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PART I. INTRODUCTION AND OVERVIEW: SOCIAL SYSTEMS INDICATORS OF
ALCOHOLISM AND ALCOHOL ABUSE IN ALASKA, 1975

A. INTRODUCTION

Alcoholism and alcohol abuse are terms that appear elusive to define and terms that produce a good deal of confusion in both social and business discourse. These terms have come to function as general catch-all categories for the adverse personal and social events that are typically linked with excessive alcohol consumption.

In view of the many alternative ways for describing alcoholism and alcohol abuse, the differing opinions about the topic, and the available research and information regarding descriptions and analysis of alcohol problems, there is a need to specify the problems that are alcohol-related rather than continue to use such broad, ambiguous terms as "alcoholism" and "alcohol abuse". For certain levels of discourse, such terms are wholly appropriate, but for the purposes of social problem solving, a more refined specification of problems is required.

B. STATEMENT OF PROBLEM

For these reasons, the intent of this Volume is to focus attention on the known, measurable indicators of the adverse impact of alcohol on Alaska's social system in general, and on selected subsystems--health and social services, criminal justice system, traffic safety system, the economy,* and the alcohol consumers. The identification of the

*Economic analysis provided in Volume I, The Economic Impact of Alcoholism and Alcohol Abuse in Alaska, 1975.

character and the magnitude of the different configurations of alcohol problems for the Alaskan population also serves to provide a context for the conventionally known alcohol-related events--deaths, accidents, arrests, etc. Within the identified contexts, these events can comprise a system of social indicators that describe and measure the events generated by people with problematic behavior.

Such social system indicators can thus provide a profile of alcohol-related problems for the population as a whole or for various subpopulation groups. This would allow for any changes in the nature or extent of problems to be monitored over time; or, it could also be used to compare similar changes in subpopulation groups. In addition, specific programs designed and implemented to reduce or prevent a designated problem--a set of social indicators, may also be evaluated over a period of time, for a whole population or for various subpopulation groups. Thus the appropriateness or effectiveness of institutional responses to social problems could also become a matter of serious consideration within this framework.

It is important that knowledge of these indicators not be ignored in the consideration of various government policies for the general welfare of the population. These indicators may be viewed separately, for the purposes stated above, but in combination, they represent an interrelated set of factors which simultaneously provide not only a better understanding of alcoholism and alcohol abuse, but also provide multiple comprehensive directions for the creation or development of meaningful responses.

The beginnings of such a system of indicators that profile the state's alcohol-related problems are outlined in this volume, given the availability of data. The general categories for the investigation of measurable indicators considered in this Volume include: the prevalence of problem drinkers; alcohol consumption rates and drinking patterns; alcohol-related motor vehicle accidents; alcohol-related mortality; alcohol-related crime; and, other various physical and mental health factors.

C. SUMMARIES OF EACH OF THE MAJOR PARTS
OF THIS VOLUME AND MAJOR FINDINGS

PART II. The Prevalence of Alcoholism and Alcohol Abuse in Alaska:
A Description and Comparison of Procedures and Estimates

There are several accepted formulae for the estimation of the number of alcoholics and/or problem drinkers in any given population group. Each is based on different population characteristics and therefore each may have certain limitations when applied to various population groups.

For the first time in Alaska, each of these procedures is described and applied to the Alaskan population to yield an estimate of prevalence. In addition, the advantages and disadvantages of each procedure, for application to Alaska, are discussed and the various estimates are compared. In the past, only the Jellinek method has been calculated for Alaska. In addition to this more popular method, the Marden, Ledermann, Keller, and various mortality procedures are discussed and developed.

Also, estimation procedures based on the size of the population and identifiable alcohol problems are also explored.

No individual procedure was found to be totally acceptable for singular application to Alaska. However, three procedures--the Jellinek, Marden, and Ledermann methods each produced similar estimates. In view of the fact that each of these methods is based on independent variables, and other evidence presented in this Part, an estimate of 30,000 problem drinkers was accepted as reliable in Alaska for 1975.

Part III. Major Theories Regarding the Etiology of Alcoholism

There is little understanding about the causes underlying the development of alcohol addiction. Because the addiction syndrome of alcoholism takes so long to become established in a person, its developmental antecedents are particularly obscure and difficult to isolate. From a biological point of view, causality is difficult to establish simply because of the sheer number of symptoms. No one theory suffices for all the known manifestations and/or syndromes of alcoholism, alcohol abuse, alcohol dependence, alcohol addiction, etc. Similarly, it has proven difficult to identify behavioral factors which may contribute to the etiology of alcoholism in a person. Researchers have been unable to develop a suitable animal behavioral model for studying alcohol dependence. This combination of difficulties prevents any real certainty about the etiology of alcoholism. The crucial determinants in the developmental process are still unknown, and the very

nature of the addictive process remains largely a matter of conjecture.

A number of theories that have been advanced to attempt to explain alcohol dependency in the individual are summarized in this part. These theories can be generally categorized into three classes--physiological, psychological, and sociological. The rather brief overview of these major theoretical formulations is presented only for general reference. Hopefully, the discussion at least establishes the full range of positions regarding the etiology of alcoholism and provides a general background for the consideration of the material in the rest of this Volume.

Part IV. Consumption of Beverage Alcohol: Trends, Comparisons and Implications for Alaska

The relationship between the consumption of beverage alcohol and alcoholism and alcohol abuse has long been the focus of scientific researchers, particularly epidemiologists whose major concern is the mass aspects of diseases and behavioral disorders. The mass aspects of alcoholism have recently become the subject of increasing research activity.

This Part covers three main areas: a comparison of Alaska's alcohol consumption characteristics with other states, the nation, and international patterns of consumption; an analysis of Alaskan consumption patterns in relation to the prevalence of alcoholism; and, a discussion of various factors which are associated with increased rates of

consumption in certain population groups, with a particular emphasis on government control measures.

The per capita consumption of absolute alcohol in Alaska was found to be very high. It is high by international standards, and even higher by national standards. Alaska is also distinguished by its definitive preference for distilled spirits over beer and wine. Most alarming, however, and independent of the level of annual consumption, or beverage of preference, is the dramatic rate of increase in annual consumption. Although annual consumption of beverage alcohol is increasing throughout the world, Alaska's annual consumption increased 80% in the period from 1958 to 1975, compared to a national increase of 46%.

Epidemiological research indicates that an increasing rate of annual consumption corresponds to an increasing prevalence of alcoholism--a fact which makes Alaska's extremely rapid rate of increasing annual consumption most disturbing. Increases in annual consumption in Alaska correspond to similar increases in the rates of deaths due to alcoholism and cirrhosis of the liver.

In populations with a relatively high rate of annual consumption, alcoholism is more likely the result of social practices, whereas in low consumption populations, it is more likely the result of individual psychopathology or sociopathology. Given the relationship between patterns of excessive consumption and moderate consumption, attention must be given to factors that affect rates of consumption in a population in order to reduce the prevalence of alcoholism.

consumption of alcohol in Alaska is higher than in any other state to the nation as a whole. Alaska has more than twice as many retail outlets per 1000 persons as the competitive average of the other states. Also, Alaska has fewer hours of prohibited sales than other license states. In addition, the relative price of alcohol has actually decreased by 40% in the period from 1970 to 1975. In Alaska, the consumer relative price for beverage alcohol rose by .3% during that period, while the consumer relative price for all other commodities increased by 41.2%. One reason for this disparity may be the stability of taxes on alcohol. Since state and federal taxes account for 50% to 75% of the price of alcohol, taxes which do not increase with inflation prevent the price of alcohol from behaving like other commodities in the free market. The state excise tax on alcohol has not changed since 1961.

Part V. Mortality and Consumption of Alcohol

The effects of alcohol consumption on the health of Alaskans is considered in this section which concentrates on the relationship between excess mortality and excessive consumption of beverage alcohol. For general reference the connections between alcohol abuse and specific causes of death are presented. The section on Alaska's excess mortality covers overall mortality rates within regions of the state. In each category, high risk populations are identified by age, race and sex, whenever the data allow.

General research findings show that heavy drinkers have a mortality rate that is two to four times higher than those who are not. Abuse of alcohol has been linked to cirrhosis of liver, cardiovascular disease and cancer of the upper respiratory and digestive tracts. There is also a very strong link between alcohol abuse and violent deaths--accidents, suicide, homicide and alcoholism. Alaska was found to have higher mortality rates for specific causes that have been linked to alcohol abuse. The main high risk populations for these categories are the young and middle age ranges, and the state's Native population.

Part VI. Alcohol-Related Crime and the Criminal Justice System

Part VI investigates a variety of indicators concerning the relationship between alcohol consumption and crime, and the effects of alcohol-related crime on the criminal justice system. The analysis reflects the nature and extent of the impact of alcohol-related crime on the criminal justice system, rather than the impact of the adverse consequences of alcohol-related criminal acts on victims or society in general.

The evidence presented shows that, in spite of the attention given by the media and the general public to the relationship between alcohol consumption and violent crimes, the greatest impact on the criminal justice system of alcohol-related crimes derives primarily from the commission of misdemeanor type offenses. The high degree of general public

concern about violent crimes and alcohol is in part justified; a large percentage of violent crimes (homicide, rape, and aggravated assault) are alcohol-related. But arrests for all violent crimes, and robbery, account for only four percent of total arrests for all offenses in the state. In terms of number of arrests, alcohol-related misdemeanors have a much greater effect on the criminal justice system.

During the period from 1973 to 1975, arrests for alcohol-related misdemeanor offenses accounted for 39% of the total number of adult and juvenile arrests for all offenses. If juveniles and adults are separated for analysis, then 47% of all adult arrests are for alcohol-related offenses. This group of adults, primarily males (85%) account for 87% of all alcohol-related arrests.

The relative impact of the arrests of alcohol-related offenses on the criminal justice system appears to be greater in rural-city areas. In these areas, arrests for alcohol-related offenses account for a greater percentage of all arrests (47%), compared to urban areas (39%), and rural areas (34%).

The impact of arrests for alcohol-related offenses on the prosecution, judicial, and correction components of the criminal justice system is also considered, but only in brief overview due to the nature of the available data.

Part VII. Alcohol and Traffic Safety

The purpose of this part is to describe the relationship between alcohol and motor vehicle crashes. As background, the relation between

alcohol consumption, blood alcohol concentration, and degree of physical and mental impairment is reviewed. In addition, an overview of different types of crashes in Alaska is presented and compared with national findings. Then, the actual extent of alcohol-involvement in different types of crashes in Alaska is presented. Other sections describe the characteristics of drunk drivers, enforcement activities throughout the state, and the outcomes of judicial processing.

One of the most important indicators for traffic safety concerns is the motor vehicle fatality rate. In Alaska, the fatality rate has been increasing annually, while that for the whole nation has been steadily decreasing. Statewide records show that about 46% of motor vehicle fatalities involved alcohol impaired drivers in 1975. In Anchorage, 18 of 20 (90%) of the traffic fatalities were alcohol-related.

Available research shows that drivers are impaired physically and mentally, and the probability of a crash increases, when a person's blood alcohol concentration (BAC) reaches .05%. The statutory limit for presumption of operating a motor vehicle while intoxicated is .10% BAC in Alaska. The average BAC level for a person arrested for OMVI in Alaska in 1975 was .18%. Of those arrested, 92% had a BAC over .10%.

Of those convicted for OMVI during that same year, two out of ten had at least one prior OMVI conviction, 18 of 20 had at least one prior major traffic violation (reckless driving, negligent driving, leaving the scene of an accident), and 13 of 20 had one or more traffic accidents. This type of driving record is, of course, not typical of the average

licensed driver. These distinguishing characteristics, along with the person's drinking history, make drunk drivers an important target group not only for highway safety concerns but for early intervention for treatment for problem drinker drivers. Arrests for drunk driving accounted for 22% of all adult arrests in the state in 1975.

Given the large proportion of young drivers in Alaska, the increasing number of drivers, the increasing recreational nighttime driving, and increasing alcohol consumption, alcohol involvement in motor vehicle accidents will also probably increase.

Part VIII. Other Social Systems Indicators of Alcoholism and Alcohol Abuse

There are a number of other indicators of the impact of excessive drinking of beverage alcohol that need to be mentioned--that provide yet other perspectives on the social impact of alcoholism and alcohol abuse. They comprise the general category of reported morbidity, including both disease and trauma, which can be directly or indirectly linked to alcohol abuse. This Part brings together the available data on the incidence of various adverse events as reported in the utilization of inpatient and outpatient health services, and other social services.

Such information, even if complete and exhaustive of all relevant units of service, would not be truly indicative of the nature and magnitude of the impact of alcoholism and alcohol abuse on the health and well-being of the general population. Neither is such information truly representative of the impact on the health and social services delivery system, since only a small portion of the presenting problems necessary for admissions (diagnosis) for alcoholism or alcohol abuse ever become

documented in a health care setting. Although there are great limitations on the adequacy of these data, the presentation does provide some idea of the known, minimum impact of alcohol misuse on the health and social service delivery systems.

The findings provided are numerous, and only loosely related. In spite of the data limitations, the information does demonstrate that a large, and increasing, portion of both inpatient and outpatient admissions, and social service encounters may be attributed to abusive alcohol consumption.

Part IX Summary Discussion and Conclusion

This last Part provides an overview of the major findings contained in each of the Parts. Also, in this Part, the Marden procedure, for the estimation of the prevalence of problem drinkers in a population, was used to provide a more refined specification of target groups within the total group of drinkers with problems. These findings indicate that:

The distribution of drinkers with problems in Alaska shows that males who are employed, particularly craftsmen and kindred workers, primarily in the age group 20-29 years old, constitute the largest categorical target group.

It is clear that public inebriates do not constitute the greatest proportion of the population of problem drinkers; but unemployed male drinkers with problems are much younger than might have been expected.

Males in the military, aged 20-29, constitute a disproportionate share of the population of drinkers with problems, relative to their total numbers.

Females, unemployed and employed, aged 30-49, constitute a clearly identifiable target group.

The thrust of this Volume is on the specification of alcohol problems in order to develop a clear identification of the character of the problems to be attacked.

Out of the many findings in this Volume, two particular notions emerge that deserve special attention. First, the population of the state of Alaska qualifies, without question, as a high consuming population, with regard to beverage alcohol. Further, and most important, there appears to be a very high degree of correspondence between the increasing average annual consumption of beverage alcohol in the state, and the nature and extent of individual public health and social problems associated with the current use of beverage alcohol. This notion directs attention to factors that control levels of population consumption.

The second notion of particular import, though not so certain as the first, is the appearance of discrepancies in the characteristics of the sub-populations receiving treatment services for alcoholism and alcohol abuse. This last notion raises the question of the effective and efficient distribution of treatment resources.

There exist many different views about the various factors involved in each and all of the various configurations of specific alcohol problems. There also exist a variety of organizations--official, voluntary and professional, that all play important roles in efforts to reduce and prevent alcohol problems. Because of this diversity, it is extremely important that there be general agreement on the part of those involved as to the

goals and objectives to be achieved and a mutual understanding of the approaches and methods to be used. If such agreement and understanding are not achieved, then the actions taken by the various groups may be discordant and ineffectual, or even counterproductive.

PART II. THE PREVALENCE OF ALCOHOLISM AND ALCOHOL ABUSE IN
ALASKA: A DESCRIPTION AND COMPARISON OF PROCEDURES
AND ESTIMATES

A. INTRODUCTION

In any society, the most elemental indicator of the impact of alcohol is the size of the alcoholic sub-population. Epidemiologically,¹ this is referred to as the prevalence² of alcoholism in that society, by which is meant the number of alcoholics or problem drinkers within the general population. The size of this group governs the interpretation of all other alcohol-related indicators. Related mortalities, attendant social costs, alcoholism program client loads, etc.--all depend for their value and meaning on the known size and characteristics of this sub-population.

