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Abstract
The purpose of this study was to document historical trends and socioeconomic inequalities in ill health outcomes related to alcohol consumption, narcotics use and tobacco smoking over the seventeen years prior to the implementation of the Swedish government's first strategy for alcohol, narcotics, doping and tobacco (ANDT) in 2011. We also sought to explain the changes over time in terms of changes in the population distribution of selected demographic and socioeconomic characteristics. Our two key research questions, for each of alcohol, narcotics and smoking were: 1) How have trends in a) consumption, inpatient care and deaths, and b) income-related inequalities therein developed over time? 2) To what extent can demographic (gender, age, civil status, foreign background), socioeconomic (parental education, own education) and social characteristics (social isolation, proportion of welfare recipients in the municipality) explain the trends in a) levels of consumption, inpatient care and deaths, and b) income-related inequalities therein? For consumption, we investigated the prevalence of heavy drinking and smoking; data on narcotics use were not available. We used International Classification of Diseases (ICD) codes to identify inpatient care and deaths related to alcohol, narcotics and smoking. In our main analyses we used income as a measure of socioeconomic rank. We performed sensitivity analyses to investigate: i) the use of education as an alternative socioeconomic rank, ii) differences between measures of relative and absolute inequality, and iii) sex-differences in the trends over time. We document increasing pro-poor socioeconomic-related inequalities in all of our outcomes except heavy drinking (which was concentrated among higher income individuals, and did not change significantly) during the study period. This reflects an increasing concentration of smoking, and inpatient care and deaths related to alcohol, narcotics and smoking among low income individuals. We are able to explain some of the change over time by demographic and socioeconomic changes (i.e changes in the distribution of our sample by age, foreign background and educational attainment). However, our findings suggest that most of the change observed was due to external factors, such as changing norms and behaviours, and policy or macroeconomic conditions affecting certain groups more than others. In order to achieve the goal of equality in health, ANDT as a policy area must address the increasing concentration of alcohol-, narcotics- and smoking-related outcomes among the poorest and least educated in our society.

Key words: ANDT, Inequality in health, Alcohol, Narcotics, Tobacco, Concentration index

JEL Classification: I10; I12; I14

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1. Introduction

1.1. Background

The overarching goal of the current national strategy on alcohol, narcotics, doping and tobacco (ANDT strategy 2016-2020) is for a "A society free from narcotic drugs and doping, with reduced alcohol-related medical and social harm and reduced tobacco use." (1) The Public Health Agency of Sweden (Folkhälsomyndigheten) has been assigned by the Government to support the implementation of the ANDT strategy, which includes being responsible for the overall coordination, monitoring of trends related to alcohol, narcotics, doping and tobacco, and supporting of target groups with evidence-based knowledge (2).

The ANDT strategy is part of the Government's overarching goal for equitable and gender equal development of the Swedish population's health by eliminating avoidable health gaps within a generation (1). Hence, the Public Health Agency of Sweden should consider and promote equality between groups defined by, for instance, gender, sexual orientation, income and education. Ill health outcomes related to alcohol, narcotics, doping and tobacco (for example, injuries, sickness and premature death) are commonly agreed to be avoidable and may affect different groups in society in different ways. Inequalities in the use of ANDT and the effects of the use of ANDT can therefore be contributing to socioeconomic inequalities in health and exacerbating differences in health between, for instance, different socioeconomic groups.

In order to understand how best to tackle inequalities due to ANDT, it is important to understand developments in the use of ANDT and the ill health effects of ANDT over time. Such an understanding can help in the development of appropriate policies to reduce (or eliminate) the use of ANDT and mitigate the ill health effects of ANDT in the Swedish society.

Previous research has investigated trends in alcohol consumption (see e.g. (3), (4), (5), (6)), smoking (7-10) and narcotics use (11-13) in Sweden over time, as well as socioeconomic-related inequalities in alcohol- (14-17), smoking (9) and smoking-related outcomes (18, 19). No research has (to our knowledge) sought to simultaneously investigate trends over time in the levels of- and socioeconomic inequalities in- alcohol consumption. narcotics use, and smoking, and related ill health outcomes, using comparable methods.

1.2. Purpose

The purpose of this study is to shed light on historical trends and socioeconomic inequalities in ill health outcomes related to alcohol consumption, narcotics use and tobacco smoking (ANT)[1] over the seventeen years (1994-2011) prior to the implementation of the Swedish government's first strategy for alcohol, narcotics, doping and tobacco (ANDT; implemented in 2011).

The project aims to document trends in inpatient care and deaths related to ANT and socioeconomic-related inequalities therein in Sweden. To provide context for the trends in

[1] Note that we do not investigate trends in doping or socioeconomic-related health inequalities in doping.

inpatient care and deaths, we also seek to document trends in the prevalence of heavy drinking and smoking, and socioeconomic inequalities therein. The project also aims to offer some *explanation* for the changes in the levels and socioeconomic-related inequalities in ANT-related outcomes over time – and thus inform future research and policy targeting ANDT.

For each of alcohol, narcotics and smoking, we set out to answer the following research questions:

1. How have trends in a) consumption, inpatient care and deaths, and b) income-related inequalities therein developed over time?
2. To what extent can demographic (gender, age, civil status, foreign background), socioeconomic (parental education, own education) and social characteristics (social isolation[2], proportion of welfare recipients in the municipality) explain the trends in a) levels of consumption, inpatient care and deaths, and b) income-related inequalities therein?

2. Data

2.1. Data sources

We use register data from the Swedish Interdisciplinary Panel (SIP; administered by the Centre for Economic Demography, Lund University, Sweden) and survey data from the Swedish Living Conditions Survey (ULF; administered by Statistics Sweden).

Consumption

The ULF survey is conducted yearly by Statistics Sweden (SCB) among a representative sample of the Swedish population aged 16-84. It also previously included a health panel, where a subset of individuals were re-interviewed every eight years between 1986 and 2013. The ULF data can be linked to the longitudinal integration database for health insurance and labour market studies (LISA) and the Swedish multi-generation register, among others. We use ULF to estimate the prevalence of heavy drinking (quantified in terms of average weekly consumption of 100% pure alcohol) and cigarette smoking (reporting being a daily cigarette smoker) in the population. The ULF survey does not ask about narcotics use, and we thus do not have data on consumption of narcotics in the population.

Inpatient care and deaths

SIP covers all individuals born between 1930 and 1980 who were resident in Sweden at some point during the calendar period 1968-2013. It includes data from SCB, covering information on the individuals' parents and children linked via the Swedish multi-generation register. SIP also includes data from several administrative databases, for instance the cause of death register, the national patient register, LISA and the Swedish multi-generation register. We use

[2] Only for self-reported consumption since this factor only exists in ULF. See more information on this variable in Appendix C.

SIP to identify individuals who have been hospitalised for- or who have died from- causes related to alcohol consumption, cigarette smoking or narcotics use.

Whilst the SIP and ULF datasets can be linked to many of the same administrative registers, it is not possible to link the two datasets to each other. We can thus not directly compare consumption to inpatient care and death at the individual level.

2.2. The sample

Our target population is working-age individuals. When considering inpatient care and deaths, our sample consists of all individuals aged between 31 and 64 years resident in Sweden between calendar years 1994 and 2011[3]. When considering heavy drinking and cigarette smoking, our sample is limited to those individuals who responded to the ULF survey sometime during calendar years 1994-2011 (or 1988-9, 1996-7 and/or 2004-5 for heavy drinking, see section 2.3).

We do not follow specific individuals over time, but rather treat each year as a separate cross-section. This allows us to compare the experience of working-age individuals in Sweden in 1994 (1988-9) versus 2011 (2004-5), rather than developments among a cohort of individuals over time.

2.3. Outcome variables

Using the SIP and ULF data, we investigate the prevalence of heavy drinking and cigarette smoking (ULF), and probabilities of inpatient care and death related to alcohol, narcotics and smoking (SIP). No data on narcotics use are available in ULF, so we do not investigate this.

Consumption

Heavy drinking

Questions on alcohol consumption were only asked in calendar years 1988-9, 1996-7 and 2004-5 as part of the health panel in ULF. We use responses to these questions to estimate average weekly consumption in grams of 100% alcohol[4] for calendar periods 1988-9, 1996-7 and 2004-5. We use this variable to identify heavy drinkers as individuals who report average weekly consumption of 100% alcohol greater than 252g for males and 168g for females (20-22).

[3] We consider individuals aged 31 to 64 years because the youngest individual in SIP in 2011 is by definition 31 years of age and the oldest individual in 1994 is 64 years (because SIP covers the entire Swedish population *born between 1930-1980*). We could consider 1980 as the initial calendar year, because this is the first year available in the ULF survey, but we would then only be able to consider ages 31-50 in a consistent manner.

[4] The ULF survey includes several questions about alcohol consumption. Individuals are first asked whether they have consumed any alcohol in the past 12 months. They are then asked a series of questions to elucidate the quantity and type of alcohol they would normally consume during the week. Note that the questions asked in 1988-9 differ slightly to those asked in 1996-7 and 2004-5. In 1988-9, individuals were asked how much of given types of alcohol (cans of beer, bottles of beer, light beer, strong beer, light wine, strong wine, spirits) they consume during an average week. In 1996-7 and 2004-5, the questions were broken down by days of the week (Monday to Thursday, Friday, Saturday and Sunday).

Cigarette smoking

ULF includes a question on current daily cigarette smoking. We use responses to this question to estimate the prevalence of cigarette smoking (reporting being a current daily smoker) in the population, for all calendar years 1994-2011.

Inpatient care

We estimate the probability of inpatient care related to alcohol, narcotics or smoking in Sweden, for all calendar years 1994-2011, using data on inpatient care from SIP.

An individual is identified as being a "case" if they have at least one inpatient hospitalisation during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to alcohol, narcotics or smoking, respectively.

Diagnoses were identified by ICD-9 and ICD-10 codes. We followed the National Board of Health and Welfare (Socialstyrelsen) alcohol and narcotics indices (23) as closely as possible[5] to identify alcohol- and narcotics-related inpatients.

We selected which smoking-related diseases to investigate based on published estimates of the relative risk for the disease among smokers compared to non-smokers, and the share of diagnoses and deaths from the disease attributable to smoking, obtained from the literature (24-26). This means that we do not investigate conditions such as coronary heart disease (CHD) and stroke. Whilst these are strongly associated with smoking, they are also associated with many other risk factors: in Sweden about 40% of CHD diagnoses among 0-59 year olds are attributable to smoking, compared to about 90% of lung cancers and about 60% of chronic obstructive pulmonary disorder (COPD) diagnoses (26).

The ICD-9 and ICD-10 codes we used for alcohol, narcotics and smoking are presented in tables 1, 2 and 3, respectively.

Deaths

We identify deaths due to alcohol and narcotics using two separate indicators available in the SIP deaths data. These indicators identify all deaths due to alcohol or narcotics at the four digit level, based on the Socialstyrelsen alcohol and narcotics indices (23). We identify deaths

[5] The ICD codes available in the SIP inpatient data are only available at the three-digit level, whilst four digit ICD codes are generally necessary to identify alcohol- and narcotics- related diseases and differentiate between these, in general and according to the Socialstyrelsen indices. We were thus not able to include all codes from the Socialstyrelsen indices and only included ICD codes where the disease identified at the three-digit level was highly related to alcohol or narcotics, respectively. Moreover, we did not include the ICD-9 codes for non-dependent abuse of drugs (ICD-9 code 305) at all. This is because this three-digit code includes both non-dependent abuse of alcohol (ICD-9 code 305.0) as well as non-dependent abuse of other drugs (e.g. narcotics: ICD-9 codes 305.2–305.7 and 305.9). This was not an issue for identifying smoking-related diseases as all included diseases were identifiable at the three-digit level.

related to smoking as ones where the main cause of death or one of the top three additional causes of death is related to smoking, using the ICD codes laid out in table 3.

Table 1: ICD codes to identify alcohol-related diagnoses

	ICD code
ICD-9 (diagnoses up until 1997)	
Alcohol-induced mental disorders	291
Alcohol dependence syndrome	303
Chronic liver disease and cirrhosis	571
Toxic effect of alcohol	980
Accidental poisoning by alcohol not elsewhere classified	E860
Alcohol poisoning	E980 in combination with 980
ICD-10 (diagnoses from 1997 onwards)	
Mental and behavioural disorders due to use of alcohol	F10
Alcoholic liver disease	K70
Toxic effect of alcohol	T51
Evidence of alcohol involvement determined by blood alcohol level	Y90
Evidence of alcohol involvement determined by level of intoxication	Y91
Accidental poisoning by and exposure to alcohol	X45
Poisoning by and exposure to alcohol, undetermined intent	Y15

Table 2: ICD codes to identify narcotics-related diagnoses

	ICD code
ICD-9 (diagnoses up until 1997)	
Drug induced mental disorders	292
Drug dependence	304
Poisoning by analgesics antipyretics and antirheumatics	965
Poisoning by psychotropic agents	969
Accidental poisoning by analgesics antipyretics and antirheumatics	E850
Accidental poisoning by other psychotropic agents	E854
Poisoning by analgesics, antipyretics, and antirheumatics, undetermined whether accidentally or purposely inflicted	E9800*
Poisoning by tranquilizers and other psychotropic agents, undetermined whether accidentally or purposely inflicted	E9803*
Poisoning by other specified drugs and medicinal substances, undetermined whether accidentally or purposely inflicted	E9804*
ICD-10 (diagnoses from 1997 onwards)	
Mental and behavioural disorders due to psychoactive substance use	F11, F12, F13, F14, F15, F16, F18, F19
Poisoning by narcotics and psychodysleptics [hallucinogens]	T40
Accidental poisoning by exposure to nonopioid analgesics, antipyretics and antirheumatics	X40
Accidental poisoning by exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified	X42
Poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified, undetermined intent	Y12

* Note, external diagnoses are coded with up to five digits

Table 3: ICD codes to identify smoking-related inpatient care and deaths

	ICD code
ICD-9 (diagnoses up until 1997)	
Malignant Neoplasm Of lip, oral cavity, and pharynx	140-149
Malignant neoplasm of oesophagus	150
Malignant neoplasm of larynx	164
Malignant neoplasm of trachea, bronchus and lung	162
Bronchitis, not specified as acute or chronic	490
Chronic bronchitis	491
Emphysema	492
Chronic airway obstruction, not elsewhere classified	496
ICD-10 (diagnoses from 1997 onwards)	
Malignant neoplasms of lip, oral cavity and pharynx	C00-C14
Malignant neoplasm of oesophagus	C15
Malignant neoplasm of larynx	C32
Malignant neoplasm of trachea	C33
Malignant neoplasm of bronchus and lung	C34
Bronchitis, not specified as acute or chronic	J40
Simple and mucopurulent chronic bronchitis	J41
Unspecified chronic bronchitis	J42
Emphysema	J43
Other chronic obstructive pulmonary disease	J44

2.4. Socioeconomic ranking variable

In our main analyses, we measure socioeconomic status using equivalised household income. Use of equivalised household income is preferred in health economics, as it takes into account the composition of the household. The equivalisation was carried out by SCB, prior to us accessing the SIP and ULF data, and was done by weighting household income according to the number of adults and children in the household, and whether the adults were in a partnership. The weights have changed over time, but from 2005 onwards equivalisation was carried out by weighting household disposable income by 1.00 if the household was made up of only one adult, 0.51 if there were two adults cohabiting (sammanboende), 0.52 for the first child (aged 0-19 years), 0.42 for every additional child, and 0.60 for an additional adult (27).

Our preferred approach is to use income measured in the previous year. This is not possible with the ULF data so we use income measured in the current year when investigating income-related inequalities in heavy drinking and cigarette smoking. We conduct sensitivity analyses using the highest level of attained education as a ranking variable instead of income.

2.5. Explanatory variables

We have selected several variables for investigation that we deem potentially important as explanatory factors for substance use. These were coded as binary indicator variables, except where indicated below.

In our analyses, we investigate the effects of age (continuous, recentered so that age 31 = 0), sex (female = 1, male = 0), civil status (married/registered partner = 1, single = 0), foreign background (indicator variables for foreign-born and foreign-born parents), individual educational attainment (indicator variables for: less than the mandatory 9 years, 10-12 years,

more than 12 years, where our base category is 10-12 years), mother's and father's educational attainment (more than the mandatory 9 years = 1, or not = 0), non-participation in the labour market (individual; no positive labour income in the given year = 1, positive labour income in the given year = 0) and the proportion of individuals in the municipality on financial welfare support (continuous). When investigating heavy drinking and current smoking using the ULF data we also use a variable we constructed indicating social isolation[6].

The constant term in our regressions is thus made up of males aged 31 years, who are not married or in a registered partnership, are Swedish-born with Swedish-born parents, have 10-12 years of education, whose parents have no secondary education, who participated in the labour market in the given year and who live in a municipality with a low share of individuals on financial welfare support.

We include age because the age pattern of use for alcohol, narcotics and tobacco differs. Frequency of alcohol consumption increases with age up to 64 years, while prevalence of smoking is highest in the 50 to 64 year age group. Prevalence of narcotics use, on the other hand, has been found to be highest among individuals aged 17 to 29 in Sweden (28). Of note, this could be in part due to alcohol and tobacco-related diseases having a long latency period, whereas the ill health consequences of narcotics are likely to be more immediate and more likely to result in death, thus reducing the prevalence of narcotics consumption among older age groups (if those with problem use die prematurely). Income and educational attainment also vary over the life course, with income generally increasing with age until retirement, and education increasing through one's twenties and thirties and generally plateauing thereafter. This, alongside different patterns of alcohol, narcotics and tobacco use by age makes it important to consider age when investigating socioeconomic-related inequalities in alcohol-, narcotics- and tobacco-related outcomes.

We include sex because there are clear differences in how men and women drink, who is more likely to use narcotics and who smokes regularly. When it comes to alcohol, males drink and drink intensively more often than females (28). Alcoholism is also estimated to be more prevalent among males than females in Sweden (28). Regarding tobacco, males are more likely to be addicted to and use snus while females are more likely to smoke daily and be addicted to cigarettes. Males are more likely than females to be addicted to tobacco in any form (28). Sex differences are also observed regarding illicit drug use – females are slightly more likely than males to use prescription medications without a prescription, while males are more likely to have used narcotics in the past 12 months (28). Males are also more likely to suffer from narcotics addiction (28). Females are also more likely to earn less than men, but have higher levels of educational attainment (29). This, coupled with their different patterns of use of alcohol, narcotics and tobacco means it is important to take sex into account when investigating socioeconomic-related inequalities in alcohol-, narcotics- and tobacco-related outcomes.

Own and parents' foreign background are included because ANT-related behaviours are likely to differ by background, e.g. smoking is more common among individuals with a foreign

[6] We adopt the same approach as Statistics Sweden in defining social isolation as individuals living alone, who meet their close family, relatives or friends less than once per week.

background than those with a Swedish background (20). Foreign background has also been found to be associated with substance abuse (30-35). For instance, the risk of being hospitalised for substance misuse (all substances) has been found to be higher among young male refugees in Sweden compared to the general population (32). In contrast, among this same population, the risk of being hospitalized for an alcohol-related disorder was found to be less common among young refugees compared to the general population (33). Second-generation immigrants have also been found to have higher risks of compulsory treatment for substance use disorders than individuals born in Sweden to Swedish-born parents (31). Foreign background is thus important to take into account when investigating different aspects of ANT use and the health consequences thereof. Foreign background is also important when it comes to income, as foreign-born individuals tend to have lower income than individuals with a Swedish background, and individuals with a foreign background tend to struggle with labour market integration more than Swedes born to Swedish-born parents (36). Individuals born abroad may, moreover, have lower educational attainment than individuals born in Sweden to Swedish-born parents. This, coupled with differences in use of alcohol, narcotics and tobacco between individuals with a foreign versus Swedish background means it is important to take into account foreign background when investigating socioeconomic-related inequalities.

Strong and persistent education gradients are observed across nearly all health outcomes and behaviours (37), and Sweden has observed a large increase in the educational level in its population (38). This increase in educational attainment amongst the population is expected to have affected health behaviours and outcomes. Moreover, educational attainment is intricately tied to socioeconomic position, and is thus important to take into account when investigating socioeconomic inequalities in alcohol-, narcotics- and tobacco-related outcomes.

Where one lives and the opportunities available there have been shown to be associated with health-related behaviours, for instance living in an area with low social capital may be associated with substance use among teenagers in Sweden (39). We therefore include a measure of local deprivation (proportion on welfare support in the municipality). Where one lives is moreover likely related to income, and there are large regional inequalities in income in Sweden (40), making local area effects important to take into account when investigating socioeconomic-related inequalities.

Social relationships are important when it comes to health and health behaviours (41). An individual's civil status (being married or in a registered partnership), as well as their exposure to social isolation, may thus affect their behaviours regarding alcohol consumption, narcotics use and smoking. Individuals who are cohabiting (as most individuals in a married or registered partnership do) moreover tend to have higher earned income that single individuals (29). We therefore include indicators of civil status (whether an individual is in a married or registered partnership or not) and social isolation (defined as living alone and meeting close family, relatives or friends less than once per week)[7] in our analyses.

