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History of health care use and disease burden in older adults with different levels of alcohol use. A register-based cohort study

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Abstract

Background: Only a smaller part of all individuals with problematic alcohol use ever seek alcohol treatment. Knowledge of general help-seeking behavior in the health-care system can identify possibilities for prevention and intervention.

Method: The current study described health care use, burden of disease, and prior morbidities over a 15-year-period by current alcohol use behavior among Danish adults aged 60-70. The Danish National Health Survey 2013, and the baseline assessment of the Elderly Study (2014–2016), were linked to Danish national registers to collect annual information on health care use and morbidity 15 years prior to inclusion. Participants from the three largest Danish municipalities were divided into four groups with varying drinking patterns and no recent treatment, and one group of treatment-seeking individuals with a 12-month alcohol use disorder (AUD): 12-months abstinent (n=691), low- (n=1978), moderate- (n=602), and high-risk drinkers (n=467), and treatment-seekers with 12-months DSM-5 AUD (n=262). Negative binomial regression models were utilized to compare rates of health care use, and logistic regressions were used to compare odds of diagnoses.

Results: Low-, moderate-, and high-risk drinkers had similar rates of past health care utilization (Low risk mean yearly number of contacts for primary care 7.50 (yearly range 6.25-8.45), outpatient care 0.80 (0.41-1.32) and inpatient care 0.13 (0.10-0.21). Higher rates were observed for both 12-months abstinence (Adjusted RR=1.16-1.26) and AUD (ARR=1.40-1.60) compared to low-risk alcohol consumption. Individuals with AUD had higher odds of previous liver (Adjusted OR=6.30)-, ulcer (AOR=2.83) - and peripheral vascular disease (AOR 2,71). 12-months abstinence was associated with higher odds of diabetes (AOR=1.97), and ulcer disease (AOR=2.10).

Conclusions: Looking back in time, older adults have had health care contacts regularly, with those receiving treatment for AUD having had the highest contact frequency and prevalence of alcohol-related diseases. Thus, these health care settings may provide possibilities for prevention and intervention.

Keywords: older adults**,** alcohol use, alcohol use disorder, health care

Introduction

In general, alcohol use is a major contributor to the burden of mortality and many disease outcomes are impacted causally by alcohol in a dose–response manner (Rehm et al., 2017). Specifically, older adults are more likely than younger people to have health issues that can be negatively affected by alcohol consumption (Blow and Barry, 2012, Kuerbis et al., 2014). In the western world, there is evidence that the drinking patterns of older adults have changed towards an increase in alcohol consumption and heavy episodic drinking (Bartoli et al., 2017, Grant et al., 2017, Han et al., 2016, Muñoz et al., 2018).

Higher alcohol use is cross-sectionally associated with greater morbidity and use of health care (Balsa et al., 2008, Zarkin et al., 2004, Ormond and Murphy, 2017, Lee et al., 2017). Given their age, older adults may have a long history of morbidity and health care utilization. However, a long-term retrospective history of morbidity and help-seeking in health care among older adults, viewed in the context of their current alcohol use in old age, is largely unknown. Looking back in time and studying retrospective data, it may be possible to find early indications on problematic alcohol use in older age, understand previous health care utilization patterns, and determine possible platforms for prevention strategies.

It is estimated that about 10-15% of Danish older adults drink more than recommended by the health authorities (Statens Institut for Folkesundhed, 2017). Rather few individuals seek help. In Denmark, approximately 15,000 individuals (all age groups, in total) are each year treated for problematic alcohol use, despite that 140,000 individuals are estimated to suffer from alcohol dependence (Hansen et al., 2011, Schwarz et al., 2018). A study by Mack et al. found that only about half of German individuals with lifetime alcohol dependence ever seek help, and North American studies indicate that it is mostly those with severe alcohol use disorder (AUD) who end up seeking treatment (Grant et al., 2015, Hasin et al., 2007). Hence, knowledge about when and where the individual, who drinks excessively or even has a disorder, is', or has been in contact with the health care system, can offer knowledge about the possibilities for intervening at an earlier stage of the drinking career and offer prevention and treatment if needed.

Access to Danish nation-wide longitudinal administrative registers on primary care use and hospitalization data, combined with survey information on current drinking habits, gives a unique opportunity to address this. Thus, in this retrospective study among adults aged 60-70, with different alcohol use behavior, we aimed to: (1) describe and analyze use of health care over the past 15 years, grouped by current alcohol use behavior, and (2) identify the most common prior morbidities as causes for hospital contacts, and the burden of disease over 15 years in this age-group, grouped by current alcohol use behavior. We combined data from two studies: the Danish part of the international randomized trial, the Elderly Study (Andersen et al., 2020) (inclusion 2014-2016), and a sub-sample of the participants in the Danish National Health Survey 2013 (DNHS 2013). The rationale for combining data from the trial with survey data was to include

individuals suffering from AUD and seeking treatment, a group typically much under-represented in surveys (Christensen et al., 2015, McMinn et al., 2020).

Materials and Methods

Study Population

The population in this study has been described in detail (Mejldal et al., 2020). Therefore, it will only be described briefly here.

The Elderly Study

The Elderly study (ClinicalTrials.gov database: NCT02084173) evaluated the effects of two brief outpatient intervention programs for patients fulfilling the DSM5 criteria for AUD (American Psychiatric Association, 2013) in older adults (age 60 or older). The study was conducted by research centers in three countries (Denmark; United States; and Germany) between 2014 and 2016. In the current paper', only baseline data from the Danish sites was used (Andersen et al., 2020). Details and results of the Elderly study can be found in Andersen et al. (Andersen et al., 2020).

The Danish National Health Survey 2013 (DNHS 2013)

In 2013, the five Danish Regions, and the National Institute of Public Health at the University of Southern Denmark, conducted the second Danish National Health Survey (DNHS) among a representative sample of the Danish population (16 years or older)(Christensen et al., 2012). In this survey 300,450 individuals (response rate 54%) were invited to answer a questionnaire with 54 core questions, including a section on alcohol use. In the questionnaire, alcohol consumption was assessed as the number of standard drinks (à 12 g of pure alcohol) per day in a typical week. It included both information on standard drink equivalents of typical beverages, and a question on current abstinence (minimum past 12 months abstinence). Furthermore, a modified variant of the CAGE (Cut down, Annoyed, Guilty, Early-morning) test was included in the questionnaire, the CAGE-C (Copenhagen) test (Zierau et al., 2005). Contrary to the CAGE test, which covers lifetime alcohol consumption (Mayfield et al., 1974), the CAGE-C only covers the past 12 months. CAGE-C has been shown to have a high sensitivity and specificity compared with DSM-III criteria of alcohol abuse and ICD-10 criteria of alcohol dependence and harmful use (Zierau et al., 2005).

