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Sociodemographic Predictors of Transitions across Stages of Alcohol Use, Disorders and Remission in the National Comorbidity Survey-Replication

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Abstract

BACKGROUND—Although much is known about risk factors for the initiation of alcohol use, abuse and dependence, few population-based studies have examined the predictors of transitions *across* these stages.

AIM—To examine the sociodemographic predictors of transitions across six stages of alcohol use in the National Comorbidity Survey Replication (NCS-R) a nationally representative household survey of the U.S. population.

METHODS—A lifetime history of alcohol use, regular use (at least 12 drinks in a year), DSM-IV alcohol abuse and dependence with abuse was collected in 5692 NCS-R respondents using the WHO Composite International Diagnostic Interview (CIDI), Version 3.0.

RESULTS—Lifetime prevalence estimates were 91.7% for lifetime alcohol use, 72.9% for regular use, 13.2% for abuse, and 5.4% for dependence with abuse. Male sex, young age, non-Hispanic White race/ethnicity, low education, student status, and never being married predicted the **onset of alcohol use**, the transition from **use to regular use**, and from **regular use to abuse**. An early age of onset of alcohol use also predicted the latter transition. The transition from **abuse to dependence** was associated with an early age of onset of regular alcohol use, being previously married, and student status. **Remission** was predicted by young age, and a later age of onset of alcohol abuse.

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CONCLUSION—The reduced number and magnitude of factors associated with transitions to dependence and remission suggests qualitatively different risk factors at these stages relative to other stages of progression. Further knowledge is needed concerning the mechanisms underlying these differences in order to guide selective and indicated prevention programs.

Keywords

alcohol; abuse; dependence; remission; transitions

INTRODUCTION

Alcohol dependence has been estimated to affect between 8% and 14% of the U.S. population (1–3), and hazardous alcohol consumption (more than 20 g pure alcohol daily for women and more than 40 g daily for men) is common among non-dependent individuals (4). Considered together, the full spectrum of problematic alcohol use is estimated to be the seventh leading cause of premature death and disability in the U.S. (5), costing $185 billion annually (6).

Previous research has identified a wide array of risk factors for alcohol use, abuse and dependence, including several sociodemographic factors that show consistent associations across different population-based investigations. In particular, heavier alcohol use is more frequent among males, the unmarried, and less educated (7–11). Race appears to differentially affect risk, as several studies have reported decreased alcohol use, abuse or dependence in Asians (10,12,13) and non-Hispanic Blacks as compared to Whites (14). Cohort effects have also been observed indicating that alcohol use, abuse and dependence were more common among those born following World War II (1,7,15). Additionally, data from both retrospective (16) and longitudinal investigations (11,17) have underscored the important role of age of initial alcohol use in predicting future alcohol problems. .

Despite the considerable literature on the association between alcohol and sociodemographic characteristics, the role of these factors across the different stages of alcohol use, namely initial use, regular use, abuse and dependence is still unclear. The few investigations that have examined differential predictors of initiation of alcohol consumption and the transitions to subsequent stages of use have typically included a limited number of stages (such as the transition from use to dependence) or have included a restricted number of sociodemographic risk factors (1,18–20). For example, one of the only analyses of differential predictors of lifetime use and the transition to lifetime dependence did not include sex or age in adjusted regression analysis, even though age cohort was associated with lifetime dependence in univariate models (1). Another study using latent transition analysis to examine the transition into and out of large-effect drinking limited their analysis to young adults and did not include DSM-IV diagnoses of abuse and dependence (21). A similar study that found evidence to suggest that prevention and intervention targets may vary by different developmental periods also focused on young adults (22). Additionally, only a limited number of studies have investigated age of onset (11,16,17) as a predictor of transitions across stages. Finally, little is known about the sociodemographic correlates of remission from problematic alcohol use, despite some evidence that marital status, female gender and age may have important associations with this stage (23,24).

