

CHAPTER II

LITERATURE REVIEW

Literature review is intended to provide a review of the literature offering evidence of the relationship between public health impacts of alcohol consumption and related harm, methods for quantifying alcohol caused morbidity and mortality, indicators of alcohol-related harm from health, police and other offices statistic, general surveillance system, and surveillance system for alcohol-related harm shown as below:

1. The Public Health Impact of Alcohol Consumption
 - 1.1. Health Effects of Alcohol Consumption
 - 1.2. Social Problems Associated with Alcohol Consumption
 - 1.2.1. Alcohol consumption and the workplace
 - 1.2.2. Alcohol consumption and the family
 - 1.2.3. Alcohol and poverty
 - 1.2.4. Alcohol and domestic violence
 - 1.3. Economic and Social Costs of Alcohol Consumption
2. Methods for quantifying alcohol caused morbidity and mortality
3. Indicators of problems mainly attributable to long-term use of alcohol
4. Indicators of harm attributable mainly to the short-term or acute effects of drinking alcohol
5. Surveillance System
 - 5.1 The role of public health surveillance
 - 5.2 Types of Surveillance System
 - 5.3 Characteristics of surveillance system
 - 5.4 Surveillance Systems and Data sources for alcohol consumption and related harm

1. The Public Health Impact of Alcohol Consumption

Alcohol has been consumed since ancient times. Throughout history, the drinking of alcoholic beverage has played an important role in social and cultural events in many societies.

Alcohol use remains deeply embedded in many societies. Globally, some 2 billion people consume alcoholic beverages. Alcohol is a source of pleasure to many and a source of income for governments. However, the cost to health is high-76.3 million people experience alcohol-use disorders, according to conservative estimates (World Health Organization, Geneva, 2004)

1.1 Health Effects of Alcohol Consumption

Alcohol use is related to wide range of physical, mental, and social harms. Alcohol consumption was linked to more than 62 disease conditions in a series of recent meta-analyses (English et al., 1995; Gutjahr, gmel&Rehm, 2001; Ridolfo & Stevenson, 2001; Single et al., 1999). The link between alcohol consumption and consequences depends a) on the two main dimensions of alcohol consumption: average volume of consumption and patterns of drinking; and b) on the mediating mechanisms: biochemical effects, intoxication, and dependence (see Figure 2 for the main paths)

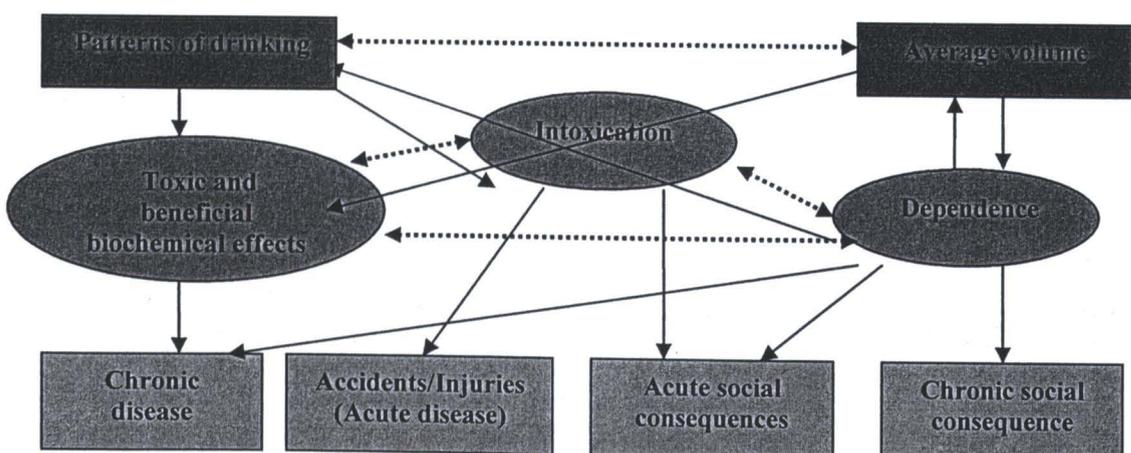


Figure1 Model of alcohol consumption, mediating variables, and short-term and Long-term consequences

Source: Rehm et al. (2003 c) cited in WHO Global Status Report on Alcohol 2004.

Direct biochemical effects of alcohol may influence chronic disease either in a beneficial (e.g., protection against blood clot formation of moderate consumption (Zakhari, 1997), which is protective for coronary heart disease) or harmful way (e.g., toxic effects on acinar cells triggering pancreatic damage (Apte Wilson & Korsten, 1997).

Intoxication is a powerful mediator many for acute outcomes, such as accidents, or intentional injuries or deaths, domestic conflict and violence (Klingemann & Gmel, 2001; Gmel & Rehm, 2003).

Alcohol dependence is a powerful mechanism sustaining alcohol consumption and thus affecting both chronic and acute consequences of alcohol, though it is also a consequence of drinking itself.

Alcohol consumption ranks among the leading causes of death and poor health. Average volume of consumption as a risk factor is mainly linked to long-term consequences (WHO, 2000a). Acute effects of alcohol related to injury and death are much better predicted by patterns of drinking (Rehm et al., 1996; Bondy, 1996; Puddey et al., 1999), although there is also an association with volume of drinking. For example, the same overall average volume of alcohol can be consumed in small quantities regularly with meals (e.g. two drinks a day with meals) or in large quantities on few occasions, (e.g. two bottles of wine on a single occasion every Friday). In other words, the impact of an average volume of consumption on mortality or morbidity is partly moderated by the way alcohol is consumed by the individual, which in turn is influenced by the social context (Room & Makela, 2000). It will also be argued but it should be noted that patterns of drinking have not only been linked to acute health outcomes such as injuries, but also to chronic diseases such as coronary heart disease (CHD) and especially sudden cardiac death. Alcohol can influence many organs such as the liver, the digestive system (stomach, esophagus, and pancreases), the heart and circulatory system, the bones skin and muscles and the brain and nervous system. Other effects including mental health problems, sexual problems, infectious disease, malnutrition, cancer, and development of the fetus in pregnant women.

1.1.1 The liver

The liver is responsible for metabolising alcohol. If the liver has to break down too much alcohol, its other functions are adversely affected and the organ can become damaged. In 2003, there were 12,207 deaths from alcohol-related chronic liver disease (CLD). Approximately 75% of those deaths occurred among men (CDC, NCHS, 2003). In the United States approximately 40% of the deaths from unspecified liver disease attributable to heavy alcohol consumption (Parrish, 1993). These are three stages of damage including fatty liver, alcoholic hepatitis and alcoholic cirrhosis.

1) Fatty liver

Fatty liver can be detected by liver function tests. Fatty liver may not progress to more severe damage, and can be reversed by the cessation of drinking. However, it is an indicator that more permanent damage may occur in the future. Fatty liver is very common amongst heavy drinkers.

2) Alcoholic Hepatitis

The onset of alcoholic hepatitis may be sudden and the symptoms severe. It may be indicated by loss of appetite, vomiting, severe abdominal pain, and jaundice. Abstinence and a good diet may lead to full recovery in mild to moderate cases. Heather et al (2001) found that very severe cases can be fatal, and alcoholic hepatitis has a general mortality of 15-20%.

3) Alcoholic Cirrhosis

Cirrhosis is the result of continuous liver damage. Normally when the liver is damaged it can regenerate itself. In cirrhosis the process of healing fails and scar tissue develops, preventing the liver from carrying out its normal function.

There is no cure for cirrhosis but sufferers who manage to stop drinking completely have a far better chance of survival. Those who continue to drink will go on to develop complete liver failure and a further 10% of sufferers go on to develop liver cancer, fatal in about six months (DOH, 2001).

Cirrhosis can cause scar tissue to block the flow of blood into the liver. This increases the pressure in the portal vein (portal hypertension) and causes veins in the esophageal varices. Ruptured varices bleed profusely and can be fatal.

1.1.2 The digestive system (Stomach, esophagus and pancreas)



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The damaging effects of heavy alcohol consumption are not limited to the liver; a high alcohol intake can also have negative effects on the rest of the digestive system.