[7] We adopt the same approach as Statistics Sweden in defining social isolation. We are only able to construct a variable for social isolation using the ULF data.

2.6. Descriptive statistics

Table 4 contains descriptive statistics for the ULF and SIP samples. We present statistics for calendar years 1994 and 2011 for both samples, as well as statistics for the ULF sample in 1988-9 and 2004-5 (these were the only calendar years for which information on alcohol consumption, thus heavy drinking, was available). These show how the characteristics of the population differ between the periods and help to inform our investigation of the changes over time.

To facilitate our analysis of how these variables have contributed to changes over time in heavy drinking, cigarette smoking and alcohol-, narcotics- and smoking-related inpatient care and deaths, we present the observed changes in the distributions of the characteristics. From this we clearly see that in all samples there have been important changes in nearly all of our explanatory variables. For instance, the proportion foreign-born increased by between 2 and 6 percentage points (depending on the sample considered), the proportion married or in a registered partnership decreased by between 10 and 12 percentage points, and the proportion with less than 10 years of education decreased by between 14 and 17 percentage points. The rate of non-participation (not reporting any labour income in a given year) increased by up to 3 percentage points. In contrast, the average share of individuals on welfare in a municipality decreased by up to 2 percentage points. The proportion of the population classed as socially isolated stayed relatively consistent between both 1988-9 and 2004-5, and 1994 and 2011.

As part of our analyses, we investigate whether changes in the distribution of these characteristics in the population could help explain any changes we see in the levels of each of our outcomes and the inequalities therein. This is what we investigate using the Oaxaca-Blinder decomposition method (see section 3.2).

Table 4: Descriptive statistics for the ULF and SIP data

	ULF						SIP		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	1988-9	2004-5	Δ	1994	2011	Δ	1994	2011	Δ
Age (years)	46.07	47.30	1.23	46.40	48.17	1.77	46.47	47.44	0.97
	(9.503)	(9.803)		(9.332)	(9.929)		(9.347)	(9.687)	
Female (%)	49.73	50.09	0.36	50.80	52.53	1.73	49.47	49.48	0.01
	(50.00)	(50.00)		(50.00)	(49.95)		(50.00)	(50.00)	
Foreign-born (%)	10.54	12.95	2.41	12.18	16.12	3.94	11.85	17.83	5.98
	(30.71)	(33.58)		(32.71)	(36.78)		(32.32)	(38.28)	
Missing foreign-born (%)	0.0157	0.630	0.61	0	0.284	0.28	0.00508	0.00642	0
	(1.253)	(7.913)		(0)	(5.318)		(0.713)	(0.801)	
Foreign-born parents (%)	0.566	1.803	1.24	0.846	2.511	1.67	1.068	2.665	1.6
	(7.499)	(13.31)		(9.158)	(15.65)		(10.28)	(16.11)	
Missing foreign-born parents	0.0157	0.630	0.61	0	0.284	0.28	23.70	16.13	-7.6
	(1.253)	(7.913)		(0)	(5.318)		(42.53)	(36.78)	
Married (%)	67.39	54.95	-12.4	64.27	54.60	-9.7	61.70	50.24	-11
	(46.88)	(49.76)		(47.93)	(49.80)		(48.61)	(50.00)	
<10 years education (%)	31.01	14.28	-16.7	23.90	10.09	-14	30.79	14.53	-16
	(46.26)	(34.99)		(42.65)	(30.12)		(46.16)	(35.24)	
>12 years education (%)	25.59	38.55	13	31.69	44.84	13.2	24.98	38.43	13.5
	(43.64)	(48.68)		(46.54)	(49.74)		(43.29)	(48.64)	
>9 years educ mother (%)	11.92	30.80	18.9	18.42	36.90	18.5	17.71	36.85	19.1
	(32.41)	(46.17)		(38.77)	(48.26)		(38.17)	(48.24)	
Missing mother educ (%)	55.25	40.06	-15.2	48.04	41.39	-6.7	47.41	40.34	-7.1
	(49.73)	(49.01)		(49.97)	(49.26)		(49.93)	(49.06)	
>9 years educ father (%)	10.76	23.29	12.5	15.19	27.66	12.5	15.06	27.38	12.3
	(30.99)	(42.27)		(35.90)	(44.74)		(35.77)	(44.59)	
Missing father educ (%)	70.25	56.97	-13.3	63.29	56.99	-6.3	64.06	55.60	-8.5
	(45.72)	(49.52)		(48.21)	(49.52)		(47.98)	(49.69)	
Non-participation (%)	6.629	9.713	3.08	8.988	9.072	0.08	10.17	12.38	2.21
	(24.88)	(29.62)		(28.61)	(28.73)		(30.23)	(32.94)	
Welfare share (muncipality, %)	2.947	2.494	-0.45	4.250	2.452	-1.8	4.077	2.541	-1.5
	(1.112)	(0.995)		(1.667)	(0.986)		(1.467)	(1.000)	
Social Isolation (%)	2.121	2.293	0.17	2.067	1.904	-0.2			
	(14.41)	(14.97)		(14.23)	(13.67)				
Missing Social isolation (%)	0.361	0.350	-0.01	0.157	0.729	0.57			
	(6.000)	(5.906)		(3.955)	(8.509)				
Disposable family income (100SEK)	751.2	1,595	844	1,159	2,169	1010	1,081	1,933	852
	(303.9)	(911.2)		(1,100)	(1,304)		(705.5)	(5,600)	
Observations	6,366	5,714		3,193	2,469		3,660,610	4,096,793	

Notes: Married denotes being married or having a registered partner.

Source: ULF, SIP

3. Method

The analyses conducted in this report are divided into two parts. In part 1, we investigate trends and socioeconomic inequalities over time in the prevalence of smoking and heavy drinking, and the probabilities of inpatient care and death related to alcohol, narcotics and

smoking (per 100,000).[8] In part 2, we seek to explain the changes over time in the levels and inequalities in terms of selected demographic and socioeconomic characteristics (for both, see 3.2). We investigate outcomes related to alcohol, narcotics and smoking separately, but adopt the same empirical approach to investigate each.

3.1. Income-related inequalities

We measure socioeconomic-related inequality using the concentration index (CI). The CI is a summary measure of the concentration of the (ill) health outcome (or behaviour, e.g. heavy drinking) by socioeconomic rank, and it can range from -1 to +1. The magnitude of the concentration index reflects the degree of inequality, whilst the sign reflects whether the variable of interest is concentrated among individuals of lower (-) or higher (+) socioeconomic rank. A CI of 0 means the distribution of the outcome is equal in the population, whereas a CI of -1 (+1) indicates that the outcome is completely concentrated among the poorest (richest).

The starting point for the CI is the concentration curve, which plots the distribution of the cumulative share of the (ill) health outcome along the y-axis against the cumulative share of the population ranked by increasing income along the x-axis. A 45° line from the origin indicates complete equality (thus called the line of equality). A larger distance between the line of equality and the concentration curve means greater inequality.

We measure the CI of income-related health inequality using the following formula:

$$CI = \frac{2}{\bar{Y}_{ANT}} cov(Y_{ANT}, R)$$

where Y_{ANT} represents the outcome variables related to alcohol, narcotics and smoking that we consider (heavy drinking, cigarette smoking, inpatient care, and deaths), $\bar{Y}_{ANT}$ is the mean of our outcome variable and R is the fractional socioeconomic rank (ranges from 0 to 1). As mentioned above, in our main analyses we use equivalised household income as the socioeconomic ranking variable. In sensitivity analyses we investigate the use of educational attainment as an alternative ranking variable.[9]

We measure the concentration index for heavy drinking, cigarette smoking, and inpatient care and deaths related to alcohol, narcotics and smoking for every calendar year 1994 to 2011 (1988-9, 1996-7 and 2004-5 for heavy drinking).

The CI is useful for comparing changes over time in inequality because it takes into account the entire population and is sensitive to changes in the distribution of the population by socioeconomic status. This means that rather than comparing the gap between, for instance, the richest and the poorest or the

[8] As detailed above, information on narcotics consumption is not available in ULF and information on alcohol consumption in ULF is only available for calendar years 1988-89, 1996-7 and 2004-5. We estimate probabilities of inpatient care and death (from SIP), as well as the prevalence of current smokers (from ULF), for every calendar year in the period 1994 to 2011.

[9] To ensure a continuous ranking variable when using education we ranked people randomly within each education group. This has no impact on the level of inequality but may impact any decomposition.

highest and lowest educated groups in a population (the size of which might change over time), we can summarise the distribution of health by income among the entire population.

The CI is a measure of relative inequality. By this, we mean that it is insensitive to proportional changes in health experienced by the entire population (say, if everyone started drinking 50% more). This is as opposed to absolute inequality, which is sensitive to proportional changes in health but not to absolute changes in health experienced by the entire population (say, if everyone started drinking two more units of alcohol per week).

As is perhaps clear from the above, measures of relative versus absolute inequality involve different value judgments as to what is "fair" versus "unfair" (42, 43). They can thus paint very different pictures of inequality in the same population. Relative inequality may be the preferred measure to investigate if the aim of policy is to reduce and/or eliminate inequalities between subgroups (independent of other considerations, e.g. absolute levels of health or overall health). This is because reduced relative inequalities imply that health is improving at a relatively better rate among more disadvantaged individuals (43). However, in order to ensure that the improvements are occurring among all groups and harming no group, it is also important to evaluate absolute changes in inequality as well (43). Because both measures of absolute and relative inequality involve important normative value judgments, it is recommended to compute and compare both, in order to provide a more complete picture to other researchers and policy-makers[10] (42, 43).

3.2. Explaining the changes over time

We use the Oaxaca-Blinder decomposition method to investigate the reasons behind any changes we observe between 1994 and 2011 (1988-9 and 2004-5 for heavy drinking) in our outcomes of interest and their socioeconomic related inequalities.

The Oaxaca-Blinder decomposition method enables us to investigate differences we observe in the mean of an outcome between two groups (e.g. gender differences in income, or differences in the prevalence of heavy drinking between two time periods). The Oaxaca-Blinder decomposition method allows us to separate the observed difference into two parts. The first part is the amount we can explain by a change in the characteristics of the population (defined by the selected explanatory variables), holding the effects of each of the characteristics constant over time ("explained"). The second part is the amount attributable to a change in the effect of each of the characteristics ("unexplained").

In our analyses, we consider the change we can explain if the effects in 2011 were the same as those in 1994, i.e. we take the 1994 coefficients as given and use these, combined with the change in the distribution of the explanatory variables over time, to obtain our explained component.

Changes in levels

The following three equations illustrate the Oaxaca-Blinder decomposition. First, we estimate separate linear probability models of alcohol-, narcotics- and smoking-related outcomes (Y)

[10] Indeed, several other (rank-dependent) indices of inequality exist and are used in health economics, each involving slightly different value judgments. In order to provide an even more complete picture on might compute and compare inequality using each of these indices.

for individuals in calendar years 1994 and 2011 (periods 1988-9 and 2004-5 for heavy drinking):

$$Y_{1994} = X_{1994}'\beta_{1994} + \epsilon_{1994}$$

$$Y_{2011} = X_{2011}'\beta_{2011} + \epsilon_{2011}$$

where X is a vector of explanatory variables, β_{2011} and β_{1994} are vectors of coefficients and ϵ is an error term. [11] Let b_{2011} and b_{1994} be respectively the regression estimates of β_{2011} and β_{1994}. The regression coefficient estimates, b_{2011} and b_{1994} can be interpreted as the association between the outcome Y and a marginal increase in X. Since the average value of the residuals in a linear regression is zero, we can express the changes in mean health (where we are comparing calendar years 1994 and 2011) as:

$$\overline{Y_{2011}} - \overline{Y_{1994}} = \overline{X_{2011}}'b_{2011} - \overline{X_{1994}}'b_{1994} = b_{1994}(\overline{X_{2011}} - \overline{X_{1994}}) + \overline{X_{2011}}(b_{2011} - b_{1994})$$

where the first part of the right hand side is the *explained* part, the impact of the differences in the explanatory variables ($\overline{X_{2011}} - \overline{X_{1994}}$) between 1994 and 2011, evaluated using the coefficients for period 1994. The second part is the differential *not* explained by differences in observed characteristics X; the *unexplained* part.

The explained part is the part of the difference between the two calendar years that we can explain through changes in the distribution of the selected demographic and socioeconomic characteristics. Conversely, the difference that is due to a difference in the coefficients of these characteristics between the two calendar years makes up the unexplained part. These two parts can be further split into the contribution of specific explanatory variables. For example, how much of the explained change is due to a change in the proportion with foreign background, and how much of the unexplained change is due to an increasing/decreasing concentration of ANT among those with foreign background (i.e. a change in the coefficient/association between foreign background and ANT outcomes).

Changes in inequalities

We also use the Oaxaca-Blinder decomposition method to decompose the CI. In order to do this we make a transformation of the CI. This transformation is called a recentered influence function (RIF).

The RIF of the CI is a transformation of the CI that tells us, for each individual, how that individual influences the CI. The mean of all RIFs in the population (the average influence of every individual on the concentration index) is thus the CI itself. As such, we can decompose the RIF of the CI using standard regression techniques, and estimate the marginal effects of potential explanatory variables on the CI using a simple linear regression. This is the method of RIF regression, proposed by Firpo et al. with an application to income inequality (44, 45) and extended by Heckley et al. (46) to allow for decomposition of indices of socioeconomic-

[11] Some characteristics, such as educational attainment, civil status and employment status are potentially endogenous. For instance, a breakdown in one's marriage might lead to an increase in alcohol consumption, but high levels of alcohol consumption might in turn lead to a breakdown in one's marriage.

related health inequality, including the CI. The nice thing about RIF regression is it allows any statistic to be expressed as a mean of influences. Because OB decomposition is applied to the mean, we can then apply OB decomposition with RIF.

Thus, for calendar years 1994 and 2011, for example, we would have:

$$\mathrm{RIF(CI)}_{1994} = \mathrm{X}_{1994}{}'\delta_{1994} + \varepsilon_{1994}$$

$$\mathrm{RIF(CI)}_{2011} = \mathrm{X}_{2011}{}'\delta_{2011} + \varepsilon_{2011}$$

where RIF(CI) denotes the RIF of the CI and X is a vector of potential explanatory variables. The coefficients δ denote the effect of a local (marginal) change in each of the covariates on the socioeconomic-related inequality in the population. Using the RIF of the CI and Oaxaca-Blinder decomposition combined, we can express the changes in the concentration index between 1994 and 2011 as:

$$\begin{aligned}\overline{\mathrm{RIF(CI)}_{2011}} - \overline{\mathrm{RIF(CI)}_{1994}} &= \overline{\mathrm{X}_{2011}}{}' d_{2011} - \overline{\mathrm{X}_{1994}}{}' d_{1994} \\ &= d_{2011}(\overline{\mathrm{X}_{2011}} - \overline{\mathrm{X}_{1994}}) + \overline{\mathrm{X}_{1994}}(d_{2011} - d_{1994})\end{aligned}$$

which breaks down the change in inequalities in outcomes related to alcohol, narcotics, and smoking into an explained ($d_{2011}(\overline{\mathrm{X}_{2011}} - \overline{\mathrm{X}_{1994}})$) and an unexplained part ($\overline{\mathrm{X}_{1994}}(d_{2011} - d_{1994})$.

4. Results

We present our results in two parts. In *part 1*, we present trends over time in the levels and income-related inequalities in ANT-related outcomes. We also present concentration curves of the concentration of each ill health outcome against income rank in the population in 1994 and 2011 (1988-9 and 2004-5 for heavy drinking).

In *part 2*, we seek to explain the changes over time in the levels and inequalities, using our knowledge of how the characteristics of the population have changed between 1994 and 2011 (1988-9 and 2004-5 for heavy drinking), and how each of our explanatory variables was associated with each outcome (and inequalities therein) in 1994 (1988-9 for heavy drinking).

In each section, we then present detailed results for alcohol, narcotics and smoking separately.

Part 1: Trends over time

4.1. Alcohol

The prevalence of individuals aged 31 to 64 years reporting heavy alcohol consumption[12] more than doubled between 1988-9 and 2004-5 (figure 1, panel A), from 1,697 per 100,000 to 4,673 per 100,000 (table 5). In contrast, alcohol-related inpatient care and deaths decreased overall between 1994 and 2011 (figure 1, panels B and C), from 406 to 387 per 100,000 for inpatient care and from 33 to 23 per 100,000 for deaths (table 5). Notably, the trend in alcohol-related inpatient care has been increasing again since 2001 (figure 1, panel B).

[12] >252g and >168g 100% alcohol per week for men and women, respectively

As the prevalence of heavy drinking increased, so did income-related inequality therein (figure 1, panel D; figure 2). Over time, heavy drinking became more concentrated among those with higher income (increased pro-rich inequality): from no statistically significant inequality in 1994 to a statistically significant concentration index of 0.1 in 2011 (table 5). This can be seen in figure 2, panel A where the concentration curves for heavy drinking in both 1988-9 and 2004-5 are below the line of equality.

Inequalities in alcohol related inpatient care and deaths also increased, but as opposed to heavy drinking these outcomes became more concentrated among those with lower income (increased pro-poor inequality; figure 1, panel D; figure 2, panels B and C; table 5). The concentration curves for inpatient care and deaths show that about 50% of alcohol-related inpatient care and deaths were concentrated among the poorest 20% in 2004-5, up from about 30% concentrated among the poorest 20% in 1988-9 (figure 2, panels B and C).

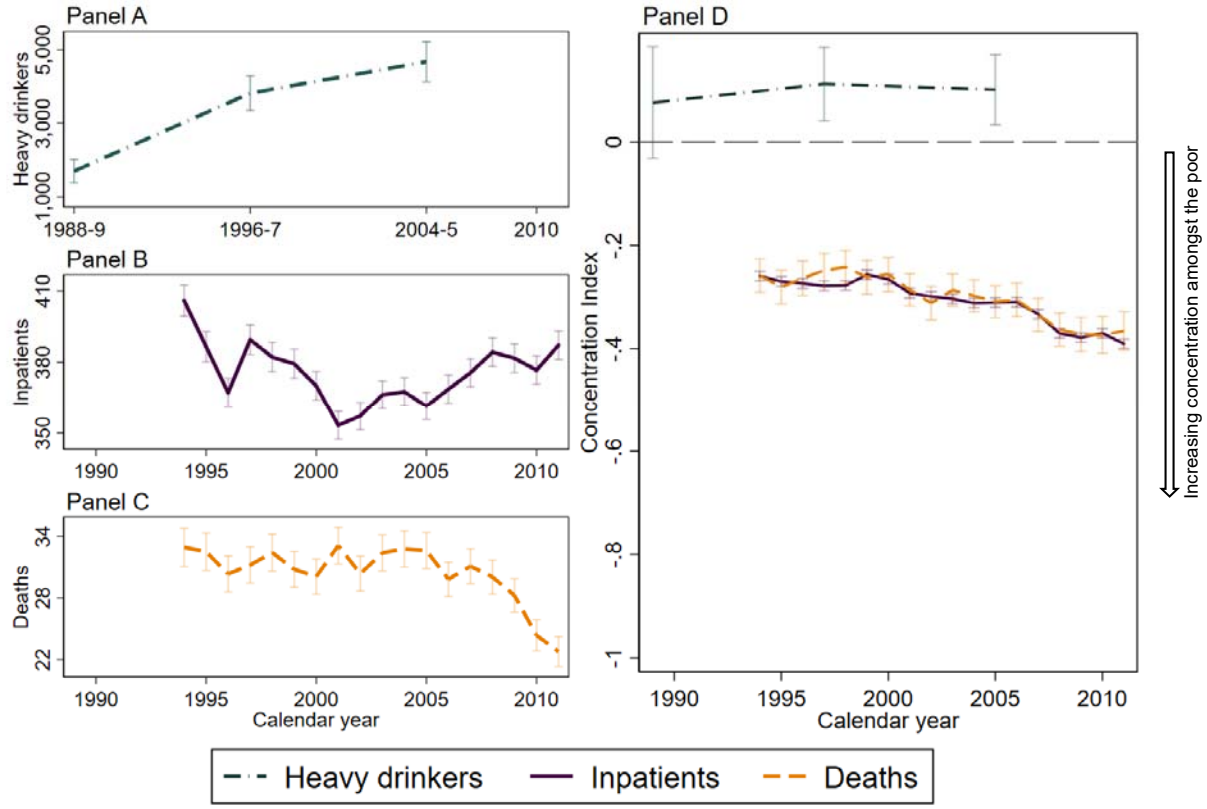
Table 5: Changes over time in levels (per 100,000) and inequalities in heavy drinking (1988-9 and 2004-5), and alcohol-related inpatient care and deaths (1994 and 2011)

	Levels			Inequalities		
VARIABLES	1994 (1988-9)	2011 (2004-5)	Δ	1994 (1988-9)	2011 (2004-5)	Δ
Heavy drinker	1,697***	4,673***	2,976***	0.0760	0.101***	0.0249
	(162.1)	(279.6)	(323.2)	(0.0565)	(0.0347)	(0.0663)
Inpatients	406.0***	387.2***	-18.77***	-0.259***	-0.390***	-0.131***
	(3.323)	(3.068)	(4.523)	(0.00420)	(0.00412)	(0.00588)
Deaths	32.95***	22.80***	-10.15***	-0.259***	-0.366***	-0.107***
	(0.949)	(0.746)	(1.207)	(0.0144)	(0.0176)	(0.0227)

Notes: Heavy drinking =1 if >252g and >168g 100% alcohol per week for men and women, respectively. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to alcohol. Deaths identified using the Socialstyrelsen alcohol index. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Commas denote thousands, full stops denote decimals.

