavily on statistical grounds. Sometimes, indicators with opposing characteristics (from the theoretical viewpoint) are included in a factor which is very difficult to explain.

Relationships between latent constructs cannot be sought in multiple regression technique. In exploratory factor analysis, such relationships are only expressed in terms of correlations. This does neither imply nor guarantee any causal relationship between two or more latents. Any hypothesis testing in terms of the direction of causality is not possible because of the lack of theoretical basis. On the other hand, SEM requires that any causality direction be specified a priori in the model with theoretical backing. Thus, the plausibility of the proposed causality direction can be tested for statistical inference. A variety of goodness-of-fit criteria are available for this purpose. These criteria permit comparison of different models in terms of their fit to the data. This feature equips SEM with very powerful tools for inferential purposes. Direct and indirect causal effects of variables can be tested simultaneously. Applicability of the theoretical model to different groups of data can be tested. Statistical comparison of the proposed model between groups of data in terms of its validity and the degree of strength of causal paths can be done as well. It is also possible to compare means of unobserved latent constructs. None of these features are available with other multivariate analysis methods.

The traditional multivariate procedures are incapable of either assessing or correcting for the unreliability of measures known as *measurement errors*. The traditional regression analysis which uses weighted least square estimation criteria ignores the measurement errors. The commonly held view is that these errors introduce biases in regression coefficients which lower the power of statistical tests for interaction. The application of confirmatory factor analysis as a means of dealing with the problem of unreliability is an advantageous alternate procedure. It provides estimates of these errors which can be statistically tested for significance. The mathematical relationships between various error terms can be analysed by a simple two-way interaction when driving at parameter estimates (Bentler, 1993). Covariation or correlation between errors can thus be tested for statistical significance.

The approach based on latent variable modelling to deal with the measurement error has some advantages over regression coefficients. This approach relies on multiple indicators of each variable to incorporate error theories into model tests and parameter estimation. The SEM with a latent variable approach coupled with the maximum likelihood estimation method have been found to do a satisfactory job of interaction analysis in the presence of measurement error in terms of Type I and Type II errors (Jaccard & Wan, 1995).

A general structural approach allows estimation of relationships between longitudinally assessed psychological constructs and other variables. Thus, it is possible to test any growth or decline in the strength of such theoretically and empirically relevant relationships over time. Theory-based structural models also permit consistent and efficient estimation of the degree of covariation between change in one or more repetitively measured latent dimensions and other variables.

The Use of SEM in Psychology

The use of structural equation modelling has been widely practised in different areas of psychology, the majority of which were published in the Journal of Experimental Social Psychology and the Journal of Personality and Social Psychology. The use of structural equation modelling has been found in many drug and alcohol abuse studies (Aiken, Stein & Bentler, 1994; Bentler, 1987; Dembo, Williams & Wothke et al., 1994; Huba & Bentler, 1982; Kinnier, Metha & Keim, 1984; Lennox & Dennis, 1994; Martin, 1992; Newcomb, 1994; Stein, Newcomb & Bentler, 1987; Stice & Barrera, 1995, Wills, DuHamel & Vaccaro, 1995). Other popular areas in which structural equation modelling was used include attribution, attitudes, loneliness, depression, personality, self-esteem, psychological well-being, health, self-concept, achievement motivation, love, mood, exposure effect, assimilation and contrast, sexual and dating behaviour, value, academic performance, socially desirable response and social support (see Breckler, 1990).

Reasons for Using the WHDS Data Set

The Winnipeg Health and Drinking Survey (WHDS) is a longitudinal panel survey using a lifespan approach to the relationship between personality and substance abuse (smoking and alcohol use). The data were gathered with an interval of 2 years, the first collected in 1989 (Wave 1) and the second in 1991 (Wave 2). The final data collection is in progress and expected to be finished in 1997 (Wave 3) with a sample interval of 6 years.

A number of studies were done on these data in recent years, but none of these studies aimed to find the relationship between unemployment, poverty (or income) and alcohol abuse. Most of the studies analysed a relationship between personality and substance abuse. These include: personality and drinking (Anderson, Barnes, Patton et al., 1994; Barnes, Feinstein & Murray, 1992; Barnes, Murray & Bentler et al., 1994; Barnes, Murray & Patton et al., 1995; Barnes, Patton & Murray, 1993; 1994a; 1994b; 1994c; Beaudin, Barnes, Murray et al., 1994; Patton, Barnes & Murray, 1993a; 1993b; 1994a; 1994b; 1994c; Murray & Barnes, 1990; Sommer, Barnes & Murray, 1990; 1991; 1992a); personality and smoking (Patton, 1994; Patton, Barnes & Murray, 1991; 1992; 1993c; 1993d; 1994d; 1994e); assessment of alcohol abuse (Murray, Barnes & Patton, 1991; 1992; 1994); sex differences in partner abuse (Sommer, Barnes & Murray, 1991; 1992b; Sommer, Barnes, Murray et al., 1994); ethnicity, religion and family history as predictors of drinking behaviour (Rodrigue, Barnes & Murray, 1992); reliability and validity of the SIRI in a Canadian sample (Barnes, Patton & Murray, 1993); longitudinal analysis of the relationship between smoking and drinking (Murray, Beaudin & Barnes, 1994); types of alcoholics in the general population (Patton, Barnes & Murray, 1994c); Structural equation modelling and personality research (Barnes, Murray, Patton & Bentler, 1995); a longitudinal study of drinking patterns and partner abuse in a community sample (Sommer, Murray & Barnes, 1995); a personality typology of smokers (Patton, Barnes & Murray, 1997); a longitudinal analysis of the relationship between smoking and drinking (Murray, Barnes, Patton et al., manuscript in preparation).

The reasons why the present study is proposed to be done on the WHDS data base are many. First, the data contain observations on a relatively large sample size (e.g., 1257 in Wave 1) which can be used for testing causal relationships between alcohol-related variables on a community level. Second, the data were collected following a longitudinal design, so the effects (or causes) of alcohol abuse, unemployment and poverty (or income) can be studied with a sample interval of 2 years. As described earlier the effects of unemployment are lagged and thus to study its relationship with alcohol abuse, a longitudinal data base is required. The present study takes advantage of the longitudinal design of WHDS data to find a causal relationship between unemployment, poverty and alcohol abuse. Third, it is suggested that alcohol abuse should include measures of alcohol consumption, alcohol problems and alcohol dependency. WHDS data used standard scales to measure alcohol problems and dependency in addition to measures of alcohol consumption. Fourth, the pattern and level of drinking of individuals has relevance in the relationship of unemployment and drinking. It was noted in earlier research that a large proportion of heavy drinkers change their drinking level following job loss compared to moderate and mild drinkers. It is necessary to consider these patterns and levels of drinking in determining the relationship between unemployment and alcohol abuse, and this can be obtained from life-span information on alcohol use. The WHDS data includes questions on life-span alcohol use. Fifth, the WHDS data have almost equal numbers of males and females in each age group. Sixth, the data have almost equal representation of young, middle and older age groups. This will facilitate the comparison of the proposed models for different groups by gender and age. Finally, as a future research, this study can be extended to examine the relationship between unemployment and alcohol abuse using Wave 3 data of the WHDS.

Among the above studies which used WHDS data, Patton (1994) used SEM to examine the relationship between personality and smoking. Using WHDS data, other studies are in progress which apply SEM to find relationships between personality and smoking, and personality and alcohol abuse.

METHOD

Sample

The cross-sectional and longitudinal data previously collected in 1989 (Wave 1) and 1991 (Wave 2) by the WHDS (Murray, Barnes & Patton, 1994) were used in this study. A stratified random sample of adult residents of Winnipeg (between ages 18 to 64) who were not institutionalized were used. This sample was drawn from the records of the Manitoba Health Services Commission (MHSC), the local medicare administration. The initial sample was stratified by age and gender, and consisted of 4,000 names and mailing addresses, in each of six categories: (1) males 18-34, (2) males 35-49, (3) males 50-64, (4) females 18-34, (5) females 35-49, (6) females 50-64. In each age-gender cell, a random subsample was drawn of sufficient size, estimating response rate, to obtain 200 interviews for a total of 1200 completed interviews. Additional random samples were drawn, where needed.

The total sample for Wave 1 was 1,257. To arrange a date and time for the Wave 2 interview, each participant was again contacted by phone approximately 2 years after the date of the first interview. Of the 1,257 interviewed in first Wave, 280 subjects were eliminated in the second Wave. Of these, 61 could not be located, 8 had since died, 83 had moved out of the city, and 128 refused to complete the Wave 2 questionnaire. In total, 977 participants completed both Wave 1 and Wave 2 interviews.

In specifying equal cell sizes for the above age strata, the younger respondents were undersampled (34.2% of the 1989 sample were aged 45-64 compared to 46.1% in the

1988 Canadian census) and older respondents were oversampled (41.2% of the 1989 sample were aged 45-64 compared to 31.0% in the census). Other characteristics also deviated from the population values, such as percent married, separated or divorced (78.2% of 1989 sample compared to 65.0% in the census).

The medicare list contains the names of all individuals who have received medical services in the Province of Manitoba, and addresses were normally updated at each visit to a physician. In 1984, the system was modified such that payments from it always were sent to physicians' offices, and there was no longer a built-in motivation for individuals to update their address information. The relatively large incidence of individuals unable to be found are displayed in Table 2 and are likely related to this administrative change.

Table 2

Samples drawn and response rates for age/gender cells

Cell	Sample Drawn	Unable to find	Ineligible	Refused	Complete
Males (18-34)	501	142 (28.3%)	53 (10.6%)	95 (19.0%)	211 (42.1%)
Females (18-34)	511	119 (23.3%)	57 (11.2%)	88 (17.2%)	247 (48.3%)
Males (35-49)	478	85 (17.8%)	52 (10.9%)	132 (27.6%)	209 (43.7%)
Females (35-49)	393	37 (9.4%)	48 (12.2%)	104 (26.5%)	204 (51.9%)
Males (50-64)	414	40 (9.7%)	57 (13.8%)	125 (30.2%)	192 (46.4%)
Females (50-64)	456	23 (5.0%)	69 (15.1%)	160 (35.1%)	204 (44.7%)

Procedure

Prior to being contacted for recruitment as subjects of Wave 1, all potential respondents (N=2753) were sent an introductory letter explaining the nature of the "Winnipeg Health and Drinking Survey" (See Appendix A). Within one to three weeks following the receipt of this letter all respondents were contacted by an interviewer to arrange an interview. It was found that 336 (8.1%) subjects were ineligible. Of these, some moved away (166), some had insufficient command of English language (155), some were institutionalized or had died (15). Prospective respondents who could not be contacted by phone for an interview appointment were approached at their home address. A mean of five attempts was made to contact them (range 3 to 11). A total of 446 (14.9%) of the original sample were not found. The response rate, calculated as the percent of completed interviews compared to the number who were located and were eligible was 64.3%. When the number not found is included in the denominator, the percent is 52.4%. The response data for each cell are shown in Table 2. Interviews were conducted mainly in the participants' home (unless otherwise arranged for the participants' convenience). The interview itself included three components administered in the following order: (1) a structured interview schedule containing the demographic variables, family history and alcohol abuse questions; (2) Group Embedded Figures Test; (3) a self-report battery of personality tests. The total package was generally completed within 90 minutes. All respondents were required to complete a consent form indicating that they understood the conditions of participation in the survey including their right to withdraw at any time, and the guarantee that responses would be kept confidential.

Data Preparation

The WHDS data were stored in the main frame computer as data files. In order to use with EQS program on a personal computer, these data had to be transformed into EQS readable format. Two options were available for this purpose. These were: (1) to prepare the variance-covariance matrix of relevant variables using SAS in the main frame, and to transport the matrix to EQS, and (2) to transport the entire set of raw data to the PC and to make necessary changes so that the raw data (of the required variables) could be taken as input to EQS. Although transporting the variance-covariance matrix would have saved an appreciable amount of time, the second approach of transporting entire data set was chosen. This choice was made to take full advantage of various useful features of EQS when working with raw data. These features include systematic handling of missing values (e.g., excluding or imputing with different techniques), easier computation of univariate and multivariate statistics (i.e., for exploring the distributions), simpler graphical representation, and *most importantly*, the features of handling non-normal data, subsamples, categories and selected cases from the data.

The WHDS data were first copied into two data files in the main frame, one for Wave 1 and the other for Wave 2. These files were down loaded (through a modem) to the PC. The down loaded files were checked (manually as well as with programs) to ensure that the transfer was properly achieved (sometimes, noises enter into the data due to disturbance in the phone line while down loading is in progress). It was found that the transfer was fully successful.

The variables stored in the original data set were not all directly used in this study. Rather, combinations of different variables of the original data set were needed. SAS codes were used for the initial transformations of the formatted input data into useable variables. The needed variables were printed into a file using SAS for PC. The contents of these files were transformed into DOS text files (i.e., with .DAT extension) that can be read by EQS. This transformation was a lengthy editing procedure since the output from SAS for PC prints comments on every page, and with frequent page breaks.

The variables used in the model were computed using SAS coding. Dichotomization and categorization of variables were avoided where continuous scores were available. A brief description of the measures (including latent constructs) are given in the following section. The questions used for computing these variables are given as well. It should be noted here that question numbers (of the same questions) in Wave 1 and Wave 2 are not the same. Also, there are some new questions in Wave 2 that are designed to record changes since Wave 1 of the survey. Note that the question numbers mentioned below to compute different measures refer to question numbers of Wave 1.

Measures

Demographics

Demographic variables include age, gender, marital status, education, religion, ethnicity, family income and occupational status. This section of the interview contained 20 items (See Appendix B). The demographic characteristics of the Wave 1 sample at baseline are summarized in Table 3.

Table 3

Description of WHDS samples, in percent (except age)

	Males (n = 615)	Females (n = 642)	Total (N=1257)
Mean Age (years)	42.5	39.5	40.6
Marital Status			
Single	21.3	17.9	19.6
Married or equivalent	72.2	70.4	71.5
Widowed	1.0	3.4	2.2
Divorced or separated	5.0	8.3	6.7
Education			
Some grade school	1.8	2.6	2.2
Grade school	3.6	3.3	3.4
Some high school	19.0	19.9	19.5
High school	22.0	26.2	24.1
Some college	26.5	25.4	25.9
University graduate	15.9	16.5	16.2
Some post-graduate	3.6	3.6	3.6
Master's or doctorate	7.6	2.5	5.0
Family income			
<$10,000	3.4	4.4	3.9
$10,000 to 19,999	5.2	9.6	7.5
$20,000 to 34,999	20.9	24.3	22.7
$35,000 to 49,999	25.4	21.8	23.5
$50,000^{+}	40.5	28.0	34.1
Refused or missing	1.5	2.9	2.2
Don't know	3.1	8.9	6.0

Table 3 (*continued*)

Employment status			
Working full time	75.0	42.1	58.2
Working part time	3.6	20.6	12.3
Unemployed	4.4	5.0	4.7
Student	6.2	5.4	5.9
Homemaker	0.0	18.7	9.7
Retired	8.3	6.4	7.3
Other	2.6	1.9	2.2
Religious preference			
Catholic	25.9	32.4	29.3
Protestant	39.0	43.4	41.2
Jewish	2.4	3.0	2.7
Other	12.1	10.6	11.3
None	20.6	10.6	15.5
Ethnicity			
White	92.5	91.6	92.0
Black	1.6	0.8	1.2
Asian	3.7	4.2	4.0
Native	1.1	1.9	1.5
Other	1.0	1.6	1

Respondents were predominantly married (71.5%). The distribution of characteristics are comparable for males and females, except for the scarcity of high income females, and the distinct employment status distribution of the males and females. In Wave 2 data, 51.6% were females and 48.4% were males. For Wave 1, mean age for females were 39.5 years and for males 42.5 years.

Since this study includes longitudinal analysis, responses of the subjects who had completed questionnaires of both waves were retained. Subjects were assigned a unique code number (variable CODENUM) in Wave 1 which was kept the same for the two year follow-up questionnaire of Wave 2. Observations corresponding to same CODENUM in Wave 1 and Wave 2 were joined. This joining resulted in some missing values since for some CODENUMs (subject) observations do not exist in both waves (subjects having no follow-up). Since values of both Waves are to be considered together, the CODENUMs which do not have observations in both Waves were deleted. Some subjects who have observations in both Waves also have values for some variables (e.g., INCOME) missing. These subjects were also deleted. Although procedures are available to generate values for the missing observations, these were not followed in this study. The reasons for not using predicted missing variable values are (a) that any technique of imputing missing observations uses the observed non-missing values to predict a value (which signifies some sort of average condition) for the missing cell, and there is no way of knowing what the subject's response would have been for this cell, and (b) that the sample size without imputing missing observations is fairly large.

The data set contains 865 observations for which there are no missing values (i.e., all variables have values at both waves). These 865 observations were used for estimation and evaluation of models in this study. A demographic description of these non-missing observations is presented in Table 4 and Table 5. Note that the values are the number of observations in the cell and the quantities in parenthesis are corresponding percentages.

Table 4

Description of Sample of Wave 1 used in the Wave 1 - Wave 2 analysis

	Male (n=433)	Females (n=432)	Total (n=865)
Age Group			
Group 1 (18 - 25 Years)	135(31.18)	166(38.43)	301(34.80)
Group 2 (25 - 35 Years)	146(33.72)	154(35.65)	300(34.68)
Group 3 (35 - 65 Years)	152(35.10)	112(25.93)	264(30.52)
Education			
Some Grade School	5 (1.15)	8 (1.85)	13 (1.50)
Grade School	12 (2.77)	8 (1.85)	20 (2.31)
Some High School	72(16.63)	81(18.75)	153(17.69)
High School	91(21.02)	110(25.46)	201(23.24)
Some College	120(27.71)	110(25.46)	230(26.59)
University Graduate	78(18.01)	81(18.75)	159(18.38)
Some Post-Graduate	15 (3.46)	21 (4.86)	36 (4.16)
Masters or Doctorate	40 (9.24)	13 (3.01)	53 (6.13)
Family Income			
< $10,000	10 (2.31)	19 (4.40)	29 (3.35)
$10,000 - $19,999	19 (4.39)	39 (9.03)	58 (6.71)
$20,000 - $34,999	92(21.25)	118(27.31)	210(24.28)
$35,000 - $49,999	118(27.25)	112(25.93)	230(26.59)
$50,000 or over	194(44.80)	144(33.33)	338(39.08)

Table 4 (*continued*)

	Male (n=433)	**Females** (n=432)	**Total** (n=865)
Employment Status			
Working Full Time	330(76.21)	189(43.75)	519(60.00)
Working Part Time	13 (3.00)	87(20.14)	100(11.56)
Part Time Student	3 (0.69)	2 (0.46)	5 (0.58)
Full Time Student	21 (4.85)	22 (5.09)	43 (4.97)
Retired	41 (9.47)	23 (5.32)	64 (7.40)
Homemaker	0 (0.00)	80(18.52)	80 (9.25)
Other	13 (3.00)	9 (2.08)	22 (2.54)
Unemployed	12 (2.77)	20 (4.63)	32 (3.70)
Number of Family Members			
One	31 (7.16)	50(11.57)	81 (9.36)
Two	124(28.64)	127(29.40)	251(29.02)
Three	92(21.25)	105(24.31)	197(22.77)
Four	127(29.33)	107(24.77)	234(27.05)
Five	46(10.62)	35 (8.10)	81 (9.36)
Six	9 (2.08)	4 (0.93)	13 (1.50)
Seven	3 (0.69)	2 (0.46)	5 (0.58)
Eight	1 (0.23)	2 (0.46)	3 (0.35)

Table 5

Description of Sample of Wave 2 used in the Wave 1 - Wave 2 analysis

	Male (n=433)	Females (n=432)	Total (n=865)
Age Group			
Group 1 (18 - 25 Years)	135(31.18)	166(38.43)	301(34.80)
Group 2 (25 - 35 Years)	146(33.72)	154(35.65)	300(34.68)
Group 3 (35 - 65 Years)	152(35.10)	112(25.93)	264(30.52)
Education			
Some Grade School	6 (1.39)	6 (1.39)	12 (1.39)
Grade School	4 (0.92)	8 (1.85)	12 (1.39)
Some High School	76(17.55)	77(17.82)	153(17.69)
High School	92(21.25)	112(25.93)	204(23.58)
Some College	112(25.87)	110(25.46)	222(25.66)
University Graduate	85(19.63)	89(20.60)	174(20.12)
Some Post-Graduate	21 (4.85)	18 (4.17)	39 (4.51)
Masters or Doctorate	37 (8.55)	12 (2.78)	49 (5.66)
Family Income			
< $10,000	9 (2.08)	15 (3.47)	24 (2.77)
$10,000 - $19,999	21 (4.85)	48(11.11)	69 (7.89)
$20,000 - $34,999	71(16.40)	100(23.15)	171(19.77)
$35,000 - $49,999	105(24.25)	113(26.16)	218(25.20)
$50,000 or over	227(52.42)	156(36.11)	383(44.28)

Table 5 (*continued*)

	Male (n=433)	Females (n=432)	Total (n=865)
Employment Status			
Working Full Time	333(76.91)	198(45.83)	531(61.39)
Working Part Time	9 (2.08)	84(19.44)	93(10.75)
Part Time Student	8 (1.85)	5 (1.16)	13 (1.50)
Full Time Student	16 (3.70)	13 (3.01)	29 (3.35)
Retired	47(10.85)	31 (7.18)	78 (9.02)
Homemaker	0 (0.00)	73(16.90)	73 (8.44)
Other	16 (3.70)	13 (3.01)	29 (3.35)
Unemployed	4 (0.92)	15 (3.47)	19 (2.20)
Number of Family Members			
One	33 (7.62)	50(11.57)	83 (9.60)
Two	124(28.64)	132(30.56)	256(29.60)
Three	88(20.32)	95(21.99)	183(21.16)
Four	122(28.18)	105(24.31)	227(26.24)
Five	51(11.78)	40(9.26)	91(10.52)
Six	11 (2.54)	5 (1.16)	16 (1.85)
Seven	3 (0.69)	3 (0.69)	6 (0.69)
Eight	1 (0.23)	2 (0.46)	3 (0.35)

Alcohol Abuse

Alcohol abuse was measured in three different ways. These are alcohol use, alcohol problems, and alcohol dependence. The diagnostic criteria included in each of these constructs are described below. Different questions of the original questionnaire were used for different constructs. For convenience, these questions are shown as different groups in a number of appendices. These are: Appendix C (Q10, Q11, Q13A - Q13C, Q14A - Q14C, Q15A - Q15C, Q16 and Q17); Appendix D (Q18A - Q18I, Q19A - Q19F); Appendix E (Q12A - Q12J, Q21P - Q21Z, Q21AA - Q21HH); Appendix F (Q21A - Q21O); and Appendix G (Q20A - Q20M).

Alcohol Use

This was determined according to the amount of alcohol consumed by the individual and was measured using the standard *Volume Variability Index* (VVI) (Cahalan & Room, 1974). In this instrument *volume of ethanol* per day was derived from quantity and frequency questions asked separately about wine, beer and liquor used over the past 30 days. Drinks were estimated to contain 0.6 ounce of ethanol for beer and liquor, and 0.64 ounce for wine (Murray et al., 1994).

Questions related to alcohol use are given in Appendix C. Questions used to calculate volume of ethanol are: Q11, Q13A, Q13B, Q14A, Q14B, Q15A, and Q15B. Questions used to compute Volume Variability Index are: Q13A, Q13B, Q13C, Q14A, Q14B, Q14C, Q15A, Q15B, and Q15C. Both of these variables are good indicators of volume of ethanol consumed. However, Volume Variability Index takes into account the occasions of >8 drinks in a sitting (Q13C, Q14C and Q15C). These questions are considered separately in the model.

Also retained as separate indicators of alcohol use are *binge drinking* (variable HEAVY) and *highest maximum ever* (variable HMAX) consumed at any one time. Assigning scores for binge drinking was done according to Q17. If a subject stayed drunk for more than 1 day in a row during the last 12 months, then HEAVY=2; if this happened 1 to 3 years ago, then HEAVY=1; if it happened more than 3 years ago or never then HEAVY=0. The difference between *Never* and *More than 3 years ago* may be more properly recognized by reassigning the scores as HEAVY = 0 (Never), 1 (>3 years ago), 2 (1 to 3 years ago), and 3 (during the last 12 months). Some other questions related to binge drinking are available in the questionnaire (Q21R, Q21S and Q21T). These questions were used together for a better indicator. Question Q21T was combined with Q17 for this purpose.

HMAX was computed from scores of Q11, Q16, Q13C, Q14C, and Q15C. This variable was assigned a value of 0, 1, 2 and 3 depending on the scores of the above questions. This scale may, however, not properly represent the response. For example, HMAX = 3 if response to either Q13C, 14C or 15C is 1 (i.e., >8 drinks nearly every day which corresponds to 30 such occurrences per month). HMAX = 2 for 8 occurrences per month, HMAX = 1 for 2 occurrences per month, and HMAX = 0 for less than 1 occurrence or never. The relative position of responses were maintained by simply keeping the frequencies. Also, all of the above values of HMAX were assigned depending on either Q13C (wine), Q14C (beer) or Q15C (drinks with liquor). However, for a person, more than one question may be relevant as in volume of ethanol. The variable was redefined as HMAX = (Q13C+Q14C+Q15C) which will take care of the above concerns.

Alcohol Problems

Items measuring alcohol problems were drawn from an earlier Manitoba study (Murray, 1978) which relied on the Cahalan & Room (1974) strategy for measuring alcohol problems. Alcohol problems were determined by using eight diagnostic criteria. These include: *symptomatic drinking* called (*symptom*, questions Q18A, Q18C, Q18D, Q18E, Q18F and Q18G), problems with controlling drinking (*control*, questions Q18A, Q18H Q18I and Q19F), spouse complaining about drinking (*spouse*, questions Q20J and Q20M), problems at work due to drinking (*job*, questions Q19E and Q20B), problems with police due to drinking (*police*, questions Q19C and Q19D), health problems due to drinking (*health*, question Q19A, Q21P and Q19A), accidents due to drinking (*accid*, question Q19B), and problems due to binge drinking (*binge*, question Q17; questions Q21S and Q21T) (see Appendix D).

The eight variables that were used in this group were all dichotomized in the previous studies. This, however, may not recognize the relative severity of the problem. The relative degree of the problem may be represented simply by keeping the original scores (adding responses of the questions for the problem). Note that the responses to some questions were assigned values consistent with the response (starting with NEVER=0).

Alcohol Dependence

Three diagnostic criteria were used for alcohol dependence. These were the Diagnostic Interview Schedule Version III Revised (DIS III-R) (Robins et al., 1989), the Short form of the Alcohol Dependence Data Scale (SADD) (Raistrick, Dunbar & Davidson, 1983), and (c) Short form of Michigan Alcoholism Screening Test (SMAST) developed by Pokorny, Miller & Kaplan (1972).

The DIS III-R is a revised version of Diagnostic Interview Schedule (DIS III) (Robins et al., 1989), designed to classify alcoholics according to the diagnostic criteria of the DSM III-R (1987). The DIS III-R instrument contained 28 items (see Appendix E) and has been found to have reliability of 0.80 and above (Erdman, Klein, Greist et al., 1987; Robins, Helzer & Ratcliff, et al., 1982). The DSM III-R (1987) definition of alcohol abuse refers to impairment in social and/or occupational functioning. The DSM III-R (1987) alcohol dependence includes physiological indicators of impairment. Alcohol abuse and dependence are aggregated together in this analysis.

There is an extensive criterion for alcohol dependence. It denotes lifetime diagnosis of dependence (variable ALC3R) and its categorized variable (DSMDIAG). The computation of ALC3R uses a number of questions and computes the dependence criterion (Criterion A of DSM-III-R) and the dependence duration criterion (Criterion B of DSM-III-R). The criterion A has nine levels and these were computed separately. The levels were added up to form the value of Criterion A. Abuse symptoms and functional impairment were also computed. The questions used are: Q18B, Q18F, Q18I, Q19A, Q19B, Q19C, Q19D, Q19E, Q19F, Q20B, Q20C, Q20F, Q20G, Q20H, Q20I, Q20J, Q20L,

Q20M, Q21C, Q21F, Q21G, Q21H, Q21I, Q21K, Q21L, Q21N, Q21P, Q21Q, Q21S, Q21U, Q21V, Q21W, Q21X, Q21Y, Q21Z, Q21AA, Q21BB, Q21CC, Q21DD, Q21EE, Q21FF, Q21GG, and Q21HH. The responses to these questions were handled differently, sometimes adding the score and sometimes qualifying the response with 0 or 1. Also, the dependence duration (variable AD3RB) was computed on the basis of 7 questions (Q21W, Q21X, Q21BB, Q21DD, Q21FF, Q21GG and Q21HH). All of these questions refer to duration lasting for 1 month or more (except the last two questions which refer to working with children). All have 4 or more levels of answers.

The SADD scale is based on the construct of the alcohol dependence syndrome (Edwards, 1986; Edwards & Gross, 1976) which is predominantly physical in its definition and has been administered to both clinical and non-clinical samples: it consists of 15 items (See Appendix F) and strongly distinguishes the alcoholic sample. The split - half reliability of the 15 item short form is 0.87. Jorge & Mazur (1985) obtained a split-half reliability of 0.88 in an interview, and 0.82 when self administered. It has also shown high test-retest reliability (0.90) and performed well in discriminating clinically diagnosed alcoholics from normals.

Fifteen questions were used to calculate this score. These are: Q21A to Q21O. The responses to these questions were considered if there were less than 4 (i.e., <=3) missing responses. The summation of responses were averaged over 15 questions and correction was made for the response of NEVER (i.e., Never=0 instead of Never=1). This is a good scale. However, to keep the continuous nature of the response, a new variable SADD2 was created which keeps the summation of corrected responses irrespective of number of missing values. This summation is not averaged over 15. Both of these variables were tried in the model.

The SMAST (Short Michigan Alcoholism Screening Test) has proven to be as effective as the longer version in screening for alcoholism (Selzer, Vinokur & Rooijen, 1975). The test is intended to screen individuals in the general population and has been used in many other studies. This instrument contained 13 items (See Appendix G) and was designed to produce a more effective, shorter, self-administered and more easily scored version of the original MAST. Reliability coefficients of SMAST were computed for two comparison groups separately and combined, and yielded coefficients only slightly lower than for the MAST (Selzer et al., 1975) whereas validity coefficients were found to be slightly higher. Based on tests for reliability and validity, the authors concluded that the SMAST is as effective as the MAST in screening for alcoholism.

Two different MAST scores were tried in this study, MAST10 and MAST13. The MAST10 is the respondent's MAST Score based on 10 questions (Pokorny et al., 1972). These questions are: Q20A, Q20B, Q20C, Q20D, Q20E, Q20F, Q20G, Q20H, Q20I and Q19C. The MAST13 is the respondent's 13-item MAST score (Selzer et al., 1975). Questions used for MAST13 are: Q20A, Q20B, Q20D, Q20E, Q20G, Q20H, Q20I, Q20J, Q20K, Q20L, Q20M, Q19C and Q19D. Both of these scores are good indicators and were tried in the model.

Poverty

Poverty in this study has been defined as the lack of resources available to an individual. These resources have direct (and indirect) impact on the subject's economic and psychological setting for alcohol use and abuse. Four measures of poverty were used in this study. These are *income, number of family members, education* and *employment.*

Depending on its level, income may directly affect the availability of alcohol to an individual. A person may not be able to afford buying drinks while fulfilling other important and basic necessities of life. Whether a person would choose to do so or not may as well be determined by his/her psychological and intellectual background in determining priorities. The number of family members residing in the same household and utilizing their collective income for everyday needed expenses would, to some extent, determine such priorities. Also, affordability of alcohol depends on income and the number of members on whom it is spent. Therefore, income and number of family members should be included as measures of poverty as defined in this study.

