

# Alcohol abuse, employment, earnings and marital status

by

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## Abstract

This paper investigates the effect of severe alcoholism on the capacity to hold a job, to earn an income and to maintain a marriage or cohabitation. We use longitudinal data from labour market registers covering a 5% sample of the Danish adult population followed from 1976 to 1993 merged with data from the Central Psychiatric Case Register which covers all cases of hospitalizations with psychiatric disorders and their diagnoses since 1969. A matched case control approach is applied. Using this sampling frame, we are able to follow people up to 13 years before they are admitted to hospital and more than 20 years after treatment and compare them with a control group. We find early reductions in productivity from 5-6 years before hospital treatment. Cohabitation is lower for cases and is reduced much more than for the control group. Labour force participation is reduced with about 1/3 during the development of the disease. Hospital treatment seems to have some effect on the de-route but not a lasting effect.

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## Introduction

There is an increasing literature on the positive effect on health of moderate alcohol consumption, see French and Zarkin, 1995 and Klatsky et al (1990) for a medical explanation. However, at the same time it is generally believed that alcohol abuse has high costs to society. These take the form of treatment costs, related diseases, loss of income and indirect costs to relatives of alcohol abusers in the form of agony and spoiled opportunities.

Though there are good theoretical reasons to expect an adverse effect on income and employment, some studies show that this hypothesis is not supported unanimously, see Kenkel and Ribar (1994). Nevertheless, most studies show that severe alcoholism leads to reductions in income, but there seems to be some disagreement on the magnitude and direction. The substance abuse literature contains reports of negative as well as positive effects of alcoholism on the employment rate and on income<sup>2</sup>. The same diversity of results is found for drug abuse<sup>3</sup>. There are of course several roads to lower income and employment. The most direct one is a lower daily production. The more indirect is that people who are abusers participate less in education on the job and off the job. Therefore, their salary does not grow. Another reason is that abusers have more difficulty getting a new job than non-abusers when searching according to two studies of the closure of a shipyard (Andersen, 1996). Given that most people change job quite often, this will have a substantial impact on employment and probably earnings.

Most studies on health related questions including alcohol consumption are based on surveys, where the respondents are asked about the consumption together with questions on income, worked hours, marital status etc. Especially when it comes to alcohol consumption this leads to underreporting. It is generally claimed that the reported amounts of alcohol should be doubled to reveal the real consumption. Another issue is that the most severe cases will not be covered by any survey because of general intoxication and social de-route.

This study takes a different route and exploits the fact that the Danish administrative registers of social data can be merged with records from a register of all inpatients of psychiatric hospitals in Denmark. Of the latter, we are only selecting those with a diagnosis as alcoholics. This is clearly limiting the sample compared to most other studies using surveys. First, only a limited number of those being characterized as abusers will ever be treated at a hospital. Second, the identification of cases is based on a clear diagnosis and is not based on self assessment. The main indication for hospitalization is that the case is so severe that any anti poisoning treatment has to be carried out under strictly medical supervision mainly to prevent delirium. The data are likely to cover all patients in Denmark, because hospitals are all public, and there is no fee for services. The threshold of hospital admissions varies only little between these hospitals. Diagnoses are classified according to the WHO classification, ICD-8. Alcoholism is just one of 6 classes of diagnoses. The general indication for hospital treatment is that alcoholism has come so far that the cure has to happen under medical

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<sup>2</sup>Thus, a negative impact on earnings and employment is found in Mullahy and Sinclair (1993), while Berger and Leigh (1988) find that drinkers earn more. Part of the diversity is probably because of differences with respect to the severity of alcoholism reflected in different measures.

<sup>3</sup>Kaestner, 1991 finds a positive effect on earnings while Gill and Michaels, 1992, find a negative effect.

control. Often there will be other psychiatric indications and social causes. There is also a system for outpatient treatment. It is generally believed that this system only treats the lighter cases.

Unlike most other data sets, the data exploited are based on a nationally representative sample. The result is that we are also including institutionalized persons and those who are so sick that they would not be covered in many surveys. Furthermore, we are able to include several thousands cases and many more control persons. Another advantage is that we are able to follow people way before they actually become admitted and many years afterwards. The results are that there is a reduction in labour force participation of between 0 and 40% and between 5 and 30% in earnings and between 20 and 50% in marriages depending of the distance to hospital admission. These numbers are compatible with what Kenkel and Ribar gets from using data from NLSY. They find that alcohol abuse is related to about 10% lower earnings, insignificantly lower number of hours, and a 30% reduction in the number being married. Given that the latter data show the conditions at a point of time before the time of hospitalization in our data, it looks like our results are in the same ballpark.

Our approach and data will of course only show the top of the iceberg. The number of people with a diagnosis as alcoholics will only be a fraction of those who could be characterized as abusers. According to the American comorbidity study (Ettner et al (1997) 1.4% of all women and 3.3% of all men suffer from alcohol abuse, while the numbers being characterized as alcohol dependents is 3.7 and 10.4% respectively.

