

## PAPERS AND SHORT REPORTS

**Has mortality related to alcohol decreased in Sweden?**

ANDERS ROMELSJÖ, GUNNAR ÅGREN

**Abstract**

In Sweden sales of alcohol dropped 17% from 1976 to 1982. Similarly, comparison of data from 1979 and 1982 shows that the mortality from cirrhosis of the liver declined appreciably, by 28% in men and 29% in women. During 1979-82 mortality from pancreatitis also declined noticeably, by 30% in men and 36% in women. By contrast, no decrease occurred in mortality from alcoholic psychosis, alcoholism, or alcohol intoxication.

The decrease in mortality from cirrhosis of the liver and pancreatitis is probably explained by a decrease in the consumption of alcohol among an important subgroup of high consumers of alcohol. The lack of a decrease in mortality from alcoholic psychosis, alcoholism, and alcohol intoxication may be because such diagnoses are often made in socially deteriorated, more dependent alcoholic subjects who have not been able to reduce their consumption.

**Introduction**

In recent years a decrease in the consumption of alcohol has been reported in several countries, including Sweden.<sup>1</sup> This provides an opportunity to study the possible effect of a decrease in the consumption of alcohol on death related to alcohol. According to the total consumption model based on Ledermann's work, the decrease in most deaths related to alcohol should be greater than the decrease in total consumption of alcohol.<sup>2-5</sup>

Sweden, with a population of about 8.3 million, has a state monopoly for the distribution and sale of alcoholic beverages. In 1976 sales of alcohol expressed in terms of litres of 100% ethanol totalled 7.7 l per person aged over 14. This figure dropped by 17% to about 6.4 l in 1982. Even if there had been an increase

in the illicit production of homemade strong liquor and in the licit production of homemade wine by the public the general opinion by Swedish experts was that consumption had decreased; this was supported by results of surveys.<sup>6</sup> Swedish surveys have shown that a small proportion of men and women consume a large proportion of the total amount of alcoholic beverages. In 1968, 10% of men consumed 40% of the reported total consumption while 10% of women consumed 47% of the total.<sup>6</sup>

In 1979 sales of alcohol were 8% higher than in 1968 while the proportion of high consumers was 29% higher than in 1968. This agrees with Ledermann's theory.<sup>2</sup> The same criterion for high consumption of alcohol was used for both years of the survey. The proportion of high consumers among women was 3% in 1968 and 8% in 1979. Recently, two studies from public opinion polls indicated that the proportion of high consumers had declined at least as much as the mean consumption.<sup>7, 8</sup>

The reduction in the consumption of alcohol can partly be explained by a greater interest in the problems associated with alcohol in Sweden during the past years, raised prices, and restrictive measures. In 1976 the Swedish parliament abolished the sale of medium to strong beer (3.6% alcohol) in ordinary shops. That beer was replaced by another beer with a lower content of alcohol (2.8% alcohol). The Swedish parliament decided in 1981 that the state retail shops had to close on Saturdays. The prices of alcoholic beverages have increased about as much as wages and the consumer price index since 1976.<sup>9</sup>

Over the past few years there have been several information campaigns. Many organisations, among them the Swedish Medical Association, have also presented policy documents on alcohol, supporting restrictive measures. By the end of 1984 almost half (200) of the professors in Swedish medical schools had joined in a proposal to ration alcohol for three years, during which time the different consequences would be evaluated.

We studied the mortality in Sweden from certain diseases closely related to alcohol and its relation to the sale of alcoholic beverages.

**Subjects and methods**

Mortality from the following diseases was studied using the cause of death register for 1973-82: alcoholic psychosis, alcoholism, alcohol intoxication, cirrhosis of the liver, and pancreatitis. The contributory

Karolinska Institute, Department of Social Medicine, Kronan Health Centre, S-172 83 Sundbyberg, Sweden

ANDERS ROMELSJÖ, MD, research fellow  
GUNNAR ÅGREN, MD, research fellow

Correspondence to: Dr A Romelsjö.

cause of death was studied for all diseases except pancreatitis (because of the paucity of data on this disease). The underlying (primary) cause of death, however, was studied for all diseases. The number of cases in which death certificates giving cirrhosis of the liver as an underlying cause were based on necropsy evidence was also examined.