The prevalence of alcoholism or problem drinking in a society is not only important as an indicator, however. It is also taken as a focus and point of departure in virtually every undertaking which has as its goal either the treatment or prevention of alcoholism or the amelioration of its effects on society. Whether the purpose is to establish the client needs of regional and local alcoholism programs, formulate relevant legislation, or identify the human sub-stratum of social and economic costs, the size and characteristics of the alcoholic sub-population become extremely important.

From almost any perspective, in fact--whether as indicator, planning focus, or other--the estimation of alcoholism prevalence is important because it affords the single, most tangible clue to the pervasiveness

¹The epidemiology of alcoholism is that science which deals with the incidence, distribution, and control of alcoholism as a disease.

²As opposed to the incidence of alcoholism, which refers to its rate of occurrence in a society.

of alcohol-related problems in a society: the number (and kind) of people having them.

For this reason, the present report has as its purpose the estimation of alcoholism prevalence in Alaska. Because a variety of approaches to prevalence estimation exist, the most important and commonly employed methods are presented and discussed. The key indicators on which they depend are identified, their particular limitations are noted, and each of the methods is applied to Alaska. The multiple estimates of prevalence so generated are then compared and evaluated in terms of their suitability to Alaska's population base. Following examination of the factors most known to affect alcoholism prevalence (anywhere), an attempt is made to resolve the various estimates and arrive at a best possible estimate of alcoholism prevalence in the state.

Problems In Estimating Prevalence

There are significant problems involved in estimating the prevalence of alcoholism or problem drinking in a society. While most of them are taken up on an individual basis during discussion of the estimation procedures themselves, some are worth mentioning at the outset because of their categorical nature.

The most important problem, affecting all methods of prevalence estimation, is one of definition: specifically, the nature of the sub-population to be measured. Some methods address "alcoholics" as the relevant sub-population. Others address "problem drinkers". Yet others address drinkers who consume at the same rate as known alcoholics. This disparity in the methods' definition of a target group for measurement is important for two reasons: first, different data need to be collected, depending on which conceptualizations of the target group are used; and

second, use of different estimation procedures (and thus different conceptualizations of the target group) makes comparison of prevalence estimates difficult, if not impossible.

In the present report, two conceptualizations of the target population have been employed: "alcoholics" and "problem drinkers". Generally, the number of problem drinkers has been taken as approximately twice the number of alcoholics in a population, and note has been made where departures from this approach have been necessary. Other forms of nomenclature found in the methods described ("excessive drinkers", "alcohol abusers", "alcoholic-level consumers") have been regarded as synonymous with "problem drinkers".

Several other categorical difficulties surrounding the estimation of prevalence are also worth mentioning at the outset, since they have important ramifications for alcoholism program planning as well as for simple understanding of the respective prevalence estimates obtained.

Chief among these is the fact that many alcohol-related patterns may not, in themselves, be indicative of pathological behavior; they might, in fact, describe perfectly harmless behavior. For example, the consumption of beverage alcohol at a given level no matter how high, is not in itself sufficient proof of alcoholic or pathological behavior. Particularly with regard to prevalence estimation procedures focusing on societal consumption rates, it is important that this be kept in mind.

Another problem relevant to prevalence estimation is the difficulty in estimating the size of a population's "hidden drinker" sector.

Unless an alcoholic or problem drinker dies, develops an illness which is treated, has an automobile accident, registers in an alcohol treatment program, or otherwise "impacts" the social system, it is impossible to identify him or her as an alcoholic or problem drinker. There is no easy way to get around this problem, but it is worth keeping in mind that the "hidden drinker" portion of any alcoholic sub-population is, for the most part, statistically inaccessible. The corollary of this, of course, is that any prevalence estimate will constitute an under-enumeration by virtue of its insensitivity to "hidden" drinkers.

A final problem has as much to do with Alaska itself as with the difficulties in prevalence estimation. This is simply that most prevalence estimation procedures apply only (or best) to large populations, and rapidly lose sensitivity when applied to small (under a few hundred thousand) or local population bases.³ Given Alaska's relatively small population (approximately 404,600 in 1975),⁴ this becomes an important consideration.

Methods Of Estimating Prevalence

Granted the foregoing problems and caveats, it remains to be said that the prevalence estimation procedures discussed and employed in this report are of the kind termed "indirect" methods. Unlike "direct" methods (e.g., a direct head count of alcoholics, either on a sample or comprehensive basis), indirect methods are a means of determining prevalence through the use of documentary statistics known to vary with the rate of

³ Parker G. Marden, A Procedure For Estimating The Potential Clientele Of Alcoholism Service Programs. Prepared for the Division of Special Treatment and Rehabilitation Programs, National Institute on Alcohol Abuse and Alcoholism, 1974. Note 2, page 4.

⁴ From Alaska Department of Labor.

alcoholism or problem drinking in a population.⁵

The purpose and advantage of such methods lie in the fact that they are easier and cheaper to employ than direct methods of prevalence estimation. Also, given the relative abundance of epidemiological data for alcoholism, the use of indirect methods permits an enviable latitude approaching the problem of estimating alcoholism prevalence.⁶

In the ensuing portions of the report, several such indirect methods of prevalence estimation are discussed and employed to estimate Alaska's alcoholic or problem drinker population. Table II-1, below, synthesizes these estimation procedures, showing the primary indicator(s) monitored by each and the particular target population measured:

TABLE II-1

PREVALENCE ESTIMATION PROCEDURES (INCLUDING PRIMARY INDICATORS AND PARTICULAR TARGET POPULATION)

Method	Primary Indicator	Prevalence Conceptualization
Jellinek	Deaths due to liver cirrhosis	"alcoholics"
Marden	Demographic data and established risk factors	"drinkers with problems"
Ledermann	Mean annual per capita consumption level	"alcoholic"-level consumers
Other Mortality Methods	Various deaths attributable to alcoholism, cirrhosis, and suicide	"alcoholics"
"Other" Methods	Various	various

⁵Robert E. Popham, "Indirect Methods Of Alcoholism Prevalence Estimation", p. 294. In Alcohol and Alcoholism (Popham, ed.).

⁶ Ibid.

B. PREVALENCE METHODS AND ESTIMATES

A variety of prevalence estimation procedures have been employed to obtain estimates of alcoholism prevalence in Alaska. In this section of the report, the various methods used are presented and discussed. Background essential for understanding the methods and primary data necessary for their application are synopsized, and the mechanics of each method outlined. Additionally, the major limitations of each method are noted, and each is employed to obtain an estimate of the number of alcoholics or problem drinkers in the state.

1. JELLINEK METHOD

Background⁷

The prevalence estimation procedure formulated by E.M. Jellinek is probably the best known and most widely applied method for enumerating the number of alcoholics in a given population. Based on projections from official liver cirrhosis mortality statistics, the method dates back to 1942 when the research which ultimately spawned the method was first reported. The estimation formula itself was first described in 1951, with the first full account appearing in 1956.

Description Of The Method

The Jellinek Alcoholism Estimation Formula determines the number of "alcoholics" in a given population. Based on the official mortality rate from cirrhosis of the liver, it is expressed as:

$$A = \frac{PD}{K} \times R$$

⁷From Popham, Ibid., pp. 294-306.

where:

A = total estimated number of alcoholics living in a given area during a given year

B = total number of deaths (for males, for females) during a given year in a given area due to cirrhosis of the liver (reported officially for the area of jurisdiction)

P = percentage of liver cirrhosis deaths attributable to alcoholism (a constant: 62.8% for males, 21.6% for females)

K = percentage of all alcoholics with complications who die of liver cirrhosis (a presumed constant: 0.694%)

R = ratio of all alcoholics to the number of alcoholics with complications (a constant: 5.3)

Thus, to determine the number of living alcoholics in a given area during a given time, only the official number of cirrhosis deaths for males and females must be determined.

Application To Alaska

During 1975, there were a total of 49 deaths in Alaska due to cirrhosis of the liver.⁸ Since 25 of these deaths are known to have occurred among males, and 24 among females, the respective prevalence within each group may be estimated via the Jellinek formula.

For males, the number of alcoholics in 1975 may be expressed as:

$$A = \frac{PD}{K} \times R$$

where:

A = estimated number of male alcoholics in Alaska during 1975

D = 25 deaths among males due to liver cirrhosis

⁸Bureau of Vital Statistics, Alaska State Department of Health and Social Services.

$$P = 0.628 \text{ (constant)}$$

$$K = 0.00694 \text{ (constant)}$$

$$R = 5.3 \text{ (constant).}$$

Thus, the number of male alcoholics can be determined as:

$$A = \frac{(0.628) (25)}{0.00694} \times 5.3$$
$$= 11,990 \text{ male alcoholics.}$$

Similarly, the number of female alcoholics in Alaska during 1975 may be expressed by the Jellinek formula (substituting the relevant values of 24 and 0.216 for D and P, respectively) as follows:

$$A = \frac{(0.216) (24)}{0.00694} \times 5.3$$
$$= 3,959 \text{ female alcoholics.}$$

Thus, the total number of alcoholics in Alaska during 1975 may be estimated at approximately 15,949--of whom approximately 11,990 were males and some 3,959 were females.⁹

It is interesting to note that an earlier Alaska prevalence study¹⁰ utilizing the Jellinek method estimated the total number of alcoholics in the state during 1971-72 to be approximately 15,610 persons. Comparison of this estimate with our 1975 estimate of 15,949 alcoholics would seem to indicate that the state has gained only some 339 alcoholics since 1971-72. This is probably not true, however, as cirrhosis deaths very rarely occur in younger persons (alcoholism being a progressive disease), and it is younger persons who presumably are most responsible for the gains since

⁹Estimates of prevalence obtained via the different methods are compared are displayed in Table II-4, in Section C.

¹⁰Allocation of Adult Alcoholics in Alaska by Geographic, Sex and Racial Indices. Prepared by Alaska Center for Research, Planning and Evaluation for the Alaska State Office of Alcoholism, July, 1973.

1971-72 in population. Much more likely is the probability that current liver cirrhosis mortality statistics do not yet register or reflect the growth in overall population in Alaska since 1971-72, nor therefore any accompanying increase in the number of alcoholics and problem drinkers. (Population size and annual fluctuations in cirrhosis mortality rates have long been recognized as important factors affecting the validity of prevalence estimates based on the Jellinek equation. See section immediately following for discussion of these and other limitations of the method.)

If cirrhosis statistics have not been able to reflect a significant change since 1971-72 in the overall size of the alcoholic sub-population, however, they do strongly indicate a dramatic increase in the number of female alcoholics in Alaska. Specifically, application of the Jellinek formula to cirrhosis data for 1971-72 produced an estimate of approximately 2,642 female alcoholics in the state at that time,¹¹ while our present estimate indicates that there were approximately 3,959 female alcoholics in Alaska during 1975--an increase of some 50%. (Male alcoholics would seem to have decreased during the same period by approximately 7.5%, but change of such small scale is not considered significant.)

Limitations Of The Method

An entire body of literature exists describing the various limitations and controversies of the Jellinek method--e.g., that official mortality statistics underreport the true incidence of liver cirrhosis, that transient causes such as epidemic hepatitis can distort the validity of liver cirrhosis as an index, that the method is not valid for various societies which show a high incidence of parasitic liver disease mortality, etc.

¹¹ Ibid.

No attempt is made here to comprehensively treat the matter of these limitations. The intent, rather, is to point out those specific limitations and considerations which either address the overall validity of the method or point towards problems in applying the method to Alaska.

One such limitation of the Jellinek method is that liver cirrhosis mortality rates have been known to fluctuate randomly and considerably from one year to the next.¹² If so, estimates based on liver cirrhosis mortality rates from preceding years could seriously underestimate the number of alcoholics actually alive in a population at a given time. Jellinek himself has noted that such variation is "especially marked" in populations of 300,000 or less.¹³ This factor is of considerable importance in attempting to estimate prevalence in Alaska, where the annual number of liver cirrhosis deaths has fluctuated extensively in recent years. For example, a high cirrhosis mortality rate several years ago (e.g., in the 1973 Alaska study), when compared with current rates, would indicate little growth in the estimated number of alcoholics in the state. Had a lower mortality rate from a more recent year been taken for the same comparison, however, a dramatic increase in prevalence would have been indicated. By the same process, had an earlier annual mortality rate been taken which was higher than current rates, comparison would indicate not an increase in prevalence, but a decrease. The method's susceptibility to such annual fluctuations, therefore, stands as a critical limitation of its validity for Alaska.

Other relevant limitations of the Jellinek method have to do with the values of constants P, K, and R. With regard to P (percentage of liver cirrhosis deaths attributable to alcoholism), it has been shown¹⁴ that the percentage not only varies from one country to

¹²Popham, loc. cit., p. 296.

¹³Ibid.

¹⁴Ibid., p. 297.

another, but specifically that it varies according to temporal changes and (particularly) regional differences in the prevalence of alcoholism within the same country. As a consequence, the formula may underestimate prevalence when the cirrhosis death rate exceeds that for the year to which P applies, and overestimate it when the rate is lower.¹⁵

Given Alaska's rapid growth in recent years, as well as its degree of regional difference from the rest of the nation, the degree of error in estimation due to this could be significant.

Concerning the constant K (percentage of all alcoholics with complications who die of liver cirrhosis), theorists have warned that it is probably not representative of the death rate from liver cirrhosis among living alcoholics. They also caution, that because Jellinek's estimated value for K tends to run high, it causes an underenumeration of the number of estimated alcoholics in a population.¹⁶

In a like manner, the value assigned by Jellinek to constant R (ratio of all alcoholics to the number of alcoholics with complications) is said¹⁷ to further underestimate prevalence because it is derived from clinical samples, and the proportion of alcoholics with complications tends to run higher in clinical samples.

Overall, however, perhaps the most important limitation of the Jellinek method is that it, in effect, "homogenizes" a population.¹⁸ This occurs because the method (and the estimate it arrives at) does not reflect the fact that persons from different backgrounds may have different probabilities of becoming alcoholics or alcohol abusers. For

¹⁵ Ibid.

¹⁶ Ibid.

¹⁷ Ibid.

¹⁸ Marden, loc. cit. p. 5.

a state as variegated in its racial and cultural composition as Alaska, such an "homogenization" would give an overall estimation of the number of alcoholics in the state, but little indication of any significant cluster within a particular subpopulation. (The Jellinek-based prevalence study done in Alaska in 1973, mentioned earlier, did attempt to stratify the alcoholic subpopulation by age, race, sex, and geographic location, but must be regarded as highly unreliable due to the known statistical limitations of the method for small subpopulations.)

In sum, it should be said that the Jellinek method of prevalence estimation shows a high correlation with estimates generated by other prevalence methods, and is generally agreed to be sufficiently accurate for purposes of education and program development.¹⁹ The fact remains, however, that its strength is in producing an estimate of the total number of alcoholics in an area. If, on the other hand, concern is more with the differences in prevalence--both through time or across regions--the Jellinek method evidences a number of significant shortcomings with respect to its application to Alaska.

2. MARDEN METHOD

Background²⁰

The prevalence estimation procedure developed by Parker G. Marden in 1974 was an outgrowth of two related purposes. The first was to develop a method which would estimate not only the size, but the composition as well, of the potential clientele for alcoholism service programs. The second was to develop a prevalence estimation procedure which would recognize and reflect the fact that problems of alcohol abuse vary in degree and kind among various sub-populations.

¹⁹Popham, p. 299.

²⁰From Marden, op. cit.

In both these respects, the Marden procedure can be seen as a reaction to earlier prevalence estimation procedures (e.g., the Jellinek method) which produced estimates only of the overall size of the alcoholic sub-population, and which thus had proven unreflective of local and sub-population conditions. The Marden method remains, to date, the only prevalence estimation procedure which provides a stratification of the estimated abuser sub-population.

