Mortality

The mortality after screening, or after appointment for screening in the case of the non-participants, was followed for 1975–80, a follow-up time of 0–6 years (mean 3 years). The mean age of death was 50 years. All deaths in Malmö residents are registered at the department of pathology, and from this file deaths in men in the analysed cohorts were identified. For the dead subjects information was collected from all available sources: screening protocols, hospital records, necropsy reports, police records, and death certificates. Most necropsies on men dying in hospital were done at the department of pathology, and those for men dying outside hospital were done at the department of forensic medicine. In Sweden a forensic necropsy is done at the request of the police for violent or unexpected or unexplained deaths.

Alcohol-positive History

By studying all available information a revised cause of death was established, and the history of alcohol use was investigated. If a subject was registered at the department for alcoholic diseases (DAD), or if any other source of information indicated alcohol abuse, he was labelled as having an alcohol-positive history (APH). The presence of alcohol in the blood at forensic necropsy was also noted.

Alcohol-related Death

We created a cause of death category, “alcohol-related death”: a death was included in this category if high alcohol consumption was considered the major underlying cause in the chain of events leading to the death. In this study the following subgroups were identified. Accidents were defined as accidental deaths occurring in an alcohol-intoxicated state. Almost all occurred in known alcoholics. Organic deaths were caused by an organic complication of alcoholism in an alcoholic—e.g., liver cirrhosis, pancreatitis, and cardiomyopathy.

Suicide in a known alcoholic. Pneumonia in a known alcoholic. Cause unknown in a known alcoholic.

Intoxication.—Under this heading we included deaths in known alcoholics, most of whom were found dead, all with alcohol in the blood or urine at necropsy, and with no other specific cause of death demonstrable, such as myocardial infarction, cancer, or haemorrhage.

Cause of Death Statistics

The underlying causes of death according to the 8th International Classification of Diseases were recovered from the Swedish Central Bureau of Statistics. In this classification, alcohol is explicitly stated as the cause of death in E860.000 (alcohol intoxication), 291 (alcohol psychosis), 303 (alcoholism), and 571.00 (alcoholic cirrhosis of the liver). However, in this classification many cases of supposedly non-alcoholic liver cirrhosis do have alcoholic aetiology, as do cases of pancreatitis.

RESULTS

During the study period 199 men died, and they form the study group. Necropsy was carried out for 175 men (87.9%). 16 of 111 deaths in men whose necropsy was done in the department of pathology or who had no necropsy (fig. 1) were alcohol related (14.4%). Liver cirrhosis was the cause of death in 12 of these. 33 (29.7%) had an APH, and 21 (18.9%) were known at the DAD.

In the forensic-necropsy group (fig. 2) 45 of 88 deaths were classified as alcohol related (51.1%). Alcohol was present in...
Fig. 1—In-hospital necropsy and no-necropsy deaths (n = 111).

APH = alcohol-positive history; AMI = acute myocardial infarction; CHD = coronary heart disease; alcohol indicator = APH and/or alcohol-related death (blood ethanol was not analysed, but was not expected to be found in any case).

The blood at necropsy in 26 cases (29.5%) and in 1 subject it was found only in the urine. The blood alcohol concentrations ranged from 0.2 to 3.1 promille (20-310 mg/100 ml). 59 cases (67.0%) had an APH, and 44 (50.0%) men were registered at the DAD.

In all, 61 of the 199 deaths (30.7%) were classified as alcohol related. This category was thus a major mortality category in this population, and alcohol-related deaths were more common than deaths due to cancer or cardiovascular diseases. 92 subjects (46.2%) had an APH, and 65 (32.7%) were registered at the DAD.

Intoxication accounted for 19 of the 61 alcohol-related deaths (31.1%). The blood alcohol concentrations in this group ranged from 0.2 to 2.9 promille (20-290 mg/100 ml); 1 subject had alcohol in the urine only. Many subjects had combinations of intoxication with alcohol and sedatives, hypnotics, and other drugs. Varying degrees of myocardial fibrosis, coronary atherosclerosis, or both were found at necropsy. The exact part played by any one of these factors in causing the death was difficult to establish. It was also unclear whether in some cases there was suicidal intent. Cirrhosis of the liver accounted for 16 deaths—i.e., 26.2% of all alcohol-related deaths. 1 of these subjects also had an α1-antitrypsin deficiency, 1 non-alcoholic man died of (biliary) liver cirrhosis. Thus, 16 of 17 deaths from liver cirrhosis (94.1%) occurred in alcoholics. 9 alcohol-related deaths were due to accidents, 3 to pneumonia, 6 to suicide, 6 to other organic causes, and the cause was unknown in 2.

