

QUARTERLY JOURNAL OF
STUDIES ON ALCOHOL

Lay Supplement No. 6

DISPLAY COPY
ALCOHOL AND LENGTH
OF LIFE

Prepared and issued by the
QUARTERLY JOURNAL OF STUDIES ON ALCOHOL

List of Lay Supplements Published and in Preparation

Published

1. The Problems of Alcohol
2. The Nature of Alcoholic Beverages and the Extent of their Use
3. Alcohol and Industrial Efficiency
4. Facts on Delirium Tremens
5. Alcohol, Heredity and Germ Damage
6. Alcohol and Length of Life
7. What Happens to Alcohol in the Body
8. Alcoholic Beverages as a Food and their Relation to Nutrition
9. Facts on Cirrhosis of the Liver
10. The Drinker and the Drunkard
11. How Alcohol Affects Psychological Behavior
12. The Rehabilitation of Inebriates

In Preparation [Titles tentative]

13. How Alcoholic Beverages Affect the Body
14. Government and the Alcohol Problem

Orders should be addressed to:

QUARTERLY JOURNAL OF STUDIES ON ALCOHOL
Editorial Office: Laboratory of Applied Physiology,
Yale University
52 Hillhouse Avenue, New Haven, Conn.

The Lay Supplements range in length from 12 to 24 pages. All except No. 1 contain, when available, a suitable list of selected reading for those who are interested in studying the subject beyond the scope of the Supplements.

Prices: 10 cents each; \$6 per hundred of each Lay Supplement;
\$1 per set of 14 Lay Supplements.

(Subscribers to the full set of 14 Lay Supplements receive each additional Supplement when it is published)

Copyright Dec. 1941 by JOURNAL OF STUDIES ON ALCOHOL, INC., Publishers
Reprinted Sept. 1945, Aug. 1946, March 1948, Sept. 1949, Sept. 1951, July 1952
Printed in the United States of America

ALCOHOL AND LENGTH OF LIFE

THE average man lives longer today because he is better protected than in the past against those forces which tend to shorten his life.

In the United States in 1901 a newborn white male infant could be expected to reach, on the average, an age of 48.2 years. In 1940, the expectation was 60.8 years.

The prolongation of average length of life has resulted from the application of the knowledge gained by medical science for the control of disease, particularly infectious disease. As a result of this knowledge and its application, more men live longer than in the past.

But what is called the span of life, that is, the upper limits of human life itself, has not been advanced. A man who had reached his 90th birthday in 1901 had, on the average, 2.9 years to live, and in 1940, the life expectation at this age was also 2.9 years.

A still further increase in the *average length* of life, but not in the *span* of life, may be expected if man is able to gain further knowledge and apply it. Unfortunately it often happens that even when such knowledge is gained he is unwilling to apply it, particularly if the application interferes with his pleasures. And too often also what he sometimes considers his pleasures is the gratification he finds in excesses. Man often wants to eat his cake and have it too. This saying is particularly appropriate here since the excesses in which he indulges are largely those of eating and drinking.

From time to time it is impressed on man how detrimental some excesses are to prolongation of life. The tendency is then to confuse *abuse* with use itself and to assume unreasonably that use to any extent, moderate as well as excessive, is the cause of detriment. The harm known to arise from excess is then assumed to exist inherently in the substance which causes harm in excess. Thus while overenthusiasm against overeating cannot be carried to the point of not eating at all, it has often been applied to one or more particular foods. The food then bears the blame for the harm from excessive use. Thus fads have arisen in which no meat is eaten, or no salt is used, or all milk is avoided, when the fact is, only excessive use is harmful.

Similarly, it has long been believed that the excessive use of alcohol shortens life. But as with the food fads, the extent of use has often been ignored and the idea of excess discarded, so that the arbitrary conclusion reached is that the use of alcohol shortens life. *Use and abuse are not synonymous, either for alcohol, or for potatoes or meat.* Unfortunately, the illogical confusion of use and abuse has actually found its way into some otherwise scientific writings on alcohol and conclusions are made as to the effects of alcohol without any qualifications as to the amount of alcohol used. Alcohol is taken as synonymous with all beverages containing alcohol. No distinction is made between the man, on the one hand, who drinks temperately and uses an alcoholic beverage as an accessory to his meals and, on the other hand, the man who drinks to excess and uses alcohol as a substitute for other foods.

Still other investigators following this unscientific way of thinking have assumed that any change in behavior or response, no matter of what nature, after drinking even very minute quantities of alcohol, is an indication that the changes are detrimental changes simply because they occur *after* the use of alcohol. They reason that alcohol is bad; therefore, any change in bodily activity found after the use of alcohol must be bad.