Description Of The Method

The Marden method estimates the number of "drinkers with problems" (age 20+) in an overall population. To achieve this, it relies on U.S. Census statistics pertaining to age, sex, and occupation, as well as on established alcoholism risk factors for each of a specified set of sub-populations. Knowing the number of persons in a particular sub-population, and the established percentage of individuals in that sub-population who are likely to be problem drinkers, allows easy calculation of the number of problem drinkers in each sub-population, and, therefore, in the overall population.

The method involves the use of three matrices. The first, Matrix A (Figure II-1), is simply a categorization of the population being inspected according to age, sex, and occupational status. Based on the most recent U.S. Census statistics (or on any other more recent survey of the relevant population), the cells of the matrix are used to record the number of individuals within the overall population who fall into each of the cell-categories so represented.

The second matrix, Matrix B (Figure II-2), contains the sub-populations risk factors for each of the cells in Matrix A, as established

through a national sample survey conducted in 1972 by Cahalan and Room.²¹

The third matrix for the method, Matrix C (Figure II-3) is simply a combination of the first two matrices. That is, if the number of persons in each of the subpopulation cells in Matrix A is multiplied by the corresponding cell risk factor from Matrix B, and the product entered into the appropriate cell of Matrix C, the result will be a stratification (by age, sex, and occupation) of the total problem drinker subpopulation. In this way, both a total number of problem drinkers may be obtained, as well as the number of such persons within the various specified subpopulations.

Application To Alaska

Application of the Marden method to Alaska's 1975 population proved easy, once a series of adjustments were performed to reflect population increases (and redistribution) in the state since the 1970 U.S. Census. It has been hoped that the method could be used to stratify the state's population along four dimensions--age, sex, occupational status, and race--but the unavailability of relevant risk factors for Alaska's ethnic subpopulations and the unsuitability of occupational employment data classified by race precluded isolation and identification of problem drinkers among ethnic subpopulations. Such problem drinkers are included in the various subpopulation estimates arrived at (by age, sex, and occupation), although probably underenumerated. Should risk factors appropriate to Alaska's ethnic and racial composition be determined and pertinent employment data become available, the Marden method could be

21

Sub-population risk factors were established by determining, on a sample basis, the relative percentages of individuals in each cell category who manifested at least seven (out of a total of 11) specific problems commonly associated with drinking. Such persons were designated as "drinkers with problems." The problems were: frequent intoxication, binge drinking, symptomatic drinking, psychological dependence, problems with spouse or relatives, problems with friends or neighbors, job problems, problems with the law (or police, or accidents), health problems, financial problems, and belligerence. (From Marden, op. cit., p. 8.)

employed to further stratify the overall population and permit identification of problem drinkers among racial categories as well.

For ease of computation, the civilian and military sectors of the statewide population were held separate, and the number of problem drinkers in each calculated independently. Figure II-4 shows the state's 1975 (adjusted) civilian population, allocated among the various subpopulation cells of the Marden "A" matrix. Figure II-5 shows the relevant subpopulational risk factors of Matrix "B". Figure II-6 shows the number of estimated problem drinkers within the civilian sector of Alaska's populace, as apportioned among the subpopulational cells of the Marden "C" matrix.

In similar fashion, Figures II-7, II-8, and II-9 show the allocation of the 1975 Alaska military population (adjusted), the relevant risk factors (averaged) from Matrix B and the apportioning of the estimated military problem drinkers among the various subpopulational categories.

The results of these determinations are shown in Table II-2, below.

TABLE II-2

ESTIMATES OF PROBLEM DRINKERS AGE 20+ AMONG ALASKA'S 1975
POPULATION (ADJUSTED), AS DETERMINED BY THE MARDEN
PREVALENCE ESTIMATION PROCEDURE

	Male	Female	Total
Civilian Population			
Employed	15,631	*	
Unemployed	4,532	*	
Subtotal	20,163	5,799	25,962
Military Population	5,721	26	5,747
TOTAL	25,884	5,825	31,709

*females not separated in the instrument

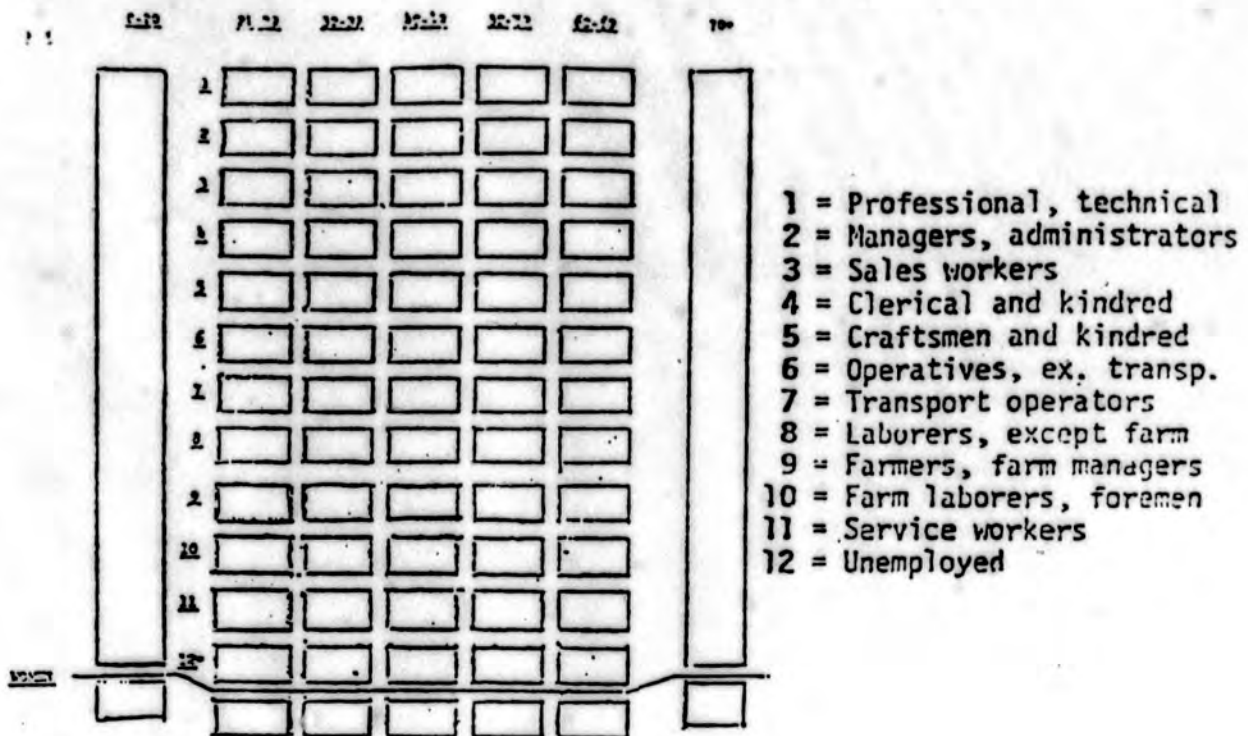


FIGURE II-1 Marden Matrix A

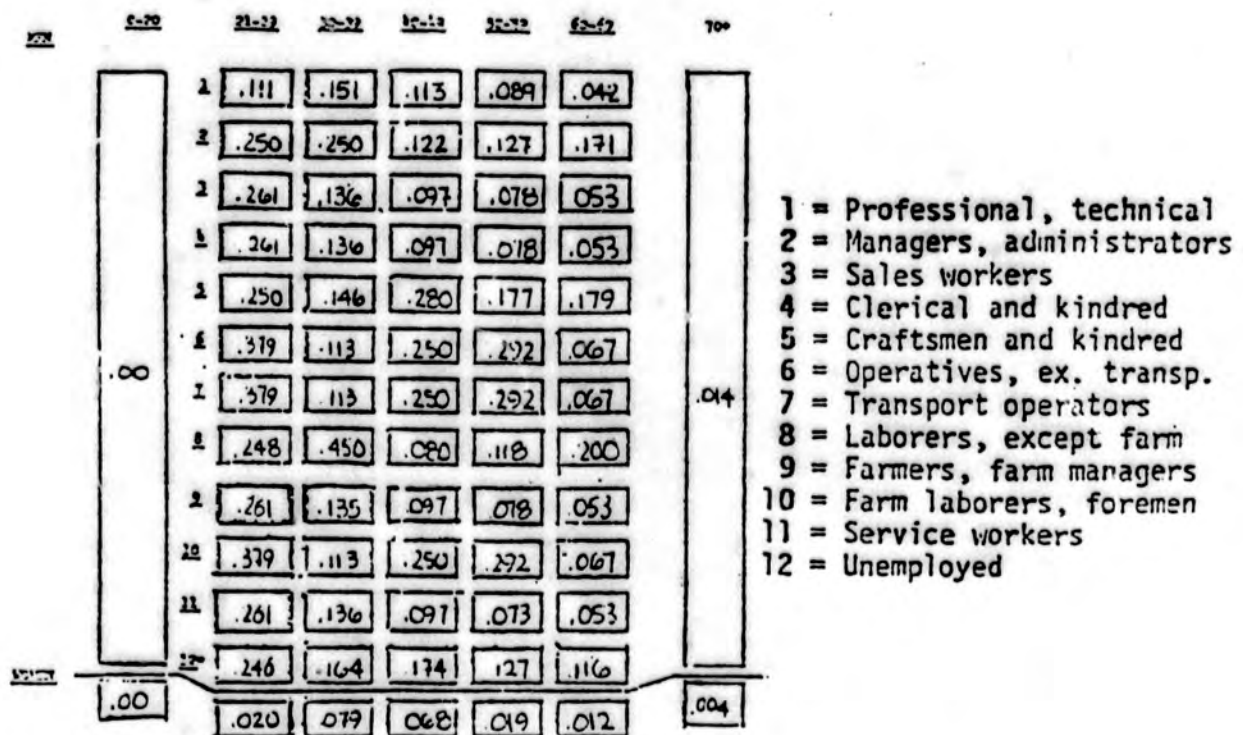


FIGURE II-2 Marden Matrix B

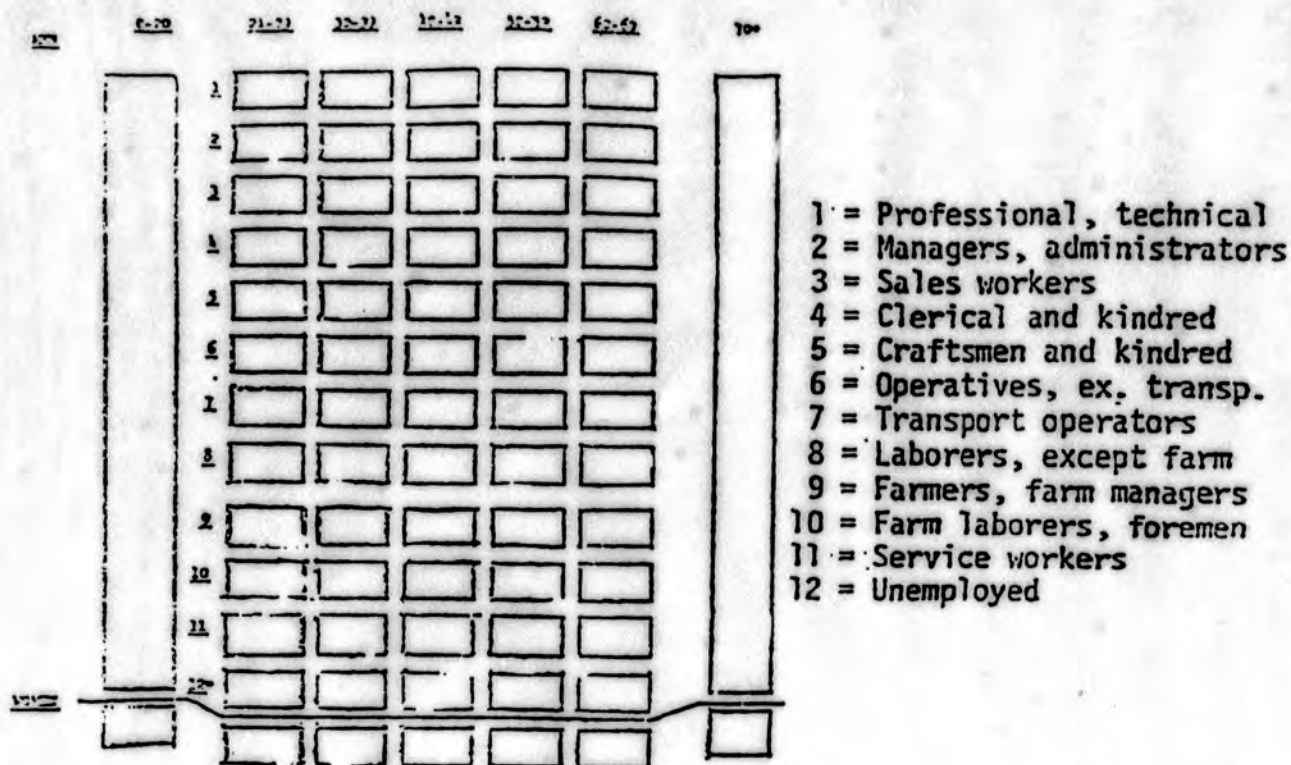


FIGURE II-3 Marden Matrix C

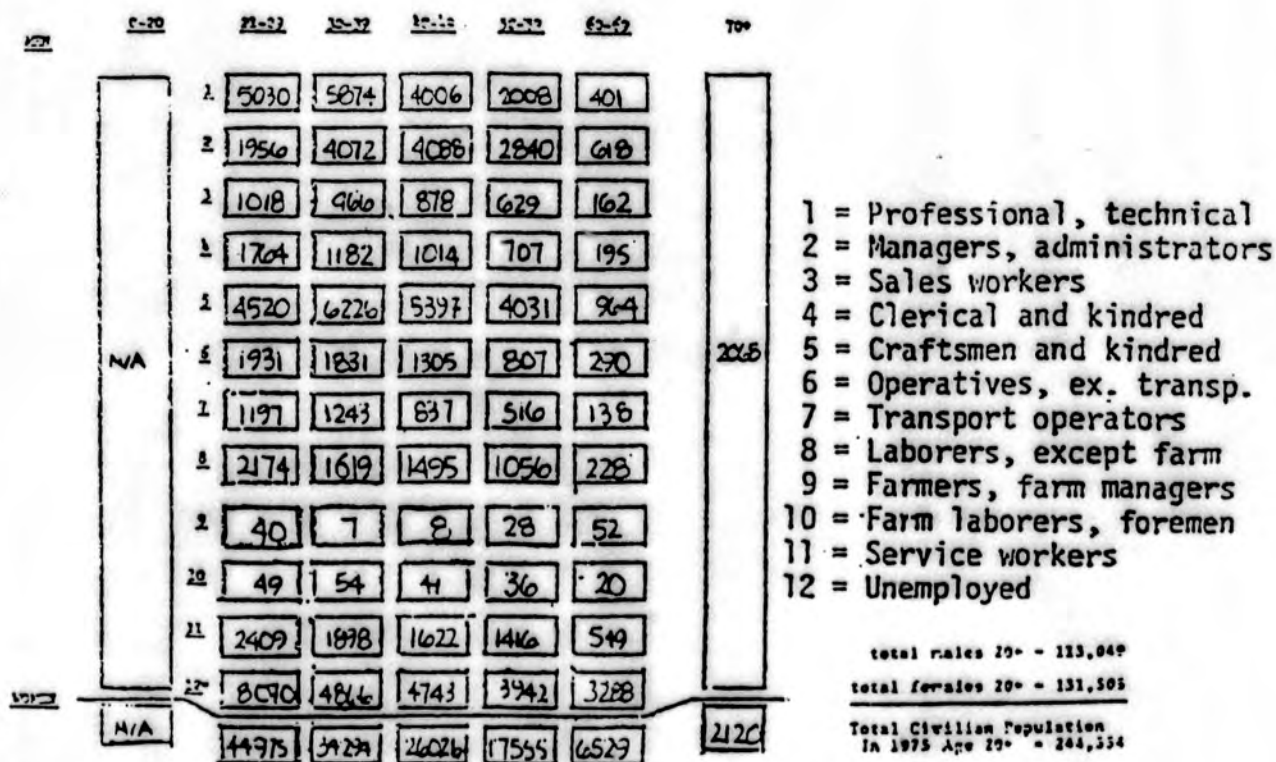


FIGURE II-4 1975 civilian population of Alaska* by sex, age, and occupational category--Matrix A