The lack of information on the sociodemographic predictors of transitions across the full trajectory of alcohol use constitutes an important barrier to identifying high-risk individuals and to improving the precision of existing prevention programs. The National Comorbidity Survey-Replication (NCS-R), a nationally representative sample of the U.S. population, has confirmed many of the general associations observed in the literature linking alcohol use disorders to younger age, male sex, work or student status, education and other

sociodemographic variables (14). The current report aims to further examine these associations in the NCS-R in order to determine how these sociodemographic factors affect transitions from: lifetime nonuse to use of alcohol; use to regular use; regular use to abuse; abuse to dependence; and from abuse-dependence to remission.

MATERIALS AND METHODS

Participants and Procedures

The NCS-R is a nationally representative face-to-face survey of the prevalence and correlates of DSM-IV mental disorders that was carried out between February 2001 and April 2003 (25). The sampling frame was English speaking adults (ages 18 years and older) residing in the civilian household population in the continental U.S. who were selected using a multi-stage clustered area probability design. The interviews were administered by professional interviewers from the Institute for Social Research at the University of Michigan (70.9% response rate). Interviewers explained the study and obtained verbal informed consent prior to beginning each interview. These recruitment and consent procedures were approved by the Human Subjects Committees of both Harvard Medical School and the University of Michigan.

The NCS-R was administered in two parts. Part I included demographic and core diagnostic assessments administered to all 9282 respondents. Part II included additional questions administered to all respondents who met criteria for at least one mental disorder during the Part I interview and a 25% probability sub-sample of other Part I respondents (n=5692). This sample was weighted to adjust for differential probabilities of selection within households and from the Part I sample, differences in intensity of recruitment effort among hard-to-recruit cases, and residual discrepancies between the sample and sociodemographic and geographic correlates of the 2000 Census. Further details concerning the design and weighting procedures are reported elsewhere (26).

Diagnostic Assessment

Assessment of alcohol use, abuse and dependence was based on Version 3.0 of the World Health Organization Composite International Diagnostic Interview (WHO-CIDI) (27), a fully structured interview that generates diagnoses according to definitions and criteria of both the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV) and International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) diagnostic systems. DSM-IV criteria are used in the current report. Good concordance was found in an NCS-R clinical reappraisal sub-sample between diagnoses of substance use disorders based on the CIDI and diagnoses based on blinded clinical reappraisal interviews using the Structured Clinical Interview for DSM-IV (SCID; (28)) (kappa values between 0.36 and 0.70) (15,29).

The alcohol module was administered to all respondents in the Part II sample. An initial screening question asked the age at which respondents first drank an alcoholic beverage. If the respondent reported ever drinking, a series of questions assessed drinking behavior and criteria for DSM-IV alcohol abuse and dependence. Alcohol variables examined in the present analyses include variables for six stages of alcohol use (never use, ever use, regular use (defined as ever drinking at least 12 drinks in a year), abuse, dependence and remission), as well as variables that represent the conditional use of alcohol in three of these stages (regular use among alcohol users, alcohol abuse among regular alcohol users, alcohol dependence among alcohol abusers). Remission was defined as the cessation of alcohol use and the absence of any symptoms for at least two years before interview.

Age-of-onset and transition variables

A number of age-of-onset (AOO) variables were created, including AOO of alcohol use ("How old were you the very first time you ever drank an alcoholic beverage?"), and AOO of regular drinking ("How old were you when you first started drinking at least 12 drinks in a year?"). The onset of alcohol abuse and alcohol dependence was defined as the ages at which *any* symptoms of abuse or dependence first occurred ("How old were you the very first time you had any of these problems?"). A fourth AOO variable determined the most recent age of having any symptom among respondents with a history of remitted alcohol abuse or dependence. Additional variables were created to represent the speed of transition between onset of first use and onset of first regular use among lifetime regular users, as well as the speed of transition between onset of first regular alcohol use and onset of abuse. Both of these speed-of-transition variables were calculated by taking the age of onset of the earlier stage of alcohol use and subtracting it from the age of onset of the later stage.

