# Birth-sex cohort alcohol use transitions in the general population: the cross-sectional PEGASUS-Murcia project

## *Las transiciones en el uso de alcohol en una cohorte de nacimiento-sexo en la población general: el proyecto transversal PEGASUS-Murcia*

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## Abstract

To examine the potential impact of prevalence of alcohol use in a birth-sex cohort on subsequent initiation and progression of alcohol use in the PEGASUS-Murcia project, a cross-sectional survey of a representative sample of non-institutionalized adults in Murcia (Spain). Data on lifetime history of alcohol use, DSM-IV use disorders, and remission were collected from 1,459 adults using face-to-face interviewers based on the Composite International Diagnostic Interview (CIDI 3.0). Life-table estimates based on survival functions for alcohol use age-of-onset and remission were used as time-varying predictors of subsequent individual-level alcohol use in discrete-time survival models. Nearly nine out of ten adults had a lifetime alcohol use history at time of interview. Of these lifetime users, 84.3% became regular users (>12 drinks a year) and 5.5-1.6% went on to meet criteria for DSM-IV alcohol abuse or dependence, respectively. By the age of 18, 70.9% of respondents had used alcohol, and one half (50.2%) had used regularly. Regular use sharply increased during early adulthood to reach 90.8% by age 22. Birth-sex cohort alcohol use was significantly and positively associated with increased odds of all subsequent transitions examined except for the transition from use to abuse. The findings highlight sensitive periods with rapid transitions to higher levels of alcohol use and emphasize the importance of cohort experiences in the full spectrum of stages of alcohol use. These results may contribute to predicting population-levels trends in alcohol-related problems in Spain.

*Keywords:* Alcohol; Abuse; Cohort-use; Dependence; Remission.

## Resumen

Examinar el impacto potencial de la prevalencia de uso de alcohol en una cohorte de nacimiento-sexo en el inicio y progresión del uso de alcohol en el proyecto PEGASUS-Murcia, encuesta transversal en una muestra representativa de adultos no institucionalizados de Murcia (España). Se entrevistaron personalmente a 1.459 adultos sobre consumo de alcohol a lo largo de la vida, trastornos por uso de alcohol (criterios DSM-IV) y remisión utilizando la Entrevista Diagnóstica Internacional Compuesta (CIDI 3.0). Se calcularon estimaciones de tablas de vida basadas en las funciones de supervivencia para la edad de inicio en el uso de alcohol y su remisión en modelos de supervivencia de tiempo discreto. Casi nueve de cada diez adultos tuvieron una historia de uso de alcohol a lo largo de la vida. Entre ellos, 84,3% desarrolló un uso regular (> 12 bebidas por año) y 5,5% y 1,6% cumplieron criterios DSM-IV de Abuso y Dependencia de alcohol, respectivamente. A los 18 años, 70,9% había usado alcohol, 50,2% de forma regular, con un aumento brusco en adultos jóvenes (90,8% a los 22 años). El uso de alcohol de la cohorte de nacimiento-sexo se asoció significativamente con mayores probabilidades para todas las transiciones examinadas, excepto en la transición uso-abuso. Se detectan períodos sensibles con transiciones rápidas a niveles más altos de uso de alcohol. Las experiencias de cohortes en todas las etapas del consumo de alcohol son importantes. Estos resultados podrían contribuir a la predicción de las tendencias poblacionales de los problemas con el alcohol en España.

*Palabras clave:* Alcohol; Abuso; Cohorte; Dependencia; Remisión.

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According to the Spanish Observatory on Drugs and Drug Abuse (Observatorio Español de la Droga y las Toxicomanías, 2017), more than 90% of Spanish citizens had used alcohol at least once in their life between 2009-2015 with daily alcohol consumption among 9.3% of the population (Gual et al., 2016). Alcohol consumption per capita among individuals 15 years and above in Spain is estimated at 11.2 liters per year (World Health Organization, 2014) and alcoholism is considered to be a major public health problem (Pérez, 2002). Since the mid 1970's, overall alcohol consumption decreased due mostly to a decrease in wine consumption. As of 2010, 50% of recorded alcohol consumption was beer, followed by spirits (28%) and wine (20%). As is the case in Spain, most adults living in Western cultures have used alcohol at some point in their life (Degenhardt et al., 2008), however only a small portion develops an alcohol use disorder (AUD) (Demyttenaere et al., 2004). Considering the severity of alcohol-related burden of disease (Rehm, Gmel & Gual, 2013; Rehm et al., 2009), there has been extensive research to identify factors associated with the risk of transitioning from earlier to later stages of alcohol use.