## Possible Methods

The usual approach is to estimate a model in which current earnings is specified to be a function of exogenous current drinking. This could be expressed in the model

$$Y_i = \alpha X_i + \beta A_i + u_i, \quad (1.1)$$

where  $Y_i$  represents the natural logarithm of individual 'i's earnings,  $X_i$  is characteristics of the individual,  $A_i$  is a measure of alcohol problems, and  $u_i$  represents an error term. The coefficient on the alcohol variable will then tell if alcohol has a negative or positive impact on earnings or any other measure represented by  $Y$ . According to Kenkel and Ribar (1994) a negative sign has in the past often been interpreted as if alcohol causes lower earnings. They also mention that the estimates suggest, that there is generally concluded that problem drinking causes earnings losses in the range of 10 to 20 percent. However, there is no strong consensus about the sign of  $\beta$  not its significance. Recent research shows that users of alcohol and drugs may earn more than non-users, see Berger and Leigh (1988). This is in accordance with medical and epidemiological studies that suggest that alcohol in moderate amounts especially in the form of wine may improve health and productivity. See Shaber (1993). There are several problems in these studies. First, they tend to use different measurements of the alcohol intake. Second, only few surveys have information on labour market variables.

However, there may also be indirect effect of alcohol abuse, because early drinking may result in lower education. Thus, Mullahy and Sindelar (1989) find that alcoholics attain about one and a half year less schooling than do people without alcohol problems. This means that  $A$  is positively correlated with  $X$ , if one of the elements in  $X$  is education. Similarly, with

respect to on-the-job training and the ability to do job search and in that way obtaining better jobs. These indirect effects will all introduce a downward bias in the estimate of the direct effect of alcohol ( $\beta$ ). Mullahy and Sindelar (1993) claim that these indirect effects may be responsible for almost half of the total effects of alcohol on earnings. However, the magnitude of this indirect effect probably depends on the severity of alcohol abuse.

The simple model above could be extended with a person specific effect that captures that people differ with respect to their earnings capacity in a way that is idiosyncratic for each person. Kenkel and Ribar suggest furthermore, that individual alcohol consumption is a function of some individual characteristics (alcoholism in the family, antisocial parents, and mental illness in the family) and the person specific effect. One obvious problem with this specification is that the person specific effect may not be constant over time nor age of the individual, because social norms change and because an escalating alcohol abuse may have different effects on earnings and other left hand side variables ( $Y$ ). Even longitudinal data will not help in this context.

Turning back to basic equation (1), these problems could be interpreted as correlations between the error term and the alcohol consumption,  $A$ . Finally, there is a possibility that changes in income, unemployment or marital status may themselves affect the alcohol consumption. This is identical to saying that there might be a simultaneity problem. A possible solution to both problems would be to use instrumental variables (IV) techniques. The idea here is to find an instrument for alcohol consumption that is correlated with the alcohol abuse but not with the left hand side variable. Though this technique provides unbiased estimates, the efficiency may be low, if good instruments are not found. Kenkel and Ribar use the percentage of the population living in dry counties, the average beer price, parents' and distant relatives' alcoholism. The results of their IV estimation show a 30% reduction of earnings due to alcohol dependence and non-significant reduction of hours and the marriage rate. The earnings reduction is as expected much larger in the IV-regression than in the OLS, while the lower precision in the estimates are responsible for the non-significance.

From these different estimates, one may draw the conclusion that the choice of specification actually matters for the estimated effect of alcohol.

These methods will not help us because we do not have a measurement of the alcohol consumption over time. Instead, we have information on admission to hospital at one point of time together with very rich information on earnings, labour force participation, and marital status over a long period before and after the admission.

After a introduction to the data in the following chapter, we will explain the method we have chosen to apply. The subsequent section deals with results followed by discussion and conclusions.

## Data

The data is constructed by merging two longitudinal data sets using a common identifier, the CPR-number<sup>4</sup>. The first data set is The Longitudinal Labour Market Register (LLMR), which consists of records from various Danish administrative registers on income, unemployment, education, work history, and demographics. The register contains a 5% random sample of the adult Danish Population (15-74 years of age) who are followed over the years 1976-93 or 206,784 persons. The sample is representative for the population between 15 and 74 of age. The sample is not balanced, which means that we are observing most persons for the whole period, but a small number of persons disappears from the sample due to attrition and a similar small number is added to the sample. Attrition is caused by death or emigration. The sample is supplemented with people turning 15 or immigrants, so that the representative nature of the sample is maintained. The labour market data has been used extensively over the last 15 years and has proven to give a reliable picture of flows on the labour market, see Westergaard-Nielsen (1989). One reason for the reliability is that the underlying administrative data are updated almost every time a person approaches public authorities. The sample is updated annually and people are followed for as long as they are alive, fulfilling the age requirement and provided they are still living in the country.

These data were merged with the Danish Psychiatric Case Register<sup>5</sup> using the CPR-number as the identifying key. The Danish Psychiatric Case Register has been described in detail by Munk-Jørgensen and Mortensen (1997) and in short, it covers all psychiatric inpatient facilities in Denmark. The register has been available on a computerized basis since 1969. The resulting sample consists of 5% of the population with psychiatric records on all those in the sample that have ever been admitted to a psychiatric hospital, which also means that we can distinguish between people who have been admitted (cases) and those who have not been admitted at the point of observation (controls). About 5% (10,400) of the total sample appears to have been admitted to a hospital due to a psychiatric diagnosis during the period 1976-93. Of these 1086 persons (.6% of the non admitted in the sample) were diagnosed with alcoholism.