Sociodemographic Correlates

Sociodemographic correlates include age (defined by age at interview in categories 18–29 years, 30–44 years, 45–59 years, and ≥60 years), sex, race/ethnicity (Non-Hispanic Black, Non-Hispanic White, Hispanic, and Other), completed years of education (less than high school (0–11), high school (12), some college (13–15), and college graduate (16 or more), student status (student vs. non-student), and marital status (never married, previously married, and married/cohabitating). Information collected in the NCS-R for education (number of years of education), student status, and marital status (ever married, age of first marriage, age marriage ended) was used to treat these variables as time-varying covariates in our survival analyses (see below). Information on income was only collected at the time of interview (unlike the other variables covering every year of the person's life) and therefore was not included as a covariate in the survival models.

Statistical Analysis

The relationship between sociodemographic predictors and the six stages of alcohol use were determined by cross-tabulation analysis. Estimated projected AOO distributions of the cumulative lifetime probability of alcohol use, regular use, abuse and dependence as of age 60 were obtained by the actuarial method implemented in PROC LIFETEST in SAS (version 9.1.3, SAS Institute, Cary, N.C.).

Predictors of transitions across the six stages were examined using discrete-time survival analysis using the logit function with person-year as the unit of analysis (30). Standard errors and significant tests were estimated using the Taylor series linearization method (31) implemented in SUDAAN to adjust for design effects (Research Triangle Institute, 2004). Multivariate significance tests were made with Wald χ^2 tests using Taylor series design-based coefficient variance-covariance matrices. The result of this approach are similar to that obtained using a complementary log-log function and reporting hazard ratios, and was chosen as the preferred method due to easier interpretability. The person-year data array used in the transition from never use to first use includes all years in the life of the respondents prior to and including their age at having their first drink. The person-year data array for the following three stages of analysis (ever use to regular use, regular use to abuse, abuse to dependence) included all years beginning with the year after the earlier transition and continuing through the year of onset of the next transition or, for respondents who never made the next transition, through their age at interview. For the transition from abuse-dependence to remission, the person-year data array was defined as all years beginning in the year after the first onset of abuse (in the case of lifetime abusers who never developed dependence) or dependence and continuing either for two years after the most recent occurrence of any abuse-dependence symptom (which, as noted above, was our operational definition of remission) or until one year prior to age at

interview (in the case of respondents whose most recent abuse-dependence symptoms occurred more recently than two years before interview, who were defined as not remitted).

All survival equations included predictors for age at interview, sex, race-ethnicity, education (time-varying), student status (time-varying), marital status (time-varying), and person-year (time-varying). In addition, the equations for later stages included additional covariates on the onset and timing of earlier stages. This same process was applied in all equations that included information about multiple earlier transitions. The final models, however, included only those AOO/transition variables which showed consistent associations with the respective transition.

RESULTS

Prevalence of Alcohol Use, Abuse and Dependence

The vast majority of all respondents (91.7%, SE= 0.9) reported that they had at least a sip of alcohol at some time in their life, 72.9% (1.3) reported using alcohol regularly at some time in their life, 13.2% (0.6) met criteria for alcohol abuse at some time in their life, and 5.4% (0.3) of met criteria for alcohol dependence at some time in their life. Successive pairs of these prevalence estimates can be divided by each other to compute transition probabilities, with 79.5% (1.0) of ever users making the transition to regular use, 18.1% (0.8) of regular users going on to develop alcohol abuse, and 41.0% (1.6) of lifetime alcohol abusers making the transition to alcohol dependence. Of the respondents with a history of lifetime abuse and dependence, the proportions that had remitted were 79.1% (1.6) and 75.2% (3.1), respectively.

Age-of-Onset of Alcohol Use, Abuse and Dependence

The cumulative AOO curves for each successive stage of alcohol use are presented in Figure 1. The onset of each stage of alcohol use, whether it be first use, regular use, abuse or dependence, shows the sharpest increase in the decade between the early teens and the early 20s. Half of all projected lifetime users beginning use by age 16–17 years and more than half of all projected lifetime abusers and people with lifetime dependence meeting criteria for these disorders by age 21. The vast majority (over 90%) of projected lifetime abuse-dependence began by the mid-30s.