Male sex, lower education level, ethnicity, exposure to traumatic events, prior mental disorders, and age of first alcohol use have been associated with greater risk of transitioning from alcohol use to alcohol use disorders (DeWit, Adlaf, Offord & Ogborne, 2000; Flórez-Salamanca et al., 2013; Grant, 1997; Kalaydjian et al., 2009; Lee et al., 2009; Lev-Ran, Imtiaz, Rehm & Le Foll, 2013; Lopez-Quintero et al., 2011; Oberleitner, Smith, Weinberger, Mazure & McKee, 2015; Probst, Moyo, Purshouse & Rehm, 2015; Silveira et al., 2011; Suliman, Seedat, Williams & Stein, 2010; Werner et al., 2016). In addition, contextual factors including peer substance use, period, birth-sex cohort and age have been shown to affect both a given population's use of alcohol (Degenhardt, Stockings, Patton, Hall & Lynskey, 2016; Grant, 1997; Rehm et al., 2015) and transitions from use to disorders (Grant, 1997). Yet, the role of birth-sex cohort use in the full spectrum of transitions from use to AUDs and from AUDs to remission remains unclear. Studies that have examined factors associated with the full trajectory of alcohol use have provided evidence of differential risk of contextual factors as a function of the stage of progression (Abdin, Subramaniam, Vaingankar & Chong, 2013; Carballo, Fernandez-Hermida, Secades-Villa & García-Rodríguez, 2008; Carballo et al., 2008; Kalaydjian et al., 2009; Lee et al., 2009; Silveira et al., 2011), reinforcing the need to include the full spectrum of alcohol transitions when examining specific risk factors.

The study seeks to examine the role of cohort use in the natural history of alcohol use and use disorders in a representative sample of the general population of Murcia, one of 17 autonomous regions of Spain. The specific objectives are to identify the age of onset and time to transition between various stages of alcohol use in the general population of Murcia, and to estimate the association of birth-sex cohort alcohol use with the probability of transitioning to regular alcohol use, use disorder, and remission from abuse.

## Method

### *Procedure and participants*

The Psychiatric Enquiry to General Population in Southeast Spain-Murcia (PEGASUS-Murcia) project is a cross-sectional general population survey that is part of the World Mental Health (WMH) Survey Initiative (http://www.hcp.med.harvard.edu/wmh/). The study was carried out between 2010 and 2012 and was designed to collect data on the prevalence, age of onset, burden, treatment, and correlates of common mental disorders in a representative sample of the general population of adults residing in the Murcia region (Navarro-Mateu et al., 2013b; Navarro-Mateu et al., 2015). The overall response rate was 67.7%. After obtaining written consent for participation, face-to-face computer-assisted interviews were conducted by trained lay-interviewers with 2,621 adults 18 or older. As described in detail previously (Navarro-Mateu et al., 2013b), interviews were divided into two parts to reduce participant burden: Part 1 and Part 2. Part 1 was administered to all participants and included the core diagnostic assessment of mood and anxiety disorders. Part 2 comprised the assessment of additional mental disorders including alcohol use disorders and was administered to respondents who had endorsed mood and anxiety symptoms, and to a probability subsample of those who had not endorsed such symptoms. The present study is based on the Part 2 sample (n=1,459) for which data on alcohol use and alcohol use disorders were collected. The protocol was approved by the Clinical Ethics Research Committee of the University Hospital Virgen de la Arrixaca of Murcia. The present study has been written in accordance with the STROBE (Strengthening The Reporting of Observational Studies in Epidemiology) statement guidelines (von Elm et al., 2007).