In the official cause of death statistics (see table), only 4 of the 16 cases of alcoholic liver cirrhosis were assigned an alcoholic aetiology (571.00). 5 deaths were coded as alcohol intoxication (E 860.00) and 1 as alcoholism (303.20). Altogether, 10 of 61 cases were correctly coded as alcohol related, an under-reporting of about 5 out of 6 cases. If all deaths from liver cirrhosis,11 pancreatitis,2 and oesophageal varices (456.00, 1 death) are added, 24 deaths (12.1%) are included (see table).

To investigate whether the size of the alcohol-related-death category was an exaggeration of the role of alcohol abuse as a cause of death, a theoretical estimate of the magnitude of this role was made. The study population comprised 10 353 men, of whom 808 (7.8%) were registered at the DAD. 65 of these died during follow-up, a death rate of 8.0%. Another 27 deaths occurred in men with an APH, but these men were not known at the DAD. If we assume that the APH group had the same death rate as the DAD group, the whole group with an APH may have consisted of 1146 men. The population without an APH thus had a death rate of 1.2% during the follow-up period (107 deaths). The death rate in the APH, DAD-registered group was thus 6.8 times that in the men with no history of alcohol abuse.

If the APH group had had the same death rate as the non-alcoholic population, 13.8 men would have died—i.e., there

| Table: Comparison of Estimates of the Part Played by Alcohol in 199 Deaths in Middle-aged Men |

<table>
<thead>
<tr>
<th>Method</th>
<th>No.</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol-related death category</td>
<td>61</td>
<td>30.7</td>
</tr>
<tr>
<td>Calculation of excess deaths in men with APH</td>
<td>78</td>
<td>39.2</td>
</tr>
<tr>
<td>Official statistics:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E 860.00; 571.00; 303.20 only</td>
<td>10</td>
<td>5.0</td>
</tr>
<tr>
<td>E 860.00; 571.00; 303.20 plus 571.90; 456.00; 577</td>
<td>24</td>
<td>12.1</td>
</tr>
</tbody>
</table>
was an excess of 78 deaths in the APH population (92 deaths actually occurred). This figure of 78 deaths should be compared with our earlier estimate of 61 deaths as alcohol related.

This calculation assumes that all excess deaths due to alcohol abuse occurred in the APH population.

DISCUSSION

We have attempted to evaluate the extent of alcohol abuse as a cause of death in an unselected population, not using official statistics or self-reporting of alcohol consumption habits. In men who died at around the age of 50 years in this study, alcohol-related causes of death formed the largest mortality category and accounted for about a third of all deaths. This estimate corresponded quite well with a theoretical estimate, but it was six times higher than official statistics indicated. This under-reporting has been pointed out by others.5,6

Despite the arbitrariness of the definition of the category alcohol-related deaths, even our total probably underestimates the true extent of alcohol abuse in death for many reasons. In some subjects for whom scanty data were available, alcohol abuse may have been an important factor. Also, we did not consider death from cancer, myocardial infarction, stroke, or other specific cardiovascular disease to be alcohol related, although alcohol has been incriminated as one aetiological factor in these diseases.7–11 However, the mode of death in subjects with moderate alcohol concentrations in the blood at necropsy may have been cardiac arrhythmias.12 The effects of intervention against heavy drinking in the participants with high levels of S-GT may also have reduced the number of alcohol-related deaths, and preliminary results indeed indicate a slight effect of intervention on mortality (unpublished).

Usually, analyses of the role of alcohol abuse in mortality are undertaken in selected populations, such as cohorts of alcoholics,13–16 but we think it important to study unselected populations in order, for instance, to monitor effects of public health measures.

The extent of alcohol abuse as a cause of death in this group necessitates a search for objective methods17 to identify alcohol-related health problems in order to institute preventive measures, as have been suggested by Lieber,18 and which are attempted in the Malmö Preventive Programme.19

This study was supported by the Swedish Council for Planning and Coordination of Research.

Correspondence should be addressed to B. P., Section of Preventive Medicine, Department of Internal Medicine, Malmö General Hospital, S-214 01 Malmö, Sweden.

REFERENCES

