

ALCOHOL PROBLEMS IN BAHRAIN

by

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KATHRYN MARLEY MAGRUDER. Alcohol Problems in Bahrain (Under the direction of BERTON H. KAPLAN, Ph.D.

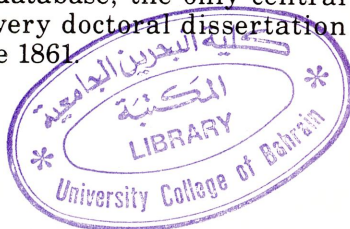
A comparative descriptive study was undertaken in 1976 to study alcohol problems in the State of Bahrain located in the Arabian Gulf. Average absolute alcohol consumption was used as the primary indicator of alcohol problems. The theoretical background for using average absolute alcohol consumption is based on the distribution of consumption theory which states that alcohol consumption in a homogeneous society is approximately log normally distributed bounded by zero on the left and 365 liters of absolute alcohol per year on the right. When the mean consumption is known, the proportion of drinkers falling above a certain limit (i.e., in a high risk category of drinking) can be determined. Thus, mean absolute alcohol consumption can be used to compare countries for alcohol problems.

There are three broad categories of factors which influence consumption: legal factors, economic factors, and socio-cultural factors. Legal factors include such things as hours of sale, type and alcoholic content of beverages available in an area, prohibition, legal drinking age, etc. Economic factors include taxation and the ratio of the cost of alcohol to the average amount of disposable income. Socio-cultural factors include religious controls, family controls, and informal community controls.



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In Bahrain, legal and economic factors tend to be the ones that would favor high alcohol consumption patterns, while the socio-cultural factors would favor a low consumption pattern. Bahrain is a moderately wealthy country whose economy is based on oil production and refining. Poverty and price of alcohol are hardly a problem. Although officially a Muslim state, alcohol is in practice available to anyone, and there are no state restrictions on hours of sale, hours of operation in bars, or amount sold at any one time. The predominant alcohol controls come from the Islamic prohibition of alcohol consumption (95.7% of the population is Muslim).

This small state became an excellent natural laboratory where legal controls are minimal, economic controls are negligible, and the system of alcohol control relies almost entirely on the inherent social controls. This setting led to the main question of this dissertation: To what extent does this social control system work? To answer this question, data were collected on alcohol consumption.

The results show clearly that Bahrain is a very low consumption country. The average absolute alcohol consumption for the 15 and older population in 1973 is 4.6 liters and only Israel, out of 28 countries, ranks below Bahrain. This supports the main thesis that societal controls (through Islam and the resulting pressures to conform to the norm of abstinence) are the primary reason for low consumption.

Data on liver cirrhosis mortality, psychiatric admissions for alcoholism, alcohol crimes (i.e., public intoxication and illegal possession), and alcohol traffic arrests were also collected to show longitudinal trends. These data indicate that alcohol is becoming more of a problem in Bahrain, and that the effect of relatively easy access to alcohol, both legally and economically, is not entirely masked by the strength of the societal controls.

The major trends of the longitudinal data are as follows:

- 1) consumption of liters of absolute alcohol per 15 and older population went from 3.7 in 1971 to 5.0 in 1975;
- 2) psychiatric inpatient admission rates per 100,000 for alcoholism increased from 5.1 in 1971 to 15.5 in 1975;
- 3) psychiatric readmission rates per 100,000 for alcoholism increased from 3.2 in 1971 to 11.5 in 1975;
- 4) alcohol crime rates per 1000 population increased from 1.9 in 1970 to 4.4 in 1975;
- 5) alcohol traffic accident rates per 1000 licensed drivers increased from 2.5 in 1970 to 3.2 in 1975;
- 6) the rate per 100,000 of cirrhosis deaths declined from 10.4 in 1973 to 4.3 in 1975;
- 7) the rate per 100,000 of alcohol psychiatric admissions declined slightly from 2.3 in 1971 to 2.0 in 1975.

Outpatient psychiatric admissions and cirrhosis mortality are the only two indicators not supportive of the trend of increasing alcohol problems.

In summary, alcohol consumption in Bahrain is very low. While Islam is a strong force now in keeping alcohol abuse at a minimum, the patterns of increasing problems indicate

the force of Islam is weakening (at least with regard to drinking alcohol) and that other controls will be necessary to keep alcohol problems in check.

To my father and mother who have no idea how much  
help they were in all phases of my dissertation.

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## CHAPTER ONE

### INTRODUCTION

There have been many different societal responses to alcohol, varying in type and intensity from incorporating alcohol use into many daily activities to indignation at even taking a drink. Among these varied responses (of which there are many in any one given society), there are invariably some which address the problem of excessive drinking and are expressed collectively. In our own rather legalistic society, control of excessive alcohol use has fallen predominantly into the realm of the legal and enforcement system. To a large extent, the intent behind these controls has shifted from the desire to keep societal alcohol problems in check to a desire to efficiently administer the distribution and sale of alcoholic beverages and collect the huge volume of sales taxes.

With our own society as the main example, it is not too surprising that there are substantial numbers of health professionals or others specializing in alcohol problems who doubt the efficacy of alcohol controls and insist that the desire to drink is unaffected by external restrictions. But anyone who has followed the growing body of alcohol control literature cannot help but note that the evidence is consistently and persuasively in support of the notion that where alcohol controls are tight, there are fewer alcohol problems than where controls are loose

(deLint and Schmidt, 1974). The types of controls generally considered are hours of sale, type and alcoholic content of beverages available in an area, prohibition, legal drinking age, type of sale system (state controlled versus free enterprise), and controls specifically related to a particular type of alcohol problem (such as enforcement of driving under the influence laws).

- Economic controls are another type of controls which are sometimes legally imposed and sometimes the unintentional result of economic forces. The ratio of the cost of alcohol to the average amount of disposable income has been shown to vary directly with per capita consumption in a given area (Popham, Schmidt, and deLint, 1971); therefore, whether this ratio is manipulated intentionally (through taxation of alcohol), or whether it varies naturally (by inflation, salary increases, or whatever), the result is generally predictable and drinking habits are affected. The Irish are an example of a people with a love for drink and have a reputation for extreme drunkenness, but statistics do not bear this out. Ireland has one of the lowest rates of alcohol consumption (Alcohol and Health, 1971), and probably the reason is that poverty keeps drinking down. Similarly, recent tax increases on alcohol in France specifically imposed to cut down on consumption and alcohol problems have apparently been effective (deLint and Schmidt, 1974).

But there are controls other than legal and economic controls. These controls include religious controls, family

controls, and informal community controls. Since these controls, (which we shall call social controls for lack of a better phrase) are rather diminished with regard to alcohol in Western countries, it is not surprising that they have generally been omitted from study and even theoretical formulation. An example which immediately shows the importance of social controls is a comparison of Utah (with a high proportion of Mormons whose religion prohibits drinking) to Nevada; Utah has a much lower rate of alcohol consumption (Alcohol and Health, 1971) and of other alcohol-related health problems (Fuchs, 1974). Anecdotally, many fundamental Southern Protestants are believed not to drink as much as non-fundamentalists, and in fact consumption in the South is lower than any other area in the country (Cahalan et al., 1969).

Thus, three aspects of control have been identified: legal, social, and economic. It would be all too easy, though, with the two examples just mentioned to dismiss the notion of social control on the grounds that it is not anything which can be rightfully manipulated in order to decrease alcohol problems. But, consider areas where there are no legal restrictions on alcohol--only economic and social. Many of the developing nations in Africa and Asia would fit this pattern. As these countries become wealthier, it is important to know to what extent the social controls will in fact control alcohol problems. Will legal restrictions be necessary? And, do social controls erode? The study and evolution of social controls is an especially important area of investigation because we

need to know the power of these controls, and if and at what point legal and economic controls should be instituted. From a more theoretical point of view, the knowledge of social alcohol controls will help to explain more about alcohol consumption variation among populations.

Perhaps the most ideal kind of society with regard to alcohol control is the one which limits its consumption almost entirely on the basis of social controls, thus avoiding the artificial and externally imposed manipulations of legal and economic controls. Unfortunately, it is difficult to isolate social controls, because poverty and strong social controls usually occur together in unindustrialized countries where no one has ever bothered to study alcoholism in the first place (i.e., India and Egypt), or strong legal and social controls occur simultaneously (i.e., Saudi Arabia).

This is not always the case, though. The State of Bahrain in the Arabian Gulf is an example of a country where poverty and price of alcohol are hardly a problem: the price of alcohol is about the same as in the United States, and the predominantly oil-based economy put the gross national product in 1973 at a healthy \$900 per capita and in 1976 gave Bahrain the highest revenue ever at \$588 million -- representing a 20% increase over 1976 and about a 50% increase over 1975. In addition, even though it is a Muslim state, alcohol is in practice available to anyone, and there are no state restrictions on hours of sale, hours of operation in bars, or amount sold at any one time. Thus, in this setting, the

predominant controls are non-legal and non-economic religious controls (95.7% of the population is Muslim). This small state is an excellent natural laboratory where legal controls are minimal, economic controls are negligible, and the system of alcohol control relies almost entirely on the inherent social controls. With this type of setting, it is now possible to ask the question: to what extent does this social control system work?

There is a long line of research which documents the positive relationship between per capita absolute consumption and various indicators of alcohol problems (i.e., cirrhosis mortality, alcohol-related traffic accidents, alcohol crimes, alcoholic psychiatric admissions, etc.). Thus, one test of the extent to which the Bahraini social controls work is the position of Bahrain in a rank ordering of per capita consumption of countries with varying types of alcohol controls. Another test is the relative rate of various alcohol problems in comparison to other countries.

The significance of achieving the previously mentioned objectives is multi-fold:

1. The effectiveness of the social alcohol controls operating in Bahrain can be determined. This will be important because of the theoretical reasons stated earlier. This should also be important to other Muslim countries with new found wealth which want to have the advantages of Western technology but which also want to preserve their own social

order and at the same time attract Western consultants and technicians by offering some of the freedoms and privileges to which they are accustomed.

2. The relationship between the mean per capita consumption and alcohol problems will offer either support for or rejection of the distribution of consumption theory which states that mean alcohol consumption is an indicator of the proportion of excessive drinkers.
3. By collecting data to determine the rate of liver cirrhosis mortality, it will be possible to discuss the relative importance of liver cirrhosis as an indicator of alcohol problems in developing countries.
4. The alcohol data collected in Bahrain will provide a baseline for health planning and also for evaluating future increments or decrements in alcohol-problem rates. Since almost no information is available about alcohol problems in other Muslim countries, this data will serve as a very rough indicator of the extent of their problems.

## CHAPTER TWO

### LITERATURE REVIEW

In this chapter we shall review the major explanatory models for variations in alcohol use, and then, in the light of the model which emerges, we shall look at the efficacy of alcohol controls. In the third section of this chapter, because of the special focus on liver cirrhosis in international alcohol research, the relationship between alcohol consumption and liver cirrhosis will be examined. Finally, the fourth section is a review of the known research that has been done on the subject of alcohol use among Muslims.

#### I. Models of Cross-Cultural Explanations of Alcohol Use

Variations in drinking styles, patterns, and problems have long been observed among different groups of people, and numerous explanations have been put forth. The main purpose of this section is to review critically the major themes that have emerged as explanations for the question: why do some groups have more alcohol problems than others?

##### A. Socio-cultural explanations

Horton (1943) was the earliest to attempt a cross-cultural explanation of alcohol use based on Human Relations Area Files (HRAF) material. He found that hunter tribes drank more than settled agricultural tribes and concluded that "the primary

function of alcoholic beverages in all societies is the reduction of anxiety." His deduction was as follows: hunting tribes have more subsistence insecurity than agricultural tribes which leads to economic insecurity which leads to anxiety which leads to drinking to reduce anxiety. Field (1962) was an early critic of Horton. Using the same data base, he showed that there is no relationship between drinking and a number of measures of anxiety. Horton's use of subsistence anxiety has also been criticized by Schaeffer (1976) who showed that it is highly doubtful that hunting tribes had more subsistence insecurity than agricultural tribes. (See also Lee and DeVore, 1968). Lemert (1954) has shown that there was more drunkenness among American Northwest Indians after they became rich from fur trading (and their insecurity resolved), and deLint and Schmidt (1974) have shown that in modern societies, as income goes up (controlling for inflation), so does alcohol consumption. Aside from methodological criticisms (which Room (1972), Cahalan (1976), and Stull (1975) have gone into extensively), the major hypothesis (that subsistence anxiety causes heavy drinking) just does not hold up.

But there are two ideas from this cluster of studies which researchers considered salvageable. One is that anxiety in general (not specifically subsistence anxiety) might relate to drinking. The other is that economy might relate to drinking -- not in the way that Horton had first hypothesized, but in precisely the opposite way, that is, that subsistence problems mean less disposable income and therefore less to spend on

drinking, whereas lack of subsistence problems means extra income and more to spend on drinking. The anxiety hypothesis has wide popular appeal, but has not fared well under the scrutiny of research, as is shown below.

A short comment about the Human Relations Area Files is in order before proceeding. These files are a collection of ethnography-type studies (by different authors) of predominately pre-literate societies. In all the cross-cultural studies cited here where HRAF data were used, Muslim societies were specifically eliminated from study because of their known sanction against alcohol. We are left wondering about other groups which were included for study but also had sanctions against alcohol which were just less widely known. Since "alcohol sanctions" was not a variable under study, it is difficult to know the extent to which all the results are confounded by such a crucial factor, unless one might argue that alcohol sanctions are a result of the specific cultural factors under study (none of the HRAF researchers had considered this point).

The second problem with these cross-cultural studies is that they use such alcohol problems as "drunken brawling" and "extreme insobriety." The trouble is that these variables are extremely liable to observer error, and especially when we consider that different observers studied each tribe. Also, it should be mentioned that alcohol use was usually tangential to the main purpose of the studies. Furthermore, the strength of the alcohol consumed is not known, quantity and frequency are not known, nor is the percentage of drinkers. In all, these

studies should be interpreted very cautiously.

Field (1962) concentrated on sober societies (again using the HRAF) and showed that there is less drinking in highly organized, respectful (along hierarchical lines), controlled societies than among unorganized, peer-oriented, less controlled societies. (But could it not be that those societies which are organized, respectful, and controlled also have specific controls to limit alcohol consumption, or perhaps have limited access to alcohol?) Field has been criticized by Schaeffer (1973) because his data were poorly (unreliably) coded, and he focused on explaining sobriety and not drunkenness. His study is also subject to the previously mentioned criticisms of studies based on HRAF data.

Bacon et. al. (1965) emphasized early childhood experiences involving frustration during socialization using HRAF data. The thesis of this study is that dependency conflict (originating in childhood) leads to heavy drinking in adulthood, and presumably the drinking relieves the anxiety caused by the dependency conflict. While the theory fits nicely into a Freudian framework stressing oral dependency, it does not hold up under psychological testing. McClelland (1972) and co-workers conducted a series of psychological experiments and found that oral dependency fantasies during drinking and non-drinking periods were the same.

In psychological studies testing the overall anxiety (or tension reduction) theory, the results are inconsistent. Observationally, a number of studies have related problem

drinking and alcoholism to anxiety (Williams, 1966; Manson, 1948; Walton, 1968), but are unable to separate cause and effect (does anxiety cause heavy drinking or does heavy drinking cause anxiety?). Kammeier et al. (1973) found pre-alcoholics as college freshmen to be no more anxious or tense than their classmates. As they went from the pre-alcoholic to alcoholic stage, however, there was an increase in anxiety (and also depression, distress, guilt and inadequacy), but initially the two groups were the same with regard to anxiety. Was it increased drinking that increased anxiety?

Some evidence pointing in this direction comes from measuring anxiety during drinking situations. Williams (1966) showed that with moderate amounts of alcohol (1.72-2.58 ounces of pure ethanol) anxiety went down, but at over 3.64 ounces of pure ethanol, anxiety levels returned to the pre-drinking level. Higgins and Marlatt (1973) manipulated anxiety states in alcoholics and social drinkers, and found that subsequent alcohol consumption was not related for either group or for high or low anxiety states.

Furthermore, common sense dictates that it would be near impossible to distinguish France, Austria, United States, Poland, or Southern Ireland (for example) on the basis of anxiety levels. In fact, the average Frenchman consumes 1.4, 2.8, 3.0 and 3.7 times more than the average Austrian, American, Pole, and Southern Irishman respectively. Is he also that much more anxious?

McClelland et al. (1972) have put out a body of

psychological research which supports the notion that drinking for some men heightens a sense of personal power. Men who feel powerful (not powerless) drink more to further enhance the feeling of power. (Wilsnack (1974) has put forth a similar theory for females which says that they drink to enhance their femininity). In addition to the psychological studies which they conducted, they cite evidence from an analysis of folk-tale content (which they also claim as support for Field (1962), but damaging to Horton (1943) and Bacon et al. (1965). Schaeffer (1976) has severely criticized the folk-tale methodology, but in his own reanalysis of the HRAF data has found support for McClelland's theory anyway. He has interpreted his own work as well as the work of McClelland et al. (1972) and Bacon et al. (1965) to be supportive of Horton and a general anxiety reduction hypothesis.

Clearly, these studies are open to different interpretations, and given the data base and the weaknesses pointed out earlier in this chapter, it is not surprising. At present, the power theory seems to be the dominant theory, but with its main support from the psychological work of its originators; therefore, its primary value is as a psychological explanation of individual alcohol abuse rather than as an explanation for the variation in rates of alcohol abuse found in different national or cultural settings. Simmons (1973) puts it clearly: ". . . that a concern about male superiority and power is one of the principal causes of alcohol still remains a hypothesis that now needs systematic testing in a variety of interpersonal,

social, and cultural settings to ascertain the extent to which it can retain and enhance its predictive power."

In summary, the evidence from socio-cultural studies of cross-cultural alcohol problems is contradictory, controversial, and highly suspect. There are ideas that can possibly be salvaged from these studies, but until the methodology is tightened up (i.e., how available is alcohol, what is its strength, what is the total consumption, how frequently does drinking occur, etc.), there is little confidence in the answers that they give us, and we are left still asking the question: why do some groups have more alcohol problems than others?

#### B. Constitutional explanations

People have always been fascinated by hereditary explanations of alcoholism. There is good reason to pursue this line of thought, as the popular observation that alcoholism runs in families has been borne out in research (Goodwin, 1976); furthermore, Goodwin tackled the nature/nurture problem. He showed that adoptees separated before six weeks from their biological alcoholic parents and raised by non-alcoholic parents indeed had a four times higher rate of alcoholism than did a group of control adoptees from biological non-alcoholic parents. The average age of the groups was only 30 years, so it is surprising that the results were so strong at such an early age. It is possible, though, that the stronger the hereditary component, the earlier the onset of alcoholism, and the less the hereditary component, the longer it would

take for alcoholism to develop. The results are intriguing, but at this stage would hardly offer an explanation for variations in cross-cultural alcohol problems. That we could attribute the differences among French, American, and British rates of alcohol problems to be completely or in part due to genetic differences is definitely beyond the scope of present research in this field.

Ewing et al. (1974) studied the differences between Occidentals and Orientals in their response to moderate amounts of alcohol. The majority of Orientals tested (about three-fourths) reported feeling bad: their pulse rate went up as did blood pressure readings, and they reported pounding in the head and dysphoria. The Occidentals (Caucasians) felt good: they were relaxed and their pulse rate was the same or lower than when sober. Ewing (1977) suggests that acetaldehyde poisoning is a factor in this racial sensitivity. Probably with regard to the differences in alcohol consumption rates between Western countries and Oriental countries, this hypersensitivity is a factor. No differences among other ethnic groups in physiological response to alcohol have been conclusively demonstrated.

At first, work with American Indians looked as if it would prove the firewater myth to be true on a physiological basis. Fenna et al. (1971) observed the metabolism rate of alcohol by Indians to be slower than Caucasians, thus Indians actually got more drunk on less alcohol and stayed drunk longer. The findings have not been confirmed, though, and some researchers have even reported opposite results (Schaeffer, 1977).

While this line of research could be promising to explain individual differences in response to alcohol, at present the state of the art is not advanced to the point of offering valid explanations for cross-cultural variations.

### C. The distribution of consumption thesis

In recent years a new model of alcohol problems has surfaced, mainly in international circles. This model has been labeled the "distribution of consumption" thesis. The following paragraphs will present the major tenets of this model, the kinds of data on which it was based, and criticisms of this approach.

#### 1. The model

The distribution of consumption thesis has often been called the Ledermann model due to the work of Sully Ledermann who first advanced it (1956). It is based on a special one parameter case of the log normal distribution where the range is fixed and the mean determines the shape of the distribution. The reasoning is as follows: it is not possible to drink less than zero, so the left bound must be fixed, and the right bound is fixed by the biological limit of consumption after which death is likely to result. Ledermann determined this limit to be one liter of absolute alcohol per day (365 liters per year).

But why the log normal distribution instead of the normal distribution? Ledermann reasoned that if the normal distribution were the correct model, and the left bound is limited

at zero and the mean consumption known, then the right half of the distribution must be symmetrical to the left. This meant that the limit of 365 liters per year was irrelevant. In a low consumption area where the mean is, say, 5 liters per year, then the maximum consumption would be 10 liters of absolute alcohol per year. From observation, it was obvious that this was not true. Even in low consumption countries, there are at least some drinkers who consume much more than the 10 liter maximum. This led to the rejection of the normal distribution, and, after examining data from several countries, the adoption of the log normal distribution which did not have the upper limit problem of the normal distribution.

The two conditions of the model have to do with the 365 liter maximum and homogeneity of the population. Ledermann assumed that the percentage of the population consuming over 365 liters of absolute alcohol per year was very small and independent of the mean consumption. (Thus, 365 would still be considered the upper limit, and only the mean would be needed to reconstruct the distribution). He also assumed that the population must be homogeneous, as differences in culture, religion, sex, etc. could affect consumption. He particularly concentrated on sex differences, but other differences are as important if not more so. For example, a large Jewish group (known to be a low consumption group) might change the shape of an otherwise lognormally distributed per capita consumption pattern.

The interesting part of the distribution of consumption theory is its corollaries, which have enormous implications for prevention. First of all, if this theory is valid, it challenges the current bimodal notion of "alcoholism." (This bimodal concept of alcoholism implies that alcoholics are a separate group altogether and that their drinking is not related in any way to the average population consumption). Since in the distribution of consumption case the curve is smooth and unimodal, the distribution does not naturally divide itself into alcoholics and nonalcoholics, and any such attempt at a cut point would be arbitrary. (On this point, there is no difference between the log normal curve and any other unimodal curve). What the curve suggests is something like a dose-response relationship, such that the higher one's consumption, the higher one's probability of experiencing alcohol-related problems (including addiction, cirrhosis, traffic accidents, etc.) and the lower one's consumption, the lower the same probability; therefore in a population, the lower the mean consumption, the lower the number of alcohol problems. This is because the lower the consumption, the lower the proportion of the population falling in the right tail (the high probability of problems area). The bimodal distribution, however, suggests that in the "alcoholism" case aggregate consumption is relatively unimportant and that the numbers of alcoholics are determined by factors other than those shaping general consumption.

Ledermann attempted to validate his model empirically on the basis of nine diverse samples:

- 1 - data on alcohol and wine consumption from 274 hospitalized men (aged 45-65), about half of whom (138) were cancer patients and the rest of whom were in a general medical ward
- 2 - consumption data from Italians living in the United States and Italian-Americans (1951-1952)
- 3 - survey and field work in Italy on wine consumption
- 4 - blood alcohol contents of 1750 Chicago motorists who were hospitalized after an accident (presumably due to alcohol) 1935-1937
- 5 - blood alcohol levels of 624 French workers who came for treatment at a government center (1951-1953)
- 6 - data on wine consumption from 247 Parisian men (1943)
- 7 - the amount of spirits bought by 6942 Finns (1948)
- 8 - the amount of spirits bought by 28,000 Swedes (1948)
- 9 - wine consumption data from 181 tuberculosis patients in France (before their illness)

In addition to this original supporting evidence, more validating data have been presented by Ledermann himself (1964), Skog (1971) deLint and Schmidt (1968), Smart and Schmidt (1970), and Cartwright et al. (1976). The deLint and Schmidt study (1968) showed that the pattern of Canadian buying of wine and distilled spirits fits the Ledermann model. In other words, the distribution of the number of bottles bought (adjusting for absolute alcohol content) is

Ledermann distributed (which we assume to mean is log normal with both the right and left limits fixed). In a different sample, beer purchases were similarly distributed. The question that this work hinges upon is to what extent does purchase of alcoholic beverages reflect consumption? Since the time frame was only one month (the month of March), purchasers of large amounts could merely be having parties or in some other way buying alcohol for other consumers. The answer to this in the study was to check on the number of different transactions. Those who bought a lot in a few visits would be assumed to be "stocking up" or buying for a party, whereas those who bought a lot over many visits would be assumed to be buying for their own consumption. In fact, two-thirds of those who bought 20 or more bottles in one month did so on at least 11 different occasions, and it was assumed that most of this was for their own individual consumption. No statistical test of log normality was given.

The Smart and Schmidt (1970) study showed that blood alcohol levels in five different studies of drivers not involved in accidents were log normally distributed. According to the authors' method of fit, all five studies fit log normal expectancy on the basis of skewness measures of less than 0.15.

In an unusual and imaginative approach to the problem, Cartwright et al. (1976) validated per capita alcohol consumption as an indicator of the prevalence of alcohol-related problems. They showed that in two time samples (1965 and 1974), the reported consumption increased an average of 5.6%

over the nine year period, which was paralleled by an average yearly increase of 4.5% per capita consumption according to British national statistics. Secondly, there was no significant difference between the two samples in the proportion of abstainers, or in the overall distribution of frequency of drinking (an average of 1.9 drinking days reported in 1965 and 2.0 in 1974); therefore, the increased consumption was due to increased amounts on drinking occasions (1.8 drinks per drinking occasion in 1965 and 2.7 in 1974 -- an increase of 48%). The third point made is that the more alcohol a person consumes, the higher his score on the alcohol-related problems increased as a result of increased consumption. The authors claim that their study provides evidence for the Ledermann model by showing on an individual level that as the mean consumption increases, so does the number of alcohol problems. Although the same people are not involved in the two samples, it is still the first attempt at validating the model on a longitudinal basis and a non-ecological level.

## 2. Criticisms

There have been many criticisms of the distribution of consumption thesis, most of them leveled at the original samples Ledermann used. Miller and Agnew (1974) feel that each of the nine samples had at least one inadequacy (i.e., a clinical population may not be representative of other drinkers). Also, many of the samples were small, which could easily affect the right tail of the distribution where numbers are small anyway. While the criticism is valid, the strength

of the data is that all nine samples support Ledermann -- even with the various inadequacies. Also supporting the theory is the fact that the samples are diverse and do not all have the same inadequacies.

Skog (1973) reanalyzed the original Ledermann data and some more recent data, and found support for the log normality hypothesis, but no support for the constant proportion of the amount greater than 365 liters. The implications of this are that now two parameters ( $\bar{x}$  and  $\sigma^2$ ) are needed to approximate the log normal curve for any given population and thereby calculate the number of heavy drinkers. Miller and Agnew give an example which illustrates the difference that the variance makes: the percentage of drinkers consuming greater than 15 centiliters of absolute alcohol per day in a population with an average per capita consumption of 11 liters per year is 2.81% using Ledermann's 365 liter limit. Using 100 liters or 500 liters, the values are 0.48% and 3.22% respectively. The amount of variation depends on the mean and the end point; however, if the end point is fairly close to Ledermann's value, then the difference in the proportion greater than 15 centiliters is not that much. For example, in the above case, the difference between Ledermann's 365 liter limit and a 500 liter limit (which is a rather large spread) is only 0.41%. While comparability across populations might be slightly affected by the variable upper limit (because of the two parameters used to calculate the high risk proportion would not be identical across all

comparison groups), longitudinal comparability within a population should not be affected, as the upper limit would not be expected to vary from year-to-year within a population. Thus, the corollary of the theory that reduction of the mean leads to reduction of heavy drinkers still holds.

The point is that if the right limit varies a small amount in different populations, then comparisons might be weakened some, but it is hardly damning evidence for the entire theory. In other words, some of the differences in the number of heavy drinkers from population A to population B might be due to the different endpoint, but unless the endpoint difference is huge (which is doubtful), the error is not serious. In this light, Skog (1971, 1974) has shown that in a number of natural adult and youth populations, the measures of dispersion (standard deviation of the Napierian logarithms of consumption) were very similar.

Some of the supporting studies (i.e., those of deLint and Schmidt (1968), and Smart and Schmidt (1970) have also been criticized. The deLint and Schmidt study of alcohol purchases in Ontario have been criticized because no statistical tests of log normality were used and also because purchasing practices might not represent drinking practices. As previously mentioned, the authors responded somewhat convincingly to the latter criticism but not to the former. Again, the criticisms of this study (that purchasing practices might not be representative of drinking practices) are fully speculative and hardly damning. Basically, this

study is another piece of information supporting Ledermann.

The study by Smart and Schmidt (1970) involving blood alcohol levels in drivers not involved in accidents has more serious defects. They used five samples of non-accident drivers which already means that the drivers involved in accidents were not included. These accident drivers are the ones most likely to be in the high blood alcohol ranges (where the numbers are small anyway), thus the curve is thrown more to the left. O'Neill and Wells (1971) have criticized the study on the grounds that inappropriate tests were used. The original study used skewness as the measure which tentatively indicates log normality, whereas a more stringent test is to use the goodness-of-fit  $\chi^2$  test. When O'Neill and Wells performed this on one of the samples, they got a p value less than .001 which could indicate that we should reject the null hypothesis that the data are log normally distributed. The other four samples were not tested in this manner. The other criticism by O'Neill and Wells is that Smart and Schmidt assumed a one-parameter case where the mean determines the shape of the distribution, but in fact, the form of these data indicates a two-parameter case where  $\sigma^2$  is necessary to determine the shape. When looking at blood alcohol samples, a biological maximum could be determined, thus setting the right limit and making it a one-parameter case; however, the fact that Smart and Schmidt did not do this does not take away from the properties of lognormality (provided log normality is statistically proven). It is probable that by

restricting the sample to non-accident drivers, randomization is violated, and thus the shape of the curve (especially the right tail) and its log normality would be affected. The other point is that we do not know to what extent this non-accident sample is representative of the general population. It is possible that the O'Neill and Wells criticisms would have been invalidated had the sampling been done better.