*(Adjusted population figures based on 1970 U.S. Census)

		0-20	21-30	31-40	41-50	51-60	61-70	70+
	1	.111	.151	.116	.084	.042		
	2	.250	.250	.122	.127	.171		
	3	.261	.136	.097	.078	.053		
	4	.261	.136	.097	.078	.053		
	5	.250	.146	.280	.277	.179		
	6	.379	.113	.250	.292	.067		
	7	.379	.113	.250	.292	.067		
	8	.248	.450	.080	.118	.200		
	9	.261	.135	.097	.078	.053		
	10	.379	.113	.250	.292	.067		
	11	.261	.135	.097	.076	.053		
	12	.248	.164	.174	.127	.116		
		.020	.079	.068	.029	.012		.004

1 = Professional, technical
 2 = Managers, administrators
 3 = Sales workers
 4 = Clerical and kindred
 5 = Craftsmen and kindred
 6 = Operatives, ex. transp.
 7 = Transport operators
 8 = Laborers, except farm
 9 = Farmers, farm managers
 10 = Farm laborers, foremen
 11 = Service workers
 12 = Unemployed

FIGURE II-5 Probabilities of problems related to drinking by sex, age, and occupational category--Matrix B

		0-20	21-30	31-40	41-50	51-60	61-70	70+
	1	558	887	453	179	21		
	2	489	1018	499	361	106		
	3	266	131	85	49	9		
	4	460	1101	90	55	10		
	5	1130	900	1511	713	173		
	6	732	207	326	236	19		
	7	454	140	209	151	9		
	8	539	729	120	125	46		
	9	10	1	1	2	3		
	10	19	6	10	11	1		
	11	629	258	157	110	29		
	12	2001	798	825	501	381		
		899	2709	1770	334	78		9

1 = Professional, technical
 2 = Managers, administrators
 3 = Sales workers
 4 = Clerical and kindred
 5 = Craftsmen and kindred
 6 = Operatives, ex. transp.
 7 = Transport operators
 8 = Laborers, except farm
 9 = Farmers, farm managers
 10 = Farm laborers, foremen
 11 = Service workers
 12 = Unemployed

Total Civilian Problem Drinkers Age 12+ in Alaska During 1975 = 25,582

FIGURE II-6 Estimated number of problem drinkers in Alaska's 1975 civilian population--Marden procedure

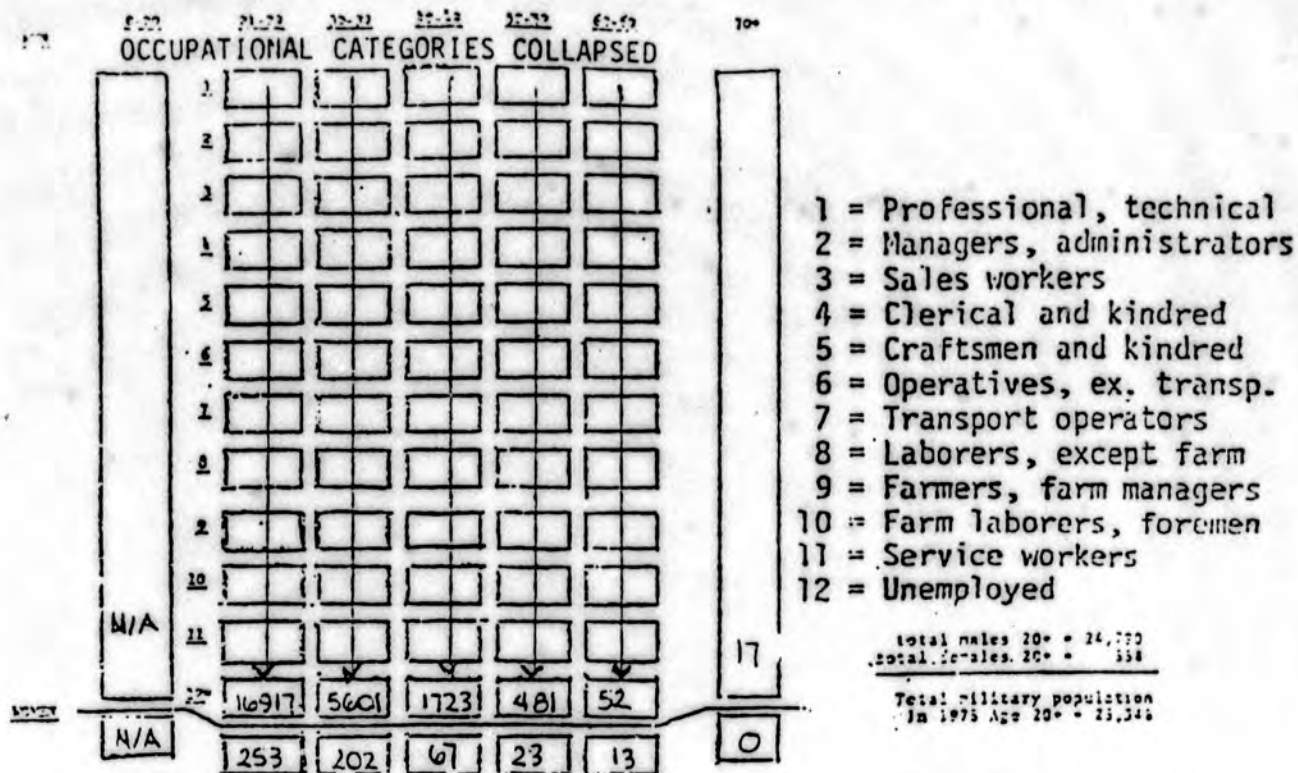


FIGURE II-7 1975 military population of Alaska (adjusted)*--Matrix A

*(Military population figures from Department of Military Affairs, Anchorage, and 1970 U.S. Census.)

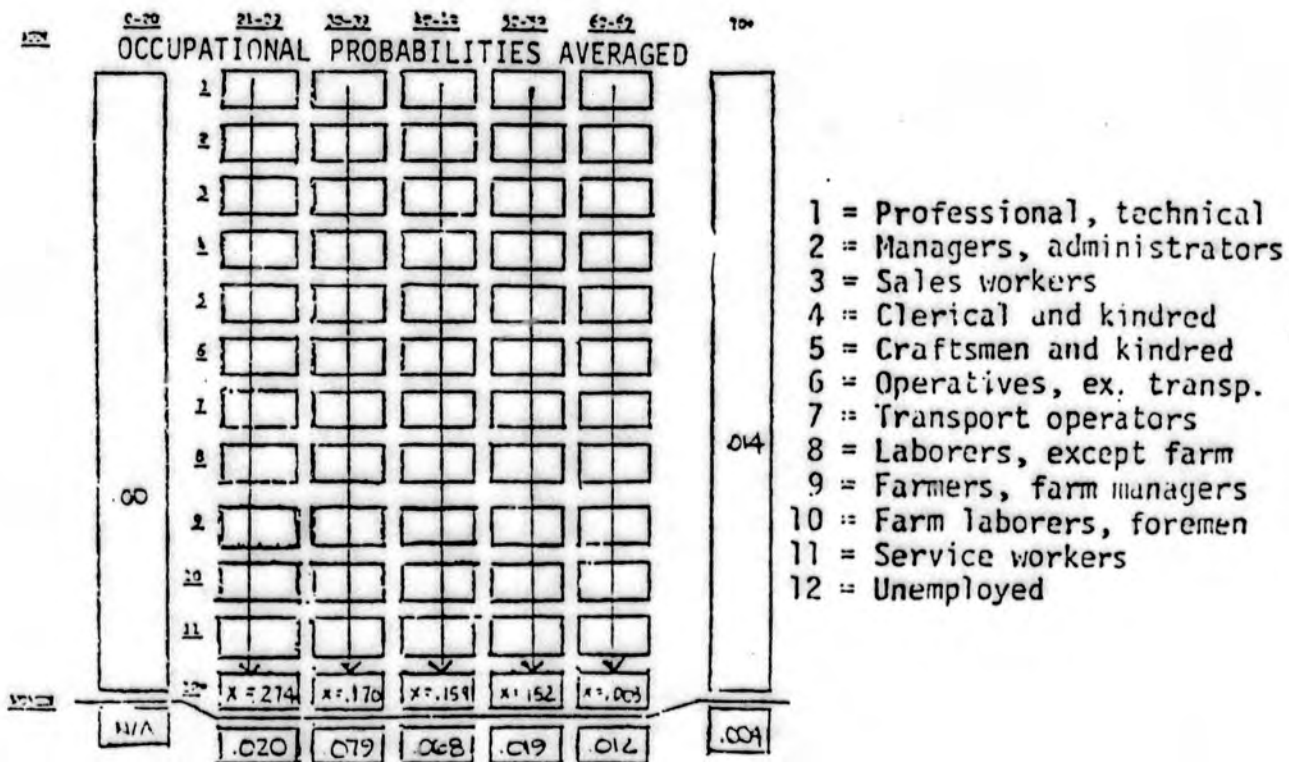


FIGURE 11-8 Military problem drinker probabilities*

^aOccupational probabilities averaged for each age group.

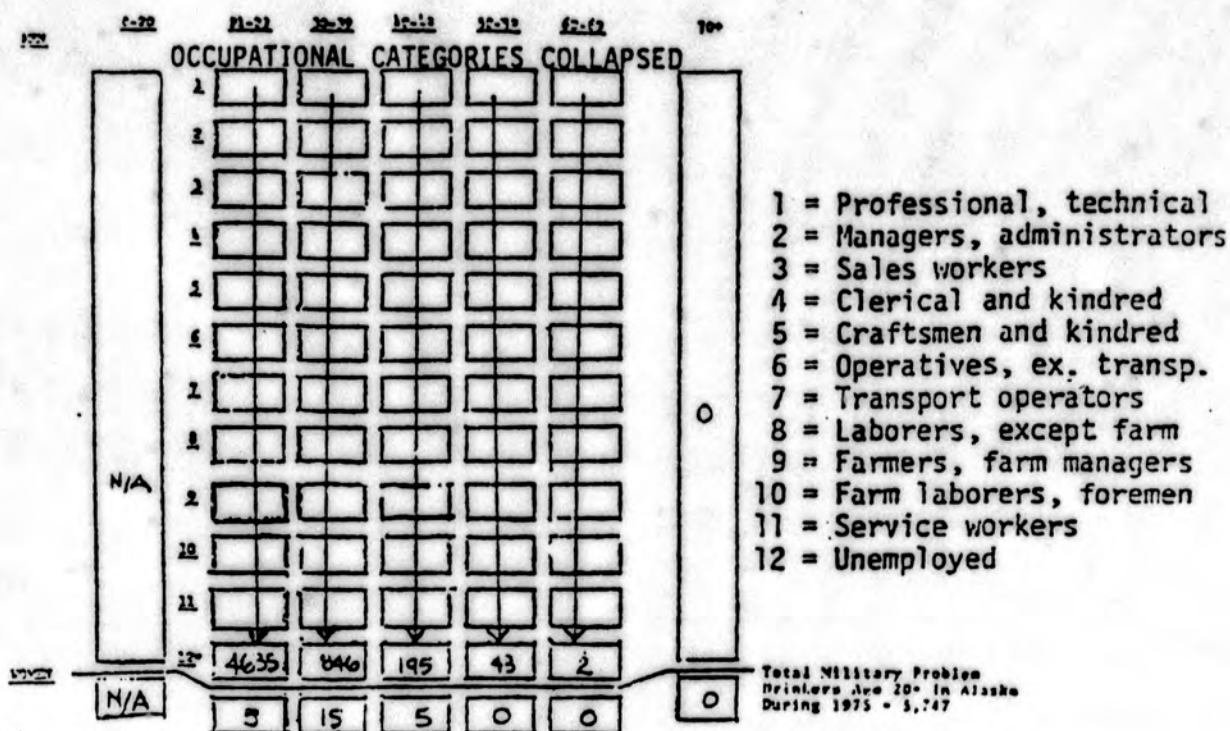


FIGURE II-9 Estimated number of problem drinkers in Alaska's 1975 military population--modified Marden procedure

Thus, it can be seen that application of the Marden estimation procedure to Alaska's population results in an estimate of 31,709 problem drinkers age 20+ in the state during 1975, with approximately 25,884 of these being males and an additional 5,825 being females.

Limitations Of The Method

While the obvious advantage of the Marden method lies in its ability to estimate prevalence within various sub-populations, it does suffer from several disadvantages and insensitivities. Some of these, discussed below, directly affect interpretation of the results as the method is applied to Alaska.

One such limitation of the Marden method is clearly the datedness of the sub-population risk factors determined by Cahalan and Room in 1972, as the drinking patterns of the national populace have shifted since that time. Even if these patterns had not shifted, however, there is still reason to doubt whether risk factors based on the national demographic composition are characteristic of Alaska's culturally pluralistic population.

Another limitation of the Marden method, and one with particular importance for Alaska, is that it tends to systematically underenumerate racial and ethnic minorities within a population. This occurs because of the difficulty in obtaining reliable estimates of minority populations in general.²² For a state such as Alaska, with its several sizeable minority populations (and relatively small overall total population) such an underenumeration could likely produce a substantial distortion of the estimated number of drinkers with problems in minority categories.

A third limitation of the method is that it produces no estimate of

²²Analyses of the 1960 U.S. Census showed significant undercounting of black and other minority populations, averaging about 10%. In high-risk categories, however, such as males aged 20-39, the underenumeration is even more pronounced, approaching 15-20%. (Marden, p. 23)

the number of problem drinkers under age twenty. For a state such as Alaska, where the young comprise a substantial portion of the overall state population, and where alcohol abuse is decidedly a problem among youth, such an omission should be regarded as serious.

Yet another relevant limitation of the Marden method with respect to its utility in Alaska is that it systematically underestimates the number of problem drinkers within the unemployed population.²³ Given Alaska's generally high rate of unemployment and seasonal employment, such an underestimation warrants attention.

Finally, the Marden method may likely underestimate the prevalence of "drinkers with problems" in Alaska due to the fact that it is systematically insensitive to the kinds of population shifts characteristic of rapid-growth areas. The method's dependence on census data prevents correction for the fact that rapid growth in an area or region is usually caused by significant in-migration, and that such in-migrants are predominantly younger people in those age groups for which risk factors are highest.²⁴ Given the kind of growth which has characterized Alaska during recent years, such an omission could easily be sizeable.

In sum, the Marden estimation procedure suffers from several categorical deficiencies which render its application to Alaska problematic--deficiencies which directly coincide, as it happens, with known eccentricities of Alaska. These deficiencies, however, do not alter the fact that the Marden method is still the only prevalence estimation procedure with any sensitivity whatsoever to rates of problem drinking within sub-population categories. Whatever the problems involved in applying the method to Alaska, this distinct advantage over other estimation procedures argues strongly for its use. If its various biases and underenumerations

²³Marden, p. 26.

²⁴*ibid* " 27

(relative to Alaska) are understood and allowed for, the method may prove to be more valuable--and more useful for planners--than any other method.

3. LEDERMANN (CONSUMPTION) METHOD

Background

The prevalence estimation procedure developed in 1954 by the French theorist Sully Ledermann is based on the fact that the number of excessive drinkers in a population increases disproportionately as the overall level of alcohol consumption in that population rises. The link between the two, Ledermann found, was that changes in the overall level of annual per capita intake of alcohol in a society caused a redistribution of the number of individuals consuming at specific levels. As the overall per capita intake went up, Ledermann found, so did the number of persons whose consumption level could be described as "excessive".