### *Measures: Alcohol use and stages of use*

The Spanish adaptation (Navarro-Mateu et al., 2013a) of the CAPI (Computer Assisted Personal Interviewing) version of the WHO Composite International Diagnostic Interview 3.0 (hereafter referred to as the CIDI) (Kessler & Ustun, 2004) was used to ascertain the presence of Diagnostic and Statistical Manual of Mental Disorders, Fourth edition (DSM-IV) (American Psychiatric Association, 2000) alcohol use disorders (AUDs). Alcohol use was defined as having ever consumed a standard alcoholic beverage, including beer, wine, wine coolers, or hard liquor. Regular use was defined as having 12 alcoholic drinks or

more in a one-year period. Questions regarding alcohol abuse and dependence were asked of all persons who, in the year they drank most, either consumed alcohol at least once per week, or drank five or more drinks per day on the days they drank. Remission was defined as the absence of disorder-related symptoms for more than 12 months prior to the interview. In addition, retrospective age-of-onset reports were provided regarding each stage of alcohol use.

### *Data Analysis*

All analyses were based on weighted data, accounting for stratification and clustering, as described in detail elsewhere (Navarro-Mateu et al., 2013b). Briefly, sampling weights were applied to account for differential probabilities of selection at each sampling stage, and post-stratification weights were applied to ensure the data were representative of the regional general population based on available census data from the Murcia region in 2010. Part 2 individuals were additionally weighted in order to adjust for differential sampling of individuals with mental health problems and ensure data representativeness of the Part 2 subsample. Lifetime prevalence was estimated as the proportion of all respondents who had ever met criteria for a given disorder in their lifetime up to the age at interview. Life-table (actuarial) estimates of the survival functions for age of onset and remission were produced using the PROC LIFETEST procedure in SAS Version 9.4.

The association between transitions across alcohol stages and birth-sex cohort-level lifetime prevalence of use controlling for basic socio-demographics were assessed using odds ratios and confidence interval estimates from multivariable discrete-time survival models in the PROC SURVEYLOGISTIC procedure in SAS, with person-year as the unit of analysis and a logistic link function. Person-years were defined from six years of age for modelling commencement of use, from age of onset of abuse for remission from abuse, and all other models from age of onset of the first stage to age of onset of the second (depending on the model) or age at interview (for censored cases). There was an insufficient number of dependence cases to analyze transitions to, or from, alcohol dependence.

A contextual variable was defined to represent the level of alcohol use in an individual's birth and sex cohort to estimate the effect of changes in use over time. Birth cohort was defined as an individual's year of birth +/- 5 years, creating an 11-year wide sex-specific cohort around each year of birth. The cohort widths were reduced for those aged below 23 years to as close as possible ensure symmetry around birth year, and were top-coded from age 65 and above. The covariate modelled was a time-varying estimate of the proportion of people (/10) in the individual's birth cohort who has used alcohol by the prior person year.

Other variables considered in all use/use disorder transition models were sex, age of commencing use (except in modelling commencement of use) defined as early, mid or late tertile time-varying education levels and age of person year (<=14, 15-17, 18-20, 21-24, 25-29 and 30+). In addition to these, the remission from abuse models also included speed of transition from use to abuse and years with the disorder, as well as alternate person year age groupings (<=18, 19-20, 21-22, 23-24, 25-29, 30-39 and 40+). Multivariate significance tests were made with Wald $\chi^2$ tests using Taylor series design-based coefficient variance-covariance matrices to account for complex sampling design. All significance tests were evaluated at the .05 level with two-sided tests.

## Results

### *Prevalence of alcohol use, alcohol use disorders and remission*

The great majority of respondents (89.4%) consumed alcohol at least once in their lifetime, with 75.4% respondents having used alcohol regularly ( ≥12 drinks a year) (Table 1). The lifetime prevalence of DSM-IV alcohol abuse (without dependence) was 4.9% and of alcohol dependence 1.5%. Once conditioning on use, while the great majority of adults used alcohol regularly (84.3%), only a small portion developed alcohol abuse (5.5%) or dependence (1.6%). Most respondents with lifetime abuse

Table 1. *Prevalence of alcohol use, DSM-IV alcohol use disorders and remission in Murcia.*

| | n | % [a] | SE |
|---|---|---|---|
| **Lifetime prevalence** | | | |
| Use | 1459 | 89.4 | 1.3 |
| Using ≥12 drinks a year | 1459 | 75.4 | 2.4 |
| Abuse W/O dependence | 1459 | 4.9 | 0.7 |
| Dependence | 1459 | 1.5 | 0.5 |
| Remission from abuse | 1459 | 4.2 | 0.8 |
| Remission from dependence | 1459 | 1.2 | 0.5 |
| **Conditional prevalence** | | | |
| Using ≥12 drinks a year \| use | 1272 | 84.3 | 1.9 |
| Abuse W/O dependence \| use | 1272 | 5.5 | 0.7 |
| Dependence \| use | 1272 | 1.6 | 0.6 |
| Remission from abuse \| LT abuse W/O dependence | 73 | 85.3 | 7.6 |
| Remission from dependence \| LT dependence | 20 | 79.4 | 13.5 |