We will measure economic activity in two dimensions: employment and wage rates. Employment is in this study defined according to the earnings of a person, i.e. if the person earns more than the basic tax allowance of about 30,000 DKK in 1994 then he or she is considered to be employed. If the person earns less we define him or her as not employed. This definition is chosen to capture economic activity on the labour market instead of relying on a formal definition of attachment to the labor market. Similarly, the tax allowance threshold is chosen to avoid categorizing as working if somebody else in the household is just “using” their tax allowance.

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<sup>4</sup>The CPR number can be compared to a social security number though it is used more widely.

<sup>5</sup>The research facilities of Statistics Denmark make it possible for us to use hitherto confident data. The CPR-number is a ten digit number that can be logically checked for errors. Each individual born in or immigrating to Denmark is assigned a number which is used uniformly across all registration systems in Denmark, including the population registers and registers of cause of death.

	One admission	Admitted more than once	Participation	Number with
Affective	0.35	0.25	0.29	1593
Alcohol	0.37	0.25	0.30	1086
Non-organic and non psychotic	0.44	0.28	0.36	4807
No main diagnosis	0.47	0.45	0.46	297
Schizophrenia	0.27	0.13	0.16	1006
Substance	0.24	0.18	0.21	274
Organic	0.23	0.11	0.16	585
Never admitted			0.60	197136

The summary table (Table 1) shows that the overall participation ratio was 59% in 1993 and only 39% among people who at that time had been admitted once and 23% among people who at that time had been admitted more than once. Employment is much lower among patients than among people who have not been admitted to a hospital. The second part of the summary table shows that the age dimension is very important with respect to participation for patients as well as non-patients.

*Table 1. Summary table of labour force participation in 1993, all diagnoses.*

	One admission	Admitted more than once	Participation	Number with diagnosis	Number in % of total
Affective	0.35	0.25	0.29	1593	0.8
Alcohol	0.37	0.25	0.30	1086	0.5
Non-organic and non psychotic	0.44	0.28	0.36	4807	2.3
No main diagnosis	0.47	0.45	0.46	297	0.1
Schizophrenia	0.27	0.13	0.16	1006	0.5
Substance	0.24	0.18	0.21	274	0.1
Organic	0.23	0.11	0.16	585	0.3
Never admitted			0.60	197136	95.3
Total sample				206784	100

The second dimension of economic activity is the wage rate for those who are employed. Total wages come from the tax registers. The wage rate is calculated for each person dividing the total wage income with a number of hours provided by the supplementary pension scheme, ATP.

The third left hand side variable is the cohabitation indicator. Using the registers for where people live together with the housing register, Statistics Denmark is able to present an indicator for the cohabitation status of all persons living in Denmark.

The data for patients contains two time dimensions: a calendar dimension and an age dimension. The calendar dimension picks up changes to the practice of admitting people to hospital. It is known that first time admission has decreased over the investigated period as it has in most countries. It is also known from time-series studies that increase in the aggregate rate of unemployment is followed by more admissions; see Eriksson, Agerbo, Mortensen and Westergaard-Nielsen (1998). The age dimension contains all age patterns in the admission probability as reported in Figure 1. The age distribution of first admission shows a very distinct pattern with a maximum at 37 years of age. The peak occurs later than for any other diagnosis and is much more uni-modal than any of the other diagnoses. Figure 2 shows the similar age pattern for all psychiatric diagnoses.

Figure 1. The age specific frequency distribution of first admissions with a diagnosis with alcoholism, observations, and smoothed curve.