In his studies of consumption frequencies²⁵ Ledermann discovered that the distribution of such frequencies tended to be log normal in character, and further that the log normal character of the distribution held for populations which differed greatly in such things as drinking habits and attitudes, beverage preference, legislative controls, etc.²⁶ Although unable to establish precisely why such a distribution should recur across different populations, Ledermann discovered that the relation was definitely fixed. From this, he generated a prevalence estimation procedure which would determine the number of persons in a given society or population who would consume alcohol at any specified level of intake.

²⁵I.e., the number of persons in a society consuming alcohol at various levels of annual intake.

²⁶Wolfgang Schmidt and Jan de Lint, "Estimating The Prevalence Of Alcoholism From Alcohol Consumption And Mortality Data," Quarterly Journal of Studies on Alcohol, 31 (1970), 957-964.

The Ledermann method does not estimate the number of "alcoholics" or "problem drinkers" in a population. Instead, it estimates the number of persons who are likely to consume at or above a prescribed level. For example, hospital and clinical studies have shown that alcoholic clients generally consume an average of 15 cl. of absolute alcohol per day.²⁷ (See bottom of Table II-3 in the following section for English system equivalents.) If this is taken as an indication of the consumption level above which alcohol-attendant problems are likely to emerge in an individual's life, the Ledermann method of prevalence estimation becomes valuable for its ability to estimate how many persons in a population consume in excess of that amount (and who are, therefore, potential clients for treatment programs).

Description Of The Method

The Ledermann method requires as its primary datum the average annual per capita consumption of absolute alcohol for a given population. In effect, if the assumption is made that consumption frequencies adhere to a logarithmic normal distribution (explained below), the mean annual per capita consumption level will be sufficient for determining the number of persons in that population who consume at or beyond a specified level of individual intake.²⁸

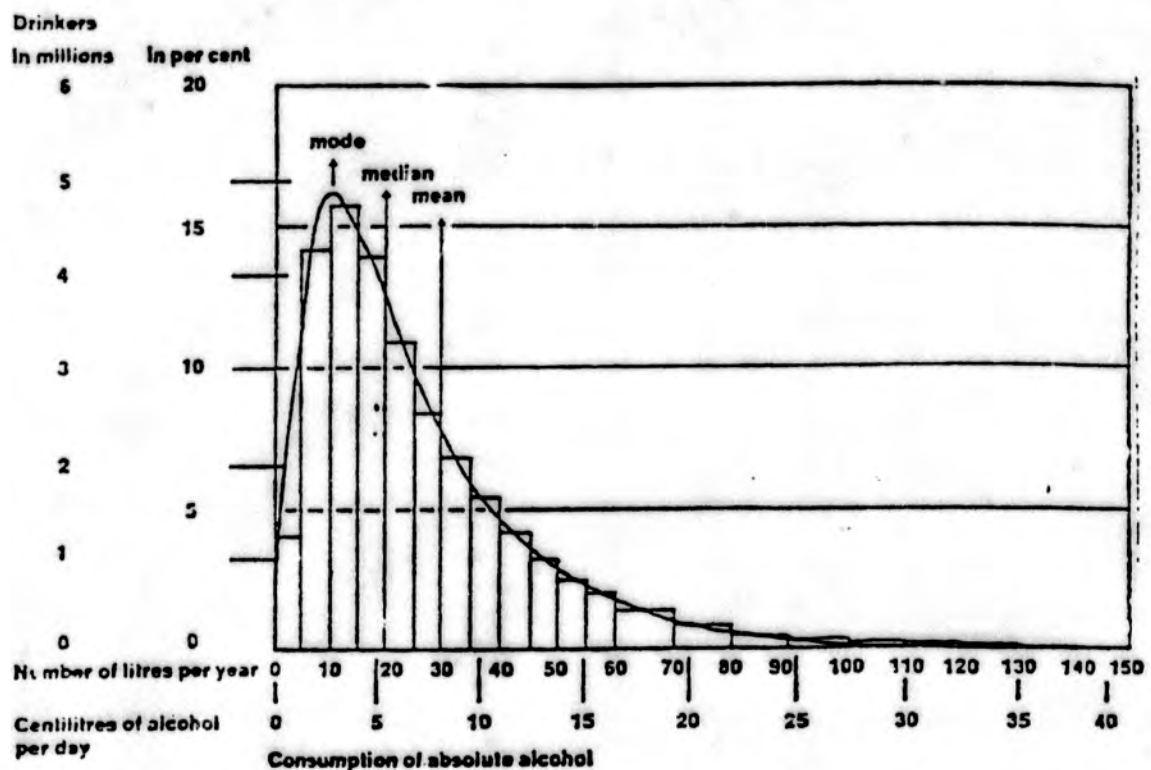
If the number of liters of absolute alcohol that each person in a given population consumed annually were to be plotted on a graph, the resultant curve would not be a normal Gaussian or "bell" shaped distribution curve. This is because, as with the distribution of personal in-

²⁷ Gary Miller and Neil Agnew, "The Ledermann Model Of Alcohol Consumption", Quarterly Journal of Studies on Alcohol, 35 (1974), 877-898.

²⁸ More recent consumption-based estimates of prevalence have been based on direct observation of liquor purchases (Popham, p. 303). Such a method is normally too costly and burdensome for widescale application, but possibly could be very useful in a state such as Alaska, if conducted on a sample basis.

comes in a society, the distribution of liquor consumed is not uniform; rather, the greatest majority of persons drink (or earn) a relatively small amount, while a small minority of persons drink (or earn) a great deal. Thus, the greatest majority of the population would be included under the left-hand portion of a frequency distribution curve, and a very small percentage included under the right-hand portion, or "tail" (see Figure II-10).

FIGURE II-10
DISTRIBUTION OF CONSUMPTION FREQUENCIES



Source: R.E. Popham, "Indirect Methods of Alcoholism Prevalence Estimation", in Alcohol and Alcoholism, R. E. Popham, ed..

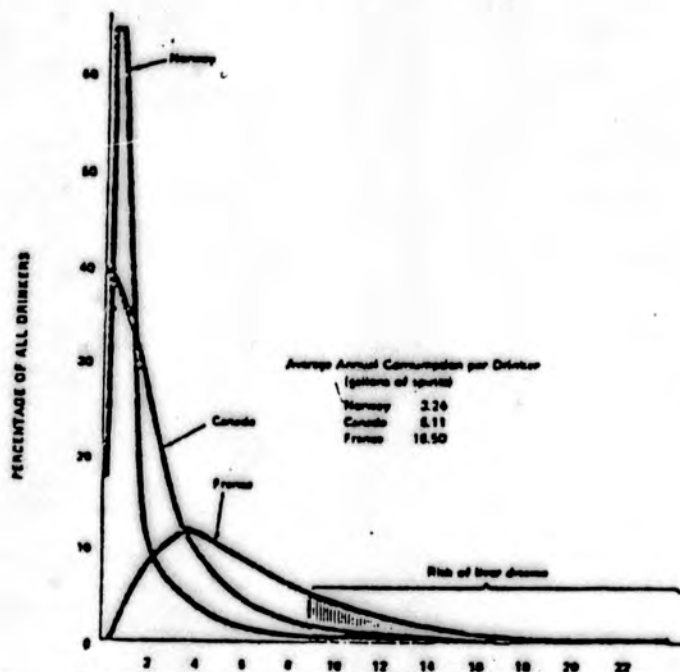
In his studies, Ledermann noted that the frequency distribution of consumption averages in a society greatly approximated the shape of the logarithmic normal curve.²⁹ Given certain standard properties of log

²⁹In a logarithmic normal curve, the natural logarithms (exponents) of the data--rather than the data themselves--are normally distributed.

normal curves, he was then able to make certain generalizations; in particular, concerning the relative percentages of consumers described by certain portions of the curve, as the overall level of consumption for the society increased or decreased. For example, Figure II-11 shows 1968 consumption curves for Norway, Canada, and France. As can be seen, the percentage of the population consuming at high-intake levels (and therefore risking liver disease) tends to increase dramatically as the overall mean annual per capita consumption level ($\bar{c}$) increases.

FIGURE II-11

RELATIONSHIP BETWEEN LEVEL OF OVERALL CONSUMPTION AND SIZE OF "RISK" POPULATION



Distribution Curves of Alcohol Use in Norway, Canada and France in 1968 by Average Daily Consumption (Ounces of Spirits). The average annual consumption is in Imperial gallons. The higher the average per capita intake, the more the distribution curve shifts toward the high-intake end of the scale. The hatched area indicates the levels of intake associated with a proven risk of liver disease.

Source: G.H. Miller and N. Agnew, "The Ledermann Model of Alcohol Consumption", Quarterly Journal of Studies on Alcohol, 35, 1974.

Thus, argued Ledermann, if some level of consumption were to be arbitrarily defined as "excessive" (et al.), the log normal characteristics of the alcohol consumption curve would allow easy estimation of how many

people in a society drink less than that amount of alcohol (e.g., 15 cl./day), and how many drink more than that.³⁰

The implication of Ledermann's method, of course, is that a reduction in the overall level of alcohol consumption in a given society will have the salutary effect of disproportionately lowering the number of drinkers consuming at all (and, therefore, also "excessive") levels. Researchers, however, have cautioned against taking too simplistic an approach to this possibility.³¹

Application To Alaska

The Ledermann procedure may be applied to Alaska, as explained, to determine the number of persons consuming at or above any level of consumption. Since, as mentioned earlier, it has been established that known alcoholics consume on the average of 15 cl. of absolute alcohol a day, that level has been taken here as indicative of "excessive drinking".³² Thus, the number of "excessive drinkers" estimated in this portion of the report refers to the number of persons in Alaska during 1975 who consumed at or above the level of 15 cl. of absolute alcohol per day.

³⁰ Normally, there is a family of log normal distributions for each level of mean consumption. By assuming first, however, that very few individuals in a society would drink more than a liter of absolute alcohol per day (likely to be fatal), and second, that the number of such drinkers would be independent of a population's mean consumption, Ledermann "fixed" the right-hand tail of the distribution, as a utilitarian device. Thus, his distribution curve is a special instance of the log normal curve in which the mean consumption level completely defines the distribution. (Miller and Agnew, p. 879.)

³¹ Miller and Agnew cite Robin Room: "The existence of the log normal distribution as an approximation of cross-sectional empirical realities does not demand that prevention measures, to be effective, must apply to all consumers, as for instance a rise in price does." The authors use the analogy of income distribution, where attempts are made to redistribute incomes among individuals rather than lowering all incomes with a general tax hike. (Miller and Agnew, op. cit., p. 885.)

³² NIAAA Alcoholism Treatment Center Monitoring System output reports for 1975 show that clients at 44 treatment centers about the country averaged

Since the primary datum needed to employ the Ledermann method is Alaska's annual per capita level of consumption ($\bar{c}$), this must first be computed. Overall consumption of absolute alcohol in Alaska during 1975 totaled approximately 1,106,403 gallons--comprised of 584,562 gallons of absolute alcohol from liquor sales, 122,227 gallons from wine sales, and 399,614 gallons from the sale of beer.³³ Given a 1975 drinking-age (18+) population in Alaska of approximately 243,416--of whom approximately 158,220 persons, or 65%, may be considered as actual drinkers--the overall 1975 per capita level of consumption ($\bar{c}$) for Alaska may be determined as:

$$\bar{c} = \frac{1,106,403}{158,220} = 6.99 \text{ gallons/drinker/year}$$

Converting to liters (1 gallon = 3.785 liters), a ($\bar{c}$) of 26.47 liters per person is arrived at. Thus, the 1975 level of per capita consumption among actual drinkers in Alaska can be said to have been approximately 26.47 liters of absolute alcohol per drinker.

Table II-3, adapted from Jan de Lint's 1973 study of consumption averages and other epidemiological factors,³⁴ shows the respective percentages of consumers³⁵ drinking in excess of 15 cl. of absolute

16.56 cl. (5.6 oz.) of absolute alcohol daily when drinking. The rate shows considerable fluctuation annually, however, and is here mentioned simply as general corroboration of the 15 cl. level. It might be noted that clients at Juneau and Ketchikan treatment centers during 1975 averaged 24.25 cl. (8.2 oz.) and 19.22 cl. (6.5 oz.) of absolute alcohol daily, respectively--indicative of the generally higher levels of consumption found in Alaska.

33Computed from Department of Revenue Monthly reports, "Report of Alcoholic Beverage Distributed or Sold in Alaska", 1975.

34Jan de Lint, The Epidemiology of Alcoholism: The Elusive Nature of the Problem, Estimating the Prevalence of Excessive Alcohol Use and Alcohol-Related Mortality, Current Trends and the Issue of Prevention. Addiction Research Foundation manuscript, 1973.

35Defined by de Lint (and Ledermann) as the drinking-age population, as opposed to the population of actual drinkers used to determine ($\bar{c}$).

alcohol daily, given certain overall annual levels of intake ($\bar{c}$). Thus, it can be seen by inspection that Alaska's 1975 level of per capita intake ($\bar{c} = 26.5$ liters) indicates that between 9.97% ($\bar{c} = 26.0$) and 10.62% ($\bar{c} = 27.0$) of its drinking-age consumers (243,416), or between 24,269 and 25,851 individuals, were "excessive drinkers". Taking a mean between the two,³⁶ an estimate of approximately 25,060 excessive drinkers is obtained. (See Figure II-12.)

TABLE II-3
PERCENTAGE OF CONSUMERS WHO DRINK IN EXCESS OF 15 CL. OF ABSOLUTE ALCOHOL DAILY, FOR PER DRINKER CONSUMPTION ($\bar{c}$) RANGING FROM 4.0 TO 30.0 LITERS OF ABSOLUTE ALCOHOL YEARLY

Annual Per Drinker Consumption in Liters ($\bar{c}$)	15+ cl. Daily* (%)
4.0	0.91
5.0	1.14
6.0	1.38
7.0	1.64
8.0	1.91
9.0	2.19
10.0	2.49
11.0	2.81
12.0	3.14
13.0	3.50
14.0	3.88
15.0	4.27
16.0	4.68
17.0	5.11
18.0	5.56
19.0	6.04
20.0	6.53
21.0	7.05
22.0	7.59
23.0	8.15
24.0	8.73
25.0	9.34
26.0	9.97
Alaska: 26.5	10.30 (mean)
27.0	10.62
28.0	11.30
29.0	12.00
30.0	12.72

Adapted from: Jan de Lint, The Epidemiology of Alcoholism, Addiction Research Foundation manuscript, 1973.

*15 cl. of absolute alcohol equals approximately:

- (A) 12 oz. liquor @ 86 proof (12 standard mixed drinks); OR,
- (B) 36 oz. table wine @ 14% alcohol (9 standard glasses); OR,
- (C) 113 oz. beer @ 4.5% alcohol (9-1/2 12 oz. bottles).

³⁶ Due to the curvilinear relationship between mean levels of consumption ($\bar{c}$), direct interpolation is impossible. Thus, a mean has been taken, here, between a $\bar{c}$ of 26.0 and one of 27.0, to arrive at a reasonable estimate of the number of drinkers consuming in excess of 15 cl. of absolute alcohol daily, given Alaska's mean intake level ($\bar{c}$) of 26.47.

In sum, then, it can be said that application of the Ledermann estimation procedure to Alaska indicates that there were approximately 25,060 excessive drinkers in the state during 1975.