Source: ULF (heavy drinking), SIP (inpatient care and deaths); own calculations

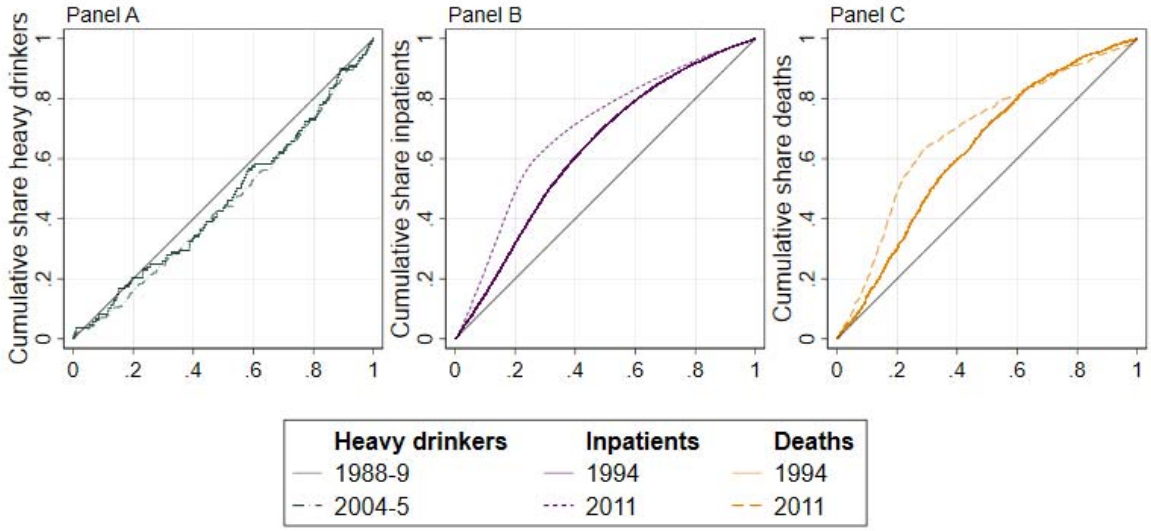
Figure 1: Trends over time in levels (per 100,000; panels A-C) and inequalities (panel D) in heavy drinking (1988-9 to 2004-5), and alcohol-related inpatient care and deaths (1994 to 2011)



Notes: Heavy drinking =1 if >252g and >168g 100% alcohol per week for men and women, respectively. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to alcohol. Deaths identified using the Socialstyrelsen alcohol index. Shaded areas show 95% confidence intervals (note that for prevalence of heavy drinking the data pertain to 1988-9, 1996-7 and 2004-5 only). The concentration index can range from -1 to +1. A greater magnitude of the concentration index denotes greater inequality, whereas the sign of the concentration index denotes whether the outcome is more concentrated among the poor (-) or the rich (+). In this figure all outcomes except heavy drinking are more concentrated among the poor.

Source: ULF (heavy drinking), SIP (inpatient care and deaths); own calculations

Figure 2: Concentration curves for heavy drinking (panel A) and alcohol-related inpatient care (panel B) and deaths (panel C): 1994 and 2011 (1988-9 and 2004-5)



Notes: Heavy drinking =1 if >252g and >168g 100% alcohol per week for men and women, respectively. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to alcohol. Deaths identified using the Socialstyrelsen alcohol index. The diagonal line represents the line of equality. Individuals are ranked by equivalised household income. When the concentration curve is above the line of equality, the outcome is concentrated among those with lower income. A greater area between the concentration curve and the line of equality indicates greater inequality.

Source: ULF (heavy drinking), SIP (inpatient care and deaths); own calculations

4.2. Narcotics

The probability of narcotics-related inpatient care in 2011 was not significantly different to that in 1994 (147 versus 146 per 100,000; table 6), however just looking at these two calendar years obscures a generally decreasing trend in inpatient care from 1997 until calendar years 2005-2006, after which inpatient care increased dramatically until 2011 (figure 3, panel A). While deaths increased overall between 1994 and 2011 (from 5 to 7 per 100,000), here too we observe a trough in 2005-2006 and an important increase thereafter (figure 3, panel B). Of note, the large drop in inpatient care observed between 1996 and 1997 is likely an artefact of the change from ICD-9 to ICD-10 diagnosis coding.

Inequalities in both narcotics-related inpatient care and deaths have increased steadily over time and have been at a similar level to one another throughout the calendar period (figure 3, panel C). This is driven by a substantial increase in the concentration of narcotics-related inpatient care and deaths among the poor: in 1994, just below 40% of inpatient care and deaths were made among the poorest 20% of the population, whereas that figure had increased to nearly 60% in 2011 (figure 4).

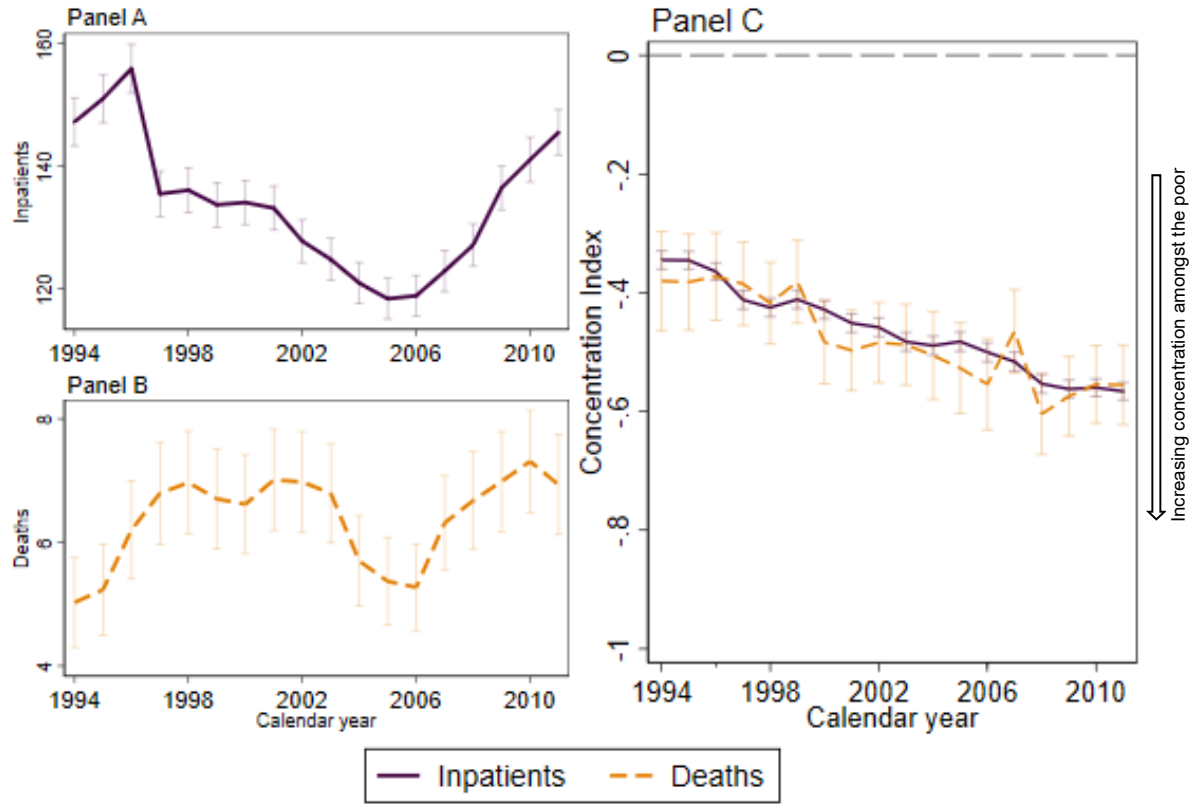
Table 6: Changes over time in levels (per 100,000) and inequalities in narcotics-related inpatient care and deaths: 1994 and 2011

	Levels			Inequalities		
VARIABLES	1994	2011	Δ	1994	2011	Δ
Inpatients	147.2***	145.5***	-1.687	-0.345***	-0.566***	-0.221***
	(2.004)	(1.883)	(2.750)	(0.00691)	(0.00543)	(0.00879)
Deaths	5.026***	6.932***	1.906***	-0.380***	-0.555***	-0.175***
	(0.371)	(0.411)	(0.554)	(0.0369)	(0.0241)	(0.0441)

Notes: Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to narcotics. Deaths identified using the Socialstyrelsen narcotics index. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Commas denote thousands, full stops denote decimals.

Source: SIP; own calculations

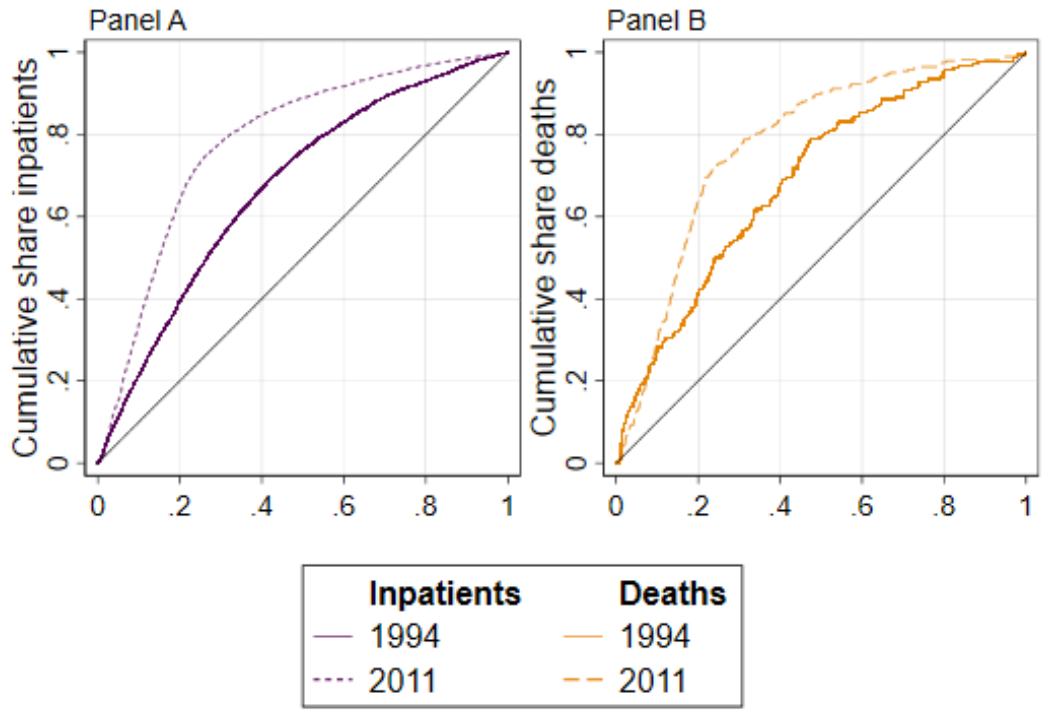
Figure 3: Trends over time in levels (per 100,000; panels A-B) and inequalities (panel C) in narcotics-related inpatient care and deaths: 1994 to 2011



Notes: Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to narcotics. Deaths identified using the Socialstyrelsen narcotics index. Shaded areas show 95% confidence intervals. The concentration index can range from -1 to +1. A greater *magnitude* of the concentration index denotes greater inequality, whereas the sign of the concentration index denotes whether the outcome is more concentrated among the poor (-) or the rich (+). In this figure all outcomes are more concentrated among the poor.

Source: SIP; own calculations

Figure 4: Concentration curves for narcotics-related inpatient care (panel A) and deaths (panel B): 1994 and 2011



Notes: Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to narcotics. Deaths identified using the Socialstyrelsen narcotics index. The diagonal line represents the line of equality. Individuals are ranked by equivalised household income. When the concentration curve is above the line of equality, the outcome is concentrated among those with lower income. A greater area between the concentration curve and the line of equality indicates greater inequality.

Source: SIP; own calculations.

4.3. Smoking

The prevalence of individuals aged 31 to 64 years reporting daily cigarette smoking more than halved between 1994 and 2011 (figure 5, panel A), from 28,030 to 13,163 per 100,000 (table 7). In contrast, the probability of receiving smoking-related inpatient care increased from 154 to 175 per 100,000 (figure 5, panel B; table 7), while the probability of dying from a smoking-related cause decreased from 32 to 29 per 100,000 (figure 5, panel C; table 7). Notably, smoking-related deaths did increase from 1994 to 2005 but have decreased substantially since then.

Income-related inequalities in smoking, inpatient care and deaths all increased over time (table 7; figure 5, panel D). For both inpatient care and deaths, the concentration index was not significantly different from zero (meaning no significant inequality) until calendar year 2002 (for inpatient care it was significantly different in 1994), indicating no statistically significant inequality up until then. Inequalities in cigarette smoking were significant in all calendar years and appear worse than inequalities in inpatient care and deaths, but the confidence intervals overlap in several years, particularly after the year 2000. Thus, while the prevalence of smoking is decreasing, smoking, inpatient care related to smoking, and dying from a smoking-related cause are all becoming more and more concentrated among the poor.

Figure 6 shows concentration curves for smoking and smoking-related inpatient care and deaths in 1994 and 2011. We can see that the concentration curves for smoking, inpatient care and deaths are all very similar to the line of equality in 1994. In contrast, in 2011, each of the outcomes is more concentrated among the poor, with approximately 30% of current smokers, inpatient care and deaths concentrated among the poorest 20% of the population (panels A, B and C).

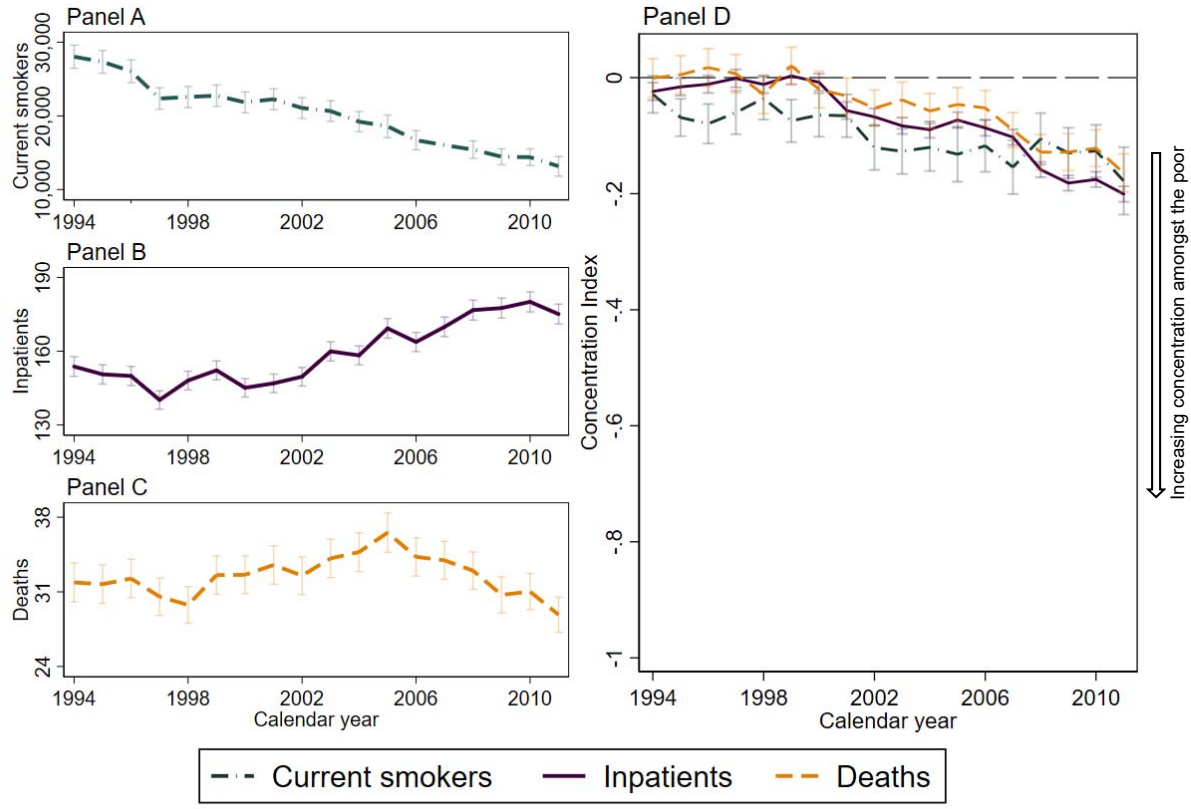
Table 7: Changes over time in levels (per 100,000) and inequalities in smoking and smoking-related inpatient care and deaths: 1994 and 2011

	Levels			Inequalities		
VARIABLES	1994	2011	Δ	1994	2011	Δ
Current smoker	28,030***	13,163***	4,867***	-0.0286*	-0.178***	-0.149***
	(796.8)	(682.6)	(1,049)	(0.0163)	(0.0301)	(0.0342)
Inpatients	153.8***	175.1***	21.34***	-0.0237***	-0.201***	-0.177***
	(2.048)	(2.066)	(2.909)	(0.00697)	(0.00656)	(0.00957)
Deaths	31.88***	28.85***	-3.028**	-0.000655	-0.164***	-0.164***
	(0.933)	(0.839)	(1.255)	(0.0157)	(0.0162)	(0.0226)

Notes: Current smoker =1 if reported being a current daily cigarette smoker. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to smoking. Death =1 if died during the given calendar year and the main cause of death or one of the top three additional causes of death is related to smoking. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Commas denote thousands, full stops denote decimals.

Source: ULF (current smoking), SIP (inpatient care and deaths); own calculations

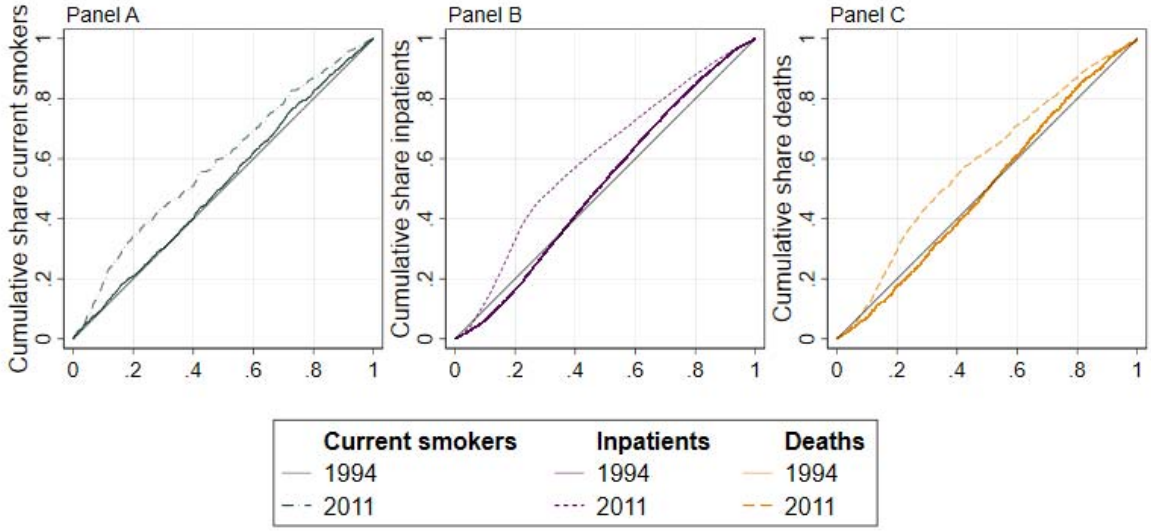
Figure 5: Trends over time in levels (per 100,000; panels A-C) and inequalities (panel D) in smoking and smoking-related inpatient care and deaths: 1994 to 2011



Notes: Current smoker =1 if reported being a current daily cigarette smoker. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to smoking. Death =1 if died during the given calendar year and the main cause of death or one of the top three additional causes of death is related to smoking. Shaded areas show 95% confidence intervals. The concentration index can range from -1 to +1. A greater *magnitude* of the concentration index denotes greater inequality, whereas the sign of the concentration index denotes whether the outcome is more concentrated among the poor (-) or the rich (+). In this figure all outcomes are more concentrated among the poor.

Source: ULF (current smoking), SIP (inpatient care and deaths); own calculations.