Design of the study presented here

Inclusion criteria for the present study were (1) between 60-70 years of age per 1. January 2013 in the DNHS 2013 or at baseline assessment of the Elderly Study, (2) information on alcohol consumption in the

DNHS 2013 questionnaire, (3) residing in the municipalities of Copenhagen, Aarhus, Odense, North Funen, and Kerteminde. Participants from the DNHS 2013 were excluded if they had received treatment for AUD 5 years prior to inclusion (1. January 2013) (n=27). This information was retrieved from the National Alcohol Treatment Register (Schwarz et al., 2018). The register contains information on all treatments, funded by the Danish municipalities according to the Danish Health Law, and free of charge for the patient. The treatment may be given in both private and public treatment facilities. If a participant from the DNHS 2013 simultaneously was an Elderly study participant, they were only included as participant of the Elderly study (n=11). Thus, no individual is repeated in the final study population.

The final study population in the present study was n=4,000, comprising 262 individuals from the Elderly Study and 3,738 individuals from DNHS 2013. A flow chart with details on inclusion/exclusion can be found in (Mejldal et al., 2020).

We linked the participants from the study population in the present study to Danish national registers (described in detail below under variables), which are nation-wide longitudinal administrative registers made available for research purposes. Every individual with permanent residence in Denmark, has a personal identification number (CPR number). Through this number, records from various registers can be merged with data from other sources (Thygesen et al., 2011).

Linking participants from the DNHS 2013 and the Elderly Study with register data was approved by the Danish Data Protection Agency. No additional consent was required by the individuals.

Variables

Three alcohol use categories corresponding to ascending levels of alcohol consumption were used, following the guidelines for adults set out by the Danish Health Authority (Grønbæk et al., 1997):

Low-risk drinking (LR): ≤14 units (á 12-gram of pure alcohol) per week (men) or ≤7 units per week (women).

Moderate-risk drinking (MR): 14≤21 units per week (men) or 7≤14 units per week (women).

High-risk drinking (HR): >21 alcohol units per week (men) or >14 units per week (women).

Individuals from the DHNS 2013 were grouped into a LR, MR, and HR group according to their reported drinking patterns in a typical week over the past year. In addition, an abstinent group (AB, no reported drinking for 12 months) was defined. Finally, the participants from the Elderly study formed a fifth group where all participants were diagnosed with past 12-months DSM5 AUD and seeking treatment at inclusion (AUD-T).

The date of the baseline interview in the Elderly study and the date of survey participation from DNHS 2013 were defined as 'date of inclusion'. The five groups (AB, LR, MR, HR, & AUD-T) are referred to as "alcohol use groups".

Outcome measures

Health care utilization

The main variables of interest were healthcare utilization as measured by primary care consultations (by general practitioner) and somatic inpatient hospitalizations or outpatient treatment in the period prior to date of inclusion. The number of primary care consultations with general practitioners (including out-of-hours) was gathered from The Danish National Health Service Register for Primary Care (NHSR) (Sahl Andersen et al., 2011). The NHSR contains all contacts and activities of health professionals contracted with the tax-funded public healthcare system. Unfortunately, it does not register any clinical information like diagnoses. In addition, as there was a break in the registration procedure in 2005, the number of primary care contacts was calculated annually, only over 8 years leading up to the year of interview.

The National Patient Register (NPR) covers all somatic and psychiatric in- and outpatient contacts in all hospitals (Lynge et al., 2011). We considered two different types of contacts from the NPR: somatic inpatient and somatic outpatient contacts. During an inpatient hospitalization an individual was not at risk of experiencing another inpatient contact, but the same individual could experience concurrent outpatient contacts. If an individual experienced a new inpatient contact less than one day after being discharged from the latest hospital admission, the events were counted as one contact. A contact was always allocated to the year of the patient's admittance, even if it spanned past a year-end. The number of contacts was gathered annually over 15 years leading up to date of inclusion.

Burden of disease

To assess the burden of disease prior to date of inclusion, we searched the NPR using ICD-10 diagnosis codes to identify patients who had somatic inpatient or outpatient hospitalizations with any morbidity contained in the Charlson Comorbidity Index (CCI)(Charlson et al., 1987). The CCI assigns weights for specific conditions, and the total score is calculated by adding these weights. Diseases with a weight of one include myocardial infarction, congestive heart failure, peripheral vascular disease, cerebrovascular disease, dementia, chronic pulmonary disease, peptic ulcer disease, mild liver disease, and diabetes without organ damage. A weight of two is assigned to diabetes with end organ damage, and nonmetastatic solid tumor/leukemia/lymphoma. Moderate or severe liver disease has a weight of three. Metastatic solid

tumor and acquired immunodeficiency syndrome (AIDS) have a weight of six. The total score is calculated by adding the weights (Charlson et al., 1987).

All relevant ICD-10 diagnoses (Quan et al., 2005) for these conditions were collected over 15 years leading up to year of inclusion in the studies and grouped according to the CCI. To maintain data confidentiality, in cases were the count in any group was ≤3 we aggregated conditions in the results section. This resulted in AIDS, hemiplegia/paraplegia, dementia, and renal disease being grouped into "other". For the same reasons, we also grouped diabetes with and without organ damage into one group, and mild- moderate and severe liver disease into one.

We calculated indicator variables for each condition in the CCI and separately calculated the overall CCI for all 15 years as described in (Charlson et al., 1987), using the exclusion rules from (Quan et al., 2011). We grouped the CCI into 0 points (none), 1-2 points (mild), 3-4 points (moderate) and ≥5 points (severe).

Other variables

Smoking status at date of inclusion was coded as an indicator variable. It was derived separately from each study. In the Elderly study, the participants were asked during the baseline interview if they currently are using any product with nicotine (including cigarettes / E-Cigs / snuff (dip) / pipe tobacco / chewing tobacco), with two possible answers: yes/no, and they were coded accordingly as "current smoker" and "nonsmoker". In the DNHS 2013, participants were asked "Do you smoke?", and had five options to answer: "Every day", "at least once a week", "less than once a week", "I have quit smoking" and "I have never smoked". We coded the first three answers as "current smoker" and the last two as "nonsmoker".

To describe the prevalence of probable AUD among the DNHS 2013 participants, we used the CAGE-C test as defined in (Zierau et al., 2005). A positive result in the CAGE-C was defined as two or more positive answers among the five questions: "Within the past year, 1) have you felt that you should cut down on your drinking? 2) have people annoyed you by criticizing your drinking? 4) have you felt bad or guilty about your drinking? 3) have you, from time to time, had a drink first thing in the morning? 5) Do you drink alcohol on weekdays outside mealtimes?", or one positive answer in addition to alcohol intake on 4 or more days per week.

We measured income using annual personal disposable income in Danish kroner (DKK) (1 EUR ≈7.5 DKK, 1 USD ≈ 6.5 DDK) from the Income Statistics Register (Baadsgaard and Quitzau, 2011), which is the sum of

pre-tax income and imputed rent minus interest expenses, tax, and paid alimonies. This information was gathered annually over 15 years leading up to year of inclusion and corrected for inflation.

The Danish Civil Registration System (Pedersen, 2011) was used to retrieve information on gender, age, and cohabiting status over 15 years. We dichotomized cohabiting status into two groups consisting of those cohabiting versus living alone.