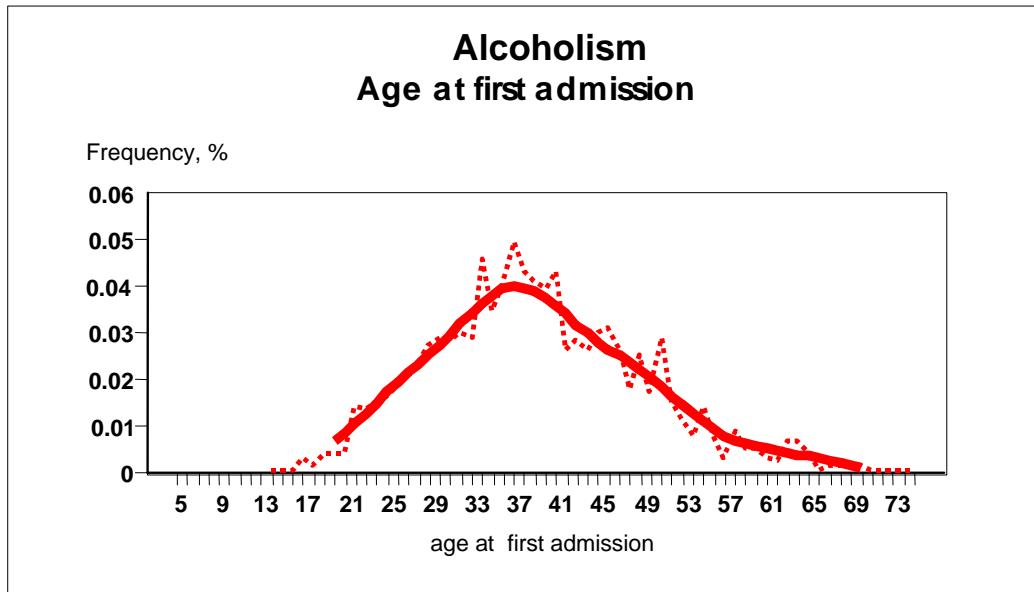
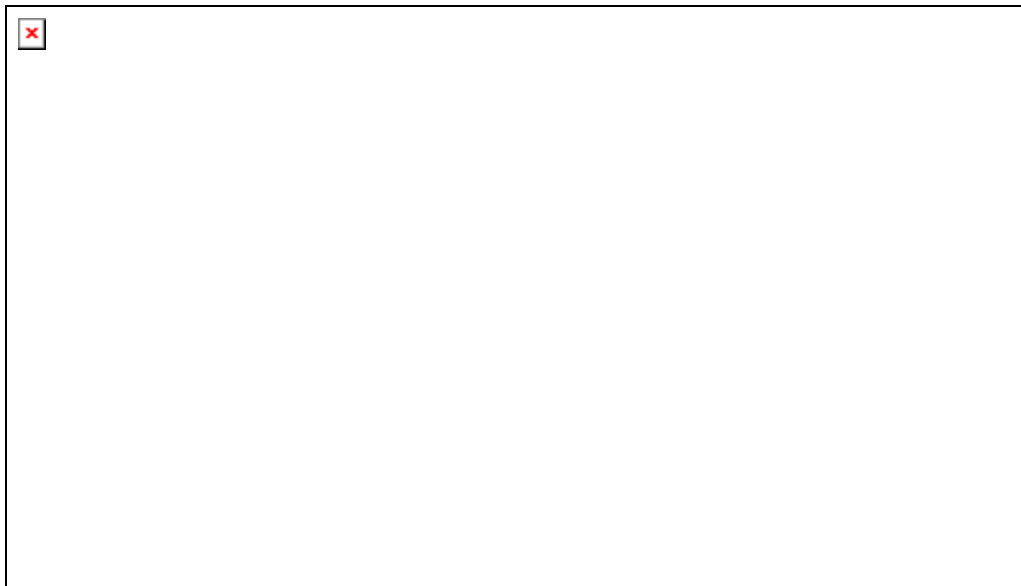


Figure 2. The age specific frequency distribution of all first admissions, men and women.



### Case Control approach

Though uncommon in the economics literature, we have chosen a case control structure to analyze the data. We have chosen a case control approach, where control persons are now selected from the vast number of persons who have not been admitted at the time of selection. For each point in time where we observe that a person has been admitted we randomly choose 10 control persons among those who have not been admitted up to this point in time and who belong to the same cohort (age) and gender as the case person. Controls and cases will have

the same characteristics with respect to the number of years we observe them before and after the selection. Therefore, we will expect that on average controls have an employment rate, a wage level and a marital status corresponding to that of the cases, had they not been admitted to hospital because of alcoholism. In this way we are controlling for the relative position in the career. This is especially important, when it comes to alcoholism, which appears to hit at a time where the labour force career is close to its peak, see Figure 1. This method is actually the same as estimating equation 1 and using gender, age, and time as the explanatory characteristics,  $X$ . The selection of controls means that we can compare cases with controls at any time before and after admission, because they have the same time distance to admission (cases) or selection (controls). Compared to the regression approach this approach has the advantage of being simple, highly intuitive, justified by the abundance of observations, forcing a minimum of structure on the data, and allowing us to use simple graphs to display the development over time of the reductions in labor force participation, earnings and marital status. The drawback is that we are not able to disentangle multiple causes.

The only important assumption we are making is that cases and controls are alike at some point of time and before alcohol starts to influence their opportunities. This is of course a heroic assumption that only can be justified by the abundance of controls. The alternative would be to use more controls. Education would be an obvious candidate but education might very well be influenced by alcohol as suggested in Mullahy and Sindelar (1989). The Graphs in Figures 4, 6, and 8 all show that earnings, participation and marital status have not differed significantly at an early point of time between cases and controls, indicating that cases and controls are actually taken out of the same distribution. Only marital status seems to indicate some non-significant differences.

Our main interest is to follow cases before and after their hospital admission to see how the disease interacts with labour market outcomes and marital status. Therefore, we will project all cases on the same time axis so that the first hospital admission is located in  $t = 0$ . The years before admission are located on the negative part of the axis and the years after on the positive axis. Even though the observation period covers 17 years, we can cover a longer time span, because the position of the first hospital admission in this span of years determines how many years before and after we are able to follow each case.

For each point on this new time axis, we can calculate mean values of employment, wage rates, and cohabitation. Asymptotic point wise 95% confidence intervals are calculated using the standard large-sample asymptotic distributions; see Agresti (1990). The sample size suggests that these confidence intervals have good coverage properties.

