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EPIDEMIOLOGICAL RESEARCH ON DRINKING PATTERNS AND PROBLEMS¹

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FOUR TRADITIONS OF ALCOHOL EPIDEMIOLOGY

Alcoholic beverages can be viewed from a number of perspectives. To a market economist, alcoholic beverages are one more category of consumer products, one which is used more widely than caviar, but less widely than soap. To a cultural anthropologist, alcoholic beverages are a widely-used medium of sociability (Partanen, 1991), carrying a wild diversity of symbolic meanings -- consider, for instance, the diverse associations in our cultures of "demon rum" and "champagne breakfast". From a public health perspective, alcoholic beverages are an agent of morbidity and mortality. Drinking alcoholic beverages, and drinking them in particular patterns and circumstances, can increase the drinker's risk of a variety of adverse health outcomes -- road traffic and other casualties, chronic health problems like cirrhosis and cancer, mental disabilities including alcohol addiction -- as well as social problems like failure in work, family and other roles, and harm to those around the drinker. Against this burden, there is some evidence that small amounts of alcohol may play a protective role in heart disease.

To study the epidemiology of drinking patterns and problems is to start from this public health perspective, since "epidemiology" itself implies that it is the patterning of a disease or disorder which is under study. Epidemiological studies, however broadly the term is construed, are thus only a portion of the whole range of social alcohol studies. Whatever their proximal focus, epidemiological studies are inherently problem-oriented studies; the eventual aim is to understand how the problems related to drinking may be prevented or ameliorated. Thus, if problem-free drinking is subjected to study, from an epidemiological perspective the aim is not to describe and understand general social processes, but to understand how drinking-related problems may be avoided.

Four traditions of alcohol epidemiology may be differentiated in terms of their underlying epistemologies. One approach -- a traditional perspective in medical epidemiology -- is to investigate drinking patterns as a potential risk factor for particular health or social problems. In this perspective, the "dependent variable" -- the outcome to be explained -- may be heart disease, or cirrhosis, or traffic casualties, and the task of the research is to specify when and under what

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circumstances aspects of drinking are etiologically involved. The investigation of the role of tobacco smoking in lung cancer would serve as a classic exemplar of this epistemological tradition. While there has been a substantial increase in epidemiological studies of the role of alcohol in physical disease in recent years, perhaps the strongest tradition of such epidemiological research in the alcohol field has been the investigation of the role of alcohol in traffic casualties.

A second approach, epidemiological studies of alcoholism or alcohol dependence, involves a quite different epistemology. Here the dependent variable -- alcoholism or alcohol dependence -- is alcohol-specific, while the independent variables or risk factors may not involve alcohol at all. Furthermore, the dependent variable is viewed as a clinical entity, a defined psychiatric disorder which the study has operationalized. The primary focus in earlier studies in this tradition was on methods of estimating the prevalence of alcoholism in different populations (Popham, 1970), although there were also a few psychiatric epidemiology studies in which alcoholism was included as a disorder. Recently, the tradition has taken on a new strength, particularly in the U.S., with the application of structured diagnostic interviews to general-population samples (Grant, 1990; Caetano 1991).

A third approach has been in terms of the epidemiology of alcohol problems. This tradition of "social epidemiology" has differed from the psychiatric epidemiological approach primarily in its view of the nature of the alcohol-specific dependent variable or variables. The study's measures of alcohol-related problems are taken at their face value, rather than regarded as operationalizations of an underlying disease entity. Thus, to avoid reifying her dependent variable, Knupfer (1967) specifically chose to call it "problem drinking" rather than "alcoholism". Other work in this tradition has often taken a "disaggregated" approach (Room, 1977a), with multiple "alcohol-related problem" variables. Frequently, work in this tradition has attended to the relation between drinking patterns as a predictor and alcohol-related problems as the dependent variable (Cahalan and Room, 1974; Mäkelä, 1978). In this sense, the third approach, like the first approach above, has long been amenable to the "harm reduction" perspective which is now coming to prominence for illicit drugs (Bruun, 1973; Room 1974).

A fourth approach has focused on the epidemiology of alcohol consumption, often without attention to whether or not there are associated problems. This tradition of work, which has been more widely carried on than any of the other three approaches, seems to have been guided by two conflicting impulses. In one perspective on the situation, the drinking itself is the problem to be explained. This "temperance" rationale can also be seen at work in the epidemiology of illicit drugs, where it has been rare to include measures of drug-related health or social problems; the main focus has been on explaining drug use itself as "the problem". The alternative, "wetter" rationale for studying drinking per se is couched in terms of the need to understand normal patterns of drinking, rather than focusing always on drinking-related problems (see debate concerning Room, 1984).

Whatever their epistemological traditions, all alcohol epidemiological studies tend to share a common set of approaches and problems in the measurement of alcohol consumption, of social and health problems, and of alcohol's relation to the problems. We turn now to a consideration of these issues of measurement.

Like other social and health phenomena, there are a number of methods by which data on drinking patterns and problems can be assembled and studied. Each method has its advantages

and drawbacks; thus, much can be gained from using several methods together in a common framework. There are a few examples of such combined approaches in the alcohol literature. For instance, a study of a strike in the Finnish alcohol stores in 1972 made use of observational data, general-population survey data, informal inquiries in special populations, hospital and casualty clinic records, and police reports in assessing the effects of the strike on consumption patterns and on alcohol-related problems (Mäkelä, 1980). Cross-national comparisons have often drawn on a variety of existing data sources: for instance, the International Study of Alcohol Control Experiences, which examined the recent history of alcohol controls, drinking levels and patterns, and alcohol-related problems in Canada, Finland, Ireland, the Netherlands, Poland, Switzerland and the United States, drew on a variety of existing institutional and social statistics and population survey data (Mäkelä et al., 1981; Single et al., 1981; Giesbrecht et al., 1983). A particularly ambitious international effort at multimethod data collection on alcohol-related problems has been the World Health Organization Study of Community Response to Alcohol-Related Problems, which aimed to combine in a common analytical frame data from existing social and health statistics, from a general-population survey, from special studies of clients in a variety of social and health agencies, and from observational studies (Ritson, 1985; Rootman and Moser, 1985).