Mortality was expressed as the number of deaths per 100 000 people each year. We studied men and women separately. Adjustment for age was not considered to be necessary because of the stability of the population in number and age distribution.<sup>9</sup>

Data on alcoholic psychosis, alcoholism, and alcohol intoxication were grouped together as these diagnoses overlap and are used in different ways by different pathologists and doctors.<sup>10</sup> Data on the sale of alcohol were obtained from official Swedish statistics.<sup>9</sup> The sale of alcoholic beverages in litres of 100% ethanol was used as a rough measure of the consumption of alcohol.

We examined statistically data on the decrease in the number of deaths related to alcohol. Results in 1982 were compared with those in 1979 using the formula:

$$\text{test variable} = (N_1 - N_2) / (N_1 + N_2)$$

where  $N_1$  was the number of deaths in 1979 and  $N_2$  the number in 1982. The test variable was assumed to be roughly  $t$  distributed. Variance was regarded as equivalent with number according to Poisson.

## Results

Mortality from cirrhosis of the liver as an underlying cause of death among men increased from 1973 to 1976, was about the same from 1977 to 1979, but had decreased 28% by 1982 (fig 1, table I). In women there was a steady increase in mortality until 1976, a fluctuating decrease until 1981, and a sharp decrease in 1982, when mortality was 29% lower than in 1979.

TABLE I—Number of deaths in Sweden for which cirrhosis of the liver was given as the primary or contributory cause and number of deaths from cirrhosis of the liver with alcoholism as the underlying cause

Year	Men			Women		
	Underlying cause	Contributory cause	Alcoholism	Underlying cause	Contributory cause	Alcoholism
1973	577	398	218	266	215	36
1974	613	409	191	246	202	35
1975	694	401	242	304	278	54
1976	717	376	231	345	190	56
1977	703	400	272	319	160	61
1978	720	402	300	311	170	66
1979	721	381	336	292	188	74
1980	677	376	306	336	181	89
1981	581	361	281	292	189	60
1982	517	421	241	209	195	48

No decrease was seen in mortality with cirrhosis of the liver as a contributory cause, but a significant decrease in mortality from cirrhosis of the liver with alcoholism as an underlying cause was noted for both men ( $p < 0.001$ ) and women ( $p < 0.05$ ) (table I and II). The decrease in mortality from cirrhosis of the liver affected people of most ages and contributed to a general reduction in mortality among adults.

The proportion of patients with cirrhosis of the liver (as an underlying cause) who underwent necropsy was high but decreased during recent years (table III). The number of such cases decreased both while there was an increase in mortality from cirrhosis of the liver and after the decrease had begun.

Mortality from pancreatitis increased from 1973 (3.0 in men and 2.0 in women) and reached its peak in 1976 in women and 1977 in

TABLE III—Number of deaths in Sweden from cirrhosis of the liver and number based on necropsy evidence

Year	Men		Women	
	n	No (%) at necropsy	n	No (%) at necropsy
1973	577	454 (78.7)	266	202 (75.9)
1974	613	484 (79.0)	246	190 (77.2)
1975	694	520 (74.9)	304	226 (74.3)
1976	717	521 (72.7)	345	250 (72.5)
1977	703	500 (71.1)	319	233 (73.0)
1978	720	474 (65.8)	311	209 (67.2)
1979	721	481 (66.7)	292	197 (67.5)
1980	677	418 (61.7)	336	218 (64.9)
1981	581	365 (62.8)	292	181 (62.0)
1982	517	320 (61.9)	209	131 (62.7)

men.<sup>2,3</sup> The subsequent decline from 1979 to 1982 was significant for men and women (table II).