1) Stomach

Gastritis is the inflammation of the stomach lining. There are two forms of gastritis acute and chronic-both of which are common amongst heavy drinkers. Acute gastritis may be characterized by nausea, cramps, fever and vomiting (which may include blood where there is also ulceration). Chronic gastritis persists over a prolonged period and may have no obvious symptoms. Where they occur, symptoms of chronic gastritis may include abdominal pain, heartburn, loss of appetite, loss of weight, nausea and vomiting.

2) Esophagus (gullet)

Excessive alcohol consumption can cause reflux; a process whereby digestive juice from the stomach is forced up into the esophagus. As the esophagus lacks the protective lining of the stomach, reflux causes a burning sensation, often referred to as heartburn. Reflux can cause esophagitis (an inflammation of the lining of the esophagus) and lead to ulceration at the junction of the stomach and esophagus. Violent retching can cause tearing and bleeding.

3) Pancreases

The pancreas is responsible for the production of the enzymes required for digestive of insulin, which is needed to control blood sugar levels. Pancreatitis is the inflammation of the pancreases. Alcohol is responsible for approximately 80% of acute pancreatitis cases and about half of chronic pancreatitis cases (ONS, 2000). Acute pancreatitis is accompanied by attacks of extreme pain and vomiting often triggered by about of heavy drinking. Heavy drinking young males are the predominant victims of acute pancreatitis.

1.1.3 The heart and circulatory system

1) Hypertension

High blood pressure or hypertension makes a person more susceptible to heart disease and strokes. At least 5-7% of diagnosed cases of hypertension are due to heavy drinking, its commonest cause after obesity (Heather et al, 2001). Binge drinking has been linked to significantly raised blood pressure. Men

who regularly drink four or more units a day are also likely to have blood pressure high enough to cause concern.

2) Sudden Death

Binge drinking, especially by people who are not used to drinking, can cause irregular heartbeats, palpitations, and in rare cases, sudden death.

3) Alcoholic cardiomyopathy

This is a chronic disease of the heart muscle found in people who have been regularly drinking 10 or more units a day for 10 or more years. For this reason, it is sometimes called “cirrhosis of the heart”. Symptoms include shortness of breath, swelling of the ankles and blueness of the extremities. In 1999, 137 people died from alcoholic cardiomyopathy (ONS, 2000).

4) Stroke

Regularly drinking more than three units a day increase the risk of one of hemorrhagic stroke-one of the more uncommon types of stroke.

1.1.4 The bones and skin

1) Bone

Heavy drinking contributes to osteoporosis. These make bones thin, soft and liable to collapse, especially in the lower spine, pelvis and thigh. Osteoporosis affects both women and, increasingly, middle aged and young men. Heather et al (2001) found that around 50% of alcohol misuses have either osteoporosis or osteopenia (reduced bone mass).

2) Skin

Heavy drinking is one of many factors that can contribute to psoriasis, especially in men. Psoriasis can take a different form in heavy drinkers: very inflamed and resistant to treatment until alcohol consumption is reduced.

1.1.5 The Brain and nervous system

Alcohol is a central nervous system depressant. The immediate effects of alcohol consumption can include slurred speech, loss of self-control and blackouts. Over a long period, however, problem drinkers and heavy social drinkers may develop various types of brain damage.

1) Wernicke’s encephalopathy

Wernicke's encephalopathy is a brain disorder caused by a lack of thiamine (vitamin B1). Lack of thiamine is a common condition amongst heavy drinkers due to poor diet and/or frequent vomiting, both of which deplete vitamin stores. The onset of Wernicke's can be quite sudden, in some cases within hours, and needs emergency hospital treatment. Large doses of thiamine by intravenous or intramuscular injection can treat the condition.

The symptoms can be easy to miss and in some cases are mistaken for simple drunkenness. They include confusion about the time or place, drowsiness, poor balance, double vision and abnormal eye movement or paralysis of eye muscles.

It has been reported that 20% of people who develop Wernicke's encephalopathy die as a result of the condition and that 80% of survivors go on to develop Korsakoff's psychosis (Thompson, 1997).

2) Korsakoff's Psychosis

If Wernicke's encephalopathy is left untreated, Korsakoff's psychosis can develop. It is signified by profound memory loss, affecting both the ability to recall events and to form new memories. Korsakoff patients often fill out their memory gaps with elaborate fantasies, a process known as confabulation. This state may be treatable by prolonged thiamine treatment and abstinence from alcohol, but improvement is seen only about a third of cases. Korsakoff's psychosis can develop without Wernicke's encephalopathy.

3) Alcoholic Dementia

Patient clinically defined as alcohol dependent may also suffer more generalized brain damage. Even when general intelligence appears intact, brain scans can show loss of brain tissue and mental tests may reveal specific abnormalities in abstract reasoning, learning new skills and coping with complex Visio-spatial problems.

4) Cerebellar Degeneration

Damage to the part of the brain responsible for co-ordinating body movements may accompany other damage to the nervous system. This damage may manifest itself as unsteadiness when walking and may impair with abstinence.

5) Peripheral neuritis or neuropathy

Peripheral neuritis is a disorder of the nervous system. Symptoms include weakness tingling, muscle pains, numbness and a sensation often described as “burning feet”. While the cause is not clear, it is probably linked to a shortage of B vitamins. Slow recovery is possible with absence, vitamin supplements, and a good general diet.

1.1.6 Mental Health Problems

Heavy drinking is closely linked with mental illness (psychiatric morbidity). Both mental illness and alcohol problems carry a powerful social stigma, and in more severe cases carry a potential risk of violence or suicide, a high relapse rate and can lead to serious personal and social problem. The relationship between alcohol and mental health is complex. However, research has shown that heavy drinking can contribute to anxiety and depression accurate or uncover a predisposition to a psychiatric disorder, and psychosis. In addition, excessive drinking has been linked to 65% of suicides (DOH, 1993).

1.1.7 Infectious Diseases

1) HIV

Alcohol use by young adults is associated with earlier initiation of sexual activity, unprotected sexual intercourse; multiple partners and an increased risk for sexually transmitted diseases. In 1998, an estimated 400,000 college students between the ages of 18 and 24 had unprotected sex after drinking, and estimated 100,000 had sex when there were so intoxicated they were unable to consent (Hinson, 2002). People who abuse alcohol more likely to engage in risky behaviors, such as having unprotected sex, having more sex partners, and using intravenous drugs. Recent studies have suggested a link between the rate of alcohol consumption and the progression of the HIV virus. A 1998 study showed that a heavy alcohol user is generally someone who progresses rapidly to AIDS after seroconversion (the development of antibodies in response to infection) (Heather et al, 2001). In a single act of unprotected sex with an infected partner, a teenage woman has a 1% risk of acquiring HIV, a 30% risk of getting genital herpes, and a 50% chance of contracting gonorrhoea (Alan Guttmacher Institute, 1994).

2) Tuberculosis

While definite figures are hard to obtain due to the multitude of factors affecting the spread of tuberculosis, it still seems apparent from studies of groups of dependent drinkers followed for many years, that groups of alcohol dependent drinkers have a prevalence of tuberculosis 15-200 times that of control groups (Heather et al, 2001).

1.1.8 Malnutrition

Alcohol contains calories and as such, many contribute to obesity. Despite this, however, alcohol is of no nutritional benefit and heavy drinkers may be at risk of malnutrition. This may be due to loss of appetite caused by nausea or illness or because all available money has been spent on alcohol. Poor nutrition is linked to the development of peripheral neuropathy, Wernicke-Korsakoff Syndrome, Cirrhosis and decreased ability to fight infection.

1.1.9 Cancer

1) Cancers of the mouth, larynx (voice box), pharynx, and esophagus

Alcohol-related cancers include oral-pharyngeal, esophagus (squamous cell type), prostate, liver, and breast. In general, the risk of cancer increases with increasing amounts of alcohol. People who drink more than five units a day have an increased risk of developing these cancers. English & Holman (1995) found that excessive drinkers were 4 times more likely to developed esophageal cancer than non-drinkers. While as American Cancer Society, (2002) found that oral cancers were six times more common in heavy alcohol users than in non-alcohol users. Even people drinking less than (2.5-5 units a day) may face a slightly increased risk. It is estimated that between 25 and 50% of cancers of the head and neck are due to alcohol. Recent studies have found that 80-90 % of cancers in there area could be avoided by abstaining from smoking and drinking (Heather et al, 2001).