In the following discussion, we will focus on methodological issues in two particular data-collection frames -- social and health statistics and general-population surveys. In focusing on these frames, we do not wish to ignore or deemphasize the importance and usefulness of observational and other data-collection methods. Much has been learned from special studies using such methods (see Room, 1977b); and, as implied by the preceding examples, such methods have an especially important role to play in multimethod studies. But in the context of epidemiological studies, it is social and health statistics and general-population samples which have served and probably will continue to serve as the primary sources of data.

THE MEASUREMENT OF ALCOHOL CONSUMPTION

Alcohol consumption statistics in epidemiology

Statistics on alcohol production and distribution, collected as a byproduct of governmental interest in taxing alcoholic beverages, are commonly viewed as indicators of alcohol consumption levels. Not quite all the beverage alcohol which is produced is actually consumed, of course. On the other hand, illicit alcohol production, home production, and tax-free personal imports will all usually escape registration in the official statistics. On balance, the statistics usually underestimate actual consumption. In the present-day U.S., this unrecorded consumption is relatively small, probably well below 10% of the recorded consumption, but in developing countries with strong traditions of home production (Partanen, 1991:46-47), or in small countries with high alcohol taxes (Österberg et al., 1990), the unrecorded consumption is often relatively large.

In principle, alcohol consumption statistics reflect the total volume of consumption of the population located in a particular geographic area. They give no indication of how the consumption is distributed between individuals or social categories in the population. The relatively small segment of the population which drinks very heavily will greatly affect the total volume; one person drinking 10 drinks a day will contribute as much to the total volume as 70 persons having a single drink once a week. Since it is estimated that one-tenth of the U.S. adult

population consumes over half the alcohol (Room, 1970), to a considerable extent trends in total consumption in a population can be regarded as an indicator of trends in very heavy drinking.

For comparative purposes, alcohol consumption statistics are usually converted to a per-capita basis, often with infants and children excluded from the population base (conventionally in U.S. statistics, the population aged 14 and over is used). Sometimes adult abstainers, with numbers estimated from survey responses, are also excluded, yielding a per-drinker consumption level. Separate statistics by general type of beverage (beer, wine, spirits) are usually available; using estimates of percentage ethanol content these are also aggregated to statistics on consumption of absolute (100%) alcohol. Sometimes distinctions by type of container are available, implying for instance a distinction between on-premises and off-premises sales. Otherwise, the main subdivisions of consumption statistics are by geography and by time. U.S. statistics are available at least on an annual basis and by state; in some states, particularly where the state monopolizes the wholesaling of alcoholic beverages, finer distinctions, for instance by county and month, are available. On the other hand, for Great Britain there are no consumption statistics available for any level below Britain as a whole.

Alcohol consumption statistics tell us something about patterns of drinking at a societal or cultural level, beyond the simple statistic of per-capita consumption. We can speak of "wine", "beer" and "spirits" drinking countries, for instance, on the basis of the predominant beverage. There has been an overall tendency towards convergence and homogenization of beverage preferences in recent years in industrialized countries, though the remaining differences are still large (Bruun et al., 1975; Mäkela et al., 1981).

Cross-sectional correlational analyses have often related other characteristics of regions, states, countries, etc., to levels of alcohol consumption. Such analyses have also related alcohol consumption levels to rates of social and health problems. While analyses like these can offer intriguing leads for further research, they are not very strong evidence of a causal relationship, since it is impossible to control for all the many other cultural and societal differences which could explain the patterns found. A more convincing approach is to study patterns over time in one or more societies, since the sociocultural variation is held relatively constant by comparing repeated observations in the same society. Using sophisticated time-series analyses, researchers have shown, for instance, that alcohol consumption levels are responsive to price in the short term even when long-term trends in consumer preference are pulling in another direction (Skog, 1986), and that rates not only of death from cirrhosis, but also of homicide and of suicide follow quite closely trends in levels of alcohol consumption, at least in some societies (see references in Norström, 1989; Skog and Elekes, 1992). Such analyses are important evidence on the causal role of drinking for many social and health problems.

Measuring drinking patterns in population surveys

The other main method of measuring drinking patterns in the population at large is by interviewing samples of the general population. The methods of survey research were first applied to detailed questioning about drinking in a pioneering survey of college students in 1949 (Straus and Bacon, 1953). The 1950s also saw the inception of other national traditions of survey research on drinking patterns and norms in such countries as Finland and the Netherlands (Allardt, 1957; Gadourek, 1963). Starting in the 1960s (e.g., Cahalan, Cisin and Crossley, 1969 for the

U.S.), nationwide surveys on drinking practices have applied full probability sampling methods, so that the results can be projected with a known level of confidence to the whole adult household population. Periodic surveys since then in several countries (e.g., Clark and Hilton, 1991 for the U.S.) not only keep our knowledge of national drinking practices up to date but also allow us to analyze and understand trends and patterns of change in drinking (for the U.S.: Midanik and Clark, 1992; Williams and DeBakey, 1992; Flewelling and Rachal, 1992).

Survey data on drinking patterns have both disadvantages and advantages in comparison to using alcohol consumption statistics. One disadvantage of surveys is that there are typically fewer data-points than from consumption statistics, which are updated at least annually. A more important disadvantage is that when compared to sales data, survey data on alcohol use usually accounts for only 45-60% of the alcohol sold. Some of this underreporting results from respondents shading their reports of their amount of drinking downwards. Also, sampling units for national alcohol surveys are households, and thus miss some heavy drinkers (for instance, those living in a hotel or shelter). Finally, the task of providing a yearly summary of a drinker's pattern of alcohol consumption is a difficult one at best, and the questions we use may be impossible to be answered accurately in a short period of time with closed-ended questions (Midanik and Hines, 1990). A well-established methodological literature (see Midanik, 1988; Clark and Hilton, 1991:19-70) seeks to improve the coverage of alcohol consumption in surveys.

The great advantage of survey data over consumption statistics is that each individual's patterns are recorded separately. An individual's drinking pattern can thus be related to other personal characteristics and behaviors. Patterns in all subgroups of the population can also be studied, while such analyses of consumption statistics are limited to geographically-defined subgroups.

