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Chronic childhood adversity and speed of transition through stages of alcohol involvement

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ABSTRACT

Background: While research suggests that chronic childhood adversities may be predictors of alcohol use disorders, little is known of their influence on accelerated transitions through stages of alcohol involvement. We estimated the speed of transition from first opportunity (to first drink, regular drinking) to alcohol use disorder, by type and number of childhood adversities experienced.

Methods: Nine-hundred-and-fifteen individuals participated in the Mexican Adolescent Mental Health Survey (a stratified multistage probabilistic sample), first as adolescents (12–17 years of age) and again eight years later as young adults (19–26 years of age). The WHO World Mental Health Composite International Diagnostic Interview (WMH-CIDI) assessed DSM-IV alcohol use disorders and twelve chronic childhood adversities. We calculated random coefficient models to estimate the association of childhood adversities with speed through stages of alcohol use involvement.

Results: Mean time from opportunity to disorder was 4.08 years and the average growth rate was 1.36 years between each stage of involvement. Some, but not all, childhood adversities accelerated the growth rate, decreasing latency between each stage of alcohol use involvement from 1.36 to 0.93 years for witnessing family violence, 0.87 years for having a life-threatening illness, 0.79 years for sexual abuse to 0.77 years for physical abuse ($p < 0.01$).

Conclusions: There is a narrower window of opportunity to prevent progression through stages of alcohol involvement in youth who have experienced certain childhood adversities. Our findings are consistent with the dimensional approach of childhood adversity that distinguishes between experiences of threat and deprivation that might differentially influence neurological development.

1. Introduction

Early to mid-adolescence is a high-risk period for initiation of alcohol use and a considerable proportion of transitions to regular use and disorder occur in the first three years after first use (Wittchen et al., 2008). Heavy alcohol use in adolescence is associated to cognitive deficits and alterations in brain activity and morphology, risky sexual behaviors, suicidal behaviors and accidents and injuries (Rehm et al., 2017). To improve prevention of alcohol use disorders, a greater understanding of alcohol use involvement trajectories and their predictors is necessary (Sher et al., 2004). The concept of alcohol use involvement trajectories refers to the course of alcohol use involvement described primarily in terms of stages and transitions in a chronological framework. Trajectory models focus on age at onset of behaviors, stages, transitions, growth curves, rates of growth, differences in timing and trajectories associated with different factors (Sher et al., 2004). Adverse experiences in childhood have been found to be associated with the opportunity for alcohol use, first drink, regular alcohol use, alcohol use disorder and related problems in adolescence and adulthood (Jirapramukpitak et al., 2011; Douglas et al., 2010).

Chronic childhood adversities may occur within the family or in the social environment, are characterized by being harmful, chronic, distressing, cumulative, varying in severity and frequency, and may alter the health and physical or psychological development of the child

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(Kalmakis and Chandler, 2013). In our prior work, some chronic childhood adversities were found to be related to different stages of alcohol involvement; for example, parental criminal behavior, family violence, and sexual abuse were associated with alcohol opportunity (first step of alcohol involvement is having the opportunity to drink regardless of whether the individual drank or not) (Wagner and Anthony, 2002); in turn, parent criminal behavior and sexual abuse were also associated with alcohol use given the opportunity, and sexual abuse, family dysfunction, parental criminal behavior, and parental loss were associated with alcohol abuse or dependence among those with alcohol use (Benjet et al., 2013).

It has been suggested that people who experience chronic childhood adversities or severe repeated trauma may be at the highest risk for early onset (Kirby, 2006; Schmid et al., 2010) and increased risk of rapid transition to alcohol use disorders (Lijffijt et al., 2014) though no studies of which we are aware have evaluated the latter. Furthermore, the age of onset of alcohol use has been found to influence the speed of transition to substance abuse or dependence (Behrendt et al., 2009; Hingson and Zha, 2009) and some adolescents may develop alcohol dependence three years after their first drink (Wittchen et al., 2008). Also, evidence indicates that externalizing disorders (Behrendt et al., 2011) and early internalizing symptoms (Menary et al., 2017) could increase the speed of transition to alcohol use disorders.

Because of the deleterious effects of heavy alcohol use on the developing brain (Rehm et al., 2017), understanding the speed of transition through stages of alcohol use in adolescents and young adults may help to develop interventions that postpone if not prevent transitions into later stages of alcohol involvement, thus minimizing effects on the brain. This information is also important to estimate the window of opportunity to implement such strategies to prevent escalation to further stages of alcohol use. Therefore, the aims of this study are to estimate the latency between the opportunity to drink and the development of DSM-IV alcohol use disorders and to investigate whether type and number of childhood adversities accelerate the transition through stages of alcohol involvement from adolescence through early adulthood.

2. Methods

2.1. Participants

This report is a secondary data analysis of a prospective cohort study, the Mexican Adolescent Mental Health Survey, a stratified multistage area probability sample representative of youth 12 to 17 years old who lived in the Mexico City Metropolitan Area. These youths were recruited in 2005 and then re-interviewed 8 years later. The analysis sample was restricted to the 915 young adults aged 19–26 in 2013 who completed interviews in both waves 1 and 2 and did not have an opportunity to drink before the age of 10. A full description of the parent study methodology and characteristics of the participants have been published previously (Benjet et al., 2009, 2016). The purpose of this study was to assess exposure to childhood chronic adversity as a predictor of the accelerated transition through stages of alcohol involvement. However, we did not have the age of onset at first occurrence of childhood adversity and to avoid that the outcome had occurred before the predictors, we limited the sample to young people who had not presented the opportunity to drink before 10 years of age. Therefore, 156 respondents were excluded from the original 1071 who responded to both waves.