2) Breast cancer

Friedenreich C.M. et al (1993) Chronic alcohol consumption has been associated with a small (average 10 %) increased in a women's of breast cancer. Several studies have suggested a link between alcohol and breast cancer. A recent review of international research in this area found that a women's relative risk

of breast cancer increased by 6% for each additional unit consumed per day (Cancer Research UK, 2002). Recent studies suggest that alcohol may play an indirect role in the development of breast cancer. Reichman, M.E. et al (1993) indicated that alcohol increased estrogen levels in premenopausal women, which in turn, may promote breast cancer. American Cancer Society (2002) compared to non-drinkers, women who consume an average of 1 alcoholic drink per day increase their risk of breast cancer by approximately 7%. Women who consume an average of 2 to 5 drinks per day increase their risk of developing breast cancer by approximately 59% compared to that of non-drinkers.

1.1.10 Development of the fetus in pregnant women

During pregnancy, alcohol from the mother's blood stream crosses the placenta and is taken up by the developing baby. The fetus is most sensitive to alcohol during the earliest stages of pregnancy, when the complex organs and nervous system are being formed.

1) Low birth weight

Alcohol consumption more than 10-15 units a week will result in a higher chance of giving birth to an underweight baby.

2) Fetal alcohol syndrome/Fetal alcohol spectrum disorder

Fetal alcohol syndrome (FAS) is the names given to a group of difficulties seen in the babies of very heavy drinking mothers. Symptoms include: growth deficiencies central nervous system defects, lowered IQ and facial malformations.

1.1.2 Acute Adverse Health Consequences: Accidental Injury and Poisoning, Suicide, Interpersonal Violence and Assault

Alcohol consumption produces effects that are often perceived as positive, as evidenced by the widespread popularity of drinking. Nevertheless, it also leads to actions that result in unintentional injury and death.

1.1.2.1 Alcohol and Accidents

Impaired psychomotor function and increased risk taking behaviors are the two key inter-raftered factors involved in alcohol-related accidents (Heather, et al, N1994). Exposure to alcohol has been shown to affect the function of various parts of the brain resulting in the disruption of muscular co-ordination reduced cognitive

powers and increased feelings of euphoria (Volkow, N, Wang, G and Doria, JJ 1995). Alcohol plays a specific role in various types of accident including:

1) Drink-driving accidents

- At 20-50 mg blood alcohol concentration (BAC) (1½-3 units for men and ½ -2 units for women) the ability to see or locate moving lights correctly is diminished as is the ability to judge distances. The tendency to take risks is increased.
- At 50-80 mg alcohol/100 ml blood(3-5 units for men, 2-3 for women)the ability to judge distances is reduced, so is the adaptability of the eyes to changing light conditions, and sensitivity to red lights is also impaired. Reactions are lower and concentration span is shorter. By the time the legal limit is reduced, drinkers are 5 times more likely to have a driving accident than before starting drinking.
- At 80-120 mg alcohol/100, ml blood (5-8 units for men, 3-5 for women) euphoria sets in and with it an over-estimation of one's abilities leading to reckless driving. The driver will begin to suffer impairment of peripheral vision (resulting in accidents due to hitting vehicles in passing), impairment of perception of obstacles and of ability to assess dimension. At 120 mg alcohol/100ml blood the driver is 10 times as likely to have an accident.

2) Drowning

Most drowning takes place in unsupervised waters; intoxicated people are more inclined to swim alone at night or to boat without flotation devices. Alcohol may induce swimmers to stay in the water too long, by creating a false sense of warmth, which can result in hyperventilation and increased venous pressure and pulse rate leading to cardiovascular collapse.

3) Burns

Alcohol can cause drowsiness, which may prompt some people to fall asleep while smoking. Intoxication can make people less alert to signs of fire and can heighten feelings of disorientation making it difficult to escape.

4) Workplace accidents

With drink impairing concentration judgment and co-ordination, accidents can affect the drinker and those around them.

5) Falls

Hingson, R, and Howland, J 1993 found that at BAC of 100mg% (5-6 units for men) a significant amount of swaying can occur when standing upright. All this level of intoxication, people find it difficult to concentrate on different tasks and experience visual impairment. All of which can contribute to falls. Slower reflexes and diminished co-ordination can also mean heavier falls and less ability to respond to avert a head injury. The most common forms of non-traffic accident to which alcohol contributes are non-fatal falls, with alcohol being implicated in 28% of falls within the home and 33% of falls that occur during leisure activities (Consumer Safety Unit, 1993).

1.2 Social Problems Associated with Alcohol Consumption

Alcohol consumption is linked to many harmful consequences for the individual drinker, the drinker's immediate environment, and society as a whole. Such social consequences as traffic accidents, workplace-related problems, family and domestic problems, and interpersonal violence have been receiving more public or research attention in recent years, indicating a growing interest in a broader concept of alcohol-related consequences. On the other hand, however, social consequences affect individuals other than the drinker e.g. passengers involved in traffic casualties, or family members affected by failure to fulfill social role obligations, or incidences of violence in the family. Ultimately, however, these events have an impact on society as a whole insofar as they affect economic productivity or require the attention and resources of the criminal justice or health care system, or of other social institutions.

1) Alcohol Consumption and Workplace

Heavy drinking at the workplace may potentially lower productivity. Sickness absence associated with harmful use of alcohol and alcohol dependence entails a substantial cost to employees and social security systems.

A number of studies have demonstrated an association between heavy drinking or alcohol abuse and unemployment. A casual association may go in either

direction, heavy drinking may lead to unemployment, but loss of work may also result in increased drinking, which may become heavy drinking.

2) Alcohol Consumption and the Family

It is well established that drinking can severely impair the individual's functioning in various social roles. Alcohol misuse is associated with many negative consequences for both the drinker's partner as well as the children. Maternal alcohol consumption during pregnancy can result in fetal alcohol syndrome in children, and parental drinking is correlated with child abuse and influences a child's environment in many social, psychological, and economic ways. Drinking can impair performance as a parent, as a spouse or partner, and as a contributor to household functioning. There are also other aspects of drinking which may impair functioning as a family member. In many societies, drinking may be carried out primarily outside the family and the home. In this circumstance, time spent while drinking often competes with the time needed to carry on the family life. Drinking also costs money and can influence upon resources particularly of a poor family, leaving other family members destitute. Also, it is worth noting that specific intoxicated events can also have lasting consequences, through home accidents and family violence. Adverse child health effects of alcohol use are primarily through two distal determinants (indirect effects)-forgone household disable income and caretaker' time for childcare. Diversion of scant economic resources for alcohol use that could have otherwise been used for seeking health care may lead to self-care or delay in seeking health care. The other potential ways by which alcohol use can reduce the household income are through morbidity associated with the drinking habit among the consuming individuals, resulting in increase in medical expenditures and loss of income due to wages, and, sometimes, resulting in the premature death of sole wage earners in a household.

Implicit in the habitual drinker's potential impact on family life is the fact that the drinking and its consequences can result in substantial mental health problems of family members. The effects of men's drinking on other members of the family is often particularly on women in their roles as mothers or wives of drinkers. The risks include violence, HIV infection, and an increased burden in their role of economic providers.

3) Alcohol and Poverty

The economic consequences of expenditures on alcohol are significant especially in high poverty areas. Besides money spent on alcohol, a heavy drinker also suffers other adverse economic effects. These include lowered wages (because of missed work and decreased efficiency on the job), lost employment opportunities, increased medical expenses for illness and accidents, legal cost of drink-related offenses, and decreased eligibility of loans.

4) Alcohol and Domestic Violence

Alcohol is present in a substantial number of domestic violence accidents. The most common pattern is drinking by both offender and victim. Alcohol has been shown to be a significant risk factor for husband-to-wife violence, and the relationship between alcohol and domestic violence is complex.

Drinking frequently has been associated with interfamily violence. The excessive alcohol use is a strong and consistent correlate of marital violence, but that violence rates vary based on research designs, methodologies, and samples. Therefore, the role of alcohol remains unclear. Studies based on interviews with abused wives tend to report higher proportions of alcohol involvement than do general population studies or police samples. In a study, examining episodes of domestic violence reported to the police in Zurich, Switzerland, evidence of alcohol involvement was found in 40% of the investigated situations. Police officers thus believed there was a clear link between alcohol and violence in at least 26% of the cases studied (Maffli & Zumbrunn, 2003).