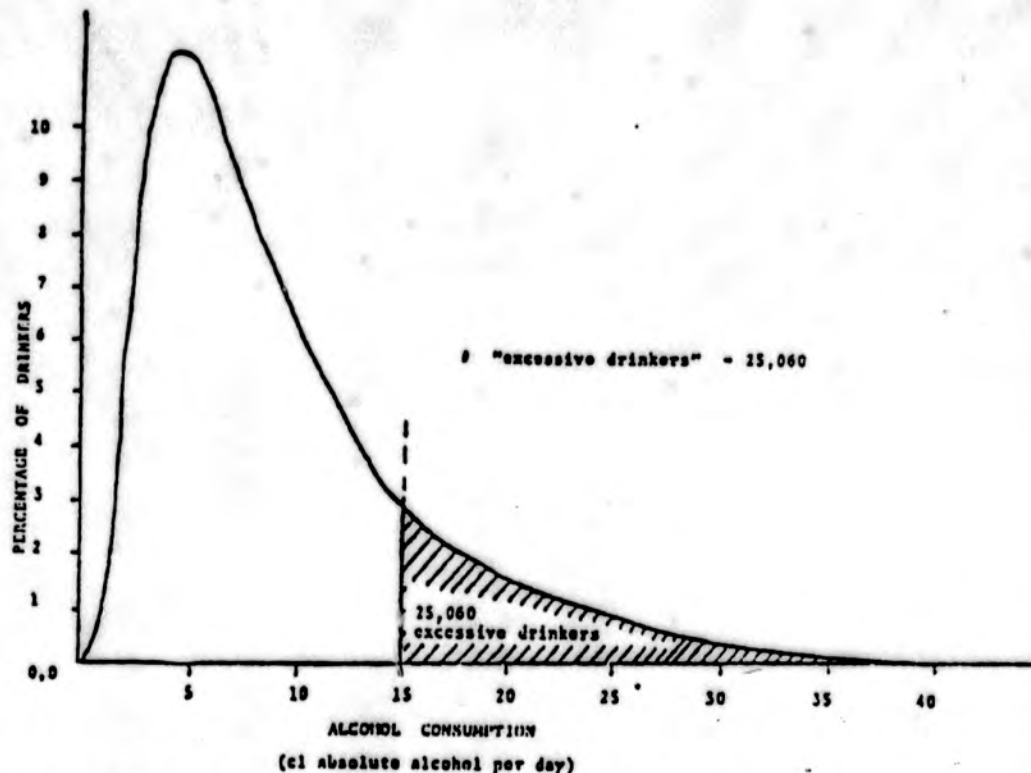


Figure 11-12 Prevalence of excessiver drinkers (15+ cl. daily) in Alaska during 1975 ($\bar{c}$ = 26.5 liters)

Limitations Of The Method

Perhaps the major limitation of the Ledermann (consumption) method is that it does not directly address the question of "alcoholics", "problem drinkers", etc. The method merely specifies the number of persons in a population likely to be consuming at, or beyond, certain levels of alcohol intake--persons, it has been noted, who may or may not in fact actually be alcoholics or problem drinkers. In short, the log normal distribution does not suggest a point at which alcohol use can be labeled

"abnormal" or "pathological".³⁷

A second major limitation of the method--and one very relevant to Alaska--is that it applies best to those societies whose consumer population is homogeneous. Cultural and religious differences within a population introduce heterogeneity, and empirical data analyses support the fact that the distribution of consumption in heterogeneous groups does not approximate the Ledermann (log normal) distribution.³⁸

Yet another limitation of the Ledermann method is rooted in the fact that correlation is not causality. By this is meant specifically that, while a high overall consumption level in a population might be responsible for an inordinate number of high-level consumers, both of those rates (overall consumption level, number of high-intake consumers) might themselves be due to yet a third, unknown factor.

4. OTHER MORTALITY METHODS

Background

Numerous studies have shown that the alcoholic lifestyle leads to a distinct mortality pattern, and that while deaths among alcoholics are attributable to a variety of causes, a few--viz., alcoholism, liver cirrhosis, and suicide--are either unique to the alcoholic lifestyle or at least occur disproportionately often. Given this fact, it is possible to use such death rates, to determine the estimated number of alcoholics in a given population.

To do this, it is necessary to first determine the death rates among alcoholics due to these specific causes. This is accomplished through investigation of death certificates, and judicious assignation of causes

³⁷ Jan de Lint and Wolfgang Schmidt, "The Distribution of Alcohol Consumption in Ontario", Quarterly Journal of Studies on Alcohol, (1974), p. 973.

³⁸ Miller and Agnew, op. cit., p. 886.

of death (necessary because "alcoholism" as a cause of death is ambiguously and variously used). The relevant primary data thus become the number of deaths in a population certified as due to these causes (alcoholism, liver cirrhosis, suicide), and the number reported in the population at large.³⁹

Description Of The Method

Taking first the problem of estimating prevalence from the mortality rate among alcoholics due to "alcoholism", it can be seen that:

$$A = \frac{D}{R}$$

where:

A = the number of alcoholics in a given population,

D = the total number of deaths in a population due to "alcoholism", and,

R = the alcoholism death rate among alcoholics (per 100,000 population).

Thus, knowing the total number of deaths in a population due specifically to "alcoholism", and the death rate due to alcoholism among alcoholics, will generate an estimate of the total number of alcoholics in a population at a given time.⁴⁰

In similar fashion, a modification of the Jellinek formula can be used to estimated prevalence from the known number of liver cirrhosis deaths in a given population. Given the Jellinek formula of

$$A = \frac{PD}{K} \times R$$

a single factor may be substituted for K and R, namely the rate of death

³⁹ Schmidt and de Lint, op. cit., p. 959.

⁴⁰ Ibid.

from liver cirrhosis among all alcoholics (R_c).⁴¹ If this is done, the modified formula may be stated as:

where:

A = the estimated number of alcoholics in a given population;

P_c = the per cent of liver cirrhosis deaths due to alcoholism;

D_c = the total number of cirrhosis deaths in a given population; and,

R_c = the rate of death from liver cirrhosis among alcoholics.

Using the (re-) formulation, the number of alcoholics within a population may be computed from the number of recorded liver cirrhosis deaths.

Yet a third method of estimating prevalence from known mortality statistics is to derive an estimate from the excess mortality rate due to suicides among the alcoholic population.⁴² The formula for doing so can be stated as:

$$A = \frac{D_s P_s}{R_s}$$

where:

A = the total number of alcoholics in a society;

D_s = the number of suicides in the general population;

P_s = the proportion of alcoholics among suicides; and

R_s = the rate of death from suicide among alcoholics.

Each of these three approaches--deaths due to alcoholism, to liver cirrhosis, and to suicide--can thus be used to estimate the number of alcoholics within a given population at a given time.

Application To Alaska

Using the method of prevalence estimation based on deaths due to

⁴¹ Ibid., p. 960.

⁴² Ibid., p. 962.

"alcoholism", it can be seen that:

$$A = \frac{D}{R}$$

where:

A = the number of alcoholics

D = the total number of deaths in a population due to "alcoholism"

R = alcoholism death rate per 100,000 population among alcoholics

Since there were 46 deaths due to alcoholism reported during 1975, and using an alcoholism death rate of 8.02 per 10,000 population,⁴³ the estimated number of alcoholics in Alaska during 1975 may be expressed as:

$$\begin{aligned} A &= \frac{46}{8.02} \times 10,000 \\ &= 57,357 \end{aligned}$$

Thus, using the number of known deaths in Alaska due to "alcoholism" during 1975, it can be estimated that there were approximately 57,357 alcoholics at that time in the state.

Using the known number of deaths in 1975 due to liver cirrhosis, prevalence in Alaska may be estimated according to the following formula:

$$A = \frac{P_c D_c}{R_c}$$

where:

P_c = 0.37 (in Ontario)

D_c = 49

R_c = 16.5 (in Ontario) (per 10,000 alcoholics)

⁴³Based on Ontario studies, this alcoholism death rate is not generally accepted as valid for other areas. Nonetheless, it is employed here to allow computation.

$$\begin{aligned} \text{Thus, } A &= \frac{(0.37) (49)}{(16.5/10,000)} \\ &= 10,988 \text{ alcoholics.} \end{aligned}$$

Therefore, the estimated number of alcoholics in Alaska, based on the number of known liver cirrhosis deaths, was 10,988 during 1975.

Using the suicide deaths method, yet a third such formulation of prevalence can be made:

$$A = \frac{D_S P_S}{R_S}$$

where:

$$D_S = 74$$

$$P_S = 0.25 \text{ (estimate for North America)}^{44}$$

$$R_S = 12.39 \text{ (in Ontario) (per 10,000 alcoholics)}$$

$$\begin{aligned} \text{Thus, } A &= \frac{(74) (0.25)}{(12.39/10,000)} \\ &= 14,931 \text{ alcoholics in 1975.} \end{aligned}$$

Therefore, using the suicide deaths method, the estimated number of alcoholics in Alaska during 1975 was approximately 14,931.

Limitations Of The Method(s)⁴⁵

The greatest limitation with respect to estimating prevalence from deaths due to "alcoholism" has to do with the known rate of death from alcoholism among alcoholics, which in the original study was computed solely for the Canadian province of Ontario. As the rate may show considerable variation over time and from one location to another, proper application of the method to Alaska should include a re-figuring of the

⁴⁴ Schmidt and de Lint, op. cit., p. 962.

⁴⁵ Ibid.

death rate (due to alcoholism) among a sample of Alaskan alcoholics.

With respect to using the re-formulation for liver cirrhosis deaths, major limitations derive from two similar considerations: first, the value for R_a (rate of death from liver cirrhosis among alcoholics) in the original study was determined only for Ontario, and may be different for Alaska; and second, the value for P_c (percent of liver cirrhosis deaths due to alcoholism) needs to be determined for Alaska through investigation of the drinking histories of a representative sample of persons who have died from liver cirrhosis.

Similarly, in estimating prevalence from suicides, a certain inaccuracy results from using the Ontario-based value for R_s (rate of death from suicide among alcoholics), as the rate is undoubtedly different for Alaska.

5. OTHER METHODS

The prevalence of alcoholism in Alaska may also be estimated by comparing Alaska's population with that of the nation as a whole, and taking a proportion of the known number of "alcoholics and alcohol abusers" nationwide, which has been estimated as approximately 9.5 million.⁴⁶ Given a 1975 national population of approximately 212.8 million,⁴⁷ then, and a 1975 Alaska population of approximately 404,600,⁴⁸ the following proportion may be established:

$$\frac{X}{404,600} = \frac{9.5 \text{ million alcoholics and alcohol abusers (in 1975)}}{212.8 \text{ million U.S. population in 1975}}$$

(Alaska Population 1975)

$$X = 18,062 \text{ alcoholics}$$

⁴⁶ Report On Alcohol, Summer 1976, p. 41.

⁴⁷ Alaska Department of Labor.

⁴⁸ Ibid.

thus, on the basis of population, Alaska would be expected to have approximately 18,062 alcoholics and alcohol abusers among its 1975 population.

Another method for crudely estimating prevalence is based on Keller (1975), who estimated that approximately 5.2% of the drinkers in a population have problems related to their drinking.⁴⁹ In 1975, the Alaska drinking-age population (18+) included approximately 243,416 persons, of whom some 158,220 (65%, based on national figures)⁵⁰ may be considered as actual drinkers. If 5.2% of these can be considered to have had "problems related to their drinking", this would indicate a total of approximately 8,227 people.

Yet a third relatively crude method for estimating prevalence is referred to as the Alcohol Problems Index (API), and is based on the ratio of a state's total consumption of alcohol (in absolute alcohol) to that of the nation as a whole.⁵¹ The method further assumes an estimated 9.5 million alcoholics and alcohol abusers, nationwide. Thus, the following proportion may be established:

$$\frac{X}{9.5 \text{ million alcoholics and alcohol abusers in 1975}} = \frac{\text{Alaska total consumption during 1975}}{\text{U.S. total consumption during 1975}}$$

Therefore:

$$X = \frac{852,610 \text{ (gallons)}}{414,324,400 \text{ (gallons)}} \times 9.5 \text{ million}$$

$$= 19,551 \text{ alcoholics and alcohol abusers in Alaska during 1975.}$$

⁴⁹ Nebraska Alcoholism Services System Plan, p. 12.

⁵⁰ Ibid.

⁵¹ Report On Alcohol, p. 40.

C. COMPARISON OF ESTIMATES

In the preceding sections of this report, a variety of methods have been employed to estimate the number of alcoholics and problem drinkers in Alaska. As these procedures employed different data bases for their determinations, and often different definitions of the population being measured, some discussion was introduced along the way concerning their respective strengths and limitations. The fact is clear, however, that even apart from their intrinsic merits or demerits, the methods display varying degrees of suitability for a state such as Alaska. In the present section, therefore, an attempt is made to discuss and evaluate the methods (and their respective estimates of prevalence in Alaska) from two related points of view: (1) the factors known to influence alcoholism prevalence anywhere, and (2) the particular eccentricities of Alaska itself.

Factors Affecting Alcoholism Prevalence

The number of alcoholics, problem drinkers, alcohol abusers, etc., in any society or population depends on a number of important factors. Generally, these factors fall into one of two large classes: cultural or societal factors which exert a categorical influence on the overall population, and those factors which pertain more to particular groups or sub-populations within the overall populace.

Among the societal or cultural class of factors affecting alcohol prevalence, perhaps the most important is the overall level of alcohol

consumption in a population. It has been argued that regardless of the arbitrary definition of alcoholism chosen, the level of prevalence in a society is invariably fixed by that society's overall level of consumption;⁵² viz., that as the mean annual consumption of alcohol increases in a population, the number of alcoholics increases disproportionately.

Two other important societal factors affecting prevalence, both related to consumption, are the general accessibility of alcoholic beverages in a society and their relative cost.⁵³ Accessibility refers to the number and type of drinking establishments in a society, as well as the hours of operation. It also refers to the number and type of liquor outlets, and a society's home drinking preferences.

In a similar fashion, the overall level of consumption of alcohol in a society has a great deal to do with its relative cost. Figure II-13, which depicts the relationship of price (expressed as a fraction of average disposable income) to consumption for the Canadian province of Ontario, shows this relationship graphically.⁵⁴

As can be seen, consumption tends to rise steadily in a society when the relative cost of beverage alcohol declines; however, it may not be the case that general consumption (and therefore prevalence) would decline were prices relative to disposable income to increase.⁵⁵ Nevertheless, the fact remains that the relative cost of beverage alcohol in

⁵² Jan de Lint and Wolfgang Schmidt, "Consumption Averages and Alcoholism Prevalence", British Journal of Addictions, 66 (1971).

⁵³ Jan de Lint and Wolfgang Schmidt, "Alcohol Use and Alcoholism", Addictions, 18(2), 1971, pp. 4-8.

⁵⁴ Ibid., p. 7.

⁵⁵ Ibid., p. 6.

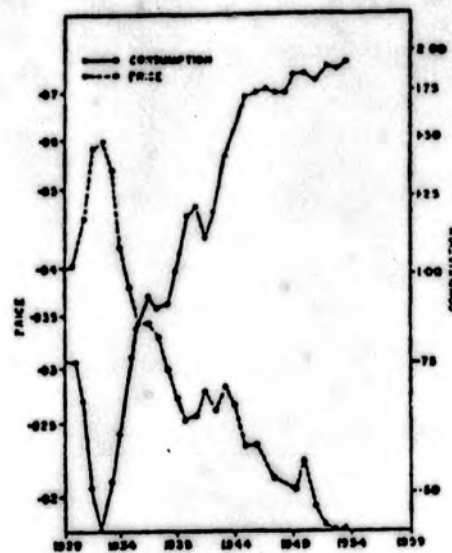


FIGURE 1X-13 Alcohol Price (P) and Consumption (C), Ontario, 1929-1953.*

*P = the price of an average gallon of absolute alcohol expressed as a fraction of average disposable income.
C = consumption in gallons of absolute alcohol per person 20 years and older.