It is this sort of unscientific conclusion, in which all results prove a preconceived idea, that makes it difficult to obtain sound information on many of the problems of alcohol. And this is especially true of the influence of alcohol on length of life. In many of the statistical studies made to show the difference in length of life of alcoholics and nonalcoholics, comparison has been made only between those who did not drink at all and those who drank, in any amounts from the most moderate and temperate to the most extreme. All valid statistics show that excessive drinking shortens life; the inclusion of the moderate drinker with the excessive drinker would, by the simple arithmetic of the situation, result in the moderate drinker also appearing to have a shorter length of life than the nondrinker.

In complete contrast to the assumption that the use of alcohol, even in the most moderate amounts, shortens life, there are some investigators who believe that such use of alcohol actually prolongs life.

The conflicting views as to the influence of alcohol on length of life, as they now exist, may be summarized as:

- (a) Excessive use of alcohol may shorten life.
- (b) The use of alcohol, even in moderate amounts, may shorten life.
- (c) The use of alcohol in moderate amounts may prolong life.
- (d) The use of alcohol has no influence on length of life.

All of these opinions cannot be correct but one or more must be. The purpose of the present Supplement is to weigh the existing evidence as carefully as possible in an effort to find out where the truth lies.

WEIGHING THE EVIDENCE

It would appear to be a simple matter to find out from statistics exactly what influence alcohol has on length of life. In reality, it is a very difficult problem. The most reliable source of information would be to follow to their death a very large number of men and women—several thousand—whose drinking habits were completely known to the investigator through personal acquaintance. But even with such acquaintance it would be difficult to be certain that the habits were really known, for people, even to their best friends, are not always honest in stating whether they do or do not use alcohol, or in what amounts. It is even more difficult to obtain an accurate history of the use of alcohol from one who is not an acquaintance, who only answers a questionnaire, or particularly one who answers the questions in a life insurance application. Under such circumstances, the moderate drinker is inclined to imply that he is a total abstainer and the heavy drinker that he is moderate in his use of alcohol.

Even if sound information could be obtained as to the use of alcohol, the statistical difficulties would not be at an end. Comparison of the longevity in the group studied would be valid only if the occupational risks of the individuals were the same. The problem of the influence of alcohol on longevity would be solved to give a precise answer only if (a) the drinking habits were known completely, and (b) the individuals were exposed to the same risks of death, except those arising from drinking. No one

has, or is likely to accumulate, such reliable information as this.

Since such definite information is lacking, it is necessary to turn to less conclusive sources. But in doing so, it must be remembered that the conclusion reached can be no more reliable than the information from which it is derived. Compromises must be made, even in science. But if we are able to keep in mind the limitations which are imposed and make no unjustified inferences, valuable and sound conclusions can sometimes be reached, even when some information is deficient. Unfortunately the limitations are frequently overlooked and statements are made which are not warranted by the information upon which they are based. It is for this reason that here, in discussing statistical studies on the influence of alcohol on length of life, we must examine critically the limitations of the statistical information available.

In order to obtain a large number of individuals, about whose use of alcohol at least some knowledge is available, most investigators turn to the figures from life insurance companies. This information, probably the best available, nevertheless has serious limitations. The main ones are as follows: (a) Policyholders are a selected group of individuals; at the time the policies are issued they are in better health than the general population. (b) Information as to the use of alcohol is largely based on the statements made by the individual himself when he applies for the policy. (c) After the policy is issued the insurance company does not ordinarily obtain any further information on the drinking habits of the policyholders; this feature is particularly important when the policy is issued to a young individual since he may be a non-drinker at the time but may become an alcoholic later. (d) In the statistics from insurance companies it is extremely difficult to distinguish between moderate and heavy drinkers; generally the comparisons must be made as between individuals who, at the time they obtained the policy, said they did not use alcohol and those who said they did. Consequently the group of nondrinkers contains some who are moderate drinkers, and even a few who have become heavy drinkers, and the group of drinkers contains, in addition to heavy drinkers, a great many who are moderate drinkers and some who have ceased to drink. In spite of all these deficiencies the information from life insurance statistics is far

superior to any other source used to investigate the effects of alcohol on longevity.

WHAT THE STATISTICS SHOW

THE statistics from life insurance companies express longevity in various ways which are suited to the particular need of the business. Some reports give the information in terms of life expectancy, some in terms of actual death as a per cent of expected death, and some as a per cent payment to beneficiaries of expected payment. To those not engaged in life insurance work, the life expectation is probably the easiest to understand, but the actuaries of the companies seem to have a preference for the actual deaths as a per cent of expected deaths.