All in all, the Smart and Schmidt study has problems, but certainly on the basis of it alone, the Ledermann model cannot be discarded. Although the statistical test of log normality was rejected, the result is only to weaken (but not invalidate) subsequent tests based on this model.

Some other criticism comes from Morgenstern (1974) because the model is based only on drinkers. Non-drinkers are excluded, perhaps on the theory that the decision to drink or not is independent of how much one drinks, or on the theory that the percentage of non-drinkers does not vary much over time. Another criticism from Morgenstern is that cross-sectional data cannot be used to make causal inferences and to predict changes; however, longitudinal data show a correlation between cirrhosis and consumption (Terris, 1967) thus strengthening the cross-sectional findings and adding weight to a theory of causation.

Skog (1974) has criticized the model because the theoretical underpinnings are weak. Although Ledermann spoke of a "boule de neige" (or snowball) effect, Skog felt that the

explanation was too vague, and in fact it just does not fit too well with our knowledge that people's drinking habits do change sometimes in a decreasing manner. A different approach is that the amount of consumption at the present time depends on the amount of consumption in the near past. Skog himself proposed this as a Markov chain process whereby we might hypothesize that the amount consumed by an individual in a current week is directly dependent on the amount consumed in the previous week (regardless of consumption during any other weeks). That is, let  $X_1, X_2, X_3, \dots$  be a sequence of random variables. If  $P(X_n = x_n / X_{n-1} = x_{n-1}, \dots, X_1 = x_1) = P(X_n = x_n / X_{n-1} = x_{n-1})$ , then the sequence of random variables  $X_1, X_2, \dots$  is called a Markov chain which means that the  $n$ th random variable ( $X_n$ ) depends only on the preceding random variable (namely  $X_{n-1}$ ).

A more realistic model, however, might be the  $m$ -dependent Markov chain where the consumption of an individual in a certain week (for example) depends on the preceding  $m$  weeks. More precisely, a sequence of random variables,  $X_1, X_2, X_3, \dots$ , is called  $m$ -dependent Markov chain if  $P(X_n = x_n / X_{n-1}, X_{n-2}, \dots, X_1 = x_1) = P(X_n = x_n / X_{n-1} = x_{n-1}, X_{n-2} = x_{n-2}, \dots, X_1 = x_1) = E(X_n = x_n / X_{n-1} = x_{n-1}, X_{n-2} = x_{n-2}, \dots, X_{n-m} = x_{n-m})$  where  $m < n$ . This means that the  $n$ th random variable  $X_n$  (i.e., consumption of the individual during the  $n$ th week) depends on the last  $m$  random variables, namely  $X_{n-1}, \dots, X_{n-m}$  (i.e., consumption of the individual during

the  $n-1$  through  $n-m$  weeks.

An example of this is that an individual's consumption during one week would probably be very similar to his consumption during the previous week (or for the  $m$ -dependent process, a fixed number of previous weeks). But if sickness, or some other event prevented drinking for several weeks, then the first week of drinking after the sickness would be apt to be at a lower level than the weeks prior to illness. Thus the new drinking level would only be dependent on the immediately preceding weeks.

Another suggestion of the process underlying the distribution of consumption thesis comes from an early article in social psychology by Allport (1934) who shows that many patterns of behavior which follow an upside-down J-curve are behaviors which he calls "conforming behaviors." That is, there is a clearly recognizable, unequivocal purpose to be achieved by the behavior (such as stopping at a stop sign), the prescribed act is known to all (it is common knowledge to stop at a stop sign), and a large proportion of the population do this prescribed act (the majority of people do stop at stop signs). Since alcohol consumption follows this upside-down J-distribution, it is possible that drinking should be seen as a conforming behavior -- the majority will conform to the societal norm (i.e., four drinks per week), but a certain proportion will exceed that norm (i.e., seven drinks per week), and a small proportion will exceed it even more. Although this theory has not been studied with regard to

alcohol, it is certainly a plausible explanation which fits well with the distribution of consumption theory.

But, whether or not there is a theory of individual consumption which backs up the distribution of consumption thesis, the central issue is that we cannot influence the number of high risk drinkers (i.e., those in the right tail) without affecting all drinkers (i.e., changing the mean consumption). The point of the theory, in any event, is to explain rates of alcoholism (which will lead to policy implications for lowering those rates), and not to explain the condition of alcoholism with individual points in the process for interventions.

Furthermore, the heart of the theory is really indisputable, and that is that the distribution is unimodal and positively skewed; therefore, the high risk group is not independent of the rest of the distribution. To lower or raise the mean consumption will lower or raise the number of high risk drinkers.

The difference that log normality with a constant endpoint makes is that populations fitting this pattern can be compared by their mean consumption and the percentage of high risk drinkers will be uniformly proportionate to the mean consumption. Without the constant endpoint across populations, the relationship between the mean and the percentage of high risk drinkers will not always be the same; however, the differences should be small enough so that comparisons will still be valid. In fact, Skog (1971) has shown an unusually high correlation between per capita consumption and proportion of persons with an average daily consumption exceeding 10

centiliters of pure alcohol as found by empirical methods.

It is my opinion that we have enough evidence to support this model and no evidence that disproves it. Surely there are some rough areas of it (i.e., the value of the upper bound), but in any event, in comparison to any other distribution theory available (i.e., the bimodal theory of alcohol consumption which says that most people drink normally, but alcoholics drink excessively and in a different class from normal drinkers) the evidence definitely favors the distribution of consumption (Ledermann) model. While it is incumbent upon researchers to refine and strengthen the model, it seems that there is enough cumulative evidence so that critics will have to prove it wrong and offer support for an alternative model, rather than just offering criticism of the present model.

All in all, the status of the distribution of consumption thesis is that it is scientifically the best model going now, but it is not without its critics. The criticisms are mainly directed at areas which need to be refined, but no criticism has to date invalidated the model, nor have there been any proposals for new models.

In the most direct way, this theory gives us an answer to the original question: why do some groups have more alcohol problems than others? Very simply, because in the aggregate, they drink more. The model does not try to explain drinking on an individual level (although some interesting ideas have been put forth) but rather it notes that the number of heavy

drinkers is related to the overall consumption in a population. In this sense it is the most "public health" approach so far described, in that public health is typically concerned not with why individuals are problem drinkers but rather how to prevent alcohol problems in the aggregate. Beauchamp (1975) has addressed this point much more thoroughly, and has also gone into some of the fallacious reasoning behind ignoring aggregate issues, including the issue of alcohol control policy, and instead analyzing ex post facto why "some people" become alcoholics (Beauchamp, 1974).

In terms of the present study, the distribution of consumption theory is important because it enables us to use a rank ordering of per capita consumption among nations as a good approximation of the rank order of the proportion of high risk drinkers. In other words, to see where Bahrain ranks among other nations in per capita consumption will be an indication of how Bahrain compares to these countries on alcohol problems and whether or not the predominately social system there is effective. Also, longitudinal trends in per capita consumption can be used as an indicator of increasing or decreasing alcohol problems in Bahrain.

## II. Alcohol Controls

At this point it is useful to review the three different types of controls or pressures which limit consumption (legal, economic, and social) and the evidence to date of their effectiveness in the light of distribution of consumption thesis.

#### A. Legal controls

The subject of legal controls is of interest to legislators, prohibitionists, the liquor industry, social drinkers, and sometimes even researchers. But the effect of legal controls on drinking behavior is difficult to evaluate because all too often laws which were originally intended to limit alcohol availability are now seen as a means of coordinating orderly distribution with the alcoholic beverage industry and/or improving state revenues through alcohol taxes (Bruun et al., 1975). Nevertheless, there are some restrictions which we can presume to have been specifically instituted in order to limit availability. The design for most of these studies has generally been to take baseline levels before a policy change, and then to take the new levels after the policy has been instituted.

Kuusi (1957) studied the change in drinking behavior in rural Finnish communities after the opening of state beer and wine package stores. In spite of the fact that there were control communities and the study was carefully conducted, the results were inconclusive. While beer and wine consumption increased, illicit liquor consumption decreased; therefore, the amount of absolute alcohol consumed probably did not change as much as its form.

Terris (1967), in a class study, showed that liver cirrhosis rates dropped during Prohibition. This does not mean that all drinking stopped: people drank more secretly and preferred distilled spirits because the alcohol was more

concentrated (Room, 1971a) but they did drink less. In a study conducted soon after Prohibition and using several independent methods of estimating consumption, Warburton (1932) calculated that in early Prohibition the per capita consumption of spirits was reduced to two-fifths of the pre-war level, while beer was reduced to one-fifteenth the pre-war level. Altogether, the absolute alcohol consumption (in all forms) in the early years was one-third the pre-war (pre-1914) consumption level. From 1927-1930 per capita consumption of spirits was 10% greater than in 1911-1914, wine was 65% greater, and beer 30% greater than for the same time period. The total absolute alcohol consumption was two-thirds greater than the pre-World War I era. The Canadian and Finnish experiences with Prohibition (Popham, 1956; Braun et al. 1960) were similar to the American experience.

Massé et al. (1976) report decreased cirrhosis mortality in France during World War II when there were food restrictions on wine, production of wine was down, wine was rationed, and there were government restrictions on the hours and days that alcohol could be consumed in cafes and restaurants.

The strike in the stores of the Finnish Alcohol Monopoly is also an example of an abrupt decrease in availability (but not total inavailability) of alcoholic beverages (Makela, 1974). For a five week period, the sales and cleaning personnel of the Alcohol Monopoly retail stores went on strike, thus alcoholic beverages were not available on a retail basis. Normal delivery of alcohol to licensed restaurants

continued, so alcohol was available in these establishments, and light beer (no more than 3.7% alcohol by weight) was also available in retail shops. The results were striking: there was a marked decrease in arrests for public drunkenness, driving under the influence arrests, crimes of violence, alcohol-related accidents, and hangover patients in outpatient clinics. Due to the fact that the duration of the strike was anticipated to be short, smuggling never really got organized, and it is impossible to know the extent to which this would have entered the picture given time. The important thing is that even though alcohol was available in an alternate mode (i.e., in restaurants and light beer), and no doubt some took advantage of this and maintained their former consumption levels, the overall level of consumption and problems was reduced. The other important point here is that the reduction of problems is clearly related only to the strike and reduced availability. Usually changes in availability are brought about through legal processes, and legal processes are a reflection of social processes, thus it is difficult to know whether to attribute drinking changes to the new law or the social sentiments behind the law.

Magruder (1976) showed that varying degrees of legal availability are associated with predictable patterns of alcoholism mortality. Most notably, wet counties in North Carolina in 1971 had twice the rate of alcoholism mortality as dry counties after age and race adjustment. Furthermore,

the relationship still held after controlling for degree of urbanization.

Room (1974) found a positive relationship between cirrhosis rates and legal availability, consumption, income, and urbanization, but a negative relationship between cirrhosis and drunk driving. His unit of measurement was the state, and the fact that drunk driving data were only available for 39 states might have influenced the results somewhat. Also, drunk driving arrest practices are known to vary a great deal in different areas.

On the other hand, Popham et al. (1971) have reported that in Canadian provinces, various controls such as government controlled monopoly systems versus private enterprises, diversification of licensed drinking places (i.e., introduction of cocktail and dining lounges, hours of sale, and the number of outlets did not explain the variation in reported liver cirrhosis mortality in the different geographical areas. Similarly, in Washington state where liquor by the drink was introduced, there was no evidence that this change had any effect on consumption or alcohol-related offenses (Bryant, 1954).

In studying motor vehicle accidents in Australia after an extension of closing hours for on-premise establishments, Raymond (1969) found that the frequency of accidents was the same as before, but the peak accident hour changed from the hour after the old closing time to the hour after the new closing time.

To summarize these types of "outlet-related" control laws, it seems that the number of distribution points (and an increase or decrease in the number of outlets) is a more important factor than the character and operation of the outlets (i.e., hours of sale, changing from only beer sold to cocktails, etc.).

Smart (1974), however, did find that self-service liquor stores were preferred over clerk-service stores, and more liquor was bought at the self-service stores because of "impulse buying." It is possible, though, that these customers who had self-selected themselves to go to the self-service stores were also heavier drinkers in the first place.

Some efforts at control have come through the lowering of alcohol content in certain beverages. This happened in Russia in 1972 when the government legislated that no more of the 50% and 56% alcohol-content vodka could be produced (Bruun et al. 1975), but the effect of this change on consumption is not known. In Finland in 1969, medium strength beer (which had previously only been available in the State Monopoly System) was released for sale on the unrestricted retail market. The result was an increase in per capita consumption (Makela, 1972).

Most countries have some type of minimum age limit for the purchase of alcohol. Whitehead (1974) cites evidence that the lowering of drinking ages in several areas of North America has resulted in both increased consumption and increased alcohol-related traffic collisions for the group

that was added to the legal drinking age group. Douglass and Filkins (1974) and Schmidt and Kornaczewski (1975) report similar findings.

#### B. Economic Controls

Although most economic controls on alcoholic beverages have not been specifically designed to control consumption and alcohol problems, the recent observation that economy and alcohol consumption are closely related has led many prevention advocates to espouse this as a strategy (deLint and Schmidt, 1974; Terris, 1968). The evidence is strongly in favor of such a strategy.

The ratio of the average cost of a gallon of alcohol to average disposable income is closely associated with alcohol consumption rates and liver cirrhosis mortality. The smaller the ratio is, the higher alcohol consumption and liver cirrhosis mortality are (Popham *et al.*, 1971; Seeley, 1960; deLint and Schmidt, 1974). In the last decade, these findings have been translated into policy in France: tax on alcohol has been increased and cirrhosis mortality and consumption have declined (deLint and Schmidt, 1974). But other efforts by the French have also been employed (such as reducing the frequency and location of outlets and removing the private distillers license) so it is difficult to only look at the results of taxation.

Economy had a large influence on reduction of Danish consumption during World War I. Food shortages drove the

price of beer up 60% (from 0.15 to 0.24 kroner per liter) and the price of akvavit up 1122%(from 0.9 to 11 kroner per liter). Initially, the per capita consumption dropped from 6.7 to 1.6 liters of absolute alcohol, and the rate of registered delirium tremens dropped from 27 per 100,000 to 2 per 100,000. A side effect was that Denmark changed from a predominately spirits drinking country to a predominately beer drinking country (Nielsen, 1965).

The theory seems simple enough, but it is worth breaking it down into its components. There are two parts of the relative cost of alcohol. The first is the cost of the alcohol itself which relates to price elasticity. Despite the traditional views of economists, alcohol has generally been shown to be price elastic -- that is, the more it costs, the less consumed (Bruun et al., 1975). Disposable income relates to income elasticity, and again, alcohol is generally elastic for income -- that is, as income increases, more alcohol is consumed (Bruun, 1975). Both price and income elasticity vary from country to country and even from area to area. And, in the case of price elasticity, it varies for different types of alcoholic beverages (Osterberg, n.d.).

While there has been speculation that price changes might not affect wealthy drinkers (Room, 1971b)(in other words, alcohol would be price inelastic for these drinkers), there is no proof of this, and furthermore, the rich are a small element in the drinking population, and there is the undeniable relationship between cirrhosis mortality deaths

and the relative price of alcohol. DeLint (1974) points out that there is no known example of a country with high alcoholism rates in the presence of high relative price; however, he cautions that increased consumption might not solely be attributed to decreased price, as taxation is to some extent a measure of alcohol acceptance by a society.

Although more work needs to be done in this area, especially to tease out the difference in the effect of societal attitudes and price and income variation, the results of the investigations to date are consistent and point to the relative price of alcohol as a determinant of overall consumption. This conclusion receives further support from psychological work where the price of drinks was artificially manipulated and the level of drinking rose or fell accordingly. (The Journal, 1977).

#### C. Social controls

Certainly the evidence in the last two subsections on legal and economic controls is impressive in its consistency and in the soundness and scope of the data. After reading these subsections, though, one could easily get the impression that 100% of the variance among cultures can be explained by economic and legal differences. We might believe this to be true except for several studies which are well known but have never before fit well into the distribution/control theory. The commonality of these studies is that the groups under study (Mormons, Jews, Southern Protestants,

and females) are subject to the same legal and economic controls as the larger society but still have lower rates of alcohol problems.

Snyder (1962) in his classic study of Jewish sobriety in America has pointed to the pressures of the Jewish community (the "in-group") against drunkenness and for sobriety and moderation as crucial to the maintenance of Jewish sobriety. On the other hand, pressure from the larger society (the "out-group") causes more drinking. The effectiveness of the in-group pressure is directly dependent on the degree of solidarity with the Orthodox community. (The stronger moral condemnation of intoxication is more prevalent in the more Orthodox Jews). Snyder himself did not supply any kind of epidemiological data on rates of alcohol problems among Jews, but surveys since then have confirmed his impression (Cahalan et al., 1969).

Concerning alcohol problems in women, Gomberg (1976) notes the consistency with which surveys all over the world show that males have a higher rate of alcohol problems than females, and she also points to the difference in feeling about men and women drinking (see also Gusfield, 1962). There is a societal attitude which is more condemning of female drinking than male drinking. This attitude still persists, in spite of the fact that male/female differences in percentage of drinkers are becoming smaller. Whatever the reason for distinguishing between male and female drinkers (Gomberg points to the fact

that drinking and the motherly role do not fit well together in people's minds), this societal pressure against female drunkenness has kept down female drinking problems.

Another example of strong group pressure against drinking is found among some Protestant denominations, mostly in the South. The survey conducted by Cahalan et al. (1969) reveals that conservative Protestants have the largest proportion of abstainers (48%) and the lowest proportion of heavy drinkers (7%) in comparison to liberal Protestants, Catholics and Jews. When churchgoing is controlled for, the proportion of heavy drinkers is still higher among Catholics than among liberal Protestants and lowest in fundamentalist Protestants (Alcohol and Health, 1971). This is borne out in national statistics on consumption: the Southern states (with more conservative Protestants) have a lower per capita consumption rate than the other areas of the country. Table 1 shows the apparent consumption of a gallon of pure ethanol for different U.S. regions in 1970 (from Alcohol and Health, 1971).

Even more powerful evidence comes from a comparison made by Fuchs (1974) of the states of Nevada and Utah. He notes that Utah is one of the healthiest states of the Union because of the high proportion of Mormons who live there and have a strong influence throughout the state. (The Mormon religion prohibits the use of alcohol and also tobacco). The two states are comparable with regard to income, schooling, degree of urbanization and climate. Table 2 shows per capita

Table 1

Apparent Consumption of a Gallon of Pure Ethanol for  
Different U.S. Regions 1970

|                                                                                                                               |           |
|-------------------------------------------------------------------------------------------------------------------------------|-----------|
| East South Central (Alabama, Mississippi,<br>Tennessee, Kentucky)                                                             | 1.63 gal. |
| West South Central (Texas, Louisiana,<br>Arkansas, Oklahoma)                                                                  | 2.19 gal. |
| West North Central (North Dakota, South<br>Dakota, Minnesota, Iowa, Nebraska,<br>Kansas, Missouri)                            | 2.46 gal. |
| South Central (Florida, Georgia, South<br>Carolina, North Carolina, Virginia,<br>Maryland, Delaware, District of<br>Columbia) | 2.56 gal. |
| East North Central (Ohio, Indiana,<br>Illinois, Michigan, Wisconsin)                                                          | 2.61 gal. |
| Mountain (Idaho, Montana, Wyoming,<br>Nevada, Arizona, Colorado,<br>New Mexico, Utah)                                         | 2.72 gal. |
| Middle Atlantic (Pennsylvania, New<br>York, New Jersey)                                                                       | 2.84 gal. |
| New England (Vermont, New Hampshire,<br>Maine, Rhode Island, Connecticut,<br>Massachusetts)                                   | 3.00 gal. |
| Pacific (Alaska, California, Hawaii,<br>Oregon, Washington)                                                                   | 3.06 gal. |

consumption and alcoholism prevalence for the two states.  
Of the 50 states and Washington, D.C., Utah has the lowest  
rate of consumption while Nevada has the highest.

Table 2

Per Capita Consumption of Absolute Alcohol and Rate of  
Alcoholism for Utah and Nevada

|        | Per capita consumption of absolute alcohol U.S. gallons 1974 | Rank | Estimated rate of alcoholism per 100,000 population age 20+ 1970 | Rank |
|--------|--------------------------------------------------------------|------|------------------------------------------------------------------|------|
| Utah   | 1.61                                                         | 51   | 2070                                                             | 47   |
| Nevada | 6.48                                                         | 1    | 6770                                                             | 1    |

One might think that the high rate of alcohol consumption is inflated due to the large tourist industry, but not entirely so since Nevada is also estimated to have the highest rate of alcoholism for 1970 (this estimate is derived by the original Jellinek formula which does not use consumption data but is based on liver cirrhosis data).

All of these examples demonstrate the effectiveness of group pressure against alcohol abuse. For those who identify strongly with these groups, the pressure is apparently felt and shows up in the low rates of alcohol problems in these groups.

However, it is obvious that there are still a lot of loose ends in these studies. For example, urbanization is a factor known to be associated with high cirrhosis rates (Magruder, 1976; Room, 1974). Perhaps some of the differences would be less pronounced if urbanization is controlled for. It would be especially easy to see that this might

happen with the conservative Protestant groups. Economy is another factor which might account for some of the differences (this might especially be true with regard to female drinking). This is merely to point out that in the light of the new wave of control literature, older studies merit reconsideration and in some cases reinterpretation.

### III. Liver Cirrhosis and Alcohol

There is an important link between per capita consumption and rates of alcohol problems. The more alcohol a person consumes, the more he is at risk for alcohol-related problems. Given the distribution of consumption thesis, the higher the per capita consumption level, the higher the rate of alcohol-related problems. Liver cirrhosis is the best example of this.

While liver cirrhosis does occur among non-alcoholics, it is estimated that in urban areas in the Americas and Britain, approximately 80% of cirrhotic deaths are due to alcoholism (Terris, 1977). While the rate of cirrhosis is generally found to be less in non-urban areas (Cahalan et al., 1969; Sundby, 1967; Magruder, 1976), there is no evidence for, nor any reason to believe that the percentage of non-urban cirrhosis due to alcohol is any different than the same percentage of urban cirrhosis.

It used to be thought that liver cirrhosis was due to the combined effect of repeated excessive alcohol intake and malnutrition. Most alcoholics who were diagnosed as cirrhotics were believed to have eaten poorly and taken so many of their

calories in the form of alcohol that they neglected to eat enough food to provide them with the proper nutrients. thereby causing cirrhosis. Recent work by Rubin and Lieber (1974) suggests that "a nutritious diet will not prevent the development of alcoholic hepatitis and cirrhosis when excessive alcohol is chronically consumed"(page 128). They worked with the baboon whose liver is morphologically indistinguishable from the human liver. Two groups of baboons were fed a normal diet from 9 months to 4 years, except that for one group alcohol replaced the carbohydrates in their diet and they also received a vitamin tablet. Of these 13 animals in the alcohol group, 7 developed fatty liver, 4 developed alcoholic hepatitis, and 2 developed cirrhosis. The point of reviewing this article is to show that alcohol has a direct toxic effect on the liver, and that excessive drinking increases a person's risk for developing cirrhosis independent of proper nutrition.

In a less rigorous study, Schuttman et al. (1968) found that all 11 tasters in an East German distillery showed pathological changes of the liver even though their nutrition was excellent. The tasters drank between 40-125 grams of pure ethanol per day at the distillery and did not drink after work. They had been employed from 2-37 years and the two most recently employed showed the least pathology.

Péguinot (1958) compared 116 cirrhotics (non-alcoholic cirrhotics were excluded) with 116 controls, matched for age, sex, and social background. There was no difference between the cases and controls for duration of drinking, protein and

caloric intake, body weight, physical activity, marital status, and social status. The only difference between the two groups was the average alcohol consumption: 174-212 grams of wine per day for the cirrhotics (for an average of 20-25 years) and 72-82 grams of wine per day for the non-cirrhotics (for an average of 20-25 years). Péquignot concluded that reduction of food is not a factor in the development of cirrhosis.

Another point concerns the length of time for cirrhosis to develop. This is important to make clear so that the epidemiological finding associating cirrhosis mortality and alcohol consumption are consistent with clinical findings. Von Oldershausen (1962, 1964), from a study involving 250 alcoholics in a recovery unit in a West Berlin hospital, has deduced that 10 years of heaving drinking leads to alcoholic hepatitis, 15 years leads to incipient cirrhosis, and 20 or more years leads to advanced cirrhosis. Rubin and Lieber (1974) suggest that it takes about 10 years of alcohol abuse to produce cirrhosis in man, while Insunza et al. (1971) suggest that the probability of cirrhosis increases after 10 years of abuse and increases even more after 15 years of abuse. The point is that the development of cirrhosis is a drawn-out process which is usually preceded by fatty liver and/or alcoholic hepatitis (Isselbacher, 1977). But, fatty liver and hepatitis are both reversible by abstinence (Lelbach, 1966).

With regard to rates of cirrhosis, after a reduction in drinking it would not take 10 years to see a corresponding reduction in cirrhosis rates. The change would be expected to show up before 10 years because the potential cirrhotics (i.e., those with alcoholic hepatitis and fatty liver) could still be reversed, thus causing a reduction in the cirrhosis rate. Table 3 shows the high and consistent correlations found longitudinally between the rate of liver cirrhosis mortality and per capita absolute alcohol consumption (for the same year) for several countries. Room (1971a) reports that several researchers have independently observed a one year time lag between consumption averages and cirrhosis mortality rates. Wallgren et al. (1970) found that allowing for a five year time lag improved correlations. Terris (in Room, 1971a) however, supports the one year lag by noting that the cirrhotic process can be arrested with abstinence, and decompensation of a previously injured liver can proceed rapidly upon resumption of drinking after abstinence. The important thing is that epidemiologic changes show up sooner than might be expected on the basis of the lengthy clinical development of the disease.

Another factor which is important both clinically and epidemiologically is amount consumed. The more consumed, the higher the probability of developing cirrhosis. This has been confirmed in a study by Péquignot (1958) which was described earlier in the chapter. Leibach (1966) found a

highly significant difference between two groups each with 108 alcoholics (less than 160 grams average daily intake and greater than 160 grams average daily intake), admitted to hospital for detoxification. There was no difference between the two groups with regard to age, body weight, and duration of alcohol abuse. The less than 160 grams group had 0% cirrhotics, and the greater than 160 grams group had 13.9% cirrhotics.

These clinical data dovetail nicely with epidemiological data. In both longitudinal and cross-sectional studies, there is a consistently high and statistically significant correlation between per capita absolute alcohol consumption and liver cirrhosis mortality. (Popham, 1956; Seeley, 1960; deLint and Schidt, 1971). The following data (from deLint and Schmidt, 1971) show a number of longitudinal series:

Table 3

Correlations between Rate of Liver Cirrhosis Mortality and  
Per Capita Absolute Alcohol Consumption

| Country   | Years                       | Correlation<br>Coefficient | Probability |
|-----------|-----------------------------|----------------------------|-------------|
| Australia | 1938-1959                   | .65                        | .005        |
| Belgium   | 1929-1959 (less<br>1940-45) | .75                        | .001        |
| Canada    | 1927-1960                   | .88                        | .001        |
| Finland   | 1933-1957                   | .78                        | .001        |
| France    | 1925-1958                   | .62                        | .001        |
| Holland   | 1927-1958                   | .57                        | .001        |
| Sweden    | 1926-1956                   | .45                        | .05         |

In a computer run of my own using 22 countries with consumption data from 1970 and cirrhosis data from 1971, a correlation of 0.83 was obtained. Sulkunen (1976) using 1971-1972 cirrhosis mortality rates and 1968-1970 consumption averages got a correlation of 0.94. The data are consistent, strong, and persuasive.

It is worth noting, though, that all of the countries included in these series are highly westernized. Clinically, there are two basic causes of cirrhosis: infectious hepatitis and alcoholism (Massé et al., 1976). As previously stated, in the Americas, about 80% of all urban cirrhosis deaths are attributed to excessive alcohol abuse (Terris, 1977). But, in developing countries and other places with high morbidity rates of infectious hepatitis, it is not known what proportion of cirrhosis deaths are due to alcohol consumption and what proportion are due to infectious hepatitis. Massé et al. (1976) report that no reliable correlation has been shown between mortality from hepatitis and mortality from cirrhosis.

Perhaps a better conceptualization of the problem, though, is to think of excessive alcohol consumption and infectious hepatitis as the two etiological components of cirrhosis. As shown earlier, per capita absolute alcohol consumption is directly related to the rate of excessive consumption in a society; therefore, it should be possible to build a regression model with cirrhosis mortality as the dependent

variable and infectious hepatitis morbidity rates and per capita absolute alcohol consumption as the independent variables. When this was done for the countries for which all three sets of information were recently available, hepatitis morbidity contributed (insignificantly) only 0.4% to the variance. Cirrhosis and consumption were positively correlated ( $r = .83$ ) (in support of previous findings), but surprisingly, hepatitis and cirrhosis were slightly negatively correlated ( $r = -.05$ ). Possible explanations for the failure to obtain significant results are that hepatitis figures are inaccurate (they were obtained from World Health Statistics Report (1973) and World Health Statistics Annual, (1974)). Also, in developing countries, where there is high infectious hepatitis morbidity, there are no data on alcohol consumption, so the information available is only for one stratum of countries.

In any event, we are left deducing from clinical work that liver cirrhosis mortality rates are an overestimate of excessive drinking in countries with high rates of infectious hepatitis, but we are left not knowing quantitatively the extent to which this is true.

#### IV. Muslims and Alcohol

It is surprising, that among the ethnic and religious alcohol studies, there has been little relating to Muslim alcohol use. Islam has always been known to prohibit the consumption of alcohol; however, the effect of this

prohibition has never been scientifically documented. Furthermore, in many Muslim countries it is impossible to distinguish between secular and religious laws because religious law has become secular law. With regard to alcohol consumption, this is true in Libya, Kuwait, Qatar, and Saudi Arabia.