Statistics

Healthcare utilization was described at two levels: the overall healthcare utilization rate for the study period for both primary healthcare, outpatient, and inpatient hospitalizations, and the average yearly utilization rate before date of inclusion. The CCI was calculated for the overall time-period of 15 years. The percentage of individuals with specific CCI diagnoses was described for the whole study period. Differences in means and distribution were tested using chi-squared test and ANOVA.

Negative binomial regression models were used to estimate rate ratios and 95% confidence intervals for the overall utilization and for yearly rates. Likelihood ratio tests were applied to test for interaction between gender or age and drinking group in the unadjusted model with the significance level defined at $P < 0.05$.

The prevalence of any specific morbidity was calculated for each alcohol use group. Furthermore, unadjusted and adjusted logistic regressions were used to estimate odds ratios (ORs) for the association between alcohol use group and each specific CCI morbidity. Unadjusted and adjusted negative binomial regression was utilized to examine the association between the alcohol use groups and the overall 15-year CCI score. It may seem counterintuitive to treat past health utilization and prior morbidity as the dependent variable and current drinking category measured at the end of the study period as the independent variable. However, as it is not our aim to establish causality, this is rather one way to contrast differences in exposure trajectories between the alcohol use categories in an interpretable way.

For all regression models, the low-risk drinking group was chosen as reference group. Covariates included in the adjusted regression models were gender, age, smoking status, income, education, and mean employment status, as socioeconomic status (represented here by income, education and employment status) is known to be associated with both health behavior/health care utilization and alcohol consumption (Mejldal et al., 2020, Frølich et al., 2019). Income and employment status were calculated as the mean income and proportion of time employed over the observed period, while the models, estimating the yearly utilization rates, used the same year's income and employment status. Smoking status is both

found to be related to alcohol consumption (Noble et al., 2015) and to being a risk factor for a long list of diseases, including cancers and peripheral vascular diseases (Rostron et al., 2014).

All analyses were conducted in Stata 16.1, with the significance level defined at $P < 0.05$. All statistical programming underwent internal review by a colleague with statistical expertise.

Results

Table 1 around here

Table 1 describes the number of participants in each group and their demographics. The mean (SD) age at inclusion ranged between 64.4 (3.1) years in the AUD-T group and 65.2 (3.1) years in the AB group. The percentage of women ranged from 35.5% in the AUD-T group to 65.3% in the AB group.

Smoking was most prevalent among the AUD-T group (83.1%) and least prevalent in the LR group (17.3%). Among the four DNHS 2013 groups, the percentage of participants with a positive CAGE-C test varied greatly from 11.5% in the LR group to 81.2% in the HR group.

Health care utilization

Table 2 around here

Overall rate of health care contacts over 15 years prior to inclusion

The overall yearly rates of health care contacts prior to inclusion, irrespectively of type, were similar for LR, MR, and HR groups (table 2), and did not differ after adjusting for covariates (table 3). For the LR group, the mean yearly number of contacts for primary, outpatient, and inpatient care were 7.50 (yearly range 6.25-8.45), 0.80 (0.41-1.32) and 0.13 (0.10-0.21), respectively. The yearly rate of all types of contacts was highest for AUD-T (table 2). For this group, the mean yearly number of contacts for primary, outpatient, and inpatient care were 12.48 (yearly range 10.52-14.17), 1.11 (0.56-1.95), and 0.22 (0.14-0.43), respectively. After adjusting for possible confounders and using LR as reference, adjusted rate ratio (ARR) for AUD-T ranged from 1.40 (95% confidence interval (CI) 1.25;1.56) in outpatient contacts to ARR 1.60 (95% CI 1.33;1.91) for inpatient contacts. The AB group had second highest number of contacts in all three types of contacts (table 2) but adjusting for possible confounders revealed only significant higher probability for inpatient (ARR=1.33, 95% CI 1.19;1.50) and primary care contacts (ARR=1.16, 95% CI 1.08;1.24) compared to LR. We found no significant interaction between gender or age and drinking group.

Yearly utilization rates in primary, outpatient, and inpatient care

The LR, MR, and HR groups displayed similar patterns of all three types of healthcare utilization over the whole study period prior to inclusion, while the AUD-T and AB groups had different and higher utilization rates (figure 1). Especially regarding primary care, AUD-T and AB had a higher utilization rate than the LR group over the 8-year study period. The greatest excess in primary care use was found in the years closest to inclusion. The unadjusted and adjusted analysis confirming these differences can be found in Appendix table 1.

Regarding outpatient and inpatient contacts, the AUD-T group began to have a significantly higher rate than the LR group at around 8 years prior to inclusion in the study. In contrast, the AB group had an inpatient contact rate significantly higher already from 12 years before inclusion and onwards, but the outpatient contact rate first became higher in the last 3 years before inclusion (appendix table 1).

Figure 1 around here

Burden of disease

Number of diseases over 15 years prior to inclusion

The AUD-T and AB groups had a larger proportion of individuals with a CCI-score of 1 and above (table 4). The MR group had the largest proportion of individuals without any CCI diagnosis (70%). Using LR as reference, negative binomial regression revealed that both the AUD-T (ARR=1.41, 95%CI 1.12;1.77) and the AB (ARR=1.38, 95%CI 1.19;1.60) groups had a significantly higher incidence rate of 15-year CCI prior to inclusion (table 5).

Table 3 around here

Most common diseases over 15 years prior to inclusion

The three most common diseases for LR, MR, and HR groups were similar, e.g. any malignancy (including leukemia and lymphoma), followed by cerebrovascular disease and diabetes (table 4). However, the adjusted logistic regressions using LR as reference and analyzing association between alcohol use group and each specific CCI morbidity revealed that the HR group had more than twice as high odds for liver disease (Adjusted OR (AOR) =2.22, 95%CI: 1.08;4.57), and MR group had slightly increased odds for myocardial infarction prior to inclusion (AOR=1.78, 95%CI: 1.07;2.98) (table 5).

Table 4 around here

For AUD-T the distribution was any malignancy or liver disease (equally common) followed by peripheral vascular disease (table 3). The high frequency of liver and peripheral vascular disease was confirmed by the logistic regression; AUD-T had 6 times as high odds for liver disease (AOR=6.3, 95% CI 3.25;12.24), and more than twice as high odds for ulcer disease (AOR=2.83, 95% CI: 1.47;5.47) and peripheral vascular disease than LR (AOR=2.71, 95% CI: 1.42;5.20) (table 4).

In the AB group, the most common morbidity was diabetes followed by any malignancy and chronic pulmonary disease. After adjustment for possible confounders the AB group had 2-fold increased odds of diabetes (AOR=1.97, 95% CI 1.49;2.62) and ulcer disease (AOR=2.1, 95% CI 1.26;3.53) (table 5).

Table 5around here

Discussion

In this study we investigated the association of healthcare use over the past 8-15 years with current alcohol use behaviors in adults aged 60-70, using Danish nation-wide longitudinal administrative registries. We furthermore identified the burden of disease as measured by the CCI and the most common diseases among the drinking groups.