A further advantage of survey data is that it allows a detailed examination of different facets of drinking behavior. Many drinkers have quite complex patterns of drinking. Let us consider a week's drinking by a relatively heavy-drinking respondent (less than five percent of North American adults report drinking as much as this). The pattern might look like this:

- one drink after work on Monday with a work associate;
- two drinks with family dinner on Monday, Tuesday and Thursday;
- no drinks on Wednesday;
- eight drinks out at a party Friday night.
- two drinks on a Saturday afternoon, relaxing in the backyard;
- four drinks out at dinner with friends on Saturday evening;
- no drinks on Sunday.

The respondent's pattern can be summarized in a number of ways. In terms of volume of drinking (the dimension tapped in aggregate statistics), the respondent drinks on the average 3 drinks a day. In terms of frequency of drinking, he or she drinks nearly every day -- 5 days out of 7. But neither of these summaries give a sense of the variability in the drinking pattern -- of the fact that the respondent drinks relatively moderate amounts on most days, but sometimes drinks much larger amounts. This aspect of drinking can be covered by a measure of dispersion, or with a summary of how often the respondent drinks more than a certain amount: for instance, this respondent probably falls into the often-used category of those drinking 5 or more drinks on one occasion at least weekly.

Which aspect of the drinking pattern is emphasized in the data collection and analysis will depend in part on the purpose of the research. As a risk factor for many long-term physical consequences of drinking -- cirrhosis of the liver, for instance -- the overall volume of drinking is probably the most important aspect. But as a risk factor for casualties or social disruptions associated with drinking, it is the "spikes" of intoxication which are most important, in combination with the drinking context. The greatest immediate risk associated with our sample respondent's drinking week, for instance, would probably be if he or she drove home on Friday or Saturday night. For studies attuned to such consequences, the average number of drinks per day is less important than the frequency of drinking large amounts of alcohol. Someone who drank every day one drink at lunch and two with dinner, for instance, would be at less risk of problems associated with intoxication than our sample respondent, although the overall volume of drinking would be the same.

There have been four main ways in which survey researchers have asked about drinking patterns. One tradition, particularly common in European studies, asks respondents about the details of recent drinking occasions (Alanko, 1984). This approach allows great flexibility in building summaries of drinking patterns, and lends itself also to collecting information on the context of drinking, but it requires many detailed questions and assumes that recent occasions are typical of the respondent's drinking.

The usual North American approach has been to ask the respondent to summarize his or her own drinking patterns. One version of this, the simplest, is to ask how often the respondent drinks, and how much he or she usually drinks on an occasion. Because of its brevity and its direct relation to the presumptively key dimension of volume of drinking, this has been the commonest approach in medical epidemiological studies, which typically are measuring many other factors as well as drinking in relation to some disease outcome such as breast cancer. But this approach ignores the dimension of variability in drinking, and is especially likely to result in underestimating the amount of drinking. Researchers hope that respondents provide an arithmetic mean number of drinks, but it is more likely that they offer modal quantities. Consider for instance our sample respondent above, who has the quite common pattern of drinking smaller amounts more frequently than larger amounts: even if he or she is motivated to provide an accurate response, the answer would probably be two drinks, when the actual average is three drinks a day. It should be noted that there is some evidence that asking usual quantity and usual frequency for each beverage type separately diminishes the underestimation. Further, Armor and Polich (1982) have proposed a method to "correct" usual quantity/frequency responses by factoring in two maximum drinking level frequency questions.

The third main approach has been called a "graduated frequencies" approach, because the respondent is asked about the frequency of drinking different amounts: for instance, how often he or she has 12 or more drinks, and then 8-11, 5-7, 3-4 and 1-2 drinks. This approach yields direct estimates of the frequency of drinking above particular thresholds, as well as estimates of volume and other facets of the drinking pattern. But it does ask quite a difficult summarizing task of the respondent. While the "usual amount" approach results in lower estimates of drinking, the "recent occasions" and "graduated frequencies" approaches seem to yield quite comparable results (Clark and Hilton, 1991:26-50; Midanik, 1992).

Finally, alcohol use has been measured in terms of social contexts. Respondents are asked

how often they engaged in common activities, how often they drink during these activities and how much they usually drink during these activities (Clark, 1985). Estimates of alcohol consumption used during some time period, usually one year, can be estimated from these social contexts and also compared to sales data (Single and Wortley, 1992). There is some evidence that this method yields higher estimates than other methods (Hilton, 1986; Single and Wortley, 1992).

It should be recognized that any single approach will do less than full justice to the complications of drinking behavior. Asking in terms of "drinks" of beer, wine and spirits, for instance, assumes an equivalence in alcohol content which is approximately true for bar drinks but often untrue for drinks poured at home. If what is really sought is an estimate of blood-alcohol levels achieved, then the time over which the drinking is done and the body weight (more exactly, the body water content) need to be taken into account. In particular, comparisons of men's and women's drinking, it has been argued, should take account of gender differences in weight and body water content (Dawson and Archer, 1992), and perhaps also in gastric alcohol metabolism (Frezza et al., 1990).

Methods of measurement and aggregation in drinking pattern measures can affect findings on the demographic patterns. In U.S. data, for instance, the relation with age and the relation with social class can be reversed according to which measure of heavy drinking is used (Room, 1971; Midanik and Room, forthcoming). In any study involving measurements of alcohol consumption, then, it is important to consider which dimensions of drinking behavior are of greatest relevance and interest to the outcome variables.

Developments in population surveys of drinking

By now, general population survey studies of drinking patterns have been carried out in many countries, often with a full analysis for English-language readers (e.g., Simpura, 1987; Harford and Towle, 1988). The availability of comparable data in different societies has given birth to a tradition of cross-national and cross-cultural analyses of drinking patterns (see Harford and Towle, 1988:22-24; Fillmore, 1992). As in the U.S., in a few other countries the lengthening tradition of general-population surveys has made it possible to analyze trends in drinking patterns, and even to undertake formal cohort analyses comparing the drinking of different age-cohorts, reaching the same life-stage at different historical moments (Neve et al., 1992).

