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HOW DO DRINKING CULTURES CHANGE? – OR DO THEY?

- A PROVISIONAL MODEL BASED ON EVIDENCE OF TRANSITIONS IN DENMARK

INTRODUCTION

Recently studies from several high-income countries have reported modest declines in alcohol consumption. These observations have been made in the course of examining longitudinal data for time trends (Devaux M. & Sassi F., 2015; Kraus et al., 2015; Livingston, 2015; World Health Organization, 2013). Included among the studied countries are the Nordic states (Lindeman et al, 2013). Except for a recent study of trends in alcoholic liver disease in Denmark (Deleuran et al, 2015), no studies, to our knowledge, have yet focused specifically on consumption trends in the Danish adult general population.

Therefore, the motivation for the present paper was specifically to examine data on alcohol consumption in Denmark for changes over the last several years and, furthermore, to place such changes within the context of the Danish drinking culture. In general, previous studies have sought to describe the nature of changes in drinking over time, but have not attempted to relate such changes to other societal changes in the respective society. Further motivation comes from observations that trends in consumption and alcohol-related harm have moved in divergent and unexpected directions in recent years (Room et al., 2013). Thus, we examine trends for several indicators related to the Danish drinking culture in general to gain a better understanding of the dynamics of Danish drinking and drinking culture.

It is first necessary to define what we mean by drinking culture. According to Room et al. (2015) a drinking culture “... refers to the shared understandings in a cultural entity on functions of and norms about drinking and associated behaviours, including settings, occasions, and limits, and [on] modes of social control of the norms and practices.” (Room et al., 2015). Thus, a drinking culture carries shared understandings regarding the meanings and appropriate or inappropriate use of

alcohol within a society. Furthermore, a society's drinking culture and its level of alcohol consumption are related, such that a change in one will influence a change in the other.

Secondly, to provide a framework for presenting the various forms of evidence, we use a model first developed by Room and his colleagues (Room et al, 2009) where the authors identify a number of factors that influence the level of alcohol consumption in a society.

We use these components of the original model, to describe a society's drinking culture. They are:

- taxes and prices, purchasing power
- physical availability and access
- alcohol advertising and promotion,
- structural changes,
- cultural customs
- norms and attitudes towards drinking, cultural politics
- societal responses to alcohol problems.

Because Room et al. developed their model to understand how a society's level of consumption changes, and not specifically how a society's drinking culture changes, some modifications were necessary, as illustrated in Figure 1. In our model, we thus treat alcohol consumption as another factor that is related to the drinking culture.

Figure 1 about here

Given this model as a starting point, we briefly review the importance of each factor and categorise it as either a primary or secondary factor as regards its influence on either levels of consumption or on the drinking culture as a whole. Primary factors are those that can be considered to have a direct effect on how much alcohol is consumed or on altering the actual drinking culture. Secondary factors are those that support the primary factors. For example, consumer purchasing power will either aid or hinder the purchase of alcohol that has already been priced or taxed (price is a primary factor) with a separate intention to aid or hinder consumption. Note that a secondary factor can also be a primary factor: some public educational campaigns are examples of this. They attempt to persuade

the population to consume less alcohol while simultaneously influencing the drinking culture as a whole by trying to change attitudes and social norms.

Primary factors:

A major policy tool affecting the level of consumption in a population is the taxation and pricing of alcoholic beverages (Babor et al., 2003; Edwards, 1994). It is most effective as a mechanism to reduce consumption, and is done by raising prices, mainly through excise taxes (e.g.(Babor et al., 2003)). Limiting the physical availability of alcohol is also a well-used approach. This is done by restricting the numbers and kinds of sales outlets, locations of outlets and hours of sale as well as raising the legal minimum age for purchasing or consuming alcohol (Mulder & deGreef, 2013).

Alcohol advertising also has an effect on consumption, especially amongst young people (Anderson, de Bruijn, Angus, Gordon, & Hastings, 2009). Societal norms and attitudes on alcohol use and misuse legitimate what is deemed as appropriate use of alcohol in a society (Mäkelä et al., 1981; Room & Mäkelä, 2000). Finally, instances of societal responses to heavy alcohol consumption and alcohol problems can be found throughout history, and are seen as influencing all of the components of a drinking culture by changing attitudes towards alcohol use. The temperance movements of the 19th and early 20th century in the Nordic countries (Johansson, 2000; Sulkunen, Sutton, Tigerstedt, & Warpenius, 2000) are prime examples.