*Note.* SE - standard error. W/O – without. LT – lifetime. n = The total unweighted number of respondents who answered alcohol use questions for lifetime prevalence, and the total unweighted number of respondents in the conditional cohort for conditional prevalence. [a] Prevalence estimates are based on weighted data.

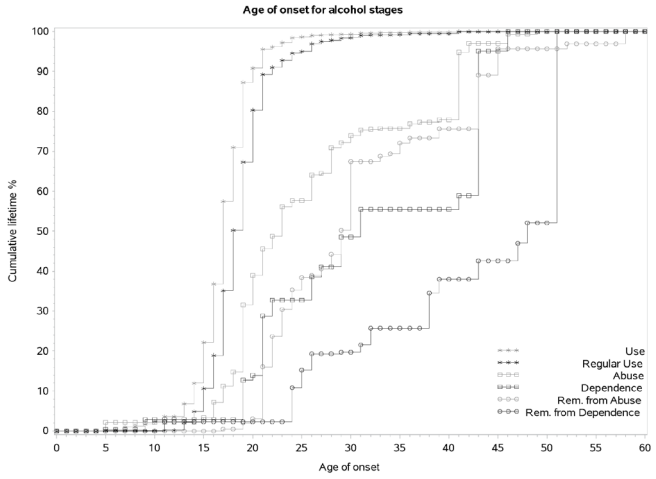


*Figure 1.* Age of onset curves for alcohol stages in the PEGASUS-Murcia projecta,b

*Note.* [a] Life-table estimates of the survival functions are based on weighted Part II data (total sample of 1,459 respondents) and include respondents with and without the specific diagnosis, where age of onset for the latter is censored at age of interview. Estimates scaled up to reach 100%. [b] Respondents with missing age of onset of remission from abuse (n=10) were excluded from the remission from abuse curve.

(85.3%) or dependence (79.4%) had remitted by the time of interview.

### *Age of onset for alcohol use stages*

The cumulative age of onset (AOO) curves for all alcohol use stages are presented in Figure 1. By the age of 18, 70,9% of alcohol users had and one half (50.2%) of regular users had started in those stages. Regular use sharply increases during early adulthood to reach 90.8% by age 22. The median AOO for alcohol abuse (23 years) is reached within 5 years of the median AOO for regular use (18 years). Three out of four cases of alcohol abuse (75.3%) are observed by age 31. One third of alcohol dependence cases are observed prior to age 22, reaching 55.4% by age 31 and 95.0% by age 43. Remission AOO curves show that