Education, on the other hand, may partly determine reshaping a person's psychological setup in dealing with any economic misfortune. Persons with different educational training level may behave differently in dealing with similar circumstances. It is expected that a person with higher educational training is less likely to resort to drinking to deal with such situations. At the same time, it is observed that economic resources available to a person are dependent on his/her education and training for a better job. Therefore, education should be a measure related to poverty.

Lack of employment, although it primarily creates an economic misfortune, has a direct impact on the psychological factors of an individual causing an increased level of stress. These issues are discussed in the literature review. Drinking is one of the outcomes for a person in the situation of losing a job. Different levels of employment (i.e., job class) may not have a direct impact on the person's level of drinking. However, income is directly related to the level of employment and so is the psychological stress imposed on a person from it. For example, a person with a full time minimum wage job may be exposed to a greater level of stress compared to an unemployed person. Therefore, the resource of employment (economic and psychological) should be considered as a measure related to poverty as defined in this study.

Scores of these measures were calculated from the questionnaires by redefining the recorded scores of these variables. This was needed to be consistent with the meaning of *poverty* as explained in the following. All of these related measures will contribute to a *latent variable* of poverty. This concept will be examined below, in section on structural equations.

Income

Income refers to money income reported by all family members 15 years or older and includes gross wages and salaries, net income from self-employment, investment income, government transfer payments (for example, family allowances, child tax credits), pensions, and miscellaneous income (scholarships and child support payments, for example). The definition of income excludes gambling wins or losses, capital gains or losses, receipts from sale of property or personal belongings, income tax refunds, loans received or repaid, lump sum settlements of insurance policies, and income in kind.

Income has a *negative* relationship with poverty i.e., the state of poverty decreases with higher income. In order to maintain a positive relationship, the recorded scores of income were redefined. (As will be discussed later, the other measures of poverty also have negative relationship with poverty. Since poverty is an unobserved latent variable, if all its measures have negative correspondence with it, the computational process in EQS will assign positive values retaining a negative meaning of the latent variable resulting in effects opposite to what is expected). This was done by calculating the deficit of an individual's income from $60,000 and was expressed in units of $10,000. The value of $60,000 was arbitrarily chosen from the sample beyond which no subject (given the number of family members of the sample) would fall below poverty line. This exercise resulted in a scale of income which has a *positive* correspondence with poverty and thereby preserves the relative meaning of poverty. The variable INCOME as used in this study can be explained as *additional earning* needed by the subject to achieve an earning level of $60,000.

Number of Family Members

There is no direct item in the questionnaire for the number of family members (NFEM) in either Wave of data. Therefore, this was indirectly calculated from other questions. For data of Wave 1, the number of family members was calculated as: NFEM1 = N(REL1, REL2, ..., REL10) + 1, where, REL1, ..., REL10 are the relationships of the subject to those persons living in the household; and N refers to number of variables in the parenthesis having non-missing values. REL1, ..., REL10 are questions in the questionnaire of Wave 1 (see Q17 in Appendix B).

The questions on relationships with persons living in the household were not asked in Wave 2. Instead, questions relating to the number of births (Q225), the number of persons moved in (Q223) and the number of persons moved out (Q227) since the data collection in Wave 1 were asked. Therefore, for Wave 2 data the number of family members (NFEM2) was computed indirectly as: NFEM2 = (NFEM1 + number of birth + number moved in - number moved out). Note that Q225, Q223 and Q227 only had a value of either 1 or 0. Any (possible) death of the family member(s) was not included for two reasons. These are: (i) the question related to the death of any relative (Q19) did not necessarily signify that the relative used to live in the same household, and (ii) when Q19 was taken into account, some subjects as a result had a *negative* number of family members. The inability to consider any death in the household possibly has introduced an error in NFEM2. The error, however, is expected to be very small since deaths in these house holds in two years are uncommon. For example, there were eight deaths among study subjects during those two years.

It was noted that subjects with higher numbers of family members tended to have higher family earnings. This is plausible because with a higher number of family members, it is likely that more members of the family are wage earners. This observation implies that the relationship between *poverty* and *number of family members* is expected to be negative. Note that this relationship does not contradict the criterion of low-income cut-offs. A family becomes poorer with a higher number of family members *if* the total income remains the same.

Education

The questions on education status in Wave 1 and Wave 2 were related to the number of years of schooling. A person having more years of schooling would have better job training and, therefore, would generally not fall below the poverty line. There is, however, no cut-off point established for years of schooling beyond which a person may be considered non-poor. It is *not* unrealistic to assume that education has a negative relationship with poverty.

The variable EDCYR was computed to signify the subject's number of years of schooling. Since this variable is considered to be a measure of the latent construct *poverty*, it was calculated as the number of *additional years* needed by the subject to achieve the highest level of education (i.e., 20 school years). In other words, this variable denotes the deficiency of education from the highest possible education. Note that education here refers to the person's number of schooling years and *not* the person's level of understanding.

Employment

The question on Current Employment Status from the questionnaire was used to define the variable *employment*. This was done by using the scores of Current Employment Status. These scores were redefined with the full-time employed and unemployed subjects assigned scores that are at the two ends of the scale. The other subjects were assigned in-between scores depending on the degree of employment of the subject. The suggested scores are: 1- Full-time job, 2- Part-time job, 3- Part-time student, 4- Full-time student, 5- Homemaker, 6- Retired, 7- Other, 8- Unemployed. This scale conserves the continuous nature of the variable, and at the same time maintains a positive correspondence with poverty. The scale also signifies the level of unemployment which is expected to have a significant relationship with alcohol abuse. Note that the variable *employment* expresses the subjects' degree of work involvement and *not* their earning. A separate variable *income* is considered for that purpose.

Analysis

Alcohol abuse in the general population as depicted in the study is expected to be related to unemployment, the effect of which is moderated by income and/or the latent construct of poverty. Alcohol abuse is assessed by a variety of measures tapping alcohol consumption patterns (alcohol use), alcohol problems, and alcohol dependence. These measures as well as other variables together with their computations from WHDS data are described in the previous section. The importance of using longitudinal data has been discussed in introduction. In this study, data from the Wave 1 and Wave 2 surveys were used for this purpose.

Statistical Methods

As discussed earlier, the variables (and constructs) associated with alcohol abuse act simultaneously. Also there are moderating effects of one variable on the influence of others. The traditional exploratory factor analysis or regression techniques are insufficient to account for these relationships. Therefore, to explain the causal relationships between alcohol abuse, poverty and unemployment, the Structural Equation Modelling (SEM) technique was used in this study. The model was evaluated and tested following the procedures that are widely used in recent studies in the social sciences. The procedure of SEM which was used to assess the hypothesized model is described as follows:

There are three important parts of the procedure. These are: (a) representation of the causal processes by a series of structural equations, and modelling of these structural equations pictorially to enable a clearer conceptualization of the theory under study; (b) simultaneous analysis of the entire system of variables to estimate the model parameters; and (c) evaluating the statistical goodness-of-fit of the model and performing required modifications. In the following, a brief description of these three parts of the procedure is provided, followed by a brief overview of the underlying assumptions.

Structural Equations

Several representations of structural models are available in the literature. The EQS Model of Bentler & Weeks (1980), the LISREL (Linear Structural Relationship) Model of Jöreskog & Sörbom (1985), the COSAN (Covariance Structural Analysis) Model of McDonald (1978; 1980), the RAM (Reticular Action) Model of McArdle (1980) and McArdle & McDonald (1984) are some of the forms that are used. The EQS (Bentler & Weeks, 1980) representation of the structural equation model was used in this study.

The variables associated with the system are categorized in one of the two groups: Measured (observed) variables and unmeasured (latent or unobserved) variables. The measured variables form the actual data base of the study. The rest of the variables represent the structural network of the system and are hypothetical in nature. These unmeasured variables can further be differentiated into (a) the latent constructs, (b) the residual associated with each observed variable (called error), and (c) the residual associated with the prediction of each construct (called disturbance).

It is recommended that the proposed model be represented pictorially in the form of a path diagram. A path diagram is a schematic representation of the model in which all the variables associated with the system are shown in boxes connected with arrows. It is customary to use rectangular boxes for measured variables, and circular or elliptical boxes for the latent variables. The straight arrow connects one variable with another showing the hypothesized causality direction (i.e., which variable causes what). The bidirectional curved arrows represent covariances between pairs of variables. Representation of the model with a path diagram should follow Wright's rules, which state that sum of the compound paths connecting two points in a path diagram denotes the correlation between these two variables where a compound path is defined as a path along the arrows that can have (a) no loops; (b) no going forward then backward; and (c) a maximum of one curved arrow per path. A detailed description of these rules can be found in Loehlin (1987).

The path diagram provides a pictorial representation of the a priori hypothesized relationships for the model. The designation of causality direction requires a further classification of all the variables into a dependent (endogenous) and an independent (exogenous) category. In the Bentler-Weeks (1980) model, a variable is considered to be a dependent variable if it can be expressed as a structural regression function of other variables. For example, the variables that have unidirectional arrows aiming at them (in the path diagram) are dependent variables. When latent variables are present in the model, the measured variables are considered to be dependent variables and to be the result of the associated latent variable and error. Any latent variable that is caused by another latent variable is also considered to be a dependent variable. All other variables which are not dependent are considered to be independent variables.

The EQS model of Bentler & Weeks (1980) expresses the structural model as:

$$\eta = \beta\eta + \gamma E \tag{1}$$

where,

η is a vector of random variables, the components of which correspond to endogenous (dependent) variables that include the latent constructs which are dependent on other latent variables,

β is a coefficient matrix containing the coefficients describing the relationships between the endogenous variables,

γ is a coefficient matrix that describes the relationships between the endogenous variables η and the exogenous (independent) and error variables, and

E is a vector of random variables, the components of which correspond to the exogenous variables and the error variables.

The variables in η and E can be latent variables. The endogenous variables in η are expressed as a linear combination of the remaining endogenous variables, of the exogenous variables in E, and of a residual component in E. The variances of and covariances between the exogenous variables are stored in a matrix Φ assuming that all variables are expressed as deviations from the mean, i.e., $\Phi = [EE']$

Parameter Estimation. The issue of parameter estimation is related to the statistical identification of the proposed model. Statistical identification focuses on whether there is a unique set of parameters consistent with the input data. The input data in structural equation models are the variances and covariances of the measured variables. For example, if there are k measured variables in the model, there will be $k(k-1)/2$ input data points.

The parameters that are to be estimated are contained in the matrices β, γ and Φ. Some of the parameters in these matrices need not be estimated. Those parameters that are considered to be known are kept fixed at some values based on theoretical considerations. These values can be zero, any non-zero value or a proportion (Hayduk, 1987). The zero value indicates no effect, a non-zero value indicates the presence of effect of a specified magnitude, and a non-zero proportion indicates proportional variances. The parameters that are not fixed to a certain value must be estimated from the model.

A structural model may be classified as just-identified, under-identified, or over-identified. A just-identified model is one in which there is a one-to-one correspondence between the structural parameters that must be identified and the input data points. In this case, the model produces a unique solution for all parameters since the number of data points equals the number of parameters to be estimated. This leaves no degrees of freedom, and hence, the model can never be rejected. This type of model can be fitted to any set of data without error (Bentler & Bonett, 1980) since the parameters are mere transformation of input data (Bentler & Chou, 1987). The just-identified model, therefore, is not desirable.

If the number of parameters that are to be estimated exceeds the number of data points (variances and covariances), then the model is called an under-identified model. In this case, the model contains insufficient information for obtaining any determinate solution of parameter estimation. A multiple number of solutions are possible in this situation. This type of model is also not desirable.

An over-identified model, on the other hand, is one in which the number of parameters to be estimated is less than the number of data points. This leaves a positive number of degrees of freedom which allows for the possible rejection or acceptance of the model. Hence, this type of model is desirable. The aim in structural equation modelling is to specify a model that is statistically an over-identified one. However, it is important to note that the requirement of a model to be an over-identified one is a necessary but not a sufficient condition for resolving the identification problem. To meet the necessary condition of an over-identified model, one can impose some constraints on the parameters. With regard to the imposition of constraints to the residuals, one rule of thumb is that the path coefficient (of residuals in the coefficient matrix) is constrained to some fixed value (usually 1.0, i.e., the coefficient of the error term fixed to 1.0) and the error variance is allowed to be estimated freely. Alternatively, one could fix the error variance and free the residual and estimate the path coefficient (Byrne, 1994). Note that a path coefficient is assigned to the residuals as well in the general Bentler & Week notation of a structural model. Instead of estimating both the coefficient and the variance of the residual, only one is estimated keeping the other fixed. Free estimation of both types of parameters is not possible. On the other hand, if both types of these parameters were fixed, the model would be a very restricted one and would not probably fit the data. A more comprehensive treatment of the identification problem can be found in Bollen (1989).

Once the proposed structural model is considered to be an over-identified one, the process of parameter estimation proceeds. Several methods of estimation are available, the choice of which is dependent upon the underlying distribution of the data. The unweighted least squares, the generalized least squares, and the normal-theory maximum likelihood are the most widely used methods of parameter estimation. In all of these methods, the parameter vector is estimated iteratively by following a nonlinear optimization algorithm. To estimate the parameters, these procedures optimize a fit criterion F. This criterion checks the difference between the sample covariances and the covariances predicted by the assumed trial values of the parameters. The set of parameter values for which the difference is a minimum is considered to be the optimal set.

Optimizing the fit function F is complicated because of the nonlinear nature of the function. Several algorithms are available for optimizing the fit criteria described above. None of these will always find the global optimum for a general nonlinear minimization problem in a reasonable amount of time. Also, no single method is invariably superior to others. The common aspects of nonlinear optimization techniques are the repeated computations of (a) the value of the optimization criterion (i.e, F) for comparison, and (b) the direction of change of the trial parameter values. The detailed description of the computational procedures are beyond the scope of the present study.

The estimated parameters are tested for (a) the appropriateness of estimates, and (b) their statistical significance. The appropriateness of the model parameters is determined by the viability of the estimated values. Any value that falls well outside the admissible range (for example, correlation values greater than 1.0) signals that either the model is wrong or the information contained in the input values is not sufficient. Large values of standard errors of the estimated parameters may indicate the inappropriateness of the parameters. Statistical significance of the parameters can be tested with *z-statistic* (parameter estimate divided by the standard error) (Byrne, 1994). The limiting factor in using this test statistic in identifying insignificant parameters is that it provides a univariate test of significance. Note that the use of a multivariate test statistic would be more appropriate. The use of a univariate test statistic may result in conclusions different from those of multivariate approach. The Wald test (Wald, 1943), which is a multivariate test statistic is available with EQS. This test helps determine whether sets of parameters that have been specified as free in the model, could all be set to zero without a substantial loss in the model fit (Bentler, 1989).

The estimated parameters are assessed for mis-specification, that is the viability of restrictions specified in the model. This is done in EQS by the Lagrange Multiplier test. This test determines the improvement (or lack of it) in the model if certain parameters (that are fixed in the present model) are specified to be free. The univariate as well as multivariate χ^2 is used in this test. Also, a parameter change statistic is used representing the value that would be obtained if a particular fixed parameter were estimated assuming it to be free.

Evaluation of the Fitted Model. The fit criterion F which guides the search for a best fitting solution for estimating the parameters (as described in the previous section) of the model can also be used to evaluate the adequacy of the fitted model. The value of the criterion at the point of best fit when multiplied by *(N - 1)* produces a quantity that has an approximately χ^2 distribution. The degrees of freedom of this distribution are obtained by subtracting the number of estimated parameters from the number of sample data points (variances and covariances). This value of χ^2 with the computed degrees of freedom can be used to test the fit of the predicted covariance matrix *C* to the sample covariance matrix *S*. If this value is greater than the tabulated value of χ^2 at a specified significance level we would reject the null hypothesis and conclude that the model does not fit the data at the specified level of significance. If the value is smaller than the tabulated value, we would then accept the null hypothesis and conclude that the model is *not incorrect*. Note that we are unable to conclude that the model is correct.

The quality of model evaluation as described above is evidently dependent on the sample size since the value of χ^2 is computed by multiplying the fit criterion *F* by *(N-1)* where *N* is the sample size. The decision regarding the acceptance or rejection of the null hypothesis is influenced by the sample size. Thus, accepting a model as a possible explanation of the underlying causal processes may simply be the result of a small sample size (Bentler & Bonnett, 1980). On the other hand, a failure to reject the model would imply a near exact fit between *C* and *S* if the sample size is extremely large. With a very large sample, we may obtain very large values of χ^2 and reject the models where the discrepancies between model and data are not large enough. That is to say that the probability of rejecting valid models increases with sample size. Therefore, it is always a good idea to examine the residuals *S-C* (for evaluating relative discrepancies between sample and predicted values) in addition to the χ^2 test before making any concluding remarks about the fit of the model.

The number of parameters present in the model in relation to the number of available data points has an effect on the conclusion regarding the acceptance and the rejection of the model. If the number of parameters that are to be estimated is very close to the number of data points (unparsimonius), then the model has a better chance of being accepted (James, Mulaik & Brett, 1982). In these models the estimated parameters become less precise than in parsimonious models (Bentler & Mooijaart, 1989). More parsimonious models should be used because the precise estimation of the parameters would portray a better description of the underlying causal processes.

It may be pointed out that alternative models should be looked at in order to choose a better model. Finding a model that fits the data reasonably well does not necessarily imply that there could be no other model that fits better. When comparing two models, it should be noted that finding one model to be significant and another to be insignificant does not demonstrate that there is a significant difference between the two. Testing more than one model is also necessitated by the fact that the evaluation of a model solely on the criterion of comparing χ^2 values is often misleading (Marsh, Balla & McDonald, 1988). This may occur due to the effect of sample size or the level of parsimony of the model as discussed above. One way to get around this problem is to perform nested or hierarchical model testing (Bentler & Bonett, 1980).

The process of hierarchical model testing involves comparison of two models where one model is nested inside the other. That is to say that a model with a smaller number of free parameters can be obtained from the model with the larger number of free parameters by fixing some of the latter. Two such nested models can be compared by a simple χ^2 test. The difference between the χ^2 values of these two models also has a χ^2 distribution. The degrees of freedom associated with this is given by the number of free parameters that are fixed in going from one model to the other (which is equal to the difference between the corresponding degrees of freedom of the two models). This value of χ^2 obtained from the difference is used to test the statistical significance of the difference between the models. If this value is significant at a specified level, then the conclusion is that there is a significant difference between the two models that are tested. This comparison is possible because the sequential χ^2 difference tests are asymptotically independent (Steiger, Shapiro & Browne, 1985). James et al. (1982) and Anderson & Gerbing (1988) have provided modifications of this process of testing nested models.

Tests of acceptance or rejection of a model based on the statistic $T = F\ (N\text{-}1)$ where, F is the fit criterion and N is the sample size (as described above), may be misleading for several reasons (see Bentler, 1993). These include (a) some basic assumptions underlying T may be false, (b) T is intended to provide not necessarily a test of a hypothesized model but the closeness of model and sample covariance, (c) T may not have a χ^2 distribution in small samples, and (d) any apriori hypothesis in large sample may be rejected even though it is only trivially false. The statistic T may, thus, not be clearly interpretable. To get around this problem, T is rescaled into a 0-1 scale by comparing the model T with that of a so-called null-model. A null model is a model where no mutual influences among variables exists. These redefined indexes are called goodness-of-fit indices.

A number of fit indices are available that can be used to choose a model that best describes the data. Bentler's (1980) Comparative fit index (CFI), McDonald's (1989) measure of centrality (MMC), Bentler & Bonnett's (1980) nonnormed coefficient (BEBOUC), Bentler & Bonnett's (1980) normed fit index (NFI), Bollen's (1986) normed index (RHO1), Bollen's (1989) nonnormed index (DELTA2), Hoelter's (1983) critical N (CN), the James et al., (1982) parsimonious fit index (PFI), Tucker & Lewis' (1973) index (TL), Jöreskog & Sörbom's (1984) goodness-of-fit index (GFI) and adjusted goodness-of-fit index (AGFI), the Scaled Satorra-Bentler index (SSB) (Chou, Bentler & Satorra, 1991), McDonald & Marsh's (1990) non-centrality parameter (RNP), and Bentler's (1990) fit index (BFI) are some of the indices that are available.

Some of these indices are influenced by the sample size or the parsimony effects (e.g., AIC, SBC, CN) while the others are not. A detailed description of the indices and their limitations can be obtained in the cited references. The use of χ^2 and its associated probability (p) value will always be useful (Gerbing & Anderson, 1992). The indices GFI and AGFI work well under conditions of non-normality. However, if the data severely violate the normality assumption, the SSB index is recommended. The indices CFI, TL, DELTA2 and MMC are not influenced by the sample size. All of the fit indices available in EQS that suit the sample size and the distribution of the data were used in the present study.

Model Modification. The description presented above provides various means of testing the adequacy of the specified Structural Equation Model. The first estimated model when subjected to those scrutiny will usually lead to the conclusion that the model fit is poor. The task thereafter is to improve the model by suggesting and testing some changes to the model. This is usually done by freeing (or fixing) some of the parameters.

The suggestion of such changes may partly be based on the evaluation of residuals. Normalized residuals (the difference between the predicted and the sample covariances) can be used for this purpose. The value of a residual, if significantly different from zero, may imply that there is a problem with the specification of the model.

The improvement of the model is usually achieved by changing the status (free or fixed) of the parameters. As discussed earlier, the Wald test and the Lagrange Multiplier test may be used to determine which parameters are to be freed. Note that these two tests signify opposite actions. The Wald test determines whether some free parameters could be fixed to zero, while the Lagrange Multiplier test determines whether some fixed parameters could be freed.

It is important to note that the changes suggested by the available methods are all solely based on the statistical criteria. In these procedures, virtually any constrained parameter (which may or may not have any theoretical relevance to the hypothesis) is eligible for testing. It is, therefore, mandatory that the researcher considers relevant theories before relaxing the constraints that may be suggested by the statistical methods. Any modification must be substantiated by strong theoretical reasoning.

Other problems that are associated with the modification procedure are that: (a) statistical indices are unreliable when constructed incorrectly (Kaplan, 1988), (b) modifications may be due to chance (capitalization on chance) (Cliff, 1983), and (c) the modified model may be tested on distributions that do not apply since no protective techniques are available (Steiger, 1990).

To get around these problems Cliff (1983) suggests cross-validation of the model for its evaluation. This is done by fitting a model to one half of the sample and then validating the fitted model using the other half of the sample (called double sample cross-validation). There are several ways (by keeping fixed loadings, fixed weights, fixed structure etc.) to achieve this validation (see MacCallum, Roznowski, Mar et al., 1994). The most serious problem with double sample validation is that it requires the data to be split in half which in turn loses some statistical power. To avoid this problem, a single sample cross-validation technique is available. A validation index (SSC) which is equivalent to Akaike Information Criterion (AIC) is proposed for this purpose (Browne & Cudeck, 1989).

Another approach to model modification is to specify and test several plausible initial models (McDonald & Marsh, 1990). Each model is independently tested using all of the data. The model that fits the data the best is accepted as a model for the underlying causal process of the problem under study. This approach was not used in this study.

Underlying Assumptions in Structural Modelling

The setting up of a structural model, the estimation of its parameters, and the evaluation of its fit are based on some fundamental assumptions that are very important. However, to strictly follow some of these assumptions poses some practical problems. A brief overview of the assumptions that is presented here will be helpful in dealing with the encountered problems. These assumptions may be grouped into (a) conceptual and (b) statistical assumptions. Some of these assumptions are given below, followed by a brief discussion in the context of the present study.

Conceptual Assumptions

1. The sample in the problem under study comes from the population that is relevant to the theoretical ideas that are tested.
2. The data are collected under appropriate conditions of measurement in relation to the theory under investigation.
3. If the structural theory is adopted to describe the cause and effect sequences over time then the data are collected in proper lag times consistent with the hypothesis being tested.
4. Appropriate theories are used to operationalize the variables for structural modelling.
5. The measured variables in the problem under study are the appropriate indicators of the latent variables. That is, the indicators are the logical consequences of the latent variables.
6. The theory supports the existence of a construct that makes sense in a given model.

The conceptual assumptions apply to the stages prior to parameter estimation, and verification of the model. Assumption 1 refers to the use of proper sampling techniques. The WHDS data were compared to 1988 Canada Census data and WAS (Winnipeg Area Survey) data (Patton, 1994), and were found to be representative of the general population. The data were collected under appropriate conditions (assumption 2). The rest of the conceptual assumptions refer to the underlying basis of the procedure. The most fundamental point in structural equation modelling is that it is a confirmatory approach, rather than an exploratory one. Therefore, the theoretical basis of the latent constructs and causal effects should be well supported. These were properly identified in this study as discussed in the previous chapter. The latent constructs of poverty, alcohol use and others used in this study are well supported in the literature.

Statistical Assumptions

1. Data are gathered from independent observations. Responses given by one person do not influence the responses given by another person.
2. An identical distribution that describes influences of variables on each other is operating in each and every individual observation.
3. Each of the units or cases in the population has an equal probability of being included in the sample under study. That is, the sample is random.
4. All relations among variables are linear.
5. The distributions of the variables are known. [Note that the distribution free methods that are available are computationally expensive for models with 20-30 variables (Bentler & Chou, 1987).
6. The sample means and covariances are used in the analysis because the underlying theory of structural modelling is based on the distribution of sample means and covariances (not on the distribution of standardized variables).
7. The sample size is large. This is required because the theory used describes the behaviour of statistics as the sample size becomes arbitrarily large (i.e, based on the *asymptotic* theory).

8. The specified model is such that if the model were true, a single set of parameters can reproduce the population covariance matrix.

The statistical assumptions refer mostly to the assumptions made for the theoretical derivation of the methods of parameter estimation, and checking the aptness of the developed model. Assumptions 1, 3 and 7 (i.e., independent observations, random and large sample) are made in almost any statistical technique that has wide application. Serious violation of these assumptions may sometimes offer incorrect conclusions from the analysis. Corrective measures are available to minimize the effects of such violations (e.g., small sample size). However, the data used in this study do not seriously violate any of these assumptions. Assumption 2 has to be made for any statistical inference from observations. The exact value for the case of each and every individual observation is seldom known. Assumption 4 refers to the equations of this procedure. Possible violations of this assumption are discussed in the discussion section of this report. Assumptions 5 and 8 refer to the estimation process. Distribution free methods of computation are available to address assumption 5. Assumption 8 refers to model identification and was tested in assessing the optimality of the model. Where the assumption was not found to be met, the model was modified so that this assumption was met as closely as possible. It is to be noted that there is little agreement on methods of evaluating nested models. That is, an evaluation of the statistical necessity of sets of parameters is limited.

A final note about EQS structural modelling should be made at this point. Work with large sample size invariably encounters problems with missing values. The EQS software has built-in features to handle missing data. The missing cases can be ignored (or deleted) without interrupting computation, or missing values can be estimated following a statistical procedure (multiple regression estimates). The user has the freedom to choose the desired procedure of handling missing data.

Models

Two models were tested in the present study. Model 1 is based on the objectives proposed in hypotheses 1 to 5 while Model 2 incorporates these and adds the objectives in hypotheses 6 to 10. Schematic representations of these two models are shown in Figure 1 (Model 1) and Figure 2 (Model 2). The measurement parts of both of these models are shown on the respective figures by square boxes. The errors in measurements are usually shown as E_i's on EQS figures. These errors are present in this study and are shown on these figures.

The models consist of a number of unobserved (latent) variables. A group of indicator (or measurement) variables are dependent on a particular latent construct. For example, there are four latent constructs (poverty, alcohol use, alcohol problems and alcohol dependence) in Model 1. Of these, poverty is based on four measurements, i.e., unemployment, income, education, and family size. The other three latent variables refer to alcohol abuse. They are also grouped with appropriate measurement variables.