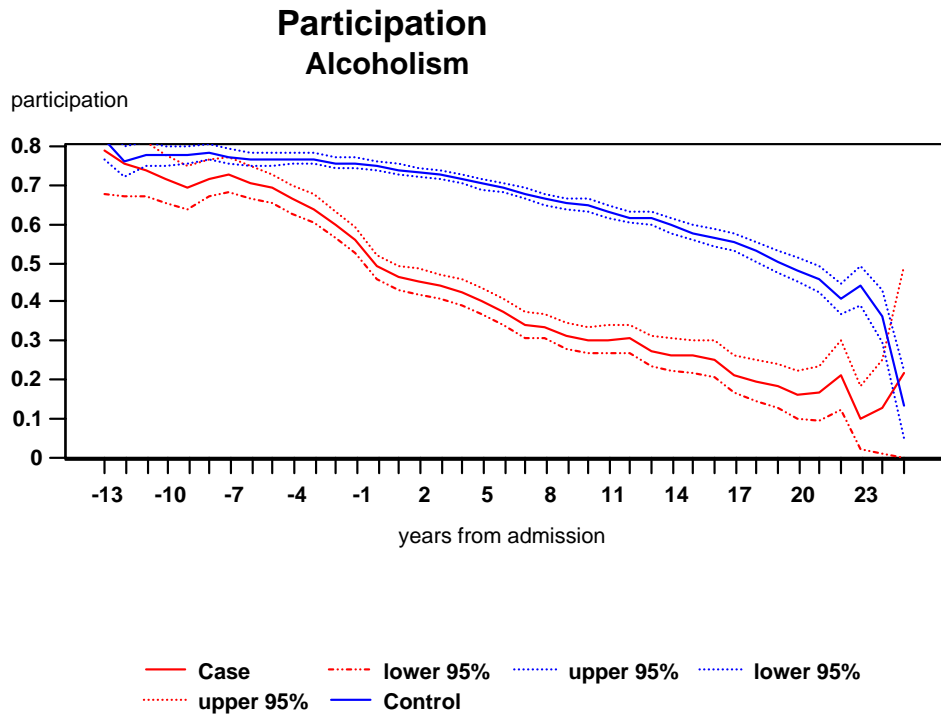
## **Participation**

Figure 3 presents the rate of participation of cases and controls. A number of features are revealed in this graph. Firstly, the standard deviations are rather small which is resulting in a very high significance of the differences between the cases and controls. The significance is somewhat less in the two ends of the x-axis, where there are fewer observations due to the construction of the sample. Secondly, cases seem to have a lower participation from the very beginning, though the difference is only significant from 5-6 years before admission. Thirdly, the decline in participation accelerates over the last 5 years before admission. At admission, the level of participation has been reduced to 45%. Fourthly, the decline of average



employment during the last two years previous to admission is substantial. Fifthly, after admission the decline compared to the control group is continuing but more modest. Sixthly, the retirement rate for cases becomes smaller 8 years after admission.

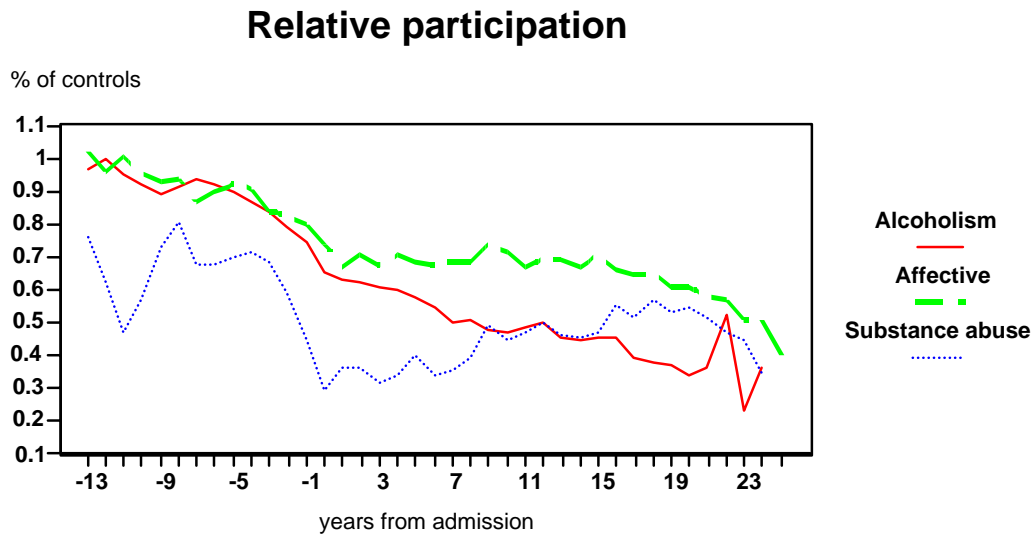
Figure 3. Participation rates of cases admitted with diagnosis alcoholism and controls.



Note: The dotted lines are approximate pointwise 95% confidence limits around the estimated labour market participation.

It is remarkable that the relative decline in labour force participation is higher and long lasting for cases with alcoholism compared with cases with other related diagnoses. Figure 4 compares the relative rate of participation for cases with affective diagnoses (depressions and bi-polar diseases), substance abuse (drug addiction) compared with their respective control groups. Cases with substance abuse are special in the sense that they probably start their drug abuse so early that many of them never get started on a normal labour market career. It is also remarkable that treatment seems to have a much smaller effect on cases with alcoholism than for other diagnoses.