Figure 2 shows that mortality from alcoholic psychosis, alcoholism, and alcohol intoxication increased until 1979, especially among women. No close correlation was seen, however, between the sale of alcohol and the mortality from these disorders. A small reduction was seen up to 1981 followed by an increase in 1982. Table IV shows the number of deaths from alcoholic psychosis, alcoholism, and alcohol intoxication, and shows that the figures for primary and contributory causes of death changed in a similar way.

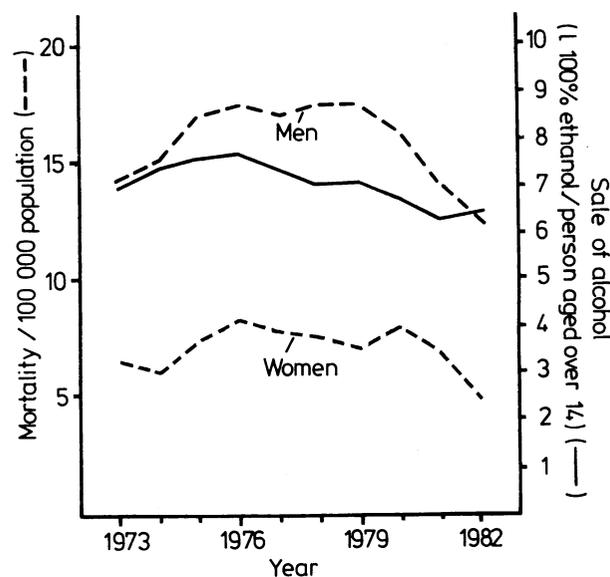


FIG 1—Mortality from cirrhosis of the liver in Sweden 1973-82 by year and sex related to sale of alcohol in litres of 100% ethanol for each subject aged over 14.

## Discussion

Mortality from cirrhosis of the liver in men and women decreased significantly from 1979 to 1982. Treatment of this disorder has changed little in the past years and therefore was not considered to be a possible explanation for this decrease. Diagnosis may be first established at necropsy. The reduction in the number of patients with cirrhosis of the liver who underwent

TABLE II—Mortality from diseases related to alcohol in 1979 and 1982, change in mortality, and significance

Diagnosis	Mortality/100 000 population				Change 1979-82 (%)		Significance	
	1979		1982		Men	Women	Men	Women
	Men	Women	Men	Women				
Cirrhosis of the liver	17.5	7.0	12.6	5.0	-28	-29	$p < 0.001$	$p < 0.001$
Pancreatitis	2.7	1.7	1.9	1.2	-30	-36	$p < 0.05$	$p < 0.05$
Alcoholic psychosis, alcoholism, and alcohol intoxication	14.7	2.9	15.0	2.5	+2	-14	NS	NS

Br Med J (Clin Res Ed): first published as 10.1136/bmj.291.6489.167 on 20 July 1985. Downloaded from http://www.bmj.com/ on 19 April 2024 by guest. Protected by copyright.

necropsy could explain a part of the reduction in mortality. The routine of coding death certification at the National Central Bureau of Statistics for subjects who had died from cirrhosis of the liver did not change during the period of our study.<sup>11</sup>

The decrease in mortality from cirrhosis of the liver is more likely to be explained by a decrease in the consumption of alcohol among high consumers of alcoholic beverages, which is supported by data from other surveys.<sup>7, 8</sup> According to Ledermann's theory, the decrease in mortality from cirrhosis of the liver