The latent construct components of the models were tested first. This was to either confirm the underlying construct of all of the measurement variables of a particular group,

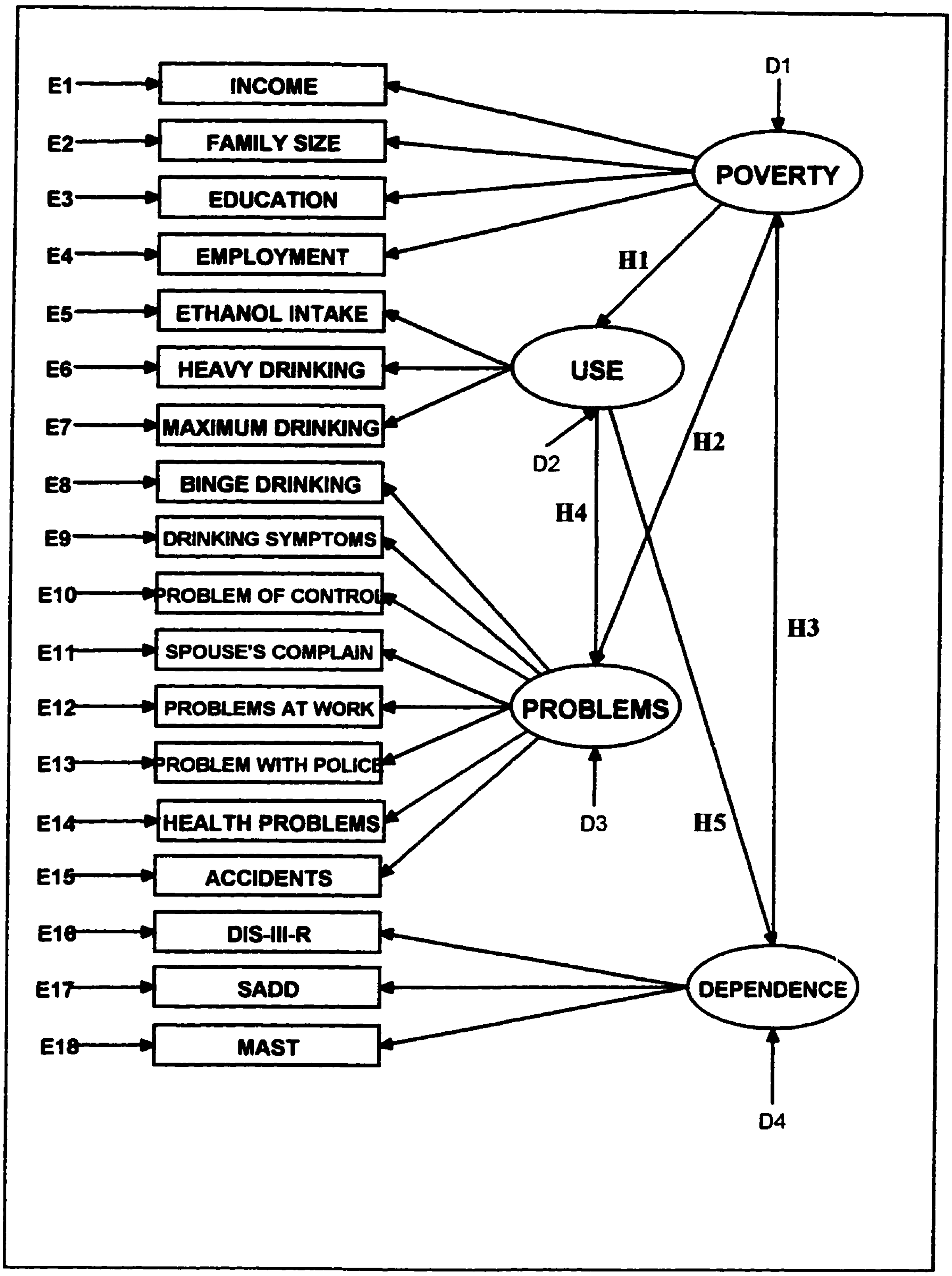


Figure 1. **Model 1 (Cross-sectional model)**

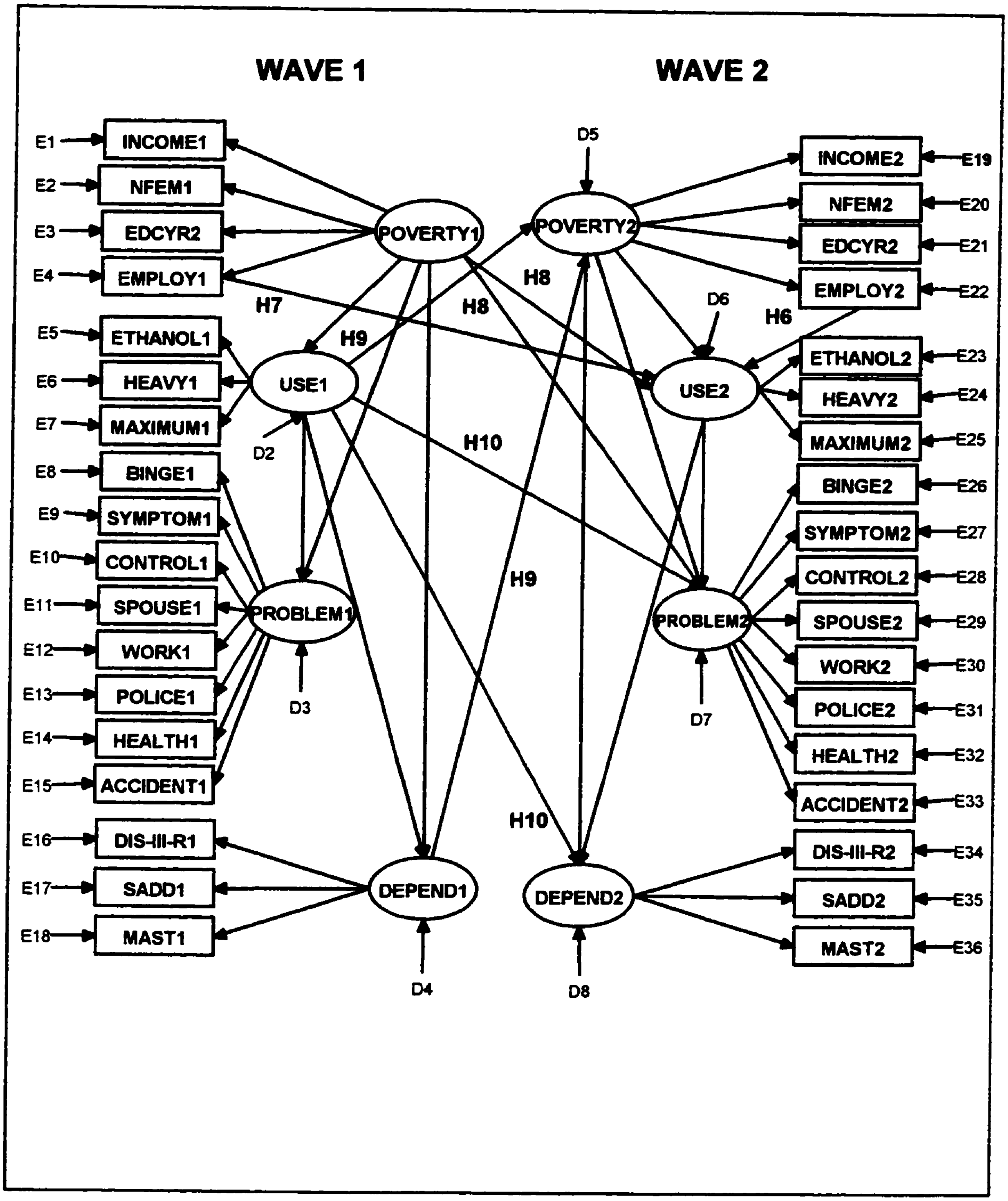


Figure 2. Model 2 (Longitudinal model)

or to suggest which measurement of the group was not caused by the construct. Note that there is a residual associated with each dependant latent construct. These residuals are usually shown as D_i's on EQS models. Both models of figure 1 and figure 2 show these residuals.

Once the measurement variables associated with the latent constructs were determined using the cross-sectional data of Wave 1, Model 1 was tested to identify the causal relationships between alcohol abuse, the latent constructs, and (directly) the measurements of unemployment. For the longitudinal model (Figure 2), the same measurement variables (as found in Model 1) were used for the respective latent constructs of Wave 2. The model was then tested. Note that there are causal paths linking latent constructs of Wave 1 and Wave 2. There are also causal paths between measurement variables of Wave 1 and some latent variables of Wave 2.

The appropriate cross-sectional and longitudinal models were thus identified using the total sample. These models were tested separately using gender and age group sub-samples. Most studies of alcohol use with unemployment excluded women's consumption patterns of alcohol, the most obvious reason being that women were found to consume less alcohol than men. It should be realized that any study of alcohol abuse will be substantially different for men and women. In the present study, both models were tested separately on males and females to provide a clearer picture regarding the difference in alcohol abuse between genders. Research also showed that the correlation between alcohol use and unemployment disappeared when subjects were controlled according to age. Age may, therefore, be an important factor to be considered. Both models were tested on three separate age groups.

Hypothesis Evaluation

The hypotheses listed earlier were tested by the following coefficients and results from testing Model 1 and 2.

1. A positive coefficient on the path from poverty to alcohol use will confirm hypothesis 1. This predicts that a causal relationship exists between poverty measures and alcohol use. This will be evaluated by testing Model 1 (Figure 1).
2. A positive coefficient on the path from poverty to alcohol problems will confirm hypothesis 2. This predicts that a causal relationship exists between poverty measures and alcohol problems. This will also be evaluated by testing Model 1 (Figure 1).
3. A positive coefficient on the path from alcohol dependence to poverty measure will confirm hypothesis 3. This predicts that a causal relationship exists between alcohol dependence and poverty measures. This will also be evaluated by testing Model 1 (Figure 1).
4. A positive coefficient on the path from alcohol use to alcohol problems, will confirm hypothesis 4. This predicts that a causal relationship exists between alcohol use and alcohol problems. This will be also be evaluated in testing Model 1 (Figure 1).
5. A positive coefficient on the path from alcohol use to alcohol dependence will confirm hypothesis 5. This predicts that a causal relationship exists between alcohol use and alcohol dependence. This will also be evaluated in testing Model 1 (Figure 1).

6. A positive coefficient on the path from unemployment at wave 2 to alcohol use at wave 2 will confirm hypothesis 5. This predicts that recent unemployment increases alcohol use. This will be evaluated in testing Model 2 (Figure 2).
7. A negative coefficient on the path from unemployment at Wave 1 to alcohol use at Wave 2 will confirm hypothesis 6. This predicts that longer unemployment decreases alcohol use. This will be evaluated in testing Model 2 (Figure 2).
8. A positive coefficient on the path from Poverty at Wave 1 to alcohol use and alcohol problems at Wave 2 will confirm hypothesis 8. This predicts that longer time poverty will lead to alcohol use and alcohol problems at a later time. This will be evaluated in testing Model 2 (Figure 2).
9. A positive coefficient on the path from alcohol use and dependence at Wave 1 to poverty at Wave 2 will confirm hypothesis 9. This predicts that increased use and dependence on alcohol at present will lead to poverty at later times. This will be revealed in testing Model 2 (Figure 2).
10. A positive coefficient on the path from alcohol use in Wave 1 to alcohol problems and alcohol dependence in Wave 2 will confirm hypothesis 10. This will predict that increased use of alcohol at an earlier time will lead to alcohol problems and alcohol dependence at a later time. This will be evaluated in testing Model 2 (Figure 2).

RESULTS

Results presented in this section consist of four parts. The first part provides results obtained from preliminary analysis of statistical properties of the measurement variables. A nomenclature of the variables and coefficients as used in this study, and the univariate and multivariate distribution of the variables are presented in this part. Following this, results obtained from the analysis of the measurement models are presented. This includes development of measurement models through Confirmatory Factor Analysis (CFA), and statistical tests of invariance of the models across random samples and demographic groups. Analysis of the structural equation model is reported next. The parameter estimation and tests for aptness and model fit are provided in this part. Evaluation of the model in light of the hypotheses is included here as well. Finally, results obtained from an analysis with additional variables that were recorded in the second phase of data collection (Wave 2) are briefly presented.

Nomenclature of the variables and Coefficients

Before presenting any results, a brief description of the variable names used in this study is provided. This will be helpful in following the results without confusion. There are *eighteen* measurement and *four* latent variables for Wave 1 data. There are the same number of measurement and latent variables for Wave 2 data, since the same variables are measured at two time points. In total there are *thirty six* measurement variables and *eight* latent variables. The conventions that were followed to name these variables are given below.

First, a short name is chosen for a measurement variable in such a way that the variable can be recognized from the name. Second, a number (1 or 2) is added at the end of the name to signify which Wave of data the variable belongs to. For example, variable *accid2* denotes problem of involvement in *accidents* due to drinking in Wave *2*. Similarly, *edcyr1* denotes additional *years of education* (schooling) to achieve the highest degree in Wave *1*. Names given to the latent variables follow the same rules. For example, *use2* refers to the latent variable of alcohol *use* in Wave *2*.

When expressed symbolically, the measurement variables of Wave 1 are given the symbols from V1 to V18, and those of Wave 2 were given V19 to V36. The latent variables of Wave 1 are symbolized as F1 to F4, and those of Wave 2 as F5 to F8. Errors associated with the measurement variables are called E1 to E36, of which E1 to E18 correspond to the measurement variables of Wave 1 and the rest are for the measurement variables of Wave 2. The disturbances (or the errors associated with the latent variables) are called D1 to D8, of which D1 to D4 are for the latents of Wave 1 and D5 to D8 are for the latents of Wave 2. The number at the end of the error (or disturbance) terms refer to the variable number with which the error is associated. For example, E7 is the error associated with the measurement variable V7. Similarly, D3 is the disturbance associated with latent F3.

The parameters (or path coefficients) are expressed by notations widely used in structural equation modelling. In this notation, the variable to which the path is directed is referred first followed by the variable where the path originated from. For example, the parameter V4F1 refers to the coefficient of the path from the latent variable F1 to the measurement variable V4. Similarly, F8F6 refers to the coefficient of the path from the latent variable F6 to the latent variable F8.

When a model is evaluated (or discussed) for *data of one Wave only*, there will be *eighteen* measurement and *four* latent variables in the model. Accordingly, the symbols for the variables and the errors are numbered from 1 to 18, and the disturbances from 1 to 4. This in no way interferes with analysis because in such cases, data for Wave 1 and Wave 2 were separated (saved in separate files) to begin with to reduce computational time and difficulty. The same numbers for Wave 1 and Wave 2 only show up in the error terms of the diagram since these terms cannot be labelled (i.e., given a name). When a model for Wave 1 is compared to that of Wave 2, the same parameter names were used for similar paths of the two waves. For example, the path from poverty to income is V1F1 for Wave 1, and V19F5 for Wave 2. When this path is compared, instead of referring to both V1F1 and V19F5, only V1F1 is used. However, when data of two waves are considered together, V1F1 will be used for Wave 1 and V19F5 will be used for Wave 2.

Sample Statistics

Relevant univariate statistical properties of the measurement variables and their multivariate distribution are examined in this section. These properties provide information about the dispersion and distribution of the variables, and covariations between them.

Mean, standard deviation, skewness and kurtosis of the measurement variables of Wave 1 data are presented in Table 6, and those for the variables of Wave 2 are presented in Table 7. Note that in these tables the variable names as used in the EQS program are also included.

Table 6

Univariate properties of variables of Wave 1

Name	Variable	Mean	SD	Skewness	Kurtosis
INCOME1	V1	1.936	1.450	0.671	-0.573
NFEM1	V2	3.066	1.274	0.422	0.114
EDCYR1	V3	7.418	2.842	-0.329	0.132
EMPLOY1	V4	2.428	2.147	1.238	0.104
ETHANOL1	V5	0.468	0.742	4.684	39.550
HEAVY1	V6	0.275	0.775	3.044	8.823
HMAX1	V7	0.025	0.069	6.585	66.176
BINGE1	V8	0.150	0.523	3.228	8.504
SYMPTOM1	V9	0.896	1.475	2.006	4.108
CONTROL1	V10	0.467	1.010	2.742	8.785
SPOUSE1	V11	0.205	0.515	2.496	5.202
JOB1	V12	0.025	0.185	8.067	70.703
POLICE1	V13	0.106	0.360	4.341	26.268
HEALTH1	V14	0.049	0.323	8.867	91.684
ACCID1	V15	0.155	0.526	4.408	22.739
ALC3R1	V16	1.646	1.176	1.355	-0.039
SADD1	V17	1.362	2.208	2.002	4.061
MAST1	V18	0.972	2.843	3.946	17.116

Table 7

Univariate properties of variables of Wave 2

Name	Variable	Mean	SD	Skewness	Kurtosis
INCOME2	V19	1.816	1.459	0.808	-0.471
NFEM2	V20	3.086	1.312	0.433	-0.015
EDCYR2	V21	7.362	2.845	-0.092	0.991
EMPLOY2	V22	2.382	2.110	1.229	-0.010
ETHANOL2	V23	0.451	0.768	4.890	40.102
HEAVY2	V24	0.563	0.740	1.760	4.781
HMAX2	V25	0.005	0.038	9.755	109.101
BINGE2	V26	0.079	0.361	4.707	21.239
SYMPTOM2	V27	0.699	1.428	2.530	6.758
CONTROL2	V28	0.298	0.848	3.593	15.188
SPOUSE2	V29	0.133	0.422	3.303	10.349
JOB2	V30	0.028	0.234	11.041	145.417
POLICE2	V31	0.086	0.402	10.524	178.333
HEALTH2	V32	0.035	0.278	10.270	121.377
ACCID2	V33	0.098	0.409	5.784	41.328
ALC3R2	V34	1.335	0.806	2.341	4.209
SADD2	V35	0.752	1.806	3.118	10.939
MAST2	V36	0.644	2.097	4.730	26.112

Values of variable means were compared for equality between *men* and *women*. This was done for all variables of both Wave 1 and Wave 2 data. The results obtained from these comparisons for Wave 1 and Wave 2 are presented in Table 8 and Table 9 respectively. The values of the means for men and women, the t-value for testing the null hypothesis that the difference between these two means is zero, and the corresponding probability are presented in these tables. The degrees of freedom for all tests is 431.

These comparisons were made to form a general idea about the extent of differences (if any) in variables related to alcohol abuse between men and women. All of the variable means can be considered different for men and women. This is true for both Wave 1 and Wave 2 data. The t-values and the probability values listed in Table 8 and in Table 9 rejected the hypothesis of zero difference between the means for men and women (at a level of significance of 5%). Note that for multiple tests (e.g., comparing mean of a variable of Wave 1 and Wave 2 between men and women) the level of significance should be adjusted for multiple comparison using any suitable method (e.g., Bonferroni's method).

Table 8

Comparison of variable means between men and women of Wave 1

Name	Variable	Men	Women	t-value	p
INCOME1	V1	1.716	2.156	-4.424	<0.01
NFEM1	V2	3.183	2.954	2.641	0.01
EDCYR1	V3	7.194	7.656	-2.397	0.02
EMPLOY1	V4	2.039	2.819	-5.354	<0.01
ETHANOL1	V5	0.648	0.286	7.318	<0.01
HEAVY1	V6	0.424	0.127	5.740	<0.01
HMAX1	V7	0.036	0.014	4.674	<0.01
BINGE1	V8	0.245	0.056	5.567	<0.01
SYMPTOM1	V9	1.252	0.537	7.860	<0.01
CONTROL1	V10	0.602	0.333	4.195	<0.01
SPOUSE1	V11	0.303	0.106	5.911	<0.01
JOB1	V12	0.042	0.009	2.573	0.01
POLICE1	V13	0.174	0.037	5.699	<0.01
HEALTH1	V14	0.072	0.025	2.093	0.04
ACCID1	V15	0.225	0.086	3.855	<0.01
ALC3R1	V16	1.928	1.366	7.533	<0.01
SADD1	V17	1.767	0.956	5.593	<0.01
MAST1	V18	1.287	0.660	3.302	<0.01

Table 9

Comparison of variable means between men and women of Wave 2

Name	Variable	Men	Women	t-value	p
INCOME2	V19	1.552	2.082	-5.418	<0.01
NFEM2	V20	3.199	2.977	2.511	0.01
EDCYR2	V21	7.111	7.628	-2.647	0.01
EMPLOY2	V22	2.000	2.766	-5.443	<0.01
ETHANOL2	V23	0.637	0.265	7.235	<0.01
HEAVY2	V24	0.785	0.340	9.778	<0.01
HMAX2	V25	0.008	0.002	2.258	0.03
BINGE2	V26	0.116	0.042	2.972	<0.01
SYMPTOM2	V27	0.951	0.440	5.502	<0.01
CONTROL2	V28	0.414	0.183	4.041	<0.01
SPOUSE2	V29	0.206	0.060	5.247	<0.01
JOB2	V30	0.053	0.002	3.294	<0.01
POLICE2	V31	0.155	0.016	5.184	<0.01
HEALTH2	V32	0.053	0.016	1.947	0.05
ACCID2	V33	0.146	0.051	3.550	<0.01
ALC3R2	V34	1.470	1.201	5.077	<0.01
SADD2	V35	0.975	0.531	3.697	<0.01
MAST2	V36	0.928	0.361	4.044	<0.01

Results presented in Table 8 and in Table 9 reveal two important differences between men and women as observed in the sample. The first difference is that on the average, women earn lower family income, have lesser number of family members, go through fewer years of schooling and have less full-time employment. All of these quantities refer to the construct of poverty, and hence, women as a group are poorer than men. Note that the variables denoting family income (*income1* and *income2*), years of schooling (*edcyr1* and *edcyr2*), and employment status (*employ1* and *employ2*) were all expressed as a deficit from a so-called maximum. Thus, a higher value of these variables signifies higher deficits i.e., lower absolute value. This was done to preserve the meaning of poverty as discussed in the method section of this report. Therefore, the mean values for women for these variables listed in Table 8 and 9 are higher (showing higher deficit or lower absolute values) compared to men.

The second difference between men and women is in the mean values of the rest of the variables. These variables describe different aspects of alcohol abuse. Mean values of all of these variables were found to be higher for men. For the sample of the present study, it was found that compared to women, men consume more alcohol by regular drinking, drink heavily, consume more alcohol at one sitting, have more alcohol related social and physical problems (including higher values of binge drinking occasions, problems controlling, symptoms of alcohol use, health problems, problems with spouse, problems with police, occasions of involvement in accidents and problems at work), and have higher alcohol dependence scores. This is true for Wave 1 and Wave 2 data. Note that these preliminary observations are made on the basis of average conditions (not considering all sources of variation) to explore whether it is worthwhile to study the difference. The findings may be different if all sources of variations are considered.

Appendix H shows the correlation and the variance-covariance matrices in tabular form. Table H1 and H2 show the correlation matrices of Wave 1 and Wave2. Table H3 shows correlation between variables of Wave 1 and Wave. The lower triangular part of the variance-covariance matrix of all measurement variables is presented in Table H4.

From the values of skewness and Kurtosis presented in Table 6 and Table 7 it is observed that some variables may be considered to be fairly normally distributed while others to substantially deviate from normal distribution. Similar conclusions were arrived at from the normal probability plots, stem-leaf plots and box-plots (features readily available in EQS but not shown here) of the variables.

The multivariate sample statistics reported in EQS are based on the kurtosis values. The statistics are related to Mardia's (1970) coefficient. The normalized estimate of this coefficient is reported in EQS. This estimate is normally distributed with a mean of zero and a variance of 1 when the sample size is large and multivariately normal. Therefore, a high positive value of the normalized estimate would signify positive multivariate kurtosis while a high negative value signifies negative multivariate kurtosis for the sample (Bentler, 1989; 1993). Both of these situations would imply significant deviation from the assumption of normal multivariate distribution of the sample. The normalized estimates of multivariate kurtosis of the sample are given in Table 10.

Table 10

Sample multivariate kurtosis

	Wave 1	Wave 2	Combined
Mardia's Coefficient	716.71	1151.84	2501.25
Normalized Estimate	392.79	631.25	703.20

Values of normalized estimates (which are essentially z-statistics) listed in Table 10 suggest that the multivariate distribution of the sample is non-normal with significant positive kurtosis. Note that a major contribution to the deviation from normality comes from the variables that measure the latent construct of *problem*.

The deviation of sample multivariate distribution from the normal distribution imposes a restriction on using Maximum Likelihood (ML) method of estimating parameter values since an assumption of normality is associated with this method. Also, the normal theory statistic χ^2 which is used to test the model fit may not reflect an adequate evaluation of the model (Hu, Bentler & Kano, 1992). When the multivariate distribution of the sample is non-normal, the above mentioned problem may be addressed in three ways. First, a distribution free estimation method may be used. These methods use the non-normal distribution of the sample and evaluate the model fit by the corresponding χ^2 statistic. ELS (Elliptical Least Square), EGLS (Elliptical Generalized Least Square), and AGLS (Arbitrary Generalized Least Square) are some of the estimation methods using non-normal distributions available in EQS Version 5.0. Second, an appropriate transformation function (e.g., square root) may be used to transform the variables that are not univariately normal into values that are normally distributed. This, however, may not guarantee multivariate normality. Also, it may be difficult to interpret the relationships obtained by using transformed variables especially when a complex transformation function is used to achieve normality. Third, a method that assumes a normal distribution may be used and the evaluation of the model fit may be tested following a correction procedure for the test statistics to adjust for the deviation from normality. The *third* approach is adopted in this study. The reasons for adopting the third approach including the general guidelines that were followed are given in the following.

Chou, Bentler & Satorra (1991) and Hu et al. (1992) argued in favour of correcting the test statistics for violation of normality assumption rather than using the methods that assume non-normal distribution of data. This is because (a) the fourth-order moment needed in distribution free method is unstable as an estimator, (b) the basic goodness-of-fit test for model adequacy under arbitrary distributions may behave quite poorly when the sample size is relatively small or model degrees of freedom are large, and (c) the method of correcting the statistics obtained from a normal distribution estimation method for non-normality performs better for a wide variety of situations (see Hu et al., 1992). Also, computations using the ML estimation method take less computer time compared to other available methods, especially when the number of variables and the sample size is large. Satorra & Bentler (1988a; 1988b) developed a statistic that provides a scaling correction for the χ^2 statistic when the underlying distribution deviates from normality. This statistic (called Satorra-Bentler Scaled Statistic or S-B χ^2) takes into account the sample kurtosis values, the model and the estimation method and has been shown to be the most reliable test statistic for covariance structure model evaluation (Hu et al., 1992). When this option is invoked in EQS the robust standard error of the parameters are also included in the output. The traditional Comparative Fit Index (CFI) which is based on the χ^2 value computed under a normal distribution assumption is corrected using S-B χ^2. The corrected value of the fit index (CFI*) is given by (see Bentler, 1993; Byrne, 1994):

$$CFI* = \frac{(\chi^2_0 - df_0) - (\chi^2_k - df_k)}{(\chi^2_0 - df_0)} \qquad (2)$$

where,

df_0 = degrees of freedom of the null model,

df_k = degrees of freedom of the hypothesized model

χ^2_0 = S-B χ^2 of the null model, and

χ^2_k = S-B χ^2 of the hypothesized model.

The null model refers to the model in which no associations between variables are considered significant. In EQS, the null model is described as a model in which each measurement variable corresponds to a distinct latent construct with no connecting paths between the latents or between the indicators (i.e., the paths have zero coefficient values). The loadings between the latent and the measurement variables are fixed at 1.00. Also, no measurement errors are allowed. This is equivalent to saying that each variable completely represents a latent construct. The quantities (χ^2_0 - df_0) and (χ^2_k - df_k) in the equation can have a minimum value of zero, i.e., any negative value should be taken as zero.

Computation of S-B χ^2 in EQS requires specifying the ROBUST estimation option with the Maximum Likelihood (ML) estimation method. This, however, uses substantial computer time since it uses the raw data matrix and computes contributions of each observation to the variance of parameter estimation. For the sake of comparison, both of the approaches (distribution free method and correction method) were used in this study. Unless otherwise specified, the reported statistics in this study all refer to values obtained from the ML estimation method using the correction for non-normality.

Preliminary Analyses

An important preliminary step in the analysis of a structural model is to test first the validity of the measurement model before evaluating the causal structure. The object of this step includes determination of the stability of the models. The validity of the measurement model is determined by using Confirmatory Factor Analysis (CFA) procedure to test the indicator variables.

It needs to be mentioned here that the variances of the latent constructs (and factors) are estimated freely in the analysis. One of the path coefficients connecting the latent and the measurement variables is kept fixed at 1.00. An alternate approach is to keep the variance of the latent construct (or factors) fixed at 1.00 while estimating all of the path coefficients freely. Both of these approaches would, however, yield the same result. This exercise is needed to avoid the identification problem and to fix the scale of the latent. The error variances are estimated freely while the paths connecting the errors and the variables are kept fixed at 1.00. These are required in Structural Equation Method of analysis to satisfy the condition of over-identification as discussed in the method section of this report. The output in the form of a diagram may contain either the parameter values or the standardized values of the coefficients. Both of these options are available in EQS. When the output contains the parameter values, the paths that were kept fixed would have a coefficient value of 1.00. The standardized output would contain the standardized values of the coefficients of the fixed paths as well.

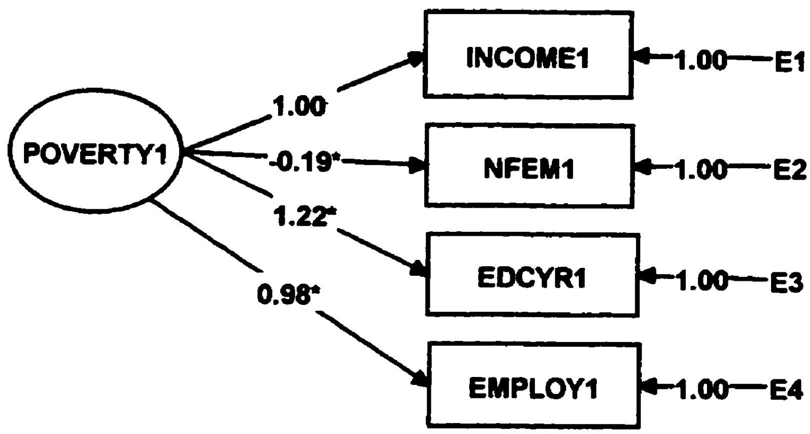
There are two theoretical constructs in the hypothesized model of this study. These are *Poverty* and *Alcohol Abuse*. Poverty here is a one factor construct while *Alcohol Abuse* is a three factor construct consisting of *Use*, *Problem* and *Dependence*. Results of the Confirmatory Factor Analysis procedure for these constructs are given below.

Poverty

This construct is tested for its indicator variables of *income*, *number of family members*, *education*, and *employment*. As mentioned in the method section of this report, these variables are redefined to suit the meaning of poverty.

The output for Wave 1 data is summarized in Figure 3. Parameter values with asterisks corresponds to freely estimated parameters. A correlation between the error terms of Income and Number of Family Members is allowed in this model. The statistics provided in this figure correspond to the Maximum Likelihood (ML) Robust estimation. Since the multivariate distribution of the variables is not normal, a correction is applied to the CFI as explained above. The correction requires an evaluation of a null model. The Satorra-Bentler χ^2 for this null model is 217.88 with 6 degrees of freedom. The S-B χ^2 for the model is 1.172 with *df* of 1 (this value is provided in figure). The corresponding corrected CFI* for this construct of Wave 1 data is 0.994. The probability value corresponding to the χ^2 is quite satisfactory (i.e., greater than 5%).

The Wald Test was done to check the multivariate significance of the parameters included in the model. Also, the LM Test was performed to see whether any other paths



EQS Summary Statistics

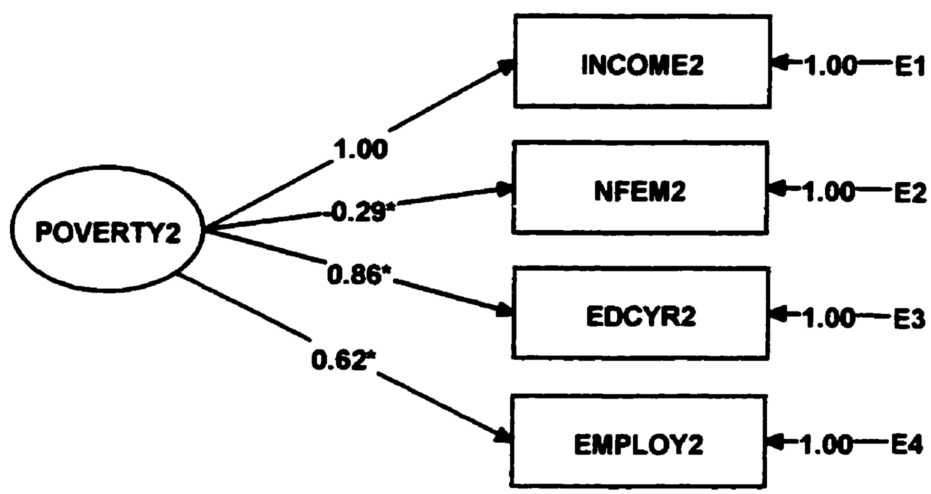
Method:	ML ROBUST
Chi-Square:	1.08
df =	1
pvalue =	0.2980
BBNFI =	0.995
BBNNFI =	0.998
CFI =	1.000
SB Chi-Square:	1.17
SB pvalue =	0.2790

Figure 3. **Measurement model of Poverty of Wave 1 data**

that are left out of the model should be included. Results from these tests suggested that neither is any path insignificant nor should any new paths be included. The *chi-square* to *df* (degrees of freedom) ratio of the model corresponding to ML estimation is 1.08 (the ratio corresponding to S-B scaled value is 1.17) which is well below the commonly used upper limit of the ratio (i.e., 5.00). The residuals are normally distributed with most values around zero. The average of absolute standardized residuals and the average of off-diagonal standardized residuals are 0.005 and 0.008 respectively. All of these statistics show that the model fit is extremely good. Note that the correlation between the error terms (E1,E2) is allowed in this model but is not shown in the figure.

Similar results are obtained for the data of Wave 2 and are shown in Figure 4. The S-B χ^2 for the null model of Wave 2 is 223.62 with a *df* of 6. The S-B χ^2 for the model is 4.38 with a *df* of 2. This results in a corrected CFI* of 0.989. The *chi-square* to *df* ratio for ML estimation is 2.03 (the ratio corresponding to S-B scale chi-square is 2.19) which is quite satisfactory. As before, the probability value corresponding to the χ^2 is satisfactory. The LM test and the Wald test showed no need of addition or deletion of any paths of the model. The residuals are normally distributed with most values around zero. The average of standardized residuals is 0.010, and the average of off-diagonal standardized residuals is 0.017. All of these statistics signify a very good model fit.