Regarding partner violence, research evidence indicates that it is more strongly associated with heavy drinking, whether usual or occasional, than is non-partner violence, and conflicts as to whether drinking by the victim makes violent acts by a partner more likely. That alcohol consumption has a stronger association with partner violence than with no partner violence may be a matter of access, with partners having more contact and thus more opportunities for violent encounters (Gmel&Rehm, 2003). Studies also report an association between drinking patterns and intimate partner violence; excessive drinkers and alcohol-dependent individuals are more likely to act violently toward their intimate partners (White& Chen, 2002).

In a 2000-2001 survey of 5109 women of reproductive age in the Rakai District of Uganda, it was found that the strength of the association between alcohol consumption and domestic violence was particularly noteworthy. Women whose partner frequently or always consumed alcohol before having sex faced risks of domestic violence almost five times higher than those whose partners never drank before having sex. Of women who recently experienced domestic violence, 52% reported that their partner had consumed alcohol and 27% reported that their partners had frequently consumed alcohol. This finding supports the conclusion that alcohol may play a direct precipitating role for domestic violence (Koenig et al., 2003).

In a study of 180 women seeking prenatal care in rural South India, it was found that 20% of the women reported domestic violence and 94.5% of these women identified their husbands as the aggressors. Husband's alcohol use was a significant risk factor for domestic violence (Halasyamani, Davis & Battacharjee, 1997). The role of alcohol in domestic violence is also cited in another Indian study that found that 33% of spouse-abusing husbands were using alcohol. Of these 15% were occasional, 45% frequent and about 40% were daily users of alcohol. More than half of the spousal abuse took place during the period of intoxication (AIIMS, 1997). A cross-sectional study of a random sample of 275 women in Barranquilla, Colombia found that habitual alcohol consumption in the women and in the spouses were factors associated with marital violence (Tuesca & Borda, 2003).

1.3 Economic and Social Costs of Alcohol Use

On the assumption that the harmful effects of drinking can be evaluated in monetary terms, health researchers and economists have attempted to estimate the costs of alcohol consumption to society. According to Klingemann & Gmel (2001), social costs are largely defined as costs to society, i.e. all costs arising from alcohol consumption that are not borne exclusively, knowingly and freely by the drinker, such as spending on the drinks. Thus, social costs are the negative economic impact of alcohol consumption on the material welfare of society. When defining costs, a key distinction is made between direct and indirect costs. According to Harwood, Fountain & Livermore (1998, cited in Klingemann & Gmel, 2001), direct costs refer to the value of goods and services actually delivered to address the harmful effects of

alcohol consumption. In contrast, indirect costs represent the value of personal productive services that are not performed because of the adverse consequences of drinking.

Single and Colleagues (2003) summarize the many purposes that estimates of the social and economic costs of alcohol use can serve:

- 1) Economic cost estimates can be used to argue or justify certain policies on alcohol i.e. such policies to reduce the harm associated with alcohol use should be given a high priority on the public policy agenda. The public is entitled to a quality standard against which individual cost estimation studies can be accessed.
- 2) Cost estimates help to appropriately target specific problems and policies. It is important for policy makers to be aware of which psychoactive substances involve the greatest economic costs. For example, the recent study conducted in Australia concluded that the costs of alcohol (and tobacco) far exceed the social costs from illicit drugs, thus drawing greater attention on public policy towards the licit drugs. The specific types of cost may also draw attention to specific areas, which need public attention, or where specific measures may be effective.
- 3) Economic costs studies help to identify information gaps, research needs, and desirable refinements to national statistical reporting systems.
- 4) The development of improved estimates of the costs of alcohol abuse offers the potential to provide baseline measures to determine the efficacy of drug policies and programmers intended to reduce the damaging consequences of alcohol use.

2. Methods for quantifying alcohol-caused morbidity and mortality

The existence of the comprehensive review of English et al (1995) in which the entire international science literature on alcohol and health at that point in time was systematically summarized and analyzed. This information provides a methodology and a starting point for estimating the proportions of 38 causes of death, injury, or illness proved to be at least partly caused by alcohol. While the adverse health consequences are only part of the total burden of harms borne by alcohol

consumption, most countries in the world have some form of data on causes of death, which apply standard international classification systems to causes of illness and injury (ICD-9, ICD-10, and DSM-IVR).

The major approach to use of death, injury and illness data to develop alcohol-related harm indicators is to estimate the proportion of different types of death illness and injury that are caused by drinking alcohol. These estimates are made on the basis of international research and local data on the prevalence of conditions and also of drinking at medium and high risk levels. Methods for estimating these called “Aetiologic Fractions” (AFs).

Aetiological Fractions also known as an attributable proportion or attributable risk which is a form of indirect quantification of morbidity and mortality due to a specified risk factor. Indirect methods involve the estimation of a probability measure of the likelihood of causation by the risk factor which is then applied to the total number of deaths, illnesses or injuries resulting from a specific cause. For example, if there is a probability (the etiological fraction) and the total number of low-birth weight babies in a population gives an estimate of the number of low-birth weight cases attributable to alcohol consumption.

“Alcohol relatedness” varies across diseases. This is commonly expressed in alcohol attributable fractions (AAF). There are different ways to determine AAFs of diseases. One is the indirect way, where relative risk estimates derived from meta-analyses are combined with country-specific disease prevalence to yield country-specific AAFs. The second is to use directly estimated AAFs, e.g. the percentage of traffic accidents where an involved person was tested positive for a blood alcohol concentration (BAC) exceeding a certain amount. For most chronic diseases the indirect method is used behind this calculation stands the assumption that the mechanism for the development of a disease depend mainly on the consumed amount of alcohol. Therefore, meta-analytical pooling of epidemiologic studies across different countries and regions all over the world can derive Relative Risks (RR).

Examples for consequences for which the AAFs are commonly directly derived are road accidents for which an alcohol attributable fraction is based on whether the accident responsible driver tested positive for alcohol and to what degree (e.g. at blood alcohol concentration $BAC \geq 0.05\%$). Wholly Alcohol-Attributable

Diseases: A number of diseases are by definition fully attributable to alcohol (AAF =1 or 100%). These are listed in table 1

Table 1 Alcohol-related underlying causes of death, alcohol-attributable fractions (AAFs), and ages for which AAFs apply

Underlying Cause of Death (ICD-10 code)	AAF	Age
Causes of Death With Explicit Mention of Alcohol		
Alcoholic psychoses(F10.5)	1.00	≥0
Alcohol dependence syndrome (F10.2)	1.00	≥0
Nondependent abuse of alcohol (F10.1)	1.00	≥0
Alcoholic polyneuropathy (G 62.1)	1.00	≥0
Alcoholic cardiomyopathy(I 42.6)	1.00	≥0
Alcoholic gastritis (K 29.2)	1.00	≥0
Alcoholic fatty liver (K 70.0)	1.00	≥0
Acute alcoholic hepatitis (K 70.1)	1.00	≥0
Alcoholic cirrhosis of liver (K 70.3)	1.00	≥0
Alcoholic liver damage, unspecified (K 70.9)	1.00	≥0
Excess blood alcohol level (R 78.0)	1.00	≥0
Accidental poisoning by ethyl alcohol, not elsewhere specified (T 59.8)	1.00	≥0
Other Alcohol-Related Diseases		
Pulmonary and other respiratory tuberculosis (011-012)	0.25	≥35
Malignant neoplasm of lip, oral cavity and pharynx (140-149)	0.50*	≥35
Malignant neoplasm of esophagus (150)	0.75	≥35
Malignant neoplasm of stomach (151)	0.20	≥35
Malignant neoplasm of liver and intrahepatic bile ducts (155)	0.15	≥35
Malignant neoplasm of larynx (161)	0.50*	≥35
Diabetes mellitus (250)	0.05	≥35
Essential hypertension (401)	0.08	≥35

Table 1 Alcohol-related underlying causes of death, alcohol-attributable fractions (AAFs), and ages for which AAFs apply (Cont.)