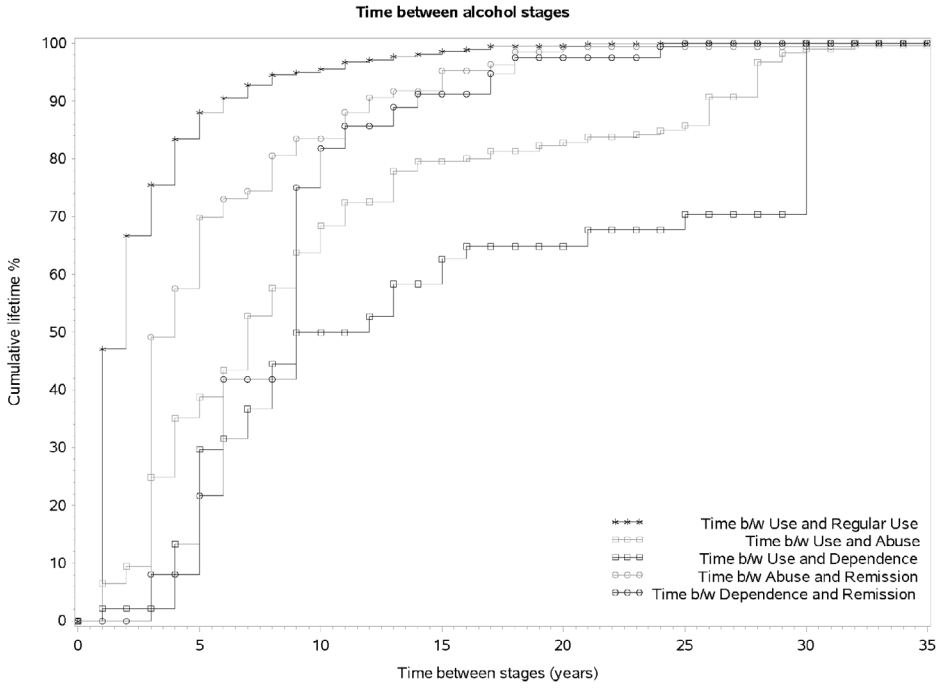


*Figure 2.* Time between alcohol stages in the PEGASUS-Murcia project[a,b]

[a] Life-table estimates of the time between stages are based on weighted Part II data and each curve only includes respondents with a diagnosis of the second stage. [b] Respondents with missing age of onset of remission from abuse (n=10) were excluded from the time between abuse and remission curve.

50% of remissions from alcohol abuse occurred by age 29 while 50% of remissions from alcohol dependence occurred by age 48 and 100% by age 51.

### *Time to transition across stages of involvement with alcohol use*

The most rapid transition is found in the transition from initial use to regular use (Figure 2). Within one year of their first drink, 47.1% of users had become regular users and within three years 75.5% had become regular users. The transition from first use to AUD is slower; 52.7% of the transitions from use to abuse occur within 7 years, and 52.7% of transitions from use to dependence occur within 12 years. The transition from AUD onset to remission was more rapid for alcohol abuse than for alcohol dependence. Within three years of disorder onset, 49.1% of alcohol abuse cases and only 8.1% of alcohol dependence had remitted. Within 9 years of disorder onset, the majority of abuse (83.5%) and dependence (75.0%) cases had remitted.

### *Transitions across alcohol use stages*

Table 2 presents multivariate discrete-time survival analyses examining covariates of transitioning from non-use to use, use to regular use, use to abuse, and regular use to abuse in a given year. The transitions from use to abuse and from regular use to abuse were significantly more common in male respondents. Birth-sex cohort alcohol use was significantly associated with increased odds for all transitions examined with the exception of the transition from use to abuse. Later commence of alcohol use, relative to other respondents, was associated with higher odds of transitioning from use to regular use. Education was also significantly associated with transitions from use to abuse and regular use to abuse with students or persons with a low-average education level at increased odds of transitioning to the disorder compared to those with a low education level.

### *Transition to remission from alcohol abuse*

Table 3 presents multivariate discrete-time survival analyses examining covariates of remission from alcohol abuse including sex, education, age tertile of first onset, birth-sex cohort alcohol use, number of years with the dis-

Table 2. *Multivariate associations of socio-demographic variables with transitions between stages of lifetime alcohol use/use disorders in Murcia.*