The construct of Poverty was tested for random halves of the sample, and for male and female groups of data. This was repeated for each Wave of data. The results were consistently similar. All the indicator variables loaded onto the construct with the same sign and they are all highly significant. The corrected CFI* values are all higher than 0.90



EQS Summary Statistics

Method:	ML ROBUST
Chi-Square:	4.05
df =	2
pvalue =	0.1323
BBNFI =	0.982
BBNNFI =	0.972
CFI =	0.991
SB Chi-Square:	4.38
SB pvalue =	0.1118

Figure 4. Measurement model of Poverty of Wave 2 data

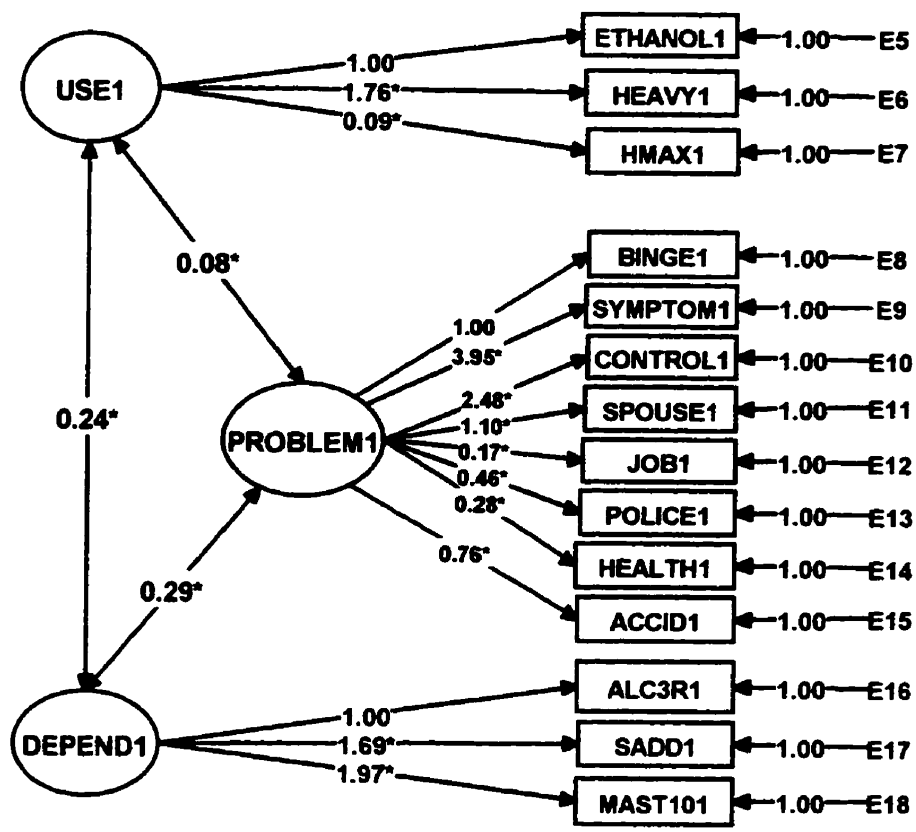
(in fact, closer to 1.00). The probabilities of the χ^2 value for all of the above groups are greater than 0.05.

Results given above provide adequate evidence of the validity of the indicator variables for the construct of *poverty* in the context of this study. Also, the results support the theoretical grounds used in formulating this construct. The causal influence of this construct on different aspects of alcohol use was tested after such an evaluation of the other constructs was made.

Alcohol Abuse

Alcohol abuse is a three factor construct with separate measurement variables for each factor. The validity of this construct is tested by following CFA procedures. In this analysis, it was assumed that the three factors of the construct are inter-correlated. Results of the analysis for Wave 1 data are presented in Figure 5.

The S-B χ^2 for the corresponding null model is 1154.04 with a *df* of 91. The S-B χ^2 for the model is 117.14 with a *df* of 71. The corrected CFI* for this construct of Wave 1 is 0.957. The probability values corresponding to the χ^2 values are less than 0.05 which may imply that the model fit is not very good. However, the sensitivity of the χ^2 statistic for large samples is well known. This is the reason why ad hoc fit indices (e.g., CFI) are widely used. A value of CFI, corrected for the non-normality of the data, of 0.957 is considered to imply a very good fit. The *chi-square* to *df* ratio is 1.650 using S-B χ^2 statistics. Even when the ML estimation is used, this ratio is 4.612 which is below 5.00.



EQS Summary Statistics

Method:	ML ROBUST
Chi-Square:	327.47
df =	71
pvalue =	0.0000
BBNFI =	0.927
BBNNFI =	0.925
CFI =	0.942
SB Chi-Square:	117.14
SB pvalue =	0.0005

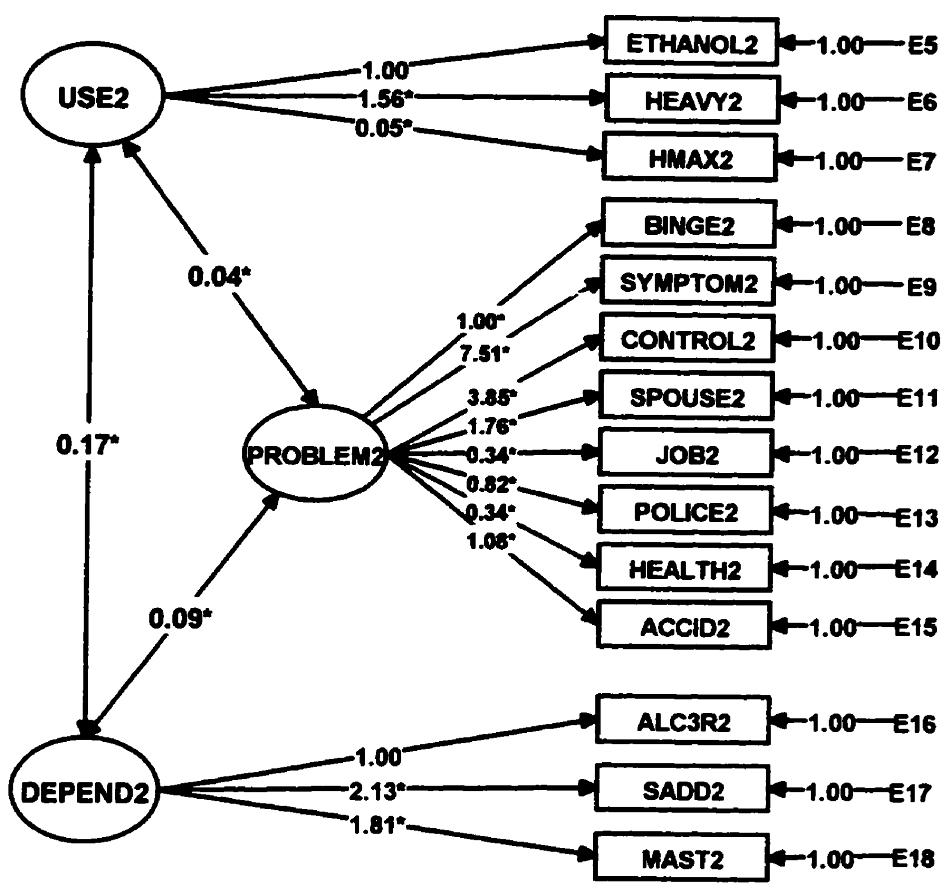
Figure 5. **Measurement model of Alcohol Abuse for Wave 1 data**

The LM test and the Wald Test suggested that no further change in the model is needed. The residuals are normally distributed with most values around zero. The average of the standardized residuals and the average of the off-diagonal standardized residuals are 0.035 and 0.040 respectively. All of these statistics suggest a very good model fit.

Correlations between error terms (E5,E7), (E8,E6) and (E16,E17) were allowed in this model. These are not shown in the figure. The value of CFI for this construct could be improved even more by allowing correlation between other error terms. This was, however, considered unnecessary because the model fit is already acceptable and allowing more parameters may invite the problem of over-parameterization.

Results for the Wave 2 data are shown in Figure 6. The S-B χ^2 for the model is 105.69 with a *df* of 70. The S-B χ^2 value for the corresponding null model is 589.31 with a df of 91. The corrected CFI* is 0.928. The probability value corresponding to χ^2 is less than 0.05. The *chi-square* to *df* ratio is 1.510 corresponding to S-B χ^2. The residuals are normally distributed with most values around zero. The average of absolute standardized residuals and the average of off-diagonal standardized residuals are 0.040 and 0.046 respectively. The LM test and the Wald test suggest no changes in the model. The correlations between error terms (E5,E7), (E6,E8), (E12,E13), (E13,E15) and (E12,E15) were allowed in this model and are not shown in the figure.

The construct was tested for equal halves of sample, and across gender groups for both Wave 1 and Wave 2 data. It was found that the measurement variables load onto the corresponding factors of the construct with similar values having the same signs. The



<u>EQS Summary Statistics</u>

Method:	ML ROBUST
Chi-Square:	393.21
df =	70
pvalue =	0.0000
BBNFI =	0.894
BBNNFI =	0.884
CFI =	0.911
SB Chi-Square:	105.69
SB pvalue =	0.0038

<u>Figure 6.</u> Measurement model of Alcohol Abuse for Wave 2 data

corrected CFI* values of the models for these tests signify that the measurement variables of this construct are valid and stable.

Correlated Errors

Correlation between errors of different variables were allowed in the estimation process of the above measurement models. The following observations regarding errors are relevant:

(a) Part of the variance of some variables cannot be explained when taken as a group in the latent. This is usually the case in almost all models. The reason for such behavior lies in the fact that it is almost never possible to consider all the variables that have a direct or an indirect effect on the variables under study. (Some are always left out). The error thus introduced in the model can partly be explained by the error terms. Allowance of correlations between the error terms can thus explain a part of the *error in covariation* that cannot be explained otherwise.

(b) Some of the variables within one latent (especially the variables of *Problem*) are correlated. This would make sense considering the nature of the variables, the way these variables are defined, and the way their values are collected. For example, problem with *police* and problem of *accident* will be correlated since almost all cases of *accident due to drinking* will have direct or indirect police involvement. Similarly, the number of problems in *job* will have some numbers common to *binge drinking occasions*.

(c) It is recommended that the measurement variables of a latent construct are such that they are kept as independent as possible. However, having such variables in this study, especially in the latent *problem*, is not possible since the presence (or absence) of one affects that of the other. In such a situation one way left to the researcher is to allow correlation between the error terms of the variables (i) to take care of the rightfully existing covariation, (ii) to allow as many different aspects of the latent as called for by the study, (iii) to allow covariation of the same errors across time, and finally, (iv) to improve the model fit.

Longitudinal Stability of Measurement Models

Each measurement model should be tested to examine its stability across time, and to determine the extent of such stability. If the respective parameters of the model under different conditions have the same sign and direction of causality, and the difference in values is not appreciable, the model may be considered as stable. If a measurement model is not stable at all (e.g., respective parameters have opposite signs), it should be redefined by looking at the background theory and measurement variables.

The stability was tested by simultaneous evaluation of each latent using data of Wave 1 and Wave 2 together. The parameters were tested for equality. Note that any test of parameter stability (cross-sectional or longitudinal) requires that a simultaneous model be fitted first. All of the measurement models were found to be stable across time.

The extent of stability was tested by checking the predicting capability of the latents across time (i.e., how well a latent can be predicted in Wave 2 by its own value in

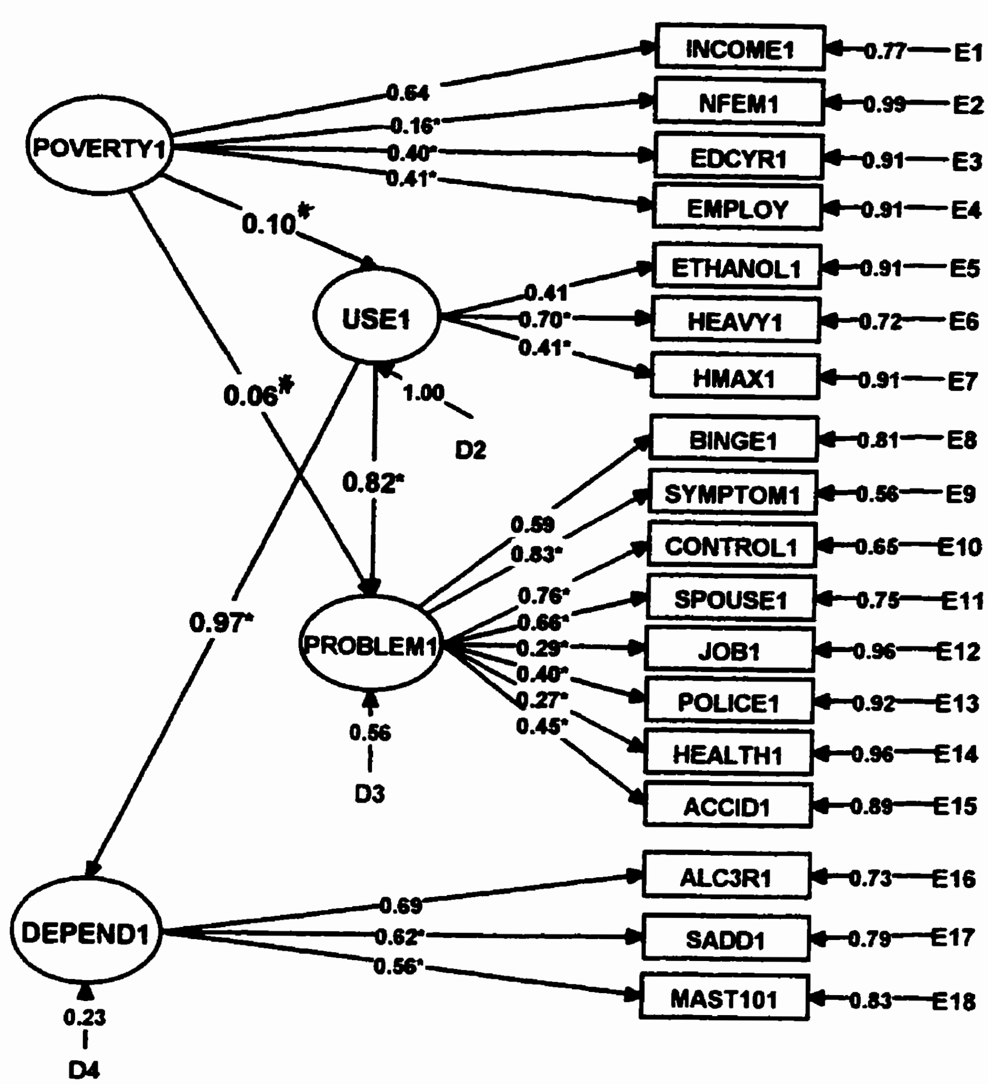
Wave 1). For this purpose, the latents were connected by a unidirectional arrow from their value at Wave 1 to that at Wave 2 (instead of joining them with a bi-directional arrow which signifies covariance). The coefficient of this path corresponding to the *standardized solution* denotes correlation between these latents (see Bentler, 1993). The so-called R^2 can thus be calculated by squaring this value. A model that is perfectly stable would have a R^2 value of 1.00 (a perfectly unstable model will have a value of 0.00).

The results of this analysis show that the measurement models are fairly stable across time. The R^2 values are: *poverty* (0.998); *use* (0.689); *dependence* (0.578); and *problem* (0.578). The latents should thus be kept in both Waves when a combined model is considered since these are stable latents but are not perfectly stable.

Evaluation of Causal Structure

Once the validities of the constructs are established, the causal structure of the model is tested next. The hypothesized causal structure as shown in Figures 1 and 2 (in the method section) is tested for parameter evaluation and statistical significance. Results obtained from such analysis are given below.

The causal structure for Wave 1 data (with all the measurement variables) is shown in Figure 7. In this figure only the significant causal paths are shown. As before the ML Robust estimation method is used in order to compute the S-B χ^2 needed to correct the fit index used for model evaluation. The S-B χ^2 for the corresponding null model is 1767.43 with a *df* of 153 while the value for the model is 201.94 with a *df* of 126. The corrected



EQS Summary Statistics

Method:	ML ROBUST
Chi-Square:	402.45
df =	126
pvalue =	0.0000
BBNFI =	0.916
BBNNFI =	0.928
CFI =	0.941
SB Chi-Square:	201.94
SB pvalue =	0.0000

Figure 7. **Causal structure of Wave 1 data (Model 1)**

CFI* is 0.953. The probability values for the corresponding χ^2 are less than 0.05. The *chi-square* to *df* ratio for this model is 1.603 corresponding to the S-B χ^2 value. Even for the ML estimation, this ratio is 3.194 which is well below 5.00. Distribution of the standardized residuals may be taken as normal. Also, these values are concentrated around zero. A frequency distribution of the standardized parameters of Wave 1 data is shown in Figure 8. The average of standardized residuals and the average of off-diagonal standardized residuals are respectively 0.035 and 0.039.The LM test and the Wald test suggest no meaningful changes in the model paths. All of these statistics show that the model fit is good.

The correlation between the error terms that were allowed in this model are the same as those allowed for the models of *poverty* and *alcohol abuse* of Wave 1 data. These are not shown in the figure. No other errors were allowed to correlate although the model fit could be further improved by doing so.

The path coefficients that are shown in Figure 7 are all standardized values. The corresponding parameter values are similar to those reported in the earlier figures. The standardized coefficients (obtainable from EQS) refer to the values corresponding to the solution in which the variances of the variables are rescaled to 1.00. This helps in comparing the relative weights of the coefficients. The EQS diagrammer is equipped to provide both the parameter values and the standardized values in the model diagram. The relative importance of the path coefficients will be further discussed in the discussion section of this report.

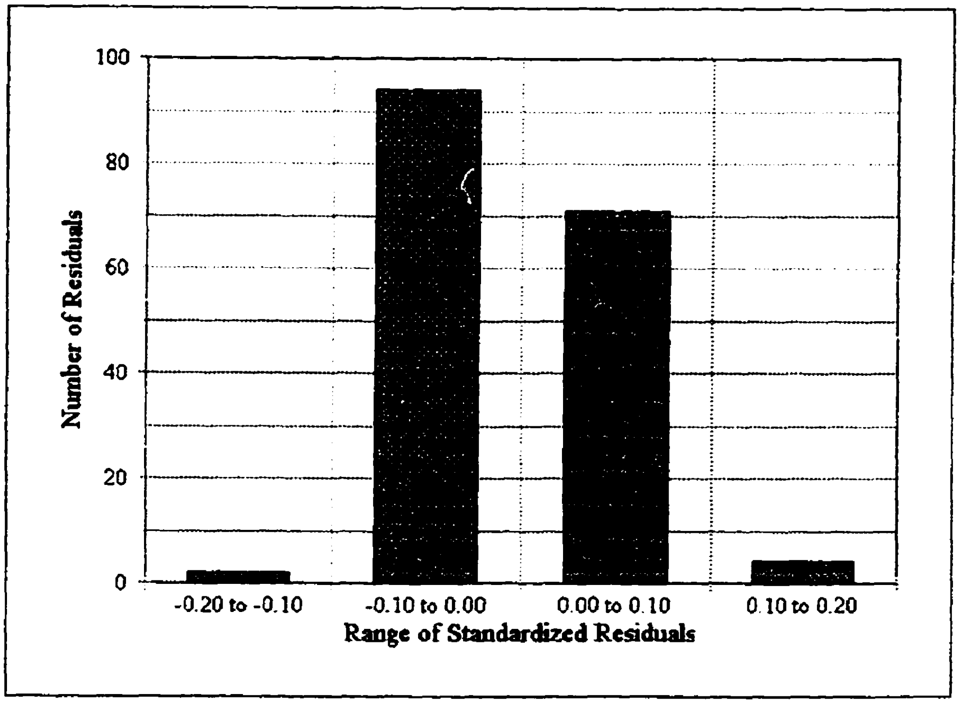
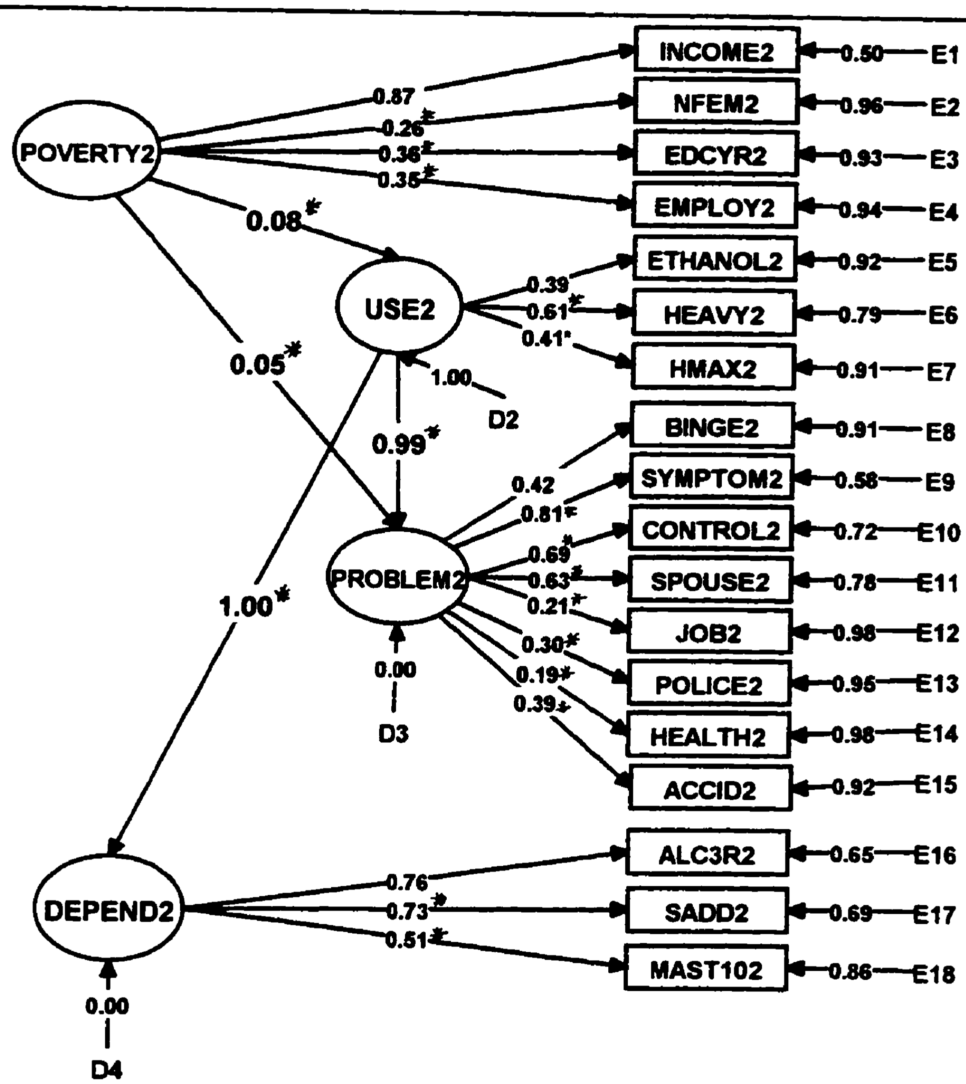


Figure 8. Distribution of standardized residuals of causal model of Wave 1 data

The causal structure connecting the two constructs and their components for Wave 2 data is shown in Figure 9. The path coefficients in this figure are those of a standardized solution. The S-B χ^2 of the model is 129.97 with a *df* of 126. The value for the null model is 972.46 with a *df* of 153. The corrected CFI* is 0.995. The probability corresponding to the χ^2 value is less than 0.05. The *chi-square* to *df* ratio is 1.032.

The standardized residuals of the causal structure model of Wave 2 data are plotted as a bar graph in Figure 10. It can be concluded that these residuals are normally distributed and that they are centred around zero. The average of the standardized residuals



EQS Summary Statistics

Method:	ML ROBUST
Chi-Square:	517.66
df =	126
pvalue =	0.000
BBNFI =	0.872
BBNNFI =	0.878
CFI =	0.900
SB Chi-Square:	129.97
SB pvalue =	0.5091

Figure 9. Causal structure of Wave 2 data (Model 1)

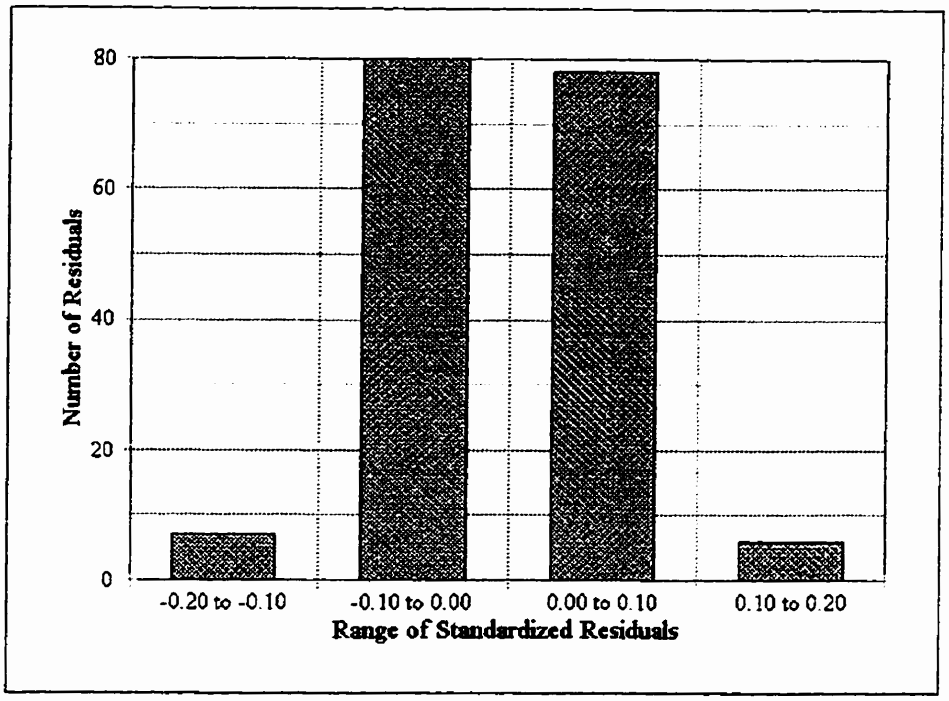


Figure 10. Distribution of standardized residuals of causal model of Wave 2 data

and that of the off-diagonal standardized residuals are 0.037 and 0.041 respectively. These observations further support the adequacy of the structural model. The LM test and the Wald test do not suggest any addition or deletion of paths in the model. As before, the error correlations allowed in this model are the same as those allowed in the *poverty* and *alcohol abuse* models. These are not shown in Figure 9.

The path coefficients and error variances together with the corresponding univariate z-statistics for Wave 1 and Wave 2 data are shown in Table 11. Note that the quantities shown in parenthesis are the univariate z-values. This value is obtained from dividing the estimate by the standard error of the estimate. The standardized parameters and the error path coefficients corresponding to the values of Table 11 are shown in Figure 7 and 9.

Table 11

Path Coefficients and Error Variances of the Causal Model of Wave 1 and 2

Latent	Path	Path Coefficient Wave1	Path Coefficient Wave 2	Error Variance Wave1	Error Variance Wave 2
POVERTY (F1)	INCOME (V1F1)	1.000	1.000	1.242 (6.714)	0.525 (1.960)
	NFEM (V2F1)	-0.216 (-2.634)	-0.272 (-4.775)	1.582 (19.552)	1.603 (19.915)
	EDCYR (V3F1)	1.236 (4.918)	0.815 (5.377)	6.762 (15.934)	7.028 (18.223)
	EMPLOY (V4F1)	0.944 (4.917)	0.583 (5.323)	3.843 (15.769)	3.910 (18.536)
USE (F2)	ETHANOL (V5F2)	1.000	1.000	0.456 (19.437)	0.503 (20.296)
	HEAVY (V6F2)	1.770 (9.807)	1.526 (10.086)	0.311 (11.709)	0.343 (19.108)
	HMAX (V7F2)	0.092 (10.187)	0.052 (10.169)	0.004 (19.494)	0.001 (20.225)
PROBLEM(F3)	BINGE (V8F3)	1.000	1.000	0.177 (19.667)	0.107 (20.144)
	SYMPTOM (V9F3)	3.947 (18.328)	7.577 (12.119)	0.677 (15.886)	0.691 (15.363)

Table 11 (*continued*)

Latent	Path	Path Coefficient Wave1	Path Coefficient Wave 2	Error Variance Wave1	Error Variance Wave 2
	CONTROL(V10F3)	2.489	3.833	0.425	0.374
		(17.406)	(11.522)	(17.798)	(18.235)
	SPOUSE (V11F3)	1.103	1.734	0.148	0.107
		(15.820)	(11.111)	(19.142)	(18.975)
	JOB (V12F3)	0.172	0.318	0.031	0.052
		(7.825)	(5.335)	(20.600)	(20.658)
	POLICE (V13F3)	0.461	0.798	0.109	0.147
		(10.434)	(7.263)	(20.406)	(20.502)
	HEALTH (V14F3)	0.277	0.347	0.097	0.075
		(7.243)	(4.955)	(20.631)	(20.681)
	ACCID (V15F3)	0.760	1.045	0.221	0.142
		(11.591)	(8.657)	(20.274)	(20.287)
DEPEND(F4)	ALC3R (V16F4)	1.000	1.000	0.729	0.276
				(16.582)	(16.986)
	SADD (V17F4)	1.689	2.145	3.005	1.454
		(23.310)	(20.985)	(18.781)	(17.674)
	MAST (V18F4)	1.967	1.761	5.549	3.240
		(17.252)	(14.512)	(19.294)	(19.796)
BETWEEN LATENTS	POVERTY	0.032	0.020	0.093	0.087
	to USE	(2.208)	(1.950)	(5.526)	(5.538)
	POVERTY	0.019	0.010	0.030	0.000
	to PROBLEM	(2.038)	(1.970)	(5.541)	(0.000)
	USE	0.831	0.514	0.036	0.000
	to PROBLEM	(8.771)	(8.559)	(0.651)	(0.000)
	USE to	2.570	2.063	0.861	1.603
	DEPENDENCE	(9.721)	(10.780)	(4.459)	(5.630)

The causal structures as obtained for data of the two Waves were tested for random halves of the corresponding sample, and between gender groups. The models were found to be valid. The respective parameters had the same causality directions and the same sign. In this analysis, additional statistical tests were conducted to verify whether the causal path coefficients of different groups were statistically different. This required simultaneous estimation of the parameters of all the models of a particular group (e.g., two models in gender group, one for men and one for women). Equality constraints were imposed on the same path of the models (e.g., V1F1 for men and V1F1 for women were kept the same) during the estimation process. The LM test was employed to verify whether the imposed equality is true. A path coefficient was considered to be different across the group if the corresponding equality constraint was violated. Results from comparisons across gender and age groups are discussed at the end of this section.

Causal Structure Across Waves

Causal structures between components of different constructs across waves were tested next. In this analysis there were 36 indicators and eight latent variables. The structure between the constructs of *poverty* and *alcohol abuse* were established for both waves of data in the previous section. The same structure for Wave 1 and Wave 2 data are retained in this analysis.

Although the available degrees of freedom is very high, the problem of local under-identification occurred. This required fixing some path coefficients (in addition to one fixed path for each latent) to make the model parameters estimable. These paths were fixed at values obtained from the estimation procedure of the separate analysis of the two waves of data presented in the previous section. The rest of the parameters were estimated freely.

The causal structure obtained from this analysis is shown in Figure 11. Only the significant paths are shown in this figure. Note that the coefficients shown are the standardized coefficients. The S-B χ^2 for the null model is 5265.28 with a *df* of 630 and that for the model is 4.544 with a *df* of 591. The corrected CFI* for the model is 1.00. The *chi-square* to *df* ratio for the ML estimation is 4.36. In addition to the error correlations allowed in the structural model of Wave 1 and Wave 2, the errors of the indicators of Poverty were allowed to correlate across time. These are not shown in the figure. The LM test and the Wald test did not suggest any justifiable further addition or deletion of paths.