Health care utilization

To our best knowledge, studies on healthcare use in older people with different levels of alcohol consumption are scarce. We found that both current abstainers and individuals with AUD had utilized all three types of healthcare at higher rates as far as 12 years before inclusion. In the literature, there is no comparable study for this age-group and over such a long period of time, since most studies, so far, are cross-sectional or prospective. Similar to our retrospective study, several cross-sectional studies have found inverse or U-shaped relationships between level of alcohol consumption and health-services use (Kunz, 1997), particularly that abstainers (Baumeister et al., 2006b) are more likely to utilize healthcare services than low-risk alcohol consumers, and that individuals with AUD are more likely to utilize healthcare than individuals not diagnosed with AUD (de Weert-van Oene et al., 2017), and also low-risk consumers (Cherpitel and Ye, 2015), but no differences between high-risk and low-risk consumers (Cherpitel and Ye, 2015, Heise, 2010). A recent cross-sectional study by Bares et al. (Bares and Kennedy, 2020) found that former alcohol users, and current light and moderate users had more health care contacts than lifetime abstainers. A 4-year prospective study by Anzai et al. ((Anzai et al., 2005) found a U-shaped relationship with lifetime abstainers and heavy drinkers having higher inpatient healthcare utilization, but an inverse

linear relationship when it came to outpatient care. Furthermore, a prospective study by Hart et al. found a J-shaped relationship when only considering mental health care admissions.

Burden of disease

The U-shaped relationship is also apparent in our study when it comes to burden of disease. Specifically, we considered the presence of chronic diseases that are part of the Charlson Comorbidity Index, known to predict short- and long-term mortality (Quan et al., 2011). We found that the CCI was higher for both high-risk drinkers and those with an AUD, and these two groups specifically had higher odds of liver disease prior to inclusion in the studies. Among many other diseases, cirrhosis of the liver is well-known to be largely attributable to alcohol consumption (Rehm et al., 2003). Interestingly, we found that the group with a moderate current alcohol consumption had an increased risk for having had myocardial infarction in the adjusted analysis. This could be a sporadic finding, as the relation of coronary heart disease (CHD) and alcohol consumption is very complex, and light to moderate consumption has been linked to lower risk of CHD when no heavy occasional drinking is involved (Rehm et al., 2003).

As in our previously published paper on socioeconomic status (SES) (Mejldal et al., 2020), we can see in the present study that individuals ,who are abstainers at the time of inclusion, have had challenges back in time, not only regarding SES, but also regarding health. They have a high rate of health-care utilization over many years, and more often suffer from diabetes or ulcer disease. As Denmark is a country where lifetime abstinence, in general, is quite uncommon, it is very likely that the main part of the abstainer group has consumed alcohol at earlier points in life (Holst et al., 2017). They may, in part, be individuals who have ceased to drink alcohol because of health conditions (also known as “sick quitters”) (Sarich et al., 2019), which probably also explains part of the U-shaped relationship of drinking level to burden of disease and to some extend the relationship to healthcare visits. This finding emphasizes our previous recommendation of treating abstinent as a separate group, and not choosing this group as a reference- or control group in scientific studies. This holds especially true when it is not possible to separate individuals who have ceased to drink alcohol, from lifetime abstainers, as there is strong evidence that the former, specifically, have more health conditions and utilize healthcare at a higher rate (Baumeister et al., 2006a). Future research should explore the subgroups of abstainers in more detail, and their specific relation to morbidity and health care use.

Limitations and Strengths

This study has several limitations and strengths. First, the study was performed on a group of Danish older adults aged 60-70 during 2013-2016. Denmark is known to be among the leading alcohol consumption countries in Europe (Järvinen, 2003). Caution must be taken when generalizing to other age cohorts, periods in life, and drinking cultures. Additionally, findings may not be generalizable to all countries as healthcare in Denmark is free of charge for the individual.

Alcohol consumption and AUD were measured only at one specific time point at the end of the observation period. Therefore, we cannot link past healthcare utilization and disease burden, measured over different time points, directly to alcohol consumption at those specific time points to investigate whether there is a reciprocal relationship between the two. Several studies find that alcohol consumption, for the largest part, steadily declines as individuals mature into older adulthood (Moos et al., 2009, Platt et al., 2010, Halonen et al., 2017), with a minority increasing their intake, maybe around retirement (Platt et al., 2010, Halonen et al., 2017).

Smoking status was determined slightly differently in the two datasets merged into one in the present study, with the Elderly Study including all types of nicotine use compared to the DNHS 2013, which only referred to smoking. However, it is estimated that most nicotine users in Denmark smoke cigarettes (93%) (The Danish Health Authority, 2019).

It may be considered a limitation to the study that we employed and combined two data sources, a health survey, and a randomized control trial, which are not directly comparable as inclusion criteria and dropout mechanisms are different. We have ensured that all individuals are in the same age range and live in the same municipalities with the same access and equal rights to health care, and the only questionnaire information we utilized from the studies are the questions on alcohol consumption from the DNHS 2013 and smoking information from both studies.

A strength of the present study is the relatively large sample size (n=4000) and that all other measures in the study, including healthcare utilization and diagnoses, stem from national high-quality administrative registers, which provide complete data for all individuals, also back in time. Most other studies only examine relatively short periods of time, e.g., 1-2 years before or after assessing alcohol consumption, often they are restricted to certain units of healthcare, or assess healthcare contact by interview with possible recall bias (Zarkin et al., 2004, Ormond and Murphy, 2017, Lee et al., 2017). Therefore, this study has a very high validity compared to self-reported measures often used in studies on healthcare utilization, and no recall-bias is introduced.

Implications and Conclusion

Healthcare settings have been considered some of the most optimal platforms for contacting and motivating individuals to reduce their alcohol intake to a safer level (Babor et al., 1986, Engler et al., 2013, McQueen et al., 2011). Our findings suggest that older adults with high-risk alcohol consumption and AUD are in frequent contact with the health care system for many years. Thus, it might be possible to target those individuals at-risk for AUD both through general practitioners and in hospital settings and offer an intervention to prevent AUD in older age. Additionally, the high-risk drinking group might be identified by the healthcare system at an earlier time-point. Although consequences of high-risk alcohol consumption and alcohol problems already are apparent, noting this group's high positive CAGE-C screening rate, higher CCI, and higher risk of liver disease, they may be reluctant to seek specific help and may highly benefit from intervention to motivate a change in drinking behavior towards lower risk levels.