Table 1 shows the life expectancy of nondrinkers as derived from a 60 year experience in the (British) United Kingdom Temperance and General Provident Institution: the expectance for drinkers, which is also given, comes from the combined experience of 23 British insurance companies. Unfortunately, no dis-

TABLE 1.

Age	<i>Expectation of Life of Male Abstainers and Nonabstainers</i>		
	<i>Expectation of Life</i>		<i>Difference</i>
	<i>Abstainers (experience in United Kingdom Temperance and General Provident Institution)</i>	<i>Nonabstainers (combined experience of 23 British insurance companies)</i>	
20	46.9	43.2	3.7
25	43.0	39.1	3.9
30	38.8	35.1	3.7
35	34.6	31.2	3.4
40	30.3	27.4	2.9
45	26.1	23.7	2.4
50	22.0	20.1	1.9
55	18.1	16.7	1.4
60	14.6	13.6	1.0
65	11.3	10.7	0.6
70	8.5	8.2	0.3

inction is made between moderate and excessive drinkers. Thus the figures in this table, on the one hand, do not express the full extent of the difference which may exist between abstainers and excessive drinkers and, on the other hand, they imply an effect due to moderate drinking which is entirely unwarranted. Such trends as are shown in this table may be attributed to the excessive drinkers included with the moderate drinkers.

The table shows a somewhat greater life expectation in favor of the abstainers, particularly below the age of 35. After the age of 35, the differences become smaller and smaller in spite of the fact that deaths from the diseases of alcoholism usually occur after this age. At 70, there is hardly any difference between the two groups.

The experience of the Mutual Life Insurance Company of New York, between 1907 and 1912, has been analyzed according to occupational groups. In each group, however, the number of policyholders was much too small to make valid comparisons as to the effects of alcohol. We are therefore giving here only the results for the combined groups. The policyholders were further classed as abstainers, temperate drinkers and moderate drinkers. This classification seems to be most arbitrary and unreasonable as those classified as moderate drinkers probably include in reality many excessive drinkers. In order to avoid misinterpretation of the data we shall merely contrast abstainers with all nonabstainers. The actual deaths of the abstainers were 53.4 per cent of the expected deaths, while the deaths of the nonabstainers were 65.0 per cent.

The data in Table 2 are based on 166,694 policies issued by the Northwestern Life Insurance Company between the years 1886 and 1895. The difference between abstainers and two groups of drinkers is expressed in terms of actual payments to beneficiaries as per cent of expected payments.

The policyholders were classified according to their habits at the time the policies were issued as (a) abstainers, (b) beer and wine drinkers and (c) whisky drinkers. The peculiar difficulties encountered in attempting to obtain accurate information on alcohol and longevity are here emphasized by the fact that E. B. Phelps, who analyzed these data, thought that beer and wine drinkers meant moderate drinkers and whisky drinkers meant

TABLE 2

*Mortality Experience of Northwestern Mutual Life Insurance
Company on Abstainers and Nonabstainers*

Ages	Actual death loss as per cent of expected death loss		
	"Abstainers"	"Moderate Drinkers"	"Heavy Drinkers"
15-29	50.3	58.4	60.0
30-39	49.1	48.4	59.5
40-49	50.9	54.7	62.8
50-59	67.5	57.3	88.0
60-69	64.8	75.0	66.7
All ages	53.1	54.4	66.8

heavy drinkers. It cannot, by any means, be assumed that the users of whisky in the general population are all necessarily heavy drinkers. It is true, however, that most of the excessive drinkers, together with many of the moderate drinkers, fall in the classification of excessive drinkers as used here. The moderate drinkers, as designated, will actually contain some excessive drinkers and also some abstainers from additions of those who have changed their habits after the time the policy was issued. The abstainers for the same reason will include some moderate drinkers and even some excessive drinkers. The life expectancies, therefore, can be taken as only showing trends with the probability that most of the abstainers were in the "abstainer" group, most of the moderate drinkers in the "moderate" group and most of the heavy drinkers in the "heavy drinking" group.

It is seen from this table that at some ages the percentage for moderate drinkers is better and for some ages worse than for abstainers and that taking all ages together there is little difference between abstainers and moderate drinkers. On the other hand, excessive drinkers show at all ages an excess of the mortality percentage over the nonabstainers, and for all ages combined, the difference is 13.7 points.

We have presented here some of the most widely accepted investigations. There are many others based on life insurance experience and in all the trends are similar to those found here. Excessive drinkers have, on an average, a shorter length of life

than nondrinkers and moderate drinkers. The findings as to moderate drinkers seem to point toward the conclusion reached by the Committee of the Medical Research Council of Great Britain in 1923, namely, that "The temperate consumption of alcoholic liquor . . . may be considered physiologically harmless in the case of the large majority of normal adults."