Another approach to studying temporal changes in drinking patterns has been through longitudinal studies measuring changes in drinking over the life-course (see Temple and Leino, 1989). The accumulation of longitudinal studies of drinking in different societies has become the raw material for an ambitious meta-analytic study (Fillmore et al., 1991), applying special statistical methods to draw generalized conclusions from a diverse collection of longitudinal studies. Longitudinal measurements of the individual's patterns of drinking over a number of years, preferably by repeated reinterviews but otherwise by retrospective questioning (Sobell et al., 1988), are destined to play an increasing role in epidemiological studies of alcohol's role in long-term health consequences of drinking such as cirrhosis or cancer. Existing prospective epidemiological studies of alcohol's role in such diseases usually rely on measurement of alcohol consumption at one particular time, while it has long been clear that there is a good deal of variability over the life-course in drinking patterns (Cahalan, Cisin and Crossley, 1969:100-124) and it has recently been reemphasized that these temporal changes have implications for morbidity

(Lazarus et al., 1991). More precise measurements of the patterning of drinking over time become particularly crucial when medical epidemiological studies are used as the basis for recommendations on safe levels of drinking (Pols and Hawks, 1992).

In a public health perspective, these analyses of cultural and temporal variations in drinking patterns promise to increase our knowledge of how to reduce alcohol-related problems, since cultural variations in patterns of drinking are associated with different mixtures of alcohol-related problems (Mäkelä et al., 1981:60-62), and in a given society rates of alcohol-related problems tend to rise and fall with changes in the level of consumption (Bruun et al., 1975; Room, 1992). Several other developments in survey studies of drinking also have the potential to contribute to reducing the rate of alcohol-related problems. Social psychological studies of alcohol expectancies and attributions, often using survey methodology, seek to explain drinking patterns and associated behavior in terms of the roles of perceptions and expectancies surrounding drinking (Leigh, 1989). Studies of norms and contexts of drinking (Simpura, 1991), with their focus on the circumstances of the drinking occasion, have the potential to suggest not only ways to modify the drinking but environmental approaches to limiting the harm from drinking.

A crucial area for further development is in studies of the relation of different levels and patterns of drinking to alcohol-related problems. While this area has received considerable attention in social epidemiological research (Mäkelä, 1978; Clark and Hilton, 1991:194-248), medical epidemiologists, as we have noted, have tended to confine themselves to a single drinking measure at a single time in their prospective studies. Most often the choice has been volume of drinking, a dimension apparently easily measured and with convenient statistical properties for multivariate analyses. But even for some chronic physical consequences of drinking -- the Fetal Alcohol Syndrome, for instance -- there is some evidence that the patterning of drinking, and not just the cumulative volume, may be important. As attention turns increasingly to alcohol's role in casualties and in social problems, the need for a multidimensional approach to measuring alcohol consumption, and for attention to the norms and contexts surrounding the drinking occasion, will become urgent.

CONCEPTUAL ISSUES IN THE MEASUREMENT OF ALCOHOL-RELATED PROBLEMS

Neither the first nor the fourth traditions considered above -- the classic tradition of epidemiology of medical disorders and the tradition of studies of the epidemiology of alcohol consumption -- are much concerned with the measurement of alcohol-related problems. Consumption studies are unconcerned with measuring health or social problems -- except to the extent drinking patterns themselves are regarded as problems -- while classic medical epidemiology starts from a measurement of the problem without regard to its alcohol relationship, calculating the relationship between drinking patterns and the health problem as the main object of the study.

Both the second and third traditions, however, are involved in defining dependent variables which include within them both a problem and a presumptive alcohol causation. In both traditions, the measurement is usually of isolated individuals, and a reported problem is usually regarded as seated within the individual rather than in an interaction or a collectivity.

The social location of the problem

If a 30-year-old father is seriously injured by a drunk driver, this can be seen as constituting various problems at a variety of different social levels. In the first place, it is obviously a health problem and potentially an economic problem for the injured man himself. The incident also creates problems for the man's family. Then, too, it is likely to result in problems with the police and courts for the drunk driver. The factory in which the injured man works also loses the productivity of his labor -- unless there is someone otherwise unemployed who can step right into his job. Likewise, the overall productivity of the society in which the victim lives potentially suffers.

On the other hand, the accident may actually benefit other people -- for instance, those who repair damaged cars, and those who earn a living supervising convicted drunk drivers. Assumptions that these people could be doing something else more productive if it weren't for the drunk driver may not match the economic and structural realities of the society.

In everyday life, as in the example we have given, incidents or conditions are often problems at multiple levels. At least in principle, however, a behavior or condition may be a problem at one level but not at another. In a society with considerable unemployment, for a worker to lose a job because of drunkenness may be a personal tragedy, but may not represent a loss of production for the society as a whole. Conversely, a work environment tolerant of drunkenness on the job may result in considerable loss of production without it causing individual problems to any of the workers involved. The individual-level design of most epidemiological studies potentially loses sight of this issue of for whom and at what level the behavior is a problem.

Alcohol as a cause of problems

For some alcohol-related problems, alcohol is intrinsic to the problem. The crime of drunk driving, for instance, is usually defined as driving an automobile while having more than a certain level of alcohol in the blood; as a problem, it does not exist without the alcohol. For most alcohol-related problems, however, alcohol can be seen as a necessary but not sufficient element in the problem, so that alcohol's causal role is conditional. Thus a drunken pedestrian's fall on an icy sidewalk might not have occurred if he had not been drinking, but it also might not have occurred if the sidewalk had not been icy, or if he had been wearing more suitable shoes. Alcohol's relation to the occurrence of a problem may also be a matter of coincidental association, so that the problem would have occurred even in the absence of drinking. It has been estimated from U.S. data that about one-half of the fatal road accidents involving a drunk driver would have occurred even if all drivers had a zero blood-alcohol level (Reed, 1981, pp. 338-341).

Even when the empirical relation of drinking to problems is well understood, the conditional nature of alcohol's role in most problems gives considerable play to social definitions of whether a problem is an alcohol problem or some other kind of problem (see Mäkelä, 1976). In many circumstances, the scope for variations in definition is even wider, since the empirical relations are not well understood. In the 1930s in the U.S., before the introduction of blood alcohol measurement equipment, policemen attributed only a very small proportion of road accidents to drinking. On the other hand, in the heyday of the U.S. temperance movement, it was an article of firm cultural belief, buttressed by studies of inebriety among prisoners, that three-quarters of all crime was due to intemperance (Levine, 1983). Societies with a historically

strong temperance tradition seem more likely than other societies to attribute social and health problems to alcohol. Societies are not even necessarily internally consistent in their definitions of alcohol's responsibility for problems; thus there is great variation within American civil and criminal law concerning the relevance of drunkenness in assigning responsibility for a problem (Dooley and Mosher, 1978; Epstein, 1978; Mosher, 1983).