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Figure 1: Number of health care contacts per person by year prior to interview

Table 1: Sample characteristics at interview date

Factor	Drinking groups: Low-risk drinking(LR)	Moderate-risk drinking (MR)	High-risk drinking (HR)	AUD-T**	Abstinent(AB)	p-value
N	1978	602	467	262	691	
Age, mean (SD)	65.0 (3.1)	64.7 (3.0)	65.0 (3.1)	64.4 (3.2)	65.2 (3.1)	0.002
Women n (%)	937 (47.4%)	385 (64.0%)	187 (40.0%)	93 (35.5%)	451 (65.3%)	<0.001
Cohabiting (yes), n (%)	1441 (72.9%)	439 (72.9%)	309 (66.2%)	103 (39.3%)	373 (54.0%)	<0.001
Disposable income*, mean (SD)	237008 (187550)	248108 (175079)	223146 (124601)	209522 (92220)	180378 (94294)	<0.001
Currently employed (yes), n (%)	596 (30.5%)	201 (34.2%)	124 (27.1%)	53 (20.4%)	125 (18.4%)	<0.001
Education						
Lower secondary	436 (22.0%)	99 (16.4%)	95 (20.3%)	47 (17.9%)	266 (38.5%)	<0.001
Upper secondary	884 (44.7%)	244 (40.5%)	196 (42.0%)	106 (40.5%)	281 (40.7%)	
Short cycle tertiary/Bachelor	459 (23.2%)	177 (29.4%)	115 (24.6%)	84 (32.1%)	106 (15.3%)	
Master or higher	199 (10.1%)	82 (13.6%)	61 (13.1%)	25 (9.5%)	38 (5.5%)	
Smoking status (yes), n (%)	342 (17.3%)	116 (19.3%)	169 (36.2%)	216 (83.1%)	158 (22.9%)	<0.001
Positive CAGE-C test, n(%)	227 (11.5%)	219 (36.4%)	379 (81.2%)	NA	NA	<0.001

Table 2: Average number of health care contacts per year per person over whole study period, including range

Factor	Drinking groups: Low-risk drinking(LR)	Moderate-risk drinking (MR)	High-risk drinking (HR)	AUD-T	Abstinent(AB)
Inpatient contacts*	0.13 (0.10-0.21)	0.12 (0.06-0.21)	0.14 (0.09-0.22)	0.22 (0.14-0.43)	0.21 (0.13-0.31)
Outpatient contacts*	0.80 (0.41-1.32)	0.75 (0.30-1.30)	0.70 (0.31-1.10)	1.11 (0.56-1.95)	0.96 (0.45-1.60)
Primary care contacts**	7.50 (6.25-8.45)	6.88 (5.92-7.68)	7.10 (5.66-8.01)	12.48 (10.52-14.17)	10.32 (8.94-11.44)

*average number of contacts per year over 15 years prior to inclusion, range consists of smallest and largest yearly average number of contacts

**average number of contacts per year over 8 years prior to inclusion, range consists of smallest and largest yearly average number of contacts

**winsorized at level 1% and 99%.

**participants from the Elderly study, with DSM5 AUD entering treatment

Table 3: Results of the unadjusted and adjusted regression models on Inpatient, Outpatient and Primary Care Contacts

	Drinking groups							
	Low-risk drinking(LR)	Moderate-risk drinking(MR)		High-risk drinking (HR)		AUD-T		Abstinent (AB)	
	Reference	Unadj, RR (95% CI)	Adj***, RR (95% CI)	Unadj, RR (95% CI)	Adj***, RR (95% CI)	Unadj, RR (95% CI)	Adj***, RR (95% CI)	Unadj, RR (95% CI)	Adj***, RR (95% CI)
Inpatient contacts*		0.89 (0.79;1.02)	0.97 (0.85;1.10)	1.07 (0.93;1.23)	1.10 (0.96;1.27)	1.74 (1.47;2.06)	1.60 (1.33;1.91)	1.60 (1.42;1.80)	1.33 (1.19;1.50)
Outpatient contacts*		0.94 (0.88;1.02)	0.95 (0.88;1.02)	0.88 (0.81;0.96)	0.91 (0.84;0.99)	1.39 (1.25;1.54)	1.40 (1.25;1.56)	1.21 (1.13;1.30)	1.05 (0.98;1.13)
Primary care contacts**		0.92 (0.86;0.99)	0.95 (0.89;1.02)	0.95 (0.88;1.03)	0.96 (0.89;1.04)	1.66 (1.50;1.84)	1.57 (1.42;1.73)	1.38 (1.29;1.48)	1.16 (1.08;1.24)

*Over a 15 year period prior to interview **Over a 8 year period prior to interview; ***Adjusted for gender, age, smoking status, income, education and mean employment status

Table 4: Charlson Comorbidity Index and Morbidities

	Drinking groups					
Factor	Low-risk drinking	Moderate-risk drinking	High-risk drinking	AUD-T	Abstinent	p-value
CCI*						<0.001
CCI=0	1310 (66.2%)	421 (69.9%)	308 (66.0%)	138 (52.7%)	369 (53.4%)	

CCI=1-2	532 (26.9%)	144 (23.9%)	119 (25.5%)	86 (32.8%)	229 (33.1%)	
CCI=3-4	90 (4.6%)	27 (4.5%)	22 (4.7%)	26 (9.9%)	53 (7.7%)	
CCI≥5	46 (2.3%)	10 (1.7%)	18 (3.9%)	12 (4.6%)	40 (5.8%)	
CCI Morbidities:						
Any malignancy, including leukemia and lymphoma	214 (10.8%)	70 (11.6%)	63 (13.5%)	28 (10.7%)	89 (12.9%)	0.39
Diabetes (with or without organ damage)	155 (7.8%)	31 (5.1%)	24 (5.1%)	16 (6.1%)	115 (16.6%)	<0.001
Cerebrovascular disease	140 (7.1%)	33 (5.5%)	33 (7.1%)	25 (9.5%)	65 (9.4%)	0.051
Chronic pulmonary disease	109 (5.5%)	20 (3.3%)	28 (6.0%)	22 (8.4%)	66 (9.6%)	<0.001
Peripheral vascular disease	56 (2.8%)	18 (3.0%)	20 (4.3%)	20 (7.6%)	36 (5.2%)	<0.001
Myocardial infarction	54 (2.7%)	22 (3.7%)	18 (3.9%)	7 (2.7%)	31 (4.5%)	0.19
Congestive heart failure	47 (2.4%)	13 (2.2%)	16 (3.4%)	8 (3.1%)	26 (3.8%)	0.25
Connective tissue disease / Rheumatologic disease	38 (1.9%)	14 (2.3%)	5 (1.1%)	5 (1.9%)	23 (3.3%)	0.096
Ulcer disease	38 (1.9%)	16 (2.7%)	9 (1.9%)	16 (6.1%)	33 (4.8%)	<0.001
Metastatic solid tumor	33 (1.7%)	7 (1.2%)	9 (1.9%)	6 (2.3%)	17 (2.5%)	0.45
Liver disease (mild, moderate or severe)	21 (1.1%)	9 (1.5%)	13 (2.8%)	28 (10.7%)	17 (2.5%)	<0.001
Other*	35 (1.8%)	5 (0.8%)	9 (1.9%)	10 (3.8%)	24 (3.5%)	0.003

*CCI Charlson Comorbidity Index calculated over 15 years, **Other CCI morbidities including HIV/Aids Hemiplegia/Paraplegia, Dementia and Renal disease, grouped to ensure discretion of data.