In a paper calculating the amount of alcohol consumed in the U.S.S.R., Traml (1976) mentions that the regions of Russia with a significant proportion of Muslims have a lower alcohol consumption than other regions. Although this was an incidental finding of the study and was not explored further, it seems to indicate that even in Russia where there are many secular pressures, the alcohol prohibition of Islam is somewhat effective.

This is contradictory to a paper by Al-Safar (1975) who, in attempting to estimate the extent of the alcohol problem in Bahrain, has stated that there are 8000 alcoholics in Bahrain. He gave no information on the mathematics of his estimation, only that it was in part based on psychiatric admissions for alcoholism (there is only one psychiatric hospital in Bahrain) and his own private practice (he is the only psychiatrist with a private practice) and that it included resident non-Bahrainis. With a total population of only a quarter of a million (including resident non-Bahrainis) this gives a very high rate of alcoholism (3.2% of the population). In Bahrain alcohol is easily available (ICAA, 1976); therefore, one wonders if this is not dissimilar to the

American Indian experience with alcohol.

There have been several papers describing alcoholic populations in clinical settings in Muslim states. Al-Safar (1974) in a clinical sample of 41 patients admitted with a diagnosis of alcoholism to the psychiatric hospital in Bahrain reported that in general the patients were socially stable. He claims that his sample is similar in stability ratings to patients described by Hore and Smith (a British sample) and Strauss and Bacon (no reference given but assumed to be an American sample); however, there were more Bahraini patients married and living with their wives. This, he reports, could be cultural since females are unable to leave their husbands. He also reports that in the last two years there has been a relaxation for the prosecution of alcohol users; therefore, traffic accidents related to alcohol have risen 120%. This paper should be viewed as extremely tentative. Most importantly, the sample is small and from a clinic setting with no mention at all of how the patients were selected for study. The descriptive statistics of the sample itself are scanty and sometimes inaccurate (the percentage single is reported as 39.3% and the percentage married is 70.7%, for a total of 110.0%).

Maghazaji (1975), Hassabo (1975), and Demerdash (1975) have done similar studies, putting together demographic profiles of hospitalized alcoholics in Iraq, Sudan, and Kuwait respectively. In each case, though, the samples were smaller than the Bahraini samples and there were no comparisons to

other clinical groups or to the population at risk. Although these studies are inadequate by epidemiologic standards, they are, however, an introduction to alcohol problems in the Middle East, and they prove that alcohol problems do exist in Muslim countries, although at what level is unknown.

While there has been no systematic study of the relationship between alcohol control laws and alcohol problems in the Middle East, there have been several observations. Saied (1975) felt that since the Libyan laws were made stricter in 1974, the number of alcohol-related crimes has decreased. No data are given, however. Al-Cairo (1975) has observed that alcohol addiction and alcohol deaths are few in Iraq, even though the sale of alcohol and the preparation of araq and local beer is not prohibited. Again, no data are given.

Al-Mukhtar (1974) has given a summary of some of the various alcohol policies in some Arab countries. His paper is a descriptive document which looks at such factors as hours of sale for alcohol, religious holidays when alcohol sale is prohibited, types of places licensed to sell alcohol, etc. While no attempt is made to link these restrictions with alcohol problems or amount of consumption, the implication is that the author is showing a wide variety of ways of controlling alcohol use which are at least culturally acceptable.

In an anecdotal fashion, Graz (1976) describes the obsession of the Qataris for alcohol. Although alcohol is officially prohibited in Qatar, Graz found that whiskey was generally available and that most of the gentlemen did not

observe the Koranic prohibition. The black market was well established, but with no organized crime overtones. The official punishment for drunken driving is 40 lashes, but practically never enforced. Instead, imprisonment and/or fines are used. It is not unusual for a drinking driver involved in an accident to run away from his car, hoping to escape being arrested for drunken driving, but hoping even more to avoid the embarrassment of having his family and relatives know that he had been drinking.

In a similar article on the United Arab Emirates, Graz (1976) notes that health officials are predicting increasing problems with alcohol in the near future. The impression there is that alcohol use is increasing, especially among young adults, even though it is officially non-existent for Qataris and most Muslim foreigners (special permits are available for non-Muslims).

From these various reports, we can infer that there is a problem with alcohol -- even in some of the totally prohibitionist countries (but notably, no report was given by Saudi Arabia). The extent of the problem is impossible to know from the kind of data so far presented. There are, however, some clues as to the appropriateness of data for estimating a problem:

- a. Psychiatric data are not acceptable. In the Al-Safar (1974) study patients reported being ashamed and guilty of their drinking and the fact that they were going against their religion; therefore, they would be less

apt to come to treatment. Also, in the countries where there is a severe punishment for drinking, fear of this punishment might keep them from treatment. One might guess, though, that a drinker in a low consumption society might be more apt to label himself deviant for smaller deviations from the norm, and others would be more apt to apply this label also.

- b. Traffic data are not acceptable. Road conditions are obviously very different as are arrest procedures and criteria for driving under the influence.
- c. Alcohol crime arrest data (public drunkenness) are not acceptable. Arrest practices are too different from Western countries to make any valid comparisons. Any alcohol imbibed or in possession is grounds for arrest in some countries.
- d. Psychiatric, traffic, and crime data could, however, be valid indicators for looking at trends in drinking problems within a country.
- e. Alcohol consumption is a valid indicator, but in prohibitionist countries it is impossible to get this information with any accuracy.
- f. Liver cirrhosis could be a valid indicator, provided the rate of non-alcoholic cirrhosis is not too different from comparison countries.

Given this background, it was decided to take one country -- the State of Bahrain, a conservative Muslim oil sheikhdom but with alcohol easily and inexpensively available

-- and collect data which would be internationally comparable and would enable us to answer two main questions:

- 1- What is the extent of alcohol abuse in Bahrain in comparison with other countries? The answer to this question will enable us to know the extent to which the Islamic prohibition against alcohol use (as opposed to secular law or economy) is effective as a control measure in Bahrain.
- 2- What are the trends in alcohol problems in Bahrain? Are they increasing or decreasing? The answer to this question will give us an idea of how well social controls are operating with the coming of modernization and Westernization.

In order to correctly interpret the findings, it was first necessary to know something about the country of Bahrain itself.

## CHAPTER THREE

### THE SETTING: BAHRAIN

The intent of this chapter is to give the reader a feel for the setting of Bahrain. In the first section, an overall description of Bahrain is given, and where appropriate, comparisons are made with other Middle East countries to give an understanding of how applicable the methodology and findings of the present study might be in these countries. The second section deals specifically with Islam and alcohol use, while the last three sections concentrate on the previously outlined factors which can influence alcohol consumption and alcohol problems (legal controls; economic factors, and socio-cultural factors).

#### I. General Description

This first section is a general description of Bahrain, not necessarily related to alcohol consumption, but more to show the general atmosphere. The description includes geography, important historical developments, demography, politics, economy, education, health care and sex roles.

The State of Bahrain is a group of islands (622 square kilometers) nestled in between the Arabian mainland and the Qatari peninsula. The lights of both Saudi Arabia and Qatar are visible at night from Bahrain. Bahrain is a part of a

major Middle Eastern subdivision known as the Arabian Peninsula which includes Saudi Arabia, Yemen, South Yemen, Oman, and the Gulf States (Bahrain, Kuwait, the United Arab Emirates, and Qatar). It is a desert-oasis environment, as are all Middle East countries. Natural springs bubble up with "sweet" water in the sea and also in the northern area of the island creating an oasis in this part of the island. This "sweet" water is said to come from the mountains of Arabia, seep under the sand, and bubble up in Bahrain and the nearby sea. The southern two-thirds of the island is typical desert and is uninhabited except for a few villages on the coast.

Although extremely humid year-round, rain is a rarity in Bahrain, and only an average of three inches falls from December to March. High temperatures (sometimes as high as 115° F.) combined with humidity make summer months very uncomfortable, while the winter is mild and temperatures never even come close to freezing. (Many Bahrainis often spend summer in cooler climes, especially if Ramadan, the Muslim month of fasting, falls in July or August).

There is good evidence that the main island of Bahrain was inhabited as early as 4000 B.C. Surely, by 2000 B.C. Bahrain, then known as Dilmun, controlled a great deal of the trade between the Fertile Crescent (the Sumerians) and the Indus Valley, and even from this early time, there are clay cuneiform tablets which speak of fish eyes (pearls) from Dilmun. Bahrain was a natural for this middle man position

due to its unique geography; the island is halfway down the Gulf and the only place where fresh water is easily available. It was almost a necessity for traders traveling the length of the gulf to stop there.

About the middle of the first millenium, the Persian Empire was established (of which Bahrain was a part). (This set the precedent for the only recently relinquished claim of Iran that Bahrain was a part of Iran). From the fourth through the seventh centuries A.D. the Sassanians (who also ruled the Persian or Alborz-Zagros region) came into power.

With the well-known expansion of Islam following the death of the Prophet Muhammad, Bahrain was the first state outside of the Arabian mainland to accept Islam and become part of the Empire; however, with the disintegration of this great empire in the early part of the tenth century, it was taken over by the Carmathians until 1058 A.D. when an uprising re-established Arab supremacy. After a sequence of Arab dynasties, the Portuguese captured the islands in 1522, and even today, there are ruins of a fortress which was built by these new rulers.

But in 1602 A.D. the Bahrainis revolted, and a state of confusion existed until 1783 when Sheikh Ahmad Al-Khaliifa (who came to Bahrain from the Arabian mainland by way of Kuwait and Qatar) restored order. The Al-Khaliifa family is still in power today. In the nineteenth century, the British East India Company arrived on the Arabian coast. By means of signed agreements with the Bahraini rulers

(begun in the second half of the nineteenth century), the East India Company and its successor, the British Indian Government, controlled the foreign affairs of the island. Even in more modern times, there was a formal agreement with the British government that they would take care of foreign affairs. In 1971, though, the British withdrew, but their influence is still profound. With independence, Bahrain became a member of the United Nations and the Arab League. The present Amir, His Highness Sheikh Issa bin Sulman Al-Khaliifa, has been ruling since 1971.

The population of Bahrain is 95.7% Muslim, 3.1% Christian (almost entirely expatriot Indians, Europeans, and Americans), and the rest are Hindu with a very small group of Jews. The Muslim population is almost equally divided between the Sunni and Shia sects (although the ruling family is Sunni). The large number of Shias is due to the Persian influence. The Sunni/Shia split is a minor point of conflict in Bahrain. Marriages, for example, between the two sects are discouraged. This makes Bahrain similar to many Middle Eastern areas where religious differences exist but are not always so minor.

The language is Arabic, but English is unquestionably the second language and very widely used. Almost all official documents are in English and Arabic, and some records are only in English (such as medical records). In everyday business it is unusual to find a non-English speaking Bahraini, and Arabic is definitely not essential for living in Bahrain; however, if one were to have the opportunity to

come into contact with women and countryside people, this would not be true. Persian is also widely spoken. Throughout the Arabian peninsula, Arabic is the first language, with English the second language (due to the British influence in the area).

Bahrain has the distinction of being the smallest country in the Middle East -- both in area (622 square kilometers) and in population (216,078 in the 1971 census). The population growth is about 3.3% per year which is very typical of the Middle East. Of the total population, 78.1% live in urban areas (that is Manama, the capital city, and Muharraq), while 21.9% are in rural areas. This is probably not as atypical as it sounds -- at least for the Arabian Gulf area, where city-states are found around oases with the surrounding land being uninhabitable. Outside the Arabian peninsula, though, non-urban people are more numerous.

The non-Bahraini population is 17.5% -- a fairly substantial proportion, but also typical of the Gulf states and major oil producing countries which can afford large numbers of advisors and cheap outside manual labor. (Kuwait is extreme in having more than 50% of the population expatriate residents). In 1971 the leading groups of foreigners in Bahrain were (in order): Omani, Indian, Pakistani, Irani, and British.

The government of Bahrain is an Emirate (or sometimes called a Sheikdom). The Amir is an absolute ruler, and the government operates according to Islamic Law. This is

typical of governments in the Arabian peninsula; however, outside the peninsula only Jordan, Iran and Morocco have absolute rulers. The present ruler of Bahrain, His Highness, Sheikh Issa bin Sulman Al-Khaliifa, is generally considered to be a benevolent ruler, and his family has been in power since 1782. Perhaps this continuity and stability, as well as the smallness of the population and the island, has to some extent given the Bahrainis a sense of security which has enabled them to be a bit more liberal than their Gulf neighbors.

As in some other Middle East countries, the main source of income is oil and oil-refining. Before oil was discovered in 1932, pearling was a major source of wealth (even as early as 2000 B.C.); however, Japan and its cultured pearls severely cut this source of revenue. Unlike the other Gulf countries, Bahrain's oil reserves are limited, so the Bahrainis have had to be cautious and careful in their planning. Education and medical care have always been priorities, and oil revenues were very early diverted to these areas.

Other major sources of income are fishing and aluminum smelting. In addition, trade has always been and continues to be important. Bahrain has excellent port facilities and a dry dock project is nearing completion.

At the end of 1971 the new Bahrain International Airport was opened. It was the first Middle East airport specifically designed to handle Jumbo Jets. Recently the Concorde

made its maiden flight from London to Bahrain, and there are now two flights weekly to London.

These air communications and excellent telecommunications have made Bahrain attractive for foreign investors. There is also no taxation and a freer atmosphere than is found in other Arabian Peninsula countries. Furthermore, the government in 1975 made a concerted effort to attract Offshore Banking Units (banks which are not allowed to offer local services but which may accept deposits from governments and large companies and make medium-term loans). There were about 30 Offshore Banking Units by May, 1977 (The Middle East and North Africa, 1977-78, 1977).

Because of the early diversion of oil revenue to education and social services, it is not surprising that Bahrain has better health statistics and higher literacy rates than most Arabian peninsula countries and than many other Middle East countries as well. Of the peninsula countries, only Kuwait surpasses Bahrain in percentage of the population that is literate. The literacy rates in 1971 for the 15 and older population were 49.2% for Bahraini males and 28.5% for Bahraini females (whereas for Kuwait the figures were 63.4% for males and 41.9% for females). Of the 15-24 year old population, the rates for Bahraini males were 77.2% (while only 71.5% for Kuwaiti males) and 54.6% for Bahraini females (60.1% for Kuwaiti females) (Population Bulletin of the U.N. Economic Commission for Western Asia,

1976). In 1968 there were 94 state schools in Bahrain (Area Handbook, 1971).

Table 4 shows the birth rates and death rates for some Middle East countries (The Environmental Fund, 1976). Clearly, the Bahrainis enjoy better health than the people of most other countries in the area.

Unlike most other Middle East countries, but like most Gulf countries, Bahrainis do not lack for the basic necessities of life, i.e., housing, medical care, food, job security, electricity, transportation. But while the standard of living is relatively high for the Middle East, we still find a group of very wealthy people and also a group of very poor people. Most of these very poor are non-Bahrainis who were brought in for manual labor.

Socially, Bahrain is very conservative -- especially regarding family activities and male/female roles and activities. The family and kin group identity is very strong. It would be unthinkable for any unmarried child (whatever age) to live outside the family (unless studying abroad, of course). But while the families are very tight in their relationships, there are not infrequently intense quarrels and situations where brothers have not spoken for years. Regarding family ties, there seems to be no difference between Bahrain and other Middle East areas.

As far as sex roles go, Bahrain is probably less conservative than her Arabian peninsula neighbors. Girls have been going to school in Bahrain since the 1930's, and today some

Table 4

Birth and Death Rates per 1000 Population for  
Middle East Countries 1976

| Country                   | Birth Rate per<br>1000 Population | Death Rate per<br>1000 Population |
|---------------------------|-----------------------------------|-----------------------------------|
| Bahrain                   | 30                                | 9                                 |
| Kuwait                    | 43                                | 7                                 |
| Oman                      | 50                                | 19                                |
| Saudi Arabia              | 50                                | 23                                |
| U.A.E.                    | 50                                | 18                                |
| Yemen Arab Republic       | 50                                | 23                                |
| Yemen Democratic Republic | 50                                | 23                                |
| Iraq                      | 49                                | 16                                |
| Jordan                    | 48                                | 16                                |
| Lebanon                   | 40                                | 10                                |
| Syria                     | 48                                | 15                                |
| Turkey                    | 40                                | 15                                |
| Iran                      | 45                                | 17                                |
| Algeria                   | 39                                | 17                                |
| Egypt                     | 44                                | 16                                |
| Libya                     | 46                                | 16                                |
| Morocco                   | 50                                | 17                                |
| Sudan                     | 49                                | 18                                |
| Tunisia                   | 41                                | 13                                |

go abroad (but usually to Arab countries) for advanced study. Women work in shops, as nurses, teachers, and secretaries (and these professions are also open to men). Some women have gone abroad to study medicine, dentistry, pharmacy, and even veterinary medicine.

But there is absolutely no dating in Bahrain (not even on the sly as in Cairo and other major Middle East cities). Once a couple is married, there is still very little socialization with the opposite sex, and no Bahraini women are to be seen eating in restaurants (even with their husbands!). Most older women wear an abaaya (a long black outer garment which goes from head to foot) and batuula (a black face mask), while most of the under 30 women wear only abaaya, and some of the young women are shedding the abaaya altogether. This is pretty much in line with other Gulf countries.

In general, Bahrain is probably most like the other Gulf States and Saudi Arabia. While the Bahraini identity is with the Arab states, the Persian influence is unmistakable and makes Bahrain somewhat unique. Perhaps, too, the comparatively stable modern history of Bahrain has led to a more secure and self-confident feeling among the people which has created a slightly less conservative atmosphere, which in turn has led to permitting alcohol on the island.

## II. Islam and Alcohol Use

If one were to point to the single most influential factor in the overall development of the Middle East, it would have to be the spread of Islam. Although Islam incorporated many

pre-Islamic ideas, there were also many new ideas that profoundly affected Middle East culture.

The Islamic view of human nature in relation to sensual gratification and release is a case in point. Generally, Islam is more realistic and accepting of bodily functions than Christianity (Gulick, 1976). For example, one might see a woman nursing in public or a man urinating in public (but with his front turned away from view). It is also noted that Muslims do not have the same guilt regarding sexuality as Christians, and certainly celibacy is not idealized. This is not to say, however, that Muslims are hedonists. Although sex is not considered a weakness of the flesh as in many interpretations of Christianity, there are definitely sanctions regarding appropriate and inappropriate sexual behavior (i.e., not appropriate before marriage, only appropriate with marriage partner), and there is a great deal of modesty and a sense of dignity regarding nudity and exposure of the body.

One would think that since Muslims do not have the same idealization of asceticism as Christians, and do not seem to be preoccupied by the enjoyment of pleasurable things under appropriate conditions, it would be logical for alcohol drinking to be condoned in moderation; however, this is not the case. The chronological order of the Koranic verses relating to alcohol use is important to understanding why this is true. The first reference to alcohol acknowledges its benefits and pleasures, and would seem to be in line with

the idea of guiltless enjoyment of pleasurable things in moderation. But later verses take progressively more negative stands until outright prohibition is reached. The earliest Koranic reference is as follows:

"And of the fruit of palm trees and of grapes  
Ye obtain an inebriating liquor and also good nourishment."

Suura xvi, 67

A chronologically later statement is stronger against wine, recognizing its dual nature:

"They ask thee concerning wine and gambling.  
Say: In them is great sin, and some profit, for men;  
But the sin is greater than the profit."

Suura ii, 219

Then comes a stronger statement:

"Don't come drunk to prayers  
Until you can understand what you say."

Suura iv, 43

Finally there is outright prohibition:

"O true believers! Surely wine and gambling and stone pillars  
and divining rods are an abomination of the work of Satan;  
Therefore, avoid them that ye may prosper."

Surra v, 93

It is almost as if the Prophet Muhammad saw that although moderation is possible for most people, the few unfortunate incidents that result from overindulgence do not warrant use by the others. There are some Islamic traditions which support this idea. First, drunkenness was known to be a problem in

Mecca and Medina at the time of Muhammad. The Encyclopedia of Islam (1927) reports that Meccans and Medinans drank as often as possible, and that gambling was also associated with drinking. Even pre-Islamic poetry frequently mentions wine. Accounts in the Hadiith describe Hamza bin Abd Al-Muttalib (Muhammad's uncle) who in a drunken episode mutilated the camels of Ali, and because of drinking parties, made errors in the prayer ritual. Wine is considered to be haraam (forbidden) and kabaa'ir (one of the gravest sins), and not only is it forbidden to drink it, but also to buy it, sell it, or cause others to drink it. The punishment is 80 blows (with palm branches or sandals), but there must be four witnesses.

There is an interesting account by Badri (1975) which tells of the dramatic change in the city of Medina when the Prophet Muhammad made the pronouncement that al-khamr (wine) was forbidden. As word spread throughout the city, people took their wine and poured it out so that there were small rivers flowing in the streets. Badri writes: "In a matter of hours a whole city state had become abstinent and the most successful campaign that had ever been launched by man against alcohol dependence was miraculously achieved." He feels that the security which Islam offered in place of the anxiety and guilt of pre-Islamic society took away the need to drink (although as was shown in the previous chapter, the relationship between anxiety and drinking is not at all proven). He claims that the gradual prohibition of alcohol over a

three-year period (described in the last paragraphs) is akin to desensitization, that the five daily prayers provide experiences not dissimilar to transcendental meditation, and that the Islamic punishment for drunkenness is the same as aversion therapy. While the theory is interesting, Badri himself offers little research to support it. One very interesting point that he does make, though, is that "for controlling alcohol drinking and safeguarding abstinence" Islam used group pressure. Although this point is briefly stated, it is perhaps the most important one of the paper and fits in with the theory of Snyder (1962) on Jewish sobriety.

Azayem (1975) believes that there are three factors involved in Islam's early success against alcohol: example, persuasion, and legislation. The Prophet himself was an example as he never drank wine or attended meetings where wine was served. The early Koranic references to khamr were persuasions to stay away from alcohol, and finally, in the last reference, prohibition was legislated. Azayem feels that this "step by step containment" was bolstered by the improved society that Islam offered.

It seems that in general, Islam supports a moderate life style and the individual always being in control of his behavior. One of the effects of alcohol is to make behavior uninhibited, and certainly this would not be conducive to self-control. Alcohol intoxication frequently leads to uncontrolled behavior and aggression, and surely this was observed early on by Muhammad and contributed to

prohibition of alcohol.

There is a slight problem with the translations from the Koran in that the word for wine throughout is khamr which literally means wine made from grapes. It comes, though, from a root word having to do with fermentation in general. The word nabiith is a more comprehensive word meaning all intoxicating beverages, but this word is not used in the Koran. The Hadiith interpret khamr to mean all intoxicating beverages, but it is not certain whether hashish and psycho-active drugs were to be included in this prohibition or not. Even today, there are disagreements among Muslims about drugs, although the prohibition of all types of alcoholic beverages is generally accepted as a part of the religion (even if not always practiced).

While Islam in Bahrain is not as fanatical as the Wahhabi Islam in Qatar and Saudi Arabia, it is still a dominant force and an important part of everyday life as the following examples indicate. Many people do not pray five times daily, but on the other hand, it is not uncommon to see people performing the ritual prayers (salaat) inside doorways, but within views of passers-by. Also, many Muslims in Bahrain refuse to take any interest on what they earn from their enormous savings accounts in banks because they see it as usury (which is forbidden in Islam). The Shiia rituals during the month of Muharram (as described earlier) are still practiced by many, and fasting during Ramadan is almost universal. In general, Islam is still a very strong factor in

Bahraini society and influences at least some people's alcohol use.

Islam affects Bahraini drinking in at least two ways. First, there are those who do not drink at all because of religious convictions. Then there is another group of Bahrainis who drink less than they might really want because of the very strong social pressures against drinking alcohol (the social pressures having been established by Islamic tradition being the norm). At a social gathering (be it large or small) no Bahraini would ever want to be seen drinking alcohol by anyone who might know him. This is in direct contrast to Western culture where even if one were a non-drinker, he would prefer to hide the fact and pretend to drink or "nurse" a drink along. Bahrainis would go to great lengths to find out who would be present at a gathering, and if other Muslims were coming, they would never take a drink -- or at least they would wait to see if the other Muslims were drinking. There was rarely drinking in the presence of women, and if any "serious" drinking were planned, the participants generally went out into the desert and pitched a tent for the entire weekend, or they rented a private villa away from the city for the weekend. The point is there is group pressure against drinking in Bahrain, it is felt, and the two best Bahraini solutions are not to drink or to escape from the view of the group. One would always have to be careful about where and with whom one drank for fear of bringing shame upon oneself and one's family.

### III. Legal Controls and Alcohol Use

In Bahrain (as in the other Gulf States) the judicial system is based on Shariia (or Islamic Law). Shariia courts are responsible for local Arabs and Muslims, and in Bahrain there are different courts for Sunnis and Shiias. All others are dealt with by a court of members of the ruling family or the Sheikh himself. In theory, then, according to the Shariia, alcohol use should be limited to non-Muslims. But in reality, this is not at all the case. The evolution of this departure from the Shariia is interesting.

Traditionally, the Shariia was strictly observed and enforced. There are several instances in national reports where illegal alcohol activities were going on, and the government went to some lengths to eliminate the problems. For example, it is reported that in 1929 araq (made from dates) was locally distilled by two or three Iraqis and Jews. But they were eventually rounded up and operations ceased. The report continues that by 1930 Bahrainis themselves had taken to making araq, hiding the stills in cellars, ruined houses, out-of-the way date gardens, and subterranean rooms. Furthermore, bottles were hidden in false walls, wells, under rubbish heaps, and under motor car seats. "In one case the police discovered that the municipal lunatic asylum was a distributing centre, and the keeper and his wife were members of a liquor gang." (!) In 1935, after numerous prosecutions, it was reported that there was a decrease in the use of araq, but unfortunately cases of "methylated spirits" began to

appear, especially increasing in 1936. The most popular drink at this time was methylated spirits mixed with eau-de-cologne. Although this new drink was said to be more harmful than araq, females liked it better and only a small bit caused drunkenness (it would only be possible to drink a small amount since large doses or continued use of methyl alcohol causes blindness or death). To combat this, the sale of methylated spirits was restricted to reliable dealers, and before sale it was mixed with chemicals to make it unpalatable; no restrictions were imposed on the sale of cologne, though! (Administrative Report, 1937). Unfortunately, there is no follow-up as to how effective this very unique preventive measure was.

There is, however, a further note in the same report that the ruler of Bahrain, the religious leaders, and the majority of the population disapproved of alcohol in spite of the fact that a small group wanted to remove the restrictions. The anonymous author attributes the increase in alcohol arrests to the influx of foreigners from countries where liquor is available. He concludes: "The most effective way of preventing the increase in drinking is to deal very drastically with cases which are proved in the courts" (Administrative Report, 1937).

Apparently, the preventive methods were either ineffective or not implemented, because 14 years later Farouhy (1951) reports that Bahrain was known as a "pleasure island." Arabian and foreign employees came to Bahrain for the

prostitutes (whom Bahrain authorities overlooked) and the 100 proof colorless araq. The Bahrain Annual Report for the Muslim year 1372 (October 1952 - September 1953) reports that "fewer persons than in the previous year were convicted for contravention of liquor and drug regulations." The reporter continues that "this does not, however, indicate any decrease in the habit of drinking which among certain classes is becoming almost universal." That year there were 24 prosecutions for distilling, selling, and possession of liquor and for dealing in hashish and opium.

In 1953, Belgrave writes that Bahrain was dry, but non-Muslims were permitted to drink. Muslims were neither allowed to possess alcohol nor to be found under the influence, and it was illegal for non-Muslims to sell alcohol to Muslims. Indians were allowed a certain allotment of alcohol, and they and Westerners could go to certain public places which were forbidden to Bahrainis (Qubain, 1955). This, along with the fact that Indians would sell part of their alcohol supply to Bahrainis at an increased price, caused a great deal of social tension in Bahrain. As the story is presently told, the Bahrainis were incensed because the Indians were making money off of them. Had it been the British to make the profit, it might not have been so bad, but the Indians are particularly looked down on (as the group which does menial and servile tasks); therefore, it was decided to allow the Bahrainis to buy their own alcohol.

This does not mean that the law was changed. In fact,

officially on paper, to this day, only non-Muslims are permitted to have or drink alcohol. In practice, though, anyone can buy as much as he wants.

Part of the reason for retaining this discrepancy between theory and practice is that Bahrain gets a great deal of money from Saudi Arabia. There is a lot of pressure from the Saudis to eliminate alcohol altogether from the island, but the Bahrainis are opposed because they enjoy this freedom and also make a large profit from alcohol tax and hotel bills. One of the ways that the Bahrainis handle this pressure is to point to the written law (that alcohol is only for the non-Muslims). Egypt in 1976 was under similar pressure from the Saudis to restrict alcohol sales to non-Muslims (Egypt had before allowed alcohol sales to everyone). After a visit from King Khaalid of Saudi Arabia, Egypt announced a new law that alcohol was only to be for non-Muslims. Reports are that in practice there were no restrictions, and several weeks later the Egyptian legislature refused to pass the law.

It is for this reason that the Bahraini government tries to be discrete about alcohol use. When the Minister of Health received the preliminary data analysis which I had done while in Bahrain and attempted to discuss the findings in the National Assembly, he was blocked from speaking because the Prime Minister wanted no mention of the word alcohol in the minutes. For this same reason, restaurants and hotels with bars and alcohol available have no official liquor license

or permit. If there is no official written sanction, then there are fewer concrete facts to criticize.

In the summaries of import regulations that are found in commercial airplanes, Bahrain is listed as not allowing alcohol to come into the country (perhaps this is partly to protect their own small monopoly in the Gulf). Also, in the paper by Al-Mukhtar (1974) Bahrain was listed as only allowing alcohol sales to non-Muslim foreigners. No doubt this was a recitation of the written law in order to minimize censure by more conservative Arab neighbors and bears little resemblance to the actual state of affairs in Bahrain.