| Variable | Category | Commencing Use | | Use to using ≥12 drinks a year | | Use to abuse (without prior dependence) | | Regular use to abuse (without prior dependence)[e] | |
|---|---|---|---|---|---|---|---|---|---|
| | | OR | 95% CI | OR | 95% CI | OR | 95% CI | OR | 95% CI |
| Sex (Ref: Female) | Male | 1.21 | (0.92-1.58) | 1.00 | (0.78-1.28) | 3.62* | (1.53-8.54) | 4.08* | (1.28-13.03) |
| | $X^2_1$ [p] | 1.92 | [0.165] | <0.10 | [0.998] | 8.62** | [0.003] | 5.63** | [0.018] |
| Percentage of individual's birth-sex cohort already using[a] | Cohort use | 1.50* | (1.44-1.57) | 1.16* | (1.09-1.24) | 1.43 | (0.98-2.10) | 1.46* | (1.06-2.01) |
| | $X^2_1$ [p] | 333.94** | [<0.001] | 19.32** | [<0.001] | 3.38 | [0.066] | 5.50** | [0.019] |
| Education level (Ref: High) | Student | 0.67 | (0.14-3.26) | 0.41* | (0.19-0.87) | 2.80 | (0.66-11.85) | 2.63 | (0.63-11.02) |
| | Low | 0.53 | (0.12-2.34) | 0.38* | (0.16-0.92) | 0.65 | (0.25-1.66) | 0.67 | (0.27-1.68) |
| | Low-average | 0.66 | (0.11-3.92) | 0.37* | (0.18-0.73) | 2.98 | (0.68-13.04) | 2.81 | (0.65-12.18) |
| | High-average | 0.60 | (0.10-2.97) | 0.32* | (0.14-0.72) | 1.23 | (0.32-4.67) | 1.22 | (0.32-4.69) |
| | $X^2_4$ [p] | 8.13 | [0.087] | 8,58 | [0.072] | 45.12** | [<0.001] | 20.27** | [<0.001] |
| Age tertile of commencing alcohol use[b, c] (Ref: Late) | Early | - | | 0.34* | (0.22-0.51) | 2.00 | (0.61-6.87) | 1.63 | (0.45-5.83) |
| | Mid | - | | 0.49* | (0.38-0.64) | 1.24 | (0.41-3.72) | 1.10 | (0.36-3.32) |
| | $X^2_2$ [p] | - | | 37.78** | [<0.001] | 1.71 | [0.425] | 1.00 | [0.609] |
| Sample Size | Total n[d] | 1 459 | | 1 272 | | 1 272 | | 1 055 | |

*Note.* OR - odds ratios; CI - confidence interval. All discrete time logistic regression analyses are based on weighted Part II person-year data controlling for person-year age groups of <=15, 16-17, 18-20, 21-24, 25-29 and 30+ (Ref). */** Significant at the 0.05 level, two-sided test. [a] Percentage (/10) of +/-5-yr sex-specific cohort who had used alcohol by the prior person year. e.g. For a female born in 1975 the cohort would be females born between 1970 and 1980. A context OR of 1.5 in commencement of use would be interpreted as, for a 10% increase of people in the age-sex cohort having commenced use by the previous person year (controlling for all other variables in the model), the odds of commencing use increases by 50%. [b] Age tertile of commencing alcohol use was included in all models except transition to initial use. [c] Individuals' age of commencing alcohol use is split into survey-specific tertiles among all those who ever used alcohol. The earliest (first) tertile is age <= 15, the 2nd tertile age 16-17 and the 3rd tertile aged 18+. [d] n = The total unweighted number of respondents included in model conditioning on initial stage. [e] Respondents were excluded from the modelling of this transition if onset of regular use was after the onset of abuse (n=4). Respondents were excluded from the modelling of the transition if the onset of the initial stage was after the onset of the second stage.

order, and speed tertile of transitioning from use to disorder. Remission from alcohol abuse was significantly associated with level of cohort alcohol use. Being female and having a low-average to high-average education level were both associated with an increased likelihood of remitting from alcohol abuse. Time with the disorder, transition speed from use to abuse, and age tertile of alcohol use initiation were not significantly associated with remission.

## Discussion

The present study sought to examine the age of onset and transition time between various stages of alcohol use in a representative sample of the general population of Region of Murcia, in the South East of Spain, and to estimate the association of cohort use with the probability of transitioning to alcohol use, use disorder, and remission. Several noteworthy findings were obtained. First, the results indicate that three quarters of the population have used alcohol regularly (≥12 drinks a year), a behavior that is largely in place by age 20. Second, the findings point to the role of birth-sex cohort use as a factor associated with the transition from one stage of alcohol use to the next. Finally, remitting from alcohol abuse was associated with female sex, cohort use and education level.

Consistent with existing data regarding the ubiquitous nature of alcohol use in western civilizations (Degenhardt et al., 2008) and with data from the Spanish Observatory on Drugs and Drug Abuse (Observatorio Español de la Droga y las Toxicomanías, 2017), lifetime alcohol use was reported in close to nine in ten residents. By age 16, one third of the population had had their first drink, sharply