Figure 6: Concentration curves for smoking (panel A) and smoking-related inpatient care (panel B) and deaths (panel C): 1994 and 2011



Notes: Current smoker =1 if reported being a current daily cigarette smoker. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to smoking. Death =1 if died during the given calendar year and the main cause of death or one of the top three additional causes of death is related to smoking. The diagonal line represents the line of equality. Individuals are ranked by equivalised household income. When the concentration curve is above the line of equality, the outcome is concentrated among those with lower income. A greater area between the concentration curve and the line of equality indicates greater inequality.

Source: ULF (current smoking), SIP (inpatient care and deaths); own calculations.

Part 2: Decomposing the changes over time

In this section, we seek to explain the changes over time in the prevalence of smoking and heavy drinking, and changes in the probabilities of receiving inpatient care or dying from a cause related to alcohol, narcotics or smoking between 1994 and 2011 (1988-9 and 2004-5 for heavy drinking), as well as the changes in income-related inequality in each.

To do this, we need to take into account the distribution of the explanatory variables in each calendar period (see section 2.6, table 4), as well as the associations between these variables and each outcome in 1994 and 2011 (1988-9 and 2004-5 for heavy drinking). This allows us to use the Oaxaca-Blinder decomposition method, which enables us to separate the change between the two periods into two parts: a part we can explain by a change in the characteristics of the population (holding the effects of each of the characteristics constant over time; "*explained*"), and a part attributable to a change in the *effect* of the characteristics ("*unexplained*")[13] (see section 3.2 for more on the Oaxaca-Blinder decomposition method).

As detailed above, the sample populations changed importantly between 1994 (1988-9) and 2011 (2004-5) (table 4), for instance the percentage married or in a registered partnership decreased by between 10 and 12 percentage points, while the percent foreign born increased

[13] In our case, we take the 1994 coefficients as given and use these, combined with the change in the distribution of the explanatory variables over time, to obtain our explained component.

by up to about 6 percentage points, and the percentage not gainfully participating in the labour force increased by up to about 3 percentage points.

Below, we start by presenting results for the associations between each explanatory variable and each of our alcohol-, narcotics- and smoking-related outcomes. We then use these findings, along with our knowledge of how the population has changed between 1994 and 2011 (1988-9 and 2004-5), to seek to explain the observed changes over time in terms of our selected demographic and socioeconomic characteristics.

4.4. Alcohol

Levels

Table 8 shows the associations between each alcohol outcome and our selected demographic and socioeconomic characteristics for each time point. Only the municipal share on welfare (positively), being female (negatively) and the constant term (positively) were significantly associated with heavy drinking in both calendar periods, while having foreign born parents (positively) and being married or in a registered partnership (negatively) were associated with heavy drinking in 2004-5 and 1988-9, respectively. Many of the explanatory variables were significantly associated with both inpatient care and deaths in both 1994 (1988-9) and 2011 (2004-5) (table 8). For example, non-participation in the labour force was significantly positively associated with inpatient care and deaths in both 1994 and 2011, but the strength of the association increased for inpatient care while it decreased for deaths. Given that the percent of the SIP population with less than 10 years of education dropped by 16 percentage points, it is striking that the association between having less than 10 years of education and being an inpatient almost doubled between 1994 and 2011.

Table 9 shows the overall and detailed Oaxaca-Blinder decomposition results. Overall, changes in the distribution of the explanatory variables cannot significantly explain the change in heavy drinking (column 1). Moreover, while the overall explained change appears significant for both inpatient care and deaths, in both cases it would actually explain an increase whereas we observe decreases over time. This can be interpreted as: there was a significant change in the characteristics that were important in predicting each outcome in 1994, but if we take the effects in 1994 as given, these changes would actually have explained an increase in inpatient care and deaths. Overall, for all three outcomes, most of the observed change over time is “unexplained”. That is to say, it is due to changes in the associations between the selected demographic and socioeconomic characteristics and the outcome, rather than changes in the distribution of the demographic and socioeconomic characteristics in the population.

Looking at the detailed decomposition results, we see that only the increase in the proportion of individuals with parents born abroad significantly explains part of the increase in heavy drinking over time (explains an increase of 86.45 per 100,000). Increases in the municipal proportions of individuals on welfare also seem to contribute but would actually explain a decrease in heavy drinking of 426.0 per 100,000 (table 9).

Changes in the proportion foreign born (an increase), the proportion with less than 10 years of education (a decrease) and those with greater than 12 years of education (an increase) seem to be important in explaining the decrease in inpatient care and deaths over time. Additionally, the municipal share on welfare seems important in explaining the decrease in inpatient care.

The unexplained part of the change in both inpatient care and deaths seems primarily driven by the constant term – that is, the effect of being in the reference group[14] seems to have changed quite dramatically over time with regards to the probability of inpatient care or death related to alcohol. Other important factors contributing to the decrease in inpatient care appear to be the stronger negative association with being foreign born and the stronger negative association with the municipal share on welfare. Reductions in the associations of non-participation in the labour force and municipal share on welfare with deaths related to alcohol seem to contribute (in addition to the constant) significantly to the unexplained reduction in alcohol-related deaths over time.

[14] Our reference group consists of 31 year old single males, born in Sweden to Swedish-born parents, with 10-12 years of education with parents who have less than 10 years education, who do participate in the labour force and live in a municipality with a low share on welfare.

Table 8: Associations between explanatory variables and heavy drinking and alcohol-related inpatient care and deaths in 1994 (1988-9) and 2011 (2004-5)

	(1)	(2)	(3)	(4)	(5)	(6)
	Heavy drinking		Inpatients		Deaths	
VARIABLES	1988-9	2004-5	1994	2011	1994	2011
Age	-29.48	25.70	3.284***	6.665***	1.180***	1.263***
	(24.29)	(37.84)	(0.496)	(0.404)	(0.142)	(0.0985)
Female	-2,346***	-3,862***	-431.2***	-294.0***	-41.27***	-24.40***
	(323.4)	(558.1)	(6.640)	(6.148)	(1.901)	(1.500)
Foreign born	-59.11	-847.0	46.17***	-105.8***	-4.408	-10.40***
	(555.7)	(940.0)	(12.85)	(14.46)	(3.680)	(3.527)
Foreign	-1,896	6,988***	-32.99	130.1***	-2.674	-5.173
parents	(2,154)	(2,096)	(32.41)	(19.14)	(9.278)	(4.669)
Married	-1,795***	-800.5	-642.5***	-412.9***	-58.00***	-25.82***
	(358.4)	(580.1)	(6.991)	(6.262)	(2.001)	(1.527)
<10 years educ	-142.4	-381.9	108.2***	208.6***	5.936***	8.134***
	(392.8)	(859.8)	(8.045)	(9.386)	(2.303)	(2.290)
>12 years educ	-471.6	-202.9	-195.9***	-170.4***	-14.46***	-7.115***
	(406.7)	(618.4)	(8.419)	(6.823)	(2.410)	(1.664)
>9 years educ	-140.9	908.1	-43.10***	2.362	-3.046	2.697
mother	(565.9)	(769.9)	(10.22)	(8.660)	(2.927)	(2.113)
>9 years educ	312.0	114.7	-25.12**	1.701	2.367	1.194
father	(636.3)	(885.7)	(11.70)	(9.761)	(3.351)	(2.381)
No labour	619.3	-78.17	931.6***	1,211***	107.0***	93.83***
participation	(680.6)	(978.2)	(11.47)	(9.759)	(3.285)	(2.380)
Share on	318.6**	938.7***	63.72***	8.540***	4.220***	0.259
welfare	(147.4)	(283.0)	(2.306)	(3.085)	(0.660)	(0.752)
Social	-278.9	1,160				
isolation	(1,146)	(1,896)				
Constant	3,162***	4,288***	576.0***	475.8***	38.52***	13.55***
	(668.0)	(1,172)	(14.04)	(13.77)	(4.019)	(3.359)
Observations	6,366	5,714	3,660,610	4,096,793	3,660,610	4,096,793
R-squared	0.016	0.015	0.007	0.008	0.001	0.001

Notes: Heavy drinking =1 if >252g and >168g 100% alcohol per week for men and women, respectively. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to alcohol. Deaths identified using the Socialstyrelsen alcohol index. We controlled for missing mother's or father's education, missing information on foreign born or parents foreign born, and missing information on social isolation (heavy drinking only). Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Commas denote thousands, full stops denote decimals.

Table 9: Overall and detailed Oaxaca-Blinder decomposition results of changes in the prevalence of heavy drinking (between 1988-9 and 2004-5) and probabilities of alcohol-related inpatient care and death (between 1994 and 2011)

	(1)	(2)	(3)	(4)	(5)	(6)
	Heavy drinking		Inpatients		Deaths	
	Δ = 2,976		Δ = -18.8		Δ = -10.2	
VARIABLES	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Overall	-53.37	3,030***	14.92***	-33.69***	3.773***	-13.92***
	(297.0)	(435.3)	(5.725)	(7.277)	(1.394)	(1.843)
Detailed						
Age	31.62	831.5	6.435***	52.31***	1.219***	1.281
	(46.78)	(677.6)	(0.393)	(9.895)	(0.0955)	(2.674)
Female	-13.69	-753.9**	-0.00943	67.84***	-0.000782	8.349***
	(35.25)	(320.9)	(0.106)	(4.477)	(0.00877)	(1.198)
Foreign	-20.41	-83.04	-6.332***	-18.00***	-0.623***	-0.710
born	(23.20)	(115.1)	(0.866)	(2.292)	(0.211)	(0.604)
Foreign	86.45***	50.24***	2.077***	1.742***	-0.0826	-0.0267
parents	(29.44)	(18.94)	(0.306)	(0.402)	(0.0746)	(0.111)
Married	99.55	670.2	47.30***	141.7***	2.959***	19.85***
	(72.48)	(459.5)	(0.732)	(5.791)	(0.175)	(1.554)
<10 years	63.88	-74.27	-33.91***	30.92***	-1.323***	0.677
educ	(143.9)	(293.1)	(1.527)	(3.806)	(0.372)	(1.000)
>12 years	-26.31	68.77	-22.91***	6.350**	-0.956***	1.836**
educ	(80.19)	(189.4)	(0.919)	(2.707)	(0.224)	(0.732)
>9 years	171.4	125.1	0.452	8.049***	0.516	1.017
educ mother	(145.5)	(114.0)	(1.658)	(2.372)	(0.404)	(0.639)
>9 years	14.37	-21.23	0.209	4.040*	0.147	-0.177
educ father	(111.0)	(117.4)	(1.202)	(2.295)	(0.293)	(0.619)
No labour	-2.411	-46.24	26.78***	28.47***	2.074***	-1.337***
participatio	(30.17)	(79.03)	(0.349)	(1.533)	(0.0568)	(0.413)
Share on	-426.0***	1,828*	-13.12***	-225.0***	-0.397	-16.15***
welfare	(129.7)	(940.5)	(4.738)	(15.70)	(1.156)	(4.081)
Social	1.995	30.52				
isolation	(4.506)	(47.05)				
Other	-33.85	-722.2	7.951***	-31.96***	0.240	-3.564
	(145.6)	(747.0)	(1.327)	(9.804)	(0.323)	(2.601)
Constant		1,126		-100.2***		-24.97***
		(1,349)		(19.66)		(5.238)
Observations	12,080	12,080	7,757,403	7,757,403	7,757,403	7,757,403

Notes: Heavy drinking =1 if >252g and >168g 100% alcohol per week for men and women, respectively. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to alcohol. Deaths identified using the Socialstyrelsen alcohol index. We controlled for missing mother's or father's education, missing information on foreign born or parents foreign born, and missing information on social isolation (heavy drinking only). In the detailed decomposition these variables are grouped under "other". Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Commas denote thousands, full stops denote decimals.

Inequalities

Table 10 presents associations between the measures of income-related inequality in each outcome and the explanatory variables for our two time points. Income-related heavy drinking inequality is not significantly associated with many of our explanatory variables, in either 1988-9 or 2004-5 (table 10). The results, however, do show a positive association between heavy drinking inequality and being female in both 1988-9 and 2004-5, suggesting an increasing concentration of heavy drinking among higher income females during this time period (increasing pro-rich inequality).

In terms of income inequality in inpatient care and deaths, the strongest negative association is with non-participation in the labour market, and this association has increased over time (see table 10). This is expected given that non-participation is strongly associated with having zero disposable income, and we also saw a strong association between non-participation in the labour market and alcohol-related inpatient care and deaths. Having more than 12 years of education is associated with increased inequality in alcohol-related inpatient care and deaths, but this association has decreased. Being foreign born and being female are both associated with a decreased concentration of inpatient care among those with lower income (decreased pro-poor inequality) in both 1994 and 2011 (being female is also associated with a decreased concentration of deaths among those with lower income in 1994). For females this association weakened over the study period, while for being foreign born it increased (for inpatient care only).

The Oaxaca-Blinder decompositions of income-related inequalities in each alcohol outcome are shown in table 11. Using the associations from 1988-9/1994 and the changes in our explanatory variables between the two time points, we are unable to explain the increased concentration of heavy drinking among those with higher income between 1988-9 and 2004-5. However, we are able to explain about one quarter of the increase in the concentration of inpatient care and about half of the increase in the concentration of deaths among those with lower income.

Looking at the detailed decompositions we see some interesting results. The increased age in the sample, increase in numbers of individuals with foreign-born parents, reduction in the proportion married or in a registered partnership, increase in the proportion of individuals with greater than 12 years of schooling, increase in the proportion of individuals whose mother has greater than 9 years of schooling and increase in non-participation in the labour market have all contributed to the observed increase in the concentration of alcohol-related inpatient care among the poor (increased pro-poor inequality). We are, however, only able to explain a small part of the increased concentration of alcohol-related deaths among the poor (by the increased age in the sample and the increase in non-participation in the labour market).

The unexplained part of the change in inequalities in inpatient care is significant, and looking at the detailed decomposition results we see that the associations between many of our explanatory variables and being an inpatient have changed over time. That being said, the unexplained change in (pro-poor) inequalities in both inpatient care and deaths seems primarily driven by the constant term. This indicates that there was a large increase in the

association between being in the reference group[15] and inequality (specifically, increased concentration of alcohol-related inpatient care and deaths among the poor), and taken alone this would explain even more of an increase in inequality than we actually observe.

Table 10: Associations between explanatory variables and income-related inequality in heavy drinking and alcohol-related inpatient care and deaths in 1994 (1988-9) and 2011 (2004-5)

	(1)	(2)	(3)	(4)	(5)	(6)
	Heavy drinking		Inpatients		Deaths	
VARIABLES	1988-9	2004-5	1994	2011	1994	2011
Age	-0.00409	-0.00725	-0.00925***	-0.00655***	-0.0113***	-0.00554**
	(0.00852)	(0.00472)	(0.000629)	(0.000545)	(0.00215)	(0.00233)
Female	0.218*	0.131*	0.0687***	0.0387***	0.0929***	0.0576
	(0.113)	(0.0696)	(0.00842)	(0.00829)	(0.0288)	(0.0354)
Foreign born	0.126	0.166	0.0430***	0.145***	0.0422	0.104
	(0.195)	(0.117)	(0.0163)	(0.0195)	(0.0557)	(0.0832)
Foreign	0.280	-0.649**	0.0267	-0.0705***	0.0538	0.0635
parents	(0.756)	(0.261)	(0.0411)	(0.0258)	(0.141)	(0.110)
Married	-0.0891	0.00277	0.118***	0.0352***	0.135***	0.0388
	(0.126)	(0.0723)	(0.00886)	(0.00844)	(0.0303)	(0.0361)
<10 years educ	-0.138	-0.0840	-0.0284***	-0.0485***	-0.0173	-0.00650
	(0.138)	(0.107)	(0.0102)	(0.0127)	(0.0349)	(0.0540)
>12 years educ	0.113	-0.146*	-0.117***	-0.0657***	-0.180***	-0.0547
	(0.143)	(0.0771)	(0.0107)	(0.00920)	(0.0365)	(0.0393)
>9 years educ	-0.106	0.0314	0.0129	-0.0257**	-0.0189	-0.00605
mother	(0.199)	(0.0960)	(0.0130)	(0.0117)	(0.0443)	(0.0499)
>9 years educ	-0.260	0.0189	-0.0289*	-0.0137	-0.0529	-0.0447
father	(0.223)	(0.110)	(0.0148)	(0.0132)	(0.0508)	(0.0562)
No labour	-0.359	0.218*	-0.233***	-0.510***	-0.319***	-0.641***
participation	(0.239)	(0.122)	(0.0145)	(0.0132)	(0.0497)	(0.0562)
Share on	-0.0416	0.00610	-0.00623**	-0.00547	-0.00425	0.00217
welfare	(0.0517)	(0.0353)	(0.00292)	(0.00416)	(0.01000)	(0.0178)
Social	0.116	0.0150				
isolation	(0.402)	(0.236)				
Constant	0.128	0.151	-0.141***	-0.281***	-0.0788	-0.295***
	(0.234)	(0.146)	(0.0178)	(0.0186)	(0.0609)	(0.0793)
Observations	6,366	5,714	3,660,610	4,096,793	3,660,610	4,096,793
R-squared	0.003	0.004	0.000	0.001	0.000	0.000

Notes: Heavy drinking =1 if >252g and >168g 100% alcohol per week for men and women, respectively. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to alcohol. Deaths identified using the

[15] Our reference group consists of 31 year old single males, born in Sweden to Swedish-born parents, with 10-12 years of education with parents who have less than 10 years education, who do participate in the labour force and live in a municipality with a low share on welfare.

Socialstyrelsen alcohol index. We controlled for missing mother's or father's education, missing information on foreign born or parents foreign born, and missing information on social isolation (inequality in heavy drinking only). Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Commas denote thousands, full stops denote decimals.

Table 11: Overall and detailed Oaxaca-Blinder decomposition results of changes in inequality in heavy drinking (between 1988-9 and 2004-5) and alcohol-related inpatient care and deaths (between 1994 and 2011)

	(1)	(2)	(3)	(4)	(5)	(6)
	Heavy drinking		Inpatients		Deaths	
	Δ = 0.02		Δ = -0.13		Δ = -0.11	
VARIABLES	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Overall	-0.00693	0.0319	-0.0351***	-0.0958***	-0.0589*	-0.0481
	(0.0367)	(0.0757)	(0.00770)	(0.00969)	(0.0329)	(0.0400)
Detailed						
Age	-0.00891	-0.0475	-0.00633***	0.0418***	-0.00534**	0.0899*
	(0.00594)	(0.147)	(0.000528)	(0.0129)	(0.00225)	(0.0490)
Female	0.000463	-0.0432	1.24e-06	-0.0148**	1.85e-06	-0.0175
	(0.00122)	(0.0662)	(1.39e-05)	(0.00584)	(2.07e-05)	(0.0226)
Foreign	0.00400	0.00423	0.00869***	0.0121***	0.00626	0.00738
born	(0.00299)	(0.0240)	(0.00117)	(0.00301)	(0.00498)	(0.0119)
Foreign	-0.00803**	-0.00526	-0.00113***	-0.00104**	0.00101	0.000104
parents	(0.00348)	(0.00460)	(0.000412)	(0.000518)	(0.00176)	(0.00191)
Married	-0.000344	0.0619	-0.00403***	-0.0511***	-0.00444	-0.0593**
	(0.00900)	(0.0977)	(0.000967)	(0.00755)	(0.00413)	(0.0291)
<10 years	0.0140	0.0168	0.00788***	-0.00620	0.00106	0.00333
educ	(0.0179)	(0.0541)	(0.00206)	(0.00500)	(0.00879)	(0.0198)
>12 years	-0.0190*	-0.0664	-0.00884***	0.0128***	-0.00735	0.0313**
educ	(0.0101)	(0.0415)	(0.00124)	(0.00352)	(0.00528)	(0.0134)
>9 years	0.00592	0.0164	-0.00492**	-0.00683**	-0.00116	0.00228
educ mother	(0.0181)	(0.0263)	(0.00223)	(0.00309)	(0.00954)	(0.0118)
>9 years	0.00237	0.0300	-0.00169	0.00228	-0.00551	0.00124
educ father	(0.0138)	(0.0268)	(0.00162)	(0.00299)	(0.00692)	(0.0114)
No labour	0.00671*	0.0382**	-0.0113***	-0.0282***	-0.0142***	-0.0328***
participatio	(0.00392)	(0.0179)	(0.000313)	(0.00200)	(0.00125)	(0.00764)
Share on	-0.00277	0.141	0.00840	0.00309	-0.00333	0.0262
welfare	(0.0160)	(0.184)	(0.00639)	(0.0207)	(0.0273)	(0.0831)
Social	2.58e-05	-0.00213				
isolation	(0.000409)	(0.00989)				
Other	-0.00145	-0.136	-0.0218***	0.0800***	-0.0259***	0.116**
	(0.0181)	(0.154)	(0.00179)	(0.0128)	(0.00763)	(0.0502)
Constant		0.0237		-0.140***		-0.216**
		(0.276)		(0.0257)		(0.1000)
Observations	12,080	12,080	7,757,403	7,757,403	7,757,403	7,757,403

Notes: Heavy drinking =1 if >252g and >168g 100% alcohol per week for men and women, respectively. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three

bi-diagnoses, or one of the top three external diagnoses is related to alcohol. Deaths identified using the Socialstyrelsen alcohol index. We controlled for missing mother's or father's education, missing information on foreign born or parents foreign born, and missing information on social isolation (heavy drinking only). In the detailed decomposition these variables are grouped under "other". Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Commas denote thousands, full stops denote decimals.