Underlying Cause of Death (ICD-10 code)	AAF	Age
Cerebrovascular disease (430-438)	0.07	≥35
Pneumonia and influenza (480-487)	0.05	≥35
Diseases of esophagus , stomach and duodenum (530-537)	0.10	≥35
Cirrhosis of liver without mention of alcohol (571.5)	0.50	≥35
Accidental falls (E880-E888)	0.35	≥15
Accidental caused by fire and flames (E890-E899)	0.45	>0
Accidental drowning and submersion (E910)	0.38	>0
Suicide and self-inflicted injury (E950-E959)	0.28	≥15
Homicide and injury purposely inflicted by other persons (E960-E969)	0.46	≥15
Other injuries and adverse effects: Excessive cold (E901) Inhalation and ingestion of food causing obstruction of respiratory tract of suffocation (E911 Striking against or struck accidentally by objects or persons (E917) Caught accidentally in or between objects (E918) Accidents caused by machinery (E919) Accidents caused by cutting and piercing instruments or objects (E920)	0.25	≥15

* AAF is 0.40 females.

Sources: Table adapted from Schultz, J., Rice, D., and Parker, D. (1990).

3. Indicators of Problems mainly attributable to long-term use of alcohol

3.1 Disease of the Liver

Cirrhosis is a chronic disease of the liver characterized by an increase in the connective tissue and alteration in gross and microscopic make-up. Deaths from liver cirrhosis have long been used as the primary measure of the rate of severe alcohol-related health problems. Chronic excessive alcohol use is the most frequently cited



cause of illness and death from liver disease and long-term heavy drinkers are over-represented in cirrhosis cases. The review by Shults et al (1991) estimated that 50 % of unspecified liver cirrhosis cases in the US were due to alcohol while the English et al (1995) review concluded that 54 % of unspecified cirrhosis in males and 43% of such cases among females in Australia could be attributed to alcohol.

Cirrhosis mortality data can be obtained from death certificate information, which generally includes date and time of death, a primary classification of cause, and place of death.

3.2 Mental Health Problems

Alcohol is by definition a causal factor in alcoholic psychosis, alcohol dependence syndrome, and harmful alcohol use. In Canada 1992 all alcohol-caused hospital separations, 6% were for alcoholic psychosis, 16.6% for alcohol dependence syndrome, and 3.6% for non-dependent abuse of alcohol. In Russia, officially recorded rates of alcohol dependence and alcoholic psychosis combined were 1.8% of the population while epidemiological surveys suggest the higher rate of between 3% and 3.5% (Vroublevsky and Harwin, 1998).

Alcohol dependence refers to a disease that is characteristic by abnormal alcohol-seeking behavior that leads to impaired control over drinking. Diagnosis of alcohol dependence focuses on an interrelated cluster of psychological symptoms, such as craving; physiological signs such as tolerance and withdrawal; and behavioral indicators such as the neglect of social, occupational, or recreational activities in favors of drinking.

The concept of alcoholism has been replaced with the terms alcohol dependence and alcohol abuse/harmful use of alcohol. The diagnostic criteria focus on patterns of use that lead to clinically significant impairment or distress. ICD-9 and ICD-10 requires evidence of either physical or psychological harm while DSM-IV requires that at least one of the following is present 1) failure to fulfill major role obligations at work, school or home 2) recurrent drinking in situations in which use is physically hazardous 3) recurrent alcohol-related legal problems; and 4) continued use despite a social or interpersonal problem caused or exacerbated by the

effects of alcohol. Alcohol dependence is coded as 303 (ICD-9) or 303.90 (DSM-IV); alcohol abuse/harmful use is coded as 305.0 in both ICD-9 and DSM-IV systems.

3.3 Fetal alcohol syndrome

A variety of studies supports the conclusion that chronic heavy maternal drinking is a necessary causal factor in “fetal alcohol syndrome” (FAS) (Knupfer1991; Stratton et al.1996). FAS is a cluster of abnormalities occurring in children born of women having histories of relatively high levels of alcohol consumption during pregnancy. A diagnosis of FAS can only be made when signs of abnormality exist in each of the following categories : growth retardation(weight or length below the 10th percentile when corrected the gestational age), central nervous system involvement(neurological abnormality such as hearing disorders development delay behavioral dysfunction or defect, intellectual impairment such as a learning disability or mental retardation and /or structural abnormalities such as brain malformations); and a characteristic face (narrow eye openings elongated and flattened mid- face thin upper lip, and /or underdeveloped groove between the upper lip and the nose).Estimates of the incidence of FAS may be influenced by a number of factors. The individual features of FAS may result from a variety of adverse influence (e.g., poor nutrition, family violence, or substance abuse, mother’s history of obstetric problems) independent of alcohol consumption or interacting with alcohol during pregnancy. English et al (1995) concluded in their review that high levels of alcohol consumption were associated with a higher risk of birth defects; they also concluded that the prevalence of heavy drinking among Australian women was so low that it would not measurably contribute to the overall incidence of fetal damage or birth defects.

3.4 Cancer

Alcohol consumption has been linked to an increased risk for various types of cancer. A meta-analysis by Vincenzo et al (2001) found that alcohol most strongly increased the risks for cancers of the oral cavity, pharynx, esophagus, and larynx. The Shultz (1991) review of epidemiological studies on the impact of alcohol consumption concluded that 50% of all oral cancer deaths, male and female, are due

to alcohol. The English et al (1995) review found that there was sufficient evidence of a causal relationship between alcohol and liver cancer, thereby attributable 18% of liver cancer deaths to alcohol. Similarly, to Shultz et al (1991) attributed 15% of such deaths to alcohol. However, in a more recent review by Farber (1996) it was concluded that there was no convincing evidence that alcohol played a direct causal role in the development of liver cancer. The potential risk of female breast cancer deserves special attention because of it is a major cause of death among women in most Western societies. A review of the evidence by the WHO Regional Office for Europe (Anderson et al, 1993) found mixed evidence. Eleven of 17 studies showed a significant positive relationship, finding a significant risk of breast cancer associated with alcohol consumption while six found no significant. The English et al (1995) review of an etiologic Fraction associated with alcohol consumption found limited evidence that alcohol is a causal factor in breast cancer and attributed a modest 3% of total breast cancer morbidity and mortality to high-risk alcohol consumption. A meta-analysis by Longnecker (1994) also showed a modest but consistent linear relationship, while Howe et al (1991) found a stronger association between heavy drinking and breast cancer. Several recent meta-analyses and critical reviews have all confirmed that there is sufficient evidence to determine that alcohol is a cause of female breast cancer (Single et al, 1999; Smith-Warner et al, 1998). In particular, from their review of seven prospective studies, Smith-Warner et al (1998) found that the risk of breast cancer increased by almost 10% with each additional 10g of alcohol consumed per day. Several possible casual mechanisms between alcohol and female breast cancer have been suggested, including hormonal influences and circulating levels of acetaldehyde.

3.5 Cardiovascular Disease

Cardiovascular disease is the leading cause of death in many countries. This includes high blood pressure (hypertension), stroke, arrhythmias, cardiomyopathy and coronary heart disease (including sudden coronary death). Alcohol is the prime cause of alcoholic cardiomyopathy. Thus, with regard to cardiovascular diseases; alcohol appears to be a causal factor in stroke, high blood pressure (hypertension), cardiomyopathy and heart failure. The relationship between alcohol consumption and

stroke is complex. On the one hand, alcohol consumption at high levels is associated with high blood pressure (hypertension), which is strong risk factor for stroke. On the other, at low levels of consumption, alcohol may have a protective effect for stroke—particularly ischemic stroke, due to its effect on HDL cholesterol, platelet stickiness and other thrombogenic factors.

The comprehensive English et al (1995) review noted 21 studies, which found a relationship between alcohol consumption and stroke, but there were also 8 studies which found no relationship. Their conclusion was that while there was limited evidence that drinking at a hazardous level (Medium Risk) caused stroke, there was sufficient evidence to conclude that harmful levels of consumption (High Risk) increased the risk of stroke. Their pooled estimate to Relative Risk showed a biphasic relationship, with a protective effect at low levels of consumption and an increased risk of stroke at high levels of consumption. In another extensive review by Carmargo and Rimm (1996), it was concluded that the evidence for a protective effect on ischemic stroke at moderate levels of drinking is mixed.

In summary, there is a consensus that alcohol consumption at low to moderate levels has a protective effect against heart disease (English et al 1995, Klatsky 1996, Svardstudd 1998), but despite the relationship of alcohol use to hypertension, conclusive evidence is still lacking regarding the relationship of alcohol consumption at high levels to coronary heart disease.