Age Effects

Cumulative AOO curves for regular alcohol use, abuse and dependence by age group are displayed in Figure 2. Alcohol use and use disorders were more common in younger as compared to older respondents, with the greatest differences found between the youngest (18–29) and oldest (60+) age groups (all $p<0.0001$). For example, 96.1% of the youngest age group (18–29 years) had used alcohol in comparison to 84.9% of the oldest age group (60+ years).Among drinkers, 77.9% of the youngest age group (18–29 years) had started regular use by the age of 18 years as opposed to only 56.2% of the oldest age group (60+ years). Similarly, over 10% and of the youngest age group (18–29) meets the criteria for alcohol abuse by 18 years as opposed to approximately 2% of the oldest group. Moreover, 6.1% of the youngest age group (18–29) is projected to meet criteria for alcohol dependence by 22, compared to 0.6% of the oldest age group (60+) who met criteria for dependence as of age 22.

Sociodemographic predictors of alcohol use and the transitions to abuse and dependence

Results from the discrete-time survival analyses are presented in Table 1. Onset of ever use was associated with being male, Non-Hispanic White, lower education or student status, never married at the time of onset, and less than 60 years of age. These sociodemographic characteristics were similarly associated with elevated risk of first onset of regular use among those who ever used alcohol and elevate risk of alcohol abuse among regular users. The

transition to alcohol abuse among regular users was also higher among regular users who reported early AOO of first alcohol use. The transition to alcohol dependence among alcohol abusers, unlike previous transitions, was not associated with gender, race-ethnicity, or age. This transition was associated, though, with student status, being previously married, and with an early AOO of regular alcohol use.

Sociodemographic predictors of remission from abuse and dependence

Results from discrete-time survival analysis of the sociodemographic predictors of remission from alcohol abuse and dependence are presented in Table 2. Remission of alcohol abuse without dependence was associated with a history of being previously married, non-student status, being less than 60 years of age, and with late AOO of alcohol abuse. Remission from alcohol dependence was also associated with increased education, being less than 60 years of age, and with later AOO of alcohol abuse.

DISCUSSION

The current study provides information about the importance of sociodemographic predictors of the transitions *across* the stages of alcohol use and related disorders. Although previous epidemiologic research has identified consistent sociodemographic risk factors for alcohol use, abuse and dependence independently (1,7–11,15), these studies did not assess the differential roles of these factors across the trajectory of alcohol use and disorders. From a clinical perspective, this lack of precision has hindered knowledge about the stages at which different individual characteristics may confer risk, and consequently may provide imprecise targets for selective or indicated prevention efforts. Knowledge of the differential role of sociodemographic risk factors across the full trajectory of alcohol use and disorders is therefore essential for improving prevention strategies that target at-risk individuals, and such information should reduce transition to subsequent stages of use across the lifetime.

The majority (72.9%) of this U.S. sample reported a lifetime history of regular alcohol use, more than 10% of the sample met lifetime criteria for abuse and 5% met criteria for abuse and dependence. Although all sociodemographic variables examined here were significantly associated with at least one stage of transition, the findings demonstrate that their importance varied across stages. Male sex, younger age, white ethnicity, lower education, and never or previous married status were generally consistent predictors of the onset and transition from use to regular use, and from regular use to abuse. These findings are in agreement with previous literature that showed more frequent alcohol use in individuals with these characteristics (1, 7–14). However, the present results expand on previous literature by also clarifying that these factors (with the exception of student status and a previous marriage) were *not* associated with the transition to alcohol dependence. Furthermore, many of these variables were unassociated with the remission of either alcohol abuse or dependence. Younger age was the only consistent predictor of remission from both alcohol abuse and dependence, while students were less likely to remit.

The transition to both alcohol abuse and dependence were both associated with an early age of onset. The transition from regular use to abuse was associated with early onset of use and the transition from abuse to dependence was associated with an early onset of abuse. These findings are in agreement with previous literature indicating that individuals with an earlier age at onset are more likely to progress to alcohol abuse and dependence (11,32,33). Remission from abuse and dependence was also predicted by age at onset, but as may be expected from research demonstrating the role of early age at onset as a marker of disorder severity (16,17, 19), a *later* age at onset of alcohol abuse increased the chance of remission. The finding that younger respondents were also more likely to remit may be attributable to shifts in contextual influences as young people move across different educational and employment settings,

transitions to use of other drugs because of increased availability, or to differential interpretation of questions about alcohol dependence across age groups.