Source: Jan de Lint and Wolfgang Schmidt, "Consumption Averages and Alcoholism Prevalence: A Brief Review of Epidemiological Investigations," British Journal of Addiction, 66 (1971), p. 101.

a society, like the general accessibility of alcoholic beverages, is significantly related to the overall consumption level and thus to a society's probable rate of alcoholism prevalence. In a situation such as exists in Alaska, where the liquor excise tax has not been increased since 1961 (and only once since statehood), the relative cost of alcohol is undoubtedly related to the high rate of consumption.

Yet another categorical factor affecting alcohol prevalence has to do with a society's general level of tolerance for drinking in conjunction with the relative degree of inner stress precipitated in people by

the environment.⁵⁶ This theory argues that in environments (such as Alaska) which produce a great deal of stress and tension among the populace and simultaneously tolerate "utilitarian drinking" (e.g., drinking to unwind) as a way of coping with such stress, high rates of alcoholism will occur. Though difficult to measure, such a factor, if true, could clearly have relevance to a state such as Alaska, where environmental conditions are generally regarded as stressful.

Beyond such societal factors affecting alcohol prevalence, there are also several noteworthy factors which have more to do with sub-populational or group drinking habits of a society. One of these, largely discredited, is the notion that prevalence will probably be greater in societies where drinkers' preferences are for distilled spirits rather than beer or wine. Cross-cultural studies do not generally support this conception, however, and indicate that while the general level of intoxication may decrease if drinkers' preferences are shifted to beer or wine, the level of actual alcoholism prevalence does not necessarily follow.⁵⁷

Another important factor affecting alcoholism prevalence has to do with group drinking practices, as in the case of various ethnic sub-populations.⁵⁸ For example, the low prevalence of alcoholism among North American Jews has been attributed to their strong disapproval of drunkenness and their use of alcoholic beverages in religious observances. Similarly, the "utilitarian" drinking practices of the Irish have been associated with the avoidance of stressful situations, and their high rate of prevalence explained along these lines. While such correlations do not hold across all situations, the influence of group drinking prac-

⁵⁶ de Lint and Schmidt, "Consumption Averages" *op. cit.*, p. 104.

⁵⁷ de Lint and Schmidt, "Alcohol Use and Alcoholism", p. 9.

⁵⁸ *Ibid.*, p. 8.

tices on overall alcoholism prevalence remains important. With respect to Alaska, unfortunately, no research has been conducted to date on the effects of ethnic or other subpopulational drinking patterns on alcoholism prevalence.

Other factors affecting prevalence among groups of subpopulations of a society include areas of residence, occupation, sex and age.⁵⁹ For example, rates of prevalence (in the United States) tend to be higher in urban areas than in rural ones (though not always), and among certain occupations such as waiters, bartenders, and cooks. Also, prevalence rates tend to be much higher among men than women, and--if "alcoholism" is being measured--among the middle-aged. (Being a progressive illness, however, alcoholism would obviously not show up in a person or particular group of persons until many years of abusive drinking had passed.) If, on the other hand, it were the prevalence of "abusive drinking" that were being measured, instead of "alcoholism", clearly a younger age group would become judged as "at risk".

Comparing The Estimates

Given the role played by such factors (as mentioned) in the prevalence of alcoholism or problem drinking in a society, it becomes possible to talk of "resolving" the various prevalence estimates which have been arrived at. Table II-4, shows the estimates of prevalence in Alaska produced by each of the methods used.

Taking each of the estimates in turn, the following remarks can be made:

The Jellinek method, while consistently one of the most reliable prevalence estimation procedures used, evidences several major limitations which tend to underestimate alcoholism prevalence in a populace such as Alaska's. These have been shown to be an untoward sensitivity with

⁵⁹ de Lint and Schmidt, "The Epidemiology of Alcoholism", pp. 10-14.

TABLE II-4
ESTIMATES OF ALCOHOLISM PREVALENCE IN ALASKA DURING 1975,
AS CALCULATED BY VARIOUS PROCEDURES

Estimation Procedures	Alcoholics	Excessive or Problem Drinkers
Jellinek Method	15,949	*
Marden Method	*	31,709
Ledermann Method	*	25,060
Other Mortality Methods		
Alcoholism Deaths	57,357	*
Cirrhosis Deaths	10,988	*
Suicide Deaths	14,931	*
Other Methods		
Population	18,062	*
Keller Method	8,227	*
Alcohol Problems Index	19,551	*

* = N/A for the method

respect to yearly fluctuations in liver cirrhosis rates--a variance particularly pronounced in populations of under 300,000, as in Alaska--a pronounced insensitivity to rapid growth and regional variations in an area, and a quite possibly misleading reliance on (unrepresentative) clinic samples for its estimate of liver complication rates. In addition, and perhaps most relevant from the point of view of Alaska, the Jellinek method tends to "homogenize" a population, failing to reflect the fact that persons from different ethnic, cultural, and geographic-social backgrounds may have different probabilities of becoming alcoholics or problem drinkers. Thus, the prevalence estimate for Alaska produced by the Jellinek method (15,949 alcoholics) is, if anything, probably low.

The Marden method, on the other hand, seems to possess advantages which may outweigh its several disadvantages (with respect to Alaska). Regarding its disadvantages, the method relies on outdated risk probabilities for its sub-population categories, systematically underenumerates racial and ethnic minorities within a population (though this is due primarily to reporting difficulties, and is not really a limitation of the instrument itself), produces no estimate of the number of problem drinkers under age twenty, underestimates alcoholism prevalence among the unemployed, and is insensitive to the kind of population shifts in areas (such as Alaska) characterized by rapid growth. In spite of these disadvantages, however, the Marden method possesses the unique advantages of being able to isolate and identify the number of problem drinkers within a variety of sub-population categories, and to identify high-risk groups. Given the need for more specific information than simply an alcoholic "body count", such sub-population determinations become extremely valuable from an alcoholism treatment and prevention perspective. As such, the Marden estimate of 31,709 problem drinkers--while probably itself still an underestimation (due to the systematic underenumerations mentioned)--probably stands as the most detailed and accurate prevalence estimate currently available for Alaska.

The Ledermann method, based on consumption frequencies within the overall population, suffers primarily from a definitional problem: i.e., it does not specify the number of "alcoholics" or "problem drinkers" (et al.) within a populace, but simply the number of people known to consume at or beyond particular levels of alcohol intake. While estimates of prevalence based on the method therefore remain only approximations, however, recent research (see Part IV) provides evidence that level of apparent consumption may be a reliable indicator of excess

drinking and associated health problems. Other shortcomings of the method include the fact that it applies best to culturally homogeneous populations (unlike Alaska's), and that it skirts the question of causality: viz., whether high levels of consumption in a society may cause high rates of problem drinking, or vice versa, or whether both phenomena may be due to yet other, external causes. On the whole, however, the method is quick and relatively easy to apply, and depends on data which are readily available. In addition to its obvious utility, the method also shows good correspondence between its estimate of prevalence in Alaska (25,060 "excessive drinkers") and that of the Marden method (31,709 "problem drinkers").

The three estimation procedures collected under the heading of "Other Mortality Methods"--based on deaths in a population due, respectively, to alcoholism, liver cirrhosis, and suicide--are each reasonably reliable methods of prevalence estimation. Because death rates valid only for Ontario had to be used for each of the methods, however, considerable distortion and variance in estimates has resulted. Thus, the respective estimates of 57,357 alcoholics, 10,988 alcoholics, and 14,931 alcoholics in Alaska during 1975 should probably be disregarded.

Finally, the three prevalence estimation procedures collected under the heading of "Other Methods" also share a common bias: their dependence on the assumption (incorrect) that Alaska has its fair share--and only its fair share--of the nation's alcoholics and problem drinkers (i.e., a number in proportion to its overall population). Such estimates, based as they are on such gross criteria as overall population, standardized percentages, and overall consumption gallonage, are so crude as to be useful only in the absence of all other prevalence estimation procedures.

What is left after all this, can best be described as an unavoidable reliance on the three major prevalence estimation procedures: the Jellinek method, the Marden method, and the Ledermann (consumption) method. Given their respective limitations noted above, particularly their insensitivities to conditions peculiarly Alaskan, none of them can independently be regarded as reliable for Alaska. If they are viewed in combination, however, a more favorable picture begins to emerge.

Most importantly, there is very good correspondence among the prevalence estimates produced by these three methods. The Jellinek estimate of 15,949 alcoholics (or, therefore, 31,898 problem drinkers) in the state matches well with the Marden estimate of 31,709 problem drinkers, as well as with the Ledermann estimate of 25,060 problem drinkers. Given the fact that each method depends on a different data base from the other two, and thus purports to be tapping different indicators of alcoholism or alcohol abuse, the correspondence of their final estimates indicates that the figure of about 30,000 problem drinkers in Alaska in 1975 is justifiable if very likely low. (Such factors as Alaska's extremely rapid rate of growth, high unemployment rate, racial and cultural heterogeneity, large youth population, etc.--factors to which all three methods are variously insensitive--virtually insure that this is the case.) Until more can be learned about actual rates and patterns of alcohol use and abuse in Alaska, thus ending reliance on transplanted methods and practices such as these, this estimate is the best available.

In closing, it can be said that the Jellinek, Marden, and Ledermann methods can each have important roles as program planning and development tools. While it is beyond the purview of this study to investigate such possibilities, it is clear that such things as the identification of risk populations within the various occupational and social strata of Alaska's

populace as afforded by the Marden method, and the monitoring and projective capabilities of the Ledermann (consumption) method, can have important applications in planning for the prevention and treatment of alcohol abuse and alcoholism. To make these applications relevant, however, much more must be learned about the particular indicators on which these estimation procedures (as well as other conceptual vehicles) depend--particularly about the way those indicators behave in the Alaskan setting. In the following parts of this volume, therefore, attention is focused on precisely these and other indicators. A further discussion of the estimated distribution of problem drinkers according to occupation, age, and sex, is, however, provided in Part IX.

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PART III. MAJOR THEORIES REGARDING THE ETIOLOGY OF ALCOHOLISM*

No discussion of alcoholism, its prevalence, or its various indicators, would be complete which did not raise the question of its etiology, or causality. While it is not intended here to present a full-scale analysis of the issues and considerations surrounding the question of what causes alcoholism, a brief overview of the major extant theories is considered indispensable. Certainly with respect to considerations about alcohol-related legislation, and with respect to the ultimate concern of alcohol treatment and prevention programs, an overview of the theories about the factors producing or resulting in alcoholism is essential.

Because the addiction syndrome of alcoholism takes so long to become established in a person, its developmental antecedents are particularly obscure and difficult to isolate. From a biological point of view, causality is difficult to establish simply because of the sheer multiplicity of symptoms; specifically, no one theory suffices for all the known manifestations and/or syndromes of alcoholism, alcohol dependence, alcohol addiction, etc. Similarly, it has proven difficult to identify behavioral factors which may contribute to the etiology of alcoholism in a person. Attempts by researchers to date to develop a suitable animal behavioral model for studying alcohol dependence and its development have done little to either corroborate or contradict extant theory, and in general may be described as inconclusive. This com-

*Adapted from Alcohol and Health, December 1971, Chapter V, "Theories About the Causes of Alcoholism," pp. 61-70.

bination of difficulties, then, prevents any real certainty with respect to the question of the etiology of alcohol-related dependencies. The crucial determinants in the developmental process are still unknown, and the very nature of the addictive process remains largely a matter of conjecture.

A number of theories do exist, however, which attempt to explain the origin and genesis of alcohol dependency in the individual. Generally falling into three classes--physiological, psychological, and sociological theories--they are synopsized below.

A. PHYSIOLOGICAL THEORIES

Physiological theories concerning the causes of alcoholism attempt to explain chronic alcohol intake in terms of physiological and biological mechanisms. Being disease theories which are founded to a lesser or greater extent on experimental research and life studies, they focus on the physiological functions and processes surrounding phenomena such as addiction, habituation, tolerance, dependence, loss of control, craving, and "appetite" for alcohol. Chief among such theories are the genetotrophic theory, the genetic theory, and the endocrine theory, explained below.

Genetotrophic Theory

The genetotrophic theory of alcoholism postulates that some persons, due to an inherited defect or "error" of metabolism, require unusual amounts of certain essential vitamins. Since their normal diet does not supply these vitamins in the quantities needed, such persons have a genetically-caused and chronic nutritional deficiency. If exposed to alcohol, they develop an abnormal craving for the substance--the consequence of which is alcoholism. Dietary experimentation with animals has proven inconclusive, however, and longitudinal studies attempting to breed high- and low- consuming strains of

rat suggest that alcohol preference is not inherited in a simple genetic fashion. Other animal studies, nonetheless, suggest that drinkers and non-drinkers may inherit different enzymatic systems--which, if true, would provide a biological basis for the disease concept of alcoholism.

Genetic Theory

Because alcoholism appears to run in families, it has been suggested that alcoholics may have inherited a physical or genetic susceptibility to be influenced adversely by ingested alcohol. The idea of a genetically-transmitted alcoholic "constitution" has not been very well supported by experimental data, however, and attempts to link alcohol preference to other inherited characteristics (color-blindness, blood type, etc.) have proven uninformative. In such studies, environmental and cultural influences, in particular, seem to have had at least as much influence on behavior such as beverage preference and level of consumption as any inherited characteristics. Thus, while the possibility of an inherited predisposition for--or immunity to--alcoholism has not been ruled out, it does seem likely that, at the least, the onset and development of alcoholism and other alcohol-related dependencies is not solely under biological control.

Endocrine Theory

Another major physiological theory of alcoholism causality is the endocrine theory, based on the observed similarities between alcoholics and persons with known endocrine disorders. This theory postulates that some failure or dysfunction of the endocrine system might be responsible for the onset of alcoholism in a person. While research studies do indicate a relationship (inverse) between thyroid activity and alcohol consumption level, however, most other endocrine activity (or the lack of it)--e.g., in the pituitary gland, adrenal cortex, etc.--appears to have little relationship to any development of alcoholism. In fact, if there is a case to be made for

the association of alcoholism and endocrine dysfunction, most of the available clinical and experimental information suggests that the endocrine characteristics associated with alcoholism may actually be the result of heavy drinking, rather than its cause.

B. PSYCHOLOGICAL THEORIES

Psychological theories regarding the etiology or causation of alcoholism categorically assume that it is a symptom of underlying personality or emotional disorder in a person. Not attempting to delineate whether such disorder is inherited or learned, these theories focus on the psychodynamic role which drives and self-conceptions play in the alcoholic person's relationship with drinking. Generally, these theories stand without benefit of experimental support, as the data themselves--drives, needs, character traits, etc.--permit only a degree of measurement. They have proven suggestive, however, as well as very useful for diagnostic and therapeutic purposes. The three principal psychological theories, outlined below, are based on psychoanalytic theory, learning and reinforcement theory, and personality trait theory.

Psychoanalytic Theory

Attempts to explain the etiology of alcoholism from the point of view of psychoanalytic theory have generally focused on the alcoholic's alleged powerlessness and tendencies towards self-destruction. The three major theoretical positions adopted in such attempts have been: (a) the Freudian view that alcoholism derives from defects in the parent-child relationship, leading to unconscious tendencies towards self-destruction, oral fixation, and/or latent homosexuality; (b) the Adlerian view that alcoholism represents a struggle for power, a compensating for feelings of inferiority first established in childhood due to overindulgent parents; and

(c) the more recent view that alcoholism develops originally as a means of coping with frustrated ambitions or desires, but (because it only further precludes attainment of such goals) becomes all the more necessary to the alcoholic for its compensatory, if false, sense of power and achievement. Application of these kinds of psychoanalytic approaches has proven quite helpful in clinical settings; scientific evidence to support such views, however, has been necessarily inconclusive, due to the difficulties involved in testing and measuring psychodynamic events.