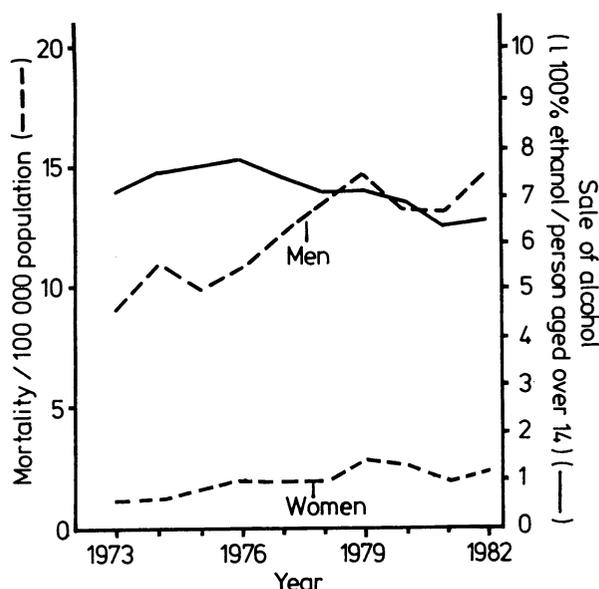


FIG 2—Mortality from alcoholic psychosis, alcoholism, and alcohol intoxication in Sweden 1973-82 by year and sex related to sale of alcohol in litres of 100% ethanol for each subject aged over 14.

TABLE IV—Number of deaths from alcoholic psychosis, alcoholism, and alcohol intoxication as underlying or contributory cause

Year	Men			Women		
	Underlying cause	Contributory cause	Total	Underlying cause	Contributory cause	Total
1973	371	733	1104	49	75	124
1974	450	838	1288	57	125	182
1975	402	804	1206	67	151	218
1976	440	919	1359	82	193	275
1977	504	1061	1565	88	188	276
1978	560	1094	1644	82	223	305
1979	606	1330	1936	122	274	396
1980	547	1293	1840	113	250	363
1981	544	1181	1725	84	240	324
1982	620	1261	1881	107	250	357

should be greater, relatively, than the reduction in the consumption of alcohol,<sup>2-5</sup> which we also found. The sale of alcoholic beverages reached a peak in 1976 while mortality from cirrhosis of the liver remained about the same during 1976-9 in men but subsequently decreased considerably. In women there was a large decline in 1981. This can be interpreted as the result of a time lag, which is more likely when there is a small change in consumption and a decrease rather than an increase.<sup>12</sup>

The decrease in mortality from cirrhosis of the liver with alcoholism as the underlying cause, a diagnosis that covers only a part of all cases of cirrhosis related to alcohol, was similar to the decrease for all deaths from cirrhosis of the liver. The decline in mortality from pancreatitis was probably due to a decrease in consumption of alcohol among high consumers.<sup>3, 13, 14</sup> The data we obtained do not support Schmidt's assumption that changes in mortality from cirrhosis reflect changes in all problems resulting from chronic heavy use of alcohol.<sup>15, 16</sup>

Could the increase in mortality from alcoholic psychosis, alcoholism, and alcohol intoxication while there was a reduction in the sale of alcohol be explained by a change in the routines for certification of death? A diagnosis of alcoholism or alcohol intoxication is often not noted on the death certificate of alcoholics.<sup>17, 18</sup> A small change in the causal classification or other routines by doctors when issuing death certificates for alcoholics could lead to a great change in the number of deaths in which alcoholism or alcohol intoxication is given as an underlying or contributory cause and in the proportion of deaths from cirrhosis of the liver with alcoholism given as the underlying cause.

There was no indication of a change in the routine of certification of death: no new instruction was given for issuing death certificates, and education of medical students in the certification of death was consistent during the study period. An increased awareness or a change in the attitude of doctors might have explained the increase in the figures for alcoholic psychosis, alcoholism, and alcohol intoxication in 1982, but this interpretation would not be so compatible with the decrease in figures for cirrhosis of the liver with alcoholism as the underlying cause in the same year.

A small change in the routine of coding could have a similar effect. A small change was made in 1980 in the coding of alcohol intoxication in which intoxication was listed as a contributory instead of an underlying cause of death in certain cases. The number of deaths with alcohol intoxication as an underlying cause was 671 out of a total of 1224 (55%) in 1978-9 and 456 out of 1049 (44%) in 1981-2.<sup>9</sup> The percentages were about the same in 1981 and 1982. The figures for alcoholic psychosis, alcoholism, and alcohol intoxication as an underlying cause of death would have been higher in 1981 and 1982 without this change in routine.