Concerning reasons for the differential importance of sociodemographic predictors across the transitions examined, one possibility is that environmental, cultural or societal variables play a greater role in earlier phases of use, while transition to alcohol use disorders are more influenced by biological or genetic factors. For example, the results of several twin studies demonstrated that genetic factors had greater influence on the development of alcohol dependence and persistence than on early stages of alcohol use (18,34). Another study using latent transition analysis showed that respondents with a family history of alcoholism were less likely to transition out of large-effect drinking (21). Prospective studies have also shown that the role of familial factors increases with the severity of drinking problems (35). For example, a recent prospective population-based study of drinkers 18 years and older in a Northeastern US showed that drinking to reduce negative affect or for social facilitation increased the risk of alcohol dependence 10 years later if they also had a family history of alcoholism (36).

Strengths of the current investigation include its use of a nationally representative dataset that encompasses individuals of a wide age range, and its capacity to distinguish between different stages of alcohol use. Respondents were also provided information necessary for distinguishing age of onset for each of these distinct alcohol stages, which allows examination of how the age of onset for a given stage may influence the transition to more severe stages as well as to remission. Finally, the use of discrete-time survival analysis permitted the modeling of transitions to subsequent stages of alcohol use while accounting for those individuals who may not have passed through the period of risk.

There are several limitations of the design and analyses of this study that should be taken into account in interpreting these findings. First, the ages of onset for the different stages of alcohol use were obtained through retrospective assessment, of which may be biased by the tendency of participants to report events closer to the time of interview than is accurate (37). However, although estimates of age of onset do tend to increase with age, this does not indicate that the rank ordering for the different events is affected. Second, sociodemographic factors may not be constant across our category of regular drinking because of the likely heterogeneity of this category. Third, the inability of the CIDI discriminate alcohol dependence without abuse may have led to reduced prevalence estimates for dependence; however, this limitation should not have altered the magnitude or significance of sociodemographic risk factors (38). Fourth, as only the age of onset for the first symptom of abuse was collected from participants, the NCS-R is also unable to distinguish the onset of abuse from that of dependence. Fifth, t the analyses focused on a limited number of sociodemographic variables. Research has identified additional population-based risk factors, and future research may benefit from qualifying their role across different stages of alcohol use, abuse, dependence and remission. Longitudinal investigations are needed to confirm the present findings and examine mechanisms underlying the shared and unique predictors of transitions across the stages of alcohol use and related conditions, as well as to promote the application of this knowledge to the development or improvement of selective or indicated prevention programs.