3.6. Other Disease related to chronic alcohol consumption

Alcohol is the direct cause of a small number of deaths and hospitalizations each year from gastritis. Alcoholic gastritis comprised 0.34% of alcohol-caused deaths in Canada in 1992 (Single et al, 1999) and 1.06% of alcohol-caused deaths for Finland between 1987 and 1993 (Mäkelä et al, 1997). The English et al (1995) review estimates that 24% of acute pancreatitis and 84% of chronic pancreatitis cases are due to alcohol; The Shultz et al, 1991 estimated that 42% of acute pancreatitis and 60% of chronic pancreatitis is due to alcohol.

4. Indicators of harm attributable mainly to the short-term effects of drinking alcohol

Short-term effects or acute consequences of alcohol consumption are: 1) alcohol-related traffic crashes, 2) alcohol-related unintentional injuries and death, 3) suicide, and 4) interpersonal violence.

4.1 Impaired driving injuries and fatalities

Alcohol consumption impairs a variety of motor and perceptual skills necessary for driving so it caused automobile crashes, which cause substantial death and injury to motor vehicle occupants and to pedestrians. These outcomes involve pain and suffering, added costs of medical care, police enforcement, insurance, and lost work. There is a numerous literature on the relationship between alcohol consumption and traffic injuries and fatalities. The English et al (1995) review of alcohol-related health disorders examined 44 studies on Blood Alcohol Concentration among fatally injured drivers and concluded that alcohol is causally related to road fatalities. In 1996, 17,196 people were killed in alcohol-related crashes in the U.S. that was 40.9% of all road crash deaths. In addition, there were 321,000 persons injured which accounted for 9% of all non-fatal crash injuries in the USA (National Highway Traffic Safety Administration 1997). Impairment from alcohol is particularly high among fatally injured drivers between the ages of 20 and 35, and the proportion of fatally injured drivers with a BAC in excess of the legal limit is generally great among drivers aged 20-25. Use of alcohol has been found to alter driving performance even at low dosage levels and to effect response times in dangerous road situations. Zador (1991) found that driver risk of being in a fatal crash doubles with each 0.02% increase in BAC. Two Australian studies found that, compared to driver BAC of less than 0.05%, the risk of injury was about 3.5 times as great with driver BAC of between 0.05 and 0.099 and about 9.5 times as great with driver BAC of 0.10% or above (English et al, 1995).

Road crash data can usually be used to estimate numbers of alcohol-related crashes. The records of road crashes track the number of crashes, injuries, and deaths in fatal crashes. Road crash reports may be based on Blood Alcohol Concentration (BAC), breathalyzer, motor skills tests, or just observation. When such data complied into machine-readable form, with time, date, and day of crash, location, number of

vehicles involved, and numbers of fatalities and injuries, it is usually possible to estimate the extent of alcohol involvement. Fatal crash reports do include the BAC of the driver. Table 2 lists the legislated maximum levels for a number of countries given in milligrams of ethanol per milliliter of blood (mg/ml).

Table 2 Standard BAC limits

Country	Standard BAC (in mg/ml)	Country	Standard BAC (in mg/ml)
Albania	0.1	Japan	0.3
Algeria	0.1	Kenya	0.8
Argentina	0.5	Kyrgyzstan	0.5
Armenia	0	Lithuania	0.4
Australia	0.5	Luxembourg	0.8
Austria	0.5	Malaysia	0.8
Azerbaijan	0	Malta	0.8
Belarus	0.5	Mexico	0.8
Belgium	0.5	Moldova	0.3
Bolivia	0.7	Mongolia	0.2
Bosnia and Herzegovia	0.5	Nepal	0
Bostwana	0.8	The Netherlands	0.5
Brazill	0.6	New Zealand	0.8
Bulgaria	0.5	Nicaragua	0.8
Cambodia	0.5	Norway	0.2
Canada	0.8	Paraguay	0.8
China	0.3	Peru	0.5
Croatia (Republic of)	0	Philippines	0.5
Czech Republic	0	Poland	0.2
Denmark	0.5	Portugal	0.5
Ecuador	0.7	Romania	0

Table 2 Standard BAC limits (Cont.)

Country	Standard BAC (in mg/ml)	Country	Standard BAC (in mg/ml)
El Salvador	0.5	Russia	0.2-0.5
Estonia	0.2	Singapore	0.8
Ethiopia	0	Slovak Republic	0
Finland	0.5	Slovenia	0.5
France	0.5	South Africa	0.5
Georgia	0.3	Spain	0.5
Germany	0.5	Sweden	0.2
Greece	0.5	Switzerland	0.5
Guatemala	0.8	Thailand	0.5
Honduras	0.7	Turkey	0.5
Hungary	0	Turkmenistan	0.3
Iceland	0.5	Uganda	0.8
India	0.3	United Kingdom	0.8
Ireland	0.8	United States	0.8
Isarel	0.5	Venezuela	0.5

Sources: Room R (1999)

With the exception of injury and death from alcohol-caused road crashes, the involvement of alcohol is greatly under-estimated by police and health personnel and cannot usually be relied on to estimate the prevalence of alcohol-related harm. A number of different measures are possible as below.

1) Fatal crashes with positive Blood Alcohol Concentration (BAC)

Police are required to determine the BAC level of drivers in fatal road crashes.

2) Alcohol-related crashes based on police reports

Alcohol-related crashes are those in which one or more of the drivers had been drinking in the judgment of the reporting police officer. Police reported alcohol-related road accident is dependent upon the reporting practices of law enforcement officers who are investigating a road crash.

3) Night-time crashes

It has been found that up to 80% of nighttime road crashes (both fatal and non-fatal) involving single, private vehicles involve prior alcohol consumption by the driver. (Gruenwald & Ponicki, 1995).

4) Fatal crashes

Drinking drivers are frequently involved in serious or fatal accidents. Fatal crashes have a high percentage of alcohol-related driving and are preferred by some as a “surrogate” measure of alcohol-involved crashes.

5) Roadside surveys

One potential indicator of drinking and driving can be derived from roadside surveys in which driver blood alcohol concentrations (BAC) are consistently measured

6) Arrests for driving under the influence (DUI)

Arrests for drunken driving are often used to measure the level of drinking and driving.

4.2 Alcohol-related unintentional injuries and deaths

Unintentional falls, drowning, near drownings, and burns are important causes of death and injury. They lead to medical costs, lost work, and pain and suffering.

Alcohol use has been associated with increased risk of injury in a wide variety of settings including road traffic accident (vehicles, bicycles, and pedestrians), falls, fires, injuries related to sports and recreational activities, self-inflicted injuries or injuries resulting from interpersonal violence. There is also some evidence that the presence of alcohol in the body at the time of injury may be associated with greater severity of injury and less positive outcomes.

Alcohol consumption produces effects that are often perceived as positive, as evidenced by the widespread popularity of drinking. Nevertheless, it also leads to actions that result in unintentional injury and death. Moderate doses of alcohol have been demonstrated in controlled experimental studies to have cognitive and psychomotor effects that are relevant to the risk of injury, such as reaction time, cognitive processing, coordination, and vigilance.

4.3 Alcohol-related intentional injuries and deaths

4.3.1 Violent

Alcohol is strongly associated with violent crime. Alcohol may have an effect on the serotonin (5HT) and GABA brain receptors that may reduce fear and anxiety about social, physical, or legal consequences of one's actions. Alcohol also affects cognitive functioning, leading to impaired problem solving in conflict situations and overly attitudinal effects of alcohol related to aggression have been identified, although at this point not necessarily linked to particular pharmacological effects on the brain.

4.3.2 Suicide

The association between suicide and excessive alcohol use is complex because 1) alcohol may act as self-medication for the relief of depression or as an associated marker of psychopathology leading to suicide 2) alcohol use disinherits impulses to suicide and directly supports aggression 3) excessive alcohol use impairs cognitive processes that otherwise assist with alternatives to impulsive or violent behavior 4) alcohol abuse may be an indicator of social disintegration associated with suicide. The Australian review of alcohol-related disorders examined a large set of Relative Risk studies, clinical case studies, and blood alcohol case studies and came to a more conservative conclusion that alcohol is implicated in 12% of male suicides and 8% of female studies. A study of coroner reports in three Canadian provinces concludes that the estimated proportion of suicides attributed to alcohol may be considerably greater than that indicated by the Australian review (Rehm et al, 1996).