The famous statistician Raymond Pearl tried to overcome the defects of life insurance data by carrying out an investigation of the actual drinking habits of some 5,000 persons who constituted a random sample of the population. His methods in this investigation were widely criticized, but the results of his study are valuable. They show exactly the same trends as the life insurance data, that is, that heavy drinkers have a shorter life expectancy than abstainers, while moderate drinkers have about the same life expectation as abstainers. Actually, the analysis of his data, age by age, showed that the moderate drinkers had a slightly higher life expectancy than the abstainers but Pearl himself stated that these differences were not significant. The only conclusion he made was that for all practical purposes there is no difference between abstainers and moderate drinkers. Nevertheless some people seized upon these figures and tried to prove from them that moderate drinking prolonged life. There is no sound evidence for this belief.

Many investigators have thought that they could obtain better information as to alcohol and longevity from the large statistics of the census bureaus than from life insurance figures. Their preconceived theory was that the general mortality of a people is more or less proportional to the per capita consumption of alcoholic beverages within a country or territory. It would involve much technical detail to show why such studies are invalid, but that they are invalid can easily be shown by a simple example.

In Table 3, 12 countries are ranked in the order of their magnitude of per capita consumption of alcohol in the first decade of this century. The number 1 denotes the highest and 12 the lowest consumption of alcohol. In the right hand column are given the rank orders of the mortality of the male population between the ages of 25 and 55.

TABLE 3

Correlation between Per Capita Consumption of Alcohol and Mortality per 100,000 Male Population, Ages 25 to 55

<i>Country</i>	<i>Rank order of per capita consumption of alcoholic beverages</i>	<i>Male mortality</i>
Denmark	1	8
France	2	1
Netherlands	3	11
Germany	4	3
Sweden	5	9
United States	6	2
Great Britain	7	4
Australia	8	6
New Zealand	9	12
Norway	10	10
Finland	11	5
Italy	12	7

It can be seen from this table that the rank orders of per capita consumption and of general mortality show no agreement except that of chance. Naturally, even in a chance drawing of numbers, one or two coincidences, as shown in the table, may occur. Such findings as that the highest consuming country ranks eighth in mortality and that the third highest consuming country has the eleventh rank in mortality make it unjustified to draw any conclusions from the fact that the second highest consumer ranks first in mortality or the tenth highest ranks tenth. No importance whatever may be attached to statements based on such studies.

The fact that the mortality of men is higher than that of women has been attributed by some investigators to the greater consumption of alcohol by men. Such a conclusion, however, leaves out of consideration the greater occupational hazards of men as well as the fact that they have a higher rate of mortality even in childhood.

Some attempt has also been made to draw conclusions from the comparative mortality in certain occupations which are supposed to embrace a larger number of heavy drinkers. These comparisons

involve so many statistical pitfalls that the conclusions are rarely valid. Likewise, in view of recent knowledge of nutrition and particularly of the vitamins, we must dismiss entirely the conflicting and irrelevant evidence of the influence of alcohol on the length of life of animals given alcohol in experiments carried out in the past.

The present state of knowledge of the influence of alcohol on longevity sums up to the following:

The only acceptable, but not infallible, source of information is the statistical records of life insurance companies; and, since even these studies suffer from many deficiencies, the only definite conclusion that may be reached is:

That *excessive* drinkers have a greater mortality and a shorter average life than *moderate drinkers and abstainers*. No conclusions may be drawn, however, relative to the actual magnitude of this difference.

As far as *moderate drinkers* are concerned, the indications are that their risk of death is neither greater nor smaller than that of abstainers.

SELECTED READING

1. Dublin, L. J. and Lotka, A. J. *Length of Life*. New York. The Ronald Press Co., 1936.
2. Hunter, A. *Longevity and mortality as affected by the use of alcohol*. In *Alcohol and Man*, Emerson, H., ed. New York. The Macmillan Co., 1933.
3. Kopf, E. W. *Review of recent literature on alcohol as a community health problem*. In *Alcohol and Man*, Emerson, H., ed. New York. The Macmillan Co., 1933.
4. Pearl, R. *Alcohol and Longevity*. New York. Alfred Knopf, 1926.
5. Weeks, C. C. *Alcohol and Human Life*. London. H. K. Lewis & Co., 1938.
6. Wilson, G. B. *Alcohol and the Nation*. London. Nicholson & Watson, 1940.
7. *Alcohol, Science and Society. Twenty-nine Lectures with Discussions as Given at the Yale Summer School of Alcohol Studies*. New Haven. Quarterly Journal of Studies on Alcohol, 1945.