Secondary factors:

The pricing of alcohol is less effective if the overall affordability of the beverages as well as the purchasing power of consumers are not taken into account and are operating at cross-purposes with price-setting. Thus, consumer purchasing power should be taken into consideration along with the effects of pricing. Other secondary factors involve societal norms and attitudes. These include educational campaigns, usually aimed at youth, but at the general public as well. An example would be the annual alcohol education campaign held in calendar week 42 in Denmark. Societal responses also can have a secondary effect. An example involves social movements that include Alcoholics

Anonymous, Mothers Against Drunk Driving (MADD) as well as the adult children of alcoholics movement. All three movements have dealt with various aspects of the alcohol problem and have influenced attitudes and norms towards alcohol consumption.

Structural changes in society, such as demographic transitions, can also have an indirect effect on alcohol consumption in a population. A recent report from Australia has hypothesised that the growing numbers of non-English speaking immigrants to the country could have an influence on Australia's abstinence rate (Livingston, 2015).

A final factor that actually does not affect drinking nor the drinking culture per se, but rather is a reflection of it, is the level of alcohol-related morbidity and mortality in a society. For example, historically liver cirrhosis rates have been viewed as an indirect measure of alcohol use and/or abuse in a country (Liang et al, 2011), and thus could be used as corroboration of trends found in alcohol consumption.

We have attempted to find evidence for the presence and movement of these factors within Danish society. In so doing, we ask two basic questions:

- 1) Have there been changes in these proposed components of Danish drinking culture?
- 2) If so, what is the direction of such change?

Methods

Data used in the present analyses are presented in Table 1 where sources and relevant years are provided. These data come from a variety of sources including Statistics Denmark, Statens Serum Institut, The Danish National Alcohol Treatment Register, Eurostat, as well as our own data from several national surveys.

Table 1 about here

Registry data

Data on alcohol-related mortality come from European Union's Eurostat databank. However the ICD-10 diagnoses available for alcohol-related mortality concern a general category of 'chronic liver disease' (ICD-10 K79; K73-73) under which alcoholic liver disease (K70) is found, and unfortunately cannot be singled out for specific inspection. Also available is the ICD-10 diagnostic category F10 'mental and behavioural disorders due to use of alcohol'.

Various data come from Statistics Denmark. These include data on consumer prices and purchasing power, taxes on alcoholic beverages, and numbers of foreign-born in Denmark. All of the above data were accessed directly from the agency's Statistics Bank (<http://www.danmarksstatistik.dk/da/Statistik/statistikbanken>).

Survey data

The survey data reported in this paper come from studies conducted in years 2003, 2004, 2005, 2006 and 2011. The surveys from 2003-2006 were based on telephone interviews conducted by a private Danish marketing firm, Vilstrup. Sampling was based on random digit dialling including mobile telephone numbers. Cooperation rates ranged from 50% to 71%, and for the present analysis samples covered the age range 16 years and older, resulting in sample sizes of 2027, 1076, 1059, and 1015 respectively. These surveys were conducted as part of an earlier project, the Nordic Tax Study (Grittner et al, 2009; Room et al., 2013). The 2011 data come from a survey conducted by Statistics Denmark in September/October for the Centre for Alcohol and Drug Research. Sampling was based on a random selection of residents via the Danish central person registration number. Mode of administration was split: first internet, then telephone. Potential respondents first received a postal letter inviting them to complete the questionnaire online. If respondents had not answered within approximately 10 days, they were contacted by telephone and interviewed. The final sample consisted of 5133 respondents representing a response rate of 64%. In restricting the age range to 16 years or older, the sample size for the present study resulted in 5037 respondents.

The measures reported from the surveys include volume, measured with beverage-specific quantity-frequency questions. Volume (per day) is the sum of beverage-specific volume measures for beer, wine, strong wine, spirits and 'alcopops'. For frequency, the categories were: 'every day or nearly every day', '4–5 times a week', '2–3 times a week', 'approximately once a week', '2–3 times a month', 'approximately once a month', 'a few times during the last 12 months', 'once in the last 12 months' and 'never'.