Bahrain has recently been described as "the only country on the Arabian side of the Gulf where the sale of alcohol is quite untrammelled" (ICAA, 1976). The same article comments that if Bahrain is to conform to the alcohol legislation of her Gulf neighbors, there would be quite a gap to close. The availability of alcohol in Bahrain has caused it to be the recreational center of the Gulf for Kuwaitis, Qataris, and Saudis. Flights from the coast of Saudi Arabia to Bahrain are only 10 minutes, and on Thursday evenings they are generally booked solid and known as the "whiskey specials" (Wood, 1977; ICAA, 1976).

It is clear that alcohol is available in Bahrain, but the question is how available? In 1976 there were 12 retail outlets, 9 hotels with restaurant/bar situations, and 14 restaurants where alcohol is available with meals and/or at the bar. The majority of these 35 outlets are in the

capitol city Manama, but there are at least four in the surrounding areas. Also, four of the restaurants are private clubs (with Bahraini and non-Bahraini membership).

There are no restrictions on hours or sale of alcohol in the hotels, restaurants, or retail outlets; however, usually the retail outlets close by about 8 o'clock p.m. when all activity in the suug (market or bazaar) slows down, and they open in the morning a little later than other suug activities (the suug opens about 6 o'clock a.m.). Many of the hotel bars might stay open all night -- especially on a Thursday night if business is good. There are no restrictions against selling alcohol on Friday (the Muslim sabbath), and many retail outlets (in addition to the restaurant and hotel bars) open at least for a while on Friday. (The only time that there were any restrictions on alcohol sales was during the three day visit of King Khaalid of Saudi Arabia in 1976).

There are no age restrictions on drinking or purchasing alcohol, nor are there restrictions on closeness of outlets to schools, mosques, or residential areas. Beer, wine, and distilled spirits are equally available in all restaurants, bars, and hotels.

Some of the retail stores offer home delivery, and even offer a 10% discount on these home deliveries (perhaps knowing that the home deliveries are usually large bulk orders and generally to prominent, wealthy customers who want to avoid being seen in a liquor store).

One gets the distinct impression that alcohol is as

available as the market will stand. In other words, supply and demand are very close to each other, and the present control system is flexible enough so that as demand increases, supply increases. There are no advertisements for alcohol, so there is little pressure from suppliers to influence demand.

Concerning laws about behavior while intoxicated, there are two types of restrictions: one against drunk driving and the other against drunkenness or possession. Possession is considered a separate crime from intoxication, although in practice, no one is arrested for possession unless he is also arrested for intoxication. Before 1976 under the old Intoxicating Liquor Code (which applied to Muslims only), the penalty for being found intoxicated was a fine of not less than 50 Bahraini Dinars (B.D.) and not more than 100 B.D. (between \$225 and \$250) or imprisonment for six months. The policy of the Police Force was (and still is) only to arrest those making a disturbance or in some way calling attention to their behavior; furthermore, imprisonment is rare (and usually only for 10-15 days if payment is impossible), and fines are generally only 10-15 B.D. (\$25-\$37.50). Under the pre-1976 code, the fine for possession of alcohol (again for Muslims only) was somewhat less strict, and rarely enforced unless someone had already been picked up for drunkenness. As law is rather informally practiced in Bahrain, those coming from a well-known family are generally not tried.

Under the new Intoxicating Liquor Code initiated in 1976, the punishment was reduced (again this only applied to

Muslims). The fine for the first drunkenness offense is 50 B.D. (\$125) and for the second offense imprisonment of not more than one month or a fine not more than 100 B.D. (\$250). Again, when the court records for several months in 1976 were reviewed, the penalties meted out were much less than specified in the law, and almost the same as those meted out under the old Intoxicating Liquor Code. While these laws were at one time intended to be a deterrent to drinking, it seems their practical use now is to preserve order and to reduce criticism from more conservative Arab neighbors.

The drunk driving laws have more of a bite and apply to Muslims and non-Muslims alike. The fine in 1974 was 60-100 B.D. (\$150-\$250) depending on the case, and after the third conviction the offender was sometimes imprisoned at the judge's discretion. In 1975 the fine was 100-150 B.D. (\$250-\$375) depending on the case, and in 1976 the fine went to 200-300 B.D. (\$500-\$750) depending on the case. Non-Bahrainis are generally treated more harshly for driving under the influence than Bahrainis. As in Qatar, Bahrainis who have been drinking and are involved in an accident frequently flee the scene and wait until they sober up to return for their car. The Traffic Directorate does have a breathalyzer, and those arrested for DUI are supposed to have been taken for testing (sometimes all occupants of the car are tested and arrested for being intoxicated); however, only a few people know how to operate the breathalyzer, so it is used inconsistently. Even so, there is no specific blood alcohol

level after which a person is considered legally intoxicated, so decisions are judgemental and up to the arresting officer.

In summary, there is little in the legal controls of Bahrain which would limit drinking. Certainly, the system for establishing drinking places and retail outlets is not restricted and free to respond to market need, and even the personal laws concerning alcohol use are very reasonably applied. From reviewing the legal response to alcohol in Bahrain, there is little reason to believe that the consumption would be low.

#### IV. Economy and Alcohol Use

Bahrain is lucky to be one of the few countries where financial troubles are rare. Bahrain is certainly not as wealthy as some of her Arabian Gulf neighbors (such as Saudi Arabia, Kuwait, Qatar, and the Emirates), but on the other hand, she is considerably wealthier than many other Arabic countries and than most Western countries. Although official statistics on per capita income are not kept (since there is no income tax, income is not recorded), the Bahraini gross national product per capita for 1973 was \$900, which put Bahrain in seventh position (out of 20 Middle East countries) and 53rd out of 145 countries all over the world (World Bank, 1976). While this index is not exactly equivalent to per capita income, it does show that Bahrain is in very sound financial shape and per capita income would tend to be high. In addition, there is free medical care, free

social services, free transportation to government jobs, and no income tax.

The catch is that the cost of living is one of the highest in the world (reputedly the third highest). Two bedroom, unfurnished, unscreened, unheated, and un-air conditioned apartments rented for \$600 per month in Manama in 1976. Food is also expensive (since almost everything is imported), but natural gas (for stoves) is very cheap, as is gasoline (29¢ per gallon of high octane in 1976), and electricity (in 1975 the cost of electricity was cut in half by government subsidies). Table 5, compiled by the Bahrain Petroleum Company (BAPCO), shows the amount of increase in cost of living using 1969 third quarter as a base. BAPCO uses this table in computing cost of living subsidies to non-Bahraini workers, and it is based on the pricing of several hundred items. From 1971 to 1975 the jump was phenomenal.

It is a general observation, though, that most of the increases that occur, especially in housing, are absorbed by governments or by large corporations. For example, any non-Bahraini who is hired by the Bahraini government to work is given free government housing (including furnishings, kitchen wares, electricity, etc.). Anyone hired by a company doing contract work in Bahrain is given either cost of living supplements or provided with company-rented housing (Sheikh Issa is generous in rewarding faithful subjects with tracts of land). But if they are not homeowners and are obliged to rent, there is a law which prevents a landlord from increasing rent or

Table 5

## Cost of Living Index (BAPCO)

| Year    | Index* | Absolute Change | % Change |
|---------|--------|-----------------|----------|
| 1967-68 | 99.8   | +3.2            | +3.2     |
| 1968-69 | 103.0  | -0.2            | -0.2     |
| 1969-70 | 102.8  | +1.7            | +1.7     |
| 1970-71 | 104.5  | +6.1            | +5.8     |
| 1971-72 | 110.6  | +5.6            | +5.1     |
| 1972-73 | 116.2  | +16.8           | +14.5    |
| 1973-74 | 133.0  | +32.2           | +24.2    |
| 1974-75 | 165.2  | +26.5           | +16.0    |

\* August, 1969 = (3rd quarter) = 100

Table 6

## Price of Alcohol in Retail Outlets in 1975

| Beverage | Cost                                    |
|----------|-----------------------------------------|
| Beer     | 4.900-5.200 B.D. per case (24 cans)     |
| Wine     | 10.000-60.000 B.D. per box (12 bottles) |
| Araq     | 18.000-30.000 B.D. per box (12 bottles) |
| Vodka    | 24.000 B.D. per box (12 bottles)        |
| Whiskey  | 24.000-30.000 B.D. per box (12 bottles) |
| Gin      | 20.000 B.D. per box (12 bottles)        |
| Brandy   | 21.600-52.800 B.D. per box (12 bottles) |

evicting a Bahraini citizen; therefore, even though ten years ago the rent might have been one-third of what it is today, if a Bahraini lives there, no rent increase is allowed. (For foreigners only 10% increase per year is permitted). Thus, while cost of living is high (and especially rents), most of the citizens and residents do not bear these expenses themselves.

With regard to the cost of alcohol, we note that most of the prices are similar to the cost of imported alcohol in the United States (all of the alcohol in Bahrain is imported). Table 6 shows the cost of different types of alcohol (1 B.D. = approximately \$2.50). There was an agreement among all the retailers that no store would duplicate another's stock, thereby avoiding competition. Thus, for example, Gray-MacKenzie might carry Carlsberg beer which Jashanmal store could not carry, but then Jashanmal store would carry Heineken which Gray-MacKenzie could not carry. Prices were also fixed. While the prices seem more expensive than American prices, it must be remembered that all alcohol is imported and nothing is made domestically. Also, in comparison with the average income, prices are relatively cheap.

Table 7 shows the average value of a liter of absolute alcohol before customs and the relative change in value from 1972 to 1975.

Table 8 shows the BAPCO index recomputed with 1971-1972 as the base year (to compare with the alcohol value index).

Table 7

Average Value (before Customs) per Liter of  
Absolute Alcohol and Relative Change 1972-1975

| Year | Value     | Absolute<br>Change | Percent<br>Change | Index |
|------|-----------|--------------------|-------------------|-------|
| 1972 | .240 B.D. |                    |                   | 100.0 |
| 1973 | .301      | .061 B.D.          | 25.4              | 125.4 |
| 1974 | .343      | .042               | 14.0              | 142.9 |
| 1975 | .420      | .077               | 22.4              | 175.0 |

Table 8

BAPCO Cost of Living Index and Absolute Alcohol Index  
1971-1975

| Year      | Old Cost of<br>Living Index | New Cost of<br>Living Index | Absolute<br>Alcohol Index |
|-----------|-----------------------------|-----------------------------|---------------------------|
| 1971-1972 | 110.6                       | 100.0                       | 100.0                     |
| 1972-1973 | 116.2                       | 105.1                       | 125.4                     |
| 1973-1974 | 133.0                       | 120.3                       | 142.9                     |
| 1974-1975 | 165.2                       | 149.4                       | 175.0                     |

Obviously the value of absolute alcohol is increasing at a higher rate than the cost of living. To what extent income has kept up with these indices is not known, but one gets the distinct impression that Bahrainis are not going through hard times. The same is true for foreigners -- certainly they would not even be in Bahrain if they were not making more money than is possible in their own country.

In summary, it is difficult to judge the year to year relationship of disposable income to alcohol prices, but it is certain that the disposable income is generally high in relation to other world countries (due to lack of taxes, the rent system and free social and health services, not to mention, of course, the oil revenues). It is doubtful that the economy influences alcohol consumption in a downward fashion.

To sum up this whole chapter, Bahrain is a country with mixed messages about drinking. While the religious tradition of Islam and the group pressures against drinking are strong, the government discretely disregards its own traditional Islamic Law about alcohol use and permits free use of alcohol except when public order is disturbed (as in drunken driving and public drunkenness). Furthermore, the economy is hardly a deterrent, and even though the price of alcohol is increasing at a higher rate than cost of living, the amount of disposable income is no doubt high enough so that money is not a major factor. One is left wondering if Bahrain is in fact a world center of alcoholism (as the 1975 paper by Al-Safar would suggest), or if the anti-alcohol pressures from the

Islamic prohibition are still strong enough to offset the lack of harsh legal and economic controls and keep consumption down. The next chapter outlines the methodology which was set up to find out which of these competing factors is the strongest.

## CHAPTER FOUR

### METHODOLOGY

At this point we can conclude the following:

1. The best model to date for comparing rates of alcohol problems among cultures or nations is the distribution of consumption model (as outlined in Chapter 2).
2. There are three broad categories of factors which influence consumption (as described in Chapter 2).
  - a. legal factors
  - b. economic factors
  - c. socio-cultural factors
3. In Bahrain, legal and economic factors tend to be the ones that would favor high consumption patterns, while the socio-cultural factors would favor a low consumption pattern (Chapter 3).

So, we are left with the problem of collecting data which will enable us to determine the extent of alcohol problems in Bahrain and which will be internationally comparable. If Bahrain is found to have a high rate of problems, the economic and legal factors would be predominant, and we would have to conclude that in this type of society even strong religious prohibitions are not effective. If, on the other hand, Bahrain is found to have a low rate of problems, then the socio-cultural factors would be predominant and the conclusion is

that even in the face of almost unlimited economic and legal availability, the religious prohibition and related societal controls are effective.

Thus, it was decided to conduct a descriptive epidemiological study. This type of descriptive research would shed some additional light on the basic relationships between alcohol controls and alcohol consumption which have emerged to date, and would show in what way these relationships are influenced by socio-cultural patterns. Data are especially lacking in societies which are vastly different from our own, and to our knowledge, there is no comprehensive study of alcohol problems in an Arab or Islamic country. Another factor which especially validates a descriptive approach in this particular case is that (as described in Chapter 3) the population of Bahrain is very homogeneous -- along cultural, racial, and religious lines. This minimizes the possibility of ecologic fallacy (i.e., that non-Muslims might account for most of the alcohol consumption), thereby maximizing the benefit of cross-cultural comparisons along these variables.

After establishing a quantitative measure of Bahraini alcohol problems, it would be possible to compare Bahrain with other countries, thus giving meaning to the quantitative measure (i.e., Bahrain has more or less of an alcohol problem than most countries). By adding this comparative perspective, we can deduce more about the role of the various factors known to influence consumption (i.e., legal, economic, and socio-cultural factors).

An alternate strategy would have been to conduct a community survey to interview a random sample of the population about their drinking habits and alcohol-related problems, but this method of inquiry was rejected for several reasons. First, in simply establishing quantity and frequency of drinking, survey research tends to underestimate consumption (due to forgetting) in comparison with estimation through sales (Makela, 1971). Given the tendency to drink secretly in Bahrain, we might expect even more severe underestimating. Secondly, interviewers could have been a problem. The language of the interviewer would have been a problem (we would have needed different interviewers for each of the three major linguistic groups -- Arabic, English, Persian) and also the sex of the interviewer would have been a delicate issue (in a door-to-door survey it would not have been proper for a strange man to be received by a female at home, nor would it have been proper for a female to be received by a male at his home). In all, it was decided to reject interviewing and take a simpler approach.

As reviewed in Chapter 2, per capita consumption can be used to determine the distribution of consumption in a population and the proportion of high risk drinkers, and it is also correlated very highly with liver cirrhosis mortality rates. Therefore, it was decided at the very least to collect consumption and cirrhosis data to establish Bahrain in an international ranking of states. Cirrhosis would be a "check" on consumption and vice-versa. In addition, for as many years as these data would be available, it would be possible to look

at time trends which would act as further checks and give an indication of whether the problem was increasing or decreasing. A further check on the increase or decrease of the problem and its magnitude would come from data sets such as alcohol psychiatric admissions to hospital, alcohol-related traffic arrests, and alcohol crimes. Taking this multi-faceted approach would reflect different ways of defining the problem, each of which might have shortcomings, but the sum total of which would give a reasonably accurate perspective of alcohol problems.

The following paragraphs give the methods for collecting the various data sets:

#### Alcohol Consumption

In order to compute per capita consumption and to look at consumption trends over the past few years, data on the amount of alcoholic beverages imported and exported were obtained through the Statistical Bureau in cooperation with the Directorate of Customs and Ports (State of Bahrain Ministry of Finance and National Economy) from documents clearing goods through the seaports and the airport. Alcoholic beverages imported represent all imported goods and include merchandise for domestic consumption and for subsequent re-export. Exports of alcoholic beverages comprise re-exports of imported goods. Data cover goods which were cleared during the statistical year (January 1 to December 31) regardless of the date of their arrival. Items are arranged in accordance

with the "Standard International Trade Classification" (SITC) revised of the United Nations. Alcoholic beverages in personal baggage and possessions of travelers are not included in the data, and we note that it is officially not permitted to bring alcohol into Bahrain for personal use. (Most of the other Gulf States have the same policy). The data are given in the SITC by weight (net kilograms) and by value (in Bahraini Dinars).

Values of the imports represent cost, insurance, and freight, while values of exports represent the cost and charges of delivering the goods on board ships for export. In order to determine the amount of alcohol remaining in Bahrain, exports were deducted from imports (both for value and kilos). Then to convert the number of kilos to liters, the information in Table 9 was used (information supplied by Gray Mackenzie).

Table 9

## Alcohol by Weight and Volume

|                             | Spirits    | Beer       | Wine       | Fermented<br>Fruit-juice |
|-----------------------------|------------|------------|------------|--------------------------|
| Average weight<br>of case   | 15 kilos   | 10 kilos   | 15 kilos   | 20 kilos                 |
| No. of bottles<br>(or tins) | 12         | 24         | 12         | 12                       |
| Contents of<br>bottle       | .95 liters | .35 liters | .95 liters | 1.35 liters              |
| Average<br>alcohol content  | 45%        | 5%         | 12%        | 31%                      |

The population base used in all rate computations is taken from Appendix A. 1971 was the year of the last census. For 1975 a projection (taken from Table 4 of an untitled document taken from the Bureau of Statistics) was used, based on previous censuses (which are taken every six years). This program assumes decreasing fertility, decreasing mortality, and constant migration. Linear interpolation was used to estimate the population between the years 1971 and 1975.

It should be noted that basing the calculation of per capita consumption only on the Bahraini population could give an overestimate of the actual per capita consumption. The reason for this is that consumption in Bahrain will be influenced by people staying in Bahrain only shortly, but these people are not included in census data. There are large numbers of non-residents coming in on short-term visas (usually to do business) and living temporarily in hotels. For a number of reasons, these people would probably drink more than the resident population of Bahrain: 1) Many take advantage of the opportunity because they come from neighboring countries where alcohol is prohibited (and for Muslims, they do not have to worry about being seen drinking by family or friends); 2) There are many businessmen temporarily in Bahrain who have the evenings to spend at leisure in hotel bars; 3) Most of these businessmen come to Bahrain on expense accounts, so the cost of the drinks is of no concern in keeping consumption down; 4) Some alcohol is taken out of the country and smuggled into the neighboring dry countries. For these

reasons, it is believed that the per capita consumption will be overestimated based on the resident population of Bahrain. In addition, there is no evidence of smuggling liquor into Bahrain, nor of any home brewing.

Per capita consumption data from other countries are available from a number of sources. It was decided to use the data compiled by Keller and Guriolo (1976) because they are the most recent available and their methods of data collection instill a great deal of confidence in the accuracy of the data.

The data they present represent "apparent consumption" from the last available year in each country. This means that the amount of tax-paid alcohol delivered to distributors in a country during one year was converted into absolute alcohol. Not included in this amount of alcohol is: the amount of delivered alcohol that was actually drunk, the amount of alcohol that was brought into the country non-commercially, the amount of bootlegging and home-brewing that was going on, the amount of alcohol that was left over in store stocks, and the amount of alcohol that was removed to dry areas or other countries.

The amounts of alcohol were generally obtained from the country concerned, and usually from alcohol councils within these countries. The alcohol content of beverages is based on the best available information from each country in order to make the conversion to absolute alcohol. Populations were obtained from the United Nations population projections. The study populations were limited to the age 15 and above population.

Liver cirrhosis mortality.

Next to per capita consumption, cirrhosis mortality was considered the most important data to collect as an internationally comparable gauge of alcohol problems. The Bahraini cirrhosis data are not without their limitations (which will be discussed), but they are not insurmountable limitations.

In Western countries, the major limitation of cirrhosis data is that cirrhosis deaths are under-recorded due to the stigma attached to an alcoholic cirrhosis death. All too frequently, the physician will register the death under a category other than cirrhosis "for the good of the family," even though cirrhosis is the correct cause of death. In an early study, Nicoll and Bellows (1934) showed that when 365 physicians were interviewed concerning the cause of death that they had listed on 5399 death certificates over a two-year period, there was a 57.1% increase in the deaths due to alcoholism as the primary cause and a 32.6% increase in deaths due to alcoholism as the secondary or contributing cause. When questioned about their reluctance to put "alcoholism" on the death certificates, the physicians showed concern with offense or detriment to the decedent and his family. Life insurance was not as important as local gossip. Fortunately for this study, this problem does not exist in Bahrain at present. The population is still very naive with regard to medical matters, and especially the relationship between cirrhosis and alcohol consumption. All of the physicians interviewed (especially the internists) stated

that cirrhosis deaths were accurately recorded to the best of their ability, and if cirrhosis was believed to be the true diagnosis, then that was what was recorded.

Also in Bahrain, there is not the problem of cirrhosis deaths due to biharziasis (schistosomiasis) as is common in Egypt and some other countries. As stated earlier, not all cirrhosis deaths are due to alcoholism (Terris (1977) reports about 80% in his Western sample), and in our statistics with the I.C.D.A. classification 571.0, there was no attempt made to differentiate between alcoholic cirrhosis of the liver and non-alcoholic cirrhosis of the liver. This is the common practice in alcoholism statistics, and it has been adhered to so that the Bahraini data will be internationally comparable. In areas with high rates of hepatitis, the cirrhosis rate should tend to proportionally overestimate the alcohol problem in comparison to countries with low rates of hepatitis; however, as shown in Chapter 2, hepatitis was not a significant predictor of cirrhosis mortality. As can be seen from Table 10, Bahrain has a moderate hepatitis rate in comparison to many Western countries, ranking sixteenth of the 22 countries listed with a rate of 62.60 per 100,000 in 1971. The range was 5.58 per 100,000 (Norway) to 244.11 per 100,000 (Poland).

On checking the records for cirrhosis deaths (as primary cause of death) two sources were examined: the Salmaniyya Hospital register and the Public Health Mortality records. It was felt that since approximately 60% of all hospital deaths occur at Salmaniyya, the search would begin there,

Table 10

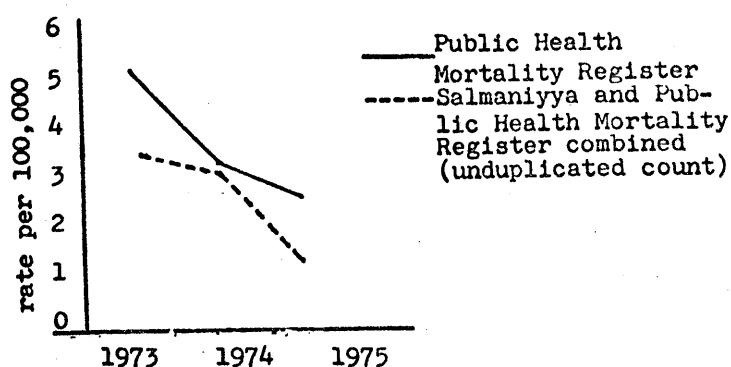
Hepatitis Morbidity Rates per 100,000 in 1971

| <u>Country</u>          | <u>Rate</u> |
|-------------------------|-------------|
| 1. Norway               | 5.58        |
| 2. Luxembourg           | 6.14        |
| 3. Finland              | 6.76        |
| 4. Portugal             | 8.77        |
| 5. Sweden               | 10.61       |
| 6. Switzerland          | 12.60       |
| 7. Belgium              | 13.86       |
| 8. Netherlands          | 18.70       |
| 9. Denmark              | 28.39       |
| 10. U.S.A.              | 28.79       |
| 11. Great Britain       | 32.26       |
| 12. Republic of Ireland | 39.15       |
| 13. Canada              | 40.25       |
| 14. Austria             | 57.99       |
| 15. Australia           | 58.86       |
| 16. Bahrain             | 62.60       |
| 17. Hungary             | 76.56       |
| 18. Italy               | 80.06       |
| 19. U.S.S.R.            | 119.12      |
| 20. Yugoslavia          | 124.25      |
| 21. New Zealand         | 159.76      |
| 22. Poland              | 244.11      |

supplementing and checking the accuracy with the Public Health records. Actually, there were discrepancies between the two sets of data. It was expected that the Public Health records would be more complete since they would include the deaths at all the hospitals, not just Salmaniyya; however, surprisingly enough, there were fewer cirrhosis deaths in the Public Health register. Salmaniyya deaths are first recorded in the patient record (which is the source of the Salmaniyya death records), and then a death certificate is made out (which is the source of the Public Health records). It is possible that in some cases the person filling out the death record did this without consulting the patient record or misread the patient record (there are frequent misspellings and handwriting problems). Because of these discrepancies, the data have been recorded in two ways: 1) cirrhosis deaths recorded only in the Public Health Mortality register, and 2) an unduplicated count of cirrhosis deaths recorded in hospital records, and the Public Health Mortality register. Figure 1 shows both sets of data for 1973-1975. As can be seen from this figure, the main difference is that the hospital and Public Health records combined are always larger. Hereafter, the combined records are always used as the lower estimate of cirrhosis mortality, assuming that they are the more complete and accurate.

Figure 1

Cirrhosis Death Rates from Public Health Records and from  
Salmaniyya and Public Health Records Combined 1973-1975



A major problem which is potentially a much more serious source of inaccuracy is the fact that only about 50% of the estimated deaths are recorded. In 1975 only 890 (49.3%) of the estimated 1805 deaths were recorded. The estimated number of deaths is based on survival ratios from Methods of Population Projection According to Age and Sex (1956).

The fact that so many deaths are missing is a disadvantage, but an effort was made to cope with the missing deaths. The question which obviously is of the greatest concern is how many of the estimated unrecorded deaths were due to cirrhosis? To estimate the missing deaths, age and sex specific five-year survival ratios were taken from Methods of Population Projection According to Age and Sex (1956) and converted into age-specific mortality ratios. Then these ratios were

applied to the 1975 projected population (assuming decreased fertility, decreasing mortality, and constant migration) and divided by 5 to obtain the total age-sex specific number of deaths. (All of this work is shown in Table 11 for males and Table 12 for females). Then the recorded deaths were subtracted from the expected deaths and percentages were calculated to obtain the percentage of unrecorded deaths in each age-sex category.

As can be seen in Figures 2. and 3., there are consistently more unrecorded female deaths than male deaths, and in general, there are more unrecorded deaths in the younger age groups. All of the recorded deaths occurred in hospital, and the unrecorded deaths out of hospital. Thus, it is likely that unrecorded deaths are more apt to be sudden deaths, heart attacks, and home accident deaths, whereas the recorded deaths are apt to be lingering illnesses or illnesses with gradual onset of symptoms. Even though cirrhosis deaths fit the latter category (so the majority of cirrhosis deaths would be recorded), a correction was still applied to estimate the number of unrecorded cirrhosis deaths.

The correction consisted of applying the age-specific proportion of unrecorded deaths for all causes to the age-specific recorded deaths for cirrhosis to obtain the estimated number of missing cirrhosis deaths (see Tables 13 for males and 14 for females). This total estimated number of cirrhosis deaths (the sum of actual cirrhosis deaths and estimated unrecorded cirrhosis deaths) is undoubtedly an

Table 11

## Estimate of Unrecorded Male Deaths 1975

| Age   | I<br>Pop. | II<br>D.R. for<br>5 Years | III<br>Expected<br>Deaths<br>5 Years | IV<br>Expected<br>Deaths<br>1 Year | V<br>Recorded<br>Deaths | VI<br>Unrecorded<br>Deaths | VII<br>Percentage<br>Unrecorded |
|-------|-----------|---------------------------|--------------------------------------|------------------------------------|-------------------------|----------------------------|---------------------------------|
| 0-4   | 22,100    | .0352                     | 777.92                               | 155.6                              | 131                     | 24.6                       | 15.8                            |
| 5-9   | 19,629    | .0107                     | 210.03                               | 42.0                               | 14                      | 28.0                       | 66.7                            |
| 10-14 | 16,361    | .0116                     | 189.79                               | 38.0                               | 6                       | 32.0                       | 84.2                            |
| 15-19 | 14,400    | .0176                     | 253.44                               | 50.7                               | 13                      | 37.7                       | 74.4                            |
| 20-24 | 10,892    | .0211                     | 229.82                               | 46.0                               | 25                      | 21.0                       | 45.7                            |
| 25-29 | 8,791     | .0219                     | 192.52                               | 38.5                               | 25                      | 13.5                       | 35.1                            |
| 30-34 | 8,207     | .0240                     | 196.97                               | 39.4                               | 15                      | 24.4                       | 61.9                            |
| 35-39 | 7,045     | .0289                     | 203.60                               | 40.7                               | 14                      | 26.7                       | 65.6                            |
| 40-44 | 6,774     | .0383                     | 259.44                               | 51.9                               | 18                      | 33.9                       | 65.3                            |
| 45-49 | 5,135     | .0551                     | 272.67                               | 54.5                               | 28                      | 26.5                       | 48.6                            |
| 50-59 | 4,448     | .0750                     | 333.60                               | 66.7                               | 47                      | 19.7                       | 29.5                            |
| 60-64 | 3,780     | .1081                     | 408.62                               | 81.7                               | 42                      | 39.7                       | 48.6                            |
| 65-69 | 2,481     | .1577                     | 391.25                               | 78.3                               | 68                      | 10.3                       | 13.2                            |

Table 11 (cont.)