The path coefficients of this longitudinal model are shown in Table 12. The quantities in parenthesis in this table are the *z-values* of the corresponding parameter estimation. The *z-values* are calculated as the ratio of parameter value to its standard error. Note that all of the z-values are highly significant (greater than 1.96).

The average of standardized residuals for this model is 0.073, and the average of off-diagonal standardized residuals is 0.074. The residuals can be taken as normally distributed with majority of them located near zero. The distribution of standardized residuals is shown in Figure 12 as a bar graph.

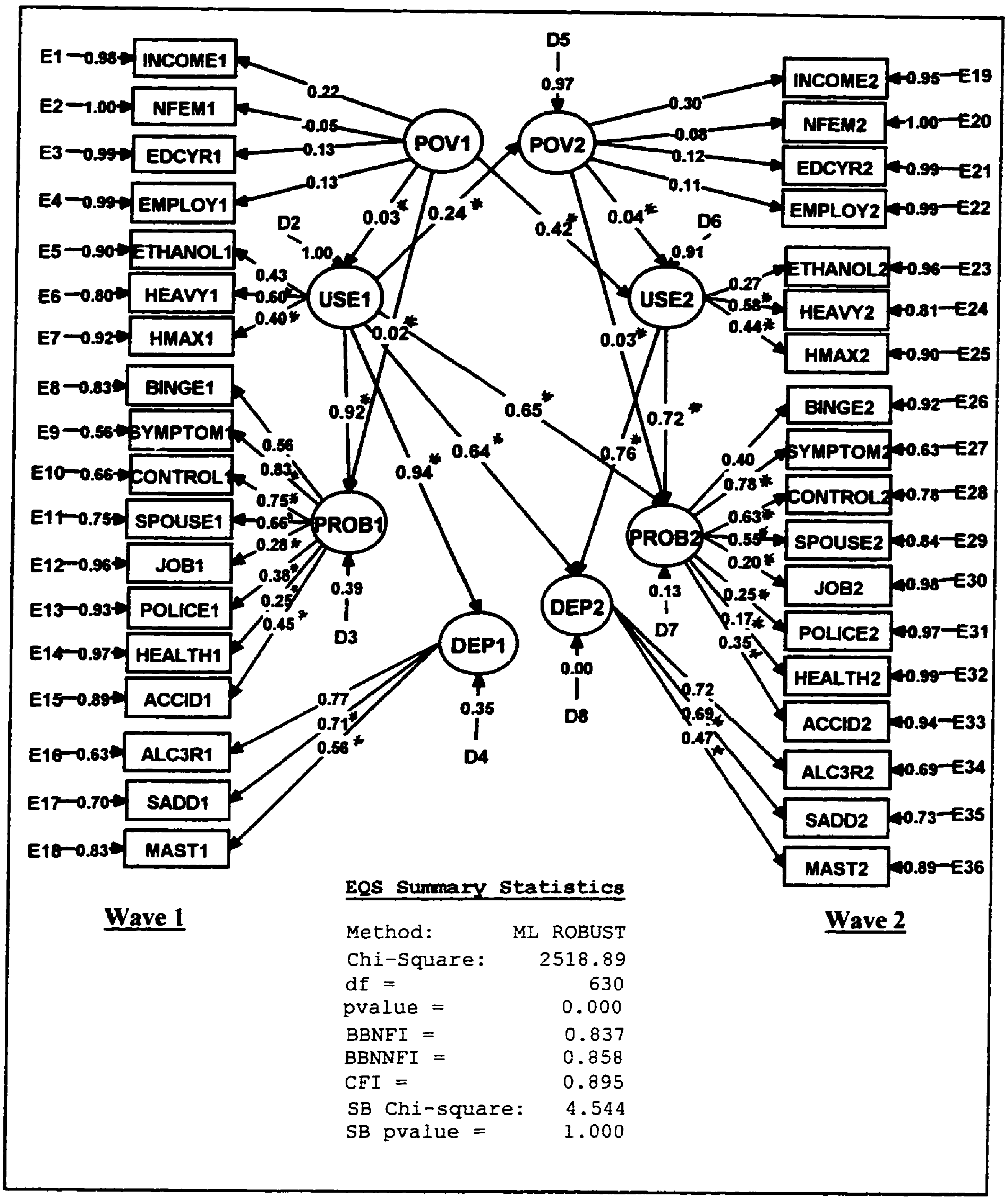


Figure 11. **Longitudinal causal structure (Model 2)**

Table 12

Coefficients and error variances of the longitudinal model

Latent	Path	Coefficient	Error Variance
POV1 (F1)	INCOME1 (V1F1)	1.000	1.682 (25.622)
	NFEM1 (V2F1)	-0.220	1.610 (20.743)
	EDCYR1 (V3F1)	1.240	7.879 (20.390)
	EMPLOY1 (V4F1)	0.940	4.522 (20.408)
USE1 (F2)	ETHANOL1 (V5F2)	1.000	0.435 (20.252)
	HEAVY1 (V6F2)	1.457 (20.664)	0.373 (18.261)
	HMAX1 (V7F2)	0.089 (12.170)	0.004 (20.009)
PROB1 (F3)	BINGE1 (V8F3)	1.000	0.180 (19.824)
	SYMPTOM1 (V9F3)	4.190 (27.724)	0.657 (15.576)
	CONTROL1 (V10F3)	2.622 (24.372)	0.432 (17.771)
	SPOUSE1 (V11F3)	1.174 (21.358)	0.148 (19.056)

Table 12 (*continued*)

Latent	Path	Coefficient	Error Variance
	JOB1 (V12F3)	0.183 (8.851)	0.031 (20.592)
	POLICE1 (V13F3)	0.470 (11.471)	0.110 (20.418)
	HEALTH1 (V14F3)	0.283 (7.128)	0.097 (20.633)
	ACCID1 (V15F3)	0.825 (13.488)	0.219 (20.212)
DEPEND1 (F4)	ALC3R1 (V16F4)	1.000	0.510 (16.349)
	SADD1 (V17F4)	1.793 (23.072)	2.356 (17.968)
	MAST1 (V18F4)	1.804 (18.649)	5.314 (19.688)
POV2 (F5)	INCOME2 (V19F5)	1.000	1.612 (22.615)
	NFEM2 (V20F5)	-0.270	1.697 (20.665)
	EDCYR2 (V21F5)	0.820	7.828 (20.529)
	EMPLOY2 (V22F5)	0.580	4.360 (20.564)

Table 12 (*continued*)

Latent	Path	Coefficient	Error Variance
USE2 (F6)	ETHANOL2 (V23F6)	1.000	0.515 (20.395)
	HEAVY2 (V24F6)	2.137 (14.405)	0.361 (17.483)
	HMAX2 (V25F6)	0.081 (11.523)	0.001 (19.297)
PROB2 (F7)	BINGE2 (V26F7)	1.000	0.104 (20.204)
	SYMPTOM2(V27F7)	7.093 (19.110)	0.672 (15.181)
	CONTROL2(V28F7)	3.543 (15.935)	0.387 (18.563)
	SPOUSE2 (V29F7)	1.551 (14.826)	0.112 (19.358)
	JOB2 (V30F7)	0.329 (5.759)	0.053 (21.805)
	POLICE2 (V31F7)	0.701 (7.022)	0.147 (21.459)
	HEALTH2 (V32F7)	0.327 (4.540)	0.075 (20.691)
	ACCID2 (V33F7)	1.001 (9.577)	0.140 (20.499)

Table 12 (*continued*)

Latent	Path	Coefficient	Error Variance
DEPEND2 (F8)	ALC3R2 (V34F8)	1.000	0.272 (17.157)
	SADD2 (V35F8)	2.125 (19.477)	1.493 (17.677)
	MAST2 (V36F8)	1.744 (14.266)	3.277 (19.887)
Between Latents	POV1 to USE1	0.030	0.101 (13.131)
	POV1 to PROB1	0.020	0.013 (4.967)
	USE1 to PROB1	0.830	
	USE1 to DEPEND1	2.570	0.092 (3.001)
	USE1 to POV2	0.302 (2.898)	0.151 (3.113)
	POV2 to USE2	0.020	0.033 (6.254)
	POV1 to USE2	0.296 (2.116)	
	POV2 to PROB2	0.010	0.000 (0.000)
	USE2 to PROB2	0.510	
	USE1 to PROB2	0.292 (13.241)	
	USE2 to DEPEND2	2.060	0.000 (0.000)
	USE1 to DEPEND2	1.091 (14.745)	

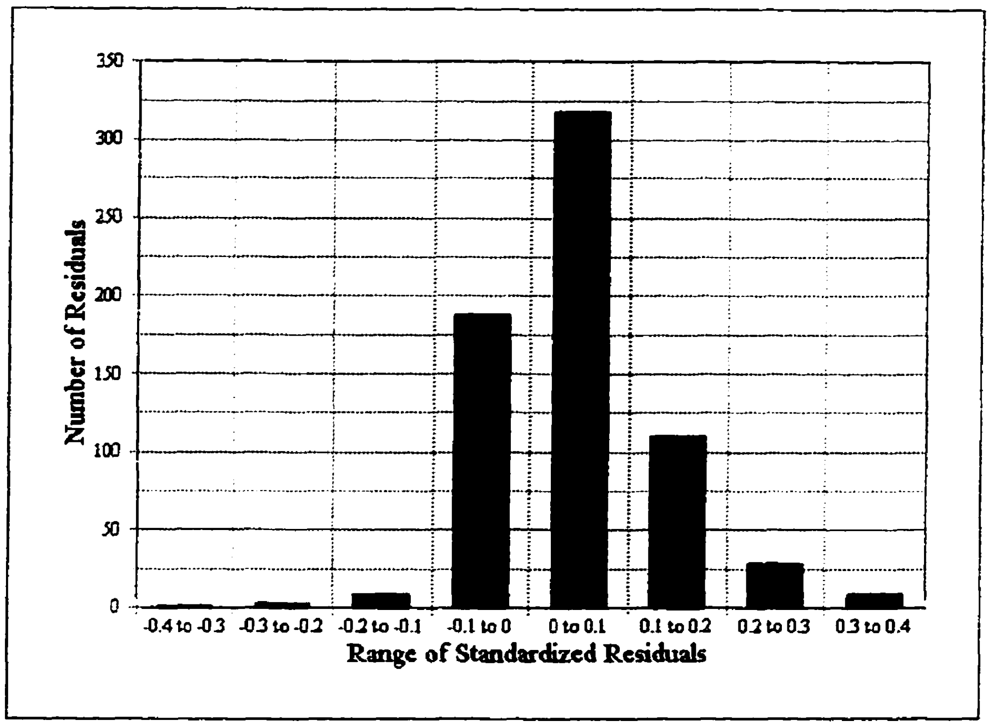


Figure 12. Distribution of standardized residuals of longitudinal model

Direct Effect of Unemployment on Alcohol Use

The direct short and long term (as permitted by the data) effect of unemployment on alcohol use was studied next. Since the measure of unemployment (variable *employ*) is not a latent variable but a measurement one, testing such effects were done following the procedures of *nonstandard* model representation of SEM (Bentler, 1993, p.102). This representation is the same as that of a standard representation except that it allows testing of direct effects of measurement variables on the latents. The computational procedures of these two representations are the same.

The direct effect of unemployment was tested by evaluating a model with an additional path from the variable *employ* to latent *alcohol use* since there was no variable called unemployment. As explained before, the scale of *employ* was expressed in such a way that it signifies the degree of unemployment (which is maximum for the unemployed person) of an individual. Therefore, if a positive coefficient of this direct path is found, it would mean that a higher value of *employ* increases *alcohol use*. A higher value of the variable *employ* means a higher degree of unemployment. Thus, a positive coefficient of the path from *employ* to *alcohol use* would signify that unemployment increases alcohol use. The reverse would be true for a negative coefficient. Only the relevant results of this analysis are presented here. Note that when the direct effect paths were considered in the model, all other paths were also present in the model.

Analysis of the direct effect of unemployment of alcohol use was done in two stages. First, data of each wave were analysed separately to evaluate the coefficient of the short term direct paths from *employ* to *use* (i.e., path from *employ1* to *use1* in Wave 1, and path from *employ2* to *use2* in Wave 2). It was found that relatively short term unemployment causes the subjects to reduce their alcohol use. The path coefficients were found to have negative values that are multivariately significant. This means that a higher value of *employ* (i.e., higher degree of unemployment) would cause a reduction in alcohol use. The coefficient (F2V4) for Wave 1 data was -0.016 (z = 2.201). The corresponding standardized value was -0.112. This coefficient (F6V22) for Wave 2 data was -0.019 (z = -3.175) with a standardized value of -0.140. Note that the path coefficient was freely estimated in both waves of data.

Second, the long-term effect of unemployment on alcohol use was examined by the combined analysis of Wave 1 and Wave 2 data. An additional path from V4 (measurement variable *employ1* of Wave 1) to F6 (latent variable *use2* of Wave 2) was tested for this purpose. The coefficient was found to be 0.010 (z = 1.960). The corresponding standardized estimate of the coefficient is 0.080. Although these coefficients are not as highly significant as the other path coefficients, these nevertheless, suggest that the short term effect of unemployment is to reduce the use of alcohol while the long term effect is to increase it.

A schematic representation of the model showing the direct effects of unemployment on alcohol use is shown in Figure 13. In this figure other measurement variables and errors or disturbances are not shown in order to highlight the direct effects. However, all the other paths including those between *employ1* and *poverty1*, and between *employ2* and *poverty2* that exist in Figure 11 are present in the model of Figure 13 as well. Note that the values of the coefficients of the direct effect paths are the standardized values.

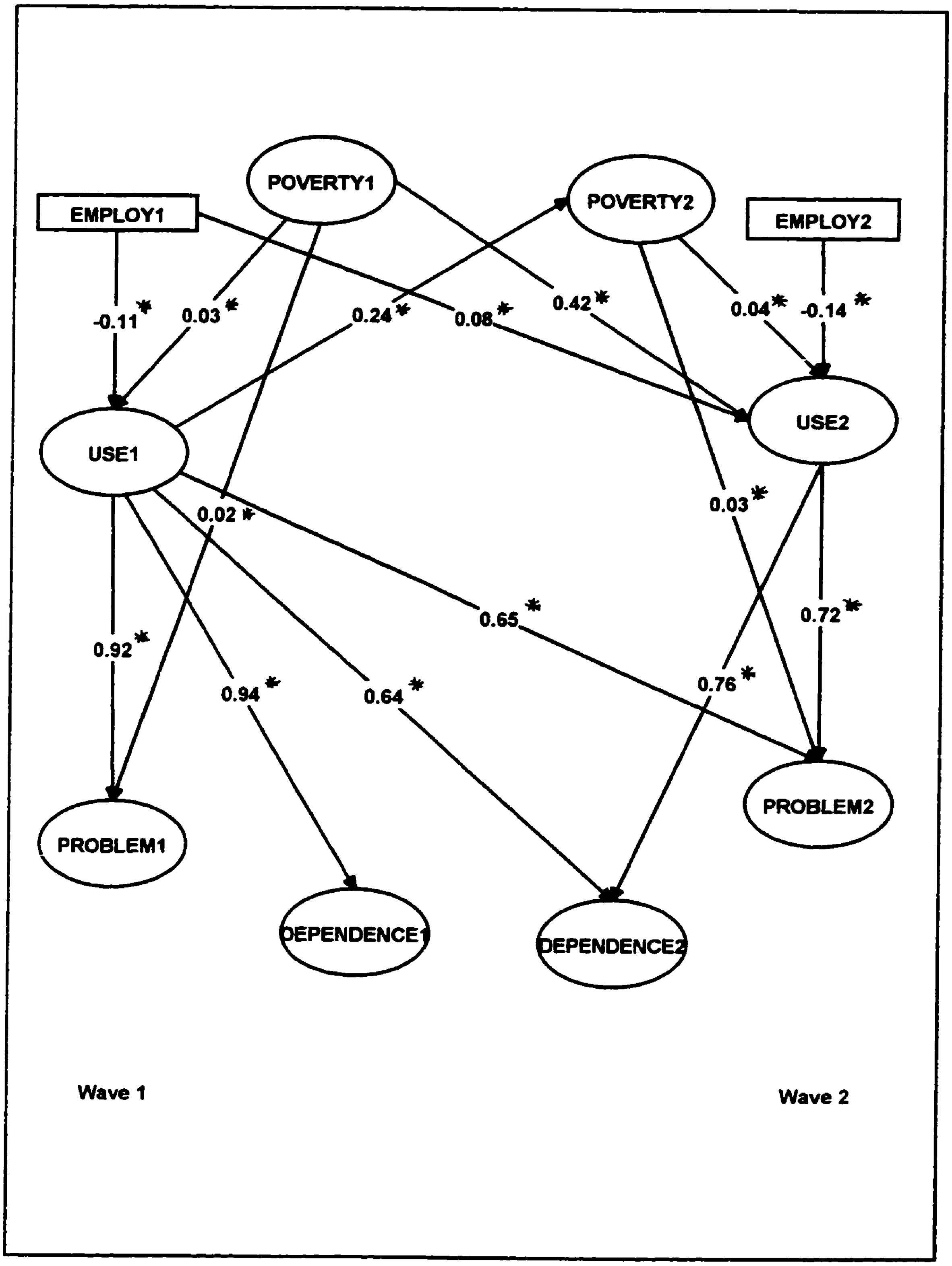


Figure 13. Direct effect of unemployment (Other measument variables and errors are not shown)

Comparison of Models Across Groups

The models developed above are the models corresponding to all observations within the data group (i.e., Wave 1, Wave 2 or combined). The data were further divided into gender groups of Men and Women; and into age groups of Age Group 1 (subjects between 18 and 34 years of age), Age Group 2 (between 35 and 49 years) and Age Group 3 (between 50 and 64 years). The models were statistically tested to note the stability and equality of the parameters. In all of these comparisons, the multi-sample analysis technique of EQS was used.

In order to compare the invariance of a structural model between two (or more) groups of data (e.g., between *men* and *women*), the following steps should be taken:

(a) Establish a *baseline model* for each group of data. The baseline model is the best fitted model for the group. This model may or may not be the same for the groups.

(b) The path coefficients and variances (and covariances) of independent variables (independent F's, all D's and E's) are statistically tested for equality by imposing constraints for equality. For example, the constraint (1, V1, F1) = (2, V1, F1) specified in the /CONSTRAINTS section in the program for the second model would test the equality of path coefficients between V1 and F1 for model 1 and model 2. The first number in the parenthesis of the constraint specification refers to the model number (i.e., 1 and 2). The parameters that can be tested for equality should follow some specifications as given below:

(i) The parameters should be freely estimated in all models. If the parameter is freely estimated in one model but *not* in the other, it cannot be tested for equality.

(ii) The parameter should exist (as non-zero) in all models. If it exists in one model but *not* in the other, it cannot be tested for equality.

(iii) The variances of the dependent variables are not freely estimated, and therefore, cannot be compared for equality.

The constraints that are required to be freed (from LMTEST results) are the ones that are violated. This means that the parameters associated with the freed constraints are not statistically the same across groups.

(c) The parameters for the measurement part of the models are tested first. The parameters of the structural part of the models are tested later. It is to be noted that when models are tested across groups, they are estimated simultaneously. This puts restrictions to the model parameter estimation, and as a result, CFI may be reduced.

(d) Once the parameters are tested for equality, it can be tested whether the *means of the latent quantities* are the same across models. This is done in EQS by testing invariance of the Latent Mean Structure. The relevant theory is described in Bentler (1992). The steps are described briefly in the following.

(i) A special variable (which is a constant), V999 is added to the model as an independent variable. The measurement variables and the latent variables are allowed to be expressed in terms of V999. (In other words, the variables are expressed as a free intercept, which is the mean, and other parts of the equation expressing the relations with other latents). By doing so, all the latent variables become dependent variables whose associated disturbances (the D's) are allowed to correlate to preserve the covariance (if any is present in the model).

(ii) These intercepts are the means associated with the dependent variables, and are tested for equality across models. This is needed because the latent variables are not observed, and therefore, their means cannot be tested for equality by conventional methods.

(iii) To avoid the identification problem, the intercepts corresponding to the latent variables in one model are set to zero (which serves as the reference), while those in other models are allowed to be estimated freely.

(iv) The constraints are imposed as before, and LMTEST is done. The results from the LMTEST will show which intercepts (i.e., which means) are *not* the same across models.

(v) The means of the latent variables are tested by simply examining the intercept terms (which are the means) and their standard errors. EQS prints the *z-statistics* whose value should be more than 1.96 (the tabulated value of z for 5% significance level) to be significantly different from zero. If the value is more than 1.96, the mean is different from the corresponding mean of the other model since the intercept terms of the other model (the *reference*) are all set to zero.

The above procedure was followed to test the invariance of models (including models for the isolated theoretical constructs) for Wave 1, Wave 2 and combined data and across different groups. Regarding the validity of the constructs and the structural stability of the models, it was found that the structures of the models are the same across groups. That is, the respective models of different groups were found to have same directional causality, and same signs for respective path coefficients. This confirms the validity of causal structures as proposed in this study. The magnitude of such coefficients may, however, statistically differ. This was tested by following the above procedure. Details of the results are not included in this report. Only the relevant results (i.e., the coefficients that were found to be different) are reported here to avoid repetition.

Models of Wave 1 and Wave 2 were compared by imposing 18 equality constraints (one for each freely estimated parameter). It was found that path coefficients *use1 to depend1* (F4,F2), *use1 to heavy1* (V6,F2), *use1 to hmax1* (V7,F2) and *prob1 to symptom1* (V9,F3) violated the equality constraints implying that they are statistically different in two waves of data. The variations in the values of these path coefficient are not dramatic. For example, the change is 19% for the path *use1 to depend1* (F4,F2). However, they have the same sign and direction of causality. The first three of these paths have higher coefficients in Wave 1 and the last has a lower coefficient.

Comparison between Models of two Gender Groups

The baseline models for *men* and *women* groups of data (Wave 1, Wave 2 and combined) are the same. Separate comparisons were made between men and women groups of Wave 1, Wave 2 and combined data. Also, separate comparisons were made between men of Wave 1 and men of Wave 2; and between women of Wave 1 and women of Wave 2.

The results obtained from the analysis of the combined data are shown in Table 13. Thirty six equality constraints were imposed in the simultaneous process of parameter estimation. Note that the fixed paths cannot be tested for equality. Only the unequal coefficients (coefficients corresponding to the constraints that were violated) are shown in the table. Inference about the equality of path coefficients between models of men and women of other sets of data (i.e., Wave 1, Wave 2) were similar to those reported in Table 13.

Thirteen equality constraints for the intercepts (means) of measurement variables that are used in models for men and women were tested using the best fitted baseline models. As suggested by the multivariate test results, constraints for (V4,V999) and (V8,V999) were violated. This implies that the *means* of measurement variables of *employ* (employment) and *binge* (problem of binge drinking) are different for men and women.

Inference about the means of the latent constructs can be made by examining the *z*-statistics for the V999 terms in the equations for F's in model 1, the model for *men*. Recall that these coefficients in model 2 (for *women*) were fixed at zero. Inference about the latent means are therefore, relative. All of the *z*-values of the V999 terms in equations of F's for model 1 are greater than 1.96 (significant at 5% level) implying that these means are different from zero. Therefore, all the latent means (of *poverty, use, problem* and *dependence*) are different for the groups *men* and *women*.

Table 13

Unequal coefficients of models for men and women using longitudinal data

Path Coefficient	Comments
USE1 to HEAVY1	Coefficient value higher in men
USE1 to HMAX1	Coefficient value higher in men
PROB1 to CONTROL1	Coefficient value lower in men
PROB1 to JOB1	Coefficient value higher in men
PROB1 to HEALTH1	Coefficient value lower in men
DEPEND1 to SADD1	Coefficient value lower in men
DEPEND1 to MAST1	Coefficient value higher in men
USE2 to HAMX2	Coefficient value higher in men
PROB2 to JOB2	Coefficient value higher in men
PROB2 to POLICE2	Coefficient value higher in men
DEPEND2 to MAST2	Coefficient value higher in men
USE1 to PROB1	Coefficient value higher in men
USE1 to DEPEND1	Coefficient value lower in men
POV2 to USE2	Coefficient value higher in men
USE2 to PROB2	Coefficient value higher in men
USE2 to DEPEND2	Coefficient value higher in men
USE1 to POV2	Coefficient value lower in men

Comparison between Models of Three Age Groups

The model was tested across *three* age groups. This was done for Wave 1, Wave 2 and combined data. Only the results from the analysis of combined data are presented here. It is to be noted that the latent construct *poverty* is not so strongly effective for the subjects in age group 3 (the older age group) compared to other age groups. Poverty appears to be not so strongly related to *employment status*, *education* or the *number of family members*. This may seem reasonable from the fact that this age group consists of mostly retired persons for whom the major source of income is other than employment The family income for this group is relatively higher (e.g., 65% having more than $40,000 and only 5% having less than $10,000 in Wave 1), and fixed. The *number of family members* for this group is relatively fixed (54% having 1 or 2, and only 7% with more than 4). Also, there were only 5 unemployed and 95% either had jobs or were retired. Since the comparison procedure requires simultaneous computation of parameter estimation, two sets of comparisons were made: (a) between age group 1 and 2, and (b) between age group 1, 2, and 3. The results obtained from these two sets of comparisons are similar. The results obtained from simultaneous comparison of the *three* groups are shown in Table 14. There were 65 equality constraints imposed on the simultaneous parameter estimation procedure. Only the constraints that were violated are shown in the table. Since there were three groups to compare, the group numbers corresponding to the violated constraints are also shown in the table. It appears that subjects in these age groups are statistically different in their alcohol abuse related behavior.

Table 14

Unequal coefficients of models of different age groups using longitudinal data

Path Coefficient	Comparison Groups	Comment
USE1 to HEAVY1	1 and 3	Coefficient is lower in Age Group 1
PROB1 to SYMPTOM1	1 and 2	Coefficient is lower in Age Group 1
PROB1 to SYMPTOM1	1 and 3	Coefficient is higher in Age Group 1
PROB1 to CONTROL1	1 and 2	Coefficient is lower in Age Group 1
PROB1 to SPOUSE1	1 and 3	Coefficient is lower in Age Group 1
PROB1 to JOB1	1 and 2	Coefficient is lower in Age Group 1
PROB1 to JOB1	1 and 3	Coefficient is lower in Age Group 1
PROB1 to POLICE1	1 and 3	Coefficient is higher in Age Group 1
PROB1 to ACCID1	1 and 2	Coefficient is higher in Age Group 1
PROB1 to ACCID1	1 and 3	Coefficient is higher in Age Group 1
DEPEND1 to SADD1	1 and 2	Coefficient is higher in Age Group 1
DEPEND1 to SADD1	1 and 3	Coefficient is higher in Age Group 1
DEPEND1 to MAST1	1 and 3	Coefficient is lower in Age Group 1
USE2 to HEAVY2	1 and 3	Coefficient is lower in Age Group 1
PROB2 to SYMPTOM2	1 and 2	Coefficient is higher in Age Group 1
PROB2 to SYMPTOM2	1 and 3	Coefficient is higher in Age Group 1
PROB2 to SPOUSE2	1 and 2	Coefficient is lower in Age Group 1
PROB2 to ACCID2	1 and 2	Coefficient is higher in Age Group 1
PROB2 to ACCID2	1 and 3	Coefficient is higher in Age Group 1

Table 14 (*continued*)

Path Coefficient	Comparison Groups	Comment
DEPEND2 to SADD2	1 and 2	Coefficient is higher in Age Group 1
DEPEND2 to SADD2	1 and 3	Coefficient is higher in Age Group 1
DEPEND2 to MAST2	1 and 3	Coefficient is lower in Age Group 1
POV2 to USE2	1 and 2	Coefficient is higher in Age Group 1
USE2 to DEPEND2	1 and 2	Coefficient is lower in Age Group 1
USE1 to PROB2	1 and 2	Coefficient is lower in Age Group 1

Effect Decomposition

The parameters of all the models presented earlier are the *causal* parameters, values of which show the direct causal effect of one variable to the other. These are used to explain causal relationships between variables. Results presented earlier in Tables and Figures, all show the direct effect of variables. The *indirect* and the *total* effects of variables on other variables can also be shown. These may help interpreting the model further (e.g., to see if there is any reducing or increasing indirect effect of a certain variable on the variable of interest).

A *direct effect* of one variable on another is the value of the path coefficient connecting these two. If there is no connecting path, there is no direct effect. There will be an *indirect effect* of one variable (say *A*) to another variable (say *B*), if it is possible to arrive at *B* starting from *A* without following the direct path between *A* and *B* in the path diagram. This indirect effect is in addition to the direct effect. The measure of an indirect effect is given by the product of the indirect paths between the variables. If there are many sequences by which a variable can influence another, the total *indirect* effect indicates the size of the effect. It indicates how one variable influences another irrespective of the paths chosen to trace from one variable to the other. Indirect effects are sample statistics and their variability can be tested by their *z*-statistics to see whether they are significantly different from zero. A *total effect* is the summation of the direct and the indirect effects. Depending on the signs of the direct and the indirect effects, the total effect can be larger or smaller than the direct effect.

The effect decomposition is obtainable from EQS by adding the option *effect = yes;* in the /PRINT statement (or checking the option for effect decomposition in print specification). This option prints out all the total and indirect effects of all variables including the error terms. Obviously, for a model with 36 measurement variables, 8 latents, 36 errors, and 8 disturbances (as in the longitudinal model of the present study), the printed output is extensive. In the following, the effect decomposition of only the latents and the variable *employ* is provided because of their relative importance in relation to this study.

The effects provided in the effect decomposition are in the natural units of the input variables implicit in the equations. Sometimes it is difficult to interpret the size of these effects due to the difference in scales (units). EQS also provides standardized values of these effects. Such standardized direct, indirect and total effects for Wave 1 and Wave 2 data are given in Table 15 and Table 16 respectively. Some of the direct effect coefficients

Table 15

Effect Decomposition of Latent Variables of Wave 1

Effect on	Effect of	Direct	Indirect	Total Effect
F2 (*use1*)	F1 (*poverty1*)	0.190	-0.048	0.142
	V4 (*employ1*)	-0.112		-0.112
F3 (*problem1*)	F1 (*poverty1*)	0.058	0.117	0.175
	F2 (*use1*)	0.823		0.823
	V4 (*employ1*)		-0.092	-0.092
F4 (*depend1*)	F1 (*poverty1*)		0.139	0.139
	F2 (*use1*)	0.976		0.976
	V4 (*employ1*)		-0.110	-0.110

Table 16

Effect Decomposition of Latent Variables of Wave 2

Effect on	Effect of	Direct	Indirect	Total Effect
F6 (*use2*)	F5 (*poverty2*)	0.154	-0.050	0.104
	V22 (*employ2*)	-0.136		-0.136
F7 (*problem2*)	F5 (*poverty2*)	0.057	0.103	0.160
	F6 (*use2*)	0.993		0.993
	V22 (*employ2*)		-0.135	-0.135
F8 (*depend2*)	F5 (*poverty2*)		0.104	0.104
	F6 (*use2*)	1.000		1.000
	V22 (*employ2*)		-0.136	-0.136

of these tables are slightly different from those provided in Figures 7 and 9. This is because the values in the figures are without considering variable *employ*, and partly because of rounding. The variable names are given in parentheses. Note that the effect of unemployment is included in all of these tables.