Table 3. *Multivariate associations of socio-demographic variables with transitions from alcohol abuse to remission in Murcia*

| **Variable** | **Category** | **Abuse (without dependence) to remission from abuse[e]** | |
|---|---|---|---|
| | | **OR** | **95% CI** |
| Sex (Ref: Female) | Male | 0.23* | (0.13-0.38) |
| | $X^2_1$ *[p]* | 31.22** | [<0.001] |
| Percentage of individual's birth-sex cohort already using[a] | Cohort use | 2.02* | (1.00-4.07) |
| | $X^2_1$ *[p]* | 3.88** | [0.049] |
| Education level (Ref: High) | Student | 1.49 | (0.26-8.42) |
| | Low | 3.14 | (0.91-10.80) |
| | Low-average | 5.42* | (2.33-12.59) |
| | High-average | 2.65* | (1.22-5.77) |
| | $X^2_4$ *[p]* | 92.25** | [<0.001] |
| Age tertile of commencing alcohol use[b] (Ref: Late) | Early | 0.63 | (0.32-1.25) |
| | Mid | 1.10 | (0.28-4.64) |
| | $X^2_2$ *[p]* | 3.31 | [0.192] |
| Speed to transition from use to disorder[c] (Ref: Late) | Early | 0.93 | (0.40-2.21) |
| | Mid | 1.12 | (0.52-2.42) |
| | $X^2_2$ *[p]* | 0.14 | [0.931] |
| Time with disorder | Years | 0.99 | (0.95-1.03) |
| | $X^2_2$ *[p]* | *0.37* | *[0.545]* |
| Sample Size | Total (N[d]) | 63 | |

*Note.* OR - odds ratios; CI - confidence interval. All discrete time logistic regression analyses are based on weighted Part II person-year data controlling for person-year age groups of <=18, 19-20, 21-22, 23-24, 25-29, 30-39 and 40+ (Ref). */** Significant at the 0.05 level, two-sided test. [a] Percentage (/10) of +/-5-yr sex-specific cohort who had used alcohol by the prior person year. e.g. For a female born in 1975 the cohort would be females born between 1970 and 1980. A context OR of 1.5 in commencement of use would be interpreted as, for a 10% increase of people in the age-sex cohort having commenced use by the previous person year (controlling for all other variables in the model), the odds of commencing use increases by 50%. [b] Individuals' age of commencing alcohol use is split into survey-specific tertiles among all those who ever used alcohol. The earliest (first) tertile is age <= 15, the 2nd tertile age 16-17 and the 3rd tertile aged 18+. [c] Individuals' speed of transition from alcohol use to disorder is split into survey-specific tertiles. When predicting remission from abuse, tertiles were calculated for transition from use to abuse: the fastest at 0-3 years, the middle tertile 4-9 years and late transitions were 10+ years. [d] n = The total unweighted number of respondents included in the model conditioning on the initial stage. [e] Remission is defined as having reported more than 12 months, or at least two birthdays, since the last disorder related problem. In cases where the reported time since last problem was less than two years and the exact age of remission could not be defined, remission age of onset was set to missing (n=10). These respondents were excluded from the modelling of transition to remission.

increasing to over two thirds by age 18, the legal drinking age in Spain. A rapid transition was found from first use to regular use with one half of users having become regular users within one year of their first drink. Three quarters of the population has used alcohol regularly which may complicate preventive efforts aimed at delaying age of first use despite its important role in the transition to AUDs (e.g., (DeWit et al., 2000; Kalaydjian et al., 2009; Silveira et al., 2011). Indeed, alcohol is available in homes and current drinking laws are not systematically enforced in Southern European establishments that sell alcoholic beverages. Easy access to alcohol might be associated with the finding that one-third of the cases of alcohol abuse and over one in ten cases of dependence occurred by age 19. Beyond the availability of alcohol to young people, these findings highlight the need for targeted prevention efforts as youth with mental disorders have been shown to have a greater risk of transitioning to higher levels of alcohol use (Conway, Swendsen, Husky, He & Merikangas, 2016).

Despite the commonality of regular alcohol use defined as 12 or more drinks a year, the lifetime prevalence of alcohol abuse without dependence (4.9%) and alcohol dependence (1.5%) are relatively low and well within the range of what is found in other western European countries (Alonso et al., 2004). In these studies, prevalence rates are largely driven by the prevalence of AUDs among men (8.6% and 2.5% for alcohol abuse and dependence, respectively) as compared to women (1.1% and 0.1%) (Navarro-Mateu et al., 2015). In the present study, male sex was strongly associated with an increased risk of transitioning from use to abuse and from regular use to abuse which is consistent with findings from other regions of the world (Cheng, Chandra, Alcover & Anthony, 2016; DeWit et al., 2000; Grant, 1997; Kalaydjian et al., 2009; Lee et al., 2009; Lopez-Quintero et al., 2011; Silveira et al., 2011; Suliman et al., 2010). However, sex was not significantly associated with the risk of transitioning from use to regular use nor was it associated with alcohol use initiation, which may in part reflect a closing male–female gap in substance use observed in recent years (Slade et al., 2016).