4.5. Narcotics

Levels

Table 12 shows the associations between our selected demographic and socioeconomic characteristics and narcotics-related inpatient care and deaths in 1994 and 2011. Narcotics-related inpatient care is significantly associated (both negatively and positively) with nearly all of the demographic and socioeconomic characteristics (except father's and mother's education) (table 12). Deaths are significantly associated (negatively and positively) with many of the characteristics as well. Interestingly, we observe significant negative associations between being foreign-born and the probability of narcotics-related inpatient care or death in both years, whereas we observe a significant positive (and large) association between having foreign-born parents and narcotics-related inpatient care (no significant association for deaths). The direction of these associations is the same in 1994 and 2011, but stronger in 2011. Strikingly, the association between having less than 10 years education and being a narcotics-related inpatient has increased by over four-fold. This suggests an increasing concentration of narcotics-related outcomes among the shrinking number of individuals with less than 10 years of education. Non-participation in the labour force was significantly positively associated with inpatient care and deaths in both years and increased dramatically for both outcomes between 1994 and 2011. Overall, it appears that between 1994 and 2011 narcotics-related inpatient care became more concentrated among low-educated, non-gainfully employed males (table 12).

Table 13 shows the overall and detailed Oaxaca-Blinder decomposition results for the changes in narcotics-related inpatient care and deaths between 1994 and 2011. Overall, population changes in the explanatory variables that were significantly associated with narcotics-related inpatient care in 1994 would explain a large decrease (46 per 100,000) in inpatient care between 1994 and 2011, while we observed only a small, non-significant decrease of 1 per 100,000. The large, significant, explained part of the change is thus offset by a nearly equally large, significant unexplained part. With regards to deaths, even though we saw a nearly 40% increase in the probability of dying from a narcotics-related cause between 1994 and 2011 (from 5 to 7 per 100,000), we cannot significantly explain the change over time with changes in our explanatory variables.

Looking at the detailed decomposition results, the higher proportion of the population with foreign-born parents, the lower proportion of individuals married or in a registered partnership, and the increase in individuals not participating in the labour market seem to explain part of the increase in inpatient care, holding the effects of these variables from 1994 constant. On the other hand, increases in the age of the sample, increases in the population foreign-born, decreases in the population with less than 10 years of education, increases in the population with more than 12 years of education and decreases in municipal population shares on welfare would explain decreases in inpatient care over time. The reduction in the proportion of the population married or in a registered partnership and the increase in those

not gainfully participating in the labour market and whose mother has more than 9 years of education also explain part of the increase in deaths.

The effect of having less than 10 years of education has increased dramatically, as has the effect of non-participation in the labour market and, surprisingly, increased age and being married or in a registered partnership. On the other hand, the effects of being female, being foreign born and being in our "other" group (missing information on parents education and foreign background) seem to have decreased. Together, these changes in the effects of the variables mean that the unexplained portion of the change is nearly as large as that which we can explain.

Table 12: Associations between explanatory variables and narcotics-related inpatient care and deaths in 1994 and 2011

	(1)	(2)	(3)	(4)
	Inpatients		Deaths	
VARIABLES	1994	2011	1994	2011
Age	-10.28***	-8.508***	-0.380***	-0.158***
	(0.300)	(0.248)	(0.0555)	(0.0544)
Female	-40.43***	-77.01***	-5.301***	-6.257***
	(4.012)	(3.778)	(0.743)	(0.827)
Foreign born	-34.18***	-72.68***	-5.199***	-5.478***
	(7.766)	(8.884)	(1.438)	(1.945)
Foreign	83.51***	117.4***	1.347	2.418
parents	(19.58)	(11.76)	(3.626)	(2.575)
Married	-171.3***	-138.5***	-8.049***	-7.726***
	(4.224)	(3.848)	(0.782)	(0.843)
<10 years educ	45.78***	200.1***	0.877	1.429
	(4.861)	(5.768)	(0.900)	(1.263)
>12 years educ	-76.51***	-65.88***	-2.762***	-4.877***
	(5.087)	(4.193)	(0.942)	(0.918)
>9 years educ	-0.468	-1.953	-1.201	2.478**
mother	(6.178)	(5.322)	(1.144)	(1.165)
>9 years educ	5.605	-6.653	0.912	0.243
father	(7.073)	(5.998)	(1.310)	(1.313)
No labour	496.5***	703.2***	23.87***	33.68***
participation	(6.932)	(5.996)	(1.284)	(1.313)
Share on	23.87***	20.14***	1.472***	0.323
welfare	(1.393)	(1.895)	(0.258)	(0.415)
Constant	266.3***	261.5***	9.516***	11.75***
	(8.483)	(8.462)	(1.571)	(1.853)
Observations	3,660,610	4,096,793	3,660,610	4,096,793
R-squared	0.003	0.005	0.000	0.000

Notes: Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to narcotics. Deaths identified using the Socialstyrelsen narcotics index. We controlled for missing mother's or father's education, and missing

information on foreign born or parents foreign born. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Commas denote thousands, full stops denote decimals.

Table 13: Overall and detailed Oaxaca-Blinder decomposition results of changes in the probabilities of narcotics-related inpatient care and death between 1994 and 2011

	(1)	(2)	(3)	(4)
	Inpatients		Deaths	
	Δ = -1.69		Δ = 1.91	
VARIABLES	Explained	Unexplained	Explained	Unexplained
Overall	-46.37***	44.68***	0.351	1.554
	(3.516)	(4.456)	(0.769)	(0.947)
Detailed				
Age	-8.215***	27.36***	-0.153***	3.438***
	(0.247)	(6.020)	(0.0525)	(1.202)
Female	-0.00247	-18.10***	-0.000201	-0.473
	(0.0277)	(2.726)	(0.00225)	(0.550)
Foreign	-4.351***	-4.561***	-0.328***	-0.0331
born	(0.532)	(1.398)	(0.116)	(0.287)
Foreign	1.875***	0.362	0.0386	0.0114
parents	(0.188)	(0.244)	(0.0411)	(0.0475)
Married	15.87***	20.20***	0.885***	0.199
	(0.444)	(3.526)	(0.0966)	(0.709)
<10 years	-32.54***	47.53***	-0.232	0.170
educ	(0.940)	(2.323)	(0.205)	(0.478)
>12 years	-8.856***	2.656	-0.656***	-0.528
educ	(0.564)	(1.647)	(0.123)	(0.329)
>9 years	-0.374	-0.263	0.474**	0.651**
educ mother	(1.019)	(1.444)	(0.223)	(0.289)
>9 years	-0.820	-1.846	0.0300	-0.101
educ father	(0.739)	(1.397)	(0.162)	(0.279)
No labour	15.54***	21.03***	0.744***	0.998***
participatio	(0.207)	(0.933)	(0.0300)	(0.187)
Share on	-30.93***	-15.22	-0.496	-4.683**
welfare	(2.911)	(9.590)	(0.637)	(1.992)
Other	6.423***	-29.65***	0.0437	-0.325
	(0.815)	(5.976)	(0.178)	(1.217)
Constant		-4.816		2.230
		(11.98)		(2.429)
Observations	7,757,403	7,757,403	7,757,403	7,757,403

Notes: Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to narcotics. Deaths identified using the Socialstyrelsen narcotics index. We controlled for missing mother's or father's education and missing information on foreign born or parents foreign born. In the detailed decomposition these variables are grouped under "other". Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Commas denote thousands, full stops denote decimals.

Inequalities

Table 14 presents associations between the measures of income-related inequality in narcotics-related inpatient care and deaths and our selected demographic and socioeconomic characteristics for 1994 and 2011. A negative association indicates that the variable in question is associated with an increase in the concentration of the outcome among the poor (increased pro-poor inequality), whereas a positive association indicates a reduction in the concentration of the outcome among the poor (thus a decrease in pro-poor inequality).

Non-participation in the labour force, older age, having foreign-born parents, more than 12 years of education and being in the reference group were associated with increased concentrations of inpatient care among the poor in both 1994 and 2011. In contrast, being female and being foreign born were significantly associated with a reduction in the concentration of inpatient care among the poor in both 1994 and 2011, and being married or in a registered partnership was associated with decreased pro-poor inequality in 1994 but increased pro-poor inequality in 2011. Interestingly, both having less than 10 years of education and having more than 12 years of education were significantly associated with increased pro-poor inequality in 2011, though the effect of having less than 10 years of education was greater. Intuitively, this suggests that a marginal increase in the population with less than 10 years of education would increase income-related inequality in inpatient care, and would do so by more than a marginal increase in the population with 12 years of education or more.

Inequality in narcotics-related deaths does not seem to be significantly associated with many of our explanatory variables in 1994, and is only associated with municipal share on welfare and being in the reference group in 2011 (table 14). In 1994, we see significant associations between one's mother having more than 9 years of education, non-participation in the labour force, and being in the reference group and increased pro-poor inequality, while being foreign born and being female are significantly associated with a reduction in the concentration of deaths among the poor.

Table 15 shows the overall and detailed Oaxaca-Blinder decomposition results. Overall, changes in our selected demographic and socioeconomic characteristics do not explain a significant change in income-related inequality in inpatient care or deaths[16]. Therefore, we cannot explain the increase in inequality based on overall changes in the population distribution of our selected characteristics. The overall changes over time in inequality seem to be driven by the unexplained portions, i.e. changes in the associations between our explanatory variables and inequalities in narcotics-related inpatient care and deaths.

The detailed decomposition for inpatient care still shows some interesting results. For instance, increasing age in the sample, the increased proportion of individuals with greater than 12 years of education, and the increased proportion of individuals not participating in the labour force significantly explain part of the increase in pro-poor inequality in inpatient care. In contrast, the decreasing proportion of individuals with less than 10 years of education, the

[16] Recall that the concentration indices here are negative, reflecting concentration of the outcome among the poor, so a positive overall change means a decrease in inequality whereas a negative overall change indicates an increase in inequality.

increasing proportion foreign born and the decreasing proportion of people married or in a registered partnership are associated with a decrease in pro-poor inequalities in inpatient care.

The unexplained portion of the change seems to be driven by increased associations between being female, being married or in a registered partnership, having less than 10 years of education, and being in the reference group and income-related inequality in inpatient care.

Table 14: Associations between explanatory variables and inequality in narcotics-related inpatient care and deaths in 1994 and 2011

	(1)	(2)	(3)	(4)
	Inpatients		Deaths	
VARIABLES	1994	2011	1994	2011
Age	-0.00324***	-0.00333***	0.00871	-0.00352
	(0.00103)	(0.000718)	(0.00552)	(0.00318)
Female	0.157***	0.0847***	0.138*	0.0620
	(0.0139)	(0.0109)	(0.0740)	(0.0484)
Foreign born	0.142***	0.186***	0.259*	0.105
	(0.0268)	(0.0257)	(0.143)	(0.114)
Foreign	-0.165**	-0.0662*	0.281	0.161
parents	(0.0676)	(0.0340)	(0.361)	(0.151)
Married	0.116***	-0.0391***	-0.0587	-0.0157
	(0.0146)	(0.0111)	(0.0779)	(0.0493)
<10 years educ	-0.0255	-0.168***	-0.0332	-0.0183
	(0.0168)	(0.0167)	(0.0896)	(0.0740)
>12 years educ	-0.0540***	-0.0687***	-0.0160	0.0242
	(0.0176)	(0.0121)	(0.0938)	(0.0538)
>9 years educ	-0.0264	0.000168	-0.220*	-0.0612
mother	(0.0213)	(0.0154)	(0.114)	(0.0682)
>9 years educ	-0.0612**	0.000821	0.153	-0.0561
father	(0.0244)	(0.0173)	(0.130)	(0.0769)
No labour	-0.231***	-0.216***	-0.428***	-0.120
participation	(0.0239)	(0.0173)	(0.128)	(0.0769)
Share on	-0.0316***	-0.00666	-0.0400	-0.0542**
welfare	(0.00481)	(0.00548)	(0.0257)	(0.0243)
Constant	-0.247***	-0.514***	-0.263*	-0.423***
	(0.0293)	(0.0245)	(0.156)	(0.109)
	3,660,610	4,096,793	3,660,610	4,096,793
R-squared	0.000	0.000	0.000	0.000

Notes: Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to narcotics. Deaths identified using the Socialstyrelsen narcotics index. We controlled for missing mother's or father's education, and missing information on foreign born or parents foreign born. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Commas denote thousands, full stops denote decimals.

Table 15: Overall and detailed Oaxaca-Blinder decomposition results of changes in inequality in narcotics-related inpatient care and deaths between 1994 and 2011

	(1)	(2)	(3)	(4)
	Inpatients		Deaths	
	Δ = -0.22		Δ = 0.18	
VARIABLES	Explained	Unexplained	Explained	Unexplained
Overall	0.0147	-0.236***	0.0535	-0.229***
	(0.0101)	(0.0134)	(0.0450)	(0.0630)
Detailed				
Age	-0.00321***	-0.00129	-0.00340	-0.189*
	(0.000693)	(0.0195)	(0.00307)	(0.0986)
Female	2.71e-06	-0.0357***	1.99e-06	-0.0376
	(3.04e-05)	(0.00873)	(2.24e-05)	(0.0437)
Foreign	0.0111***	0.00521	0.00626	-0.0183
born	(0.00154)	(0.00440)	(0.00682)	(0.0217)
Foreign	-0.00106*	0.00105	0.00257	-0.00129
parents	(0.000543)	(0.000808)	(0.00241)	(0.00418)
Married	0.00448***	-0.0956***	0.00180	0.0265
	(0.00127)	(0.0113)	(0.00565)	(0.0569)
<10 years	0.0274***	-0.0440***	0.00298	0.00458
educ	(0.00271)	(0.00728)	(0.0120)	(0.0358)
>12 years	-0.00924***	-0.00366	0.00326	0.0101
educ	(0.00163)	(0.00533)	(0.00723)	(0.0270)
>9 years	3.21e-05	0.00470	-0.0117	0.0282
educ mother	(0.00294)	(0.00466)	(0.0131)	(0.0235)
>9 years	0.000101	0.00935**	-0.00692	-0.0314
educ father	(0.00214)	(0.00451)	(0.00948)	(0.0228)
No labour	-0.00478***	0.00156	-0.00264	0.0314**
participatio	(0.000386)	(0.00301)	(0.00170)	(0.0152)
Share on	0.0102	0.101***	0.0832**	-0.0577
welfare	(0.00842)	(0.0297)	(0.0373)	(0.144)
Other	-0.0204***	0.0886***	-0.0218**	0.166*
	(0.00236)	(0.0189)	(0.0104)	(0.0941)
Constant		-0.268***		-0.160
		(0.0382)		(0.190)
Observations	7,757,403	7,757,403	7,757,403	7,757,403

Notes: Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to narcotics. Deaths identified using the Socialstyrelsen narcotics index. We controlled for missing mother's or father's education, and missing information on foreign born or parents foreign born. In the detailed decomposition these variables are grouped under "other". Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Commas denote thousands, full stops denote decimals.

4.6. Smoking

Levels

Table 16 shows associations between each of the smoking-related outcomes and our selected demographic and socioeconomic characteristics in 1994 and 2011. Smoking, and smoking-related inpatient care and deaths are all significantly associated with many of the explanatory variables (see table 16). Older age was significantly negatively associated with smoking in 1994 and positively associated with inpatient care and deaths in both 1994 and 2011. In both years, there was a strong positive association between being foreign-born and smoking, whereas the association was strong and negative between being foreign-born and inpatient care and death. Being married or in a registered partnership was strongly negatively associated with smoking, as well as inpatient care and deaths in both years, as was having more than 12 years of education. Both mother's and father's education were strongly positively associated with inpatient care in both 1994 and 2011, and with deaths in 2011. Non-participation in the labour force and increasing the share of the municipal population receiving welfare were both strongly positively associated with inpatient care and deaths in both years, and non-participation in the labour force was also associated with being a smoker in 2011 (though not in 1994). The constant is large, positive, and significant for reporting being a current smoker, whereas it is large, negative and significant for inpatient care and deaths. This indicates a higher prevalence of smoking, though a lower probability of smoking-related inpatient care and/or death among the reference group (recall that these are 31 year old males, born in Sweden to Swedish-born parents, with 10-12 years of education, participating in the labour market, living in an area with a low share of individuals on welfare and whose parents have 9 years or less of education).

Results from the Oaxaca-Blinder decompositions are presented in table 17. Overall, changes over time in the population distribution of the explanatory variables do not significantly explain the decreased prevalence of smoking, increased probability of receiving smoking-related inpatient care, or decreased probability of death. In the case of both smoking and smoking-related inpatient care, the unexplained portion of the change is large and significant, whereas we cannot explain the decrease in the probability of dying in terms of either explained or unexplained changes, even though the decrease of 3 deaths per 100,000 is statistically significant.

Looking at the detailed decomposition results, we see that only the increase in the proportion of the population with greater than 12 years of education[17] contributes to explaining the decrease in smoking, holding the effects of the characteristics from 1994 constant. Even though overall the explained portions of the changes in both inpatient care and deaths are not significant, when looking at the detailed results, changes in the distribution of many of the explanatory variables would explain the increase in the probability of inpatient care, and

[17] Our "other" variable actually also explains a significant decrease over time. It includes controls for missing mother's or father's education, missing information on foreign born or parents foreign born, and missing information on social isolation (current smoking only).

several others would explain the decrease in the probability of smoking-related death, holding the effects of the characteristics from 1994 constant (table 17). For instance, increasing age, the decreasing proportion of people married or in a registered partnership, the increase in the proportion of individuals whose mother and/or father have more than 9 years of education, and the increasing proportion of individuals not participating in the labour force all explain an increase in inpatient care. Increases in the population foreign born and with more than 12 years of education, as well as decreases in the population with less than 10 years of education and living in municipalities with a high share of the population receiving welfare seem to explain part of the decrease in deaths.

As mentioned above, overall it is the unexplained portions of the changes over time in the prevalence of smoking and probability of receiving smoking-related inpatient care that are significant. The dramatic decrease in smoking over time seems primarily driven by the constant term, indicating that the change in the association between being in our reference group and smoking has decreased dramatically over time. The constant term is also significant in explaining the decrease in deaths over time, and would explain a decrease in inpatient care as well. However, when it comes to inpatient care we actually observe an increase over time. For inpatient care, important contributors to the unexplained portion of the change are changes in the effects of age, being female, having less than 10 years of education, parents' education and non-participation in the labour market (as well as the effect of being in the "other" group).

Table 16: Associations between explanatory variables and smoking and smoking-related inpatient care and deaths in 1994 and 2011

	(1)	(2)	(3)	(4)	(5)	(6)
	Current smoker		Inpatients		Deaths	
VARIABLES	1994	2011	1994	2011	1994	2011
Age	-285.9**	139.5	13.91***	16.07***	3.086***	2.798***
	(114.2)	(87.33)	(0.306)	(0.272)	(0.140)	(0.111)
Female	3,759**	1,957	-17.17***	32.78***	-13.65***	-1.421
	(1,561)	(1,330)	(4.100)	(4.146)	(1.870)	(1.687)
Foreign born	8,111***	7,886***	-79.90***	-82.20***	-19.30***	-14.15***
	(2,619)	(2,115)	(7.937)	(9.751)	(3.620)	(3.968)
Foreign parents	26,312***	3,645	-2.506	-30.20**	6.905	4.990
	(8,548)	(4,239)	(20.01)	(12.91)	(9.128)	(5.252)
Married	-11,297***	-5,951***	-84.66***	-102.6***	-18.34***	-17.98***
	(1,673)	(1,366)	(4.317)	(4.223)	(1.969)	(1.718)
<10 years educ	3,091	2,594	33.38***	119.6***	5.388**	19.60***
	(2,034)	(2,342)	(4.968)	(6.330)	(2.266)	(2.576)
>12 years educ	-11,231***	-9,346***	-46.93***	-69.30***	-8.409***	-10.77***
	(1,843)	(1,418)	(5.199)	(4.602)	(2.371)	(1.872)
>9 years educ mother	22.39	792.2	18.98***	39.92***	3.688	7.062***
	(2,360)	(1,921)	(6.314)	(5.841)	(2.880)	(2.377)
>9 years educ father	-235.1	255.9	14.35**	37.14***	3.679	6.514**
	(2,710)	(2,187)	(7.228)	(6.582)	(3.297)	(2.678)
No labour participation	4,489	8,791***	367.3***	472.4***	59.95***	66.95***
	(2,862)	(2,422)	(7.085)	(6.581)	(3.232)	(2.678)
Share on welfare	439.5	-166.5	7.151***	8.827***	1.432**	1.980**
	(474.3)	(675.2)	(1.424)	(2.080)	(0.649)	(0.846)
Social isolation	-3,176	12,289**				
	(5,617)	(4,905)				
Constant	34,673***	12,491***	-81.95***	-187.3***	-14.56***	-32.49***
	(3,217)	(3,112)	(8.669)	(9.287)	(3.954)	(3.779)
Observations	3,193	2,469	3,660,610	4,096,793	3,660,610	4,096,793
R-squared	0.046	0.068	0.003	0.004	0.001	0.001

Notes: Current smoker =1 if reported being a current daily cigarette smoker. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to smoking. Death =1 if died during the given calendar year and the main cause of death or one of the top three additional causes of death is related to smoking. We controlled for missing mother's or father's education, missing information on foreign born or parents foreign born, and missing information on social isolation (current smoking only). Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Commas denote thousands, full stops denote decimals.