Table 5: Results of the unadjusted and adjusted regression models on Charlson Comorbidity Index and Morbidities

Drinking groups

	Low-risk drinking	Moderate-risk drinking		High-risk drinking		AUD-T		Abstinent	
		Unadj, IRR (95% CI)	Adj***, IRR (95% CI)	Unadj, IRR (95% CI)	Adj***, IRR (95% CI)	Unadj, IRR (95% CI)	Adj***, IRR (95% CI)	Unadj, IRR (95% CI)	Adj***, IRR (95% CI)
CCI* 0-15 years before interview		0.92 (0.74;1.14)	0.96 (0.81;1.15)	1.28 (1.03;1.60)	1.13 (0.93;1.37)	1.76 (1.38;2.26)	1.41 (1.12;1.77)	1.53 (1.28;1.84)	1.38 (1.19;1.60)
		Unadj, OR (95% CI)	Adj, OR (95% CI)	Unadj, OR (95% CI)	Adj, OR (95% CI)	Unadj, OR (95% CI)	Adj, OR (95% CI)	Unadj, OR (95% CI)	Adj, OR (95% CI)
Any malignancy, including leukemia and lymphoma	Reference	1.08 (0.81;1.44)	1.07(0.80;1.43)	1.29 (0.95;1.74)	1.31(0.96;1.78)	0.99 (0.65;1.50)	1.01(0.64;1.58)	1.22 (0.94;1.59)	1.11(0.84;1.47)
Diabetes (with or without organ damage)		0.64 (0.43;0.95)	0.76(0.50;1.15)	0.64 (0.41;0.99)	0.59(0.38;0.93)	0.76 (0.45;1.30)	0.71(0.41;1.24)	2.35 (1.81;3.04)	1.97(1.49;2.62)
Cerebrovascular disease		0.76 (0.52;1.13)	0.87(0.58;1.29)	1 (0.67;1.48)	0.9(0.60;1.34)	1.38 (0.89;2.16)	0.96(0.59;1.58)	1.36 (1.00;1.85)	1.23(0.88;1.71)
Chronic pulmonary disease		0.59 (0.36;0.96)	0.64(0.39;1.05)	1.09 (0.71;1.68)	1.02(0.66;1.57)	1.57 (0.98;2.53)	1.26(0.77;2.08)	1.81 (1.32;2.49)	1.28(0.90;1.81)
Peripheral vascular disease		1.06 (0.62;1.81)	1.28(0.74;2.23)	1.54 (0.91;2.59)	1.35(0.79;2.31)	2.84 (1.67;4.81)	1.92(1.06;3.45)	1.89 (1.23;2.89)	1.49(0.92;2.42)
Myocardial infarct		1.35 (0.82;2.24)	1.78(1.07;2.98)	1.43 (0.83;2.46)	1.41(0.81;2.45)	0.98 (0.44;2.17)	0.99(0.41;2.41)	1.67 (1.07;2.63)	1.57(0.96;2.58)
Congestive heart failure		0.91 (0.49;1.69)	1.23(0.66;2.29)	1.46 (0.82;2.59)	1.22(0.68;2.20)	1.29 (0.60;2.77)	0.85(0.38;1.92)	1.61 (0.99;2.61)	1.4(0.85;2.31)
Connective tissue disease / Rheumatologic disease		1.22 (0.65;2.26)	1.21(0.64;2.28)	0.55 (0.22;1.41)	0.53(0.20;1.35)	0.99 (0.39;2.55)	0.71(0.27;1.88)	1.76 (1.04;2.97)	1.21(0.70;2.10)
Ulcer disease		1.39 (0.77;2.52)	1.63(0.90;2.96)	1 (0.48;2.09)	0.92(0.44;1.91)	3.32 (1.82;6.04)	2.71(1.42;5.20)	2.56 (1.59;4.12)	2.1(1.26;3.53)
Metastatic solid tumor		0.69 (0.31;1.58)	0.69(0.30;1.55)	1.16 (0.55;2.44)	1.19(0.56;2.54)	1.38 (0.57;3.33)	1.5(0.56;4.01)	1.49 (0.82;2.69)	1.55(0.86;2.80)
Liver disease (mild, moderate or severe)		1.41 (0.64;3.11)	1.47(0.66;3.31)	2.67 (1.33;5.37)	2.22(1.08;4.57)	11.15 (6.23;19.95)	6.3(3.25;12.24)	2.35 (1.23;4.48)	1.57(0.77;3.22)
Other**		0.46 (0.18;1.19)	0.62(0.24;1.60)	1.09 (0.52;2.29)	1.09(0.50;2.37)	2.2 (1.08;4.50)	2.05(0.83;5.04)	2 (1.18;3.38)	1.44(0.81;2.56)

*CCI Charlson Comorbidity Index; **Other CCI morbidities including HIV/Aids Hemiplegia/Paraplegia, Dementia and Renal disease, grouped to ensure discretion of data; ***Adjusted for gender, age, income, education and mean employment status

Appendix table 1: Results of the unadjusted and adjusted regression models on Inpatient, Outpatient and Primary Care Contacts by year