## Estimate of Unrecorded Male Deaths 1975

| Age           | I<br>Pop. | II<br>D.R. for<br>5 Years | III<br>Expected<br>Deaths<br>5 Years | IV<br>Expected<br>Deaths<br>1 Year | V<br>Recorded<br>Deaths | VI<br>Unrecorded<br>Deaths | VII<br>Percentage<br>Unrecorded |
|---------------|-----------|---------------------------|--------------------------------------|------------------------------------|-------------------------|----------------------------|---------------------------------|
| 70-74         | 821       | .3292                     | 270.24                               | 54.1                               | 56                      | -1.9                       | -3.5                            |
| 75-79         | 686       | .4551                     | 312.20                               | 62.4                               | 59                      | 67.6                       | 53.4                            |
| 80+           | 477       | .6728                     | 320.93                               | 64.2                               |                         |                            |                                 |
| Total 133,351 |           | .0385                     | 5,127.85                             | 1,025.7                            | 594                     | 431.7                      | 42.1                            |

I Estimated 1975 population assuming decreasing Fertility, decreasing Mortality, and constant Migration

II Age Specific 5 Year Death Rate (from Methods of Population Projection According to Age and Sex. Prepared by the Population Branch of Section of Social Affairs, United Nations, New York, 1956).

III Column III x Column II

IV Column III  $\div$  5

V From Public Health Register

VI Column IV - Column V

VII Column VI  $\div$  Column IV

Table 12  
Estimate of Unrecorded Female Deaths 1975

| Age   | I<br>Pop. | II<br>D.R. for<br>5 years | III<br>Expected<br>Deaths<br>5 Years | IV<br>Expected<br>Deaths<br>1 Year | V<br>Recorded<br>Deaths | VI<br>Unrecorded<br>Deaths | VII<br>Percentage<br>Unrecorded |
|-------|-----------|---------------------------|--------------------------------------|------------------------------------|-------------------------|----------------------------|---------------------------------|
| 0-4   | 21,331    | .0331                     | 706.06                               | 141.2                              | 102                     | 39.2                       | 27.8                            |
| 5-9   | 19,003    | .0105                     | 199.55                               | 39.9                               | 6                       | 33.9                       | 85.0                            |
| 10-14 | 16,263    | .0114                     | 185.40                               | 37.1                               | 8                       | 29.1                       | 78.4                            |
| 15-19 | 14,038    | .0162                     | 227.42                               | 45.5                               | 7                       | 38.5                       | 84.6                            |
| 20-24 | 10,028    | .0193                     | 193.54                               | 38.7                               | 4                       | 34.7                       | 89.7                            |
| 25-29 | 6,464     | .0208                     | 134.24                               | 26.8                               | 5                       | 21.8                       | 81.3                            |
| 30-34 | 6,338     | .0223                     | 141.34                               | 28.3                               | 6                       | 22.3                       | 78.8                            |
| 35-39 | 5,095     | .0251                     | 127.88                               | 25.6                               | 6                       | 19.6                       | 76.6                            |
| 40-44 | 5,290     | .0309                     | 163.46                               | 32.7                               | 8                       | 24.7                       | 75.5                            |
| 45-49 | 3,891     | .0411                     | 159.92                               | 32.0                               | 12                      | 20.0                       | 62.5                            |
| 50-54 | 3,194     | .0567                     | 181.10                               | 36.2                               | 17                      | 19.2                       | 53.0                            |
| 55-59 | 2,745     | .0825                     | 226.46                               | 45.3                               | 15                      | 30.3                       | 66.9                            |
| 60-64 | 1,792     | .1257                     | 225.25                               | 45.0                               | 23                      | 22.0                       | 48.9                            |
| 65-69 | 1,104     | .1941                     | 214.29                               | 42.9                               | 9                       | 33.9                       | 79.0                            |

Table 12 (cont.)  
 Estimate of Unrecorded Female Deaths 1975

| I             | II   | III                 | IV                            | V                            | VI                 | VII                  |                          |
|---------------|------|---------------------|-------------------------------|------------------------------|--------------------|----------------------|--------------------------|
| Age           | Pop. | D.R. for<br>5 Years | Expected<br>Deaths<br>5 Years | Expected<br>Deaths<br>1 Year | Recorded<br>Deaths | Unrecorded<br>Deaths | Percentage<br>Unrecorded |
| 70-74         | 671  | .2927               | 196.40                        | 39.3                         | 24                 | 15.3                 | 38.9                     |
| 75-79         | 688  | .4181               | 287.65                        | 57.5                         | 44                 | 78.3                 | 64.0                     |
| 80+           | 498  | .6505               | 323.95                        | 64.8                         |                    |                      |                          |
| Total 118,423 |      | .0329               | 3,893.89                      | 778.8                        | 296                | 482.8                | 62.0                     |

I Estimated 1975 population assuming decreasing fertility, decreasing mortality, and constant migration

II Age Specific 5 year Death Rate (From Methods of Population Projection According to Age and Sex. Prepared by the Population Branch of Section of Social Affairs, United Nations, New York, 1956.)

III Column I x Column II

IV Column III ÷ 5

V From Public Health Register

VI Column IV - Column V

VII Column VI ÷ Column IV

Figure 2

PER CENT UNRECORDED MALE DEATHS by AGE  
1975

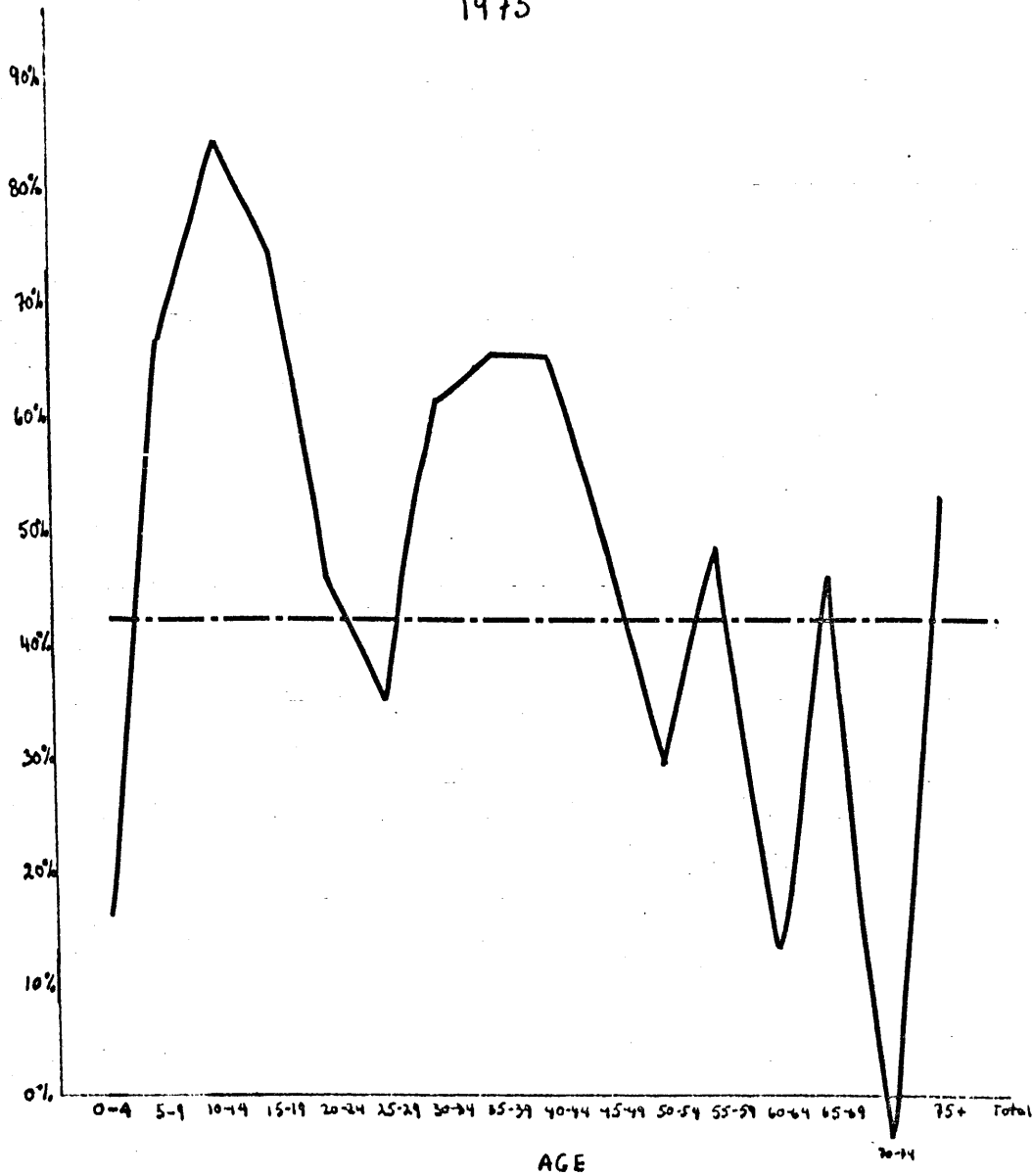


Figure 3

PER CENT UNRECORDED FEMALE DEATHS by AGE  
1975

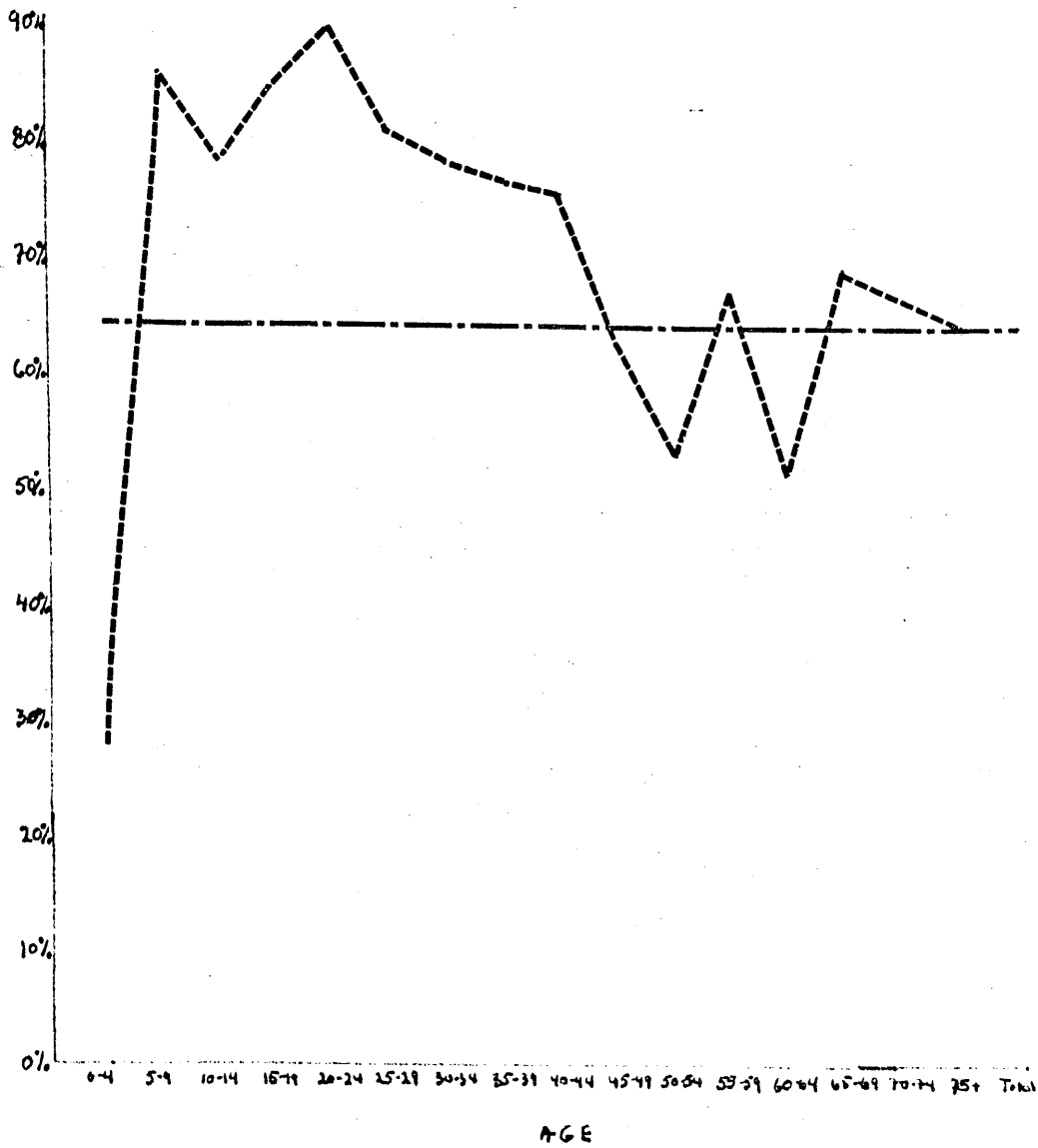


Table 13  
Males Estimated Cirrhosis Deaths  
1973-1975 Combined Totals

| Age   | I<br>Expected<br>Deaths<br>1 Year | II<br>Recorded<br>Deaths<br>1975 | III<br>Unrecorded<br>Deaths | IV<br>Percentage<br>Unrecorded | V<br>Recorded<br>Cirrhosis<br>Deaths<br>3 Years | VI<br>Estimated<br>Unrecorded<br>Deaths<br>3 Years | VII<br>Total<br>Estimated<br>Cirrhosis<br>Deaths |
|-------|-----------------------------------|----------------------------------|-----------------------------|--------------------------------|-------------------------------------------------|----------------------------------------------------|--------------------------------------------------|
| 24-34 | 77.2                              | 40                               | 37.9                        | 48.7                           | 3                                               | 2.8                                                | 5.8                                              |
| 35-44 | 92.6                              | 32                               | 60.6                        | 65.4                           | 4                                               | 7.6                                                | 11.6                                             |
| 45-54 | 121.2                             | 75                               | 46.2                        | 38.1                           | 8                                               | 5.0                                                | 13.0                                             |
| 55-64 | 160.0                             | 110                              | 50.0                        | 31.2                           | 4                                               | 1.8                                                | 5.8                                              |
| 65-74 | 115.1                             | 89                               | 26.1                        | 22.7                           | 3                                               | 0.9                                                | 1.8                                              |
| 74+   | 126.6                             | 59                               | 67.6                        | 53.4                           | 1                                               | 1.1                                                | 2.1                                              |

I. Expected deaths for one year. From Column IV Table

II. Recorded deaths 1975. From Column V Table

III. Unrecorded deaths. From Column VI Table

IV. Unrecorded deaths. From Column VII Table

V. Recorded cirrhosis deaths (from Salmaniya and Mortality Register - unduplicated count).

VI. Estimated unrecorded cirrhosis deaths

$\frac{(.01 \times \text{col. IV}) \times \text{col. V}}{\text{col. III} \times 3} = \frac{\text{col. V} \times \text{col. III}}{\text{col. II}}$  or  $\frac{(\text{col. IV})}{(\text{col. V} \times 3)} \times \text{col. II}$

VII. Total estimated cirrhosis deaths (col. V + col. VI)

Table 14  
Females Estimated Cirrhosis Deaths  
1973-1975 Combined Totals

|       | I                            | II                         | III                  | IV                       | V                                          | VI                                                        | VII                                       |
|-------|------------------------------|----------------------------|----------------------|--------------------------|--------------------------------------------|-----------------------------------------------------------|-------------------------------------------|
| Age   | Expected<br>Deaths<br>1 Year | Recorded<br>Deaths<br>1975 | Unrecorded<br>Deaths | Percentage<br>Unrecorded | Recorded<br>Cirrhosis<br>Deaths<br>3 Years | Estimated<br>Unrecorded<br>Cirrhosis<br>Deaths<br>5 Years | Total<br>Estimated<br>Cirrhosis<br>Deaths |
| 15-24 | 84.2                         | 11                         | 73.2                 | 86.9                     | 1                                          | 6.6                                                       | 7.6                                       |
| 45-54 | 68.2                         | 29                         | 39.2                 | 57.5                     | 1                                          | 1.3                                                       | 2.3                                       |
| 65-74 | 82.2                         | 33                         | 49.2                 | 59.2                     | 1                                          | 1.2                                                       | 2.2                                       |

I. Expected deaths for one year, from Column IV Table

II. Recorded deaths 1975, from Column V Table

III. Unrecorded deaths, from Column VI Table

IV. Unrecorded deaths, from Column VII Table

V. Recorded cirrhosis deaths (from Salmaniya and Mortality Register - unduplicated count).

VI. Estimated unrecorded cirrhosis deaths

$\sqrt{(.01 \times \text{col. IV}) \times \text{col. V}} \pm \sqrt{1 - (.01)} (\text{col. IV})$  or  $\sqrt{(\text{col. V} \pm 3) \pm \text{col. II}}$   
 $\times \text{col. III} \times 3 = \text{col. V} \times \text{col. III}$   
 $\text{col. II}$

VII. Total estimated cirrhosis deaths (col. V + Col. VI)

overestimate of the actual number of cirrhosis deaths. This is because cirrhosis deaths are more apt to occur in hospital and thus are proportionately over-represented in hospital deaths; therefore, this same proportion applied to the missing (non-hospital) deaths is too large and is expected to overestimate the missing cirrhosis deaths. The corrected number of cirrhosis deaths will be used in calculating the upper estimate for cirrhosis mortality rates.

A minor problem which has been noted by some is the fact that some Bahrainis go abroad for treatment. If death occurs outside of Bahrain, of course the death is not recorded officially; however, these deaths are included in the estimate of missing deaths. There is no reason to believe that there is proportionately more treatment and death outside Bahrain from cirrhosis than from any other disease; therefore, the statements made previously about estimated cirrhosis deaths among the missing deaths still hold.

Although the cirrhosis calculations are not 100% accurate due to the reasons mentioned, they are included because of their importance for international comparisons. The error sources are described in detail, and in looking at all of them, it is believed that our lower estimate of cirrhosis rates is an underestimate of the true rate since it is based on only about 50% of the deaths in Bahrain. On the other hand, our upper estimate is truly an overestimate for the following reasons: 1) the maximum number of cirrhosis deaths possible was taken from the hospital and Public Health Death

registers, 2) of the registered deaths, there is little reason to believe that many are missing because of inaccurate diagnosis to "protect the family name" from the social stigma of alcoholism, and 3) the correction for the proportion of unrecorded deaths is based on the first two overestimates, and the correction itself is believed to be an overestimate due to the fact that cirrhosis deaths are more apt to be hospital deaths.

Cirrhosis death rates for other countries are available from several sources. The most recent is Massé *et al.* (1976) who use World Health Organization data. They have taken the rate per 100,000 of reported deaths due to cirrhosis of the liver for 26 countries with complete data for the year 1971. The data are presented separately for males and females and are standardized by the direct method, the standard population being Switzerland in 1971. The Bahraini data are adjusted to be comparable to these data.

By use of a regression model with consumption and dominant beverage consumed (beer, wine, or spirits) we could predict the Bahraini male and female cirrhosis rates and see if they fell within the interval obtained. If the predicted value falls on the low side of the interval, then we would suspect that a great deal of the alcohol is consumed by non-residents and/or taken out of the country. If the predicted value is on the high side of the interval, then we would suggest that there is a high rate of non-alcoholic cirrhosis and that cirrhosis might not be as valid an indicator of

of alcohol problems in non-industrialized as in industrialized countries.

Psychiatric alcohol admissions.

Psychiatric data were taken from the Psychiatric Hospital patient records and were distinguished as to inpatient or outpatient admissions. Although the records were uneven in quality and completeness, and mostly written in English but sometimes in Arabic, a diagnosis was always included. For inpatients, there was a provisional admission diagnosis and a finalized diagnosis after the patient was evaluated by the staff. For the inpatients, the final diagnosis was the one used as the criterion for "caseness," and for the outpatients, the admitting diagnosis was used.

The diagnostic criterion for alcoholism (as expressed by the psychiatrist who was the director of the hospital) was that the patient had physical and psychological dependence (as described by Jellinek, 1960). While this psychiatrist did have specialized training in the treatment of alcoholics in England, the other physicians did not, and one wonders whether their cultural bias might influence the diagnosis. Either they might not have experience with alcoholics and thus miss the clues when dealing with a very deceptive patient, or they might be more apt to diagnose a patient as alcoholic because in Islam abstinence is the rule; therefore, it would take much less of a deviation to be considered pathological than in our own culture.

From my experience there, the latter bias is more apt to be operative than the former. By the time the patients came to the hospital, they were generally in fairly bad shape. There was a great deal of family support, so families would put up with quite a lot before going to the "Nerve Hospital" (as it was colloquially known). Secondly, the patients were surprisingly open about their problems; thus a patient coming to treatment or being brought to treatment would probably admit to his drinking problem in the sincere and somewhat naive hope that the doctors could "cure" him.

The data were collected separately for first admissions and readmissions in order to distinguish between incidence and prevalence of alcoholic admissions. Sex, age, and nationality of the patients were also recorded.

Although it is impossible to compare these data to other countries because of diagnostic differences, admission practice differences, etc., it was still felt that over a five-year period, biases would be constant and the data would reflect changes in alcohol problems in Bahrain.

#### Alcohol-related non-traffic offenses.

Alcohol-related non-traffic offenses (otherwise known in Bahrain as "liquor crimes") include both possession of alcohol and intoxication by alcohol. As mentioned earlier, according to the written Muslim law in Bahrain, it is forbidden for any Muslim to drink or possess alcoholic beverages, but in practice, only one who is causing a disturbance

or otherwise calling attention to himself is arrested. The law is applied very reasonably and to preserve order rather than morality.

Data were obtained from Major Muhammad Jassim Thawadi, Assistant Director of Criminal Investigation Division and Liaison Officer in the Ministry of Interior for the years 1970-1975. Data for all other non-traffic crimes were also obtained to see if liquor crimes followed the same trends as other crimes.

Again, although these data are not internationally comparable, they are expected to give a fairly accurate reflection of increasing or decreasing problems in Bahrain, especially since there has been no official change in enforcement policy from 1970-1975. Furthermore, they give an idea of alcohol as a public problem to the Bahrainis.

#### Alcohol-related traffic offenses and accidents.

At first it was thought to collect traffic data over a four to five year period as was done with the other data sets; however, alcohol-related traffic offenses just started being recorded in 1974, so only two years were available at the time of data collection. There were only two types of alcohol arrests available from Traffic and Licensing Affairs of the Ministry of the Interior; alcohol-related traffic offenses and alcohol-related traffic accidents.

The alcohol-related traffic offenses (known in Bahrain as "drunk cases offenses") were cases where the driver was ascertained to be under the influence of alcohol. This

should be from a blood or breath test. One wonders, though, with the lack of trained breathalyzer operators and the trouble of taking the driver to the hospital for a blood sample, whether the arresting officer might either have eliminated the testing altogether or charged the driver with a different offense which is less complicated to ascertain.

The alcohol-related traffic accidents involve a crash where the driver is known to be under the influence of alcohol (as determined by the same method for alcohol offenses). There are the same testing problems as in arrest for an alcohol offense, and also the problem of drivers running from the accident and only returning when sober.

Rates were computed using the number of licensed drivers and the number of registered vehicles for the years in question.

It was felt that the traffic data would be the most limited, but they were collected anyway, for the sake of completeness and to see if they would be consistent with the other data.

To summarize, it was decided to collect aggregate consumption data as the primary indicator of Bahraini alcohol problems, knowing that whatever figure we obtained would be an overestimate of the true consumption level. The second most important data to collect were liver cirrhosis mortality rates, for which we could obtain a lower bound (based on reported deaths) and an upper bound (based on reported and estimated missing deaths), knowing that the true rate would be within the interval. Thirdly, it was

decided to collect psychiatric data, traffic data, and crime data to investigate yearly trends in Bahraini alcohol problems. The next chapter presents the findings of this inquiry.

## CHAPTER FIVE

### RESULTS

The results are divided into the descriptive results and the comparative results, the former to be discussed first. The aim of the descriptive results is to establish baseline information to look at the trends which are developing in Bahrain, while the aim of the comparative results is to establish Bahrain's position among other countries for which consumption and cirrhosis information is available.

#### Descriptive Results

##### 1. Alcohol consumption

Table 15 shows the weight in kilos, value before customs (in Bahraini Dinars), and tax (in Bahraini Dinars) for all four categories of alcohol remaining in Bahrain for the years 1971-1975. The four exhaustive categories are: distilled spirits, beer, wine, and fermented fruit juice. There appears to be a steady increase in kilos of alcohol (except from 1973 to 1974 when there was a slight decrease) and a more than doubling in the value of the alcohol and a tripling in the taxes.

Table 16 shows the liters of the four categories of beverage alcohol and absolute alcohol remaining in Bahrain for the years 1971-1975. Table 16 was computed from Table 15

Table 15

**Alcoholic Beverages Remaining in Bahrain**  
(Imports minus Exports) 1971-1975

|                                         | 1971      | 1972      | 1973      | 1974      | 1975      |
|-----------------------------------------|-----------|-----------|-----------|-----------|-----------|
| <b>I. Weight (net kilos)</b>            |           |           |           |           |           |
| wine (including grape must)             | 139,777   | 128,934   | 209,273   | 231,953   | 400,863   |
| fermented fruit juices                  | N.A.*     | 18,234    | 180       | 2,061     | 11,321    |
| beer                                    | 3,339,930 | 3,787,502 | 3,830,838 | 3,925,607 | 4,465,079 |
| distilled alcoholic beverages           | 836,354   | 704,487   | 1,191,836 | 1,064,893 | 1,333,129 |
| TOTAL                                   | 4,316,061 | 4,639,167 | 5,232,077 | 5,224,514 | 6,210,392 |
| <b>II. Value before Customs</b>         |           |           |           |           |           |
| wine (including grape must)             | N.A.      | 45,658    | 112,791   | 127,066   | 294,165   |
| fermented fruit juices                  | N.A.      | 2,094     | 72        | 507       | 2,242     |
| beer                                    | N.A.      | 532,043   | 607,104   | 737,353   | 940,162   |
| distilled alcoholic beverages           | N.A.      | 348,337   | 618,890   | 661,843   | 914,300   |
| TOTAL                                   | N.A.      | 928,132   | 1,338,857 | 1,526,409 | 2,150,569 |
| <b>III. Tax (B.D.'s)</b>                | 383,239   | 372,821   | 588,808   | 745,317   | 1,127,507 |
| <b>IV. Tax and Value before Customs</b> | -         | 1,300,953 | 1,922,665 | 2,271,726 | 3,278,376 |

\*N.A. = Not Available

Table 16  
Alcohol Remaining in Bahrain

|                                   | 1971-1975   |             |             |             |             |
|-----------------------------------|-------------|-------------|-------------|-------------|-------------|
|                                   | 1971        | 1972        | 1973        | 1974        | 1975        |
| <b>Litres of beverage alcohol</b> |             |             |             |             |             |
| spirits                           | 633,654.9   | 533,747.5   | 902,982.6   | 806,805.5   | 1,010,031.8 |
| beer                              | 2,844,651.7 | 3,225,853.3 | 3,262,763.0 | 3,343,478.7 | 3,802,952.4 |
| wine                              | 105,901.0   | 97,685.6    | 158,553.6   | 175,736.9   | 303,709.8   |
| Fermented fruit juice             | N.A.        | 14,772.7    | 105.3       | 1,668.9     | 9,167.0     |
| Total                             | 3,584,207.6 | 3,872,059.1 | 4,324,404.5 | 4,327,690.0 | 5,125,861.0 |
| <b>Litres of absolute alcohol</b> |             |             |             |             |             |
| spirits                           | 285,144.7   | 240,186.4   | 406,342.2   | 363,062.5   | 454,514.3   |
| beer                              | 142,232.6   | 161,292.7   | 163,138.2   | 167,173.9   | 190,147.6   |
| wine                              | 12,708.1    | 11,722.3    | 19,026.4    | 21,088.4    | 36,445.2    |
| Fermented fruit juice             | -           | 510.0       | 3.7         | 58.4        | 320.8       |
| Total                             | 440,085.4   | 213,718.4   | 588,510.5   | 551,383.2   | 681,427.9   |

\*N.A. = Not Available

end Table 9 in Chapter Four. The total number of liters of beverage alcohol increases each year; however, when beverage alcohol is converted into absolute alcohol (the lower half of Table 16), the results are different. There is a slight decrease in the totals from 1971 to 1972, a large jump from 1972 to 1973, another decrease from 1973 to 1974, and another large increase from 1974 to 1975. These yearly differences are accounted for by the amount of absolute alcohol in the form of distilled spirits.

Table 17 gives the rate of consumption of alcohol as liters of beverage alcohol and liters of absolute alcohol and also as per capita and per 15 and older population. Table 17 was computed from Table 16 and Appendix A. Liters of absolute alcohol per 15 and older population is considered the best way of expressing consumption and will be used from here on out. There was a slight decrease in liters of absolute alcohol per 15 and older population from 1971 to 1972, a large increase from 1972 to 1973, a negligible decrease from 1973 to 1974, and an increase from 1974 to 1975. The overall trend is to increasing consumption, with a 35.1% increase from 1971 to 1975 (3.7 liters to 5.0 liters). This is a high rate of increase (an average of 9% per year). Sulkunen (1976) has shown trends in total per capita consumption for 34 countries, and only the German Democratic Republic had a higher average annual increase of 9.5%.

A linear model was assumed and a test was made for a non-zero slope. A careful investigation of the plot of the residuals versus the estimated values of the yearly 15 years and older per

Table 17  
Per Capita Consumption of Alcohol in Bahrain  
1971-1975

|                                   | 1971 | 1972 | 1973 | 1974 | 1975 |
|-----------------------------------|------|------|------|------|------|
| <b>Litres of beverage</b>         |      |      |      |      |      |
| per capita pop.                   | 16.6 | 17.2 | 18.5 | 17.8 | 20.4 |
| per $\geq$ 15 yrs. pop.           | 29.8 | 31.1 | 33.6 | 32.6 | 37.4 |
| <b>Litres of absolute alcohol</b> |      |      |      |      |      |
| per capita pop.                   | 2.0  | 1.8  | 2.5  | 2.3  | 2.7  |
| per $\geq$ 15 yrs. pop.           | 3.7  | 3.3  | 4.6  | 4.1  | 5.0  |

capita consumption indicated that the linear model is reasonable. Furthermore, the slope of the line was tested to be zero, and the test indicated a positive non-zero slope ( $T = 2.478$ , 3 d.f.,  $0.025 < p < 0.05$ ). Therefore, we conclude that there is an increasing linear trend for consumption.