Alcohol-related consequences consisted of the six problem items from the Alcohol Use Disorders Identification Test (AUDIT) (Babor et al, 2001) and six problems which have been traditionally seen as 'social problems' (Bloomfield et al, 2010). The AUDIT items were: "During the past year how often have you": (1) found that you were not able to stop drinking once you had started?, (2) failed to do what was normally expected of you because of your drinking?, (3) needed a drink in the morning to get yourself going after a heavy drinking session?, (4) had a feeling of guilt or remorse after drinking?, (5) been unable to remember what happened the night before because you had been drinking?, (6) have you or someone else been injured as a result of your drinking? The questions could be answered with the following frequency categories: "never", "less than monthly", "monthly", "weekly", and "daily or almost daily". We dichotomised answers into 0: never within the last 12 months versus 1: at least once in the last 12 months".

Questions on the remaining alcohol-related social problems asked whether the respondent had experienced problems due to his/her drinking in the following areas in the past 12 months: (1) work/studies, (2) daily activities/household chores, (3) partner/spouse, (4) social life, (5) finances, and (6) health. Respondents could answer 'yes, more than once', 'yes, once', or 'no'. Answers were coded dichotomously as 0 'no' and 1 'yes'.

Additionally, questions on attitudes towards alcohol were included in the 2011 survey. These items asked about the same topics as posed in earlier surveys conducted by the Centre for Alcohol and Drug Research in 1985, 1994 and 2002 (Bloomfield, 2013). The wording of the questions varied over

the years; however, a general impression of attitude shifts between certain years can be drawn.

Data collection in these earlier surveys were by personal interview (1985) and postal questionnaires (1994, 2002). Response rates were: unknown in 1985, 69.5% in 1994, and 56.4% in 2002. Control variables included age (in years), education, survey mode (telephone or internet), and education (categorized into three groups: basic schooling (low, reference group); upper secondary and vocational (middle); post-secondary (high)).

Statistical procedures used on the survey data included basic descriptives (means and standard deviations, medians and interquartile ranges in the case of skewed data or proportions in the case of categorical data). In preliminary analyses we saw that there were almost no cross-sectional changes in the brief period between 2003 and 2006. Therefore, we pooled data from 2003 to 2006 and tested cross-sectional changes between 2003-6 and 2011 using multiple regression models with adjustment for age, sex and administration mode (telephone or web). Volume (in ordered categories) and alcohol-related consequences (in ordered categories) were tested in multiple ordinal regression models. Tests for cross-sectional changes in alcohol-related consequences were adjusted for volume (log-transformed). In the supplementary table cross-sectional changes for volume were tested using linear regression models (volume was log-transformed), for problems using binary logistic regression. For all analyses, we used weighted data. Weighting ensured representativity with regard to age, sex, family type, education and family income and nationality (Danish or foreign). All analyses were conducted using IBM SPSS 22.

Period of observation

We have tried to restrict the period of study for the present paper to the decade of 2003 to 2013. However, the study period for the survey data analyses is 2003 to 2011. In some cases data were not available exactly from 2003 to 2013, and thus deviate a few years from either 2003 or 2013.

RESULTS

1. Total level of and trends in alcohol consumption in society and alcohol-related consequences

Table 2 presents an overview of alcohol consumption levels and prevalence of alcohol-related consequences for 2003-6 and 2011. In 2003-6 around 52% of men and 26% of women reported consuming over 10 grams per day on average. In 2011 50% of men and 24% of women reported these levels. On the other hand, 33% of men and almost 20% of women reported at least one alcohol-related problem (out of 12 problem items) during last 12 months in 2003-6. But in 2011 44% of men and almost 30% of women experienced at least one consequence. Both the decline in consumption as well as the rise in problem prevalence were statistically significant.

Table 2 about here

A supplemental table displays volume and problem measures in more detail for men and women and by age group for 2003-6 and 2011. Compared to 2003-6 there was a significantly higher prevalence of most problem items (stop, fail, morning drink, remember, injury, daily activities, partner) by 2011 after adjustment for administration mode, age and sex. Also for the items where no significant cross-sectional changes occurred (guilt, work and studies, social life finances, health) descriptive statistics often showed a higher prevalence in 2011 compared to 2003-6.