		Drinking groups							
		Low-risk drinking	Moderate-risk drinking		High-risk drinking		AUD-T		Abstinent	
	Time to interview (years)		Unadj, RR (95% CI)	Adj*, RR (95% CI)	Unadj, RR (95% CI)	Adj*, RR (95% CI)	Unadj, RR (95% CI)	Adj*, RR (95% CI)	Unadj, RR (95% CI)	Adj*, RR (95% CI)
Inpatient contacts	1	Reference	1.02 (0.77;1.36)	1.10 (0.82;1.47)	1.05 (0.77;1.44)	1.03 (0.75;1.42)	2.04 (1.43;2.91)	1.86 (1.25;2.77)	1.46 (1.13;1.88)	1.47 (1.12;1.91)
	2		0.82 (0.60;1.12)	0.87 (0.63;1.19)	1.29 (0.95;1.76)	1.30 (0.95;1.79)	1.89 (1.31;2.73)	1.89 (1.25;2.84)	1.91 (1.49;2.46)	1.80 (1.38;2.33)
	3		0.71 (0.51;1.00)	0.83 (0.59;1.16)	1.07 (0.76;1.49)	1.08 (0.77;1.52)	2.47 (1.71;3.57)	2.07 (1.36;3.15)	1.66 (1.27;2.18)	1.57 (1.19;2.07)
	4		0.95 (0.69;1.31)	1.03 (0.75;1.44)	1.24 (0.89;1.73)	1.26 (0.89;1.77)	2.49 (1.72;3.61)	2.50 (1.65;3.80)	1.74 (1.32;2.28)	1.45 (1.10;1.93)
	5		0.80 (0.57;1.13)	0.92 (0.65;1.31)	1.13 (0.79;1.61)	1.12 (0.78;1.61)	2.10 (1.40;3.14)	1.94 (1.24;3.03)	1.27 (0.94;1.71)	1.21 (0.88;1.65)
	6		0.95 (0.68;1.33)	0.93 (0.66;1.32)	1.29 (0.92;1.83)	1.37 (0.97;1.94)	1.60 (1.05;2.42)	1.41 (0.88;2.25)	1.69 (1.27;2.24)	1.50 (1.11;2.01)
	7		1.07 (0.77;1.49)	1.14 (0.81;1.61)	1.60 (1.14;2.24)	1.68 (1.18;2.39)	1.44 (0.93;2.23)	1.55 (0.95;2.52)	1.60 (1.20;2.15)	1.43 (1.05;1.94)
	8		0.98 (0.71;1.37)	0.93 (0.66;1.30)	0.94 (0.65;1.37)	0.97 (0.66;1.41)	1.98 (1.33;2.94)	1.50 (0.97;2.32)	1.39 (1.04;1.86)	1.13 (0.84;1.54)
	9		1.02 (0.74;1.40)	0.98 (0.71;1.36)	0.75 (0.51;1.11)	0.78 (0.53;1.16)	0.91 (0.57;1.44)	0.92 (0.56;1.52)	1.47 (1.11;1.94)	1.27 (0.95;1.70)
	10		1.03 (0.73;1.47)	1.09 (0.77;1.56)	1.03 (0.70;1.51)	1.13 (0.76;1.67)	1.07 (0.66;1.75)	0.98 (0.58;1.68)	1.74 (1.29;2.36)	1.50 (1.09;2.05)
	11		0.87 (0.61;1.24)	0.90 (0.62;1.29)	0.96 (0.65;1.41)	0.90 (0.60;1.34)	1.34 (0.86;2.11)	1.08 (0.65;1.77)	1.70 (1.27;2.28)	1.43 (1.05;1.94)
	12		0.89 (0.61;1.30)	0.90 (0.61;1.32)	0.92 (0.61;1.39)	0.89 (0.58;1.37)	1.45 (0.90;2.33)	1.15 (0.68;1.94)	1.92 (1.40;2.61)	1.54 (1.11;2.14)
	13		0.75 (0.50;1.12)	0.76 (0.50;1.15)	0.63 (0.39;1.01)	0.60 (0.36;0.98)	1.49 (0.92;2.43)	1.53 (0.88;2.66)	1.43 (1.02;2.00)	1.33 (0.93;1.89)
	14		0.84 (0.57;1.24)	0.92 (0.62;1.37)	0.85 (0.55;1.31)	0.88 (0.57;1.36)	1.24 (0.75;2.05)	1.22 (0.70;2.11)	1.61 (1.16;2.23)	1.40 (1.00;1.97)
	15		0.66 (0.44;0.99)	0.63 (0.41;0.96)	0.99 (0.66;1.48)	1.04 (0.69;1.57)	1.49 (0.94;2.36)	1.55 (0.94;2.56)	1.35 (0.98;1.86)	1.19 (0.85;1.67)

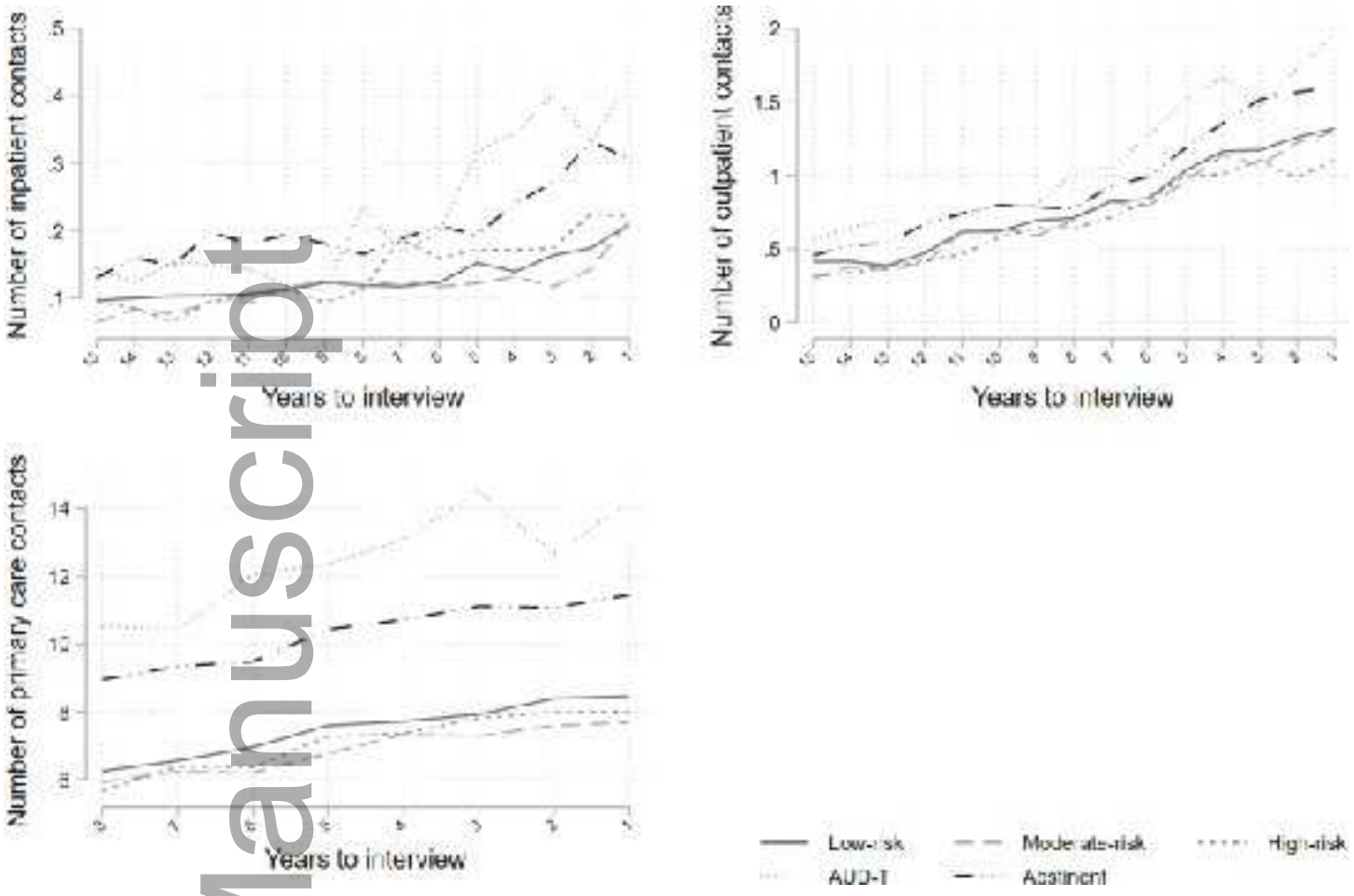
*Adjusted for gender, age, smoking status, same years income, education, and same years employment status

Appendix table 1 continued: Results of the unadjusted and adjusted regression models on Inpatient, Outpatient and Primary Care Contacts by year