Alcohol involvement in suicide is substantially under-reported. When information on alcohol as an indirect cause is not ascertained or is known but not indicated through the use of multiple diagnosis codes, death record do not report suicides involving alcohol.

4.3.3 Interpersonal violence

Violence is an intentional action by an individual or individuals that directly results in physical injury to another individual or individuals (Parkers, 1993). This definition does not necessarily imply that the person committing a violent act intends to injure or kill the victim but that the harm-producing action was intentional. Besides injury and possible death, there may be property damage and emotional

distress. Violence occurs along a continuum that ranges from minor assault among peers, in which no one is injured, to multiple homicides. Violence occurs across all kinds of interpersonal relationships including those of relatives, friends, acquaintances, and strangers. The definition may be expanded to include child abuse and minor assault without physical injury. Alcohol is implicated as a causal factor in assault in two ways: high alcohol intake represents a risk factor in becoming a victim of assault and alcohol is also a potential causal factor in committing an assault. The Australian meta-analysis examined 5 clinical case series that assessed for the presence of intoxication in assault perpetrators and conclude that 47% of assaults are attributable to alcohol. Studies in Zambia have estimated that alcohol is involved in between half and two thirds of all violent deaths (Haworth and Acuda, 1998).

Not only volume of consumption, but also patterns of drinking, especially irregular heavy drinking has been shown to determine burden of disease. Table 3 summarizes the major diseases and injury categories, proportion of the worldwide disability and death attributable to alcohol within each category.

Table 3 Major disease and injury conditions related to alcohol and proportions attributable to alcohol worldwide

Major disease	Men	Women	Both
Malignant neoplasm			
Mouth and oropharynx cancers	2.2%	9%	19%
Esophageal cancer	37%	15%	29%
Liver cancer	30%	13%	25%
Breast cancer	n/a	7%	7%
Neuropsychiatric disorders			
Unipolar depressive disorders	3%	1%	2%
Epilepsy	23%	12%	18%
Alcohol use disorders: alcohol dependence and harmful use	100%	100%	100%

Table 3 Major disease and injury conditions related to alcohol and proportions attributable to alcohol worldwide (Cont.)

Major disease	Men	Women	Both
Diabetes mellitus	-1%	-1%	-1%
Cardiovascular disorders			
Ischemic heart disease	4%	-1%	2%
Hemorrhagic stroke	18%	1%	10%
Ischemic stroke	3%	-6%	-1%
Gastrointestinal diseases			
Cirrhosis of the liver	39%	18%	32%
Unintentional Injury			
Motor vehicle accidents	25%	8%	20%
Drowning	12%	6%	10%
Falls	9%	3%	7%
Poisonings	23%	9%	18%
Intentional Injury			
Self-inflicted injuries	15%	5%	11%
Homicide	26%	16%	24%

Sources: WHO, 2002 and WHO (2004 cited in Room et al, 2005)

Alcohol consumption and alcohol-related harm are not easily assessed through traditional health or social service channels. It may be necessary to apply techniques, which appear unorthodox in terms of conventional epidemiology or social surveys such as surveillance system. There is no rigid blueprint that can be applied to all situations.

5. Surveillance System

Definition: Surveillance is defined as the “ongoing systematic collection, collation, analysis, interpretation of data and the dissemination of information to those who need to know in order that action be taken”

(www.who.int/emc/surveill/index.html).

A more complete definition of surveillance is the ongoing systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know. The final link in the surveillance chain is the application of these data to prevention and control. The goals of surveillance often differ at the various administrative levels of the public health system (Table 4). Surveillance data are used to allocate resources and evaluate the impact of control and prevention strategies and programs at all levels. However, at the local level the use of surveillance to trigger basic public health investigations and implement specific control activities predominates for infectious diseases and environmental hazards. At the local level, analysis capacity is usually much more limited than the national level. At the state level, public health agencies typically share both perspectives.

Table 4 Levels where surveillance activities are performed

Activities	National level	State level	Local level
Detection and notification of cases	-	-	Yes
Collection and consolidation of case data	Yes	Yes	Yes
Analysis and interpretation	Yes	Yes	Yes
Investigation of cases and confirmation of diagnosis:			
- Epidemiologist	-	Yes	-
- Clinician	-	-	Yes
- Laboratory	Yes	Yes	-
Feedback	Yes	Yes	Yes
Dissemination	Yes	Yes	Yes
Action			

Sources: Adapted from WHO (1999a)

Note: The term “local level” this is also referred to as the municipal, district, country, or jurisdictional level, among others.

5.1 Public Health Surveillance System

Public health surveillance is a tool to estimate the health status and behaviour of the populations, it is useful both for measuring the need for interventions and for directly measuring the effects of interventions.

Public health surveillance systems play an important role at each of the three prevention levels that are provided:

Primary: Prevention of the development of disease or injury in a susceptible or potentially susceptible population through specific measures, such as immunization.

Secondary: Efforts to decrease the duration and severity of disease/injury through early diagnosis and prompt intervention.

Tertiary: Efforts to limit mortality and the degree of disability and promote rehabilitation and restoration of function after disease/injury.

5.2 Characteristics of a surveillance system

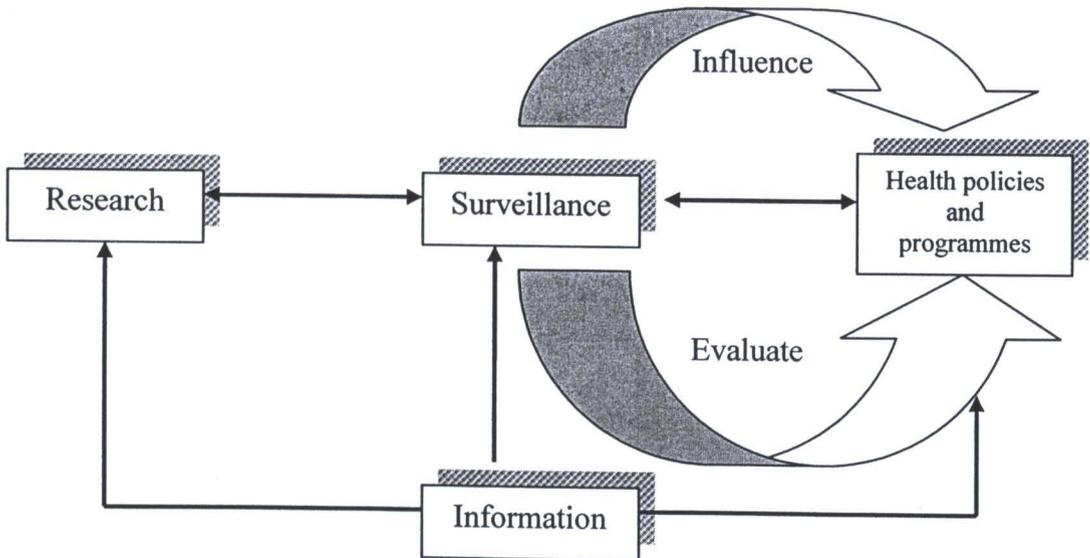


Figure 2 Characteristics of a surveillance system

Sources: Adapted from WHO (1998)

The link between information collected and its use to influence health policies is a characteristic of a surveillance system. Furthermore, surveillance can be used to evaluate health policies and preventive interventions showed as figure 2. Research

and surveillance interact to ensure that recommended policies and interventions are cost-effective and that surveillance methods are valid so better quality data improve decision-making.

5.3 Types of Surveillance Systems

5.3.1 Passive Surveillance

Passive surveillance is the method of standard data collection in the traditional provider-based approach.

5.3.2 Active Surveillance

Active surveillance involves active outreach to collect specific disease reports from reporting sources, such as personal visits or telephone calls to providers and laboratories.

5.3.3 Sentinel Surveillance

Sentinel surveillance systems are on the “look-out” for certain health events. A sentinel system can be defined as a system where a subset but not all reporting units are asked to report periodically, to indicate a general level of disease activity.

5.3.4 Syndromic Surveillance

Syndromic surveillance is the collection and analysis of pre-diagnosis information that leads to an estimation of the health status of the community that signal a sufficient probability of a case or an outbreak to warrant further public health response.