2. Alcohol-related problems, harm, and mortality

Figures 2 and 3 display time trends by age and sex for mortality due to alcohol-related chronic liver disease (ICD-10 codes K70, K73 and K74), while figures 4 and 5 display age and sex rates of mortality due to alcohol-related mental and behavioural disorders (ICD-10 code F10). Although crude, these statistics display clear age effects, as would be expected for chronic alcoholic conditions. However, we also see a gradual decrease in mortality for 30-49 year old men and women, and a more recent decrease in the older age groups among men for liver diseases. For mortality due to alcohol-related

disorders, similar declines are evident for men. As these data are aggregate and only cover a short period, they can only suggest towards a possible real decline in alcohol-related mortality, at least for certain causes of death. However, a recent study of the incidence of alcoholic liver disease (ALD) in Denmark corroborates these trends: Danish researchers found that overall ALD incidence rates have declined significantly since 2006 (Deleuran et al., 2015). Interestingly, they also detected a sharper decrease amongst younger Danes; i.e., those 49 years and younger as well as among men.

Figures 2 -5 about here

3. Alcohol taxes, prices and physical availability

Figure 6 follows the development of taxes over the longer period of 1987-2013 (for beer data only for 2004-2013 were available) (Danmarks Statistik, 2015). Taxes on the various types of alcoholic beverages have remained generally constant over the period 2003 to 2013. Earlier, taxes on spirits were increased in 1996 and held at a relatively high level until the 45% decrease in October 2003. Taxes on wine were lowered in 2005 after which they remained stable until 2011 when increases were introduced which have continued annually through 2013 (especially on wines of medium alcohol content). No changes in the taxation of beer had taken place in a long while until taxes were lowered in 2005. In 2012 and 2013 beer taxes were raised twice, followed by a sudden decrease in mid-2013. Overall, taxes on the various sorts of alcopops have remained quite steady, except for a noticeable drop on wine-blended drinks with higher alcohol content (data not shown). Thus, with respect to the study period (2003 - 2013), it appears that beer taxes have remained relatively steady, spirits taxes have decreased considerably at the beginning of the study period and wine taxes have experienced a modest recent increase.

Two laws affecting the physical availability of alcohol in Denmark were lifted on 1 July 2005. Both concerned off-premise sales of alcohol and point towards liberalising previous restrictions (Danish Health Authority, 2014). One of these was the elimination of a law which had set the closing of sales at 8 PM in grocery stores and a partitioning off of the display area after alcohol sales hours.

Additionally, the 'restaurant law' was lifted. Previously sales of alcohol to take away from a restaurant had to take place in a room separate from the eating establishment.

However, at the same time there were also a series of changes to laws regarding the minimum legal age for purchasing alcohol (Note: there is no age limit for consumption of alcohol) (Danish Health Authority, 2014). Between 1970 and 1998 there was no minimum purchasing age limit. In 1998 the age limit was re-introduced prohibiting alcohol sales to persons younger than 15 years of age. Since 2004 there has been a successive tightening of age limits and opening hours on alcohol sales:

- 2004: shops may not sell alcoholic beverages with an alcohol content of 1.2% or higher to persons younger than 16 years of age.
- 2008: it is illegal to serve alcoholic beverages with an alcohol content of 16.5% or higher to persons younger than 18 years of age.
- 2011: persons younger than 18 years of age are not allowed to buy (in shops) alcohol with an alcoholic content of 16.5% or higher.

4. Consumer purchasing power and demographic/structural changes

Denmark is a wealthy western European welfare state with growing consumer purchasing power (<http://www.statbank.dk/statbank5a/default.asp?w=1280>). Alcohol has apparently become more affordable between 2003 and 2013, as demonstrated in all indicators of consumer purchasing ability shown in Figure 7. During this same period the estimated per capita consumption of alcohol has fallen. Purchasing power parity increased between 2003 and 2013 by 25%. Prices increased in the same period by 21%, but the price of alcohol rose only by 18%. More specifically, alcohol prices declined from 2004 to 2007 compared to 2003, increased slightly between 2007 and 2011, but not reaching the same level of increase as that for purchasing power parity or the combined consumer price index.