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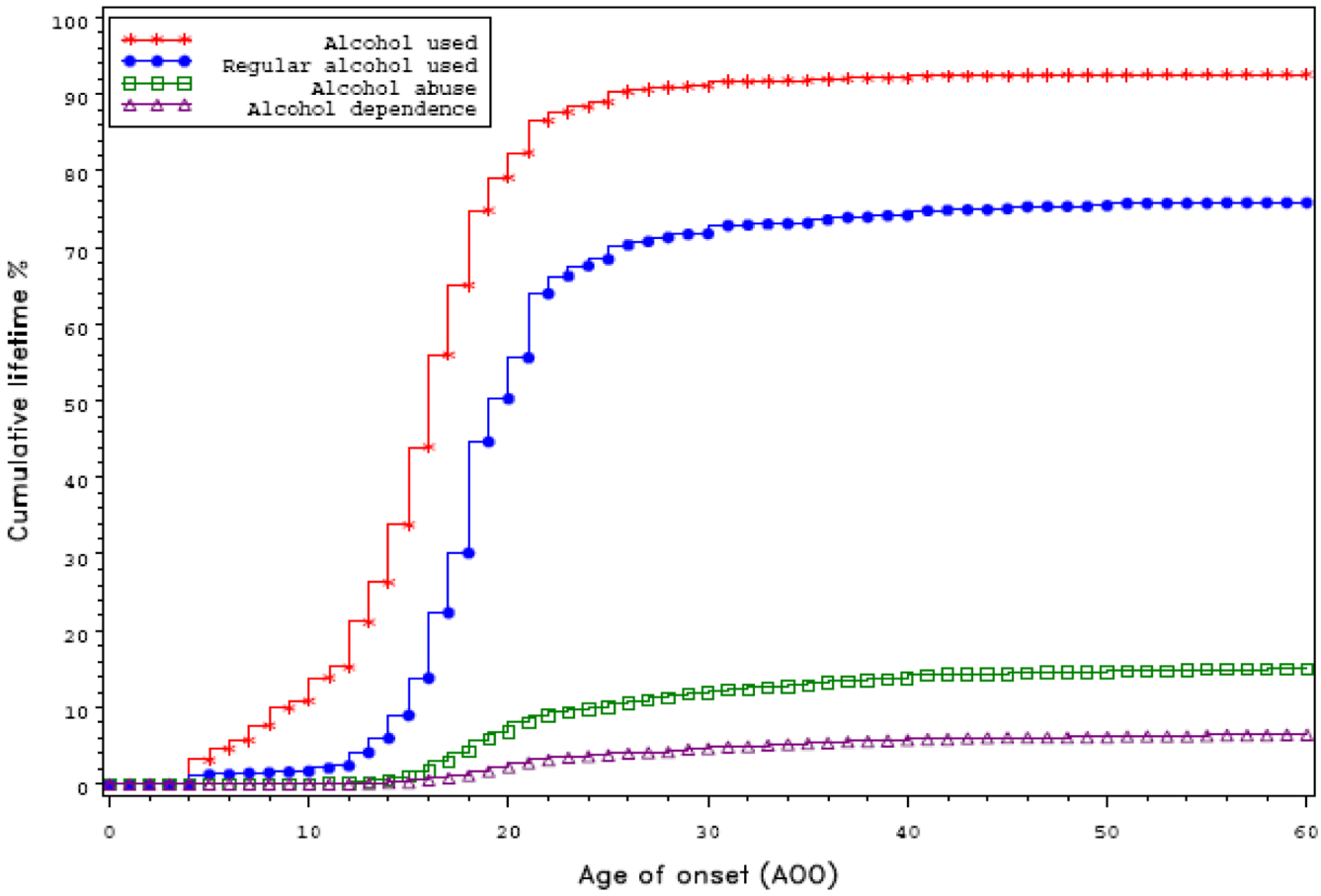

Figure 1.
Age-of-onset of alcohol use, regular use, abuse and Dependence of each user in the total Part II sample