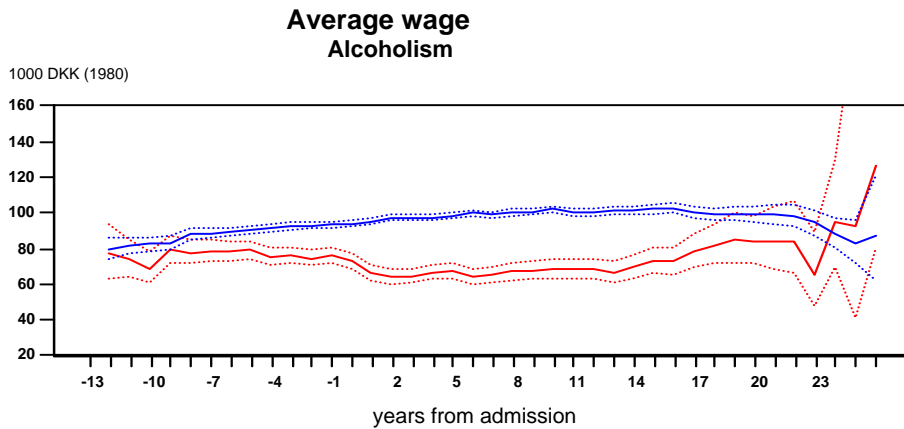
Figure 4. The relative impact of different diagnoses on labour force participation.



## Earnings

We will now turn to the development of the earnings of those among the admitted persons who are employed. For this analysis, we will use the same approach as above, though we will have to adopt it to deal with the problem that we are only observing wage for those who participate. This means that for every time we observe a patient we randomly pick 10 control persons, who have identical characteristics with respect to cohort and gender. For those years where these persons have a wage above the basic tax allowance, we calculate the mean for cases as well as for controls. For each case and control we will then observe wages before and after the selection point. All wages are transformed into 1980 prices. At this point of the analysis, we are neglecting any differences that are due to differences in education and experience. By controlling for these factors we could have achieved a higher precision. However, the large number of observations and the generally small standard deviations of the mean values for cases and controls indicate that we do not have to be overly concerned about this caveat.

Figure 5. Average wages for cases and controls.



Note: The dotted lines are describing the 95% confidence intervals. Pointwise 95% confidence limits for the wage income are based on the logarithm transformed wage.

Again the controls show the expected upward but decreasing slope due to the normal life cycle trajectory. The cases show lower earnings from the very first observations 13 years previous to admission, though it is not significant. Here, the difference is about DKK 4,000 (1980-level) per year. However, the differences are only statistically significant from about 10 years before and up to 17 years after the first admission. While the average wage income increases for the controls it is slightly decreasing for cases and it takes a dive at the time of admission and the subsequent year. At that time the difference is about DKK 35,000. This difference is preserved almost for the rest of the observed time, though there is a slight catch up effect probably coming from a non random exit behaviour among those who stop working among the cases.

Figure 6. Relative wages for cases compared with controls.

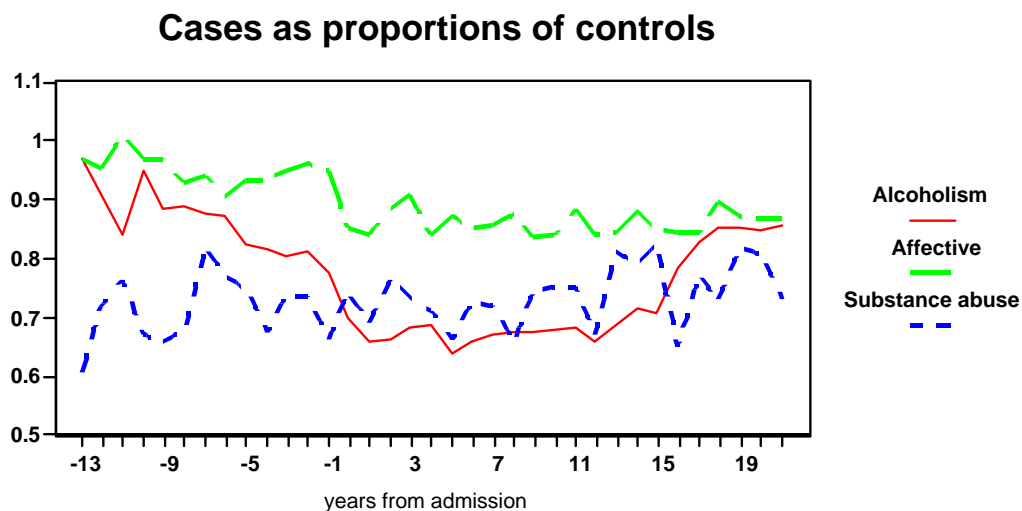


Figure 6 shows that the decline in wages continues until about 3 years after hospital treatment for alcoholists, where it finally levels off at a level of about 70% of the wages of the control group. This is a much more dramatic reduction than what is seen for affective diagnoses and for substance abuse.