Figure 7 about here

A potential structural factor affecting the drinking culture could be demographic changes. The influence of an increasing proportion of foreign-born youth has been raised as a potential factor influencing total alcohol consumption both in Sweden (Svensson & Andersson, 2016) and in Australia (Livingston, 2015). The proportion of foreign-born youth also has increased substantially between 2003 and 2013 in Denmark (see Figure 8). Most of the foreign-born youth come from Middle Eastern and Asian countries where drinking is not as widespread. It has been hypothesized elsewhere that this shift in the demographic make-up of the youth population is likely to have some impact on abstention rates (Livingston, 2015). However, in undertaking an arima time-series analysis researchers concluded that such demographic changes have not affected youth drinking levels in Sweden (Svensson & Andersson, 2016). This is the only such study to date, but as is apparent by current global conflicts, the numbers of foreign-born youth immigrating to industrialized countries show no signs of stagnation or decline. This source of demographic change could have implications later.

Figure 8 about here

5. Norms on drinking and intoxication; the cultural position of alcohol in society

Elmeland and Villumsen (Elmeland & Villumsen, 2013) recently examined trends in public attitudes and opinions towards Danish drinking. Based on the 2011 survey data they reported on the responses to questions regarding youth drinking and alcohol consumption among the Danish adult general population (figure 9). These data show a steep cross-sectional rise in prevalence of those who believe that Danish adults drink too much. The same is true for opinions on youth drinking.

Figure 9 about here

Also as Elmeland and Villumsen point out, a significant majority support a ban on alcohol at the workplace. The wording of this question was identical in 2002 and 2011 and very similar in 1994. Sentiments regarding this issue have changed from a minority opinion in 1989 to nearly 80% by 2011

(Figure 10). At the same time, however, Denmark has kept certain hallmarks of its liberal orientation. Only a minority believes that drinking in public should be banned (wording either exact or very similar between 1994 and 2011) as well as other restrictions such as monopoly stores, banning of alcohol at sporting events, reducing the number of restaurants and bars selling alcohol and well as higher taxes (data not shown).

It appears that a debate about the place and value of alcohol within Danish society has begun. A good marker for this development is the founding of a non-profit organisation called “Alkohol & Samfund” (“Alcohol and Society” or A&S) in 2012. Its homepage states that the organisation is meant to challenge “the alcohol culture in Denmark in order to strengthen the prevention of alcohol problems” (<http://alkohologsamfund.dk/node/49>). Among its activities are a counselling service for adults and youth and the publication of a quarterly magazine “RUS”. The magazine’s webpage contains subheadings regarding “alcohol culture”, treatment, prevention, policy and “viewpoint”. Alcohol and Society also drafted a “political appeal” to the Danish government and parliament to address the negative consequences of alcohol consumption in the country. Ten aims are articulated, with most of them focusing on youth drinking, lowering the BAC for beginning drivers, and improved access to treatment.

6. Alcohol advertising and promotion

There are three main regulations governing alcohol advertising in Denmark, two of which are actual laws, the ‘broadcasting act’ and the marketing law’, and one which is a voluntary code, of ‘self-regulation’ by the alcohol industry (Alkohol & Samfund, 2015). The regulations aim to ensure that marketing is not directed at children and young persons, and that advertising is not conducted in connection with sports or physical activities.

As far as can be determined from various public documents, the voluntary code was not seen as very strong and thus in 2005, when the marketing law was subject to review, it was strengthened in 2006 to explicitly ban advertising directed towards children and young people. By 2010, however, the

industry's alcohol advertising board revised its "Guidelines" so that they corresponded to the European Standards for Self-Regulation as issued in 2007 by the EU Commission (directive 2007/65/EF from 11. December 2007). This EU directive is a "minimum directive" meaning that Denmark may formulate regulations that are even stricter. The main changes included an "objects" clause, which was introduced into the guidelines and emphasises the protection of children and young persons, and that the provision on children and young persons be strengthened. In sum, advertising has become more restricted over our study period, even if it has been accomplished by self-regulatory measures of the alcohol industry. It is not known how well such guidelines are enforced.

7. Education and health promotion campaigns

The Danish Health Authority coordinates several alcohol education campaigns which include ongoing information to pregnant women and an annual campaign held in week 40 each year (<https://sundhedsstyrelsen.dk/da/sundhed/alkohol/kampagner>). In both 2014 and 2015, this annual campaign was directed toward 45 to 65 year old blue collar men , and carried the main message of reducing the frequency of consuming five or more drinks per occasion.