There are many types of surveillance systems, which vary from very simple to complex. All surveillance systems involve six elements that are provided:

- 1) Detection and notification of health event;
- 2) Investigations and confirmation (epidemiological, clinical, laboratory);
- 3) Collection of data;
- 4) Analysis and interpretation of data;
- 5) Feedback and dissemination of results and;
- 6) Response- a link to public health programs, specifically actions for prevention and control.

5.4 Surveillance Systems and Data Sources for Alcohol Consumption and-related harm

5.4.1 Social Indicator Analysis Study (SIAS) of the Demand for Substance Abuse Treatment in Mississippi

The major purpose of the Social Indicator Analysis Study (SIAS) is to develop a method of estimating the levels of need for substance abuse treatment within sub state (community) areas, and, secondarily, to determine when the levels of need are changing so that treatment levels can be adjusted accordingly. Many of the types and sources of data searched for initial assessment will be discussed below:

1) Potential Direct Measures of Alcohol Abuse

Potential Direct Measures of Alcohol Abuse includes per capita sales of alcohol, the numbers of licensed liquor stores, DUI arrests, alcohol-related deaths, and so forth. The admission and discharge data from private hospitals in the state are not known to be available through any source. The only admissions-and-discharge data that we are likely to have available to us will be through the Mississippi Department of Mental Health and the Department of Vocational Rehabilitation. Attendance at self-help groups, such as Alcoholic-Anonymous, is not likely to be available at the sub state level.

2) Potential Direct Measure of Drug Abuse

Potential Direct Measure of Drug Abuse tends to parallel those for direct measures for alcohol involving arrests, mortality, and admissions-and-discharge indicators.

3) Potential Indirect Measures of Alcohol Abuse

Potential Indirect Measures of Alcohol Abuse includes several conventional domestic crime rates, taken from both the FBI Uniform Crime Reports (UCR) databases as well as from the Mississippi Youth Court System.

4) Potential Indirect Measures of Drug Abuse

Potential Indirect Measures of Drug Abuse also tends to parallel those indirect measures for alcohol, with some exceptions. HIV-incidence is sensitive topic when it involves the release of local-area occurrence data (witness the controversy among states in their participation NIH/NCHS mortality reporting data system) and Mississippi is no exception.

5) Less Direct Measures of Alcohol or Drug Abuse

Less Direct Measures of Alcohol or Drug Abuse include a range of indicators that might prove to be both valid and useful. These include vital statistics indicators-such as the suicide rate, infant mortality rate, proportion of annual births to teens, the incidence of STDs as well as tuberculosis-and a variety of demographic variables, such as poverty, percentage of racial minorities, unemployment, housing density, the “deteriorated” character of neighborhoods, and the age structure of the local population.

5.4.2 Assessment of Alcohol and Other Drug (AOD) - Related Social Indicators in Illinois and Its Sub State Areas

The purpose of this study was to formulate conclusions regarding the nature and extent of alcohol and other drug (AOD)-related problems and conditions within the State of Illinois and its sub state areas based upon the status of social indicators that have been shown to be predictive of high rates of such problems and conditions.

The primary goals of this needs assessment study were to obtain a “lay of the land” concerning levels of substance abuse-related social indicators across Illinois sub state areas, and to determine the potential usefulness of this information in guiding substance abuse policy, planning, and resource allocation decisions. Two sequential statistical procedures were used in analysis of this study’s social indicator data. A principal component analysis was first conducted using the 87 selected social indicators variables measured for each of Illinois’102 countries and 76 Chicago community areas. The purpose of principal components analysis is to yield a simpler picture than what might be presented by merely ranking sub state areas on each of a variety of social indicators. It is meant to answer the question: “What therolitical factors account for the majority of differences across areas on a larger set of indicators?” Not only can rankings of countries or community areas on a large number of variables be potentially confusing, it is almost certainly the case that the indicators are to some degree related to one another, and that some indicators will be more important than others in differentiating among local areas in decisions regarding relative impacts of substance abuse. The purpose of multiple regression analysis is to investigate the usefulness of a series of variable in estimating individual values for some predicted variable. A “stepwise” approach was used in each analysis. At the

conclusion of each analysis, an equation resulted that can be used in prediction of sub state area population rates of admissions based on an area's scale scores on factors in the equation.

Based on the literature reviewed, conceptual framework for development predictive model alcohol-related harm that culturally appropriately Thai society was showed in figure 3.

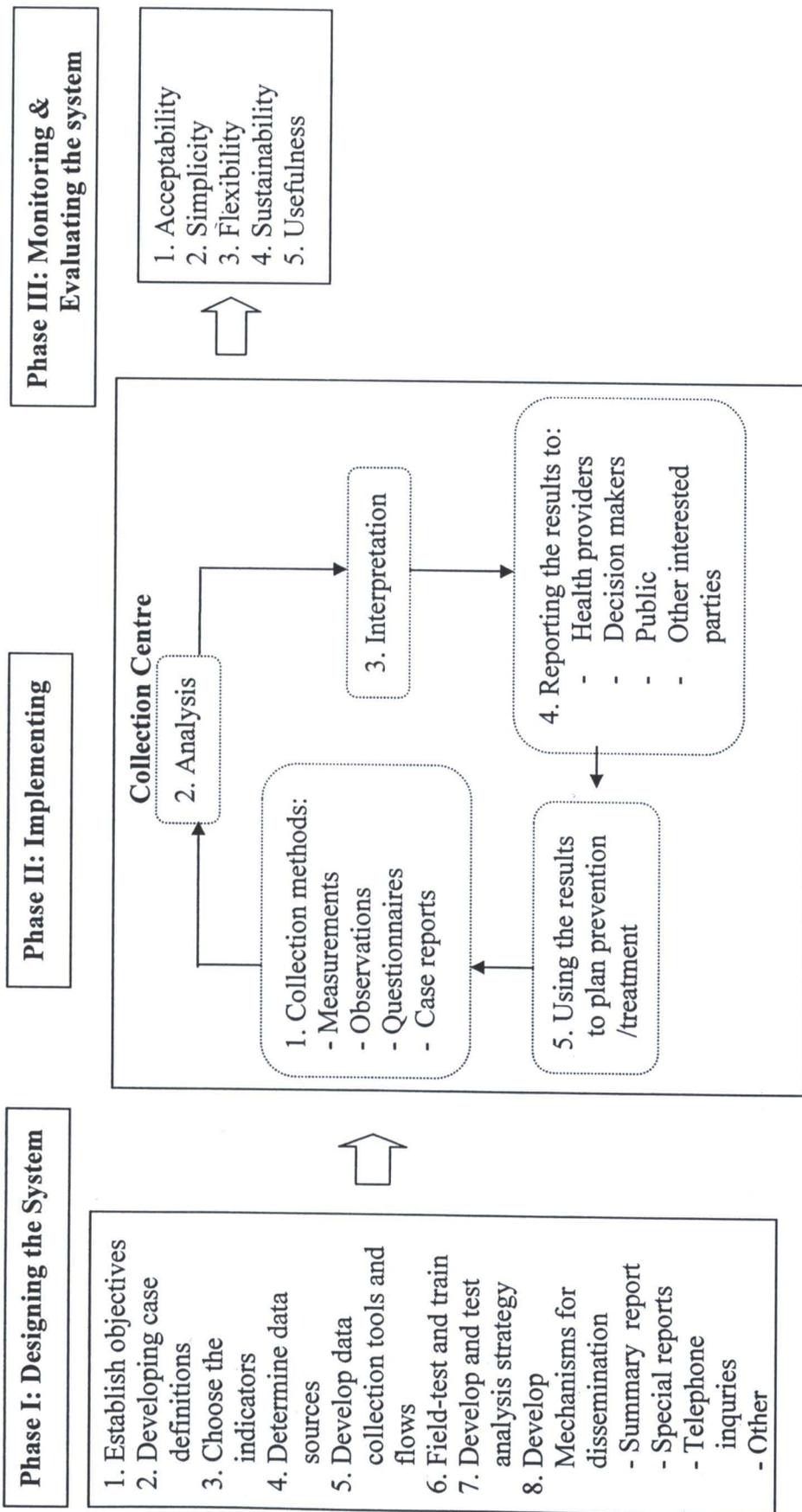


Figure 3 Conceptual framework for Development Alcohol Surveillance System