At the individual level, too, there are considerable variations in whether a problem is defined as an alcohol problem. Stereotypically, a husband and wife may agree that they have a marital problem, but the wife defines it as a problem with the husband's drinking, while the husband defines it as a problem with the wife's "nagging". A U.S. study of domestic disturbances where the police were called in found considerable differences in perspective on the role of alcohol in the events. The police reported that the complainant had been drinking in 26% of the cases and the person complained against in 30%; however, they perceived alcohol to be primary in the origins of only 14% of the disputes. In 10% of the cases, complainants described the person complained against as drunk -- but the police agreed with this description less than half the time (Bard and Zacker, 1974). A forensic study of injured robbery victims in Poland suggests that in Poland, too, there is often disagreement between the victim and an attending professional concerning the role of alcohol in problematic events (Marek, Widacki and Hanausek, 1974). Despite such scattered data, systematic investigation of the circumstances in which problematic behaviors are attributed to drinking remains an agenda for future research (see Room and Collins, 1983; Critchlow, 1983).

For alcohol-specific indicators in social and health statistics, the alcohol attribution is usually made by a professional (e.g., a doctor for a death certificate). Frequently, however, the identification of the alcohol aspect does not necessarily attribute cause (e.g., a policeman checking off a box marked "had been drinking"), and the attribution is frequently based on hearsay from relatives or bystanders.

Both for psychiatric and social epidemiological population surveys, the main source of the alcohol attribution is the drinking respondent him/herself. Particularly in social epidemiological surveys, the respondent is also often asked to report whether others find the respondent's drinking is causing problems.

Types of alcohol-related problems

The tradition of psychiatric epidemiology is typically interested in only a couple of diagnostic dimensions: alcohol dependence (DSM-III-R, DSM-IV, and ICD-10), and alcohol abuse (DSM) or harmful drinking (ICD-10). In a structured diagnostic interview approach, however, a long series of questions will lie behind these diagnostic categories, with the questions often considerably overlapping questions in the alcohol problems measurement tradition (Room, 1991). Likewise, several types of problems are included in some form in the alcohol dependence criteria, so that almost all of the issues discussed below concerning types of problems are invoked for this tradition as well as for the social epidemiological tradition.

We may divide the primary alcohol-related problems, as seen at the individual level, into a few major types: problems of physiological consequences of drinking; mental and existential problems; casualty problems; and problems of social demeanor and role performance (Figure 1; see also Room, 1980a, 1981). Each of these general types of problems can occur in association

with a particular drinking event. Thus a drunken episode can result in death from an alcohol overdose as a physiological consequence, in feelings of guilt and remorse as a mental consequence, in a broken leg as a casualty problem, and in an arrest for disturbing the peace as a social-performance problem. On the other hand, most types of problem may occur in the wake of a whole sequence of drinking events, that is as a consequence of the individual's drinking history seen as a condition. Thus a long history of heavy drinking may lead to alcoholic cirrhosis as a physiological consequence, to an existential sense of loss of control as a mental consequence, to suicide as a casualty problem, and to a loss of a child custody dispute as a social-performance problem. It should be noted that despite a tendency for "acute" consequences to be associated with drinking events, and "chronic" consequences with a cumulative drinking history, a bout of drunkenness can have chronic consequences and a history of drinking can have an acute outcome.

FIGURE 1: EXAMPLES OF TYPES OF INDIVIDUAL-LEVEL PROBLEMS COMMONLY RELATED TO DRINKING EVENTS AND TO DRINKING HISTORY

	Type of alcohol-related problem --			
related to:	<u>Physiological</u> <u>Consequences</u>	<u>Mental &</u> <u>Existential Probs.</u>	<u>Casualty</u> <u>Problems</u>	<u>Soc.Demeanor</u> <u>& Role Probs.</u>
<u>Drinking</u> <u>Event</u>	overdose	remorse & guilt	broken leg	arrest: distur- bing the peace
<u>Drinking</u> <u>History</u>	cirrhosis	feelings of loss of control	suicide	loss of family relations

In a clinical frame of reference, it is quite usual to interpret a pattern of events -- of symptoms and behaviors -- as signifying a disease condition. In everyday life, also, the repetition of behaviors will eventually earn for their performer a summary label or master identity. Often, then, what we consider as a condition is actually a description of a sequence of events. Arriving at appropriate criteria for characterizing drinking behaviors and events as a condition is a perplexing conceptual and methodological problem. Frequently, attributions of a condition -- for instance, "alcoholism" or "alcohol dependence" -- both in research and in life are based on a relatively small base of events. Perhaps the extreme in this regard is the assumption in some drunk-driving studies that anyone arrested with a blood-alcohol level over .25% should be considered as an alcoholic (see Cameron, 1977, p. 236). A disposition to see events only as potential indicators of conditions may divert attention away from promising prevention strategies: it is worth keeping in mind that events are often more easily prevented than conditions.

The four major types of alcohol problems each have a different conceptual location and raise different problems of methodology and measurement. The conceptual location of physiological consequences of drinking is not problematic: such problems are in principle physically measurable problems of the individual's body. At least the most extreme indicator -- death -- is measured and recorded in the health statistics in most countries, and measures of morbidity are also sometimes available. But while the fact of death is incontrovertible, the attribution to alcohol is not; alcohol-specific attributions, in fact, are so subject to cultural definition that cross-cultural comparisons usually fall back on total cirrhosis mortality, whether or not alcohol-related, rather than using "cirrhosis with mention of alcoholism". For mortality, at least, a blood-alcohol reading can establish alcohol's presence in the events of death. This is appropriate for acute physiological consequences of drinking bouts such as alcohol poisoning; but for the numerically more important chronic physiological consequences of drinking, drinking history rather than alcohol in the event is the relevant aspect of alcohol to be measuring.