DISCUSSION

This paper has assembled a variety of data related to alcohol use in Denmark in order to assess the presence of change in various components of the country's drinking culture and further to assess the direction of any change. To accomplish this we have adapted the model of alcohol consumption proposed by Room et al (Room et al., 2009).

We briefly summarise the changes we have documented as they map on to the factors illustrated in the model. If we start with the central circles for *alcohol consumption* and *alcohol-related harm and mortality*, we have seen through our survey data that consumption has decreased over our study period. This decrease is also borne out in other reports concerning trends in Denmark (Devaux &

Sassi, 2015; World Health Organization, 2013). Although our data cover a relatively short period and the size of the decrease is modest, we believe our material to be sound. This is not only because they agree with other reports, but also because the trends are corroborated by both registry data on alcohol-related mortality (figures 2-5) and alcoholic liver disease incidence rates (Deleuran et al, 2015).

Interestingly, the prevalence of almost all of the alcohol-related problem items, taken mainly from the AUDIT questionnaire, have risen over our study period. Similar results were found for the problem items of the CAGE questionnaire during a period of decreasing consumption in regions of France and Switzerland between the 1990s and mid-2000s (Etter & Gmel, 2011; Messiah et al., 2008) and for alcohol problems in general in the early 1980s in the US (Midanik & Clark, 1995). All of these trends in survey-reported consumption and problems are in line with the observations made previously regarding the “long waves of alcohol consumption” (Mäkelä et al., 1981) first proposed by Mäkelä et al (1981) with regard to their study of eight former temperance societies, “The International Study of Alcohol Control Experiences”. Although these researchers were considering a much longer period, they observed that in such societies an oscillating pattern is identifiable in which alcohol consumption repeatedly rises and later falls over the course of about three generations. During the downturn, there appears an increased prevalence of self-reported problems and social responses, as a somewhat time-lagged reaction to the peak in consumption (Room et al., 2009). It could be that the shorter 10-year period that we have examined embodies part of the downturn in a “long wave” of consumption and consequences in Denmark. Indications of support for such an assumption are the decreases in consumption that have also been observed in several other industrialized countries (Devaux & Sassi, 2015; Livingston, 2015; World Health Organization, 2013).

Changes in the remaining factors in our model take different directions. *Taxes and prices*, have either remained stable or have decreased during the study period (while consumption has declined). With *Physical availability*, we see both the lifting of certain laws pertaining to restriction of the location of sales, but also the tightening of sales to minors. This latter measure may be the more

influential with regard to the decline in consumption than the relaxation of product accessibility in grocery stores.

It is advantageous to consider all of the circles in the left-hand column together, as it has become apparent that at least three of these interact with each other, whilst the top circle (purchasing power /demographic changes), for the most part, has mainly a one-way influence on the other circles. As we have reported, *purchasing power* has made alcohol more affordable, along with lower prices through decreased taxes, theoretically this should have enabled, if not encouraged, Danes to buy and consume more alcohol.

With regard to *drinking norms and attitudes* we have seen evidence of change in the increasing self-criticism of the Danish drinking culture and drinking levels. This includes a recent debate piece by a 19-year-old high school student and daughter of an alcoholic father for one of the main Danish national newspapers “Politiken” (Månsson, 2015). The student wrote of the negative peer reactions that one faces in Denmark if one declines to drink alcohol. She also observed the need for a “change of culture”. The column sparked television interviews and reports as well as similar articles in competing newspapers. Such sustained national attention could be considered a sign in itself of a growing awareness of Denmark’s drinking culture as problematic. There are also signs of increased activity in the realm of cultural politics with the founding of the organisation “Alcohol and Society” and the initiation of their activities. *Advertising and promotion* have faced tighter restrictions, mostly through industry self-imposed regulations. However, these increased regulations have come at the behest of EU directives that have been concerned with marketing to youth. Our observation is that these developments in the area of regulations, as shown in the figure, interact with, but also reflect developments in social norms and attitudes.

A problem, which Room et al. did not address in their model is the possibility that these factors could carry differing weights (Room et al., 2009). Another problem is the actual purpose of the model: can it actually predict a change in drinking culture? Can it confirm a change in drinking

culture? How could it be used for these purposes? At present we have used it only to better organize, describe and map out the various “moving parts” of a drinking culture.