The diagnoses of alcoholic psychosis, alcoholism, and alcohol intoxication are more often given to alcoholics whose social standards have deteriorated.<sup>19, 20</sup> Consumption of alcohol may not have decreased among this group of high consumers, who may be poorer at controlling their consumption than other high consumers. An earlier Swedish study found that death from cirrhosis of the liver was significantly more common in men from social classes I and II than men from social class III. The proportion of men known by the social welfare agency to have alcoholic problems, however, was significantly higher in social class III than social classes I and II.<sup>21</sup> The diagnoses therefore seemed to have a social meaning, which supports our interpretation.

Wodak *et al* reported that 18% of patients with cirrhosis of the liver and other alcoholic liver diseases were severely dependent on alcohol compared with 56% of patients without such diseases visiting an alcohol treatment unit,<sup>22</sup> which further supports our interpretation. No information was given, however, on the social class of these patients. Results from a follow up study of patients with disease of the liver related to alcohol suggested that most of such patients escape detection for many years because they are relatively mildly dependent on alcohol.<sup>23</sup>

Some of the results from a study by Kendell *et al* disagree with our hypothesis.<sup>24</sup> They studied interview data on the consumption of alcohol of a random sample of men and women in the Lothian region in Scotland during 1978-9. This study was repeated in 1981-2 for 463 people classified as regular drinkers at the initial interview. An increase in excise duty on alcoholic beverages early in 1981, between the two interviews, was followed by a decrease in consumption of alcohol and adverse effects related to alcohol, especially among high consumers. These results were compatible with the total consumption model based on Ledermann's hypothesis.<sup>2-5</sup> About a fifth of the decrease was considered to be related to an increase in unemployment from 7.9% in men and 4.0% in women in 1978 to 14.2% in men and 7.9% in women in 1982. The sample included 42 people who were dependent on alcohol and who also reported a significant decrease in consumption of alcohol and adverse effects related to alcohol. This disagrees with our hypothesis.

In Sweden many alcoholics with more severe social problems depend mainly on allowances from the social insurance system. Others live on a disability pension, which since the end of the 1970s has become easier for known alcoholics to obtain.<sup>25</sup> Those often more dependent alcoholics have had little if any reduction in their disposable income in recent years, which makes them less aware of increases in the price of alcoholic beverages. Moreover, such increases have not been as drastic in Sweden as in Scotland,<sup>9</sup> and also unemployment has not been as high as in the Lothian area even though it rose from 2.1% in 1979 to 3.1% in 1982.<sup>9</sup> Thus there are important differences between the Scottish and Swedish studies.

In the second interviews in 1981-2 non-participation was high, being 31%, with a disproportionate number of young, unmarried, and unemployed subjects—that is, a group with a lower or a more insecure social position, making the results of Kendell *et al*<sup>24</sup> generally more uncertain. Thus we do not think that their study challenges our interpretation.

In another study Kendell reported that a fall in consumption of alcohol per person in the United Kingdom of 11% in 1979-82 was followed by a 19% fall in first admissions to hospital for alcohol dependence, a 16% fall in convictions due to drunkenness, a 7% fall in drinking and driving convictions, and a 4% fall in mortality due to cirrhosis.<sup>26</sup> In Sweden, however, the number of subjects taken into custody for drunkenness remained the same during 1979-82 as did the number of drinking and driving convictions.<sup>9</sup> In Sweden there are no statistics on first admissions to hospital for alcohol dependence, but, as in the United Kingdom, mortality from cancer of the oesophagus increased during 1979-82.<sup>9</sup> The findings from the United Kingdom add weight to the argument that consumption per head is the crucial variable determining the magnitude of the burden imposed on the community by the harmful effects of excessive drinking.