Alcohol's presence in the event is far more relevant in establishing an alcohol attribution for casualty problems -- whether they are classified as unintended ("accidental") or intentionally inflicted ("criminal"). In terms of the resultant injuries and impairments, such problems are also located in the individual's body. As occurrences, however, they fall in the class of what Haddon terms "energy damage processes" -- the too-rapid transfer of energy between the individual's body and the physical environment (Haddon, 1973). In this sense, attention to the physical and social environment of behavior while and following drinking is as important as attention to the behavior itself in understanding the occurrence of alcohol-related casualties. From a preventive standpoint, making the environment safer may often be a more effective strategy for reducing rates of alcohol-related casualties than attempting to alter drinking behavior (Ross, 1982).

The category of mental and existential problems related to drinking is usually seen as located in the individual -- whether in the mind, the body, or the soul -- although there are schools of thought such as transactional analysis or family process theories which would tend to see such problems as located in social interactions between two or more parties. But wherever such problems are seen as being located, the problem is defined not only by the pattern of behaviors and experiences but also by the interpretation of them by the drinker or by others. At the heart of the modern disease concept of alcoholism has been the concept of a consciously experienced loss of control over drinking, and over one's life as a result of drinking. Similarly, the concept of addiction represents a clinical or self-"diagnosis" of repeated behaviors which are presumptively harmful (Room, 1973). Such concepts may be seen as quite culture-bound -- addiction conceptions of alcoholism only became established in European thought in the early nineteenth century (Levine, 1978; Room, 1985).

Apart from the issue of loss of control, a variety of other mental problems are also seen as alcohol-related. In part reflecting its pharmacological action, alcohol is deeply entwined with depressive disorders. Some neurological disorders reflect physiological changes due to long-term heavy drinking. Drinking is also seen as causing various kinds of "disinhibition", and particularly as leading to aggression and violence. While this link is a widely and firmly held belief, drunken comportment has been shown to vary greatly in different cultures (MacAndrew and Edgerton, 1969), and convergent lines of evidence suggest that the link between drunkenness and aggressive mental states is a matter of cultural interpretation and belief more than of pharmacology (see

Room and Collins, 1983; Critchlow, 1986).

Perhaps the most variegated among the four categories of alcohol-related problems we have outlined is the area of problems of social demeanor and role performance. Since such problems by definition represent an incongruity between an individual's actual performance in a given situation and the performance expected of him by others, these problems are as much located in the relevant social norms and in the reactions of others to the drinker's behavior as they are in the drinker's behavior. From the point of view of prevention, this implies the possibility of reducing the level of problems by changing the normative reactions to the drinker's behavior, or by insulating the behavior from potential reactions, as well as by changing the behavior itself.

In some cultures and times, the fact of drinking is itself considered a problem. In most societies, drinking is considered problematic in particular situations (e.g., in a law court) and for particular statuses (e.g., children). A legal prohibition on having more than a limited blood-alcohol level while driving an automobile is now nearly universal in industrialized societies. In many societies, drunkenness -- particularly drunkenness in public places, and particularly when associated with a disruptive demeanor -- has been regarded as a crime or at least as warranting police attention.

These varied proscriptions and prescriptions regarding drinking events and associated behaviors are the threads which form much of the tapestry of alcohol's position in a particular culture. But at least as important in most societies are the social problems related to longer-term cumulative drinking patterns. In many industrial societies, indeed, the most common stimulus for referral to alcoholism treatment is a perception that the individual has defaulted on major social roles -- responsibilities in the family and in the work setting -- as a result of repeated drinking episodes. It is this empirical connection which underlay the tendency, criticized by Seeley, for classic definitions of "alcoholism" as a disease to "include such social consequences . . . in the definition of a disease" (Seeley, 1959, p. 355).

TRADITIONS OF MEASUREMENT OF ALCOHOL-RELATED PROBLEMS

Social and health statistics

The extraordinary range of social, health and personal problems related to drinking is matched by the wide variety of social and health agencies that respond to the problems. But these agencies tend to vary considerably in the attention they give to record-keeping, and in the specific attention they give to the role of alcohol in the problems. The most widely available statistical series with data directly related to alcohol problems are mortality statistics by cause of death. While few categories in these series are alcohol-specific (and those that are -- e.g. death from "alcoholism" -- are often ill-defined), a number of causes of death are sufficiently alcohol-related to have been used as indicators of alcohol problems trends, and -- with somewhat less confidence -- in cross-cultural and other comparisons of geographic units. Indicators of chronic health consequences of drinking have included mortality from cirrhosis, from head and neck cancers, and from alcoholism and alcoholic psychosis. Cirrhosis mortality has been the most widely used of these indicators, although the earlier tradition of treating it as an adequate indirect indicator of a globally-defined "alcoholism" has been largely abandoned (see Popham, 1970). Suicide and homicide mortality statistics have sometimes been used as indicators of alcohol's role in violent events. In many places with well-developed death recording systems, statistics are now available

on the blood alcohol level in the decedent at the time of death. The best-developed vital statistics in this respect are those on road traffic deaths; for such deaths, blood alcohol level is now routinely determined in many places. Such measurements greatly improve the utility of casualty death series as alcohol problems indicators, although it must be kept in mind that alcohol's presence does not necessarily imply even conditional causation of the event.

In general, morbidity data are far less comprehensively available than mortality data. The most widely available alcohol-related morbidity statistic has been for admissions to psychiatric hospitals with a diagnosis of "alcoholism", "alcoholic psychosis" or related conditions. This statistic used to be more widely useful than it is now; in the decades before the 1960s, psychiatric hospitals were probably the main location of state-provided treatment for alcohol-related mental problems in most industrialized countries. In some countries, such as Poland (Moskalewicz, 1981), these statistics remained useful indicators of alcohol-related problems into the 1980s -- at least as such problems are manifested in state-supported treatment facilities. But in some countries, the decentralization of mental problems treatment into community institutions, often combined with the growth of alcohol-specific community treatment agencies, has made psychiatric admissions indicators unavailable, or irrelevant as indicators of the whole alcoholism treatment population (see Bunce et al., 1981; Morgan, 1982).