Drinking groups

		Low-risk drinking	Moderate-risk drinking		High-risk drinking		AUD-T		Abstinent	
	Time to interview (years)		Unadj, RR (95% CI)	Adj*, RR (95% CI)	Unadj, RR (95% CI)	Adj*, RR (95% CI)	Unadj, RR (95% CI)	Adj*, RR (95% CI)	Unadj, RR (95% CI)	Adj*, RR (95% CI)
Outpations contacts	1		0.98 (0.86;1.12)	0.97 (0.85;1.11)	0.83 (0.72;0.97)	0.87 (0.74;1.01)	1.48 (1.24;1.77)	1.62 (1.33;1.97)	1.21 (1.07;1.37)	1.17 (1.03;1.33)
	2		0.97 (0.85;1.11)	0.93 (0.81;1.06)	0.78 (0.67;0.91)	0.83 (0.71;0.97)	1.37 (1.15;1.64)	1.54 (1.27;1.88)	1.24 (1.10;1.40)	1.15 (1.01;1.30)
	3		0.91 (0.80;1.04)	0.90 (0.79;1.03)	0.94 (0.81;1.08)	1.00 (0.86;1.15)	1.24 (1.04;1.49)	1.35 (1.11;1.65)	1.29 (1.15;1.46)	1.22 (1.08;1.37)
	4		0.98 (0.86;1.11)	0.94 (0.82;1.07)	0.87 (0.75;1.00)	0.92 (0.79;1.06)	1.43 (1.20;1.70)	1.53 (1.27;1.86)	1.16 (1.03;1.31)	1.05 (0.93;1.19)
	5		0.93 (0.81;1.07)	0.93 (0.81;1.08)	0.96 (0.82;1.13)	0.99 (0.84;1.16)	1.47 (1.22;1.77)	1.46 (1.19;1.79)	1.15 (1.01;1.31)	1.05 (0.92;1.20)
	6		0.94 (0.80;1.10)	0.89 (0.76;1.05)	0.98 (0.83;1.17)	1.06 (0.88;1.26)	1.50 (1.22;1.85)	1.76 (1.39;2.22)	1.18 (1.02;1.36)	1.10 (0.94;1.28)
	7		0.99 (0.85;1.17)	0.95 (0.81;1.12)	0.87 (0.72;1.04)	0.93 (0.77;1.12)	1.28 (1.03;1.59)	1.40 (1.10;1.77)	1.12 (0.97;1.30)	0.96 (0.82;1.12)
	8	Reference	0.98 (0.81;1.17)	0.96 (0.80;1.16)	0.90 (0.73;1.10)	0.91 (0.74;1.13)	1.43 (1.12;1.83)	1.33 (1.02;1.74)	1.09 (0.92;1.29)	0.98 (0.82;1.17)
	9		0.85 (0.71;1.02)	0.86 (0.72;1.04)	0.93 (0.76;1.13)	0.98 (0.80;1.20)	1.15 (0.90;1.48)	1.08 (0.83;1.42)	1.13 (0.96;1.34)	1.01 (0.85;1.20)
	10		1.04 (0.86;1.25)	1.06 (0.88;1.28)	0.93 (0.75;1.15)	0.98 (0.79;1.21)	1.29 (1.00;1.66)	1.23 (0.94;1.63)	1.29 (1.08;1.53)	1.09 (0.91;1.30)
	11		0.99 (0.83;1.19)	1.01 (0.84;1.21)	0.75 (0.61;0.93)	0.78 (0.63;0.96)	1.20 (0.94;1.53)	1.23 (0.94;1.62)	1.20 (1.01;1.41)	1.07 (0.90;1.27)
	12		0.85 (0.70;1.05)	0.85 (0.69;1.04)	0.89 (0.71;1.11)	0.90 (0.71;1.13)	1.49 (1.14;1.93)	1.34 (1.00;1.79)	1.42 (1.19;1.70)	1.17 (0.97;1.42)
	13		0.93 (0.75;1.16)	0.94 (0.75;1.17)	0.98 (0.77;1.24)	1.00 (0.78;1.27)	1.80 (1.37;2.36)	1.76 (1.30;2.37)	1.40 (1.15;1.69)	1.28 (1.05;1.56)
	14		0.91 (0.74;1.13)	0.99 (0.80;1.22)	0.81 (0.64;1.03)	0.82 (0.65;1.05)	1.57 (1.20;2.06)	1.49 (1.11;2.01)	1.27 (1.05;1.53)	1.10 (0.91;1.35)
	15		0.73 (0.59;0.90)	0.74 (0.60;0.93)	0.76 (0.60;0.96)	0.73 (0.57;0.93)	1.36 (1.04;1.78)	1.21 (0.90;1.63)	1.10 (0.91;1.33)	0.98 (0.80;1.19)
Primary care contacts	1		0.91 (0.83;0.99)	0.93 (0.85;1.02)	0.95 (0.86;1.05)	0.95 (0.86;1.05)	1.68 (1.48;1.89)	1.66 (1.45;1.89)	1.35 (1.25;1.47)	1.26 (1.16;1.37)
	2		0.90 (0.83;0.99)	0.94 (0.86;1.03)	0.95 (0.86;1.05)	0.96 (0.87;1.05)	1.51 (1.34;1.70)	1.49 (1.31;1.70)	1.32 (1.22;1.43)	1.22 (1.13;1.33)
	3		0.92 (0.84;1.01)	0.97 (0.88;1.06)	0.99 (0.89;1.09)	1.00 (0.90;1.11)	1.83 (1.62;2.08)	1.83 (1.59;2.09)	1.40 (1.29;1.53)	1.28 (1.18;1.40)
	4	Reference	0.95 (0.87;1.04)	0.99 (0.91;1.09)	0.95 (0.86;1.06)	0.97 (0.88;1.08)	1.70 (1.49;1.93)	1.67 (1.46;1.92)	1.39 (1.27;1.52)	1.24 (1.14;1.36)
	5		0.89 (0.81;0.98)	0.92 (0.84;1.01)	0.96 (0.86;1.06)	0.98 (0.88;1.08)	1.63 (1.43;1.85)	1.63 (1.42;1.88)	1.37 (1.26;1.50)	1.23 (1.13;1.35)
	6		0.89 (0.81;0.98)	0.89 (0.81;0.98)	0.92 (0.82;1.02)	0.94 (0.84;1.05)	1.73 (1.52;1.98)	1.72 (1.49;1.99)	1.36 (1.25;1.49)	1.18 (1.08;1.30)
	7		0.95 (0.87;1.05)	0.96 (0.88;1.06)	0.98 (0.88;1.08)	1.01 (0.91;1.12)	1.59 (1.40;1.82)	1.56 (1.35;1.79)	1.43 (1.30;1.56)	1.21 (1.11;1.33)
	8		0.95 (0.86;1.05)	0.95 (0.86;1.05)	0.91 (0.81;1.01)	0.93 (0.84;1.04)	1.68 (1.47;1.93)	1.57 (1.36;1.82)	1.43 (1.31;1.57)	1.19 (1.09;1.31)

*Adjusted for gender, age, smoking status, same years income, education, and same years employment status



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