However, one strategy to help us better understand the present situation would be to compare our inventory of developments to those that have occurred during the same period (and earlier) in another society. Among the countries with declining consumption is Italy which has experienced a dramatic drop in drinking over the last 30 years (Devaux & Sassi, 2015), and yet, no one is about to judge the country as a changed drinking culture. Italians still enjoy wine at mealtimes (perhaps not to the same extent as earlier) and intoxication is still relatively infrequent (compared to the Nordic experience). The main driver for this drop has been the decrease in wine consumption accompanied with fewer opportunities to consume. Two-hour lunches are no longer the norm, family dinners are less frequent, young people are increasingly turning to beer as their beverage of preference, and health awareness has grown (Allamani et al, 2010). Allamani et al. (2010) conclude that such changes have not been brought about by intentional alcohol policy measures; rather they are by-products of a changing post-war European society. In contrast, we can identify that Denmark has indeed implemented policy measures with the aim of modifying consumption: raising the minimum age for purchasing alcohol and tightening advertising regulations, for example. However, it is beyond the abilities of the present paper to determine whether the changes observed in Denmark are products of deliberate policy changes or are a part of a larger phenomenon to which Italy and other industrialized nations belong. In other words, what perhaps is first seen as differing pathways to reduced consumption in the two countries is actually a shared participation in a common “long wave of alcohol consumption”. Both Italy and Denmark, as well as other industrialized countries sharing in this decline, may have their own unique characteristics that hallmark an ebbing of the consumption wave. Perhaps it is too early to determine whether Denmark, and Italy for that matter, are merely in the midst of riding out the crest of a long wave of reduced consumption or whether their drinking cultures are undergoing change that is more fundamental.

Further limitations to our study include that there still could be several other variables of which we have not yet taken account. For example, we have not included a variable that represents computer and internet usage, especially by young people. Furthermore, we have omitted a component found in the model of Room et al. (2009): that which they have called *stabilizing factors*. One of these is *the habit-forming nature of alcohol drinking*. Because this does not lend itself to measurement, and is a constant, it was not included in our present scheme. However, it could still play a role in drinking culture change that we have not yet captured. Another factor, “*cultural customs*”, is indeed subject to measurement, but no data are known to be presently available. This would require a longitudinal study that monitors changes in the endorsement of the various Danish drinking customs, such as alcohol at Christmas lunches, confirmation and birthday parties, weddings, etc.

Despite this, we believe we have taken some first steps in creating a basic model of drinking cultures, and in showing that some aspects of the Danish drinking world have indeed changed within the last decade. Future alcohol surveys could attempt to measure some of the factors we have identified. That would constitute a substantial step towards a more complete model, not only of the drinking culture of Denmark, but of drinking societies in general.

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table 1. Overview of data sources

Factors (figure 1; read from left)	Data Type	Years Used	Data Sources
<ul style="list-style-type: none"> Consumer purchasing power 	PPP (purchasing power parity) Consumer price index Consumer price index for alcohol	2003-2013	Statistics Denmark 2015 http://www.statbank.dk/statbank5a/default.asp?w=1280 , PPS, PRIS61, PRIS6
<ul style="list-style-type: none"> Demographic, structural changes 	Proportion of foreign-born residents of Denmark by age group source, Alcohol treatment rates	2003-2013, 2008-2013	Statistics Denmark 2015; Danish Health Authority 2015
<ul style="list-style-type: none"> Societal drinking norms and attitudes 	CRF national survey data	1985, 1989, 1994, 2002, 2011	Elmeland & Villumsen, 2013
<ul style="list-style-type: none"> Alcohol advertising and promotion 	Laws and guidelines (for industry) changes	2000, 2006, 2010	Alkohol & Samfund, 2015
<ul style="list-style-type: none"> Education and health promotion campaigns 	Information on topics and frequency of official campaigns in Denmark		Danish Health Authority
<ul style="list-style-type: none"> Taxes, prices 	Taxes on alcoholic beverages	1987 -2013	Danish Tax Ministry 2015
<ul style="list-style-type: none"> Physical availability 	Law changes affecting physical availability and minimum legal age	2005, Minimal age: 1995, 1998, 2004, 2008, 2011	Danish Health Authority 2014
<ul style="list-style-type: none"> Total level of consumption 	Survey data	2003-2006, 2011	Room et al. 2013 (2003-2006), own data
<ul style="list-style-type: none"> Alcohol related problems, harm and mortality 	Survey data on problems, Registry data on mortality	2003-2006, 2011; Mortality: 2001-2012	Problem data: Room et al. 2013 (2003-2006), own data; Registry data on mortality: Eurostat