As detailed in the previous chapter, it is believed that the calculation of per capita consumption is an overestimate due to non-resident visitations. To show the extent to which drinking and taking alcohol out of Bahrain could be influenced by non-residents, we have listed in Table 18 the arrivals and departures in Bahrain from 1969 to 1975 of non-Bahrainis. Some of these non-Bahrainis are residents coming in and out of Bahrain for vacations and business in other states; however, it is believed that most of the arrivals and departures are non-residents. After all, there are close to 40,000 non-Bahraini residents in Bahrain, and each one would have had to leave the country six times in 1975 to account for the figures shown. Furthermore, the growing hotel business is evidence in itself of increasing numbers of short-term visitors.

Another factor mentioned earlier which can influence consumption is the cost of alcohol relative to disposable income. Below is listed the average cost of a liter of absolute alcohol from 1972-1975 (dealer cost represents value after customs and tax). As can be seen from Table 19, there is a 53.0% increase from 1972 to 1975.

Table 18  
 Non-Bahraini Arrivals and Departures in Bahrain  
 1969-1975

|      | non-Bahraini<br>Arrivals | non-Bahraini<br>Departures | Persons Entering<br>on 72-Hours Visa |
|------|--------------------------|----------------------------|--------------------------------------|
| 1969 | 125,637                  | 124,710                    | not available                        |
| 1970 | 129,707                  | 129,023                    | not available                        |
| 1971 | 160,812                  | 164,175                    | not available                        |
| 1972 | 154,776                  | 143,990                    | 24,750 -                             |
| 1973 | 168,552                  | 162,946                    | 35,594                               |
| 1974 | 196,496                  | 194,644                    | 45,680                               |
| 1975 | 238,013                  | 231,410                    | 57,301                               |

Table 19

Average Dealer Cost of a Liter of Absclute Alcohol (B.D.'s)  
1972-1975

| <u>Year</u> | <u>Average Dealer Cost</u> |
|-------------|----------------------------|
| 1972        | 3.145 B.D.                 |
| 1973        | 3.267                      |
| 1974        | 4.120                      |
| 1975        | 4.811                      |

The following table shows the increase in cost of living and the increase in the dealer cost of a liter of absolute alcohol from 1972 to 1975 using 1972 as the base year. The calculation of both indices is the equivalent of taking the percent increase each year over 1972.

Table 20

Cost of Living and Cost of Absolute Alcohol Indices 1972-1975

| <u>Year</u> | <u>Cost of Living Index</u> | <u>Cost of Absolute Alcohol Index</u> |
|-------------|-----------------------------|---------------------------------------|
| 1972        | 100.0                       | 100.0                                 |
| 1973        | 114.5                       | 103.9                                 |
| 1974        | 142.2                       | 131.0                                 |
| 1975        | 165.0                       | 153.0                                 |

The dealer cost of absolute alcohol does not quite keep up with the cost of living. Unfortunately, there are no data on income. If income kept up with the cost of living, we would expect a slight increase in alcohol consumption. If income increased at a higher rate than cost of living, then we would expect consumption to go down. And, if income increased at a lower rate than cost of living, we would expect

consumption to decrease. It is difficult to believe that income would have increased 65% from 1972 to 1975, which makes it highly probable that a large portion of the increase in consumption is, as we speculated, due to the increasing numbers of non-resident visitors to Bahrain.

While there has been no change in the laws pertaining to alcohol and in the enforcement policy, there has been an increase in the number of places where alcohol is available. While no official count was ever made (because there are no licenses required), hotel bars, restaurant bars, and retail outlets have all increased. During the six months I was there, at least one new hotel bar, one new restaurant bar, and one new retail outlet opened. The hotel bars are largely patronized by non-residents, whereas the restaurant bars and retail outlets are patronized by both residents and non-residents. Thus, there is reason to believe that Bahraini interests in drinking (as well as non-resident interests) are increasing, and the increased number of outlets is a response to this. But also, the greater number of outlets encourages more drinking.

In summary, we note an increasing trend in alcohol consumption in Bahrain. There is good evidence that at least part of the increase is due to increasing numbers of non-residents visiting the island and drinking during their stay as well as taking Bahrain alcohol back with them to their dry countries. The data on cost of living and cost of alcohol support this theory. Although the increase in restaurant bars,

retail outlets, and especially hotel bars is somewhat due to the increased demand of non-residents, there is some increase in demand by residents of the island.

The other alcohol indicators that were collected should be expected to act as further evidence for or against the non-resident theory; specifically, if the increased consumption is due to non-residents, then indicators such as liver cirrhosis mortality, alcohol psychiatric admissions, and alcohol crimes should be fairly stable. If, on the other hand, the increase is due to residents, then these other indicators should also increase.

## 2. Liver cirrhosis mortality

Cirrhosis mortality was considered the next most important data to collect as it correlates highly with consumption (see Table 3 in Chapter 3). As mentioned in the last chapter, there was a problem with the missing deaths; however a correction formula was used to estimate these deaths. For reasons stated earlier, the resulting cirrhosis mortality rate is believed to overestimate the true cirrhosis mortality rate. Table 21 shows the difference in rates between the overestimate (Method II) and the underestimate (Method I), and Table 22 shows the age/sex breakdown of the estimated cirrhosis deaths. Methods I and II were described earlier in Chapter 4.

Table 21

Two Methods for Calculating Cirrhosis Deaths per 100,000  
in Bahrain

|                 | <u>1973</u> | <u>1974</u> | <u>1975</u> | <u>Average<br/>1973-1975</u> |
|-----------------|-------------|-------------|-------------|------------------------------|
| Male            |             |             |             |                              |
| Method I        | 8.8         | 4.6         | 4.5         | 6.0                          |
| Method II       | 16.2        | 8.5         | 8.2         | 10.9                         |
| Female          |             |             |             |                              |
| Method I        | 0.9         | 1.8         | 0.0         | 0.9                          |
| Method II       | 3.7         | 7.1         | 0.0         | 3.5                          |
| Male and Female |             |             |             |                              |
| Method I        | 5.1         | 3.3         | 2.4         | 3.6                          |
| Method II       | 10.4        | 7.8         | 4.3         | 7.4                          |

Method I: Actual number of recorded cirrhosis deaths (from Public Health and Salmaniyya Death Registers, unduplicated count).

Method II: Estimated number of cirrhosis deaths (from Public Health and Salmaniyya Death Registers, unduplicated count, and adjusted for unrecorded deaths).

Regardless of which method was used, the overall rate of cirrhosis mortality appears to be decreasing over the three year period. The standard deviations of these rates ranged from 0.9 per 100,000 to 3.6 per 100,000 so the precision of the observed trend could be affected.

The male rate decreased drastically from 1973 to 1974 (from 16.2 to 8.5 per 100,000) and decreased slightly from 1974 to 1975 (8.5 to 8.2 per 100,000). The female rate increased from 1973 to 1974 (3.7 to 7.1 per 100,000), but in 1975 there were no female cirrhosis deaths. The males consistently have a higher rate than the

females; taking the average of all the three years, the male rate is 3.1 times the female rate.

Chi-square tests of linearity were performed separately for males, females, and the total population for Method I and Method II. In all cases except for females Method II, the null hypothesis of linearity was accepted. When further testing of the slopes was performed, only the slope for the total population Method II was significantly less than zero, although the slope for the total population Method I just missed significance at the conventional .05 level (the test results are shown in Appendix B). It should be remembered that Method II is merely an inflation of Method I; therefore, it is not surprising to find a steeper and significantly negative slope for Method II. From these tests we can conclude that there is generally a linear trend, and for the total population the slope is significant in a negative direction.

Table 22 shows the breakdown of the estimated cirrhosis deaths by year, age, and sex. Table 23 shows the breakdown of the estimated cirrhosis deaths by year, age and sex. Table 23 shows the same thing, only as rates per 100,000 (computed from the population distribution in Appendix A). Looking at the data for Bahrain, the male data have a bimodal distribution peaking in the 45-54 age group and again in the older age groups. The 1973 male rates were almost twice the 1974 or 1975 rates, while the 1974 and 1975 male data were almost identical. For females, the data are less consistent (due to fewer cases). There were no female cirrhosis deaths in 1975. In contrast to

Table 22  
Estimated Cirrhosis Deaths by Year, Age and Sex  
1973-1975

|                        | Total Estimated<br>Cirrhosis<br>Deaths 3 Years | Estimated Cirrhosis Deaths<br>$(A_i \times B_j)_{ij} \quad T = A_i B_j$ |                |                |
|------------------------|------------------------------------------------|-------------------------------------------------------------------------|----------------|----------------|
| Age                    |                                                | 1973                                                                    | 1974           | 1975           |
| <u>Males</u>           |                                                |                                                                         |                |                |
| 25-34                  | 5.8 ( $A_1$ )                                  | 2.8                                                                     | 1.5            | 1.5            |
| 35-44                  | 11.6 ( $A_2$ )                                 | 5.6                                                                     | 5.0            | 3.0            |
| 45-54                  | 13.0 ( $A_3$ )                                 | 6.2                                                                     | 3.4            | 3.4            |
| 55-64                  | 5.8 ( $A_4$ )                                  | 2.8                                                                     | 1.5            | 1.5            |
| 65-74                  | 3.9 ( $A_5$ )                                  | 1.9                                                                     | 1.0            | 1.0            |
| 75+                    | 2.1 ( $A_6$ )                                  | 1.0                                                                     | 0.5            | 0.5            |
| Total                  | 42.2 (T)                                       | 20.2 ( $B_1$ )                                                          | 11.0 ( $B_2$ ) | 11.0 ( $B_3$ ) |
| <u>Females</u>         |                                                |                                                                         |                |                |
| 15-24                  | 7.6 ( $A_1$ )                                  | 2.5                                                                     | 5.1            | -              |
| 45-54                  | 2.3 ( $A_2$ )                                  | 0.8                                                                     | 1.5            | -              |
| 65-74                  | 2.2 ( $A_3$ )                                  | 0.7                                                                     | 1.5            | -              |
| Total                  | 12.1 (T)                                       | 4.0 ( $B_1$ )                                                           | 8.1 ( $B_2$ )  | - ( $B_3$ )    |
| <u>Male and Female</u> |                                                |                                                                         |                |                |
| 15-24                  | 7.6                                            | 2.5                                                                     | 5.1            | -              |
| 25-34                  | 5.8                                            | 2.8                                                                     | 1.5            | 1.5            |
| 35-44                  | 11.6                                           | 5.6                                                                     | 3.0            | 3.0            |
| 45-54                  | 15.3                                           | 7.0                                                                     | 4.9            | 3.4            |
| 55-60                  | 5.8                                            | 2.8                                                                     | 1.5            | 1.5            |
| 65-74                  | 6.1                                            | 2.6                                                                     | 2.5            | 1.0            |
| 75+                    | 2.1                                            | 1.0                                                                     | 0.5            | 0.5            |
| Total                  | 54.3                                           | 24.3                                                                    | 19.0           | 10.9           |

Table 23

Rate Per 100,000 of Cirrhosis Deaths by Year, Age and Sex

1973-1975

| Age                    | 1973 | 1974 | 1975 | Average<br>1973-1975 |
|------------------------|------|------|------|----------------------|
| <u>Males</u>           |      |      |      |                      |
| 15-24                  | 0.0  | 0.0  | 0.0  | 0.0                  |
| 25-34                  | 16.5 | 8.8  | 8.8  | 11.4                 |
| 35-44                  | 41.4 | 21.9 | 21.7 | 28.3                 |
| 45-54                  | 65.7 | 35.8 | 35.5 | 45.6                 |
| 55-64                  | 52.1 | 25.8 | 24.0 | 33.2                 |
| 65-74                  | 89.3 | 46.8 | 46.6 | 60.9                 |
| 74+                    | 95.2 | 45.2 | 43.0 | 63.2                 |
| Total                  | 16.2 | 8.5  | 8.2  | 10.9                 |
| <u>Females</u>         |      |      |      |                      |
| 15-24                  | 12.0 | 22.8 | 0.0  | 11.3                 |
| 25-34                  | 0.0  | 0.0  | 0.0  | 0.0                  |
| 35-44                  | 0.0  | 0.0  | 2.0  | 0.0                  |
| 45-54                  | 13.0 | 21.6 | 0.0  | 11.1                 |
| 55-64                  | 0.0  | 0.0  | 0.0  | 0.0                  |
| 65-74                  | 39.0 | 84.0 | 0.0  | 41.1                 |
| 74+                    | 0.0  | 0.0  | 0.0  | 0.0                  |
| Total                  | 3.7  | 7.1  | 0.0  | 3.5                  |
| <u>Male and Female</u> |      |      |      |                      |
| 15-24                  | 5.7  | 10.9 | -    | 5.4                  |
| 25-34                  | 9.5  | 5.0  | 5.0  | 6.5                  |
| 35-44                  | 23.7 | 12.5 | 12.4 | 16.2                 |
| 45-54                  | 43.2 | 29.8 | 20.4 | 31.0                 |
| 55-64                  | 30.2 | 14.9 | 13.9 | 19.3                 |
| 65-74                  | 66.3 | 63.8 | 25.5 | 51.9                 |
| 75+                    | 45.8 | 22.1 | 21.3 | 30.9                 |
| Total                  | 10.4 | 7.8  | 4.3  | 7.4                  |

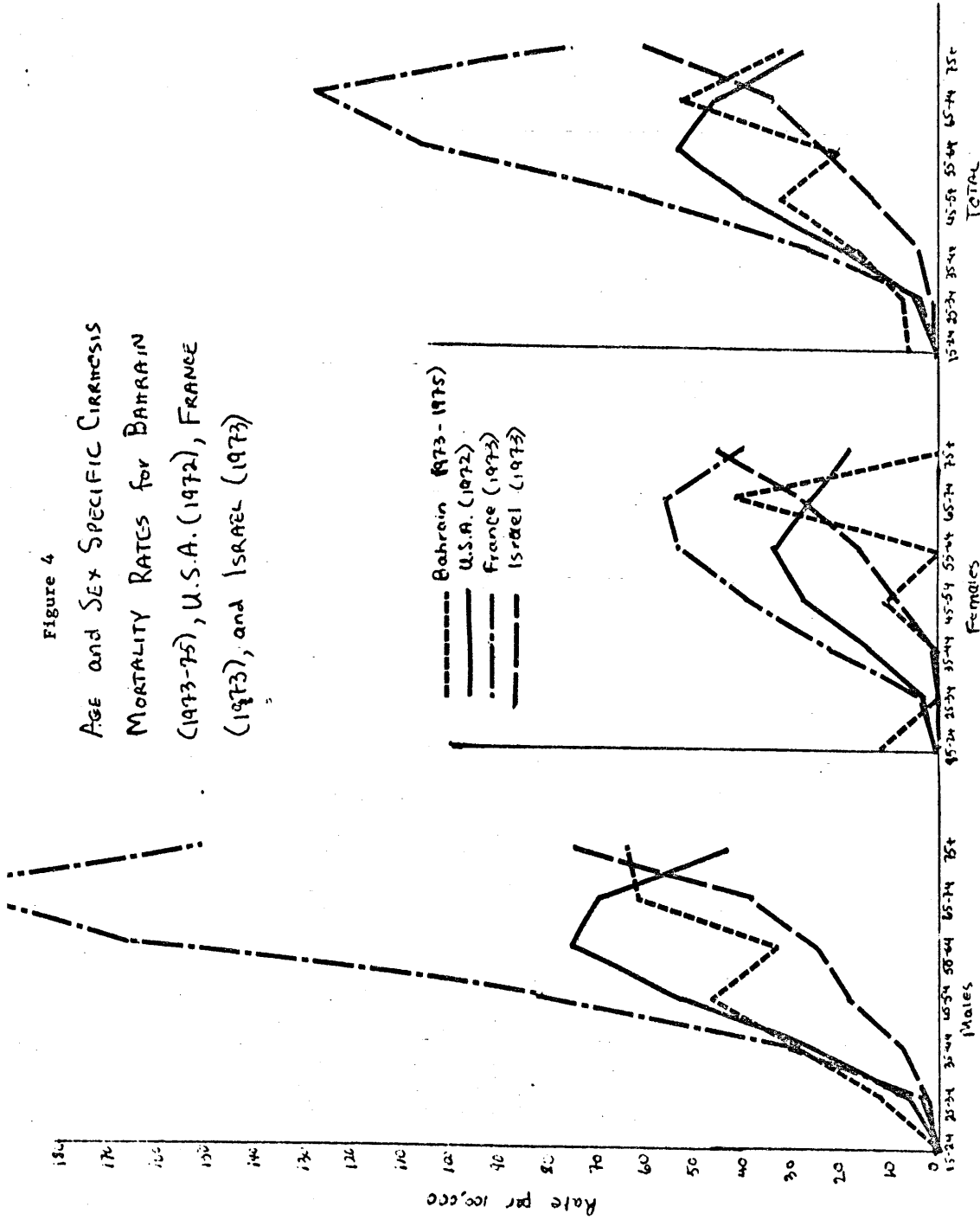
the male pattern, the rates were almost twice as high in 1974 as in 1973. Although most female age groups had no deaths, the 15-24 age group was represented (but it was not represented in the males). The other two age groups represented were the 45-54 group and the 65-74 group; however, these rates were less than the corresponding male rates (except for the 65-74 group in 1974).

The female deaths are too small numerically to ascribe any significance to the age distribution. Although it would be tempting to interpret the bimodal male distribution as illustrative of two etiologies of cirrhosis, we feel that, again, the numbers are very small and therefore subject to random error.

In looking at the shape of age-specific (15 and above) male cirrhosis death rates for 52 countries in 1973, it is apparent that there are three basic shapes of distributions. One is a positively skewed curve with a drop in the rate of the older ages (see U.S.A. and France in Figure 4) which occurred in 27 countries. The other is a positively skewed curve, almost linear, with progressively higher rates at each age group (see Israel in Figure 4) which occurred in 21 countries. The third type (which occurred in only four countries) is similar to the Bahraini curve with a dip after middle age but a rise again in old age. The etiologic reason for the differences in these curves is not clear. Although the Bahraini pattern fits the third pattern, we see no particular significance in this, especially since the numbers of deaths

Figure 4

AGE AND SEX SPECIFIC CIRRHOSIS  
MORTALITY RATES FOR BAHRAIN  
(1973-75), U.S.A. (1972), FRANCE  
(1973), and ISRAEL (1973)



in Bahrain were small and the correction factor applied to them would exaggerate any random variations.

It is clear, though, that the male/female differences are no accident (crude relative risk of 3.1 and Mantel-Haenszel estimated mean odds ratio of 2.2). This is consistent with the observation that Bahraini females almost never drink, and female consumption would almost exclusively be due to the female expatriot population.

The cirrhosis patterns of 1973-1975 do not follow the consumption patterns of 1973-1975. First, it should be remembered that the actual consumption increase by Bahraini residents is not as high as the data indicate, due to the increasing number of visitors to the island. Secondly, we note the small number of cirrhosis deaths and the weak support for a significant negative slope. With this in mind, the large reductions in cirrhosis mortality during these three years is probably exaggerated, and it is better not to interpret these data as indicative of trends in alcohol use. Rather, the best use is to take the three year average and compare this with other countries.

### 3. Psychiatric alcohol admissions

Psychiatric alcohol records were divided into two categories: inpatient admissions and outpatient admissions. Data are presented for each category of admissions as alcohol admissions and total admissions, and as raw numbers, rates per 100,000 population, and percentage of total admissions. The

percentage of total admissions is given to show to what degree alcohol admissions are a result of overall admission trends and policies.

Inpatient psychiatric alcohol admissions. Table 24 shows alcoholism psychiatric inpatient first admissions from 1971-1975 separately for males and females. The standard deviations of these rates are reasonably small so that the observed trend would probably not be affected by lack of precision, the largest being 4.7 per 100,000 for males in 1975. Alcohol admissions show an overall increase from 1971-1975 of 5.1 per 100,000 to 15.5 per 100,000. The years 1972 and 1974, however, were years of decline. Even though the overall admission trend is increasing (in spite of a decrease from 1974 to 1975), the alcohol increase is independent as shown by the alcohol admissions as percentage of total admissions. The male pattern really accounts for the overall pattern as there was only one female inpatient first admission during this time.

Chi-square tests of linearity were performed separately for males, females, and the total population. In all three cases, the null hypothesis of linearity was accepted. When further testing of the slopes was performed, the slopes for the males and the total population were significantly greater than zero. As expected, the slope for the female data was not significantly different from zero. The test results are shown in Appendix B. From these tests we can conclude that there is a linear trend, and for males and the total population the trend is significant in an increasing direction.

Table 24  
Alcoholism Psychiatric Inpatient First Admission Only  
By Number, Rate Per 100,000 Population, and Percentage of Total Admissions 1971-1975

|                            | 1971 |       |       | 1972 |       |       | 1973 |       |       | 1974 |       |       | 1975 |       |       |
|----------------------------|------|-------|-------|------|-------|-------|------|-------|-------|------|-------|-------|------|-------|-------|
|                            | No.  | Rate* | %**   | No.  | Rate* | %**   | No.  | Rate* | %**   | No.  | Rate* | %**   | No.  | Rate* | %**   |
| Male Alcoholism            | 11   | 9.4   | 11.1  | 6    | 5.0   | 4.7   | 26   | 20.8  | 18.0  | 24   | 18.6  | 11.4  | 39   | 20.2  | 10.8  |
| Total Male Admissions      | 99   | 85.1  | 100.0 | 128  | 106.2 | 100.0 | 163  | 130.6 | 100.0 | 211  | 163.4 | 100.0 | 208  | 156.0 | 100.0 |
| Female Alcoholism          | -    | -     | -     | -    | -     | -     | -    | -     | -     | 1    | 0.9   | 0.7   | -    | -     | -     |
| Total Female Admissions    | 67   | 67.2  | 100.0 | 91   | 87.1  | 100.0 | 132  | 121.0 | 100.0 | 136  | 119.6 | 100.0 | 126  | 106.4 | 100.0 |
| Male and Female Alcoholism | 11   | 5.1   | 6.6   | 6    | 2.7   | 2.7   | 26   | 11.1  | 8.8   | 25   | 10.3  | 7.2   | 39   | 15.5  | 11.7  |
| Total Admissions           | 168  | 76.8  | 100.0 | 219  | 97.3  | 100.0 | 295  | 126.1 | 100.0 | 347  | 142.9 | 100.0 | 334  | 132.6 | 100.0 |

\* Rate per 100,000 population using census projections

\*\* Percentage of total admissions

Table 25

## Alcoholism Psychiatric Inpatient Admissions 1971-1975

|                                            | <u>1971</u> |       | <u>1972</u> |       | <u>1973</u> |       | <u>1974</u> |       | <u>1975</u> |       |
|--------------------------------------------|-------------|-------|-------------|-------|-------------|-------|-------------|-------|-------------|-------|
|                                            | No.         | Rate* | No.         | Rate* | No.         | Rate* | No.         | Rate* | No.         | Rate* |
| Alcohol Readmissions                       | 7           | 3.2   | 5           | 2.2   | 16          | 6.8   | 19          | 7.8   | 29          | 11.0  |
| Total Alcohol Admissions<br>(first and re) | 18          | 8.3   | 11          | 4.9   | 42          | 18.0  | 44          | 18.1  | 68          | 27.0  |

---

\*Per 100,000 population

It is interesting to note that the years 1972 and 1974 were also years of decline in per capita absolute alcohol consumption, which adds weight to the theory that the resident population accounts for the changes in consumption. On the idea that alcohol availability would affect prevalence as well as incidence in any given year, first admissions and re-admissions were combined. When this is done, the drop from 1973 to 1974 disappears (but the difference between the two years is still negligible: 18.0 versus 18.1 per 100,000). When only the male data are taken, though, the relationship found in the previous table still obtains. These data support the theory that resident drinking habits account for the rise in alcohol consumption.

Outpatient psychiatric alcohol admissions. Outpatient alcoholism data are somewhat more difficult to interpret. In general, there are low rates of alcohol admissions (see Table 26) among the outpatient population. There is a jump from 2.1 per 100,000 in 1973 to 7.0 per 100,000 in 1974. The highest rate during the five year period is found in 1974, and 1973-1974 is also the largest increase. This is in contrast to the inpatient pattern where there was a very slight decrease from 1973 to 1974 and a jump in 1975. There are no female outpatient alcohol admissions.

The standard deviations were again small enough so as not to affect the trends; however,  $\chi^2$  tests of linearity for the male and female data together proved significant. Thus the null hypothesis that the observed trends are linear was rejected

### Psychiatric Outpatient Alcoholism First Admissions

### Psychiatric Outpatient Alcoholism First Admissions

By Number, Rate Per 100,000 and Percentage of Total

|                              | 1971-1975 |       |       |      |       |       |      |       |       |      |       |       |      |       |       |
|------------------------------|-----------|-------|-------|------|-------|-------|------|-------|-------|------|-------|-------|------|-------|-------|
|                              | 1971      |       |       | 1972 |       |       | 1973 |       |       | 1974 |       |       | 1975 |       |       |
|                              | No.       | Rate  | %     | No.  | Rate  | %     | No.  | Rate  | %     | No.  | Rate  | %     | No.  | Rate  | %     |
| All Outpatient               |           |       |       |      |       |       |      |       |       |      |       |       |      |       |       |
| Alcoholism Male Admissions   | 5         | 4.3   | 2.4   | 3    | 2.5   | 1.4   | 5    |       |       | 17   | 13.2  | 10.4  | 5    | 3.7   | 3.5   |
| Total Male Admissions        | 205       | 172.2 | 100.0 | 209  | 173.3 | 100.0 | 214  | 171.4 | 100.0 | 164  | 127.0 | 100.0 | 144  | 108.0 | 100.0 |
| Alcoholism Female Admissions | -         | -     | -     | -    | -     | -     | -    | -     | -     | -    | -     | -     | -    | -     | -     |
| Total Female Admissions      | 170       | 170.4 | 100.0 | 319  | 305.5 | 100.0 | 248  | 227.3 | 100.0 | 217  | 190.8 | 100.0 | 213  | 179.9 | 100.0 |
| All Alcoholism Admissions    | 5         | 2.3   | 1.3   | 3    | 1.3   | 0.6   | 5    | 2.1   | 1.1   | 17   | 7.0   | 4.5   | 5    | 2.0   | 1.4   |
| Total Admissions             | 375       | 173.5 | 100.0 | 528  | 234.7 | 100.0 | 462  | 197.5 | 100.0 | 381  | 156.9 | 100.0 | 357  | 161.8 | 100.0 |

(for males,  $\chi^2 = 18.568$   $p > .001$ , 3 d.f. for males and females,  $\chi^2 = 15.436$ ,  $p > .005$ , 3 d.f.), and no further tests were performed. One reason for this trend is that outpatient cases are presumably less severe than inpatient cases, and therefore more subject to diagnostic error. Also, outpatients might only have made one visit, further complicating the diagnostic process.

The outpatient data show again that alcohol is not a problem among females in Bahrain. Other than that, they do not relate to the overall consumption pattern or the overall inpatient admission program.

#### 4. Alcohol-related non-traffic offenses

Table 27 shows alcohol-related non-traffic offenses (alcohol crimes) from 1970 through 1975. The data are presented in raw numbers, rates per 1,000 population and percentage of total crimes. The percentage of total crimes is given to show the degree to which alcohol crimes are a result of overall enforcement policies. The standard deviations were so small that the overall trend could not be affected.

As can be seen from Table 27, both the rate of alcohol crimes per 1000 population and alcohol crimes as a percentage of total crimes increased until 1973, after which time both rates declined. In contrast, the rate of all crimes per 1000 population decreased slightly from 1970 to 1971, increased slightly each year until 1974, and then decreased slightly from 1974 to 1975. Thus, the changes in the rate

Table 27  
Alcohol Crime Statistics  
By Number, Percentage of Total Crime, and Rate Per 1000 Population

|               | 1970 |            | 1971 |            | 1972 |            | 1973 |            | 1974 |            | 1975 |            |
|---------------|------|------------|------|------------|------|------------|------|------------|------|------------|------|------------|
|               | No.  | % of Total | No.  | % of Total | No.  | % of Total | No.  | % of Total | No.  | % of Total | No.  | % of Total |
| Liquor Crimes | 415  | 9.4        | 561  | 12.7       | 708  | 14.8       | 1121 | 21.8       | 1152 | 18.6       | 1120 | 18.4       |
|               |      | 1.9        |      | 2.6        |      | 3.1        |      | 4.8        |      | 4.7        |      | 4.4        |
| Total Crimes  | 4415 | 100.0      | 4111 | 100.0      | 4700 | 100.0      | 5147 | 100.0      | 6209 | 100.0      | 6084 | 100.0      |
|               |      | 20.4       |      | 19.0       |      | 21.3       |      | 22.0       |      | 25.6       |      | 24.2       |

\* Rate per 1000 population using 1971 population

\*\* Rate per 1000 population based on projected population using 1971 census

of alcohol crimes do not correlate with the overall change in crime rate.

A chi-square test for linearity was performed and was significant at the .001 level ( $\chi^2 = 86.72$ , 4 d.f.), thus the null hypothesis of linearity was rejected, and we conclude that for these data a linear model is not appropriate. This does not take away from the fact that there is an unmistakable increase in alcohol crime rates during the study period. It does raise the issue that perhaps another curve would better describe these data.

For the years 1971-1975 alcohol crimes were the third leading cause of crime (behind assaults and thefts), while in 1970 and 1971 alcohol crimes were fourth (behind assaults, thefts, and immigration offenses). These particular data appear to be very stable and not subject to sudden fluctuations from year to year (which improves confidence in their reliability). The vast majority of alcohol arrests are for possession of alcohol rather than for intoxication. Taking 1973 as a sample year, 9.6% (108) of the alcohol arrests were for possession, the other 90.4% (1013) being for intoxication.

As a public problem, alcohol does not seem to be increasing since 1973; however, over the entire six year period, the rate of alcohol crimes has increased 132% (and 69% since 1971). Thus, while the alcohol crime data do not fit exactly the consumption pattern, in general, the two have increased substantially over their 1971 level. This is

supportive of the theory that the Bahraini residents account for the increased consumption.