Table 17: Overall and detailed Oaxaca-Blinder decomposition results of changes in the prevalence of smoking and probabilities of smoking-related inpatient care and death between 1994 and 2011

	(1)	(2)	(3)	(4)	(5)	(6)
	Current smoking		Inpatients		Deaths	
	Δ = -14,867		Δ = 21.3		Δ = -3.0	
VARIABLES	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Overall	-213.9	-14,653***	-5.662	27.00***	-1.887	-1.141
	(1,371)	(1,697)	(3.857)	(4.824)	(1.568)	(2.008)
Detailed						
Age	245.9	6,552***	15.52***	33.47***	2.702***	-4.457
	(158.1)	(2,215)	(0.285)	(6.341)	(0.109)	(2.759)
Female	33.90	-915.5	0.00105	24.71***	-4.56e-05	6.051***
	(34.89)	(1,042)	(0.0118)	(2.885)	(0.000514)	(1.246)
Foreign	310.5***	-27.45	-4.921***	-0.272	-0.847***	0.610
born	(111.5)	(410.1)	(0.584)	(1.489)	(0.238)	(0.636)
Foreign	60.71	-191.7**	-0.482**	-0.296	0.0797	-0.0205
parents	(71.78)	(88.65)	(0.206)	(0.254)	(0.0839)	(0.112)
Married	575.4***	3,436**	11.75***	-11.06***	2.059***	0.223
	(153.4)	(1,389)	(0.485)	(3.726)	(0.197)	(1.613)
<10 years	-358.3	-118.8	-19.45***	26.56***	-3.187***	4.377***
educ	(324.5)	(741.2)	(1.030)	(2.478)	(0.419)	(1.056)
>12 years	-1,228***	597.4	-9.316***	-5.590***	-1.448***	-0.590
educ	(222.3)	(737.1)	(0.619)	(1.735)	(0.252)	(0.755)
>9 years	146.4	141.8	7.640***	3.707**	1.352***	0.597
educ mother	(355.2)	(560.5)	(1.118)	(1.523)	(0.455)	(0.661)
>9 years	31.93	74.58	4.576***	3.432**	0.802**	0.427
educ father	(272.8)	(528.9)	(0.811)	(1.472)	(0.330)	(0.640)
No labour	7.392	386.7	10.44***	10.69***	1.480***	0.712*
participatio	(67.59)	(337.7)	(0.181)	(0.984)	(0.0611)	(0.427)
Share on	299.3	-2,575	-13.56***	6.833	-3.041**	2.233
welfare	(1,214)	(3,507)	(3.195)	(10.28)	(1.300)	(4.349)
Social	-20.08	319.7**				
isolation	(46.52)	(159.0)				
Other	-318.9*	-151.0	-7.861***	40.15***	-1.839***	6.627**
	(183.2)	(2,156)	(0.895)	(6.348)	(0.364)	(2.725)
Constant		-22,181***		-105.3***		-17.93***
		(4,476)		(12.70)		(5.470)
Observations	5,662	5,662	7,757,403	7,757,403	7,757,403	7,757,403

Notes: Current smoker =1 if reported being a current daily cigarette smoker. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to smoking. Death =1 if died during the given calendar year and the main cause of death or one of the top three additional causes of death is related to smoking. We controlled for missing mother's or father's education, missing information on foreign born or parents foreign born, and missing information on social isolation (current smoking only). In the detailed decomposition these variables are grouped under "other". Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Commas denote thousands, full stops denote decimals.

Inequalities

Income-related inequalities in smoking were not significantly associated with many of our explanatory variables (see table 18). Age, having less than 10 years of education, having more than 12 years of education and non-participation in the labour market were all significantly associated with an increased concentration of inpatient care and deaths among the poor (increased pro-poor inequality) in both 1994 and 2011. On the other hand, being female and being married or in a registered partnership were both significantly associated with a decreased concentration of inpatient care and deaths among the poor in both 1994 and 2011, and whilst the effect of being in the reference group on inequalities in inpatient care was significant in both 1994 and 2011 it differed in direction, being associated with a decreased concentration of inpatient care among the poor in 1994 but an increased concentration in 2011. Interestingly municipal share on welfare was only significantly associated with increased pro-poor inequality in inpatient care and deaths in 1994.

The Oaxaca-Blinder decomposition results of changes in the smoking-related inequalities between 1994 and 2011 are presented in table 19. Overall, we are able to explain a large portion of the increase in the pro-poor inequalities in current smoking, inpatient care and deaths.

Looking at the detailed decomposition results, changes in very few of the characteristics alone can explain the increase in inequalities in current smoking (only the increase in the population foreign born). For inequalities in inpatient care and deaths, changes in the age distribution, decreases in the proportion married or in a registered partnership, increases in the proportion with more than 12 years of education, increases in the proportion whose mother has more than 9 years of education and increases in the proportion not participating in the labour force that significantly explain the increase in pro-poor inequality. The increase in the proportion of the population whose father has more than 9 years of education is also significantly associated with increased pro-poor inequality in inpatient care.

The unexplained portion of the change is only significant for inequalities in inpatient care. Looking at the detailed results it is only the increased associations between pro-poor inequality and non-participation in the labour force, having less than 10 years of education and being in the reference group that are significant contributors to the unexplained increase in income-related inequality. The constant is large and significant, reflecting an increase in pro-poor inequality among the reference group.

Table 18: Associations between explanatory variables and inequality in smoking and smoking-related inpatient care and deaths in 1994 and 2011

	(1)	(2)	(3)	(4)	(5)	(6)
	Current smoker		Inpatients		Deaths	
VARIABLES	1994	2011	1994	2011	1994	2011
Age	0.000764	-0.00348	-0.0199***	-0.0103***	-0.0198***	-0.0129***
	(0.00237)	(0.00395)	(0.00104)	(0.000867)	(0.00236)	(0.00214)
Female	-0.0310	0.0770	0.0401***	0.0595***	0.0791**	0.146***
	(0.0325)	(0.0602)	(0.0140)	(0.0132)	(0.0316)	(0.0326)
Foreign born	-0.0739	-0.311***	-0.0368	0.108***	0.0513	-0.00122
	(0.0545)	(0.0957)	(0.0271)	(0.0310)	(0.0611)	(0.0766)
Foreign parents	-0.298*	-0.142	0.0279	0.0769*	-0.00686	0.0241
	(0.178)	(0.192)	(0.0682)	(0.0411)	(0.154)	(0.101)
Married	0.0126	0.0209	0.217***	0.189***	0.211***	0.187***
	(0.0348)	(0.0618)	(0.0147)	(0.0134)	(0.0332)	(0.0332)
<10 years educ	0.0307	-0.0826	-0.0375**	-0.0899***	-0.0986***	-0.0286
	(0.0423)	(0.106)	(0.0169)	(0.0201)	(0.0382)	(0.0497)
>12 years educ	-0.0443	-0.0330	-0.168***	-0.0966***	-0.154***	-0.142***
	(0.0383)	(0.0641)	(0.0177)	(0.0146)	(0.0400)	(0.0361)
>9 years educ	-0.0668	-0.0663	-0.0257	-0.0379**	-0.0149	-0.124***
mother	(0.0491)	(0.0869)	(0.0215)	(0.0186)	(0.0486)	(0.0459)
>9 years educ	-0.0179	-0.0585	-0.0727***	-0.0822***	-0.118**	-0.0504
father	(0.0563)	(0.0989)	(0.0246)	(0.0209)	(0.0556)	(0.0517)
No labour	-0.131**	-0.382***	-0.499***	-0.614***	-0.575***	-0.628***
participation	(0.0595)	(0.110)	(0.0241)	(0.0209)	(0.0545)	(0.0517)
Share on	0.00596	0.0446	-0.0155***	0.00851	-0.0252**	0.00525
welfare	(0.00986)	(0.0305)	(0.00485)	(0.00662)	(0.0110)	(0.0163)
Social isolation	-0.0447	0.0129				
	(0.117)	(0.222)				
Constant	0.0196	-0.0572	0.293***	-0.0855***	0.363***	0.0300
	(0.0669)	(0.141)	(0.0295)	(0.0296)	(0.0667)	(0.0729)
Observations	3,193	2,469	3,660,610	4,096,793	3,660,610	4,096,793
R-squared	0.009	0.019	0.000	0.000	0.000	0.000

Notes: Current smoker =1 if reported being a current daily cigarette smoker. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to smoking. Death =1 if died during the given calendar year and the main cause of death or one of the top three additional causes of death is related to smoking. We controlled for missing mother's or father's education, missing information on foreign born or parents foreign born, and missing information on social isolation (current smoking only). Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Commas denote thousands, full stops denote decimals.

Table 19: Overall and detailed Oaxaca-Blinder decomposition results of changes in inequality in smoking and smoking-related inpatient care and deaths between 1994 and 2011

	(1)	(2)	(3)	(4)	(5)	(6)
	Current smoking		Inpatients		Deaths	
	Δ = -0.15		Δ = -0.18		Δ = -0.16	
VARIABLES	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Overall	-0.104*	-0.0453	-0.0774***	-0.0995***	-0.115***	-0.0482
	(0.0614)	(0.0700)	(0.0123)	(0.0156)	(0.0302)	(0.0377)
Detailed						
Age	-0.00614	-0.0654	-0.00999***	0.148***	-0.0125***	0.107**
	(0.00702)	(0.0710)	(0.000840)	(0.0210)	(0.00207)	(0.0492)
Female	0.00133	0.0548	1.91e-06	0.00959	4.68e-06	0.0330
	(0.00147)	(0.0347)	(2.14e-05)	(0.00951)	(5.25e-05)	(0.0224)
Foreign	-0.0122**	-0.0289**	0.00646***	0.0171***	-7.32e-05	-0.00622
born	(0.00477)	(0.0135)	(0.00186)	(0.00488)	(0.00458)	(0.0116)
Foreign	-0.00236	0.00133	0.00123*	0.000523	0.000384	0.000330
parents	(0.00323)	(0.00223)	(0.000656)	(0.000850)	(0.00162)	(0.00197)
Married	-0.00202	0.00533	-0.0216***	-0.0172	-0.0214***	-0.0150
	(0.00598)	(0.0456)	(0.00154)	(0.0123)	(0.00380)	(0.0290)
<10 years	0.0114	-0.0271	0.0146***	-0.0161**	0.00465	0.0216
educ	(0.0147)	(0.0273)	(0.00328)	(0.00810)	(0.00808)	(0.0193)
>12 years	-0.00434	0.00359	-0.0130***	0.0179***	-0.0191***	0.00301
educ	(0.00844)	(0.0237)	(0.00197)	(0.00574)	(0.00486)	(0.0135)
>9 years	-0.0123	8.89e-05	-0.00725**	-0.00216	-0.0237***	-0.0193
educ mother	(0.0161)	(0.0184)	(0.00356)	(0.00503)	(0.00878)	(0.0118)
>9 years	-0.00730	-0.00617	-0.0101***	-0.00142	-0.00621	0.0102
educ father	(0.0124)	(0.0173)	(0.00258)	(0.00487)	(0.00637)	(0.0114)
No labour	-0.000321	-0.0226**	-0.0136***	-0.0116***	-0.0139***	-0.00535
participatio	(0.00294)	(0.0113)	(0.000483)	(0.00325)	(0.00115)	(0.00764)
Share on	-0.0801	0.164	-0.0131	0.0980***	-0.00807	0.124
welfare	(0.0549)	(0.136)	(0.0102)	(0.0335)	(0.0251)	(0.0802)
Social	-2.11e-05	0.00119				
isolation	(0.000366)	(0.00518)				
Other	0.0105	-0.0489	-0.0111***	0.0370*	-0.0156**	0.0309
	(0.00816)	(0.0747)	(0.00285)	(0.0208)	(0.00702)	(0.0494)
Constant		-0.192		-0.379***		-0.333***
		(0.156)		(0.0418)		(0.0988)
Observations	5,662	5,662	7,757,403	7,757,403	7,757,403	7,757,403

Notes: Current smoker =1 if reported being a current daily cigarette smoker. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to smoking. Death =1 if died during the given calendar year and the main cause of death or one of the top three additional causes of death is related to smoking. We controlled for missing mother's or father's education, missing information on foreign born or parents foreign born, and missing information on social isolation (current smoking only). In the detailed decomposition these variables are grouped under "other". Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Commas denote thousands, full stops denote decimals.

5. Sensitivity analyses

To investigate the reliability of our results we have carried out several sensitivity analyses. First, we investigate whether and how the trends in inequalities over time differ if we use an absolute measure of inequality rather than a relative one. Second, we investigate how the trends in inequalities over time differ if we use educational attainment as an alternative measure of socioeconomic rank. Third, we investigate how our results differ if we investigate trends over time by sex as opposed to for the population as a whole.

5.1. Absolute versus relative inequalities

As discussed above (see section 3.1), socioeconomic-related inequalities in health can be measured in absolute or relative terms. According to relative measures of inequality (such as the concentration index presented in the main results of this report), if the health of all individuals in a population were to change by the same relative (proportional) amount, inequality would remain unchanged. In contrast, according to absolute measures of inequality, if the health of all individuals in a population were to change by the same absolute amount then inequality would be unchanged. These differing measures of inequality reflect different value judgments about what is "fair" and "unfair". It can thus be important to consider both when investigating inequality (42, 43).

To compare absolute and relative changes in inequality over time we use a novel graphing tool. This tool enables depiction of absolute and relative inequality as well as the mean of health in the same figure. The benefit of this is that we are able to consider relative versus absolute changes without our conclusions being dependent on the scale of the axis chosen. This thus enables us to compare how inequality may have changed in relative versus absolute terms over the study period.

In the figures, the dotted lines represent different values of the concentration index. A movement from one dotted line to another would represent a change in relative inequality, while a movement along a dotted line means that relative inequality has remained unchanged. Recall that the concentration index can range from -1 to +1. A greater *magnitude* of the concentration index denotes greater inequality, whereas the sign of the concentration index denotes whether the outcome is more concentrated among the poor (-) or the rich (+). .

Absolute inequality is displayed along the y-axis, while the mean of the health variable in the population is displayed along the x-axis. In our case, each of the health variables represent a binary ill health outcome. The population mean thus corresponds to the population-level probability (or prevalence) of the ill health outcome.

Absolute inequality can take on values between the negative of the mean of the (ill) health variable in the population and the positive of the mean of the (ill) health variable in the population. If absolute inequality were equal to the negative of the mean of the (ill) health variable, this would mean that all (ill) health was concentrated among the very poorest in the population. In the contour graphs, this would be represented by a data point in the lower right-hand corner of the graph, and would correspond to a concentration index of -1.

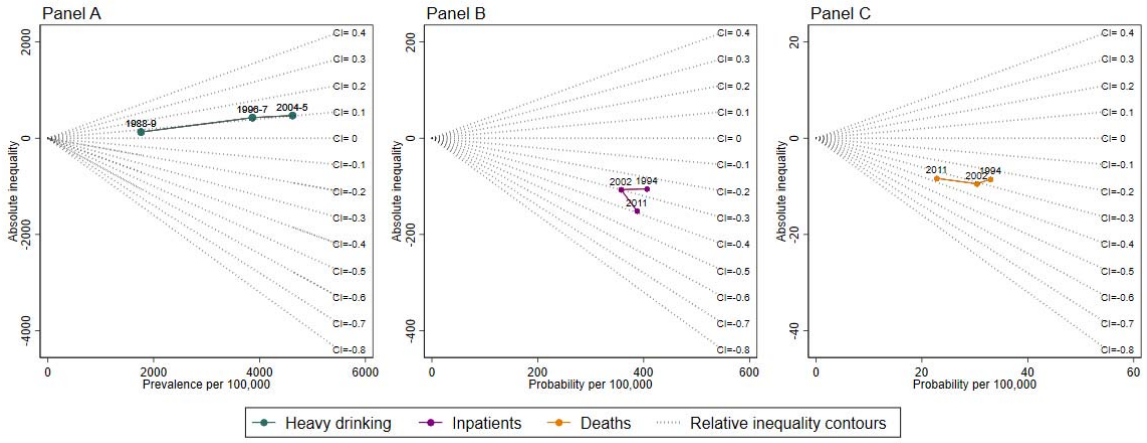
Taking the example of alcohol-related deaths, we see that the probability of death decreased importantly between 1994 and 2011 (data points move from right towards the left), but absolute

inequality stayed relatively unchanged (the shift from right to left is fairly horizontal). In contrast, relative inequalities increased from about -0.25 to about -0.4 (shift from right of the -0.3 contour line to nearly the -0.4 contour line).

Alcohol

The overall picture when investigating absolute instead of relative inequalities in the alcohol-related outcomes is quite different (figure 7). Absolute inequalities in inpatient care increased fairly similarly to relative inequalities. In contrast, absolute inequalities in heavy drinking increased much more (more than doubled towards a more pro-rich distribution) than relative inequalities. Absolute inequalities in deaths were relatively similar (slight decrease) in 1994 and 2011, while relative inequalities increased and the population probability of alcohol-related death decreased importantly.

Figure 7: Changes over time in absolute (per 100,000) versus relative inequalities in heavy drinking (panel A), and inpatient care (panel B) and deaths (panel C) related to alcohol



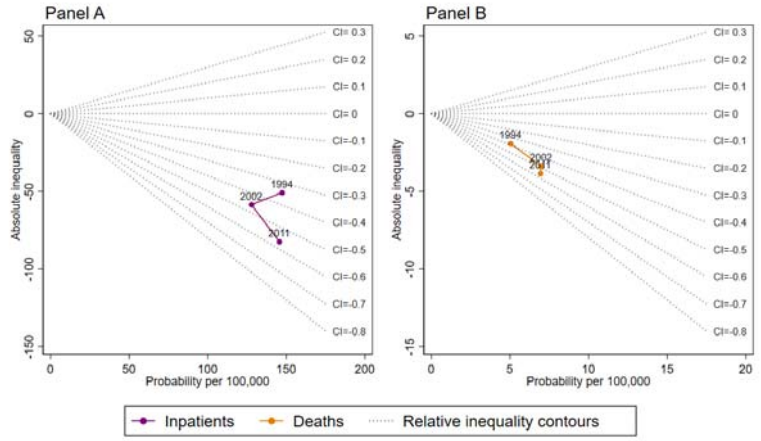
Notes: Heavy drinking =1 if >252g and >168g 100% alcohol per week for men and women, respectively. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to alcohol. Deaths identified using the Socialstyrelsen alcohol index.

Source: ULF (heavy drinking), SIP (inpatient care and deaths); own calculations

Narcotics

For narcotics, we again see a difference between absolute and relative inequalities. Whereas the increase in relative and absolute inequalities in inpatient care is similar, the increase in inequalities in narcotics-related deaths is much greater when measured on an absolute scale (an increase of approximately 100% versus the increase of approximately 50% observed in relative terms; figure 8).

Figure 8: Changes over time in absolute versus relative inequalities in inpatient care (panel B) and deaths (panel C) related to narcotics



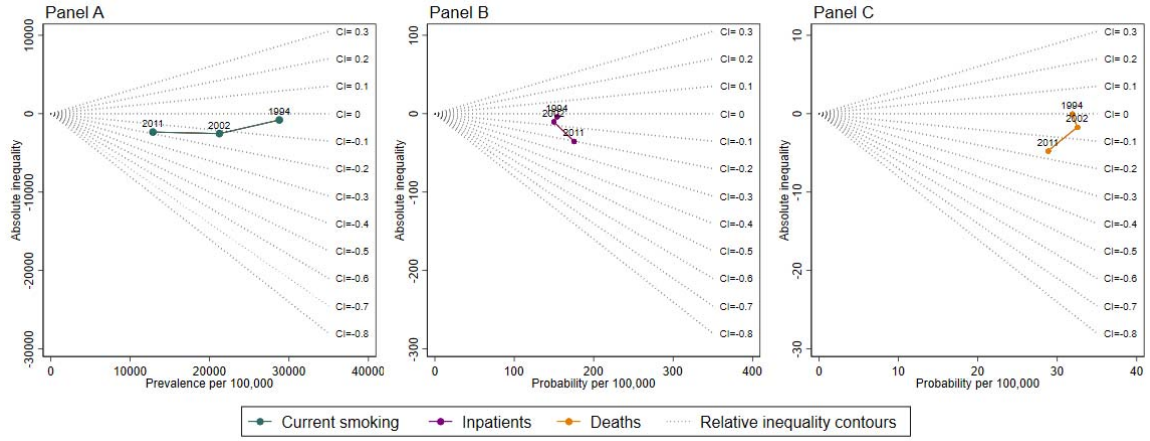
Notes: Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to narcotics. Deaths identified using the Socialstyrelsen narcotics index.