The effect decomposition for the longitudinal model is given in Table 17. The variable names are given in parentheses. Also, in this table there are some direct effect values which are slightly different from those given in Figure 11 and Table 14. The reason for this difference is because the values in Figure 11 and Table 12 are without considering the variable *employ*. Also, values in Figure 11 are rounded off to two decimal places.

The effect decomposition presented in Tables 15, 16 and 17 shows that for all of the variables the total effect is greater than the direct effects except for the effect of poverty on alcohol use. One possible reason for the total effect of poverty on alcohol use to be less than the direct effect is due to fact that the direct effect of variable *employ* is considered separately. Note that *employ* is a measurement variable of the latent *poverty*.

It should also be mentioned that all of the indirect effects are univariately significant except for the indirect effect of *use1* on *depend2*. A procedure for testing multivariate significance is not available with EQS and hence, was not done in this study.

Model with additional employment variable

Some additional variables regarding occurrence of unemployment and onset of financial problems encountered by the subjects during the two-year period since the Wave

Table 17

Effect decomposition of latent variables of longitudinal model

Effect on	Effect of	Direct	Indirect	Total Effect
F2 (*use1*)	F1 (*poverty1*)	0.047	-0.020	0.027
	V4 (*employ1*)	-0.107		-0.107
F3 (*problem1*)	F1 (*poverty1*)	0.035	0.022	0.057
	F2 (*use1*)	0.919		0.919
	V4 (*employ1*)		-0.098	-0.098
F4 (*depend1*)	F1 (*poverty1*)		0.022	0.022
	F2 (*use1*)	0.920		0.920
	V4 (*employ1*)		-0.100	-0.100
F5 (*poverty2*)	F2(*use1*)	0.240		0.240
F6 (*use2*)	F1 (*poverty1*)	0.205	0.017	0.221
	F5 (*poverty2*)	0.046	-0.025	0.021
	V4 (*employ1*)	0.075		0.075
	V22 (*employ2*)	-0.193		-0.193
F7 (*problem2*)	F1 (*poverty1*)		0.177	0.177
	F2 (*use1*)	0.653	0.010	0.663
	F5 (*poverty2*)	0.033	0.015	0.048
	F6 (*use2*)	0.727		0.727
	V4 (*employ1*)		-0.017	-0.017
	V22 (*employ2*)		-0.141	-0.141
F8 (*depend2*)	F1 (*poverty1*)		0.185	0.185
	F2 (*use1*)	0.629	0.003	0.632
	F5 (*poverty2*)		0.016	0.016
	F6 (*use2*)	0.769		0.769
	V4 (*employ1*)		-0.010	-0.010
	V22 (*employ2*)		-0.149	-0.149

1 data were recorded are available. This additional information was processed to calculate new variables of *outjob* (length of unemployed status), *finprob* (number of financial problem) and *finprt* (duration of financial problem). The duration of employment status and the duration of financial problems were calculated from indirect questions asked during Wave 2 data collection. The subjects were requested to state whether they had lost their jobs or had financial problems during the last two years. In case of a positive response, they were asked to state how long ago that happened. If the subject was still unemployed during Wave 2 data collection, *outjob* (or *finprt*) was taken as the time between the job loss and data collection. Otherwise, *outjob* (or *finprt*) was taken as half the time between job loss and data collection.

These new variables were taken to represent a latent called *financial*. This latent represents financial problems that are different from those expressed by latent *poverty*. Note that poverty may not always represent a state of having severe financial difficulty. The latent *financial* was hypothesized to have a causal relation to *alcohol abuse* of the subjects. It was found that the latent *financial* increases alcohol use in Wave 2. The path coefficients between this latent and its component measurement variables were all statistically significant. The causal path between *financial* and *use* in Wave 2 was found to be positive and statistically significant. More research is needed in order to justify any concluding remarks about these variables.

Summary of Results of Hypothesis Testing

The results presented above are summarized in relation to the hypotheses of this study in Table 18. The path coefficients corresponding to the hypothesis, and the table numbers where the values of these coefficients are listed, are given in this table as well. For the hypotheses on cross-sectional data, there are two paths (one for Wave 1 and one for Wave 2) corresponding to the hypothesis. The path name for Wave 2 in these cases are provided in parentheses. Note that the tables in which the values of the path coefficients corresponding to these hypotheses (cross-sectional) are presented, do not contain the path names for Wave 2. Instead, the values of path coefficients for Wave 2 are listed under the heading *Wave 2.*

The discussion on the results of hypothesis testing and other relevant issues are presented in the next chapter.

Table 18

Results of Hypothesis Testing

Hypothesis	Path	Table	Significance
1. There is a positive causal effect of poverty on alcohol use	F2F1	11	Supported
	(F6F5)	11	Supported
2. There is a positive causal effect of poverty on alcohol problems	F3F1	11	Supported
	(F7F5)	11	Supported
3. Alcohol dependence causes poverty	F1F4		Not supported
	(F5F8)		Not Supported

Table 18 (continued)

Hypothesis	Path	Table	Significance
4. Alcohol use causes alcohol problems to increase	F3F2 (F7F6)	11 11	Supported Supported
5. Alcohol use causes increased alcohol dependence	F4F2 (F8F6)	11 11	Supported Supported
6. Recent unemployment causes increased alcohol use	F2V4 (F6V22)	17 17	Not supported Not Supported
7. Longer unemployment causes decreased alcohol use	F6V4	17	Not supported
8. (a) Prolonged poverty increases alcohol use (b) Prolonged poverty increases alcohol problems	F6F1 F7F1	12	Supported Supported (indirect)
9. (a) Alcohol use in Wave 1 will increase poverty in Wave 2 (b) Alcohol dependence in Wave 1 will increase poverty in Wave2	F5F2 F5F4	12	Supported Not supported
10. (a) Alcohol use in Wave 1 will increase alcohol problems in Wave 2 (b) Alcohol use in Wave 1 will increase alcohol dependence in Wave 2	F7F2 F8F2	12 12	Supported Supported
11. (a) There is a difference in alcohol use, alcohol problems and alcohol dependence between men and women (b) Alcohol use, alcohol dependence and alcohol problems are more prevalent in men	Various Various	13 13	Supported Supported
12. Alcohol use, alcohol problems and alcohol dependence are more prevalent in younger age group	Various	14	Supported

DISCUSSION

The causal relationship between indicators of poverty and alcohol abuse was the central focus of this study. The hypothesized relationships were based on the available correlational investigations conducted by different authors in different socio-political settings. Unlike most of the previous studies, this study adopted an exception in defining alcohol abuse as a three-factor latent namely, alcohol use, problems and dependence. Defining alcohol abuse in this way made it possible (a) to present a comprehensive description of all aspects of the phenomenon, and (b) to consider simultaneously the component aspects to represent the phenomenon in its entirety. The approach of analysis that was adopted was the Bentler-Week structural equation modelling representation of both the observed and the latent variables. This way, it was possible to investigate any causal relationship (between variables) that are free of any measurement errors irrespective of their origin. At the same time, it was possible to investigate any existing direct and indirect effect of the causal variables on these three factors of alcohol abuse.

The performance of the structural model of alcohol abuse developed in the previous section was evaluated in terms of the relations hypothesized from the theoretical considerations. This section presents a discussion on such performances and provides explanations of agreement (or deviation) between the observed and the hypothesized directions of causality. First, the assumptions relating to the structural constructs are discussed. Sources of error and suggestions towards improvement of measurement of the indicator variables are also included. Second, a discussion of the results obtained from the causal structural model is presented. Hypotheses about cross-sectional data, longitudinal data and demographic variables are presented separately. Discussion of the hypotheses that were found to be in agreement with the observed model and those that were in disagreement with the model are presented together. Agents responsible for any observed deviations are discussed (if identified) as well. Third, a brief discussion of other issues that may affect the general performance of the models under study is presented followed by the identified limitations of the present study. Fourth, the concluding remarks arising from the analysis are presented. Finally, recommendations are provided for further research.

Latent Constructs

The previous section on the results obtained from this study confirmed that the assumptions underlying the indicator variables which describe the latent constructs of poverty (or the lack of resources) and alcohol abuse are both adequate and representative. It was established that there are sufficient reasons, as revealed by the data of this study, to believe that aspects of poverty can be well represented by the four variables i.e., income, number of family members, education and employment. There may be additional variables that weakly represent poverty and are not included in this study. For example, a person trained in physical sciences may perform differently (in terms of income or stress coping strategies) than one with social sciences even though they have the same number of schooling years (education). However, the major component variables are considered in the model presented here, and the effect of the minor indicators are assumed to be represented as errors (or disturbances) in the model.

It was not unreasonable to assume that poverty is represented by a lack in education and a lack in employment. Data analysed in this study supports this assumption. Both of these variables have a high positive path coefficient with poverty. These two variables represent an additional aspect of the lack of economic resources. This additional aspect signifies a part of psychological resources available to an individual in coping with stress. It is the general consensus arrived from this study that a higher deficit in these two areas leads to a higher level of alcohol abuse. A higher deficit in family income, when considered with the number of family members, has the same increasing effect on an individual's level of alcohol abuse.

On the other hand, the construct of alcohol abuse was measured by variables that represented three factors of the construct. These were alcohol use, problems and dependence. As discussed before, consumption, which describes only a part of the phenomenon under study, cannot adequately describe alcohol abuse when considered alone. A complete representation of alcohol abuse requires inclusion of variables in addition to that of alcohol consumption. With this goal, it was proposed that alcohol abuse is a three factor construct and, collectively these factors represent the physical, social and personal aspects of alcohol abuse.

The measurement variables of each of these three factors are all positively related to the factors. This signifies that the factors are well represented by their measurement variables. Also, it was found that these three factors of alcohol abuse are highly positively correlated. The results presented in the previous section support the proposition that alcohol abuse is a three factor construct, and that the construct is well represented when these factors are considered together.

It may be mentioned that the factor *problem* could further be divided into two factors: (a) physical problems (*binge*, *symptom*, *control* and *health*), and (b) social problems (*spouse*, *job*, *police* and *accident*). This would be equivalent to saying that the construct of alcohol abuse consists of four factors (instead of three as used in this study), the additional one being the result of dividing the factor of *problem*. Analysis of the data in the present study revealed that representing the model with alcohol abuse expressed as a four factor construct does not appreciably improve the model. Instead, it further complicates the model resulting in a non-significant improvement in χ^2 value. Therefore, it was concluded that for the data considered in this study, the construct of alcohol abuse is best represented by three factors, and there is no need for further division of the measurement variables of the factor *problem*. However, it may be worthwhile to investigate this further in future research.

Hypothesis Evaluation

Hypotheses proposed in this study can be classified into three groups. These are (a) hypotheses on cross-sectional data, (b) hypotheses on longitudinal data, and (c) hypotheses on demographic variables. Separate discussions on these three groups of hypotheses are presented in the following.

Hypotheses on Cross-sectional Data

Two separate causal structural models showing causal links between latents were considered in order to evaluate the hypotheses on cross-sectional data. These were the structural model of Wave 1 and Wave 2 respectively. It was argued that if any causal path supporting a hypothesis (cross-sectional) is significant, it will be significant for models of both waves of data. Also, if a path is insignificant, it will be true for both waves as well. There may, however, be a statistical difference present between the respective path coefficients of the two models (e.g., the path coefficient in one model may be statistically lower than the same coefficient in the other). Presence of such a statistical difference does not invalidate the test of the hypothesis represented by the path as long as the coefficients are (both univariately and multivariately) significant. Rather it emphasizes the statistical nature of the model considered. In this study, tests were conducted to investigate temporal invariance of path coefficients by comparing the respective values of Wave 1 and Wave 2 simultaneously.

There were six hypotheses (Hypothesis 1 to 6) in this group. Hypothesis 6 was different from the other five in nature. This hypothesis dealt with the direct effect of a measurement variable (*employ*) on the latents. In this study, evaluation of the hypotheses dealing with the direct effect of a measurement variable on the latents was done by estimating the appropriate parameters of a separate model in which these effects, in addition to the other proposed effects, were considered. Results obtained from such analysis are also discussed below.

The *first* hypothesis on cross-sectional data (Hypothesis 1) proposed in this study was that there is a positive causal effect of poverty on alcohol use. This is equivalent to saying that an increased level of poverty will cause an increased level of alcohol use. This hypothesis was confirmed by significant path coefficients for models of both Wave 1 and Wave 2 (see values of F2F1 in Table 11 for the values of coefficients and Figure 7 and 9 for standardized values). The corresponding path coefficient for model of Wave 1 and that of Wave 2 were found to be statistically the same. The direct and the indirect effects of poverty on alcohol use were significant but opposing in nature. The indirect effect was negative for both waves. No explanation for this behaviour was apparent. Perhaps it is a reflection of the moderating effects of other variables (e.g., reduction of affordability due to economic constraint).

The significant and invariant character of the path coefficient representing hypothesis *one* confirmed the theoretical basis upon which the hypothesis was constructed. Poverty (or lack of resources) causes psychological stress in an individual and, on an aggregate level, it is likely that there will be an increase in the level of alcohol use to cope with this added stress. Both interpersonal and intra-personal conflicts may be working together for people in poverty which led them to increase their drinking. People living in poverty conditions (either by losing their job, having low education or being unfortunate to be in such condition) develop low self esteem, become restless and feel depressed from being alienated from healthy living and a healthy environment. Thus, both of these external (being poor) and internal cues (low self esteem) may have elicited physiological reactions opposite to those engendered by alcohol and thus, may have increased drinking.

There is evidence to suggest that individuals with lower socio-economic status are associated with greater exposure to stressful life events than those with higher socio-economic status (Dohrenwend, 1973). It has been found that the former group experiences more physical stress and are also less able to cope with that stress (Pearlin & Schooler, 1978), and further they have less access to social support (Liem & Liem, 1978). More exposure to stress results in more extreme total distress for these poor people. The absence of personal and social supports within the poor may be one of the reasons why individuals in poverty are more vulnerable to alcohol use.

Depending on the availability of other coping resources (e.g., education), this behaviour may be different on an individual level. However, moderating effects of any other variable may not act in a way that shows any visible significance of such effects in the cross-sectional data. For example, it may take longer for a person to consider the affordability perspective compared to the perspective of coping with psychological stress in reacting to a sudden drop in income (e.g., being unemployed) by changing his/her level of drinking induced by such a drop. Any such difference (if any) would more likely be revealed in the longitudinal characteristics of the paths.

The *second* hypothesis in this category (Hypothesis 2) stated that there exists a positive causal relationship between poverty and alcohol problems. An increased level of poverty will cause an increase in observed problems related to alcohol use. This hypothesis was confirmed by significant (both univariate and multivariate) positive path coefficients (F3F1) for models of Wave 1 and Wave 2 data (see Table 11 for the coefficients and Figures 7 and 9 for the standardized values). Note that the total causal effect of poverty on alcohol problems is the sum of the direct effect of poverty on alcohol problems and the indirect effect of poverty through alcohol use. The direct, indirect and total effects were all positive and significant for both waves of data (see Table 15 and 16 in the result section for the values). The corresponding path coefficients for Wave 1 and Wave 2 data were found to be statistically the same (i.e., temporally invariant).

The indirect causal effect of poverty on alcohol related problems is self explanatory. As the poverty level increases so does the level of alcohol use. Since there is a positive relation between alcohol use and problems, an increase in poverty level will cause an increase in the alcohol related problems, the effect being transferred through alcohol use. There is evidence of the existence of a direct causal effect of poverty on alcohol related problems. This direct effect is initiated by the environment an individual is exposed to because of an increased level of poverty. More alcohol related problems are likely to occur within individuals having higher levels of poverty (or lack of coping resources). Poorer persons are prone to increased health problems due to drinking because of the lack of proper nutrition and/or living conditions. The quality of life experienced by people living in poverty is worsened even more due to the effects of residential segregation and discrimination from those more affluent. These factors affect the baseline health status and sometimes, the access to health care and may cause other health problems. Alcohol consumption in segregated, poorer neighbourhoods is more visible and more likely leads to police contacts. People living in these areas are more likely to be arrested for drinking and driving because they socialize and live in dense, urban, accident prone neighbourhoods that are often heavily monitored by law enforcement officers (Herd, 1994). Also, a poorer person may be more likely to experience more problems at work due to drinking compared to others, even at the same level of drinking. This may be caused by an increased level of dissatisfaction with the nature and the pay structure of the job, and the associated psychological stresses induced in the person. Similar arguments can be put forward to explain an increased level of other alcohol related problems in poorer persons. The lack of resources available to such persons that would have either (a) prevented them from causing such problems or (b) assisted them in dealing with the problems once they occur, contribute to increased level of problems. The present study supports these arguments by accepting the hypothesis. This was supported by other studies (e.g., Mustonen et. al., 1994) that found accidents and drunk driving to be common among men who are poor or are unemployed.

The *third* hypothesis on cross-sectional data (Hypothesis 3) deals with the causal effect of alcohol dependence on poverty. It was proposed that alcohol dependence will cause poverty with a positive effect. This hypothesis was not supported by the data of this study. The path coefficient (F1F4) was not statistically significant (univariate as well as multivariate) in models of both waves of data. These paths are not shown in the diagrams presented in Figures 7 and 9.

The assumptions made in formulating this hypothesis were based on the observations mentioned in the literature. As an individual becomes more dependent on alcohol, it is likely that he/she would have more problems at work (possibly losing a job) resulting in a decrease in income. Also, if such an individual loses employment, it is more difficult for the individual to (a) find another job because of the troubled history in the previous job and his/her lack of motivation to find a new one, and (b) to stay in the new job (if found) because of the same problems that caused job loss in the first place. This would translate to the individual as causes of reduced earning and hence, of increased poverty. Therefore, it is likely that there is a positive causal effect of alcohol dependence on poverty. Such a result was found by Welte & Barnes (1992). Those who have a prior history of alcohol abuse are more vulnerable to relapse, and because they have more troubled work histories are more likely to precipitate their own job loss. Therefore, an interaction is suggested in which the unemployment and current alcohol disorder association would be greater for those with a lifetime diagnosis than for those without. The risk for being unemployed and being poor is greater among those who are life time diagnosed. This was found by Dooley et al. (1992) where a higher risk of unemployment was present among those who were life time diagnosed (44%) compared to those who were never diagnosed before (2.2%).

Failure to confirm the third hypothesis for the cross-sectional data (Wave 1 and Wave 2) is, however, not surprising. The reason why such a positive causal relation was not found in this study is, perhaps, time. It may require some time to translate the effects of dependence on alcohol into job loss through problems at work and absenteeism. Most employers would not take prompt action against an employee who tends to behave in the above mentioned way in the work place. Usually, the employer would grant some time to the employee to correct his/her behaviour before he/she is fired. Some employers even offer counselling and other assistance programs for such employees. Therefore, it is likely that in a cross-sectional data, the positive causal effect of alcohol dependence on poverty will not be evident since such data may not allow sufficient time for the relationship to take into effect. However, the direct effect (if any) would more likely be evident in longitudinal data.

There is an indirect causal effect of poverty on alcohol dependence which is positive in nature (see Table 15 and 16 in the result section of this report for the values of the indirect effect). This effect of poverty resulted through alcohol use. The observed effect, however, opposes the hypothesis.

The *fourth* hypothesis (Hypothesis 4) proposed in this study was that alcohol use causes alcohol problems in a positive fashion, i.e., increased alcohol use causes an increase in level of alcohol related problems in the population. The data confirmed this hypothesis by the highly significant path coefficients between alcohol use and alcohol problems (F3F2) for models of both waves of data (see Table 11 for the coefficient values, and Figures 7 and 9 for the standardized values). When compared simultaneously, this coefficient was found to be statistically the same for models of wave 1 and wave 2 data. There was no indirect effect of alcohol use on alcohol problem.

The problems related to alcohol use reflect one aspect of the construct of alcohol abuse. Evidently the level of these problems will depend on the level of quantity and pattern of alcohol use by the individual. For example, involvement in accidents related to drinking is directly dependent on the amount of alcohol intake by the individual prior to such accidents. Problems at work will similarly be dependent on the pattern and amount of drinking of the individual. Other problems related to alcohol use that are used in this study would all have similar dependency on alcohol use. The results of analysis of WHDS data reinforces the background arguments on which hypothesis *three* was based. Alcohol use (amount of ethanol, heavy drinking and maximum consumption in one sitting) in the present study were found to be important in predicting drinking problems. This finding is consistent with the findings of Hilton (1988b); Single & Wortley (1992); and Welte & Barnes (1992). For instance, in earlier studies it was found that while amount of drinking (expressed by volume measures) was important, it was also the pattern of drinking (large quantities per occasion versus more frequent light drinking) that was one of the key determinants of drinking problems.

The *fifth* hypothesis on cross-sectional data (Hypothesis 5) proposed that there is a positive causal effect of alcohol use on alcohol dependence. This hypothesis was confirmed in this study. This is evident by the highly significant estimated values of the parameter (F4F2) for both waves of data (see Table 11 for the values, and Figures 7 and 9 for standardized values). However, when compared simultaneously, this path coefficient was found to be statistically different for models of Wave 1 and Wave 2 data. The coefficient is lower in model for Wave 2 data. There was no indirect effect of alcohol use on alcohol dependence.

Alcohol dependence in an individual is initiated and enhanced by the use of alcohol. The regular, prolonged and unchecked consumption of alcohol will risk causing dependency in some individuals. An individual develops a dependency in his/her physical system by such use of alcohol. This is because alcohol is addictive in nature. Results presented in this report support these arguments and are consistent with previous studies where physical dependence on alcohol due to heavy drinking was found.

Any possible reason for having a lower path coefficient between alcohol use and dependence in Wave 2 compared to that of Wave 1 was not apparent from the available information. Perhaps, the difference is due to the random fluctuation usually observed in statistical data. However, the point has to be stressed at this juncture that having a different coefficient in models of two waves does not imply rejection of the hypothesis. This is because the estimated value of this parameter in both waves is highly significant (both univariately and multivariately).

The *sixth and the last* hypothesis in this group proposed that recent unemployment will increase alcohol use in Wave 2. This is equivalent to saying that there will be a positive causal effect of variable *employ2* on the latent *use2*. Note that the scale of employment status was reversed to create the variable *employ2* thereby denoting the degree of *un*employment. A higher value of the variable thus, means a higher level of unemployment (the highest value refers to a person who lost his/her job). Therefore, a positive causal path between *employ2* and *use2* would mean an increase in alcohol use with unemployment.

This hypothesis was not supported by the data of this study. Although the hypothesis was proposed for Wave 2 data only, separate models for Wave 1 and Wave 2 showing this direct effect were tested. It was found that the corresponding path coefficients between unemployment and alcohol use were *negative* for both waves of data. The negative path coefficient (F2V4) was significant for both waves of data (see Table 15 and 16 for the estimates of the direct effect of unemployment in the result section of this report). When compared simultaneously, the coefficient was found to be statistically the same for both Wave 1 and Wave 2 data. Thus, analysis of the cross-sectional data of this study concluded that recent unemployment causes a *reduction* in alcohol use in the general population. Note that there was no indirect effect present.

The background arguments on which the hypothesis was based, all concentrated on the idea that it is likely for an individual to start drinking more, immediately after being unemployed, to cope with the added psychological stress. Also, such an individual would not take into account the financial constraint imposed on him/her by the event of job loss. It will take a while for the unemployed individual to duly consider the economic realities thereby reducing alcohol use. Such a realization will only take place once the benefits from employment insurance and other sources or personal savings are exhausted. Until then an unemployed individual would keep on drinking more.

The reasons why such arguments in favour of an increased alcohol use with recent unemployment may not be true for a cross-section of population lie in a number of other factors influencing the relationship. *First*, the strategy adopted by an individual to cope with the added psychological stress may possibly be something other than drinking. This includes spending more time looking for a job. The event of job loss is increasingly becoming a common occurrence in present day society which, in turn, is increasing in an individual the awareness of such an event occurring in his/her own life. This increased awareness prepares an individual to certain extent to deal with the stress due to job loss. It is likely that such an individual will spent most of his/her available time in search of a new job instead of spending the time drinking heavily. *Second*, a recently unemployed person may be more likely to spend the extra time taking care of things for the family for which he/she could not afford time prior to job loss. This is true especially for individuals with family and young children. Also, the individual may engage in community and social activities. *Third*, being aware of the fact that the benefit payments will soon run out, an unemployed person is more likely to look for an alternate steady source of earning before that happens. He/she is more likely to reduce expenditures that can be viewed as redundant in relation to those for basic necessities. It is likely that a sizeable portion of the recently unemployed individuals will categorise expenses for drinking as redundant spending and therefore, will reduce alcohol consumption. Again, this will be true for individuals with family and young children. *Fourth*, it is likely that recently unemployed individuals, on the average, will try to regain his/her position and status with the family, friends and community by finding a job as soon as possible. Furthermore, such individuals will be very reluctant to fall back on any kind of social assistance program. *Fifth*, the antecedent drinking habit of an unemployed person will have a strong role in determining whether he/she will resort to drinking to cope with job loss. For example, an occasional drinker may stop drinking all together to reduce spending after being unemployed. On the other hand, a heavy drinker may start drinking more under the same circumstances. Also, other coping resources (e.g., education, religious beliefs, social and ethnic background, counselling etc.) may moderate the level of drinking for an individual. *Finally*, individual differences in coping mechanisms have an influence on drinking. There are often some close friends and relatives who help the unemployed to cope with their stress immediately after job loss. In such cases individuals who rely on other people in time of stress would not increase their drinking until there is a lack of support. The social support from friends and relatives, who expect the individual to deal with his/her own problems, may decline in course of time. Thus, individuals suffering from longer period of unemployment may increase their alcohol consumption in absence of such social support. Self-reliant people will not start drinking immediately after being unemployed because they will first try to use their own resources to deal with the stress of unemployment. When such resources decrease towards the end they might start drinking as period of unemployment lingers.

All of the above factors work against the proposed hypothesis. It is possible that the combined effect of these factors may produce a situation under which the recent unemployment may reduce alcohol use for a cross-section of population. The situation may, however, be reversed for the prolonged unemployed. Once the job searching phase is over (i.e., the person realizes that he/she is not going to get a job very soon no matter how hard he/she looks for it), an individual may decide to quit looking for a job, losing self-esteem and control over the situation. The individual is likely to be frustrated enough to subject him/herself to increased psychological stress and start drinking more. How long it would take for the individual to come to this state will again depend on physical, social and psychological resources available to the individual. This effect of increase in alcohol use with prolonged unemployment (if any) may be evident when the longer term effect of unemployment is looked into.

Hypotheses on Longitudinal Data

Four main hypotheses (Hypothesis 7 to 10) were proposed in this study that required the use of longitudinal characteristics of the data. Hypothesis 7 dealt with the direct effect of employment (a measurement variable) on the latents. All other hypotheses (8, 9 and 10) had two distinct parts.

All of the hypotheses on longitudinal data were tested using information collected in Wave 1 and in the two-year follow-up (Wave 2). A combined model showing the longitudinal as well as the cross-sectional paths was tested for this purpose. The longitudinal direct effect of unemployment was tested by a separate model which showed all of the above paths and the direct paths (longitudinal and cross-sectional) from employment (*employ*) to alcohol use (*use*). Results of these analyses were presented in the previous section and are discussed below.

The *first* hypothesis in this group (Hypothesis 7) proposed that longer unemployment will show a decrease in alcohol use. This is equivalent to saying that the causal path from variable *employ1* to latent *use2* (F6V4) will have a significant negative coefficient. The hypothesis was not supported from the analysis of data of the present study. The path coefficient F6V4 was found to be positive and statistically significant (both univariately and multivariately). The coefficient value was 0.010 which is significant at 5% significance level. The standardized value was 0.08. Thus, data of this study concluded that longer unemployment increases alcohol use. There was no indirect effect present (see Table 17).

The background arguments on which hypothesis 7 was based are provided under the discussion of hypothesis 6 above. Some of the reasons why this hypothesis may have been rejected by the data are provided there as well. It is likely for a cross-section of population not to resort to drinking immediately after job loss. Rather, they may do so to cope with the induced stress only after their efforts to find a new job are exhausted. During such a situation the individual gets depressed and uses the extra time by drinking alcohol instead of other constructive purposes. Constructive use of leisure time provides most protection from the harmful effects of unemployment in its earlier stages (Hill, 1977). As the duration of unemployment increases, the individual tends to become more discouraged and devote less time to the pursuit of other leisure interests. Once that happens, the question of affordability may prove to be a secondary issue to the individual. Such a person may even be willing to spend a sizeable sum of welfare payments made to him/her for buying drinks. Fulfilling basic necessities for one's self and for the family (if any) may become unimportant for such an individual.

Also, unemployment is followed by a major identity loss. Whether one is able to handle these losses in an acceptable way is determined by the person's compensatory possibility at his/her own disposal and also by the compensatory possibilities society has to offer. In the present study, during short term unemployment people normally had some sort of economic compensation (from unemployment benefits). It is possible that these benefits prevented provoking induced stress (due to short term unemployment) to the level faced by people with longer unemployment. People with longer unemployment faced least compensatory possibilities (from within and from society) which made them psychologically vulnerable. This resulted in more alcohol use (in the longitudinal study) as a means to reduce anxiety, tension and depression. Several previous studies have supported this pattern of increase in alcohol use under prolonged unemployment as found in the present study (Crawford et al., 1987; Dooley et al., 1992; Janlert & Hammerstrom, 1992). For example, Mustonen et al., (1994) found alcohol consumption to increase with the duration of unemployment showing the highest level of consumption among men who had been unemployed for 27 - 52 weeks. Duration of job loss may thus be regarded as one of the most significant factors characterizing an individual's employment situation. These may be some of the reasons why alcohol use in the present study was found to increase in longitudinal data rather than in the cross-sectional data.

It should be mentioned that the number of subjects that were *totally* unemployed in Wave 1 and Wave 2 were very low (about 4.0%, which is lower than the national average). Results obtained from a sample consisting of such a low number of unemployed subjects may have introduced some error. However, this is not far from the provincial average, and any other representative sample would have similar percentages of unemployed subjects. It should also be noted that while the number of totally unemployed subjects was low, the number of subjects with relatively higher *degree of unemployment* (i.e., subjects without full-time jobs) was not. A substantial number of subjects were *partly* unemployed in the sample. Forty percent of subjects in Wave 1 and 38.6% in Wave 2 did not have regular full time jobs (including part time, retired, home makers and students). The reasons for partial unemployment may have been similar to those for total unemployment. The effects of part unemployment on an individual may be similar to those experienced by a totally unemployed individual. Also, while the employment status for some subjects changed over the two-year follow up, the status remained the same for the majority of the subjects. However, any effect of the above limitations was minimized in this study by expressing employment as a continuous scale. Recognizing these drawbacks, it can be fairly concluded from the data that prolonged unemployment increases alcohol use in the general population.

The *second* hypothesis in this group (Hypothesis 8) has two distinct parts. The first part (called Hypothesis 8a) proposed that poverty in Wave 1 will cause alcohol use in Wave 2 to increase. This is equivalent to saying that there will be a significant positive value of the path coefficient between *poverty1* and *use2* (path F6F1). In other words, prolonged poverty will increase alcohol use in the general population. This hypothesis was confirmed by the data. The path coefficient is positive and significant (see Table 12 for the parameter value, and Figure 11 for the standardized value). Also, the direct and the indirect effects were positive and significant (see Table 17 for values).This hypothesis was based on the argument that prolonged poverty induces a combination of psychological and environmental states on an individual which encourages an increase in alcohol use. These states include, among others, increased stress, low self esteem, a feeling of worthlessness, poor living conditions, violent neighbourhoods etc. Individuals subjected to these conditions will be tempted to increase their alcohol use in an attempt to momentarily forget the miseries of life. Therefore, it is likely that a prolonged state of poverty will cause the use of alcohol to increase in the general population.