5. Alcohol-related traffic offenses and accidents.

The traffic data are divided into alcohol-related offenses and alcohol-related accidents for the years 1974 and 1975. Data are presented for each category of arrest as raw numbers, percentage of total offenses or arrests, rate per 1000 driver's licenses, and rate per 1000 vehicles registered. As in all the other tables, the precision of the rates as determined by the standard deviations is very high.

Alcohol-related traffic offenses. As can be seen from Table 28, alcohol-related traffic offenses increased from 1974 to 1975: as crude numbers, as rates per 1000 total driver's licenses, and as rates per 1000 total vehicles registered. As a percentage of total offenses, however, the alcohol-related traffic offenses are practically the same from 1974 to 1975 (1.1% and 1.0% respectively). So at first while it seemed as if alcohol-related traffic offenses were becoming more of a problem, a more likely interpretation is that the increasing violations are due to the increased activity of the police force. Thus, it appears that the announced heavy increase in fines for drunk driving had no effect in acting as a deterrent to would-be offenders. Perhaps this is due to the fact that an average of only 2.6 offenders were apprehended per week in 1975. This is a small number and probably too small to serve as a negative example for drinking

Table 28  
Alcohol-Related Driving Accidents and Offenses  
By Number, Percentage of Total, Rate Per 1000 Driver's Licenses, and Rate Per 1000  
Vehicles Registered 1974-1975

|                                    | 1974   |               |                                        |                                          | 1975   |               |                                         |                                           |
|------------------------------------|--------|---------------|----------------------------------------|------------------------------------------|--------|---------------|-----------------------------------------|-------------------------------------------|
|                                    | No.    | % of<br>Total | Rate per 1000<br>Driver's<br>Licenses* | Rate per 1000<br>Vehicles<br>Registered* | No.    | % of<br>Total | Rate per 1000<br>Driver's<br>Licenses** | Rate per 1000<br>Vehicles<br>Registered** |
| Drunk cases accidents              | 224    | 4.9           | 4.0                                    | 8.3                                      | 318    | 5.9           | 5.2                                     | 9.7                                       |
| Total accidents                    | 4603   | 100.0         | 82.7                                   | 163.7                                    | 5371   | 100.0         | 87.0                                    | 163.2                                     |
| Drunk cases offenses               | 137    | 1.1           | 2.5                                    | 4.9                                      | 199    | 1.0           | 3.2                                     | 6.0                                       |
| Total offenses                     | 12,729 | 100.0         | 228.5                                  | 452.2                                    | 20,286 | 100.0         | 328.7                                   | 616.5                                     |
| Drunk cases accidents and offenses | 361    | 2.1           | 6.5                                    | 12.8                                     | 517    | 2.0           | 8.4                                     | 15.7                                      |
| Total accidents and offenses       | 17,338 | 100.0         | 311.2                                  | 615.9                                    | 25,657 | 100.0         | 415.8                                   | 779.7                                     |

\* 55,717 driver's licenses in 1974  
28,149 vehicles registered in 1974

\*\* 61,711 driver's licenses in 1975  
32,907 vehicles registered in 1975

drivers. In other words, the probability of arrest would be too small to worry about.

Alcohol-related traffic accidents. In looking at actual traffic accidents involving alcohol, we find the same trend as for alcohol-related traffic offenses (see Table 28). Alcohol accidents increased in all ways measured: in crude numbers, as a percentage of total accidents, as a rate per 1000 total driver's licenses, and as a rate per 1000 vehicles registered. This leads us to believe that alcohol actually was more of a problem from 1974 to 1975, as consumption data also indicate.

Surprisingly, the alcohol accidents rate per week (4.3 in 1974 and 6.1 in 1975) is higher than the alcohol offense rate. This leads us to believe that arrests for drunken driving are largely a function of the officer, whereas alcohol accidents (being a fait accompli) must be investigated. Thus, the rate of alcohol accidents will more accurately reflect the overall alcohol problem.

Although these data are the most limited of all, the most reliable of the two indicators (alcohol-related traffic accidents) shows an increase from 1974 to 1975 and supports the theory that the increased consumption is due to residents.

To summarize all the descriptive results, consumption increased in a linear fashion as did psychiatric inpatient admissions. Alcohol-related crimes increased

(although not linearly), and alcohol-related traffic accidents also increased. These increases support the theory that the growing alcohol consumption in Bahrain is accounted for by the resident population. On the other hand, the lack of increase for outpatient admissions and cirrhosis rates along with the increasing hotel business and increasing numbers of non-Bahraini visitors support the theory that the extra consumption is due to non-resident visitors. We must conclude, then, that both theories are partially correct, and that both the residents and the visitors together account for the increased consumption.

#### Comparative results

The comparative results involve only alcohol consumption and cirrhosis mortality, as they are the only two data sets with fairly standard criteria internationally.

##### 1. Per capita consumption.

Table 29 shows the apparent consumption of distilled spirits, wine, and beer for 27 countries and Bahrain in liters per capita of the population aged 15 years and over. The data were taken from Keller and Gurioli (1976), except for the Bahraini data which are assembled in this report. In consumption of absolute alcohol in all forms, Bahrain ranks 27th of the 28 countries. Bahrain ranks 16th in absolute alcohol consumed in the form of spirits, 28th in absolute alcohol consumed in the form of wine, and 23rd in absolute alcohol consumed in the form of beer. Clearly,

Table 29

Apparent Consumption of Distilled Spirits, Wine and Beer in 27 Countries and Bahrain, in  
Liters of Absolute Alcohol per Capita of the 15+ Population

|                    | Year    | Total | Rank | Spirits | Rank | Wine  | Rank | Beer | Rank |
|--------------------|---------|-------|------|---------|------|-------|------|------|------|
| 1. Portugal        | 1974    | 23.43 | 1    | 0.78    | 28   | 20.80 | 1    | 1.85 | 20   |
| 2. France          | 1972    | 22.44 | 2    | 4.42    | 4    | 14.88 | 2    | 3.14 | 14   |
| 3. West Germany    | 1974    | 14.82 | 3    | 3.45    | 12   | 2.95  | 10   | 8.42 | 4    |
| 4. Belgium         | 1973    | 14.36 | 4    | 2.30    | 20   | 2.79  | 11   | 9.27 | 1    |
| 5. Austria         | 1972    | 14.08 | 5    | 3.17    | 15   | 4.72  | 7    | 6.19 | 7    |
| 6. Switzerland     | 1971-73 | 13.92 | 6    | 2.85    | 17   | 6.13  | 5    | 4.94 | 11   |
| 7. Italy           | 1973    | 13.56 | 7    | 1.26    | 27   | 11.49 | 3    | 0.81 | 24   |
| 8. Australia       | 1972-73 | 13.27 | 8    | 1.77    | 26   | 2.39  | 12   | 9.11 | 2    |
| 9. Spain           | 1971    | 12.85 | 9    | 3.24    | 14   | 9.39  | 4    | 0.22 | 28   |
| 10. New Zealand    | 1972    | 12.61 | 10   | 1.84    | 23   | 1.89  | 16   | 8.88 | 3    |
| 11. Hungary        | 1972    | 12.36 | 11   | 3.80    | 8    | 5.57  | 6    | 2.99 | 15   |
| 12. Czechoslovakia | 1973    | 11.28 | 12   | 3.48    | 11   | 2.15  | 14   | 5.65 | 9    |
| 13. Denmark        | 1973    | 10.94 | 13   | 2.22    | 21   | 2.10  | 15   | 6.62 | 6    |
| 14. Canada         | 1974    | 10.78 | 14   | 3.84    | 7    | 1.21  | 20   | 5.73 | 8    |

Table 29 (cont.)

Apparent Consumption of Distilled Spirits, Wine and Beer in 27 Countries and Bahrain, in  
Liters of Absolute Alcohol Per Capita of the 15+ Population

| Country                  | Year         | Total        | Rank | Spirits      | Rank | Wine         | Rank | Beer         | Rank |
|--------------------------|--------------|--------------|------|--------------|------|--------------|------|--------------|------|
| 15. Netherlands          | 1974         | 10.60        | 15   | 3.68         | 9    | 2.36         | 13   | 4.56         | 13   |
| 16. U.S.A.               | 1975         | 10.48        | 16   | 4.31         | 5    | 1.26         | 19   | 4.91         | 12   |
| 17. United Kingdom       | 1974         | 10.16        | 17   | 2.02         | 22   | 1.50         | 17   | 6.64         | 5    |
| 18. Soviet Union         | 1972         | 8.85         | 18   | 4.63         | 3    | 3.43         | 8    | 0.79         | 26   |
| 19. Ireland              | 1973         | 8.31         | 19   | 2.50         | 18   | 0.44         | 26   | 5.37         | 10   |
| 20. Poland               | 1974         | 8.07         | 20   | 5.43         | 2    | 1.27         | 18   | 1.37         | 21   |
| 21. Finland              | 1973         | 7.64         | 21   | 3.95         | 6    | 0.84         | 22   | 2.85         | 16   |
| 22. Japan                | 1974         | 7.39         | 22   | 1.81         | 25   | 3.38         | 19   | 2.20         | 19   |
| 23. Peru                 | 1970         | 7.27         | 23   | 5.68         | 1    | 0.27         | 27   | 1.32         | 22   |
| 24. Sweden               | 1973         | 6.97         | 24   | 3.31         | 13   | 1.13         | 21   | 2.53         | 18   |
| 25. Norway               | 1974         | 5.58         | 25   | 2.40         | 19   | 0.57         | 24   | 2.61         | 17   |
| Bahrain                  | 1975         | 4.97         |      | 3.32         |      | 0.27         |      | 1.39         |      |
| 26. Iceland              | 1973         | 4.46         | 26   | 3.61         | 10   | 0.55         | 25   | 0.80         | 25   |
| 27. Bahrain<br>(Bahrain) | 1973<br>1974 | 4.57<br>4.15 | 27   | 3.16<br>2.73 | 16   | 0.15<br>0.16 | 28   | 1.27<br>1.26 | 23   |
| 28. Israel               | 1974         | 3.25         | 28   | 1.83         | 24   | 0.67         | 23   | 0.75         | 27   |

of countries where alcohol consumption are available, Bahrain is one of the very lowest consuming countries.

It is interesting to note that only Israel ranks lower than Bahrain in total consumption. In addition to the large Jewish population there, there is a sizable Muslim population, and this is the only country on the list (other than Bahrain) where the Muslim population is significant.

The distribution of total consumption ranges from 3.25 liters to 23.43 liters per capita. This wide range is largely a result of the wine distribution which is from 20.80 liters to 0.15 liters. The beer range is from 9.27 liters to 0.22 liters, while the spirits range is the least of all: from 5.68 liters to 0.78 liters. From this, it is apparent that most of the high consuming countries must consume a fairly large amount of wine in order to be above 13 liters.

Table 30 shows the same countries with the percentage of the total consumption accounted for by beer, wine, and distilled spirits. Of the 28 countries listed, 25.0% (or seven) drank predominately wine, 48.4% (thirteen) predominately beer, and 28.6% (eight) predominately spirits. It appears, in looking at the data, that the wine drinking countries are found most often in the high consumption area of the distribution, and the beer drinking countries are in the middle. An analysis of variance which examined variability in total consumption by predominant beverage supported this and was significant at the 0.0002 level.

Table 30

Percentage of Total Consumption of Absolute Alcohol Accounted for by Beer, Wine, and  
Distilled Spirits in 27 Countries and Bahrain

| Country            | Year    | % Spirits | % Wine | % Beer | Predominant Beverage |
|--------------------|---------|-----------|--------|--------|----------------------|
| 1. Portugal        | 1974    | 3.3       | 88.8   | 7.9    | Wine                 |
| 2. France          | 1972    | 19.7      | 66.3   | 14.0   | Wine                 |
| 3. West Germany    | 1974    | 23.3      | 19.9   | 56.8   | Beer                 |
| 4. Belgium         | 1973    | 16.0      | 19.4   | 64.6   | Beer                 |
| 5. Austria         | 1972    | 22.5      | 33.5   | 44.0   | Beer                 |
| 6. Switzerland     | 1971-73 | 20.5      | 44.0   | 35.5   | Wine                 |
| 7. Italy           | 1973    | 9.3       | 84.7   | 6.0    | Wine                 |
| 8. Australia       | 1972-73 | 13.3      | 18.0   | 68.7   | Beer                 |
| 9. Spain           | 1971    | 25.2      | 73.1   | 1.7    | Wine                 |
| 10. New Zealand    | 1972    | 14.6      | 15.0   | 70.4   | Beer                 |
| 11. Hungary        | 1972    | 30.7      | 45.1   | 24.2   | Wine                 |
| 12. Czechoslovakia | 1973    | 30.8      | 19.1   | 50.1   | Beer                 |
| 13. Denmark        | 1973    | 20.3      | 19.2   | 60.5   | Beer                 |
| 14. Canada         | 1974    | 35.6      | 11.2   | 53.2   | Beer                 |
| 15. Netherlands    | 1974    | 34.7      | 22.3   | 43.0   | Beer                 |

Table 30 (cont.)

Percentage of Total Consumption of Absolute Alcohol Accounted for by Beer, Wine, and  
Distilled Spirits in 27 Countries and Bahrain

| Country            | Year | % Spirits | % Wine | % Beer | Predominant Beverage |
|--------------------|------|-----------|--------|--------|----------------------|
| 16. U.S.A.         | 1975 | 41.1      | 12.0   | 46.9   | Beer                 |
| 17. United Kingdom | 1974 | 19.9      | 14.8   | 65.3   | Beer                 |
| 18. Soviet Union   | 1972 | 52.3      | 38.8   | 8.9    | Spirits              |
| 19. Ireland        | 1973 | 30.1      | 5.3    | 64.6   | Beer                 |
| 20. Poland         | 1974 | 67.3      | 15.7   | 17.0   | Spirits              |
| 21. Finland        | 1973 | 51.7      | 11.0   | 37.3   | Spirits              |
| 22. Japan          | 1974 | 24.5      | 45.7   | 29.8   | Wine                 |
| 23. Peru           | 1970 | 78.1      | 3.7    | 18.2   | Spirits              |
| 24. Sweden         | 1973 | 47.5      | 16.2   | 36.3   | Spirits              |
| 25. Norway         | 1974 | 43.0      | 10.2   | 46.8   | Beer                 |
| (Bahrain)          | 1975 | 66.7      | 5.4    | 27.9   |                      |
| 26. Iceland        | 1973 | 72.8      | 11.1   | 16.1   | Spirits              |
| 27. Bahrain        | 1973 | 69.0      | 3.2    | 27.7   | Spirits              |
| (Bahrain)          | 1974 | 65.8      | 3.9    | 30.4   |                      |
| 28. Israel         | 1974 | 56.3      | 20.6   | 23.1   | Spirits              |

Table 31  
Analysis of Variance

| <u>Source</u>                       | <u>DF</u> | <u>Sum of Squares</u> | <u>Mean Square</u> | <u>F Ratio</u> | <u>F Probability</u> |
|-------------------------------------|-----------|-----------------------|--------------------|----------------|----------------------|
| Between predominant beverage groups | 2         | 290.7593              | 145.3796           | 11.825         | 0.0002               |
| Within predominant beverage groups  | 25        | 307.3185              | 12.2927            |                |                      |
| Total                               | 27        | 598.0776              |                    |                |                      |

The overall low consumption in Bahrain clearly fits the pattern of predominantly spirits drinking countries.

Sulkunen (1976) notes that exports of distilled spirits usually exceed domestic consumption by several hundred percent, whereas exports of beer and wine are much less than domestic consumption. Furthermore, countries where the imported alcohol amounts to a substantial proportion of the total consumption usually have low overall consumptions. Bahrain fits this pattern perfectly, as all alcohol consumed is imported, and predominately in the form of distilled spirits.

Algeria is the only major wine producing country that is an exception to this rule. The per capita consumption of wine was 1.5 liters in 1969 (or about 0.18 liters of absolute alcohol in the form of wine), which is extremely low in comparison to other wine producing countries. South Africa, Chile, Yugoslavia, Hungary, Greece, and Bulgaria (only to

mention a few) all produce less wine than Algeria, but their consumption is in the range of 9.3 to 50.0 liters of wine per capita. Surely, the fact that Algeria is a Muslim country is the central factor in the low consumption rate.

## 2. Liver cirrhosis death rates.

Tables 32 and 33 show the male and female adjusted cirrhosis death rates for 26 countries in 1971 and the lower and upper age-adjusted estimates for Bahrain for 1973-1975.\*

(The lower estimate uses the maximum number of actually recorded deaths while the upper estimate adjusts these recorded deaths for the percentage of unrecorded deaths). The age-adjusted male rate is between 19.72 per 100,000 and 11.52 per 100,000 (compared with the unadjusted rate which is between 10.9 per 100,000 and 6.0 per 100,000). The age-adjusted female rate is between 6.41 per 100,000 and 2.34 per 100,000 (compared with the unadjusted rate which is between 3.5 per 100,000 and 0.9 per 100,000). The male rate is in the middle of the distribution while the female rate is in the bottom half of the distribution. Looking, though, at Figures 5 and 6, the countries are bunched very closely in the middle and lower areas of both distributions, so the absolute differences among countries is not represented well by a rank ordering.

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\*Rates were standardized by the direct method to the Swiss population.

Table 32  
Age-Adjusted Male Cirrhosis Death Rates  
1971

| <u>Country</u>                          | <u>Rate per 100,000</u> |
|-----------------------------------------|-------------------------|
| Chile                                   | 71.87                   |
| Portugal                                | 50.64                   |
| France                                  | 48.04                   |
| Italy                                   | 44.73                   |
| Austria                                 | 43.26                   |
| Fed. Rep. Germany                       | 32.09                   |
| Switzerland                             | 24.29                   |
| U.S.A.                                  | 22.52                   |
| Japan                                   | 22.36                   |
| Venezuela                               | 21.92                   |
| Czechoslovakia                          | 21.53                   |
| Bahrain (upper estimate)<br>(1973-1975) | 19.72                   |
| Hungary                                 | 16.66                   |
| Canada                                  | 14.24                   |
| Belgium                                 | 13.09                   |
| Bahrain (lower estimate)<br>(1973-1975) | 11.52                   |
| Sweden                                  | 10.28                   |
| Denmark                                 | 10.03                   |
| Australia                               | 8.82                    |
| Israel                                  | 8.20                    |

Table 32 (cont.)

## Age-Adjusted Male Cirrhosis Death Rates

1971

| <u>Country</u>    | <u>Rate per 100,000</u> |
|-------------------|-------------------------|
| Finland           | 6.19                    |
| New Zealand       | 5.58                    |
| Netherlands       | 5.47                    |
| Norway            | 4.43                    |
| Scotland          | 4.37                    |
| N. Ireland        | 3.50                    |
| England and Wales | 3.05                    |
| Ireland           | 2.90                    |

Table 33  
Age-Adjusted Female Cirrhosis Death Rates  
1971

| <u>Country</u>           | <u>Rate Per 100,000</u> |
|--------------------------|-------------------------|
| Chile                    | 28.56                   |
| Portugal                 | 24.94                   |
| France                   | 20.06                   |
| Italy                    | 15.90                   |
| Fed. Rep. Germany        | 14.41                   |
| Austria                  | 14.26                   |
| U.S.A.                   | 11.65                   |
| Venezuela                | 10.59                   |
| Japan                    | 10.52                   |
| Hungary                  | 9.63                    |
| Czechoslovakia           | 8.84                    |
| Belgium                  | 8.18                    |
| Denmark                  | 8.07                    |
| Canada                   | 7.73                    |
| Switzerland              | 6.86                    |
| Bahrain (upper estimate) | 6.41                    |
| Israel                   | 6.31                    |
| Sweden                   | 5.46                    |
| Australia                | 4.44                    |
| Netherlands              | 3.75                    |

Table 33(cont.)  
Age-Adjusted Female Cirrhosis Death Rates  
1971

| <u>Country</u>           | <u>Rate Per 100,000</u> |
|--------------------------|-------------------------|
| Scotland                 | 3.52                    |
| Finland                  | 3.38                    |
| New Zealand              | 3.12                    |
| Norway                   | 2.89                    |
| N. Ireland               | 2.88                    |
| England and Wales        | 2.66                    |
| Bahrain (lower estimate) | 2.34                    |
| Ireland                  | 2.21                    |

Figure 5

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# AGE-ADJUSTED MALIG. CARCINOMA DEATH RATES 1971

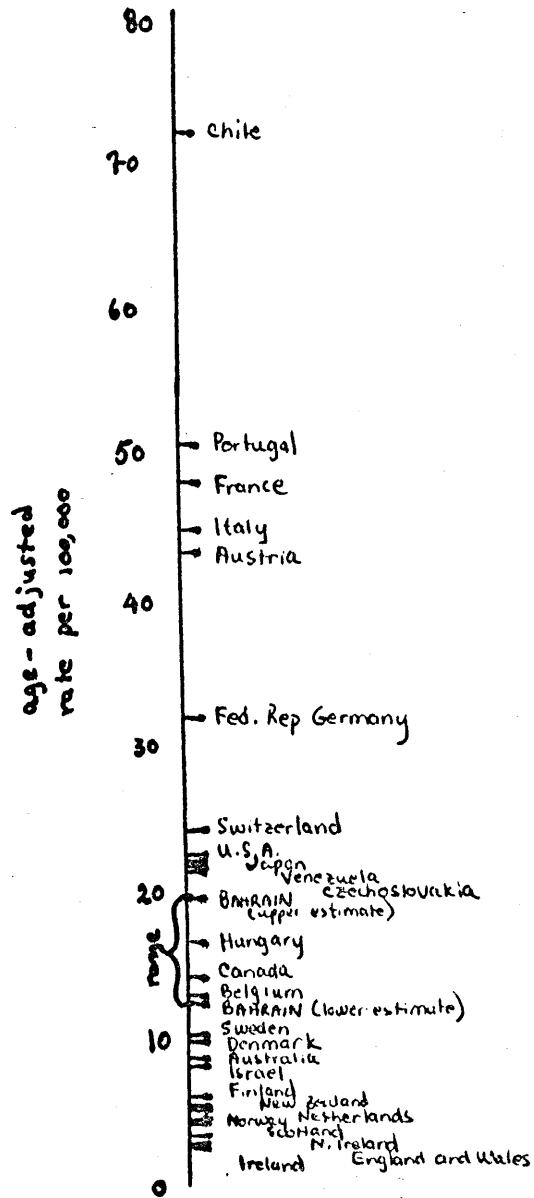
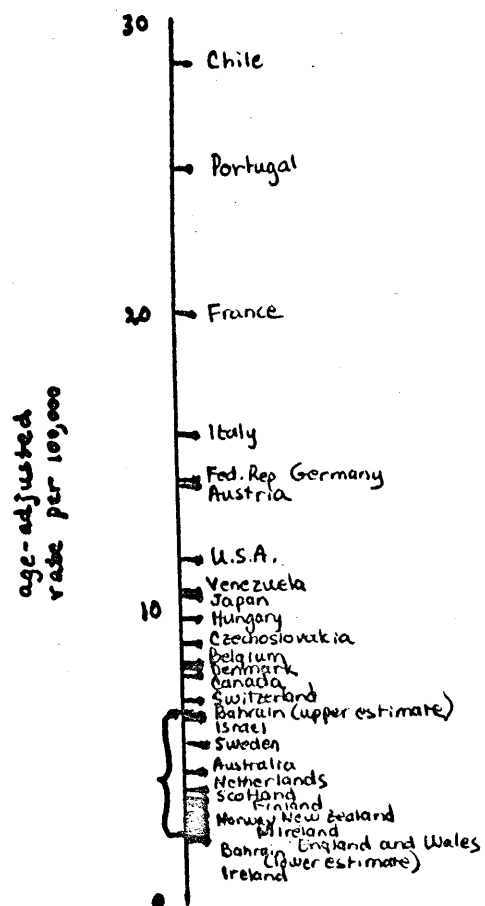


Figure 6

# AGE-ADJUSTED FEMALE CIRRHOSIS DEATH RATES 1971



While Bahrain is in a moderate to low position on these cirrhosis scales, clearly this is not consistent with what we might have expected from the consumption data. It deepens the suspicion that there is a higher rate of non-alcoholic cirrhosis in Bahrain than in the other countries listed.

### 3. Liver Cirrhosis and Consumption

Table 34 shows absolute alcohol consumption, male and female cirrhosis rates, and dominant beverage consumed for 22 countries and Bahrain. The rates are age adjusted by the direct method using the 1971 Swiss population as the standard population.

Multiple regression analyses were performed separately for male and female rates on per capita consumption and dominant beverage (treated as an indicator variable). The results are, as expected, that consumption is a highly significant predictor of cirrhosis. For males,  $F_{1, 18} = 13.01$ ,  $p < 0.0020$ , and for females  $F_{1, 18} = 16.58$ ,  $p < 0.0007$ . The addition of dominant beverage did not significantly add to the predictive power of the model. For males  $F_{2, 18} = 2.46$ ,  $0.25 < p < 0.10$ , and for females  $F_{2, 18} = 2.30$ ,  $0.25 < p < 0.10$ . Thus, it was decided to eliminate dominant beverage from the model and proceed with a simple regression of cirrhosis on consumption.

With this simpler model, male and female data were again analyzed separately. From the plots of male cirrhosis rates versus consumption and female cirrhosis rates versus consumption, it is evident that there is no lack of fit and no linear regression; however, negative predictions for

Table 34

Absolute Alcohol Consumption, Male and Female Cirrhosis Rates, and Dominant Beverage  
Consumed for 22 Countries and Bahrain

| Country        | Total Absolute<br>Alcohol Consumption | Male<br>Cirrhosis* | Female<br>Cirrhosis** | Dominant<br>Beverage |
|----------------|---------------------------------------|--------------------|-----------------------|----------------------|
| Portugal       | 23.43                                 | 50.64              | 24.94                 | Wine                 |
| France         | 22.44                                 | 48.04              | 20.06                 | Wine                 |
| W. Germany     | 14.82                                 | 32.09              | 14.41                 | Beer                 |
| Belgium        | 14.36                                 | 13.09              | 8.18                  | Beer                 |
| Austria        | 14.08                                 | 43.26              | 14.26                 | Beer                 |
| Switzerland    | 13.92                                 | 24.29              | 6.86                  | Wine                 |
| Italy          | 13.56                                 | 44.73              | 15.90                 | Wine                 |
| Australia      | 13.27                                 | 8.82               | 4.44                  | Beer                 |
| New Zealand    | 12.61                                 | 5.58               | 3.12                  | Beer                 |
| Hungary        | 12.36                                 | 16.66              | 9.63                  | Wine                 |
| Czechoslovakia | 11.28                                 | 21.53              | 8.84                  | Beer                 |
| Denmark        | 10.94                                 | 10.03              | 8.07                  | Beer                 |
| Canada         | 10.78                                 | 14.24              | 7.73                  | Beer                 |

Table 34 (cont.)

Absolute Alcohol Consumption, Male and Female Cirrhosis Rates, and Dominant Beverage  
Consumed for 22 Countries and Bahrain

| Country        | Total Absolute<br>Alcohol Consumption | Male<br>Cirrhosis* | Female<br>Cirrhosis** | Dominant<br>Beverage |
|----------------|---------------------------------------|--------------------|-----------------------|----------------------|
| Netherlands    | 10.60                                 | 5.47               | 3.75                  | Beer                 |
| U.S.A.         | 10.48                                 | 22.52              | 11.65                 | Beer                 |
| United Kingdom | 10.16                                 | 5.64               | 3.02                  | Beer                 |
| Ireland        | 8.31                                  | 2.90               | 2.21                  | Beer                 |
| Finland        | 7.64                                  | 6.19               | 3.38                  | Spirits              |
| Japan          | 7.39                                  | 22.36              | 10.52                 | Wine                 |
| Sweden         | 6.97                                  | 10.28              | 5.46                  | Spirits              |
| Norway         | 5.58                                  | 4.43               | 2.89                  | Beer                 |
| Bahrain        | 4.57                                  | 19.72-11.52        | 6.41-2.34             | Spirits              |
| Israel         | 3.25                                  | 8.20               | 6.31                  | Spirits              |

\*All except Bahrain, consumption from Keller and Gurioli (1976); liters of absolute alcohol per capita of the 15+ population, latest year available

\*\* All except Bahrain, cirrhosis from Masse et al. (1977); rates per 100,000 for 1971, standardized by direct method to Swiss population 1971.

cirrhosis rates were obtained for some of the lowest consumption countries. It was decided, therefore, to fit the model  $\log Y = A + BX$  where  $Y$  is cirrhosis death rate and  $X$  per capita consumption.

Table 35 shows the ANOVA for male cirrhosis and Table 35 for female cirrhosis. The regression equation for males is:

$$\log Y = 1.7440325 + 0.12203512 X$$

where  $Y$  = male cirrhosis rate, and  $X$  = absolute alcohol consumption. The regression equation for females is:

$$\log Y = 0.86602892 + 0.09432430 X$$

where  $Y$  = female cirrhosis rate, and  $X$  = absolute alcohol consumption. The proportion of total variability explained for males is 0.435 and for females 0.431. Another model involving logit transformation ( $\log \frac{Y}{1-Y} = A + Bx$ ) was fitted, but was rejected because the explanatory power of the equations decreased for both males and females.

Table 35

ANOVA: Male Cirrhosis on Per Capita Consumption

|                 | <u>DF</u> | <u>SS</u> | <u>MS</u> | <u>F</u> | <u>P</u> |
|-----------------|-----------|-----------|-----------|----------|----------|
| Model           | 1         | 7.0286    | 7.0286    | 15.40    | 0.0003   |
| Error           | 20        | 9.1253    | 0.4563    |          |          |
| Corrected Total | 21        | 16.1539   |           |          |          |

Table 36

ANOVA: Female Cirrhosis on Per Capita Consumption

|                 | <u>DF</u> | <u>SS</u> | <u>MS</u> | <u>F</u> | <u>P</u> |
|-----------------|-----------|-----------|-----------|----------|----------|
| Model           | 1         | 4.1990    | 4.1990    | 15.17    | 0.0009   |
| Error           | 20        | 5.5365    | 0.2768    |          |          |
| Corrected Total | 21        | 9.7355    |           |          |          |

Figures 7 and 8 shows the plots. of cirrhosis versus consumption for both the observed and predicted values. Also included are the 95% lower confidence limits and the 95% upper confidence limits.