Recent evidence regarding the importance of peer consumption (Degenhardt et al., 2016) was confirmed in our study, where birth-sex cohort alcohol use was found to be significantly associated with commencing use and of the transition from alcohol use to regular use, and from regular use to abuse. This finding suggests that preventive measures targeting cohorts may prove helpful in reducing progression into later stages of alcohol use. Birth-sex cohort alcohol use was also significantly associated with remission from abuse, underlining the importance of shared societal norms related to substance use (Pollard, Freeman, Ziegler, Hersman & Goss, 2000). Combined with findings related to the speed at which individual transition into the earlier stages of alcohol use, cohort use effects suggest that preventive efforts should be geared towards youth. Such efforts may involve school settings, colleges but should not be limited to the latter, as substance use and mental health problems are at least as prevalent if not more among young adults who are no longer in school (Blanco et al., 2008; Degenhardt et al., 2016; Kovess-Masfety et al., 2016). Finally, while the overall total alcohol consumption per capita has been cut in half in recent decades going from close to 20 liters per year in 1975 to 11.2 liters in 2010 (World Health Organization, 2014), changes in drinking patterns with a drastic reduction in wine consumption and an increase in beer consumption may point to additional venues for prevention in Spain (Mateos, Páramo, Carrera & Rodríguez-López, 2002; Paschall, Grube & Kypri, 2009; Robledo de Dios, 2002).

In contrast with a significant amount of evidence in the literature showing the importance of early age of first use in the risk of transitioning to alcohol abuse (Abdin et al., 2013; DeWit et al., 2000; Grant, Stinson & Harford, 2001; Kalaydjian et al., 2009), early age of first use was not associated with the transition from use or regular use to abuse nor was it associated with remission from abuse. In fact, it was inversely associated with the risk of transitioning from use to regular use. As mentioned previously, certain risk factors have a differential effect on the full spectrum of alcohol use stages (Kalaydjian et al., 2009; Lee et al., 2009; Silveira et al., 2011; Suliman et al., 2010). Prior studies have in fact also reported that early age of alcohol use was associated with some but not all stages of alcohol use (Silveira et al., 2011), and that it may not affect rapid transition to alcohol disorders among male adolescents or young adults (Cheng et al., 2016) . Additional research is needed to document the differential role of key factors associated with greater risk of transition to AUDs in Spain including the role of early age of alcohol use initiation.

Several limitations should be noted when interpreting the findings. First, there were insufficient rates of alcohol dependence in the present sample (1.5%) to examine associations of the transition from use to dependence, or from dependence to remission. Data was available to model the transition to remission from abuse though findings are based on a small number of abuse cases (N=63) and care should be taken in interpreting these results. That being said, the rates of alcohol use and abuse were sufficient to allow examination of the respective onsets. Second, age of onset for stages of alcohol use was based on retrospective self-reporting and may have been subject to forward telescoping (Johnson & Schultz, 2005; Shillington, Woodruff, Clapp, Reed & Lemus, 2012). However, the structured design of the diagnostic instrument combined with the strategy used in the WMH surveys have been shown to reduce this recall bias (Knäuper, Cannell, Schwarz, Bruce & Kessler, 1999). Finally, as the study was conducted in a representative sample of a single region of Spain, additional

research is needed to replicate the findings in samples of other geographic areas.

The present study documented the age of onset of the full spectrum of stages of alcohol use from first ever use to dependence and remission in the general population of the autonomous region of Murcia. To the best of our knowledge, the present findings are the first to document the timing of the natural course of alcohol use in the general population of a Southern European region. The findings highlight sensitive periods with rapid transitions to higher levels of alcohol use. The study further emphasizes the importance of cohort use in the full spectrum of stages of alcohol use which contributes important data to policy makers focused on the prevention of alcohol-related problems in Spain.

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## Conflict of interests

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