The second part of Hypothesis 8 (called Hypothesis 8b) stated that poverty in Wave 1 will cause more alcohol problems in Wave 2. The direct path coefficient between *poverty1* and *problem2* (F7F1) was not found to be significant. This path is not shown in Figure 11. However, the indirect effect of poverty in Wave 1 on alcohol problems in Wave 2 was found to be positive and significant (see Table 17 for value). Thus, there was an indirect support in favour of this hypothesis.

The *third* hypothesis on longitudinal data stated that alcohol use in Wave 1 will increase poverty in Wave 2 (Hypothesis 9a); and alcohol dependence in Wave 1 will increase poverty in Wave 2 (Hypothesis 9b). The first part of the hypothesis (9a) was confirmed by the data. The path coefficient between *use1* and *poverty2* (F5F2) was found to positive and statistically significant (see Table 12 and Figure 11 for values). There was no indirect effect present.

It was argued that as time progresses, the continued increased level of alcohol use and dependence will most likely influence the employment of the individual in a negative way. The person will have more problems at work, and will more often be absent. This will eventually reduce his/her income from employment through either job loss or reduced pay. It was found from these data that only long term alcohol use will have this effect on poverty. Alcohol abusers are particularly vulnerable to become or remain unemployed, even during periods of low unemployment rates. This part of the hypothesis is based on an idea of a selection process which is supposed to function in the labour market. The evidence which supported the first part is consistent with the longitudinal study of Dooley et al. (1992).

The second part of the hypothesis (9b) was not supported by the data. This coefficient of the path between *depend1* and *poverty2* was not found to be statistically significant. This path is, therefore, not shown in Figure 11. The hypothesis was based on the arguments put forward by the *drift hypothesis* (of the literature) which states that prior alcohol disorders predict later unemployment. It was therefore, expected that the presence of a life-time alcohol diagnosis revealed by alcohol dependence measures at Wave 1 would increase the risk of shifting from working at Wave 1 to being unemployed at Wave 2. There is evidence in the literature supporting this view. For example, Welte & Barnes (1992) found that alcohol abuse leads to homelessness, a direct measure of relative physical (and often psychological) lack of resources (poverty). One of the reasons for not finding the effect of alcohol dependence on poverty in this study may perhaps be due to insufficient follow-up time for the effect to materialize. However, further investigation is needed to arrive at a conclusive statement for the subjects of present sample.

The *fourth and final* hypothesis in this group proposed that alcohol use in Wave 1 will cause alcohol problem in Wave 2 to increase (Hypothesis 10a); and alcohol use in Wave 1 will increase alcohol dependence in Wave 2 (Hypothesis 10b). Both parts of this hypothesis were confirmed by the data. The path coefficients between *use1* and *problem2* (F7F2), and between *use1* and *depend2* (F8F2) were all positive and statistically significant (see Table 12 and Figure 11 for coefficient values). Also, the direct and the indirect effects were all positive (see Table 17). Alcohol use is thought to develop in several stages in an individual from excessive consumption to deterioration in social or work roles (alcohol problems) to physical dependence, a process not usually compressed into few months. Dooley et al., (1992) found that clinical levels of an alcohol disorder rarely (7%) appear within one year in previously undiagnosed workers. It is likely that only prolonged use of alcohol will cause a heightened alcohol dependency in an individual. Also, such use may render an individual more prone to problems related to alcohol use. This view was supported by the data of the present study.

Hypotheses on Demographic Variables

Several hypotheses on demographic groups were tested in this study. These included hypotheses on differences between *men* and *women* subjects, and between subjects of different *age groups*. All of these hypotheses were separately tested for cross-sectional data of Wave 1 and Wave 2, and for the longitudinal data (using Wave 1 and Wave 2 data). Since the results were similar, the following discussion refers to the results obtained from the analysis of longitudinal data.

The *first* hypothesis on demographic variables proposed that there is a difference in alcohol use, alcohol problems and alcohol dependence between men and women. Also, it was proposed that alcohol use, alcohol problems and alcohol dependence will be more prevalent for men. First, the difference between the models for men and women were tested. The results obtained from this test are explored further to conclude whether these characteristics are more prevalent for men.

Comparisons were made by simultaneous evaluation of two models (one for men and one for women) with imposed equality constraints using the longitudinal data. Results obtained from this analysis suggested that there is a difference between men and women in their alcohol use, alcohol problems and alcohol dependence. Several equality constraints were violated showing that the path coefficients of the models for men and for women corresponding to the violated constraints were statistically different. A list of these violated constraints is shown in Table 13 in the results section of this report. It was concluded that while the causal structural paths for these two groups of subjects are the same, the magnitude of corresponding path coefficients for some paths are statistically different. Some of these coefficients are higher for men and some are for women. Data supported the view that the *strength of causality* between aspects of alcohol abuse are different between men and women. The observed differences are discussed below.

Two distinct groups of differences were observed between men and women. These are (a) difference in the strength of causality between corresponding latents, and (b) difference in the strength of path coefficients between measurement variables and corresponding latents. In the first group, it was observed that the strength of causality from alcohol use to alcohol problems (F3F2 and F7F6) is higher in men. Also, causal relationship between alcohol use and alcohol dependence (F4F2 and F8F6) is stronger in men. The strength of causality between poverty and alcohol use is higher in men. This was found only for data of Wave 2 (F6F5). The longitudinal causality between alcohol use and poverty (i.e., between *use1* and *poverty2*, the path F5F2) is stronger in women.

Among the second group of differences, of particular interest are the coefficients of the latent *problem*. It was found that problem at work (*job1*) have a stronger contribution to alcohol problems in men than in women. Problems with control (*control1*) and health problems (*health1*) are higher in women. Also, heavy drinking (*heavy1*) and maximum drinking in one sitting (*hmax1*) are higher in men.

From the above discussion, it may be concluded that there is a difference in behaviour between men and women in relation to their alcohol abuse. This finding is consistent with numerous earlier studies reported in research on demographic variables. Data supported the view that men are heavy drinkers, likely to drink more at a sitting and have more problems at work, while women are more likely to have greater problems with control, more health problems and be lighter drinkers.

The second part of this hypothesis stated that alcohol use, alcohol problems and alcohol dependence will be more prevalent in men. This hypothesis was formulated based on the assumption that women's drinking practices are a reflection of society's insistence that women follow conventional norms of respectability. It has been suggested that the rate of deviance among women is lower than that among men because of the constraints resulting from the "*typescripts*" applied to women. Those typescripts limit women's access to unconventional roles and behaviour. Women have been socialized into "*affective*" roles in which they have been responsible for nurturing functions. At the same time, their male counterparts have been prepared for *instrumental* roles requiring active involvement in the external world outside the household. Women who internalize the requirements of affective roles might be expected to behave conventionally in many areas, including their alcohol use. Although this gender role differentiation may be declining, it is reasonable to assume that some effect of it still lingers. Another assumption was that in order to deal with stress men were found to depend on alcohol while women were found to be more depressed. Also, men, because of their majority in the working field, are assumed to use more alcohol. The difference was tested by comparing the mean of these variables for men and women. Since these variables are all latent in nature, their means are not observed and hence, cannot be measured by traditional methods. This is done in EQS by following an indirect methodology (adopting a special variable called V999) which was discussed in the results section of this report (see the topic on the comparison of models across groups). It was found that the mean of all of the latents of the construct *alcohol* *abuse* were greater in men (i.e., z-statistics for the intercept terms of these latents for men implied that the values of these terms were all significantly different from zero, while the corresponding terms for women were all set to zero for the sake of comparison). Therefore, the data of the present study support the hypothesis implying that alcohol use, alcohol problems and alcohol dependence are more prevalent in men. Poverty, on the other hand, was higher in women.

It may be mentioned here that simple t-tests for the difference between the mean values of different measurement variables for men and women (presented in Table 8 and Table 9 of the result section) concluded that the mean values are different for men and women. On the average, women were found to be poorer, to use less alcohol and to have fewer alcohol related problems. The pattern of alcohol use for women was also found to be different from men. Heavy drinking, drinking higher amounts in one sitting and binge drinking were found to be more prevalent for men. All of these findings are consistent with the conclusions arrived at from the analysis of structural equation models.

The *second and final* hypothesis in this group stated that alcohol use, alcohol problems and alcohol dependence would be more prevalent in younger age group (age group 1). Models for the three age groups were compared following procedures similar to those adopted for comparing models for men and women. Here, simultaneous estimation of model parameters was done considering three models (one for each age group) with 65 constraints imposed for testing equality of parameters. Results are provided in Table 14. The three groups were found to behave differently when compared by different aspects of alcohol abuse.

Compared to the other two groups, subjects in age group 1 (younger age) were observed to have higher symptomatic problems, higher occurrence of problems with police and higher involvement in accidents. This is consistent with the study of Parker et al. (1983) who found alcohol problems to be highest among young men and women. Problems with control, problems with spouse and problems at work were found to be lower in age group 1. Also, the strength of causal relation between poverty and alcohol use was found to be higher, in age group 1, while those between alcohol use and dependence, and between alcohol use and problems (longitudinal) were found to lower in age group 1. All of the above differences in behaviour by subjects of age group 1 are perhaps influenced by how they are perceived by the rest of the society. For example, younger people are likely to be involved in a higher number of accidents and hence, a higher number of problems with the police. At the same time, the police may not overlook minor traffic violations if the driver is younger and appear to be under the influence of alcohol (even if it is below the allowed limit). Similarly, a lower number of problems with spouse due to drinking in younger people may largely be contributed by the fact that the majority of these people are single.

Once it was established that there is a statistical difference in parameter values of the model for age group 1 compared to those for other two groups, the means of alcohol use, alcohol problems and alcohol dependence were compared with other two groups. The procedure followed was similar to that used in comparing latent means for male and female groups. It was found that those means for age group 1 were higher than the other two groups. Therefore, it can be concluded that the data of this study accepted the hypothesis that alcohol use, alcohol problems and alcohol dependence are more prevalent in the younger age group.

Drinking responses are acquired under different learning conditions which vary according to generations. Over the decades, reinforcement in the form of social approval for drinking has increased in North America. There is a variation of social approval across age groups. The social acceptance of the development of drinking behaviour of the younger age group may have in turn reinforced them to consume more alcohol. On the other hand, the general tendency among elderly to shorten the duration of their drinking occasions may be responsible for the observed less consumption in the older age group. Other physiological changes associated with age may also motivate older people to decrease their drinking. For example, the metabolism often becomes less efficient with age and this could affect the rate of consumption and possibly, would cause older people to stop drinking at a high level.

Discussion on other issues

The present study adopted a structural equation modelling approach to find causal relationships between all aspects of alcohol abuse. Under this approach, it was possible to estimate the model parameters simultaneously to test whether a theory based model is supported by the data. Thus, this approach is confirmatory in nature. Obviously, this approach is far more powerful than those adopted in traditional correlational analysis or exploratory factor analysis where relationships are explored rather than confirmed.

However, the traditional methods are useful, in their own right, in seeking relationships that are unknown or cannot be hypothesized from theory.

A number of issues that arise during the estimation and conclusion process of structural equation modelling approach have been discussed previously at different points of this report and may demand further emphasis. Of particular interest are the issue of a test statistic for model adequacy, and the issue of handling non-normal data. For the former, research indicated that the traditional χ^2 statistic is unreliable for relatively large samples because the statistic tends to reject more models than it should have. To get around this problem, researchers came up with goodness-of-fit tests that use ad hoc fit indices to assess model fit. These fit indices compare the model to a null-model (with no relationship) by using their χ^2 and degrees of freedom. Although these fit indices are effective, they are relative in nature. An absolute test statistic for which the distribution is stable and completely known is needed. More research is needed in this area.

Handling of non-normal data in structural equation modelling, especially when the sample size is very large, is difficult. Although techniques that use the actual distribution of data are available, they suffer from computational difficulties and often fail to arrive at proper conclusions (i.e., rejecting the hypothesis when it was supposed to accept it). Fit indices are available that apply correction for non-normality after estimating the model parameters on the assumption of normal distribution. Such an approach (the Satorra-Bentler corrected χ^2) was adopted in this study. Although the corrected fit-indices work very well, most of the times better than the others, the difficulties encountered by the direct approach should be further looked into for improvement. Again, a direct approach answers more questions and produces less controversy then the ad hoc procedures.

The Bentler-Week representation of structural equation modelling solves a system of linear relationships. It cannot account for a non-linear relation if it exists in the system. Such a relationship can be addressed by using piecewise linearization of the non-linear relation i.e., assuming a different linear relation for each linear piece. For example, if it is known that an independent variable increases a dependent variable at a rate that is not constant over time (if it acted for a certain period of time), and then starts to reduce it (if the influence is prolonged), then there exists a relationship that cannot be expressed by one linear equation. Under these circumstances, the increasing part of the relationship can be approximated by one (ideally by more) linear equation and the decreasing part by another. This may be achieved by having separate sets of observations at these time points (in estimating a statistical relationship). Of course, the error introduced by such linearization will depend on the number and interval of time points where observations are made. However, in the absence of a methodology which can take into account any existing non-linear relation in the system, this approach to linearization is usually adopted.

In the present study, it was hypothesized that the effect of unemployment on the alcohol use of an individual is such that recent unemployment causes alcohol use to increase, while prolonged unemployment causes it to decrease. This relation has the appearance of being non-linear and cannot be expressed by a single linear equation. A number of steps were taken to address this difficulty. *First*, observations were made at two time points (Wave 1 and Wave 2). It was assumed that the time interval is sufficient to capture both the increasing and the decreasing relationships between the two variables.

Second, two equations denoting the proposed increasing relationship between recent unemployment and alcohol use were considered. This was done by expressing separate equations for two waves of data (i.e., variable *employ1* connected to variable *use1* in Wave 1, and variable *employ2* connected to variable *use2* in the model). Assumptions made at this point were that the rate of any such increment is linear for each wave. *Third,* the *proposed* decreasing relationship between prolonged unemployment and alcohol use was expressed by a third equation. This was done by connecting *employ1* of Wave 1 to *use2* of Wave 2 in the model. It was assumed that the decrease (if any) is linear. Similar relationships between other variables were handled following the same procedure.

It is possible that the assumptions made in dealing with the apparent non-linear relationships have introduced some errors in the results. Assumed linearity in the rate of increase or in the rate of decrease may be violated in the population. These rates, however, are not known and should be further investigated. The time interval considered in the study may not be sufficient to capture the proposed opposing effects. Again, this interval is not known for the population. Observations at a third time point may be used in future to partly verify the validity of these assumptions. (It may be noted that phase three of the data collection, i.e., for Wave 3, is well under way, and these verifications can be done in future). It is believed that the consideration of separate equations for opposing effects and the use of observations in more than one time point have minimized any error introduced by the assumption of linearity.

The sample used in this study consisted of observations that had missing values for some variables. These observations were not used in the analysis. Although there are techniques available in EQS to impute these missing values, it was decided not to use such imputed values. As discussed earlier, these imputation techniques use prediction functions that rely solely on the observed non-missing values. In other words, they produce values for the missing points which expresses the average condition of the sample and *not* the actual situation. These values may, therefore, not alter the relationships developed without them. Also, if a model is altered simply because of consideration of such values (compared to the model without imputed values), the model with the imputed values should be rejected. Otherwise, conclusion of the model fit would be based on data that were *not observed*. For this study, it was assumed that the sample size is sufficiently large for the application of the procedures adopted in this study and there is no need for missing value imputation.

Limitations of the present study

Limitations of the present study are at least of two types. These are: (a) limitations due to a lack of complete description of certain variables in the data, and (b) limitations due to certain difficulties of the methodology. These are briefly discussed in the following.

The variable *income* used in this study was based on observation on family income that was collected as a range instead of a single value. In the computational process, a single value was assigned to the subjects belonging to a range by taking the midpoint of the range. For example subjects having a family income in the range of $10,000 to $20,000 was assigned an income of $15,000. All the subjects with income in this range, thus, were considered to have the same income of $15,000. Any information about the difference in income between subjects *within the same range* was lost by not collecting income as a single value variable. However, the error was minimized by assigning the value as the mid-point of the range. However, the relative position of the subjects in different income ranges was preserved. Since the structural equation modelling approach uses the continuous character of any variable to its fullest extent, it would be better utilized had the exact value of income were known for every subject. It should be recognized that even when the question is asked to seek the exact value of income, subjects will usually provide an approximate value (based on an average in his/her understanding) unless this information is collected from tax returns submitted by the individuals. The question was asked in this way in order to make the interview less intrusive from the point of view of the respondent. It likely could not have been done differently. Similar comments can be made for the variable *education* for subjects having less than high school education. For such subjects the responses to the question related to education were *some grade school* or *some high school*. The number of schooling years for these subjects were estimated at the mid-point as well. It is important to note that these difficulties would not produce sizeable errors in the analysis.

Some of the questions on alcohol problems could have been formulated to reflect more variability of the severity of the problem. For example, the problem of accidents due to drinking was given a scale depending on when such problems occurred. This would provide information about the occurrence and recency of occurrence of such problems. However, the number of such occurrences could also be incorporated for the same time frame. The combined scale would, in such situation, provide a more complete picture about the severity of the problem. In other words, a subject causing an accident only once during the last 6 months could be differentiated from the subject who caused two accidents during the last 6 months. However, the error (if any) introduced by the lack of such information would be very small, since it is an exception rather than a rule for most subjects to be involved in alcohol related accidents more than once in 6 months. Similar comments can be made for the alcohol related problems with the police.

The study is limited in its application to longitudinal causality by two sets of observations taken at two time points. Observations at more time points are needed to verify certain assumptions made in dealing with the long term effect of some variables. This can, however, be taken care of by using Wave 3 data (when data collection is completed) in future.

Limitations caused by the adoption of the analysis technique are mainly from the use of ad hoc fit indices for model evaluation, and from the procedure adopted for handling of non-normal data in EQS. The use of ad hoc fit indices was discussed at various points in the previous sections. Also, it was observed that the data of the present study did not follow a multivariate normal distribution. The extensive procedures adopted for estimating fit indices for the models using non-normal data required substantial computing time. For example, a single run of a model that used longitudinal data needed 22 hours to complete on a IBM 486 computer (with 20 MB RAM). A number of different scenarios needed to be estimated, different groups needed to be compared and hence, quite a few runs were made. These were in addition to preliminary runs for which only the maximum likelihood estimation method was used.

The need for such a long computing time was demanded by the indirect approach of the analysis (i.e., methodology using techniques for correcting non-normality) that used the raw data matrix. The size of the data set is an important factor for the length of computing time. Until an efficient computational technique that adopts a direct approach of using the actual distribution is available, this difficulty will persist. It may be noted that although the computing techniques used in this study are indirect, results from such analyses are robust, reliable and better than those obtained from other methods presently available to the researcher.

Although EQS allows manipulation of raw scores, it is not well equipped with techniques of writing longer codes needed to transform raw scores into useable scores. Values for most of the variables used in this study had to be extracted from subjects' responses to a number of questions. For example, the value of the variable *alc3r* (the DSM-III-R alcohol dependence score) was computed from the raw scores of 43 questions. Both *conditional* and *iterative* statements were needed to transform responses of these 43 questions into the scores for *alc3r*. It is very difficult, if not impossible, to use EQS for the purpose of such transformations. Even if it were possible to use EQS for this purpose, it would require an unusually larger *memory* space of a personal computer, especially with a relatively larger sample size. SAS codes were used in this study to avoid this problem. Thus, EQS is partially incomplete in its development since other computational methods have to be used for raw score manipulation depending on the nature of the study.

Conclusions

Several hypotheses on alcohol abuse proposed in this study were tested by evaluating structural models using data collected at two time points. The conclusions on the characteristics of alcohol abuse in the general population that were drawn from these tests are listed in the following.

1. Increased poverty causes increased alcohol use in a cross-sectional sample.
2. Increased poverty causes increased alcohol problems in a cross-sectional sample.
3. No evidence in the data could be found to support the idea that alcohol dependence causes poverty in a cross-sectional sample.
4. Increased alcohol use causes increased alcohol problems in a cross-sectional sample.
5. Increased alcohol use causes increased alcohol dependence in a cross-sectional sample.
6. Recent unemployment decreases alcohol use.
7. Longer unemployment increases alcohol use.
8. Prolonged poverty causes increased alcohol use.
9. There is indirect evidence present in the data to support the idea that prolonged poverty causes alcohol problems.
10. Prolonged alcohol use causes increased poverty.
11. There is no evidence present in the data to support the idea that prolonged alcohol dependence causes increased poverty.

12. Prolonged alcohol use causes increased alcohol problems.
13. Prolonged alcohol use causes increased alcohol dependence.
14. There is a difference in the characteristics of alcohol abuse between men and women.
15. Alcohol use, alcohol problems and alcohol dependence are more prevalent in men compared to women.
16. There is a difference in the characteristics of alcohol abuse between different age groups.
17. Alcohol abuse, alcohol problems and alcohol dependence are more prevalent in the younger age group compared to older age groups.

Summary of Conclusions

From the above conclusions, some general comments can be made. Even though some of the following statements were not directly tested in this study, they may be indirectly concluded from the results obtained.

1. Compared to the correlational methods, the structural equation modelling which solves a system of linear relationships simultaneously, is a better approach in estimating causal direction and magnitude.
2. The ad hoc fit indices and procedures to handle non-normal data that are available with EQS perform well in parameter estimation and model evaluation.
3. The measurement variables of family income, number of family members, years of schooling and employment status can adequately describe poverty in the general population.

4. Alcohol abuse is better represented when its three different aspects namely, alcohol use, alcohol problems and alcohol dependence are considered together.
5. The social, psychological and health effects of unemployment vary by individual susceptibility to the inherent stresses and frustrations. Consequently, these lead to corresponding variations in changes in drinking behaviour due to poverty and unemployment. The causal relationship between unemployment, poverty and alcohol abuse found in this study accounts for such variations.
6. The effects of poverty and unemployment on alcohol abuse are moderated by a number of demographical variables such as age and gender. These variations should be taken into account when explaining any such developed relationships.
7. While it was found that people in poverty tend to have higher alcohol abuse, their alcohol use may reduce immediately after job loss. However, with prolonged unemployment, such individuals may increase their consumption level even more than the pre-unemployment stage.
8. Both cross-sectional and longitudinal analysis of data are required to develop any meaningful relationship between job loss (and/or poverty) and alcohol abuse. This point was further stressed by the findings of this study.

Recommendations for Future Study

Recommendations for future studies are mainly directed towards inclusion of other variables that directly or indirectly influence the drinking pattern and behaviour of an individual. The general consensus is that in addition to imposing economic constraints, poverty and unemployment induce psychological stress in an individual. This stress, when added to stresses from other sources may, exceed the threshold of coping capacity in some individuals. Such individuals may start using alcohol as a mechanism to cope with the stress. Representation of the level of stress in the *pre-unemployed* and *unemployed* stages in a model of alcohol abuse would thus provide further insight into the process. Therefore, it is recommended that in future studies on alcohol abuse, the level of stress in an individual should be included (preferably as a latent variable).

It may be argued that even under the similar circumstances two individuals may react differently in order to deal with added psychological stress due to poverty or unemployment. This difference in behaviour is rooted in, among other things, the individual's personality traits, ethnic background, ethical convictions including religious beliefs, sense of responsibility towards family and community, level of consciousness of self esteem and preservation of good health, respect of law and rights of others etc. It is recommended that variables directly or indirectly describing the above characteristics of an individuals should be incorporated in any future study to have a more complete analysis of alcohol abuse in a population.

There is ample support in the literature that genetic predisposition and drinking practises in the family increases (or decreases) the risk of alcohol abuse. It is recommended that such data, especially those of drinking history of parents, be considered in future studies. Also, ethnic backgrounds of the subjects should be taken into consideration to reflect cultural variation in drinking practices.

It is recommended that more follow-up observations should be made in different time intervals to comment conclusively on the long-term characteristics of alcohol abuse in the general population. Observations from the Wave 3 (for which data collection is well under way) should be used together with those of Wave 1 and Wave 2 for this purpose.

The retrospective and the current general health questions can be used to study the general health consequences of alcohol abuse. Subjects' responses to such questions would be available from the Wave 3 survey. These responses may be used in future research to study the effect of alcohol abuse on general health or vice versa.

It is recommended that for the sake of comparison, another sample should be selected which represents a community where alcohol abuse, poverty and unemployment are more prevalent compared to those in the general population. Modelling such a data set would provide further insight of alcohol abuse in relation to poverty and unemployment. The treatment sample of individuals from the Addiction Foundation of Manitoba that was surveyed after Wave 2 might serve this purpose.

It is also recommended that other information about the onset and recency of financial problems and job loss that are available in the Wave 2 data should be included in any future study. Preliminary analysis done in this study using these variables showed that inclusion of these variables would provide further insight of alcohol abuse in general population.

Furthermore, consideration of alcohol abuse as a second order construct in future studies is recommended. This study was limited in considering this construct as a first order construct. Also, the latent variable *problem* may be divided into two separate latents; *social problems* and *physical problems*. Such considerations, when tested in this study, did not show any mentionable difference in effects on the objectives of the study.

The complexity and the indirect nature of statistics used for model evaluation when the data are multivariately distributed as non-normal should be further studied in an attempt to reduce the level of difficulty in model identification and parameter estimation. More studies should be undertaken on more direct approaches to solve such problems.

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APPENDIX A

WINNIPEG HEALTH AND DRINKING SURVEY
FACULTY OF HUMAN ECOLOGY
Department of Family Studies

Dear

The University of Manitoba, with the support of Health and Welfare Canada, is conducting a study on living patterns and alcohol use by people in Manitoba. Your name has been randomly chosen from all of the residents of the city.

In a few days a caller from the "Winnipeg Health & Drinking Survey" will telephone you, will explain the project in more detail, and will request to interview you. We hope that you will agree to participate. If you decide to participate, your answers are kept confidential, and the results are only reported in statistical form.

Alcohol use is an important factor which affects health in Canada. The federal government has made a large investment in Manitoba for this project, in an effort to get an accurate view of the attitudes and behavior of Manitobans towards drinking. In order to get this accurate view we have to question a broadly representative sample of the population. For the project to be successful it is important that a high percentage of the people we contact agree to participate. It doesn't matter whether you drink or don't drink. Your participation is important to provide us with the most accurate picture possible. If you have any questions about the research please give us a call.

Sincerely,

David Patton, M. A.
Project Manager
Winnipeg Health & Drinking Survey
Faculty of Human Ecology

Gordon Barnes, Ph.D.
Professor
Department of Family Studies
Faculty of Human Ecology

APPENDIX B

Demographics Information

(Note: The question numbers are the numbers in the original questionnaire)

TO COMPLETE OUR BACKGROUND INFORMATION WE NEED TO ASK YOU SOME QUESTIONS ABOUT YOURSELF.

[INTERVIEWER: CODE MALE OR FEMALE] M [ ] F [ ]

Could you please tell me your date of birth? -----/ ------/ -----
(day) (month) (year)

1. Current Marital Status:

[INTERVIEWER: IF THE RESPONDENT IS MARRIED, ASK IF THEY HAVE BEEN PREVIOUSLY DIVORCED?]

Single	[ ]
Married or equivalent	[ ]
Widowed	[ ]
Divorced or separated	[ ]
Married, but previously divorced	[ ]

2. The questions are about employment.

First, which of the categories on this card best describes what you are now doing?
[INTERVIEWER: USE RESPONDENT CARD CALLED EMPLOYMENT AND CHECK ONLY ONE: IF RESPONDENT USES MORE THAN ONE WRITE IN THE MARGIN ON THE RIGHT]

Working full-time	[ ]
Working part-time	[ ]
Unemployed & looking for work	[ ]
Full-time student	[ ]
Part-time student	[ ]
Homemaker	[ ]
Retired	[ ]
Other (specify) ----------	[ ]

In your most recent job what is/was your title? ------------------------------

Please describe the main duties or responsibilities of this position?

----

3. Educational Status:

What is the highest grade you attended or degree you received?

Some Grade School	[ ]
Grade School Complete	[ ]
Some High School	[ ]
Some College or a Technical Diploma	[ ]
University Graduate	[ ]
Some Post-Graduate Work	[ ]
Master's Degree or Doctorate	[ ]

4. What is your religious preference?

Catholic	[ ]
Protestant (Denomination) ----------	[ ]
Jewish	[ ]
Other (specify) ------------------	[ ]
None	[ ]

5. What was your parents' religion?

	Mother's	Father's
Catholic	[ ]	[ ]
Protestant (Denomination) ------	[ ]	[ ]
Jewish	[ ]	[ ]
Other (specify) --------------	[ ]	[ ]
None	[ ]	[ ]

6. When you were growing up, what was the language used most often in your home?

English	[ ]
French	[ ]
Ukrainian	[ ]
German	[ ]
Other (specify) --------	[ ]

7. In what country were you born?

Specify ----------------------------

8. To which ethnic or cultural group do you feel you belong?
Specify ---------------------------

9. What racial category would you consider yourself?

White	[ ]
Black	[ ]
Asian	[ ]
Native	[ ]
Other (specify) ---------	[ ]

10. When your mother was growing up, what was the language used most often in her family's home?

English	[ ]
French	[ ]
Ukrainian	[ ]
German	[ ]
Other (specify) ----------------	[ ]

11. In what country was your mother born?
Specify ----------------------

12. To which ethnic or cultural group does your mother belong? (Aside from Canadian)
Specify ----------------------

13. When your father was growing up, what was the language used most often in his family's home?

English	[ ]
French	[ ]
Ukrainian	[ ]
German	[ ]
Other (specify) ----------------	[ ]

14. In what country was your father born?
Specify ----------------------

15. To which ethnic or cultural group does your father belong? (Aside from Canadian)
Specify ----------------------

16. What was the size of the place where you lived the longest before you were 16?

In the country on a farm	[ ]
In the country <u>but not</u> on a farm	[ ]
Town of less 5,000 people or on a reserve	[ ]
City of 5,000 to 24,999 people	[ ]
City of 25,000 to 99,999 people	[ ]

City of 100,000 to 499,999 people	[ ]
City of 500,000 to more people	[ ]
Can't guess (Give name of place) -----------	[ ]

17. Please describe the other members of your household besides yourself.

Relationship to yourself	Age	GENDER Male	Female	EMPLOYMENT Full-Time	Part-Time	Not Employed
1. --------------	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
2. --------------	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
3. --------------	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
4. --------------	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
5. --------------	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
6. --------------	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
7. --------------	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
8. --------------	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
9. --------------	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
10. --------------	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]

18. So that we can compare this study with the whole population by broad income groups, indicate your income for the past year (that is, total income before taxes, including wages, welfare income, farm income, interest, dividends, etc.) of all members of the family presently residing in this household by checking one of these income categories.

Under $10,000	[ ]
10,000 - 20,000	[ ]
20,000 - 35,000	[ ]
35,000 - 50,000	[ ]
Over 50,000	[ ]
Don't know	[ ]

19. How many years are you living in the present home?

------ Years ----- months

20. How many times have you moved during the last 5 years?

APPENDIX C

(Note: The question numbers are the numbers in the original questionnaire)

Screening for alcohol consumption

10. Did you yourself drink any alcohol in the last 12 months? (Any wine, beer, or liquor - even a taste?)

Yes [ ] --> GO TO QUESTION 12a
No [ ] --> GO TO QUESTION 11

11. Was there ever a time when you drank wine, beer, liquor or anything containing alcohol even once?

Yes [ ] --> GO TO QUESTION 12a
No, I have never drunk alcohol [ ] --> GO TO QUESTION 22

Questions on Drinking Habits

NEXT FEW QUESTIONS ASK ABOUT YOUR DRINKING HABITS.