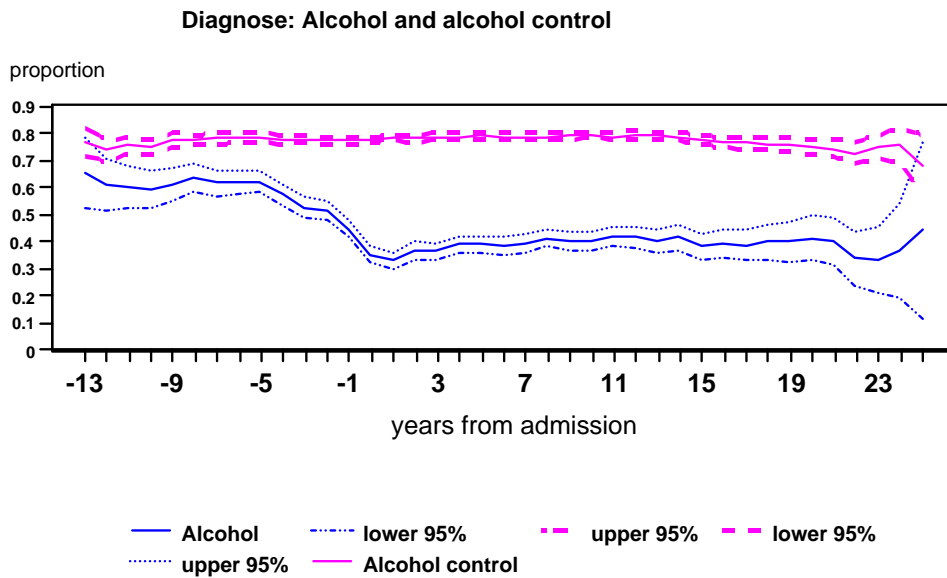
The loss in wage for alcoholists is about DKK 35,000 and highly significant while it is about DKK 20,000 for organic diagnoses but with a higher variance. The loss for substance abusers is also seen to be high, but a high variance among these cases tells us that there are some in this group who succeed in earning almost as much as the controls after treatment. The diagnosis group with the lowest difference between cases and controls is that of affective diseases.

## Marriage and Cohabitation

The last dimension we will investigate is marriage and cohabitation. The same case control approach is followed.

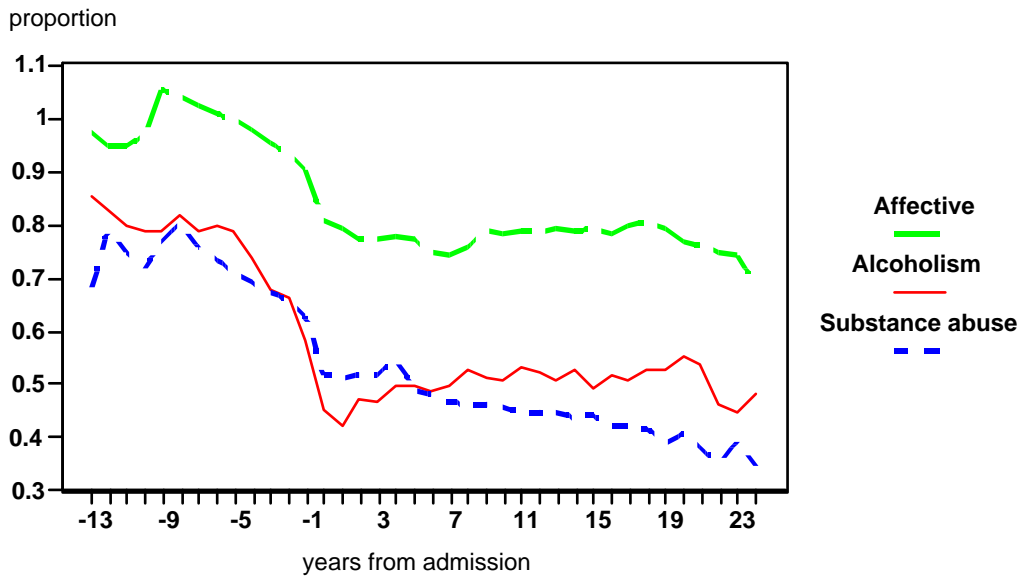
Figure 7 shows that cases already 13 years before the first admission seems to have a slightly smaller marriage and cohabitating behavior. However, the difference is only significant from about 12 years before admission. Similar to participation and wage level an accelerating decline is observed until the point of admission. But unlike these outcome measures, the level is stabilized and even slightly increased after hospital treatment. So despite the apparent economic de-rout, there is some comfort to be found in marriage and cohabitation.

Figure 7. The development of marriage and cohabitation for cases and controls.



However, the picture is more gloomy when comparing to the relative development of the cohabitation behaviour of cases with other diagnoses as seen in Figure 8. Here, alcoholists look more like drug addicts than they look like cases with affective diagnoses.

Figure 8. Marriage and cohabitation for cases compared with controls



## Discussion and conclusion

In this paper, we find that on average people who are eventually admitted to a psychiatric hospital with a main diagnosis of alcoholism start behaving differently from their control groups with respect to labor force participation, annual productivity and marital status well before they are actually admitted to a psychiatric hospital for the first time. It starts as early as about 13 years previous to admission with a slightly lower marriage/cohabitation rate and is followed by a lower participation rate together with a lower income level from year 6. Among those who work in year 6 the case persons appear to earn about 90% of controls. At the time of admission the participation rate has dropped to 65% of the controls and the annual wage has for those working dropped to 70%.

Because alcoholism hits people relatively late (late 30's) compared to other psychiatric diseases we do not observe initial or early differences in the wage level and in participation because cases get a lower education than controls. This aspect is found to be important in Kessler et al (1995) and in Jayakody et al (1996). However, the early differences in the marriage/cohabitation measure seems to indicate that there are early indications of a beginning alcohol problem that the spouse discovers but that is not discovered by the employers until much later. The alternative explanation is of course that singles and divorcees are more likely to start on a career as alcoholists.

Some diagnoses are found to be more severe for the labour market status than others. Among all diagnoses investigated in Westergaard-Nielsen et al, 1999 alcoholism has the most severe effect on earnings followed by schizophrenia and substance abuse. Affective diagnoses are seen as those with the highest employment rates and the lowest reductions in earnings.