Source: SIP; own calculations

Smoking

The overall trends in absolute and relative inequalities are similar for inpatient care and deaths. Both show dramatic increases in inequality over the time period (figure 9). Inequalities in smoking increased dramatically as well, though the relative increase is far greater (about 5 times) than the absolute increase (about double).

Figure 9: Changes over time in absolute versus relative inequalities in current daily smoking (panel A), and inpatient care (panel B) and deaths (panel C) related to smoking



Notes: Current smoker =1 if reported being a current daily cigarette smoker. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to smoking. Death =1 if died during the given calendar year and the main cause of death or one of the top three additional causes of death is related to smoking.

Source: ULF (current smoking), SIP (inpatient care and deaths); own calculations

5.2. Other measures of socioeconomic rank

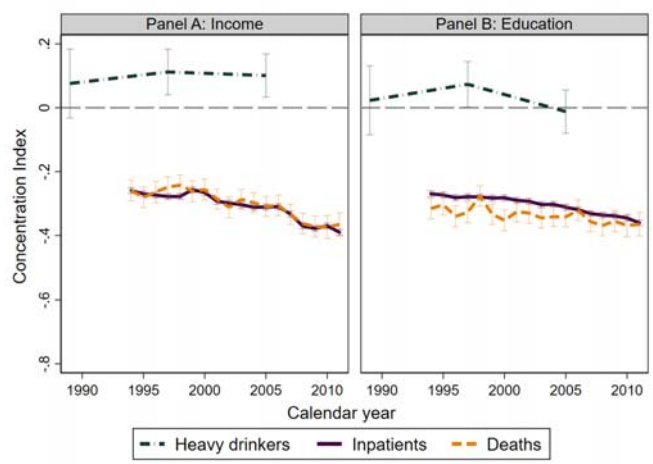
In this section, we investigate how the trends in inequalities over time differ if we use another measure of socioeconomic rank, namely educational attainment. To do this we plot the trends

over time in the concentration index measured with highest achieved educational level as the socioeconomic ranking variable.

Alcohol

Education-related inequalities in heavy drinking were lower (less pro-poor) than income-related inequalities (figure 10) and were not significant throughout the study period (recall that a concentration index of zero denotes no inequality). Education-related inequalities in alcohol-related inpatient care and deaths were slightly worse than income-related inequalities at the beginning of the study period but less pronounced at the end. This is because education-related inequalities in inpatient care and deaths appear to have changed less over time than income-related inequalities. While income-related inequalities in inpatient care and deaths were not statistically significantly different to each other throughout the study period, education-related inequalities in deaths were significantly worse than those in inpatient care during several years of the study period.

Figure 10: Trends over time in the concentration index for heavy drinking (1988-9 to 2004-5) and alcohol-related inpatient care and deaths, using educational attainment versus equivalised income as the socioeconomic ranking variable



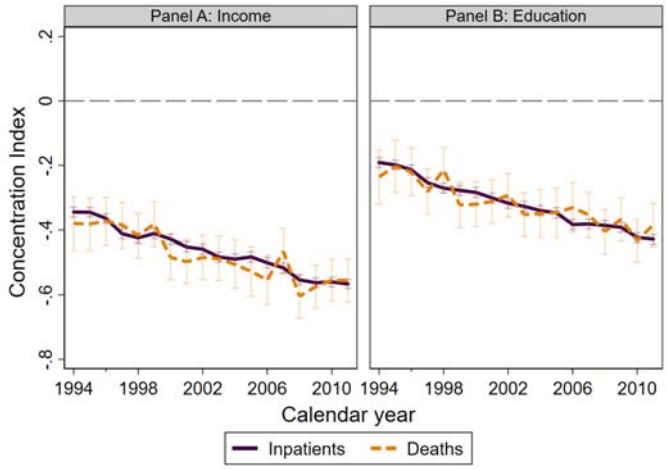
Notes: Notes: Heavy drinking =1 if >252g and >168g 100% alcohol per week for men and women, respectively. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to alcohol. Deaths identified using the Socialstyrelsen alcohol index.

Source: ULF (heavy drinking), SIP (inpatient care and deaths); own calculations

Narcotics

Education-related inequalities in narcotics-related inpatient care and deaths are considerably less stark than income-related inequalities (figure 11). Education and income-related inequalities in inpatient care and deaths, however, increased at similar rates throughout the study period.

Figure 11: Trends over time in the concentration index for narcotics-related inpatient care and deaths, using educational attainment versus equivalised income as the socioeconomic ranking variable



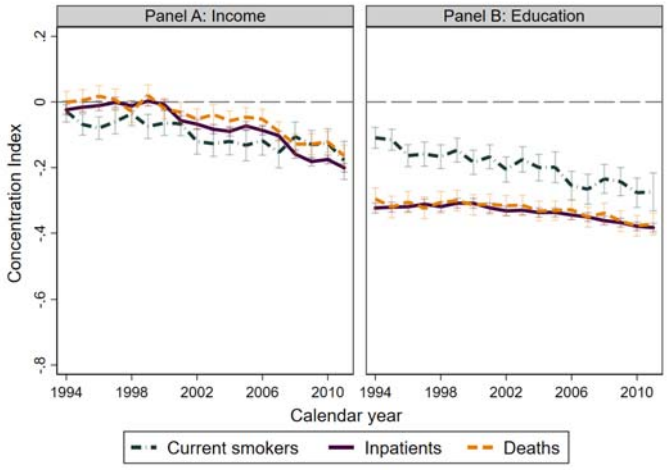
Notes: Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to narcotics. Deaths identified using the Socialstyrelsen narcotics index.

Source: SIP; own calculations

Smoking

For smoking, inequalities are considerably more pronounced if educational attainment is used as the socioeconomic ranking variable. While the change in inequalities in smoking over time appears similar using both measures of inequality, we see far less of a change over time in inequalities in inpatient care and deaths if we use educational attainment as the socioeconomic ranking variable (figure 12).

Figure 12: Trends over time in the concentration index for smoking and smoking-related inpatient care and deaths, using educational attainment versus equivalised income as the socioeconomic ranking variable



Notes: Current smoker =1 if reported being a current daily cigarette smoker. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to smoking. Death =1 if died during the given calendar year and the main cause of death or one of the top three additional causes of death is related to smoking.

Source: ULF (current smoking), SIP (inpatient care and deaths); own calculations

5.3. Differences between males and females

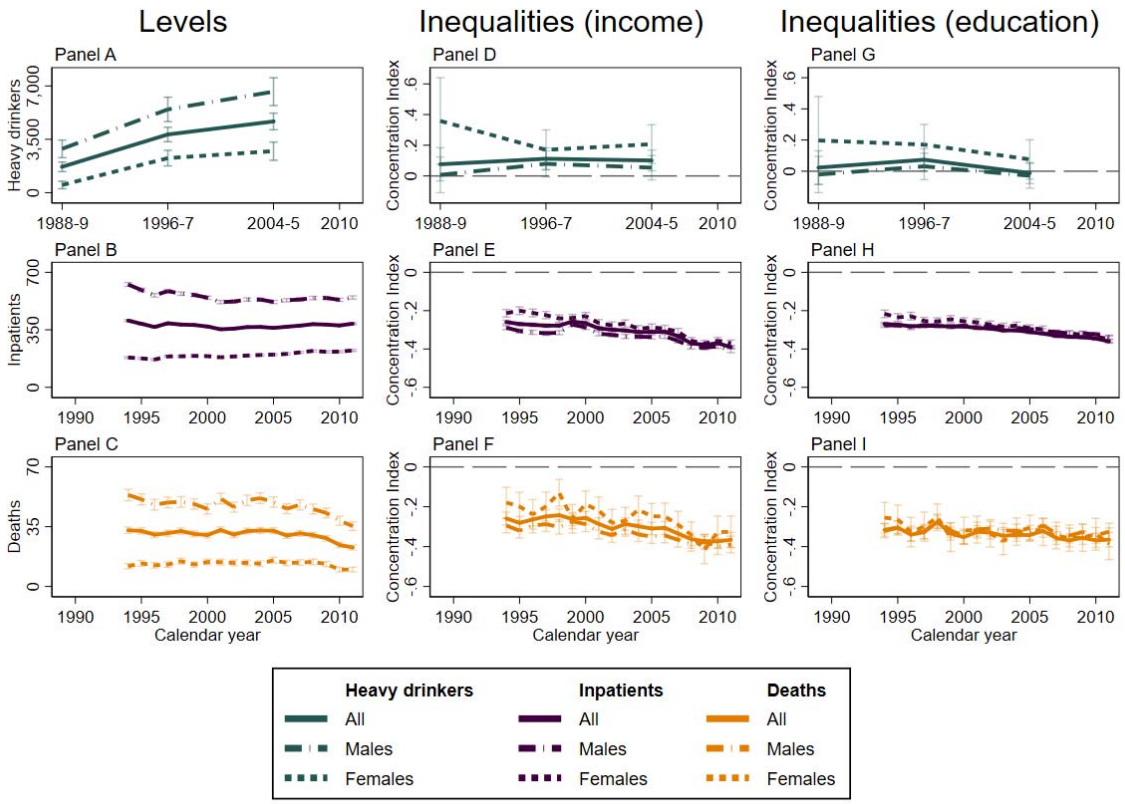
One potential concern with the trends over time presented in our main analyses is that they are presented for the population as a whole, rather than stratified by sex. To investigate the impact of this decision on our results, we now present trends in the probabilities of each alcohol, narcotics or smoking-related outcome and inequalities therein by sex, for both income-related and education-related inequalities. Of note, we do not seek to explain changes in the levels and socioeconomic-related inequalities therein by sex in this report.

Alcohol

The prevalence of heavy drinking and probabilities of inpatient care and death related to alcohol were considerably lower among females than among males during the study period (figure 13). The trends appear similar, though diverge slightly (trends among males and females move in opposite directions) over time in heavy drinking, and converge slightly over time in inpatient care and deaths.

In terms of socioeconomic inequalities, we observe less pro-poor and pro-low education inequality among females for all outcomes except heavy drinking, where we observe a more pro-rich inequality among females. Across all outcomes we also observe a convergence in the trends in inequality among males and females over time. Heavy drinking is the one outcome for which income-related and education-related inequalities among women follow a different trend than those for males and the general population: whereas we saw a slight increase in pro-rich inequality between 1988-9 and 1996-7 among males and the general population, among females we observe an important decrease in pro-rich inequality. Thus the prevalence of heavy drinking increased more among less affluent compared to more affluent females during this period. Note that heavy drinking remains more concentrated among more affluent females than less affluent ones (pro-rich inequality) throughout 1988-9 to 2004-5.

Figure 13: Sex-specific trends over time in levels (per 100,000; panels A-C), and income-related (panels D-F) and education-related (panels G-I) inequalities in heavy drinking (1988-9 to 2004-5) and alcohol-related inpatient care and deaths (1994 to 2011)



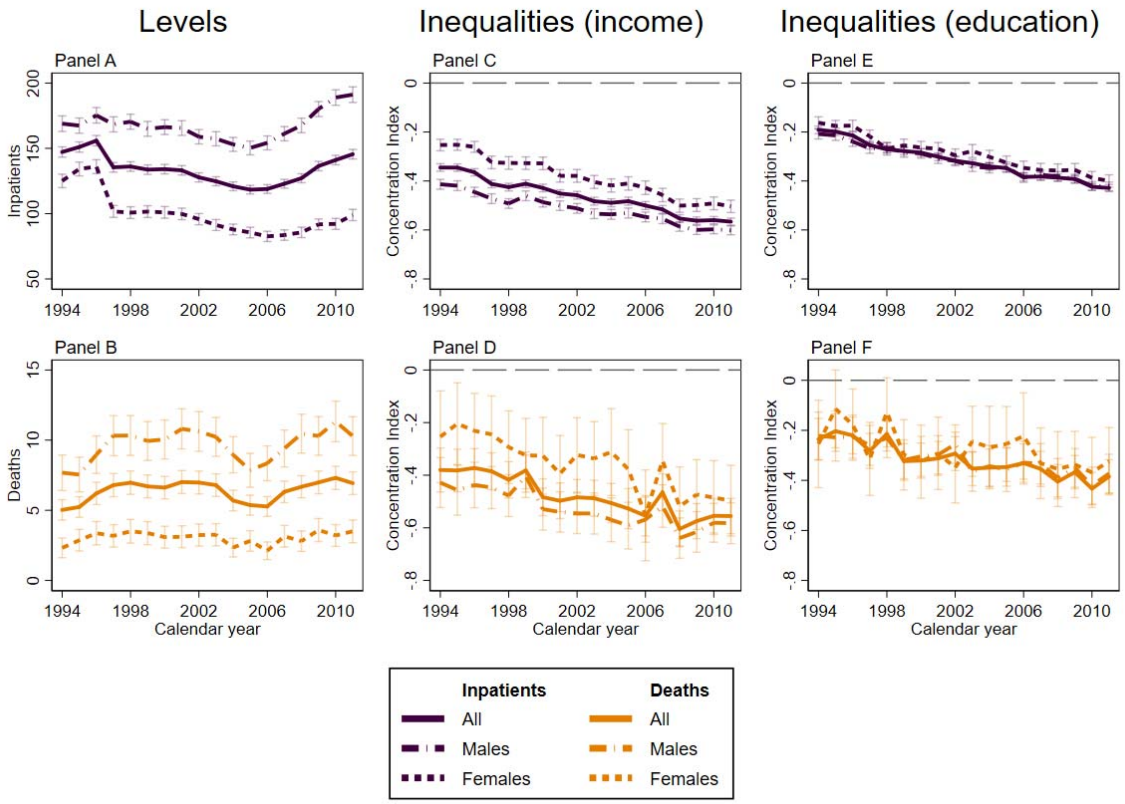
Notes: Heavy drinking =1 if >252g and >168g 100% alcohol per week for men and women, respectively. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to alcohol. Deaths identified using the Socialstyrelsen alcohol index.

Source: ULF (heavy drinking), SIP (inpatient care and deaths); own calculations

Narcotics

The probabilities of narcotics-related inpatient care and death are considerably lower among females than males (figure 14). Whilst the magnitude of each indicator differs between males and females, the overall trends among both sexes are similar – at least at first glance. Looking deeper, we see an important divergence in the trends over time, however. In particular with regards to inpatient care, where the small observed decrease over time among the general population actually obscures a large increase among males and decrease among females. Income and education-related inequalities in inpatient care and deaths are generally less pronounced among females than among males, though the trends over time are similar.

Figure 14: Sex-specific trends over time in levels (per 100,000; panels A-B), and income-related (panels C-D) and education-related (panels E-F) inequalities in narcotics-related inpatient care and deaths: 1994 to 2011



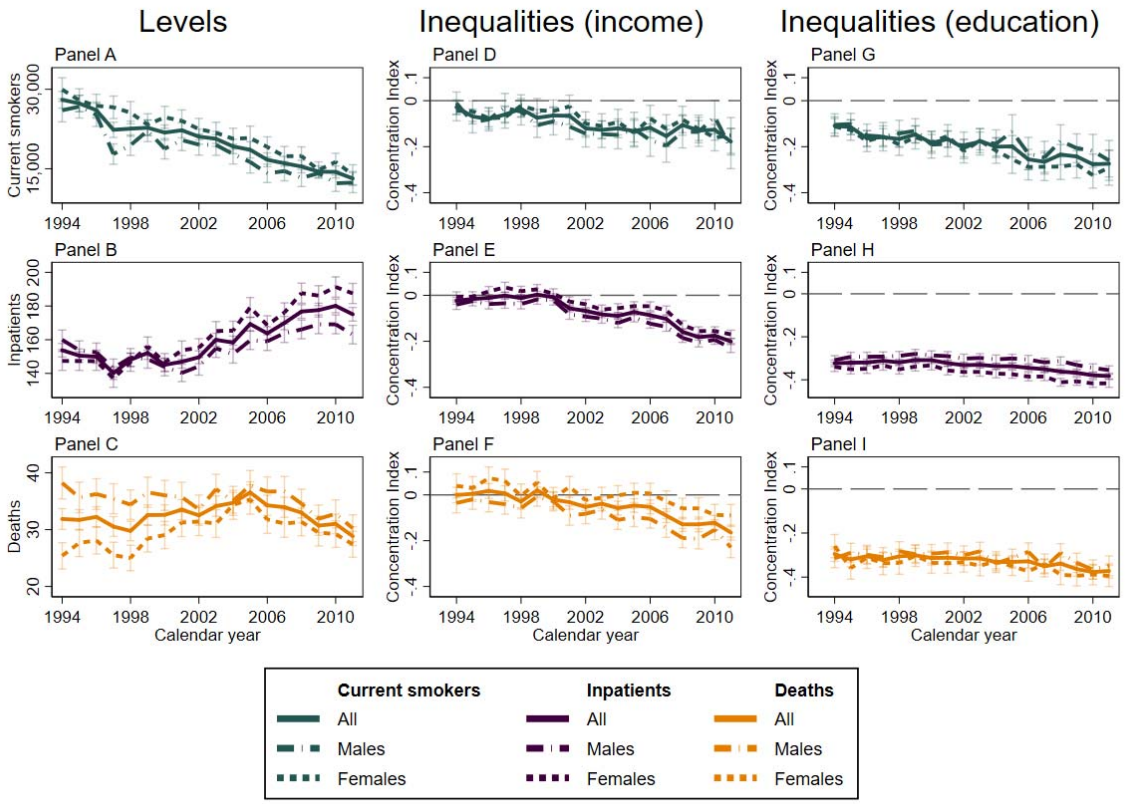
Notes: Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to narcotics. Deaths identified using the Socialstyrelsen narcotics index.

Source: SIP; own calculations

Smoking

As with alcohol and narcotics, the trends over time in each smoking-related outcomes are similar among males and females (figure 15). However, as opposed to alcohol and narcotics, the prevalence of smoking and the probability of inpatient care is actually higher among females than males throughout much of the calendar period. Interestingly we see a divergence in the trends for inpatient care and a convergence in deaths. Inpatient care among females increased more over time than among males. The probability of death from a smoking-related cause among females increased to be about the same as that among males in 2005, before decreasing at a similar rate thereafter. The trends over time in socioeconomic inequalities in each smoking outcome are very similar for males and females, with income-related inequalities in deaths differing the most. Interestingly, while income-related inequalities in each smoking-related outcome are less pronounced among females than males, education-related inequalities appear more pronounced, though differences in inequalities between males and females are only statistically significant for inpatient care.

Figure 15: Sex-specific trends over time in levels (per 100,000; panels A-C), and income-related (panels D-F) and education-related (panels G-I) inequalities in smoking and smoking-related inpatient care and deaths: 1994 to 2011



Notes: Current smoker =1 if reported being a current daily cigarette smoker. Inpatient =1 if (inpatient hospitalisation>0) during the given calendar year where the main diagnosis, one of the top three bi-diagnoses, or one of the top three external diagnoses is related to smoking. Death =1 if died during the given calendar year and the main cause of death or one of the top three additional causes of death is related to smoking.

Source: ULF (current smoking), SIP (inpatient care and deaths); own calculations

6. Discussion

6.1. Overall summary of results

With this study, we sought to document trends in consumption, inpatient care and deaths related to alcohol (heavy drinking), narcotics (use) and tobacco (daily smoking) and socioeconomic-related inequalities therein in Sweden. Importantly, we sought to establish whether socioeconomic-related inequalities in alcohol-, narcotics- and smoking-related outcomes exist and how these have changed over time. Having documented the trends, we sought to explain the changes over time in terms of selected demographic and socioeconomic characteristics.

We observed increasing pro-poor socioeconomic-related inequalities in all of our outcomes except heavy drinking during the study period. In contrast, heavy drinking was more concentrated among higher income individuals throughout the study period, and this did not change significantly between 1988-9 and 2004-5.

As a whole, much of the change over time in ANT-related outcomes and their income-related health inequalities remains unexplained by changes in the distribution of our chosen demographic and socioeconomic characteristics. While we do find that changes in the distribution of age, foreign background and educational attainment in our samples significantly contributed, statistically speaking, to explaining the changes in the levels of many of our outcomes over time, we find that most of the change over time is related to changes in the strength of the associations between these characteristics and the outcomes. This suggests that much of the change observed is due to external factors, such as changing norms and behaviours, and policy or macroeconomic conditions affecting certain groups more than others.