Our data, however, do not indicate a simple relation between changes in consumption of alcohol and mortality from all types of diseases related to alcohol. Though the consumption model based on Ledermann's theory was supported by our results for cirrhosis of the liver and pancreatitis, we could not use the theory to explain the patterns for the summed data on the diagnoses of alcoholic psychosis, alcoholism, and alcohol intoxication.<sup>2-5</sup> Future studies should also examine the characteristics of the different groups of high consumers with regard to consumption of alcohol, grade of dependence, and social position to get a better understanding of the relation between changes in the consumption of alcohol and the different kinds of damage.

We thank Stockholm county council and Professor Leif Svanström for making this study possible, for economic help, and for their interest in our work and Anders Lindeberg for advice and help in statistics and methodology.

In the period between acceptance of this paper and its publication figures for causes of death in 1983 have been published (May 1985).<sup>27</sup>

The number of deaths with liver cirrhosis as an underlying cause in men fell from 517 in 1982 to 452 in 1983, whereas there was an increase in women from 209 to 235 deaths. The average number of deaths each year from 1979 to 1981 was 660 in men and 310 in women; the corresponding figures for 1982-3 were 485 in men and 222 in women. Seventy eight men died from pancreatitis, six fewer than in 1982, and 48 women died, as in 1982. The number of deaths in 1983 due to alcoholic psychosis, alcoholism, and alcohol intoxication declined. Five hundred and sixty one men died and 101 women; thus mortality from these diagnoses remained about the same during 1979-83 for both sexes. The divergent trend for cirrhosis of the liver and pancreatitis on one hand and alcoholic psychosis, alcoholism, and alcohol intoxication on the other was therefore still apparent.

Sales of alcohol declined in 1983 and 1984 to 6.01 litres per person aged over 14 in 1984 compared with 6.41 litres in 1982.<sup>28</sup>

## References

1 Produktschap voor Gedistilleerde Dranken. *Hoeveel alcoholhoudende dranken worden er in de wereld gedronken?* Schiedam-Nederland: Produktschap voor Gedistilleerde Dranken, 1984.