Learning Theory

According to the precepts of learning and reinforcement theory, the etiology of alcoholism lies in the fact that ingestion of alcohol becomes a successful reflex response in coping with unpleasant or anxiety-producing situations. In particular, alcohol is said to reduce fear in approach-avoidance life situations, thereby lowering the alcoholic's level of anxiety concerning (originally) unpleasant situations and (at a later stage) the unpleasant consequences of chronic alcoholism. In fact, guilt feelings induced by the consequences of prolonged, excessive drinking may themselves become the stimulus and motivation for further drinking as a means of escape. Experiments using punishment and aversive conditioning have generally supported the stimulus/response relationship of anxiety and alcohol ingestion, and have also strongly supported the view that such reflexive behavior can be learned.

Personality Trait Theory

Attempts to identify the so-called "alcoholic personality" are generally conceded to have failed. While it would obviously be very valuable to know the constellation of personality characteristics peculiar to persons in a pre-alcoholic stage, attempts to isolate such characteristics (and their

configuration) have not resulted in identification of a common set. Major personality traits and tendencies so far identified in clinical experiments include low tolerance, sociability, feelings of inferiority (often in combination with attitudes of superiority, fearfulness, and dependency), intense dependence-independence conflicts, unresolved love-hate ambivalences, et al. Presumably, a personality configuration involving traits and tendencies such as these would be predisposed towards resorting to alcohol as a means of coping with the world's stresses. What experiments have not been able to determine, however, is whether these admittedly recurring personality characteristics are, instead of causes of excessive drinking, actually consequences of it.

C. SOCIOLOGICAL THEORIES

The sociological theories regarding the causes of alcoholism generally represent a shift in attention from the pathologies of the individual to the cultural and national values of a society or populace. Essentially, such theories hold that alcohol consumption (and therefore alcoholism) is directly related to the values and attitudes which a society holds regarding drinking. Thus, on the one hand, it is possible to view the near-universal use of alcohol as a symptom of its adjudged value in nearly all societies as an anxiety-reducer; and, on the other, it is possible to view alcoholism as a form of cultural deviance. Both--the cultural theory of alcoholism and the deviant behavior theory--have great relevance for the development of a generalized sociocultural explanation of alcoholism; as such, they are synopsized below.

Cultural Theory

The almost universal appearance of drinking in various societies suggests strongly that its acceptance is due in large part to the utilitarian function

it performs in the reduction of socially-caused anxieties. That function, however, is said to be mediated by several important factors--notably, the degree to which a culture or society operates to cause inner tensions or needs for adjustment in its members (certain societies producing more anxiety than others among their members), the overall attitudes toward drinking which a culture fosters and maintains (e.g., abstinence, ritual drinking, convivial drinking, utilitarian drinking, etc.), and the degree to which a culture or society provides other means of satisfaction than recourse to alcohol (e.g., other drugs, culturally acceptable ceremonies and rituals, etc.). Thus, according to cultural theories regarding the causes of alcoholism, the tension-relieving capacity of alcohol is utilized differently by various societies depending on the different drinking attitudes in effect, the respective pressures generated by the culture, and the presence or absence of any substitute methods for relieving societally-induced tensions.

Deviant Behavior Theory

In contrast to how--or whether--a society condones the consumption of alcohol by its members, the manner in which it may define consumption as undesirable behavior is also of relevance to questions of causality. The way a society chooses to define for itself what alcohol consumption, intoxication, and drunken behavior shall mean, establishes a code of conduct over and against which the inebriate or alcohol abuser comes to view himself. Theories of causality which adopt this frame of reference, therefore, portray the alcoholic as some one who, by his actions, becomes deviant, and who, by society's response (public labeling of him as a deviant), is further reinforced (and imprisoned) in that deviance. Factors contributing to such deviance, it is stressed, include strains between socially established goals

and objectives and publicly available means of attaining them, and the competition by subcultures in a populace whereby an action judged acceptable by one is considered deviant within the context of another. Through-
out, the process whereby the society or culture at large validates the alcoholic's behavior (i.e., labels it as deviant) is seen by theorists as being equal in importance to the initial activity of alcoholism.

PART IV. CONSUMPTION OF BEVERAGE ALCOHOL: TRENDS,
COMPARISONS AND IMPLICATIONS FOR ALASKA

A. INTRODUCTION

The relationship between consumption of beverage alcohol and alcoholism and alcohol abuse has long been the serious focus of scientific research. The main body of research attention comes from epidemiologists whose major concern is the mass aspect of diseases and behavioral disorders. Applied to alcoholism and alcohol abuse, one epidemiological approach involves the establishment and comparison of rates of occurrence of alcoholism in different population groups, over specified time periods. Another approach is the study of afflicted populations, which involves the collection of information about habits and conditions of life preceding the affliction. Still another approach is to investigate groups of peoples exposed to conditions suspected of producing the disorder.

The major variables associated with beverage alcohol consumption from each of the above approaches will be discussed in this section. Section B compares the characteristics of apparent alcohol consumption in the state of Alaska with other state, national, and international consumption trends and characteristics.

Section C is an analysis and discussion of Alaskan consumption patterns in relation to the major consumption theory and its implications. According to this theory, the level of average annual consumption of any population group is directly related to the prevalence of alcoholism

within that population.

Section D discusses various factors which are associated with increases in the rates of consumption in a population group, with emphasis on government control measures.

Section E is a summary of the findings in this Part.

Definitions

For purposes of clarity, it is necessary to define various terms as they are used in the context of this section:

1. "Consumption": The intake of beverage alcohol in the form of beer, wine, or distilled spirits. Excessive consumption, problem drinking, heavy consumption, etc., have various definitions.
2. "Absolute Alcohol": Ethyl Alcohol (C_2H_5OH), the intoxicating agent in alcoholic beverages, varies in percentage content by type of beverage. Conversion of different types of alcoholic beverages into absolute alcohol allows comparisons involving combinations of beverage types by considering only the total volume of absolute alcohol. The conventional conversion factors are given below:

Distilled Spirits: 43% absolute alcohol (based on an average of 86 proof liquor)

Beer: 4.5% absolute alcohol

Wine: 14% absolute alcohol

3. "Apparent Consumption": An estimate of consumption of beverage alcohol reported in terms of annual per capita consumption for a specifically designated population. Apparent consumption may be reported in units of volume by beverage type (beer, wine, liquor) or by volume of absolute alcohol, and for a total population (e.g., all persons in a state) or for just the drinking age population (typically 15 years and older).

Measures of volume of beverage alcohol may vary according to basic data source. International estimates tend to be made from reported annual sales volume.* National consumption averages are estimated from

*To arrive at an estimate of per drinker consumption, the annual sales volume of beverage alcohol is converted into units of absolute alcohol, to which estimates of illicitly produced beverage alcohol are added. This sum is then divided by the estimated number of users of beverage alcohol in a population. The overall consumption level is usually expressed as the annual alcohol consumption per drinker.

tax paid quantities entering consumer outlets.* For purposes of this report, Alaska estimates are based on taxable wholesale gallonage shipped into the state (through calendar year 1975, no appreciable quantity of beverage alcohol was manufactured in Alaska), based on excise tax payments maintained by the Alaska Department of Revenue.

The drinking age population from which estimates are made may also differ somewhat. The drinking age population is typically defined as 15 years and older. For this study, Alaska estimates of apparent consumption are based on a drinking age population of 18 years and older, due to the nature of available data.

B. COMPARISON OF THE CHARACTERISTICS OF APPARENT CONSUMPTION

Total Consumption of Beverage Alcohol

Available data on the consumption of beverage alcohol indicate a persistent trend of increasingly greater per capita consumption throughout the world.

Table IV-1, below, illustrates this trend by showing the apparent consumption of absolute alcohol for 26 industrialized countries for the years of 1960 and 1973, and the percentage change over time. The appropriate consumption rates for Alaska were computed and included in the international comparisons.

Of these countries, only one (France)** reported a decline in alcohol consumption. All others indicated increased consumption over the 13-year period. Although by international standards, the level of

*Temporary stocking up or inventory overloads may thus distort the apparent national consumption in any one year.

**France leads the world in per capita consumption of alcohol.

consumption for the U.S. does not appear very high during the indicated years,* a 36% increase in consumption was reported. The significant factor to be considered is that the U.S. showed an increase in the use of beverage alcohol similar to the international trend.

TABLE IV-1
ANNUAL ALCOHOL CONSUMPTION IN LITERS OF ABSOLUTE ALCOHOL PER
CAPITA 15 YEARS AND OLDER IN A NUMBER OF COUNTRIES
1960, 1973

Country	1960	1973	Change (%)
France	27.3	24.1	- 12
Italy	19.1	21.1	+ 10
Spain	11.9	18.5	+ 55
Luxembourg	13.8	18.5	+ 34
W. Germany	10.2	16.8	+ 65
Portugal	15.3	17.9	+ 17
Alaska	11.0	15.6	+ 42
C.S.S.R.	10.4	14.7	+ 41
Switzerland	12.5	19.3	+ 54
Austria	10.9	16.0	+ 47
Belgium	11.7	14.5	+ 24
Hungary	9.2	13.2	+ 43
Australia	9.5	12.2	+ 28
New Zealand	9.3	11.7	+ 26
E. Germany	7.8	12.3	+ 58
Yugoslavia	8.0	10.5	+ 31
U.S.A.	7.8	10.6	+ 36
Denmark	6.1	11.0	+ 80
Canada	7.8	11.1	+ 42
Great Britain	6.8	10.0	+ 47
Sweden	5.9	8.0	+ 36
Netherlands	3.8	10.1	+166
Poland	6.2	9.2	+ 48
Rep. of Ireland	4.9	9.0	+ 84
Finland	3.9	7.8	+100
Norway	3.6	5.4	+ 50

Source: Jan de Lint, Alcohol Consumption and Alcohol Problems from an Epidemiological Perspective, (unpublished manuscript, Addiction Research Foundation, Toronto, Canada, 1976), Table III.

The steady upward progression in beverage alcohol consumption seems to be a relatively recent phenomenon in the United States. Table IV-2 shows the apparent consumption of absolute alcohol in the U.S. from 1850 through 1975, and in Alaska from 1958-1975.

Between 1850 and 1945, American drinkers consumed a yearly average of slightly under two gallons of absolute alcohol per drinker. By 1945, average consumption increased to more than two gallons per drinker, remaining stable for about the next fifteen years, until 1960. Beginning

*U.S. ranked 15th (1960) and 16th (1973).

in 1960, however, apparent consumption in the U.S. increased very rapidly,* and by 1975 American drinkers were consuming approximately 40% more alcohol than they had been fifteen years earlier.

TABLE IV-2

APPARENT CONSUMPTION OF BEVERAGE ALCOHOL IN U.S. GALLONS
OF ABSOLUTE ALCOHOL PER CAPITA IN THE DRINKING AGE
POPULATION, U.S. (1850-1975)^a AND ALASKA
(1958-1975).

Year	U.S.	Alaska
1850	2.10	
1871-1880	1.72	
1891-1900	2.15	
1901-1910	2.50	
1916-1919	1.96	
1935	1.20	
1940	1.56	
1946	2.28	
1950	2.04	
1955	2.00	
1958	1.98	2.52 ^b
1959	2.06	2.70 ^c
1960	2.07	2.91
1961	2.06	2.88
1962	2.11	2.87
1963	2.15	2.91
1964	2.23	3.08
1965	2.27	3.25
1966	2.32	3.28
1967	2.37	3.58
1968	2.45	3.64
1969	2.51	4.04
1970	2.61	3.95
1971	2.61	4.34
1972	2.63	4.03
1973	2.80	4.13
1974		4.40
1975	2.90	4.54

^aExclusive of prohibition era for which accurate data are not available.

^b6/57-7/58

^c6/58-7/59

Sources: Alaska apparent consumption--computed from Department of Revenue monthly "Report of Alcohol Beverages Distributed and Sold in Alaska".
U.S. apparent consumption--multiple sources.

Dramatic as such a national increase was, the increase in apparent consumption within the state of Alaska was even more dramatic. In comparison to both international and national standards, Alaska

*Keller, Mark, ed., Alcohol and Health (Washington, D.C.: Gov't Printing Office, 1974), p. 19. An alternate explanation is that the rise in apparent consumption may not be due solely to a real increase in the average amount consumed per drinker but that a part of the total may reflect a higher proportion of actual drinkers within the drinking age population, especially women and youth.

ranks quite high in overall apparent consumption of absolute alcohol, as well as in its rate of increased use of beverage alcohol. During the years 1960 to 1973, for example, Alaska ranked within the upper third of 25 reporting countries, with respect to overall annual per capita consumption of alcohol (see Table IV-1).

When compared to national consumption figures, the recent increases in Alaska's level of apparent consumption appears even more drastic, as shown in Table IV-2. As can be seen, Alaska's level of annual consumption of absolute alcohol in 1958* was 27% greater than the national level--2.52 compared to 1.98 gallons of absolute alcohol, per person, in the drinking age population. By 1975, Alaska's rate of per capita annual consumption was 57% greater than the nation's--4.54 compared to 2.90 gallons of absolute alcohol, per person. In other words, while average annual consumption for the nation had increased by 46% from 1958 to 1975 for Alaska, it had increased by 80%. This relationship is depicted in Figure IV-1, below, which graphically shows the trend of greater annual consumption for Alaska compared to the U.S. as a whole, as well as the trend of the increasing rate of greater consumption for Alaska. There are no indications that these trends will not persist.

In short, the apparent consumption of absolute alcohol in Alaska since statehood is characterized by three facts. First, the quantity of absolute alcohol consumed annually by Alaskans has been, and still is, relatively high by both international and national standards.

*Consumption data for Alaska are not available prior to 1958, working date for statehood (actually January 3, 1959).

Second, the apparent consumption of absolute alcohol in Alaska has increased steadily since statehood--a trend consistent with international and national patterns. Finally, and most importantly, the rate of increasing annual consumption is alarmingly greater for Alaskans than the rate of increase for the national average--almost twice the rate of increase.

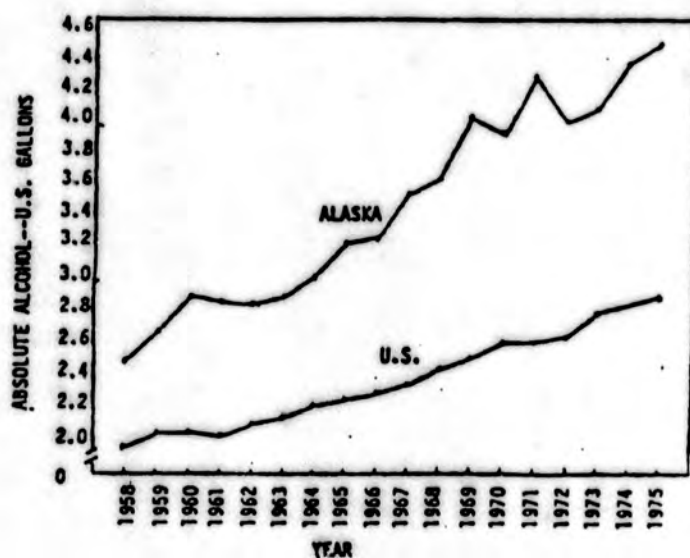


FIGURE IV-1 Apparent consumption of beverage alcohol in U.S. gallons of absolute alcohol per person in drinking-age population, Alaska and U.S., 1958-1975.

Source: Consumption figures from Table IV-2, this Volume.

Consumption of Specific Types of Beverage Alcohol

The conventional categories or types of beverage alcohol for purposes of analysis are beer, wine, and liquor. Each type has its own distinguishing characteristics and, of course, many types are included within each category. The primary characteristic of concern for division of types of beverage alcohol, however, is the alcoholic content, or percentage of absolute alcohol per unit of volume. Generally, wines contain a higher percentage of absolute alcohol (average of 14%) per unit volume than beer (average of 4.5%), while liquors contain the highest percentage of all (average of 43%).

Two major international trends have become apparent within the