Sweden joined the EU on 1 January 1995 and this triggered substantial easing of alcohol policy over the next decades: the state-owned monopoly, Systembolaget, expanded its opening hours, taxes on alcohol were lowered, and limits on the amount of alcohol one could bring into the country from abroad were abandoned (47). This increased the accessibility and affordability of alcohol, and the increased trend in heavy drinking we see may reflect this policy development. During a similar time frame, tobacco policy became more restrictive, for instance smoking was restricted in public places (48) and taxes on tobacco were increased (49). Throughout the world, important efforts have moreover been made to communicate the public health message that smoking is bad for you. This may explain much of the decrease in smoking we have seen over time. However, the decrease in smoking prevalence has been slower among low educated than high educated individuals (9), which is likely why we are seeing increasing inequality in reporting being a daily smoker. As opposed to alcohol and tobacco, Sweden has a zero tolerance policy towards narcotics (50). The Swedish narcotics market has also expanded (12), potentially in part as a result of increased economic integration and further EU expansion in 2004 and 2007, as well as new methods of synthesizing and accessing narcotics (e.g. via the post).

Interestingly, we find that the probabilities of narcotics-related inpatient care are not *that* much lower than those related to smoking. This highlights the differing age patterns of the ill health outcomes related to narcotics and smoking (as well as alcohol). Indeed, whilst all are considered to be addictive substances (or behaviours related to addictive substances, in the case of smoking) they seem to affect differing segments of the population, and the development of ill health outcomes related to consumption differs importantly for each. For instance, many deaths and instances of inpatient care related to narcotics are likely due to *current* consumption, whereas most deaths related to alcohol or smoking are likely due to *long-term heavy* consumption. Moreover smoking-related diseases are likely to be more prevalent among individuals older than the oldest age in our study (64 years), due to the long latency period between exposure to smoking and development of smoking-related disease symptoms (26).

We found some interesting differences between inequalities measured using equivalised household income versus educational attainment as the socioeconomic ranking variable. For the narcotics-related outcomes, inequalities were less pronounced when using education as the ranking variable, whereas for smoking-related outcomes inequalities were more pronounced, and for alcohol-related outcomes the inequalities were similar using both ranking variables. The reason for educational inequalities being less pronounced than income inequalities for narcotics could be a result of the potentially endogenous relationship between narcotics use

and income. Two individuals may have the same educational attainment, but if one suffers from narcotics use and this affects their ability to earn income, this will affect their income rank and population-level income-related inequalities in narcotics use. In contrast, the potential effect of smoking on income is likely less strong, meaning that for smokers the socioeconomic rank according to education or income is probably similar. The overall change over time when using education as the ranking variable versus income also generally differed: inequalities increased at a slower rate, particularly for inpatient care and deaths related to smoking and alcohol. This is perhaps because these outcomes are becoming more and more concentrated among individuals with low levels of income, even as educational attainment is increasing in the population as a whole.

We investigate whether the trends over time differ when males and females are investigated separately and find that the general trends are similar. As might be expected, the prevalence of heavy drinking and probabilities of alcohol and narcotics-related inpatient care and deaths, and smoking-related deaths are all higher among males than females, while the prevalence of smoking and the probability of smoking-related inpatient care is higher among females than males. Interestingly, while both education and income-related inequalities are generally less pronounced among females (though the confidence intervals often overlap), education-related inequalities are more pronounced among females than males for the smoking outcomes (though this is only statistically significant for inpatient care). Generally, we observe smaller sex-differences in inequality when educational attainment is used as the ranking variable.

Our findings point towards the importance of understanding *why* certain individuals are being left behind in terms of educational attainment and income, and why those individuals are more prone to substance use. For instance, is it individuals with learning difficulties or behavioural disorders with onset in early childhood and adolescence who are struggling in school, not pursuing further education and engaging in substance use? Further research should seek to investigate this more deeply.

6.2. Discussion: Alcohol

Trends over time

Heavy drinking increased dramatically over the period 1988-9 to 2004-5, while income-related inequalities therein did not change significantly (though do appear to have become slightly more concentrated among the rich). This suggests that the increase in heavy drinking was driven by an increase in heavy drinking across all members of the population. That absolute inequalities in heavy drinking increased reflects the already higher concentration of heavy drinking among richer individuals in 1994 (i.e. a 10% increase across the population means a greater absolute change where the prevalence was already higher). Of note, our heavy drinking variable is a measure of the average weekly grams of 100% alcohol consumed but does not take into account intensity of consumption (i.e. whether consumption is spread evenly throughout the week or is concentrated on certain days). It is possible, and suggested that individuals of different socioeconomic groups consume differently and have different comorbidities and other risk factors, making them more at risk for ill health outcomes (51). Even though richer individuals consume more, they may do so across more occasions during the week, whereas poorer individuals may consume more intensively on fewer occasions, which is more harmful to health. Unfortunately, we only have heavy drinking data until 2004-

5, and it is possible (and suggested) that alcohol consumption peaked around 2005 and has decreased since (12).

As opposed to heavy drinking, the probabilities of inpatient care and death related to alcohol decreased overall between 1994 and 2011. Inpatient care and deaths were more concentrated among low income individuals throught the study period (pro-poor inequality) and inequalities increased significantly over time. This suggests that indeed, while richer individuals may consume more heavily, it is poorer individuals who bear the brunt of the ill health outcomes, perhaps due to more intensive consumption on the occasions they drink. It is, however, important to note that our measure of alcohol-related inpatient care includes both short-term outcomes of alcohol consumption (e.g. alcohol poisoning and behavioural disorders due to the use of alcohol) as well as long-term outcomes (e.g. alcoholic liver disease), which may be the result of long-term exposure (52). Trends in inpatient care and particularly deaths may thus reflect intensive alcohol consumption decades earlier, when heavy drinking may have been more concentrated among the poor.

Explaining the changes

We find that changes in the distribution of our sample by educational attainment and being foreign born significantly explain part of the reduction over time in alcohol-related inpatient care and deaths. This may be because many foreign-born individuals in Sweden drink less than native Swedes. It also reflects the earlier observation that alcohol-related inpatient care and deaths were significantly positively associated with having less than 10 years of education and significantly negatively associated with having more than 12 years of education. Since the proportion of individuals with less than 10 years of education has decreased and that with more than 12 years has increased it makes sense that alcohol-related inpatient care and deaths would decrease.

There was no significant change in inequalities in heavy drinking, and few of our explanatory variables can explain the changes in inequalities in inpatient care and deaths. Only increased non-participation in the labour market seems to contribute significantly to explaining the increase in (pro-poor) inequalities in inpatient care and deaths.

Overall

Overall, it appears that changes in the Swedish population (as measured by our selected demographic and socioeconomic characteristics) may have contributed to some of the changes in alcohol-related inpatient care and deaths between 1994 and 2011. It is important to note that alcohol-related inpatient care and deaths in a given year may reflect drinking behaviours developed over several decades prior. Importantly, the majority of the change over time in heavy drinking, inpatient care and deaths (and inequalities therein) is left unexplained. This means it is due to a change in the *effect* of our selected explanatory variables rather than changes in the distribution of these variables. Future studies should seek out more recent sources of data on alcohol consumption. Additionally, they should try to elucidate how the mechanisms linking alcohol consumption to ill health outcomes differ between lower and higher socioeconomic groups (thus explaining the contrast between pro-rich inequalities in heavy drinking versus pro-poor inequalities in inpatient care and deaths).

6.3. Discussion: Narcotics

Trends over time

The probability of narcotics-related death increased importantly between 1994 and 2011, while probability of narcotics-related inpatient care remained essentially unchanged. Importantly, the probabilities of both death and inpatient care have increased dramatically since 2005-6, particularly among males. Part of the increase in deaths since 2006 has been attributed to changes in measurement and information on cause of death (13, 53). Underlying reasons for the increase in inpatient care are less clear, but as with deaths, changes in definitions, methods of measurement, policy and availability of resources for narcotics may all play a role – in addition to any real change (12).

Income-related relative inequalities (measured using the concentration index) in narcotics-related inpatient care and deaths increased dramatically over the study period, and absolute inequalities increased even more so. This is a reflection of the fact that narcotics-related inpatient care and deaths were more concentrated among the poor already at the beginning of the study period.

When using educational rank as the socioeconomic ranking variable, relative inequalities in inpatient care and deaths were less pronounced but increased at a similar rate over time. This suggests that even as the population is moving to higher levels of education, there is a group that is being left behind in terms of both income and education, and narcotics use seems to be becoming more and more concentrated among these individuals.

Explaining the changes

We find that changes in the distribution of our sample by our selected demographic and socioeconomic characteristics do not seem to explain the changes in narcotics-related inpatient care and deaths between 1994 and 2011. Indeed, in terms of inpatient care, changes in the distribution of the sociodemographic and economic characteristics would explain a large decrease in inpatient care (holding the effects from 1994 constant), whereas we observe no significant change between 1994 and 2011. Changes in the proportion of the population married or in a registered partnership and the proportion not participating in the labour market do seem to explain a large portion of the increase in narcotics-related deaths. However, both of these variables are likely to be endogenous to the outcomes. We believe that there is reason to assume that the direction of causality could very well run from narcotics consumption to each of these outcomes rather than vice versa. Of note, the strength of the association between not participating in the labour market and narcotics-related death and diagnosis did increase importantly between 1994 and 2011.

We do find that the increase in the proportion of individuals born in Sweden with foreign born parents seems to explain a small, significant part of the increase in narcotics-related inpatient care. It is critical here to be clear that we do not believe it is having foreign-born parents that causes narcotics-related inpatient care, or that it is the increase in second-generation immigrants that is driving the increase in narcotics-related inpatient care. Rather, it is likely that there are societal forces at play (that did not change between 1994 and 2011) that mean that narcotics-related inpatient care is more concentrated among this group of individuals.

We find that we are able to explain very little of the increase in inequalities in narcotics-related inpatient care and deaths over time. The increase in the proportion foreign-born would explain a decrease in inequalities as in this sample they are less likely to experience the narcotics-related outcomes and also tend to have lower income. Interestingly, increasing age in the sample and the increased proportion of individuals with greater than 12 years of education seem to explain part of the increase in inequalities in inpatient care. This is reasonable because as people age they are less likely to experience narcotics-related ill health outcomes and more likely to have higher income. Similarly, individuals with more than 12 year of education are less likely to experience narcotics-related ill health outcomes and more likely to have higher income, thus increasing the gap between themselves and the poorer individuals with less education who appear more likely to suffer from narcotics abuse.

Overall

Overall, we find that demographic and socioeconomic changes in the Swedish population do not reasonably explain the increases over time in narcotics-related deaths, or the increase over time in income-related inequalities in narcotics-related inpatient care and deaths.

Interestingly, we find that being foreign-born is negatively associated with both narcotics outcomes while having foreign-born parents is positively associated with narcotics-related inpatient care, and these associations have increased over time. Why are second-generation immigrants at higher risk of narcotics-related inpatient care? To what extent would this finding differ if we investigated young adults rather than the working age population? It is likely that the time period of analysis and the age group are important in terms of the findings. Further studies should focus on a broader age range and investigate a more recent time period, to seek to disentangle the complicated relationship between narcotics-related outcomes and foreign background, and whether this relationship has changed over time.

6.4. Discussion: Smoking

Trends over time

We observe a dramatic reduction in the prevalence of smoking between 1994 and 2011, while income and education-related inequalities therein increased by over five-fold. This suggests that whilst smoking is going down in the population as a whole, it is becoming increasingly concentrated among individuals of low socioeconomic status. Interestingly, absolute inequalities in smoking "only" doubled. This likely reflects the initially non-significant inequality in smoking and the fact that smoking has become less prevalent in the population as a whole. The increase in inequality is thus being driven by a greater rate of decrease in prevalence of smoking among high income than low income individuals.

Trends in smoking-related deaths and inpatient care increased relatively in parallel between 1994 and 2005 but opposed each other thereafter, as deaths decreased sharply. These patterns were similar among males and females. Interestingly, while the probability of inpatient care was higher among females than males, the probability of death was higher among males. This suggests that males may be seeking less care for their smoking-related ailments, and being diagnosed at a later stage with worse prognoses. Relative inequalities were nearly the same for inpatient care and deaths (and smoking) and increased throughout the study period, as did absolute inequalities.

Trends over time in education-related inequalities in smoking and related deaths and inpatient care were worse than those in income-related inequalities. This suggests that educational attainment is a more important determinant of smoking behaviour than eventual working-age income. Interestingly, while income-related inequalities in all smoking outcomes were very similar, education-related inequalities in smoking were much less pronounced than education-related inequalities in inpatient care and deaths (though the gap is narrowing). This potentially reflects the importance of education in terms of symptom recognition and access to care.

The lack of inequality in the early part of our study period likely reflects that socioeconomic inequalities in smoking are relatively new in Sweden, and the trends in inpatient care and deaths observed today are likely due to smoking exposure beginning several decades prior (26). We must thus be careful in directly comparing current trends in smoking with current trends in inpatient care and deaths, as the latter relate to long-term smoking behaviour. Our results can, however, give us some some insight into what future inequalities in smoking-related inpatient care and deaths might look like.

Explaining the changes

We find that changes in the distribution of our selected demographics and socioeconomic characteristics do not significantly explain the changes in smoking and smoking-related outcomes we observe over time. We do find that changes in the proportion of the population with more than 12 years education seem to explain part of the decrease in current smoking. This makes sense, since individuals with higher education were far less likely to smoke, even in 1994.

An interesting finding is the importance of parents' education in explaining the increase in smoking-related inpatient care between 1994 and 2011. This may seem counterintuitive at first, but likely reflects the long lag between smoking exposure and ill health outcomes, and that several decades ago smoking was not concentrated among the poor like it is today.

Contemporaneous changes in the Swedish population seem to explain some of the changes in income-related inequalities over time. For both inpatient care and deaths, increasing average age in the sample is important in explaining part of the increase in inequalities. Perhaps this is because these outcomes are more common with increasing age, and those older individuals affected by smoking-related ill health tend to have lower income, perhaps due to debilitation caused by their ill health. Increased education and increased non-participation in the labour market also seem like important characteristics in explaining the increased inequality in inpatient care and deaths. As with other outcomes investigated, this is intuitive, since as education increases in the population as a whole there is a group of individuals with lower education being left behind in terms of income and health behaviours. These individuals may also be those less likely to participate in the labour market.

Overall

Overall we are unable to explain the change over time in smoking and related deaths and inpatient care. We are able to explain some of the change in inequalities, however. What our results suggest is that smoking has become more and more concentrated among individuals with lower socioeconomic status (proxied by income and education). Further studies should

investigate and evaluate ways of promoting prevention among this (varied) group of individuals, in order to reduce socioeconomic-related inequalities in smoking.

6.5. Limitations

An important limitation of our study is that we only had data available for the time period 1994 to 2011 for most outcomes and only in calendar periods 1988-9, 1996-7 and 2004-5 for alcohol consumption. On the positive side, this study thus gives us historical information on aspects of socioeconomic inequalities related to alcohol, narcotics and smoking prior to the implementation of Sweden's first ANDT strategy. This study can thus contribute to preparation for the evaluation of the first and second ANDT strategies, implemented since 2011.

Sweden has seen important demographic changes since 2011, for example the influx of refugees from Syria in 2015. These new residents could have very different characteristics and behaviours related to substance use compared to the host population. Moreover, the so-called Great Recession hit during the end of our period of analysis (in 2008). Whilst Sweden was not hit as hard as other countries, unemployment did increase and this could have affected income and labour force participation in our sample. Moreover, it is important to note that our sample comprised working age individuals and the results may thus differ to studies focussing on young adults and those of pensionable age. Yet, as income, which is the main socioeconomic ranking variable used in this study, is highly dependent on age, this limitation may also be considered a strength.

The reason we do not have information on alcohol consumption from 2005 onwards is that after this date the ULF survey started being conducted by telephone instead of face to face interview, and Statistics Sweden (who conducts the survey) deemed that questions related to alcohol consumption would no longer be reliable. Indeed, the reliability of individual responses can be questioned even in face to face interviews, as responders who consume a lot may report lower consumption for fear of being judged by the interviewer (social desirability bias). As discussed briefly above, we also were unable to construct a comparable measure of intensity of alcohol consumption for each of the three calendar periods investigated with regards to heavy drinking. This means that we fail to capture inequalities in intensity of alcohol consumption, which could be very interesting.

Another challenge was that the time period of analysis spanned the introduction of ICD-10 codes for diagnosis and death recording, replacing ICD-9 in 1997. The ICD-10 codes unfortunately do not map perfectly to the ICD-9 codes, and this likely had an impact on the comparability of trends observed before and after 1997. We do not notice a marked change in trend for alcohol or smoking inpatient care and deaths between 1996 and 1997, but we do observe an important drop in narcotics-related inpatient care. Trends in inpatient care prior to 1997 should thus be interpreted with caution. This points to an important consideration when conducting any research. Changes in public opinion and willingness to share mental health and substance use-related challenges in a survey, changes in definitions, methods of measurement, policy and resources available for the control of certain diseases will all likely have an impact of the reported incidence and prevalence of the relevant conditions. Any trends observed must therefore be considered in light of changes in diagnostic and recording practices.

Importantly, a lot of information on parents was missing, particularly in 1994 in the SIP sample. For instance, we were missing information on mother's education for about 50% of individuals in both ULF and SIP in 1994 (1988-9) and over 40% of individuals in 2011 (2004-5), and missing information of father's education for over 63% of individuals in ULF and SIP in 1994 (1988-9) and over 55% of individuals in 2011 (2004-5). Whilst very little information on parents foreign-born was missing in ULF, parents' foreign born status was missing for 24% of individuals in the SIP sample in 1994 and 16% in 2011.

An important consideration is the usefulness of the Oaxaca Blinder decomposition in trying to explain changes in substance use and its negative health-related outcomes over time, particularly when comparing only two calendar years. An important assumption we needed to make as part of the analysis was whether to take the associations of each explanatory variable with the outcomes as "given" in 1994 or 2011, i.e. what to take as the baseline effects of the variables. We chose to use the coefficients from 1994 in our decompositions, but this means that in order to explain the changes over time we made the assumption that we could explain a portion of the change given the effects of these variables stayed the same over time. The appropriateness of this assumption is important to consider. Moreover, in all cases, changes in the distribution of many of our explanatory variables would have actually explained a change in the opposite direction than the observed change (holding the coefficients from 1994 constant), this made the overall explained change difficult to interpret for several of our outcomes. Additionally, and particularly in the case of narcotics, the trend between 1994 and 2011 was not consistent and by decomposing the change between 1994 and 2011 we only use data for those two time points, thus losing information on predictors of narcotics-related inpatient care and deaths during the intervening years.

It is important to note that whilst we use register data, which is generally considered to be reliable, changes in coding practices and medical care provision over time may affect our results. For instance, as mentioned above, part of the increase in narcotics-related deaths since 2006 has been attributed to changes in measurement and information on cause of death (13, 53). We use the main diagnosis or cause of death, the top three bidiagnoses and top three external diagnoses or causes of death to identify alcohol, narcotics or smoking-related deaths and diagnoses. We moreover count an individual as a case if they have at least one inpatient hospitalisation record in a given year. We are thus confident that we are picking up most individuals being hospitalised for alcohol, narcotics or smoking ill health outcomes. We use the Socialstyrelsen indicator for alcohol and narcotics-related deaths (23) and are confident this indicator succeeds in identifying the majority of relevant deaths.

One consideration is whether the overall decrease in inpatient hospitalisations (54) in Sweden may affect our results for alcohol and narcotics, as individuals receiving care for substance use disorders (rather than acute poisonings and disease of the liver) may be more likely to have contact with outpatient and primary care services. This is important to consider and future research could use data on outpatient records and prescriptions to investigate this further

7. Conclusion

The substances that make up the strategic policy area of the ANDT strategy are very different and largely non-overlapping. Broad conclusions regarding the trends in levels and

inequalities, and potential explanations for these, are therefore difficult to draw. Deeper investigations of these trends are critical in order to understand the development of both income and education-related inequalities in ANT-related outcomes in Sweden.

We find important inequalities in the prevalence of smoking, and inpatient care and deaths related to alcohol, narcotics and smoking in Sweden, and these are getting worse over time.[18] Part of the reason for the worsening inequalities seems to be an increasing concentration of the outcomes among poor individuals with low educational attainment, even in light of increasing education levels among the general population. There seems to be an intricate relationship between education, income (and socioeconomic status in general) and substance use that we were unable to disentangle here. This points to the importance of understanding the relationship between the determinants and consequences of ANT use among different socioeconomic groups in the population.

We are winning regarding the levels of alcohol-related inpatient care and deaths and smoking prevalence and smoking-related deaths. However, in order to fulfil the societal goal of equality in health, ANDT as a policy area must address causes for the recent increase in narcotics-related inpatient care and deaths, and the increasing concentration of alcohol-, narcotics- and smoking-related health outcomes amongst the poorest and lowest educated individuals in society. Future research should seek to elucidate why in the welfare state of Sweden there is a group of individuals being left behind; who they are, and what can be done to prevent substance abuse among this group.

[18] We also observe a small amount of inequality in heavy drinking, which also increased over time, but towards a higher concentration of heavy drinking among individuals of higher income in the population.

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