Morbidity statistics on alcohol-related injuries, including blood-alcohol levels or at least a medical notation of drunkenness, are gradually becoming more widely available, particularly for road accident injuries (see NIAAA, 1979, p. 23; Aarens et al., 1977). Nevertheless, reporting-system data on the alcohol component in casualties are generally inadequate for tracking trends. Morbidity statistics on cirrhosis and other long-term physiological consequences of drinking are also gradually becoming more available. Special studies in several countries have suggested that a heavy drinking history is part of the background of a large fraction of health conditions requiring hospitalization (see Rice et al., 1990; Gervois et al., 1985).

The other statistical system which routinely provides data on alcohol-related problems in a number of countries is the system of police and court statistics. Two major alcohol-specific charges -- drunk driving and public drunkenness arrests -- are the most widely available statistics, with the public drunkenness series being partly or completely replaced by sobering-up station statistics in countries that have decriminalized public drunkenness. While statistics on all classes of non-alcohol-specific crime are widely kept, it is only in countries -- such as Finland and Poland -- where there is a special cultural association of and concern about alcohol as a cause of violence that a systematic effort has been made to keep statistics specifying whether drinking is associated with the crime.

It will be seen that the social and health statistics relevant to alcohol-related problems which are usually available cover only a fraction of the total range of alcohol-related problems outlined above. The coverage is also very uneven across the various types of problems. Health and mental health statistics provide indicators in the physiological consequences, mental problems, and casualty problems areas, but with a heavy bias towards the most serious consequences -- death and commitment to inpatient psychiatric treatment. Police and court statistics provide indicators only concerning the criminal aspects of alcohol-related social and casualty problems. The most glaring deficiency is the lack of adequate indicators of alcohol's impact on family and work role functioning (Cook, 1991) -- or, viewed at a societal level, on the tasks of production and

reproduction (Mäkelä and Viikari, 1977).

Apart from this deficiency, the most notable drawback of social and health statistical series is that they measure the operation of major agencies of rehabilitation and social control in the society; indeed, often the primary purposes of the collection of the statistics are as "management information" and as accounting controls for these institutions. There is a lengthy literature on validity and reliability problems in mortality statistics -- and certainly alcohol-related deaths are especially likely to be misrecorded -- but, among statistical series we have been discussing, mortality statistics are probably the least sensitive to policy shifts in the societal response to health and social problems, and thus the most closely tied to "real" changes in the prevalence of alcohol-related problematic behaviors and conditions. Morbidity statistics, and police statistics even more, are notoriously sensitive to policy shifts in the societal priorities on and handling of different social and health problems. As such, they provide valuable information; but it is not information that readily forms a reliable indicator of the problematic behaviors and conditions. Sometimes internal evidence will suggest a partialing out of a trend between changes in underlying behavior and changes in social response -- for instance, a lowering of the average blood-alcohol level of arrested drunk drivers suggests that there has been a stepping up of enforcement attention to drunk driving. But in general, routinely-collected social and health statistics do not distinguish between changes in problematic behaviors and conditions in the population and changes in the societal response mechanisms. Special studies, with a much more elaborate data collection, often separate from the case-handling procedures, for a sample of cases, provide one means of periodic "recalibration" of the relative contributions to the routine statistics.

Surveys of general populations

Recent years have seen the emergence in a number of countries of traditions of population surveys concerning problems related to drinking, though these traditions are less widespread than the well-established traditions of surveys on drinking practices. As we have noted, some population surveys have been conducted within a tradition of psychiatric epidemiology, with an emphasis on defining and measuring the prevalences of psychiatrically relevant conditions -- "alcoholism", "alcohol dependence", etc. (e.g., Helgason, 1964; Weissman, Myers and Harding, 1980; Room, 1991; Grant et al., 1992). The alternative social epidemiological tradition of measurement of a range of alcohol-related problems has also been particularly active in North America (Mulford and Miller, 1960; Knupfer, 1967; Clark, 1966; Cahalan, 1970; Cahalan and Room, 1974; Clark and Hilton, 1991. See Edwards, 1973 and Room, 1977a).

The primary approach to measuring the prevalence and patterning of alcohol-related problems in surveys has been to ask respondents about their experiences of problems which they see as related to their own drinking. (In some surveys, a respondent has been asked to report on problems related to drinking for each household member; U.S. validity studies comparing data from such "collateral informants" with that from the drinker suggest that the collateral data is if anything less complete than the drinker's responses). Surveys have thus tended to rely on the drinker or a close informant to determine the issue of "attribution" -- to make the connection between the drinking and the problem. Though this is probably a sensible decision, it would be interesting to know more about the bases on which such attributions are likely to be made. An alternative approach to the survey measurement of social and casualty problems would be surveys

of the "victims" and bystanders. Only a beginning on such an approach has been made (see Fillmore, 1985), and the empirical relation between the alternative perspectives remains to be mapped.

In terms of the conceptual framework laid out above, drinking-problems surveys tend to have been oriented more to the measurement of conditions than of events (although many of the concrete items interpreted as indicating conditions actually reflect events). In English-language studies, under the influence of the disease concept of alcoholism, much attention has been given to asking questions indicating dependence on or loss of control over drinking, and to measuring behaviors seen as symptomatic of dependence. While interpretations of what respondents may mean when they report drinking "because I need it when I'm tense or nervous" or worrying "about not being able to get a drink when I need one" have changed over time (Cahalan and Room, 1974; Room, 1977a), it is certainly true that considerable numbers of respondents in English-speaking countries will answer positively to questions such as these, which indicate some degree of self-consciousness and concern over their drinking.

From their inception in the 1960s, general-population surveys of drinking problems in English-speaking countries have also included items measuring what have sometimes been called "tangible consequences" of drinking -- that is, "consequences of drinking which are at least in principle verifiable by someone other than the respondent" (Cahalan and Room, 1974, p. 27). Items covering each of the three domains of such problems outlined above -- physiological consequences, casualty problems, and social problems -- have usually been included; but it is clear that the coverage has been most adequate for the last of these three domains. In a cross-section of the general population, experience of severe physiological consequences at any one time is relatively rare. Even for such severe consequences, there is a problem of attribution; did a doctor or other health worker think the problem was related to alcohol, and if so was the respondent told of the connection? On the other hand, at least in the U.S., less stringently worded items tend to pick up vague fears and worries rather than concrete experiences of physiological problems. With respect to casualties, also, the emphasis tends to have been on relatively stringent summary items in the general drinking-problems surveys, although special analyses concentrating on the casualty area suggest a much wider experience of bumps and cuts related to drinking in the population, which could profitably be pursued with survey methods (see Aarens et al., 1977, pp. 60-62, 556-566, 591-592).