These results reflect a lower ability to maintain a job together with a lower productivity for a vast number of case persons. Our findings are, however, influenced by the availability of disability pensions and the praxis of the governmental bodies determining when people are eligible. One example may clarify this point: Alcoholism is not found to have the most severe consequences for employment, but is seen to have the most severe effects on earnings. This may be a result of the fact that the pension boards may be more reluctant to giving pensions to people with severe alcoholism than other disorders.

It is hard to find comparable results in the literature, where the results are both nationally representative and are using treatment based definitions of disorders. One important difference is of course that we have data that follow a selected group of cases. Most other data sets will refer to a non-defined point in time in the development of alcoholism. We have already mentioned the study by Kenkel and Ribar (199X). If we think of their data as covering

The National Comorbidity Study, Kessler et al (1995), seems to be another obvious candidate for benchmarking. There are, however, a number of differences that have to be taken into account. First, we can observe wage income directly and can therefore disregard income from pensions etc. that might be related to the mental disorder. We are using hospital admission data, where the comorbidity study uses diagnostic interview schedules. Because of these features and differences we will expect our results to show a more grave picture of the consequences of alcoholism and other mental disorders compared to the comorbidity studies. Table 3 compares these results.

Table 3. Comparison between our results and results from the National Comorbidity Study. Reductions of employment and wages for cases compared to controls. (The first row presents the values for controls).

	Reduction for people with psychiatric disorders			Wage income					
	Employment			0			+5		
	-5	0	+5	NCS, men	NCS, women	0	+5	NCS, men	NCS, women
No disorder/control	0.61		0.63	93.30	81.80	79601.16	83642.99	33245.00	18586.00
All cases	0.11	0.34	0.40			0.21	0.21		
Men	0.11	0.34	0.39	0.17		0.26	0.27	0.10	
Women	0.20	0.34	0.40		0.17	0.13	0.13		0.29
Diagnoses									
Affective	0.08	0.27	0.31	0.07	0.10	0.15	0.13	0.09	0.04 Depression
Alcohol	0.10	0.34	0.43	0.05	-0.10	0.30	0.36	0.12	-0.05
Schizophrenia	0.08	0.28	0.33	0.06	0.15	0.28	0.19	0.02	0.54
Substance abuse	0.19	0.48	0.63	0.06	-0.04	0.26	0.34	0.14	-0.46
Non-organic	0.30	0.70	0.60			0.19	0.17		
Organic	0.18	0.56	0.64			0.18	0.27		

Source: the NCS numbers are from Ettner, Frank and Kessler (1997). In this table, their diagnosis group for depressions are placed under affective diagnoses leaving out the manic cases.

Table 3 generally summarizes our results and shows that as was to be expected we get much stronger effects than those found in the NCS. For alcoholism and substance abuse some of the coefficients in NCS are negative, meaning that these people have an employment rate and a wage higher than persons without the disorder.

The literature has diverging results for especially alcoholism. Thus, Ettner, Frank and Kessler (1997) have a positive employment and income effect. Mullahy and Sindelar (1993) have a positive effect for the young and a negative and no effect for the older age groups. The latter result suggests that the effect should be studied separately for age groups. Our results support this. If we had chosen a common control group for all diagnoses, it would have looked like the results of Ettner, Frank and Kessler (1997). The problem is, however, that in the way we define it alcoholism peaks at an age of 37, which is the time where people are most active in the labour market. Therefore, it is important to select controls for each diagnosis who reflect the age and gender distribution of the diagnosed.

The loss to society can be measured as the sum of those who stop working due to their disease and the loss in income for those who continue working. The current cost could be measured as the gap between the graphs of cases and controls in Figure 5 times the number of admitted persons in the current year with different diagnoses. Similarly, the loss of income for those who continue working can be calculated as the mean loss multiplied with the number of persons. However, this calculation appears to neglect the fact that a number of persons experience the same symptoms but are never admitted to hospitals. These will actually weigh the control group downwards and thus contribute indirectly to a lower gap and to the negligence of a loss occurring before the first admission.

We have in this paper demonstrated that the diagnosis affects people early and has a long-term impact on the labor market careers. So far, we have been very parsimonious about the

causation, but it seems appropriate to confront the two main arguments on the direction of causation without making firm evaluations. The long period over which the disorder develops makes it even more difficult to disentangle causation. There are basically two sets of explanations: First, some people are so unlucky that their marriages break up, later they lose their jobs or do not follow the upward wage trajectories of their fellows in the same birth and gender cohorts. If this is aggravated over time, they are more likely to become seriously hit by alcoholism and eventually becoming admitted to hospital. The competing explanation is that some persons develop alcoholism. The first reaction comes from their spouses, who leave them. Much later, the growing dependence of alcohol makes them less productive and they have more difficulty holding a job. This gets worse and worse and leads to hospitalization. Only their marital status is actually stabilized by the treatment. Productivity and participation continues to go down but with a lower speed than before treatment.

The two explanations may, however, not be competing since the selection into the group of persons who are divorced and fired first, who do not get the increase in pay may be closely related to growing symptoms of alcoholism or a related psychiatric disorder. From then on the labour market situation may aggravate the position of the person. Treatment has the effect that the trajectories of the person is stabilized.

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