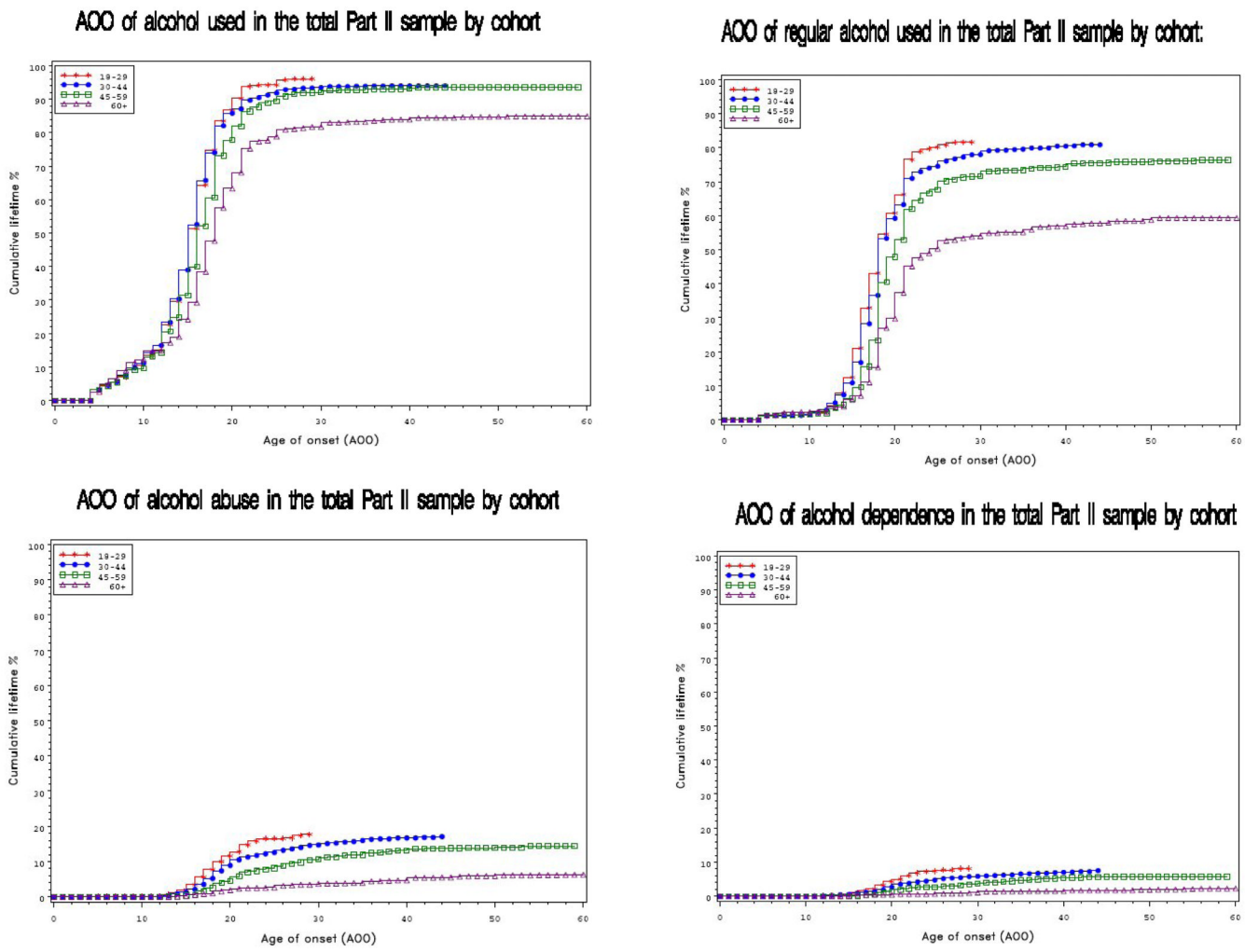

Figure 2.
Age-of-onset of alcohol stages according to cohort

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Table 1

Sociodemographic risk factors for the transition to discrete stages of alcohol-related outcomes.