13a. The next few questions ask about your use of beer, wine and liquor over the past year.

[INTERVIEWER: USE RESPONDENT CARD 13a. READ ALTERNATIVES TO RESPONDENT]

First of all, how often do you usually have wine?

Three or more times a day	[ ]
Two times a day	[ ]
Once a day	[ ]
Nearly every day	[ ]
Three or four times a week	[ ]
Once or twice a week	[ ]
One to three times a month	[ ]
Less than once a month but at least once a year	[ ]
Less than once a year	[ ] GO TO QUESTION
I have never had wine	[ ] 14a

13b. Now, think of all the times you have had <u>wine</u> recently. When you drink wine, how many glasses do you usually have?

One or two glasses	[ ]
Three or four glasses	[ ]
Five or six glasses	[ ]
More than six glasses	[ ]

13c. About how many times during the past 12 months did you have <u>eight or more</u> glasses of wine at a sitting?

Nearly every day	[ ]
One to three times a week	[ ]
One to three times a month	[ ]
Less than once a month	[ ]
Never	[ ]

14a. How often do you <u>usually</u> have <u>beer</u>?

Three or more times a day	[ ]
Two times a day	[ ]
Once a day	[ ]
Nearly every day	[ ]
Three or four times a week	[ ]
Once or twice a week	[ ]
One to three times a month	[ ]
Less than once a month but at least once a year	[ ]
Less than once a year	[ ] GO TO QUESTION
I have <u>never had</u> beer	[ ] 15a

14b. Now, think f all the times you have had beer recently, when you drink beer, how many glasses do you usually have?

One or two glasses	[ ]
Three or four glasses	[ ]
Five or six glasses	[ ]
More than six glasses	[ ]

14c. About how many times during the past 12 months did you have <u>eight or more</u> glasses of beer at a sitting?

Nearly every day	[ ]
One to three times a week	[ ]
One to three times a month	[ ]
Less than once a month	[ ]
Never	[ ]

15a. How often do you <u>usually</u> have drinks containing liquor (such as Martinis, Manhattans, or Straight drinks?)

Three or more times a day		[ ]
Two times a day		[ ]
Once a day		[ ]
Nearly every day		[ ]
Three or four times a week		[ ]
Once or twice a week		[ ]
One to three times a month		[ ]
Less than once a month but at least once a year		[ ]
Less than once a year	[ ] GO TO QUESTION	
I have <u>never had</u> liquor	[ ] 16	

15b. Now, think of all the times you have had liquor recently, when you drink <u>liquor</u>, how many drinks do you usually have?

One or two drinks	[ ]
Three or four drinks	[ ]
Five or six drinks	[ ]
More than six drinks	[ ]

15c. About how many times during the past 12 months did you have <u>eight or more</u> drinks of liquor at a sitting?

Nearly every day	[ ]
One to three times a week	[ ]
One to three times a month	[ ]
Less than once a month	[ ]
Never	[ ]

16. About how often do you drink enough to get high or tight, on the average?

Never or less than once a year	[ ]
Less than once a month, but at least once a year	[ ]
About once a month	[ ]
Two or three times a month	[ ]
Once or twice a week	[ ]
Three or four times a week	[ ]
Nearly everyday or more often	[ ]

17. Have you ever stayed drunk for more than one day in a row (i.e., without staying sober for more than a couple of hours while you were awake)?

Yes, during the last 12 months	[ ]
Yes, 1 to 3 years ago	[ ]
Yes, more than 3 years ago	[ ]
No, never happened to me	[ ]

APPENDIX D

Questions on Problem Drinking

(Note: The question numbers are the numbers in the original questionnaire)

In the next series of statements, please indicate whether each statement is true of you now, not true now but was true of you in the past, or never true using the scale on the card provided.

18a. I sometimes take a drink the first thing in the morning when I get up.

18b. Sometimes I get drunk even when there is an important reason to stay sober.

18c. I sometimes take a few quick drinks before going to a party to make sure I will have enough.

18d. I sometimes sneak drink when no one is looking.

18e. When I am drinking by myself, I tend to drink more than I do when I am drinking with other people.

18f. I have taken a drink to get rid of a hangover.

18g. I sometimes wake up in the morning after drinking and cannot remember doing somethings that I did even after people tell me about them.

18h. When I drink, I almost always drink until I pass out.

18i. There have been occasions when I kept on drinking after I promised myself not to.

Next are some questions about experiences you may have had because of your drinking. If you have ever had the experience that is mentioned in the question, please indicate the most recent time you had it. If you never had the experience just indicate the "never happened" answer.

Yes, during the last 6 months	[ ]
Yes, more than 6 months ago, but within the past year	[ ]
Yes, but it was 1-3 years ago	[ ]
Yes, but it was more than 3 years ago	[ ]
No, it never happened to me	[ ]

19a. Did a doctor ever tell you that drinking was having a bad effect on your health?

19b. Did drinking ever cause you to have an accident or injury of some kind either at work, at home, on the street or some place else?

19c. Have you ever been arrested for drunk driving?

19d. Have you ever got into any other kind of trouble with the law because of anything connected with your drinking (aside from drunk driving arrests)?

19e. Have you ever lost a job because of drinking?

19f. Have you ever thought that you really ought to stop drinking or cut down, and then found that you couldn't?

APPENDIX E

Diagnostic Interview Schedule (DIS III R)

(Note: The question numbers are the numbers in the original questionnaire)

12a. How old were you when you first had any wine, beer, or other alcohol at least once a month (for 6 months or more?)

------- Years old

12b. What is the largest number of drinks that you've ever had in one day?

-------- Drinks

(INTERVIEWER: ONLY ASK 12c. IF RESPONSE TO 12b IS GREATER OR EQUAL TO 20, IF 12b. RESPONSE IS LESS THAN 20 BUT GREATER THAN 6 SKIP TO 12e. IF 12b. RESPONSE IS LESS THAN 7 SKIP TO 13a.)

12c. When did you first have as much as 20 drinks in one day?

----- Years ago or ----- months ago

12d. When did you last have as much as 20 drinks in one fay?

----- Years ago
----- Months ago
----- within the past month

12e. Has there <u>ever</u> been a period of two weeks when every day you were drinking at least 7 drinks -- that could include beers, glasses of wine, or drinks of any kind?

Yes [ ] No [ ]
[INTERVIEWER: IF NO, SKIP TO 12h]

12f. When did you first have a period of two weeks when you drank at least 7 drinks every day?

----- years ago or ----- months ago

12g. When did you last have a period of two weeks when you drank at least 7 drinks every day?

----- years ago or ----- months ago.

12h. Has there ever been a couple of months or more when <u>at least one evening a week you drank 7 or more drinks</u> or bottles of beer or glasses of wine?

Yes [ ] No [ ]
(INTERVIEWER: IF NO, SKIP TO 13a.)

12i. When was the first time that at least one evening a week you drank 7 or more drinks?
---- years ago or ---- months ago

12j. When was the last time that at least one evening a week you drank 7 or more drinks?
---- years ago or ---- months ago

I am going to ask you more questions about drinking, these questions are related to things that might have happened to you in the past. Use the response cards to indicate your answer to the question.

Never	[ ]
Sometimes	[ ]
Often	[ ]
Nearly always	[ ]

21p. Have you ever had fits or seizures after stopping or cutting down on drinking?

21q. Have you ever taken a drink to keep from having withdrawal symptoms or to make them go away?

21r. Have you ever gone on binges or bender where you keep drinking for a couple of days or more without sobering up?

21s. When you went on these binges or benders, did you neglect some of your usual responsibilities then?

21t. Did you do that several times or go on a binge that lasted a month or more?

21u. Did you ever get tolerant to alcohol, i.e., you <u>needed to drink</u> a lot <u>more</u> in order <u>to get an effect</u>, or found that you could no longer get high on the amount you used to drink?

21v. After you had been drinking for a while, did you find that you began to be <u>able to drink as lot more before you would get drunk</u> (before your speech got thick or you were unsteady on your feet)?

[INTERVIEWER: IF "NEVER" RESPONSE SKIP TO 21x]

21w. Did your ability to drink more without feeling it last for a month or more?

21x. Have there been many days when you drank <u>much more than you expected to</u> when you began, or have you often continued drinking for more days in a row than you intended to?

21y. Have you more than once wanted to stop drinking but couldn't?

21z. Some people try to control their drinking by making rules, like not drinking before 5 o'clock or never drinking alone. Have you ever made rules like that for yourself?

[INTERVIEWER: IF "NEVER" RESPONSE, SKIP TO 21cc]

21aa. Did you make these rules because you were having trouble limiting the amount you were drinking?

21bb. Did you try to follow those rules for a month or longer or make rules for yourself several times?

21cc. Has there ever been a period when you spent so much time drinking alcohol or getting over its effects that you had little time for anything else?

[INTERVIEWER: IF "NEVER" RESPONSE SKIP TO 21ee]

21dd. Did the period you spent a lot of time drinking last a month or longer?

21ee. Have you ever given up or greatly reduced important activities in order to drink -- like sports, work, or associating with friends or relatives?

21ff. Did you give up or cut down on activities to drink for a month or more, or several times?

21gg. Has your drinking or being hung over often kept you from working or taking care of children?

21hh. Have you often worked or taken care of children at a time when you had drunk enough alcohol to make your speech thick or to make you unsteady on your feet?

APPENDIX F

Short Form of Alcohol Dependence Data Scale (SADD)

(Note: The question numbers are the numbers in the original questionnaire)

The following questions cover a wide range of topics to do with your current drinking patterns. Use the response cards to indicate your answer to the question.

Never	[ ]
Sometimes	[ ]
Often	[ ]
Nearly always	[ ]

21a. Do you find difficulty in getting the thought of drink out of your mind?

21b. Is getting drunk more important than your next meal?

21c. Do you plan your day around when and where you can drink?

21d. Do you drink in the morning, afternoon and evening? (i.e., during the same day).

21e. Do you drink for the effect of alcohol without caring what the drink is?

21f. Do you drink as much as you want irrespective of what you are doing the next day?

21g. Given that many problems might be caused by alcohol, do you still drink too much?

21h. Do you know that you won't b e able to stop drinking once you start?

21i. Do you try to control your drinking by giving it up completely for days or weeks at a time?

21j. The morning after a heavy drinking session, do you need your first drink to get yourself going?

21k. The morning after a heavy drinking session, do you wake up with a definite shakiness of your hands?

21l. After a heavy drinking session, do you wake up and retch or vomit?

21m. The morning after a heavy drinking session, do you go out of your way to avoid people?

21n. After a heavy drinking session, do you see frightening things that you later realize were imaginary?
21o. Do you go drinking and next day find you have forgotten what happened the night before?

APPENDIX G

Michigan Alcoholism Screening Test Short Form (SMAST)

(Note: The question numbers are the numbers in the original questionnaire)

Here are some more questions about experiences you may have had because of your drinking. This time indicate your response to each statement by a YES or NO.

Yes	[ ]
No	[ ]

20a. Do you feel you are a normal drinker? (By normal we mean you drink less than or as much as most other people.)

20b. Have you ever got into trouble at work because of drinking?

20c. Have you ever had delirium tremens (DTs), severe shaking, heard voices, or seen things that weren't there after heavy drinking?

20d. Do your friends or relatives think you are a normal drinker?

20e. Have you ever attended a meeting of Alcoholics Anonymous?

20f. Have you ever lost boy/girl friends because of your drinking?

20g. Have you ever neglected your obligations, your family, or your work for two or more days in a row because you were drinking?

20h. Have you ever gone to anyone for help about your drinking?

20i. Have you ever been in a hospital because of your drinking?

20j. Does your wife, husband, a parent or other near relative ever worry or complain about your drinking?

20k. Do you ever feel guilty about your drinking?

20l. Are you able to stop drinking when you want to?

20m. Has your drinking ever created problems between you and your wife, husband, a parent or other near relative?

Appendix H

Table H1
Correlation matrix of measurement variables of Wave 1

	INCOME1	NFEM1	EDCYR1	EMPLOY1	ETHANOL1	HEAVY1
INCOME1	1.000					
NFEM1	-0.317	1.000				
EDCYR1	0.249	-0.030	1.000			
EMPLOY1	0.269	-0.078	0.166	1.000		
ETHANOL1	-0.018	-0.043	-0.003	-0.054	1.000	
HEAVY1	0.065	-0.090	0.049	0.002	0.254	1.000
HMAX1	0.089	-0.014	0.075	0.049	0.474	0.259
BINGE1	0.057	-0.086	0.069	0.010	0.145	0.720
SYMPTOM1	0.068	-0.072	0.082	-0.016	0.322	0.508
CONTROL1	0.106	-0.082	0.102	-0.008	0.226	0.383
SPOUSE1	0.035	-0.054	0.026	-0.010	0.213	0.378
JOB1	0.040	-0.076	0.012	-0.004	0.023	0.202
POLICE1	0.070	-0.056	0.093	-0.038	0.106	0.231
HEALTH1	0.034	-0.064	0.050	0.008	0.143	0.146
ACCID1	0.056	-0.077	0.001	-0.046	0.285	0.321
ALC3R1	0.073	-0.071	0.049	-0.044	0.287	0.469
SADD1	0.029	-0.028	-0.011	-0.063	0.345	0.411
MAST1	0.035	-0.087	0.066	0.013	0.131	0.399

	HMAX1	BINGE1	SYMPTOM1	CONTROL1	SPOUSE1	JOB1
HMAX1	1.000					
BINGE1	0.157	1.000				
SYMPTOM1	0.319	0.497	1.000			
CONTROL1	0.202	0.421	0.631	1.000		
SPOUSE1	0.183	0.406	0.541	0.551	1.000	
JOB1	-0.019	0.272	0.184	0.278	0.274	1.000
POLICE1	0.139	0.228	0.345	0.274	0.244	0.116
HEALTH1	0.082	0.162	0.200	0.165	0.135	0.135
ACCID1	0.263	0.239	0.377	0.345	0.233	0.102
ALC3R1	0.291	0.457	0.667	0.607	0.542	0.196
SADD1	0.334	0.369	0.632	0.536	0.412	0.094
MAST1	0.136	0.464	0.491	0.506	0.458	0.273

Table H1 (*continued*)

	POLICE1	HEALTH1	ACCID1	ALC3R1	SADD1	MAST1
POLICE1	1.000					
HEALTH1	0.175	1.000				
ACCID1	0.298	0.201	1.000			
ALC3R1	0.291	0.198	0.356	1.000		
SADD1	0.215	0.138	0.345	0.617	1.000	
MAST1	0.317	0.263	0.234	0.417	0.296	1.000

Table H2
Correlation matrix of measurement variables of Wave 2

	INCOME2	NFEM2	EDCYR2	EMPLOY2	ETHANOL2	HEAVY2
INCOME2	1.000					
NFEM2	-0.225	1.000				
EDCYR2	0.317	-0.063	1.000			
EMPLOY2	0.301	-0.145	0.127	1.000		
ETHANOL2	-0.071	-0.042	0.025	-0.106	1.000	
HEAVY2	-0.002	0.037	0.033	-0.131	0.342	1.000
HMAX2	0.029	0.049	0.062	-0.024	0.424	0.370
BINGE2	0.070	-0.014	0.042	-0.032	0.077	0.410
SYMPTOM2	0.085	-0.029	0.050	-0.049	0.358	0.539
CONTROL2	0.144	-0.038	0.091	-0.015	0.222	0.361
SPOUSE2	0.048	-0.035	0.045	-0.015	0.189	0.313
JOB2	0.017	0.026	-0.092	-0.007	0.005	0.117
POLICE2	0.030	0.010	0.020	-0.064	0.087	0.200
HEALTH2	0.036	-0.024	0.087	0.072	0.111	0.074
ACCID2	0.019	-0.009	-0.035	-0.060	0.196	0.199
ALC3R2	0.097	-0.033	0.063	-0.015	0.250	0.462
SADD2	0.077	0.004	0.080	-0.087	0.321	0.464
MAST2	0.044	-0.030	0.042	-0.010	0.095	0.250

Table H2 (*continued*)

	HMAX2	BINGE2	SYMPTOM2	CONTROL2	SPOUSE2	JOB2
HMAX2	1.000					
BINGE2	0.141	1.000				
SYMPTOM2	0.362	0.365	1.000			
CONTROL2	0.286	0.252	0.538	1.000		
SPOUSE2	0.144	0.258	0.499	0.514	1.000	
JOB2	0.018	0.111	0.122	0.256	0.162	1.000
POLICE2	0.066	0.201	0.210	0.299	0.158	0.467
HEALTH2	0.114	0.042	0.195	0.108	0.138	0.003
ACCID2	0.103	0.143	0.296	0.292	0.206	0.262
ALC3R2	0.282	0.307	0.604	0.506	0.526	0.190
SADD2	0.371	0.331	0.614	0.508	0.403	0.052
MAST2	0.080	0.277	0.381	0.416	0.431	0.237

	POLICE2	HEALTH2	ACCID2	ALC3R2	SADD2	MAST2
POLICE2	1.000					
HEALTH2	0.098	1.000				
ACCID2	0.413	-0.010	1.000			
ALC3R2	0.222	0.165	0.332	1.000		
SADD2	0.157	0.095	0.308	0.545	1.000	
MAST2	0.315	0.087	0.265	0.427	0.296	1.000

Table H3
Correlation coefficients between measurement variables of Wave 1 and wave 2

	INCOME1	NFEM1	EDCYR1	EMPLOY1	ETHANOL1	HEAVY1
INCOME2	0.676	-0.235	0.315	0.292	-0.036	0.053
NFEM2	-0.271	0.914	-0.054	-0.088	-0.048	-0.076
EDCYR2	0.268	-0.029	0.855	0.156	0.011	0.043
EMPLOY2	0.235	-0.141	0.141	0.623	-0.112	-0.054
ETHANOL2	-0.049	-0.021	0.017	-0.014	0.658	0.189
HEAVY2	0.020	0.002	0.045	-0.053	0.336	0.341
HMAX2	0.024	0.053	0.082	0.059	0.296	0.131
BINGE2	0.017	-0.014	0.038	0.015	0.130	0.403
SYMPTOM2	0.062	-0.049	0.078	0.010	0.328	0.409
CONTROL2	0.119	-0.058	0.106	-0.015	0.233	0.285
SPOUSE2	0.043	-0.036	0.040	-0.026	0.219	0.228
JOB2	-0.037	0.025	-0.039	-0.056	0.025	0.162
POLICE2	0.032	0.000	0.027	-0.030	0.068	0.214
HEALTH2	0.030	0.010	0.059	0.074	0.124	0.042
ACCID2	0.025	-0.035	-0.032	-0.035	0.199	0.265
ALC3R2	0.084	-0.052	0.076	-0.000	0.204	0.381
SADD2	0.055	-0.025	0.086	-0.003	0.333	0.300
MAST2	0.023	-0.023	0.062	-0.017	0.146	0.325

	HMAX1	BINGE1	SYMPTOM1	CONTROL1	SPOUSE1	JOB1
INCOME2	0.089	0.057	0.070	0.110	0.018	0.076
NFEM2	0.016	-0.079	-0.060	-0.076	-0.047	-0.071
EDCYR2	0.053	0.063	0.091	0.110	0.046	-0.001
EMPLOY2	-0.074	-0.040	-0.066	-0.059	-0.005	0.020
ETHANOL2	0.401	0.094	0.260	0.140	0.165	0.003
HEAVY2	0.365	0.236	0.439	0.298	0.302	0.090
HMAX2	0.393	0.065	0.216	0.176	0.112	-0.019
BINGE2	0.114	0.397	0.326	0.229	0.187	0.057
SYMPTOM2	0.337	0.350	0.674	0.481	0.438	0.104
CONTROL2	0.221	0.314	0.440	0.531	0.396	0.151
SPOUSE2	0.117	0.303	0.370	0.389	0.616	0.194
JOB2	0.026	0.212	0.106	0.131	0.145	0.466
POLICE2	0.119	0.175	0.210	0.161	0.150	0.033
HEALTH2	0.107	0.091	0.099	0.111	0.072	-0.017

Table H3 (*continued*)

	HMAX1	BINGE1	SYMPTOM1	CONTROL1	SPOUSE1	JOB1
ACCID2	0.156	0.190	0.276	0.180	0.174	0.059
ALC3R2	0.253	0.402	0.473	0.433	0.471	0.199
SADD2	0.342	0.262	0.464	0.427	0.348	0.019
MAST2	0.114	0.405	0.389	0.394	0.363	0.179

	POLICE1	HEALTH1	ACCID1	ALC3R1	SADD1	MAST1
INCOME2	0.062	0.112	0.040	0.059	0.042	0.051
NFEM2	-0.027	-0.062	-0.063	-0.043	-0.009	-0.106
EDCYR2	0.067	0.046	0.001	0.061	0.010	0.068
EMPLOY2	-0.038	0.059	-0.086	-0.093	-0.097	0.011
ETHANOL2	0.120	0.027	0.170	0.194	0.273	0.070
HEAVY2	0.244	0.055	0.192	0.395	0.369	0.173
HMAX2	0.119	0.010	0.069	0.148	0.158	0.089
BINGE2	0.158	0.096	0.064	0.243	0.258	0.207
SYMPTOM2	0.240	0.057	0.288	0.514	0.524	0.302
CONTROL2	0.218	0.061	0.184	0.399	0.421	0.352
SPOUSE2	0.204	0.063	0.142	0.351	0.301	0.310
JOB2	0.061	0.028	0.059	0.124	0.061	0.144
POLICE2	0.424	0.004	0.178	0.159	0.115	0.193
HEALTH2	0.102	0.110	0.058	0.112	0.143	0.108
ACCID2	0.196	0.034	0.370	0.250	0.210	0.175
ALC3R2	0.256	0.066	0.257	0.500	0.455	0.338
SADD2	0.245	0.056	0.252	0.460	0.531	0.214
MAST2	0.303	0.125	0.165	0.284	0.220	0.636

Table H4
Variance-covariance matrix of measurement variables used in longitudinal models

	INCOME1	NFEM1	EDCYR1	EMPLOY1	ETHANOL1	HEAVY1
INCOME1	2.103					
NFEM1	-0.585	1.622				
EDCYR1	1.025	-0.108	8.078			
EMPLOY1	0.836	-0.212	1.012	4.611		
ETHANOL1	-0.019	-0.041	-0.006	-0.086	0.550	
HEAVY1	0.073	-0.089	0.109	0.004	0.146	0.600
HMAX1	0.009	-0.001	0.015	0.007	0.024	0.014
BINGE1	0.044	-0.057	0.102	0.011	0.056	0.292
SYMPTOM1	0.146	-0.135	0.342	-0.052	0.353	0.581
CONTROL1	0.156	-0.106	0.293	-0.017	0.169	0.300
SPOUSE1	0.026	-0.035	0.038	-0.011	0.081	0.151
JOB1	0.011	-0.018	0.006	-0.002	0.003	0.029
POLICE1	0.036	-0.026	0.095	-0.029	0.028	0.064
HEALTH1	0.016	-0.026	0.046	0.006	0.034	0.036
ACCID1	0.043	-0.052	0.001	-0.052	0.111	0.131
ALC3R1	0.125	-0.106	0.165	-0.110	0.250	0.427
SADD1	0.092	-0.079	-0.068	-0.299	0.564	0.702
MAST1	0.146	-0.314	0.530	0.080	0.276	0.879
INCOME2	1.431	-0.436	1.307	0.915	-0.039	0.060
NFEM2	-0.515	1.527	-0.200	-0.248	-0.047	-0.077
EDCYR2	1.106	-0.107	6.915	0.950	0.024	0.094
EMPLOY2	0.719	-0.378	0.843	2.822	-0.176	-0.089
ETHANOL2	-0.055	-0.021	0.037	-0.023	0.375	0.112
HEAVY2	0.022	0.002	0.094	-0.085	0.184	0.196
HMAX2	0.001	0.003	0.009	0.005	0.008	0.004
BINGE2	0.009	-0.006	0.039	0.011	0.035	0.113
SYMPTOM2	0.127	-0.089	0.315	0.029	0.347	0.452
CONTROL2	0.146	-0.063	0.255	-0.027	0.146	0.188
SPOUSE2	0.026	-0.019	0.048	-0.023	0.069	0.074
JOB2	-0.013	0.007	-0.026	-0.028	0.004	0.029
POLICE2	0.019	0.000	0.031	-0.026	0.020	0.067
HEALTH2	0.012	0.003	0.047	0.044	0.026	0.009
ACCID2	0.015	-0.018	-0.038	-0.031	0.061	0.084
ALC3R2	0.098	-0.053	0.175	-0.000	0.122	0.238
SADD2	0.144	-0.057	0.442	-0.011	0.446	0.419
MAST2	0.070	-0.062	0.369	-0.074	0.227	0.527

Table H4 (*continued*)

	HMAX1	BINGE1	SYMPTOM1	CONTROL1	SPOUSE1	JOB1
HMAX1	0.005					
BINGE1	0.006	0.274				
SYMPTOM1	0.033	0.384	2.174			
CONTROL1	0.014	0.223	0.940	1.020		
SPOUSE1	0.007	0.109	0.410	0.286	0.265	
JOB1	-0.000	0.026	0.050	0.052	0.026	0.034
POLICE1	0.003	0.043	0.184	0.100	0.045	0.008
HEALTH1	0.002	0.027	0.095	0.054	0.022	0.008
ACCID1	0.010	0.066	0.293	0.183	0.063	0.010
ALC3R1	0.024	0.281	1.158	0.721	0.328	0.043
SADD1	0.051	0.426	2.058	1.195	0.468	0.038
MAST1	0.027	0.691	2.060	1.452	0.670	0.143
INCOME2	0.009	0.044	0.150	0.161	0.013	0.021
NFEM2	0.001	-0.055	-0.116	-0.101	-0.031	-0.017
EDCYR2	0.010	0.094	0.382	0.315	0.067	-0.001
EMPLOY2	-0.011	-0.045	-0.207	-0.126	-0.005	0.008
ETHANOL2	0.021	0.038	0.294	0.109	0.065	0.000
HEAVY2	0.019	0.091	0.479	0.223	0.115	0.012
HMAX2	0.001	0.001	0.012	0.007	0.002	-0.000
BINGE2	0.003	0.075	0.174	0.084	0.035	0.004
SYMPTOM2	0.033	0.262	1.419	0.694	0.322	0.027
CONTROL2	0.013	0.139	0.550	0.454	0.173	0.024
SPOUSE2	0.003	0.067	0.230	0.166	0.134	0.015
JOB2	0.000	0.026	0.036	0.031	0.017	0.020
POLICE2	0.003	0.037	0.125	0.065	0.031	0.002
HEALTH2	0.002	0.013	0.041	0.031	0.010	-0.001
ACCID2	0.004	0.041	0.166	0.074	0.037	0.004
ALC3R2	0.014	0.169	0.562	0.352	0.195	0.030
SADD2	0.043	0.248	1.235	0.780	0.323	0.006
MAST2	0.017	0.445	1.204	0.834	0.391	0.069

	POLICE1	HEALTH1	ACCID1	ALC3R1	SADD1	MAST1
POLICE1	0.130					
HEALTH1	0.020	0.104				
ACCID1	0.056	0.034	0.277			
ALC3R1	0.123	0.075	0.220	1.384		
SADD1	0.171	0.098	0.401	1.603	4.873	
MAST1	0.325	0.241	0.350	1.395	1.861	8.083

Table H4 (*continued*)

	POLICE1	HEALTH1	ACCID1	ALC3R1	SADD1	MAST1
INCOME2	0.033	0.053	0.030	0.101	0.136	0.212
NFEM2	-0.013	-0.026	-0.043	-0.067	-0.026	-0.395
EDCYR2	0.068	0.042	0.002	0.204	0.064	0.553
EMPLOY2	-0.029	0.040	-0.095	-0.231	-0.450	0.068
ETHANOL2	0.033	0.007	0.069	0.175	0.462	0.152
HEAVY2	0.065	0.013	0.075	0.344	0.603	0.363
HMAX2	0.002	0.000	0.001	0.007	0.013	0.010
BINGE2	0.021	0.011	0.012	0.103	0.205	0.213
SYMPTOM2	0.123	0.026	0.217	0.863	1.652	1.227
CONTROL2	0.067	0.017	0.082	0.398	0.788	0.847
SPOUSE2	0.031	0.009	0.031	0.174	0.280	0.372
JOB2	0.005	0.002	0.007	0.034	0.032	0.096
POLICE2	0.061	0.000	0.038	0.075	0.102	0.221
HEALTH2	0.010	0.010	0.009	0.037	0.088	0.085
ACCID2	0.029	0.004	0.080	0.120	0.190	0.204
ALC3R2	0.074	0.017	0.109	0.474	0.809	0.773
SADD2	0.159	0.033	0.240	0.978	2.117	1.096
MAST2	0.229	0.084	0.183	0.701	1.017	3.793

	INCOME2	NFEM2	EDCYR2	EMPLOY2	ETHANOL2	HEAVY2
INCOME2	2.128					
NFEM2	-0.431	1.722				
EDCYR2	1.316	-0.236	8.093			
EMPLOY2	0.927	-0.402	0.760	4.454		
ETHANOL2	-0.080	-0.043	0.056	-0.172	0.590	
HEAVY2	-0.002	0.036	0.070	-0.205	0.194	0.547
HMAX2	0.002	0.002	0.007	-0.002	0.012	0.010
BINGE2	0.037	-0.007	0.043	-0.024	0.021	0.110
SYMPTOM2	0.177	-0.054	0.203	-0.148	0.393	0.570
CONTROL2	0.179	-0.042	0.220	-0.027	0.145	0.227
SPOUSE2	0.030	-0.019	0.054	-0.014	0.061	0.098
JOB2	0.006	0.008	-0.062	-0.004	0.001	0.020
POLICE2	0.017	0.005	0.023	-0.055	0.027	0.059
HEALTH2	0.014	-0.009	0.069	0.042	0.024	0.015
ACCID2	0.011	-0.005	-0.041	-0.051	0.062	0.060
ALC3R2	0.114	-0.035	0.143	-0.026	0.155	0.275
SADD2	0.202	0.009	0.412	-0.330	0.446	0.620
MAST2	0.133	-0.082	0.248	-0.046	0.154	0.387

Table H4 (*continued*)

	HMAX2	BINGE2	SYMPTOM2	CONTROL2	SPOUSE2	JOB2
HMAX2	0.001					
BINGE2	0.002	0.130				
SYMPTOM2	0.020	0.188	2.039			
CONTROL2	0.009	0.077	0.651	0.719		
SPOUSE2	0.002	0.039	0.300	0.184	0.178	
JOB2	0.000	0.009	0.041	0.051	0.016	0.055
POLICE2	0.001	0.029	0.121	0.102	0.027	0.044
HEALTH2	0.001	0.004	0.078	0.026	0.016	0.000
ACCID2	0.002	0.021	0.173	0.101	0.036	0.025
ALC3R2	0.009	0.089	0.695	0.345	0.179	0.036
SADD2	0.025	0.216	1.583	0.778	0.307	0.022
MAST2	0.006	0.210	1.142	0.739	0.381	0.116

	POLICE2	HEALTH2	ACCID2	ALC3R2	SADD2	MAST2
POLICE2	0.162					
HEALTH2	0.011	0.077				
ACCID2	0.068	-0.001	0.167			
ALC3R2	0.072	0.037	0.109	0.649		
SADD2	0.114	0.048	0.227	0.793	3.261	
MAST2	0.265	0.051	0.227	0.721	1.120	4.396