- 2 Ledermann S. *Alcool, alcoolisme, alcoolisation. Données scientifiques de caractère physiologique, économique et social.* Paris: Presses Universitaires de France, 1956.
- 3 Bruun K, *et al.* *Alcohol control policies in a public health perspective.* Forssa: Finnish Foundation for Alcohol Studies, 1975.
- 4 Smith R. The relation between consumption and damage. *Br Med J* 1981;**282**: 895-8.
- 5 Paton A. The politics of alcohol. *Br Med J* 1985;**290**:1-2.
- 6 Nilsson T, Klöfver H. *Alcohol consumption habits. A review of surveys 1968-1980.* Stockholm: National Board of Health and Welfare, 1984.
- 7 Holm S. *Alcohol consumption in the population 1982-84.* Vällingby: Swedish Institute of Public Opinion Research, 1984.
- 8 Viström G. *A basic survey for the alcohol retailing monopoly.* Stockholm: Market Information Centre, 1981.
- 9 National Central Bureau of Statistics. *Statistical abstract of Sweden 1985.* Stockholm: Liber, 1985.
- 10 Poikolainen K. *Alcohol poisoning in four nordic countries.* Vol 28. Forssa: Finnish Foundation for Alcohol studies, 1977.
- 11 Eklöf D. *Control of quality of death certificates.* Stockholm: National Central Bureau of Statistics, 1983.
- 12 Skog OJ. Liver cirrhosis epidemiology: some methodological problems. *Br J Addict* 1980;**75**:227-43.
- 13 Lake-Bakaar G. Alcohol and the pancreas. *Br Med Bull* 1982;**38**:57-62.
- 14 Seligson U, Cho JW, Ihre T, Lundh G. Clinical course and autopsy findings in acute and chronic pancreatitis. *Acta Chir Scand* 1982;**148**:269-74.
- 15 Schmidt W. Cirrhosis and alcohol consumption: an epidemiological perspective. In: Edwards G, Grant M, eds. *Alcoholism, new knowledge and new responses.* London: Crooner, Helm, 1977.
- 16 Davies P. Some empirical grounds for controlling alcohol consumption. *British Journal of Alcohol and Alcoholism* 1982;**17**:109-16.
- 17 Hackl U. Untersuchungen zur Ermittlung der wahren Alkoholismus-Sterblichkeit. *Dtsch Med Wochenschr* 1980;**105**:1343-7.
- 18 Peterson B, Krantz P, Kristenson H, Trelle E, Sternby NH. Alcohol-related death; a major contributory to mortality in urban middle-aged men. *Lancet* 1982;iii: 1088-90.
- 19 Park P. Social-class factors in alcoholism. In: Kissin B, Begleiter H, eds. *The pathogenesis of alcoholism. Psycho-social factors.* New York: Plenum Press, 1983:365-404. (*The biology of alcoholism.* Vol 6.)
- 20 Wolf J, Chaletz MD, Blaue H, Hill M. Social factors in the diagnosis of alcoholism. II. Attitudes of physicians. *Quarterly Journal of Studies on Alcohol* 1965;**26**:72-9.
- 21 Bjurulf P, Sternby H, Wistedt B. Definitions of alcoholism. Relevance of liver disease and temperance board registrations in Sweden. *Quarterly Journal of Studies on Alcohol* 1971;**32**:393-405.
- 22 Wodak AD, Saunders JB, Ewusi-Mensah I, Davis M, Williams R. Severity of alcohol dependence in patients with alcoholic liver disease. *Br Med J* 1983;**287**: 1420-2.
- 23 Saunders JB, Wodak AK, Williams R. Past experience of advice and treatment of drinking problems of patients with alcoholic liver disease. *Br J Addict* 1985;**80**:51-6.
- 24 Kendell RE, de Roumanieu M, Ritson EB. Influence of an increase in excise duty on alcohol consumption and its adverse effects. *Br Med J* 1983;**287**:809-11.
- 25 Elton M, Hörnquist JO. Grounds of disability pension. *Scand J Soc Med* 1983; **11**:53-8.
- 26 Kendell RE. The beneficial consequences of the United Kingdom's declining per capita consumption of alcohol in 1979-82. *Alcohol and Alcoholism* 1984; **19**:271-6.
- 27 National Central Bureau of Statistics. *Press release on causes of death in 1983.* Stockholm: National Central Bureau of Statistics, 1985. (05.10.)
- 28 Kolk T. *Alcoholic beverages in 1984.* Stockholm: National Board of Health and Welfare, 1985.

(Accepted 4 April 1985)

## WHAT MAKES THE BIRTH EASIE

For a Caution to this let me advise all Midwives,  
 1 Not to give any thing inwardly to hasten the Birth, before they know the true time of Birth is at hand; for the want of observing this hath spoiled many a Child, and put the Mother to twice as much pain as needed.  
 2 Let not the child be forced away, unless an immoderate flux of blood come down; for if such Symptom appear, your best way to save the woman's life is to force away the child. I have known some Women, and that of late dayes, that in such cases have fallen into the hands of such creatures, that they had as good have sent for a Butcher to deliver them.  
 3 I confess it is something hard at first, to know when the true time of the Woman's Labour is, many women being troubled with pains so long before their true Labour comes, yea, some many weeks before.

## AN INTERPRETATION OF CERTAIN CRABBED NAMES WHICH YOU SHALL MEET WITH UNEXPLAINED IN THIS TREATISE

*Praeputium*, Is the Fore-skin of the Yard, that which the Jews were commanded to cut off from their Children at eight dayes of age.  
*Prostates*, Are the Kernels which keep the Seed after the Stones have taken the pains to finish it. I cannot but wonder why men should call an involuntary shedding of the Seed, the Running of the Reins, when the fault is in these Kernels. The Reins are so busied about the Urin, that they regard not the Seed at all.  
*Superfoetation*, Is when one child is conceived after another is fore-conceived in the womb.  
*Sutura*, Is a joyning as the bones of the Skull are joyned; it properly signifies a stitching.

Nicholas Culpeper (1616-54)  
 Directory for Midwives, 1671