Both in U.S. data (e.g., Cahalan 1970) and elsewhere (Roizen, 1981), the most common "tangible consequence" of drinking in survey studies is usually "spouse complaints" about the respondents' drinking -- in fact, predominantly wives' complaints about their husbands' drinking. The wives, when asked about the matter, confirm the high prevalence of such family disputes (Knupfer, 1968; Room et al., 1991). Studies of young couples in Finland and the Soviet Union have shown that in those societies, too, wives have the burden of being expected to try to control their husband's drinking (Holmila, 1987). Surveys also find substantial rates of dissatisfaction among other family members, and some complaints also from the work environment and from friends (Room et al., 1991). U.S. respondents are often willing to concur that their "drinking has harmed" significant roles and areas of their life, although concrete occurrences like divorce over drinking are considerably rarer. Problems with the police over drinking are also reported by only a small proportion of the U.S. population. Limited sample sizes have often constrained more

extended analyses of particular problems of social demeanor and role performance. But, despite their limitations, survey research data are usually the best method available of estimating the prevalence of the social problems -- besides offering the possibility of a more extended correlational analysis.

To a considerable extent, then, the survey method and the health and social statistics method of measurement complement each other in their strengths and weaknesses. Thus health and social statistics make their best showing in measurements of chronic physiological conditions and of casualties, while surveys do better in measuring experiential and affective states and problems of social demeanor and role performance. Likewise, health and social statistics record problems that are very serious better than those which are mundane and everyday, while the rarity of any particular kind of serious event or condition makes it difficult to "capture" adequately in any but an extraordinarily large -- and thus expensive -- population sample.

Developments in population surveys of alcohol-related problems

Recent years have seen the expansion to a broader range of countries and cultures both of social epidemiological surveys concerning alcohol-related problems (e.g., Garretsen, 1983; Harford and Towle, 1988; Hauge and Irgens-Jensen, 1985; Roizen, 1981) and psychiatric epidemiological surveys concerning alcohol dependence and other diagnostic categories (e.g., Helzer and Canino, 1992). With the exception of inter-Scandinavian comparisons, relatively little advantage has yet been taken of the opportunities the spread of alcohol-related problems surveys offers for comparative analysis.

A recent development in North America has been the completion of psychiatric epidemiological surveys with sample sizes an order of magnitude greater than previous surveys in the alcohol field. Thus the 1988 National Health Interview Survey alcohol supplement was completed by 43,809 adults (Grant et al., 1991; Grant et al., 1992). Reports will be appearing shortly from the U.S. National Comorbidity Survey (N= 8908), coordinated by Ron Kessler, and the equally large Ontario Health Survey supplement, and from the U.S. National Longitudinal Alcohol Epidemiology Survey (N= 50,000), directed by Bridget Grant. All of these instruments are primarily oriented to the criteria for dependence and abuse diagnoses, but also include substantial data on drinking patterns and problems. Such large data-sets will allow analyses of rates and patterns in relatively small population segments, for instance specific ethnic groups and specific occupations, which have heretofore been mostly beyond the reach of survey analyses. They will also allow researchers to pick up Knupfer's challenge (1989) to study drinking problems in the relatively small proportion of general populations which are really heavy drinkers.

As with drinking patterns, the lengthening of the tradition of general-population surveys of drinking problems has made possible the development of a tradition of trend studies (Clark and Hilton, 1991:139-162). The trend-lines for different alcohol-related problems will not necessarily run in parallel; in particular, in an era of heightened consciousness of alcohol-related problems and a heightened problematization of heavy drinking in the U.S., there is some evidence that indicators of experienced loss of control and of interpersonal problems with drinking may go up even as consumption levels and indicators of alcohol-related physical problems such as cirrhosis or casualties are dropping.

From the first, epidemiological surveys of drinking problems have often been concerned

with longitudinal patterns through the life-course (e.g., Robins et al., 1962; Knupfer, 1972; Cahalan, 1969). The contrast between the peak for drinking problems at ages 18-25 in general populations in many industrial countries and the peak for clinical population of alcoholics at ages 35-39 has posed the question of which young problem drinkers will "mature out", under what circumstances, and which will go on to join the clinical population. In U.S. data, it is clear that there is substantial "natural remission" (without clinical intervention) among general-population problem drinkers (Roizen et al., 1978), but that the turnover in drinking problems is smaller among middle aged than among younger respondents (Fillmore, 1987a; Fillmore, 1987b).

As noted above, the analysis of the relation of different drinking patterns to rates of different alcohol-related problems remains an understudied area, despite its crucial significance in policy discussions of "safe levels" of drinking (Pols and Hawks, 1992). A number of analyses of the relation between drinking levels and patterns (e.g., Clark and Hilton, 1991:194-246; Knupfer, 1989) have picked up the analytical traditions reviewed by Mäkelä (1978), and such analyses have recently been extended cross-nationally (Fillmore et al., 1992). But we are still a long way from specifying risk functions for particular kinds of alcohol problems by patterns of drinking in a particular group in a particular society -- the kind of information which would best inform policy and publicity on "safe levels" of drinking. As the discussion above indicates, it is clear that the amount drunk on and circumstances of heavier drinking occasions are more important than overall volume of drinking as a risk factor for casualties and for many social problems of drinking, and publicity on "safe levels" would be well advised to take this into account.

Apart from the broader research possibilities of multivariate and longitudinal analysis, the social importance of measuring trends in alcohol problems indicators constitutes a strong argument for periodic general-population drinking practices and problems surveys. As Edwards put it some time ago, "a case might be made for any country which uses alcohol as a recreational drug also accepting the need for a national sample survey repeated at, say, 5-year intervals" (Edwards, 1973, p. 51).

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