Table 2. Survey waves sample description (percentages, means (standard deviations), medians and interquartile ranges (IQR)), volume and number of dependence problems by wave and sex, odds ratios and 95%CI for cross-sectional change from 2003-6 to 2011 for volume and problems

Total samples		2003-2006		2011	
n		5177		5037	
Sex (males):		49.1%		49.9%	
Age in years, mean (SD):		46 (18)		46 (17)	
Education:					
low		22.8%		22.8%	
middle		43.7%		39.8%	
high		33.5%		37.3%	
Drinking status (drank in last 12 months):		93.5%		92.0%	
Samples by gender		2003-2006		2011	
		Men	Women	Men	Women
n		2363	2814	2377	2660
Volume mean (SD) / median (IQR) in grams ethanol/day		17(22)/11 (4-23)	7(12)/4 (1-10)	18(27)/10 (4-22)	8(15)/4 (1-10)
Mean volume/grams of pure alcohol per day				2 missing	1 missing
					OR (95% CI) P-value
≤2g		14.8%	36.5%	15.7%	34.7%
>2-10g		32.1%	37.6%	34.4%	40.3%
>10-20g		24.9%	17.4%	22.3%	15.2%
20+g		28.2%	8.6%	27.6%	9.8%
No. alcohol problems of 12 total				(1 miss.)	(1 miss.)
0		66.9%	81.3%	56.0%	71.3%
1		16.5%	10.5%	17.5%	11.9%
2		7.5%	4.4%	9.4%	6.8%
>2		9.1%	3.7%	17.2%	10.0%

Figures 2 and 3. Chronic liver diseases mortality due to chronic liver diseases (K70 /73/74) by age group and by sex (in 100.000) (source:{Eurostat, 2015 578 /id}).

Men

women

Figures 4 and 5. Mortality due to alcohol-related disorders (f10) by age group (in 100.000) and sex. (source: {Eurostat, 2015 578 /id}).

Men

women

Figure 6. Tax on spirits /wine / beer. source: (Danmarks Statistik, 2014)

Figure 7. Various indicators of consumer purchasing power

^a Statistics Denmark <http://www.statbank.dk/statbank5a/default.asp?w=1280>,

PPS: prices and consumption PPP11, PRIS61: Consumer price index by main figures, PRIS6: Consumer price index by commodity group and unit

Figure 8. Proportion of foreign-born residents of Denmark by age group source: (Statistics Denmark, 2015)

Figure 9. Percentage of respondents who agree with statements on youth drinking¹ and drinking in the adult general population². Source: (Elmeland & Villumsen, 2013)

¹The wording was: 1985 "Do you find that the majority of the youth (younger than 20) in general drinks the right amount, a little too much or way too much?". 1994 "Do you find that the young people (younger than 18) you know drink the right amount, a little too much or too much?". 2011 "Do you in general find the Danish youth's alcohol consumption to be...?"

²The wording was: 1985 "Do you find that the majority of the adult population in general drinks the right amount, a little too much or way too much?". 2011 "Do you in general find the adult Danish population's alcohol consumption to be...?"

Figure 10. Percentage of respondents who agree with restrictions on location of drinking.
Source: (Elmeland & Villumsen, 2013)

¹ Question wording was: 1989: "Access to alcohol in the workplace should be without limitations, with some limitations or no access at all?"; 1994: "A ban against drinking alcohol in the workplace should be implemented?" 2002 & 2011: "It should be prohibited to drink alcohol in the workplace".

² Question wording was: 1985: "It should be prohibited to drink alcohol in streets, squares, parks or similar public places?"; 1994: "It should be prohibited to drink alcohol in public places, pedestrian streets, etc., except at public venues?" ; 2002 & 2011 "It should be prohibited to drink alcohol in public places, pedestrian streets, etc."