The predicted value for the Bahraini male cirrhosis rate utilizing the data on 22 countries and excluding Bahrain is 5.65 per 100,000, and the predicted value for the Bahraini female cirrhosis rate is 3.66 per 100,000. The female predicted value is within the actual upper and lower estimates we made earlier, whereas the male predicted value does not fall within our earlier estimates. The 95% confidence limits around the female predicted value are 2.38 to 5.63, and the observed range is from 2.34 to 6.41. The 95% confidence limits around the male predicted value are 3.25 to 9.83, and the observed range from 11.52 to 19.72. While the female predicted and observed intervals are almost identical, there is no overlap at all between the male predicted and observed intervals.

The fact that the male predicted interval is lower than the observed interval supports the theory that a large portion

Male Cirrhosis Rates and Absolute Alcohol Consumption:  
Observed and Predicted Values for 22 Countries & BAHRAIN

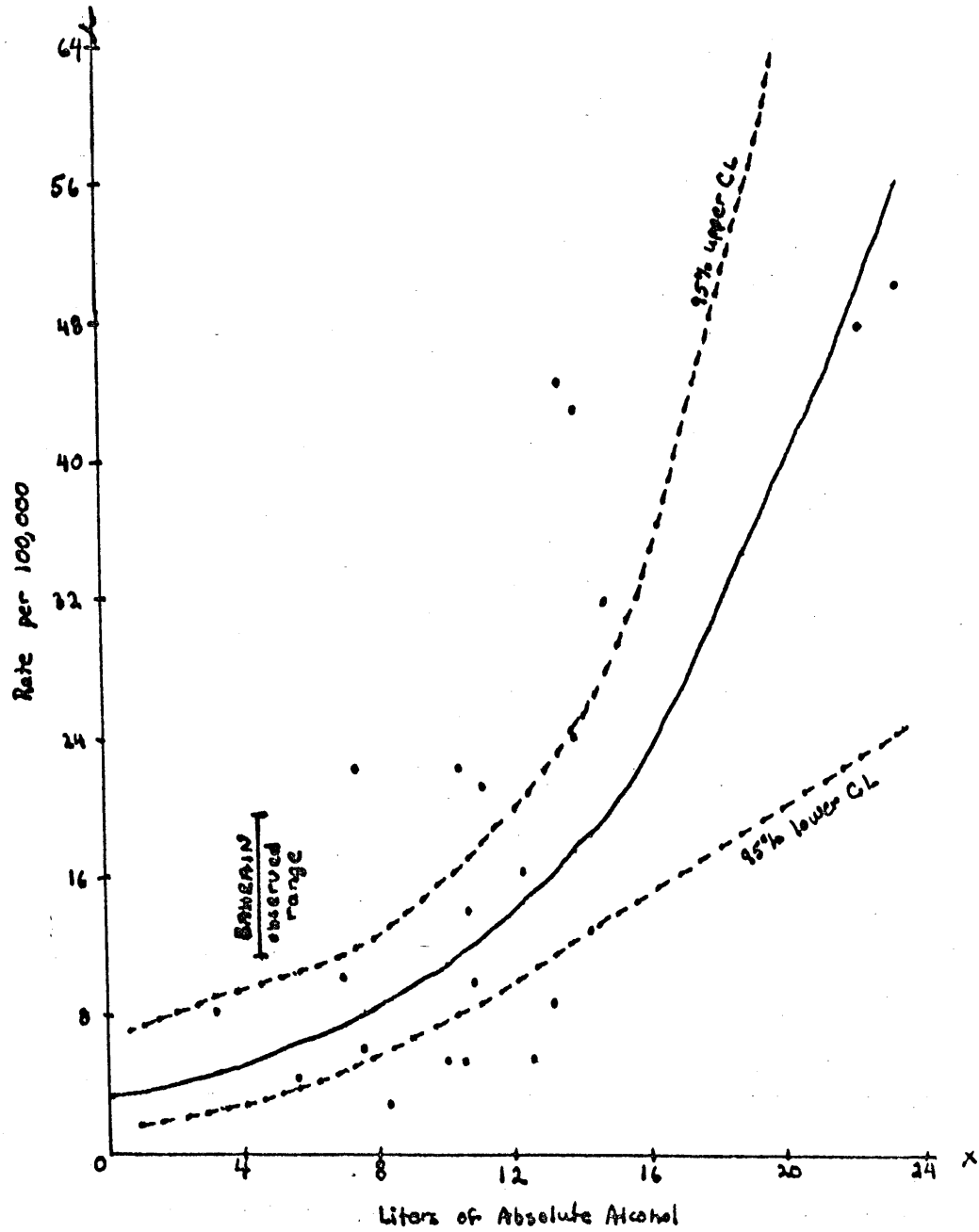
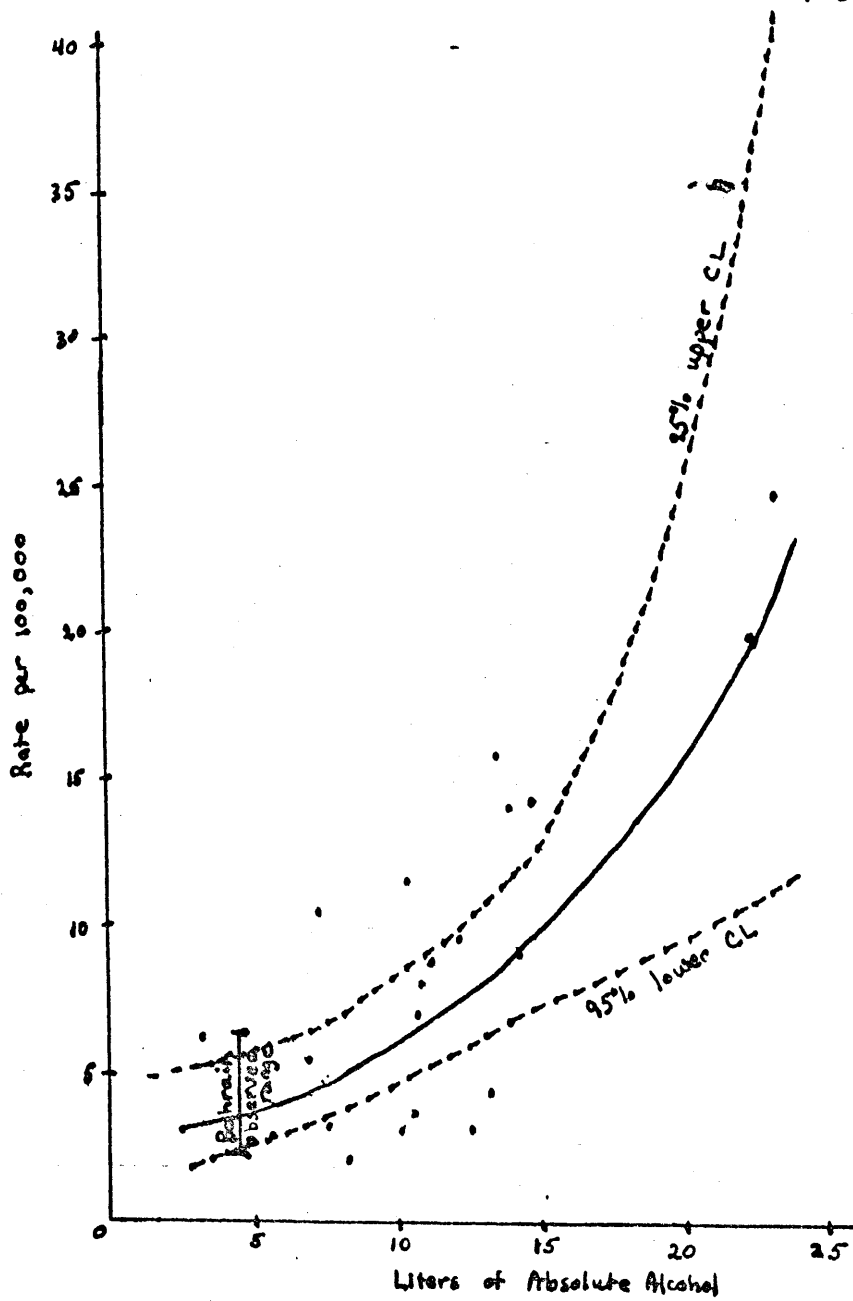


Figure 8

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Female Cirrhosis Rates and Absolute Alcohol Consumption;  
Observed and Predicted Values for 22 Countries & Bahrain



of the Bahraini male cirrhosis deaths are non-alcoholic (because the predicted interval is based on alcohol consumption). The high amount of overlap for the observed and predicted female range could mean that female cirrhosis is primarily alcohol-related. A more likely interpretation, however, is that since Bahraini females rarely drink alcohol, the female rate also reflects a high proportion of non-alcoholic cirrhosis.

Overall, the findings indicate that consumption in Bahrain is low but increasing. While there is good evidence that there are increasing numbers of visitors entering and exiting Bahrain each year and that they might account for part of the increased consumption, there is also evidence from the psychiatric, non-traffic, and traffic data that at least part of the increased consumption is accounted for by the residents themselves, as alcohol-related problems appear to be increasing. Inpatient psychiatric admissions for alcoholism showed an overall increase, as did non-traffic arrests for drunkenness and possession of alcohol and alcohol-related accidents.

Liver cirrhosis mortality turned out to be a much less valid predictor in this setting than was anticipated. The overall three-year cirrhosis trend was downward, which was at odds with the other data sets, and even more importantly, the predicted interval for male cirrhosis was much less than the obtained interval and did not coincide at all. Although there was considerable overlap between the female predicted

and obtained intervals, since female drinking is rare in Bahrain (in the other data sets this was borne out by the fact that males had consistently higher problem rates than females), it was almost certain that most, if not all, of the female cirrhosis is non-alcoholic.

The significance of these findings will be discussed in the next chapter.

## CHAPTER SIX

### SUMMARY AND CONCLUSIONS

The comparative results show clearly that Bahrain is a very low consumption country (only Israel, out of 28 countries, ranks below Bahrain for 1973). The results support the main thesis, that societal controls (through Islam and the resulting pressures to conform to the norm of abstinence) are the primary reason for low consumption. Clearly the norm is the Koranic standard of complete abstinence from alcohol, and with such a strong and well defined norm, it is not surprising to find that the vast majority of the population conforms, with deviations becoming fewer and fewer the further the distance from the norm.

However, the longitudinal data indicate that the norm is changing and that the effect of the relatively easy access, both legally and economically, to alcohol in Bahrain is not entirely masked by the strength of the societal controls. In other words, the increases in per capita alcohol consumption, the rate of inpatient psychiatric first admissions and readmissions for alcoholism, the rate of alcohol crimes, and the rate of traffic accidents and traffic offenses all point to the fact that even though alcohol consumption is at a low level now, both consumption and alcohol problems are increasing.

Table 37 summarizes the trends of the major variables.

First, the increase in the number of persons visiting Bahrain (from 129,707 in 1970 to 238,013 in 1975) is evidence that at least some of the increase in consumption is probably due to the increasing number of temporary visitors in Bahrain. On the other hand, the increases in 1) psychiatric inpatient admission rates (from 5.1 per 100,000 in 1971 to 15.5 per 100,000 in 1975), 2) psychiatric readmission rates (from 3.2 per 100,000 in 1971 to 11.5 per 100,000 in 1975), 3) alcohol crime rates (from 1.9 per 1,000 in 1970 to 4.4 per 1,000 in 1975), 4) alcohol traffic accident rates (from 4.0 per 1000 licensed drivers in 1974 to 5.2 per 1000 licensed drivers in 1975), and 5) alcohol traffic offense rates (from 2.5 per 1000 licensed drivers in 1974 to 3.2 in 1975) indicate that Bahraini residents themselves also account for a portion of the consumption increase. While Islam is a strong force now in keeping alcohol abuse at a minimum, the patterns of increasing problems indicate that the force of Islam is weakening (at least with regard to drinking alcohol) and that other controls will be necessary to keep alcohol problems in check.

The only two indicators which did not support the trend of increasing consumption and problems are the cirrhosis rates and the psychiatric outpatient admission data. From 1973 to 1975, the rate per 100,000 of cirrhosis deaths declined from 10.4 to 4.3, and was statistically a weak decreasing linear trend. The rate per 100,000 of alcohol outpatient

Table 37

## Summary of Findings

|                                                                                          | <u>1970</u> | <u>1971</u> | <u>1972</u> | <u>1973</u> | <u>1974</u> | <u>1975</u> | <u>% Change<br/>1971-1975</u> |
|------------------------------------------------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------------------------|
| Liters of absolute alcohol per 15+ population                                            |             | 3.7         | 3.3         | 4.6         | 4.1         | 5.0         | +35.1                         |
| Non-Bahraini arrivals (absolute numbers)                                                 | 129,707     | 160,812     | 154,776     | 168,552     | 196,496     | 238,013     | +83.5                         |
| Rate per 100,000 of cirrhosis death (male and female)                                    |             |             |             | 10.3        | 7.8         | 4.3         | -58.7                         |
| Rate per 100,000 of alcoholism inpatient psychiatric first admissions (male and female)  |             | 5.1         | 2.7         | 11.1        | 10.3        | 15.5        | +203.9                        |
| Rate per 100,000 of alcoholism outpatient psychiatric first admissions (male and female) |             | 2.3         | 1.3         | 3.1         | 7.0         | 2.0         | -13.0                         |
| Rate per 100,000 of alcohol crimes (male and female)                                     |             | 3.2         | 2.2         | 6.8         | 7.8         | 11.5        | +259.4                        |

Table 37 (cont.)

## Summary of Findings

|                                                                               | <u>1970</u> | <u>1971</u> | <u>1972</u> | <u>1973</u> | <u>1974</u> | <u>1975</u> | % Change<br><u>1971-1975</u> |
|-------------------------------------------------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|------------------------------|
| Rate per 1000 licensed<br>drivers of alcohol-<br>related traffic<br>accidents |             |             |             |             | 4.0         | 5.2         |                              |
| Rate per 1000 licensed<br>drivers of alcohol<br>related traffic<br>offenses   |             |             |             |             | 2.5         | 3.2         |                              |

psychiatric admissions declined slightly from 2.3 to 2.0 from 1971 to 1975, but there was no significant trend evident. As stated in Chapter 4, the outpatient data are not as reliable as the inpatient data. Furthermore, there seems to be a trend of decreasing utilization of outpatient services (see Table 26, Chapter 5) which is reflected in the alcohol outpatient admissions.

The incongruity of the cirrhosis rates is more disappointing since for so long cirrhosis has been acceptable as an indicator of alcohol problems. Obviously this is not necessarily the case when dealing with non-Westernized countries. The best that we can do is state that liver cirrhosis mortality rates are overestimators of alcohol problems in non-Westernized countries. The extent of this overestimate needs further study, as does the whole area of the epidemiology of non-alcoholic cirrhosis. Despite the non-support of the cirrhosis data and the outpatient data, the other data sets support the distribution of consumption thesis by showing that as Bahraini consumption increases, so do alcohol problems. There is not a precise year to year correspondence in every case between consumption and problems; however, the overall trends show that except for the cirrhosis rates and psychiatric outpatient data, there has been a substantial increase from the first recorded year to 1975.

The alcohol problems data which were collected (i.e., psychiatric admissions, alcohol crime data, alcohol traffic data, and liver cirrhosis mortality) served two purposes:

- 1) they offered support for the distribution of consumption

theory (except for the two indicators mentioned above) and 2) they helped to illuminate the source of the increased consumption as being due to both residents and non-residents. The distribution of consumption thesis states that the higher the average consumption, the greater the proportion of drinkers at high risk for alcohol problems. This was borne out by our results.

Although there are few legal restrictions actually imposed on the purchase, consumption, and distribution of alcoholic beverages in Bahrain, and alcohol is in a legal sense "freely" available, we still do not find there the phenomenon of neighborhood bars or a bar on every corner. In this sense, alcohol is not as accessible (although legally available) as in most Western societies. But accessibility is a two-sided issue in part determined by a society's attitude to alcohol as reflected by the level of consumption, and in part determining the level of consumption and influencing society's attitude to alcohol.

It is not surprising that in a low consumption country like Bahrain there is low accessibility to alcohol -- a reflection of the fact that there is little drinking going on. But this very same low accessibility helps to give alcohol a low profile and also contributes somewhat to low consumption. Thus, while societal controls and attitudes do keep alcohol consumption low in Bahrain, low accessibility (which is partly a function of societal attitudes) also contributes.

While the genetic and anxiety theories as explanations for heavy drinking appear on the surface to have been

rejected in favor of the distribution of consumption thesis, let it be said that these explanations are not necessarily excluded because we accepted the distribution of consumption theory as the dominant theory. What has been said is that the distribution of consumption theory is the most powerful in explaining the variations in alcohol consumption and alcohol problems at the societal level. Therefore, in terms of the public health model, by controlling the amount of exposure to the agent (alcohol), the resulting problems can also be controlled in the most efficient manner.

The hereditary theory of alcoholism clearly focuses on the host while the anxiety theory and dependency conflict theory focus on the host and the environment. The relevance of host and environment characteristics to an understanding of alcohol problems is not to be denied; what we are suggesting is that as an explanation for cross-cultural alcohol problems, the distribution of consumption theory which starts with the agent alcohol offers the most efficient single explanation. This is not to say that by adding to the model (by including host and environment theories) the power could not be improved. It is to say that first we should control for agent (alcohol) exposure before proceeding to individual and environmental explanations.

For example, if one wanted to look at the different drinking patterns in urban versus rural populations, it would be necessary to look first at availability of alcohol, because the difference in drinking might be more influenced

by lack of alcohol in the rural areas and easy access to alcohol in urban areas rather than other variables we might attribute to urban or rural life such as stressfulness. This is a major problem in the cross-cultural studies described in Chapter 2 which were based on HRAF data. The problem is that availability of alcohol was not controlled for; therefore, societies with access to commercial distilled whiskeys are compared to societies which only had the technology to make their own weak beer or wine. Also, no adjustments were made for the variations in amount and type of fruits available for fermentation. Surely, if very little fruit is available for fermentation, then very little alcohol will be produced and very little drunkenness will result. In terms of a multiple regression model, availability would be the first factor to be forced into the equation, after which personal and environmental factors could be taken into account.

Also, each of the different theories has a different domain of explanation. For example, the dependency conflict theory has to do with patterns of child rearing, thus, within a certain area with one alcohol availability policy where there would presumably be uniform exposure, the genetic or anxiety theories might be useful in distinguishing high and low risk drinkers. While these theories illuminate different levels of a model for alcohol problems, at this point we seriously doubt that they offer opportunities for large scale prevention programs. For example, on a national level, child rearing practices are very difficult to change! The

distribution of consumption theory is much more amenable to effective and workable prevention programs, and this is another reason for concentrating on it. A similar analogy can be drawn between passive prevention strategies (such as airbags for auto crash protection) and strategies which require some action or decision on the part of the individual (such as seatbelts). Passive strategies are generally much more effective.

In general, agent oriented prevention strategies are more effective and efficient than host or environment oriented strategies. The famous handle of the Broad Street pump is an excellent example of this. Although alcohol oriented prevention strategies have received little attention in comparison to strategies aimed at individuals and their environments, it is our contention that these beverage oriented strategies deserve more attention. Beverage oriented strategies include such policies as taxation, limited hours of sale, reduced alcoholic content of beverages, and others as outlined in Chapter 2.

It seems especially important to concentrate on agent oriented prevention policies in countries such as Bahrain where alcohol problems are still very low. To pursue the individual educational approach in Bahrain would probably do more harm than good, causing more of an interest in alcohol than existed before, and causing widespread experimentation among some groups.

If one were to continue to research the subject of alcohol problems in the Middle East, the next step in terms of study would be a prevalence study. Since the norm of abstinence has already been identified, the focus of the study would be to what extent individuals deviate from this norm, and what characteristics are associated with the range of drinking behavior found. In addition to demographic variables, the characteristics to be studied would be degree of religiosity, amount of exposure to drinking cultures (e.g., travel abroad, schooling abroad), and perceived pressures for and against drinking (e.g., from family, from friends). The purpose of this type of study is not to differentiate between alcoholics and non-alcoholics, but rather to look at the continuum of drinking in a non-ecological way and in a way that the findings can be related back to the distribution of consumption thesis.

Another area of further research has to do with the distribution of consumption model. While it has been suggested that this model is another case of Allport's J-curve of conforming behavior, the whole idea of a drinking norm and conformity to this norm needs to be tested. The importance of this theory of conformity is that it shows the relationship between individual and group behavior, both of which are components of aggregate consumption. This link between individual and group behavior is what is missing in the theory as it stands presently, and further research on the

relationship and the entire range of individual drinking, how it changes over time, and individual alcohol problems is needed to show the link.

Except for the suggestion of the theory of conforming behavior as the underlying mechanism in the distribution of consumption thesis and the fact that econometric studies have shown many consumer behaviors to conform to a log normal distribution, there is little that would distinguish the alcohol consumption distribution approximated by the log normal curve from a curve made up of a mixture of distributions with different means and variances. Because of the way the distributions can overlap, this model would also approximate a log normal distribution. The difference between this type of curve and the log normal is that in the former, the means could change, thereby changing the overall mean but not affecting the other sub-distribution at all. Further research is needed to clarify whether the alcohol consumption distribution truly approximates log normality, or whether another pattern is represented. The implications are enormous, as the mixture of two normals model implies that problem drinking and non-problem drinking are two very different phenomena. Research such as that by Cartwright et al. (1976) which looked at individual drinking in its entire range and individual changes over time is needed to help resolve this question.

With regard to Muslim alcohol problems, the present study can only be called a pilot project. Surely the

variation of alcohol problems within the Muslim world itself merits attention. Bahrain could prove to be a very high consumption country within this context, and the variation in legal controls could be a factor here. Controlling for religion, it would be interesting to compare a country such as Bahrain where there are few controls to a country like Kuwait where alcohol is prohibited. Indeed, the whole subject of low consumption countries has received little attention, and yet there is a great deal of potential for improving prevention strategies by looking at factors associated with low consumption patterns.

The whole idea of developing countries and the process of Westernization is another important area of research. Must Western drinking habits go hand in hand with Westernization? Can countries such as Middle East countries with long-standing sanctions against alcohol preserve this tradition but also modernize and mingle with Western cultures? The present report seems to suggest that Bahrain has so far been successful in this endeavor, but the increases that we found in consumption and alcohol problems indicate a gradual erosion of traditional norms. Optimistically, in Bahrain there are two sets of alcohol controls (legal and economic) which can still be "tightened" in support of the traditional norms. With a unified approach to the control of alcohol problems where legal, economic and societal controls all support each other, a powerful and effective set of pressures can be brought to bear on the problem.

In conclusion, this dissertation has taken a new approach in relating societal controls to the distribution of consumption thesis which has usually been related only to legal and economic controls. The findings support the theory that societal controls are indeed a very important and not to be neglected factor relating to alcohol consumption. Furthermore, new data from the State of Bahrain have been presented which support the distribution of consumption theory. There are almost no alcohol data at all from Middle East or predominately Muslim countries; therefore, in a very cautious way the Bahraini level of alcohol consumption can be taken as a crude indicator for this part of the world. It is our hope that this situation will soon change and that more alcohol data will become available from the Middle East, opening the way for learning more about alcohol prevention from low consumption countries and from cultures other than our own.

## APPENDICES

APPENDIX A  
Table  
Bahraini Population by 5-Year Age and Sex Groups 1971-1975

| Age   | 1971*   |        |         | 1972**  |         |         | 1973**  |         |         | 1974**  |         |         | 1975*** |         |         |
|-------|---------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|       | Male    | Female | Total   | Male    | Female  | Total   | Male    | Female  | Total   | Male    | Female  | Total   | Male    | Female  | Total   |
| 0-4   | 15,693  | 15,578 | 31,271  | 17,295  | 17,016  | 34,311  | 18,897  | 18,454  | 37,351  | 20,498  | 19,893  | 40,391  | 22,100  | 21,331  | 43,431  |
| 5-9   | 17,272  | 17,138 | 34,410  | 17,861  | 17,604  | 35,466  | 18,450  | 18,071  | 36,521  | 19,040  | 18,537  | 37,577  | 19,639  | 19,003  | 38,632  |
| 10-14 | 15,187  | 14,772 | 29,959  | 15,480  | 15,145  | 30,625  | 15,774  | 15,518  | 31,292  | 16,068  | 15,890  | 31,958  | 16,361  | 16,263  | 32,624  |
| 15-19 | 11,606  | 10,583 | 22,189  | 12,304  | 11,447  | 23,751  | 13,003  | 12,510  | 25,513  | 13,702  | 13,174  | 26,876  | 14,400  | 14,038  | 28,430  |
| 20-24 | 9,590   | 6,887  | 16,477  | 9,916   | 7,672   | 17,588  | 10,241  | 8,458   | 18,699  | 10,566  | 9,243   | 19,809  | 10,892  | 10,028  | 20,920  |
| 25-29 | 9,095   | 6,819  | 15,914  | 9,019   | 6,728   | 15,747  | 8,943   | 6,636   | 15,579  | 8,867   | 6,545   | 15,412  | 8,791   | 6,454   | 15,245  |
| 30-34 | 7,823   | 5,484  | 13,307  | 7,919   | 5,698   | 13,617  | 8,015   | 5,911   | 13,926  | 8,111   | 6,124   | 14,235  | 8,207   | 6,338   | 14,545  |
| 35-39 | 7,504   | 5,680  | 13,184  | 7,389   | 5,534   | 12,923  | 7,274   | 5,388   | 12,662  | 7,160   | 5,241   | 12,401  | 7,045   | 5,095   | 12,140  |
| 40-44 | 5,730   | 4,193  | 9,923   | 5,991   | 4,467   | 10,458  | 6,252   | 4,741   | 10,993  | 6,513   | 5,016   | 11,529  | 6,774   | 5,290   | 12,064  |
| 45-49 | 4,979   | 3,964  | 8,943   | 5,018   | 3,571   | 8,589   | 5,073   | 3,678   | 8,755   | 5,096   | 3,784   | 8,880   | 5,135   | 3,891   | 9,026   |
| 50-54 | 4,303   | 2,985  | 7,288   | 4,339   | 3,037   | 7,376   | 4,376   | 3,081   | 7,465   | 4,412   | 3,142   | 7,554   | 4,448   | 3,194   | 7,642   |
| 55-59 | 2,191   | 1,497  | 3,688   | 2,588   | 1,809   | 4,397   | 2,986   | 2,121   | 5,107   | 3,383   | 2,433   | 5,816   | 3,780   | 2,745   | 6,525   |
| 60-64 | 2,300   | 1,785  | 4,085   | 2,345   | 1,787   | 4,132   | 2,390   | 1,789   | 4,179   | 2,436   | 1,790   | 4,226   | 2,481   | 1,792   | 4,273   |
| 65-69 | 1,081   | 841    | 1,922   | 1,142   | 907     | 2,049   | 1,203   | 972     | 2,175   | 1,263   | 1,038   | 2,301   | 1,324   | 1,104   | 2,428   |
| 70-74 | 1,028   | 974    | 2,002   | 976     | 898     | 1,874   | 925     | 822     | 1,747   | 873     | 747     | 1,620   | 821     | 671     | 1,492   |
| 75+   | 232     | 1,084  | 2,016   | 990     | 1,109   | 2,099   | 1,047   | 1,135   | 2,182   | 1,105   | 1,161   | 2,266   | 1,163   | 1,186   | 2,349   |
| TOTAL | 116,314 | 99,764 | 216,078 | 120,573 | 104,429 | 225,002 | 225,003 | 109,093 | 233,926 | 129,092 | 113,758 | 242,850 | 133,351 | 118,423 | 251,774 |

\* Population census

\*\* Linear interpolation from 1971 to 1975

\*\*\* Projection of population (decreasing fertility, decreasing mortality, constant migration). From Table 4, untitled document from Bahraini Bureau of Statistics.

## APPENDIX B

## Test Results for Yearly Trends

Data from Table 21 (cirrhosis rates)

| X <sup>2</sup> test for linearity |                       |              | T test for B <sub>1</sub> < 0 |            |                                      |
|-----------------------------------|-----------------------|--------------|-------------------------------|------------|--------------------------------------|
|                                   | X <sup>2</sup> 1 d.f. | significance | conclusion                    | (T) 1 d.f. | Significance Conclusion              |
| Males I                           | 0.61                  | p > 0.10     | linear                        | 2.577      | p > 0.10 B <sub>1</sub> not < 0      |
| II                                | 1.07                  | p > 0.10     | linear                        | 1.872      | p > 0.10 B <sub>1</sub> not < 0      |
| Females I                         | 1.54                  | p > 0.10     | linear                        | 0.577      | p > 0.10 B <sub>1</sub> not < 0      |
| II                                | 5.81                  | p < 0.025    | non-linear                    | N.A.       |                                      |
| Total I                           | 0.19                  | p > 0.10     | linear                        | 5.195      | .05 < p < .10 B <sub>1</sub> not < 0 |
| II                                | 0.04                  | p > 0.10     | linear                        | 11.731     | B <sub>1</sub> < 0                   |

Data from Table 24 (inpatient first admissions)

| X <sup>2</sup> test for linearity |                       |              | T test for B > 0 |            |                             |
|-----------------------------------|-----------------------|--------------|------------------|------------|-----------------------------|
|                                   | X <sup>2</sup> 3 d.f. | significance | conclusion       | (T) 3 d.f. | Significance Conclusion     |
| Males                             | 6.19                  | p > 0.10     | linear           | 3.184      | p < .025 B <sub>1</sub> > 0 |
| Females                           | 3.60                  | p > 0.10     | linear           | 0.655      | p > .25 B not > 0           |
| Total                             | 5.76                  | p > 0.10     | linear           | 3.780      | p < .025 B <sub>1</sub> > 0 |

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