		Ever used alcohol among the Part II Sample (n=5692)		Regular use of alcohol among alcohol users (n=5318)		Alcohol Abuse among regular alcohol users (n=4378)		Alcohol Dependence among alcohol abusers (n=1027)	
Socio-demographic	**Sociodemographic Category**	**OR**	**(95% CI)**	**OR**	**(95% CI)**	**OR**	**(95% CI)**	**OR**	**(95% CI)**
Age at Interview	18–29	2.34*	(2.04–2.70)	2.08*	(1.81–2.40)	3.28*	(2.49–4.32)	1.23	(0.80–1.911.90)
	30–44	2.21*	(1.93–2.52)	1.72*	(1.49–2.00)	2.31*	(1.71–3.12)	1.01	(0.73–1.40)
	45–59	1.80*	(1.52–2.14)	1.45*	(1.27–1.67)	2.07*	(1.48–2.89)	1.07	(0.72–1.58)
	60+	1.0	---	1.0	---	1.0	---	1.0	---
Sex	Female	0.75*	(0.71–0.80)	0.61*	(0.56–0.68)	0.53*	(0.45–0.63)	1.12	(0.88–1.43)
	Male	1.0	---	1.0	---	1.0	---	1.0	---
Race-ethnicity	Hispanic	0.83*	(0.69–0.99)	0.74*	(0.58–0.93)	1.05	(0.75–1.46)	1.10	(0.74–1.65)
	Non-Hispanic Black	0.66*	(0.56–0.78)	0.70*	(0.60–0.81)	0.77*	(0.60–0.99)	0.70	(0.45–1.09)
	Other	0.74*	(0.58–0.96)	0.87	(0.68–1.12)	1.41	(0.88–2.25)	1.00	(0.60–1.67)
	Non-Hispanic White	1.0	---	1.0	---	1.0	---	1.0	---
Education	Student	2.48*	(1.13–5.43)	1.47*	(1.11–1.94)	2.55*	(1.69–3.87)	1.90*	(1.03–3.49)
	Low (0–11 yrs)	4.93*	(2.12–11.47)	1.85*	(1.39–2.47)	3.29*	(2.24–4.83)	1.39	(0.77–2.51)
	Low/Medium (12 yrs)	5.36*	(2.44–11.78)	1.99*	(1.51–2.62)	2.20*	(1.57–3.08)	1.55	(0.85–2.80)
	Medium (13–15 yrs)	5.14*	(2.20–11.97)	1.76*	(1.34–2.32)	1.42	(0.90–2.23)	1.59	(0.91–2.79)
	High (16+ yrs)	1.0	---	1.0	---	1.0	---	1.0	---
Marital status	Never married	7.70*	(5.04–11.74)	1.94*	(1.54–2.44)	1.58*	(1.23–2.02)	1.25	(0.93–1.68)
	Previously Married	0.28*	(0.15–0.54)	1.37*	(1.09–1.72)	2.66*	(1.92–3.68)	1.66*	(1.08–2.53)
	Married/Cohabiting	1.0	---	1.0	---	1.0	---	1.0	---
Onset	Age of onset of first alcohol use	---	---	1.02*	(1.00–1.03)	0.95*	(0.93–0.96)	---	---
	Age of onset of regular alcohol use	---	---	---	---	---	---	0.94*	(0.91–0.98)

Results are based on multivariate discrete-time survival model with person-year as the unit of analysis

*OR significant at the 0.05 level, 2-sided test

Table 2

Predictors of remission of alcohol-related outcomes

		Remission of alcohol abuse without dependence (n=584)		Remission of alcohol dependence (n=443)	
Socio-demographic	**Sociodemographic Category**	**OR**	**(95% CI)**	**OR**	**(95% CI)**
Age at Interview	18–29	11.58*	(5.76–23.24)	23.40*	(8.81–62.16)
	30–44	4.64*	(2.79–7.71)	5.25*	(2.60–10.61)
	45–59	1.97*	(1.44–2.69)	2.65*	(1.51–4.67)
	60+	1.0	---	1.0	---
Sex	Female	1.25	(0.91–1.72)	1.12	(0.88–1.42)
	Male	1.0	---	1.0	---
Race-ethnicity	Hispanic	1.15	(0.81–1.62)	0.76	(0.38–1.52)
	Non-Hispanic Black	0.88	(0.61–1.28)	1.04	(0.67–1.60)
	Other	1.26	(0.85–1.86)	1.00	(0.65–1.54)
	Non-Hispanic White	1.0	---	1.0	---
Education	Student	0.52*	(0.30–0.90)	0.33*	(0.15–0.70)
	Low (0–11 yrs)	0.86	(0.49–1.50)	0.67	(0.44–1.01)
	Low/Medium (12 yrs)	1.00	(0.67–1.47)	0.65*	(0.44–0.96)
	Medium (13–15 yrs)	0.91	(0.56–1.47)	1.00	(0.67–1.49)
	High (16+ yrs)	1.0	---	1.0	---
Marital status	Never married	1.16	(0.83–1.61)	0.81	(0.57–1.15)
	Previously Married	1.57*	(1.25–1.97)	1.19	(0.82–1.72)
	Married/Cohabiting	1.0	---	1.0	---
Onset	Age of onset of alcohol abuse	1.08*	(1.06–1.10)	1.08*	(1.06–1.11)

Results are based on multivariate discrete-time survival model with person-year as the unit of analysis

*OR significant at the 0.05 level, 2-sided test