2.2. Measures

Chronic childhood adversities, alcohol use and alcohol use disorders were evaluated at both waves with the World Mental Health version of the WHO Composite International Diagnostic Interview 3.0 (WMH-CIDI) (Kessler and Üstün, 2004). The WMH-CIDI is a fully structured diagnostic instrument that measures disorders based on the criteria of the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV; American Psychiatric Association, 1994) and includes among other disorders, assessment of alcohol abuse and dependence. For purposes of this report, we combined individuals meeting criteria for abuse and/or dependence. Adequate validity and reliability of the WMH-CIDI has been reported for assessing alcohol use disorders (Üstün et al., 1997) with moderate to good diagnostic concordance (Haro et al., 2006). Specific measures from the WMH-CIDI used in the current analyses are described below.

Growth of alcohol use involvement, the response variable, was measured in four stages:

1) Age of opportunity to use alcohol. Respondents were asked "The next questions are about the first time you had an opportunity to drink alcohol whether or not you drank. By an opportunity to drink I mean someone either offered you alcohol or you were present when others were drinking and you could have drunk if you wanted to. About how old were you the very first time you had an opportunity to drink alcohol?"
2) Age of first drink. Respondents were asked “The next questions are about your use of alcohol including beer, wine, wine coolers, and hard liquor like vodka, gin, whiskey, and mixed drinks. How old were you the very first time you ever drank an alcoholic beverage?” If the respondent couldn´t remember the exact age, they were further probed with “Can you remember what grade you were in at school?” “Was it before you were a teenager?”
3) Age of regular alcohol use. Respondents were asked “How old were you when you first had at least 12 drinks in a year? Don´t know responses were further probed as described above.
4) Age of onset of alcohol use disorders. Respondents who meet the criteria for a DSM-IV diagnosis of alcohol abuse and/or dependence were also asked the age of onset of alcohol abuse/dependence symptoms. The onset of alcohol use disorders was the age they report first manifesting at least one symptom for alcohol abuse or three or more criteria for alcohol dependence. For respondents meeting criteria for both abuse and dependence, the age of onset for abuse was used for the analysis.

Twelve childhood adversities were assessed in the WMH-CIDI. Each of the chronic adversities was evaluated using the same criteria as the World Mental Health Survey Initiative (Kessler et al., 2010a, 2010b). The adversities measured are considered to be chronic (rather than acute) experiences that occurred over the course of childhood through 16 years of age. Childhood adversities were measured at both waves and considered positive if endorsed in either of the waves.

Sexual abuse was assessed by reading a definition of rape and then asking about other forms of abuse or molestation. Respondents were asked, “The next two questions are about sexual assault. The first is about rape. We define this as someone either having sexual intercourse with you or penetrating your body with a finger or object when you did not want them to, either by threatening you or by using force. Did this ever happen to you?” “Other than rape, have you ever been sexually assaulted or molested?” Consistent with other WMH publications (Kessler et al., 2010a, 2010b), sexual abuse was considered a chronic adversity if it occurred on three or more occasions.

Physical abuse and witnessing parental violence were assessed with a modified version of the Conflict Tactics Scale (Straus, 1979). Respondents were asked “Did you ever witness serious physical fights at home, like your father beating up your mother?” and “Were you ever badly beaten up by your parents or the people who raised you?”

Neglect was evaluated with questions often used in child welfare studies (Courtney et al., 1998) such as how often the participant was left alone or unsupervised when too young to be alone, were made to do chores that were too difficult or dangerous for someone that age or often had to go without things that were needed like clothes, shoes, or

school supplies because their parents spent the money on themselves.

To assess parental loss, the adolescents were asked whether they lived with both parents all of their lives. Those who did not were asked whether this was because their parents had separated or divorced, a parent had died or some other reason. Those mentioning separations of six months or more from either parent for some other reason were classified as other parental loss, with reasons ranging from having gone to boarding school, having left home, or that their parent was in prison.

Parental pathology was evaluated using questions from the Family History Research Diagnostic Criteria Interview and included parental mental illness, substance problems, and criminal behavior as reported by the participant regarding his or her parents (Endicott et al., 1978).

Serious physical illness was based on the adolescent's report of having experienced a life-threatening physical illness. Respondents were asked, "Did you ever have a very serious or life-threatening illness?"

Participants were considered to have experienced family economic adversity if the family ever received money from a government assistance program for poor families or by lack of parental employment most or all of the participant's childhood.

2.3. Statistical analysis

Data were weighted to adjust for differential probabilities of selection and non-response as well as post-stratification to the total Mexico City Metropolitan Area adolescent population. The growth curve of alcohol use involvement was evaluated through four stages: opportunity (Stage 1), first drink (Stage 2), regular use (Stage 3) and alcohol use disorder (Stage 4). The response variable was the age of onset reported in each stage of involvement for each of the respondents. The time points corresponding to these stages were unbalanced (i.e., unequally spaced in all observations). The independent associations between the response variable and seventeen time-invariant predictors were tested (i.e., twelve types of childhood adversities including parental mental illness, parental substance problems, parental criminal behavior, witnessing family violence, physical abuse, sexual abuse, neglect, parental death, parental divorce, other parental loss, physical illness, economic adversity; and four categories of numbers of adversities from zero, one, two, and 3 or more and gender).

Two-level models, often referred to as random coefficient models (Bliese and Ployhart, 2002) were used to analyze the longitudinal data through "The Step-Up Strategy" suggested by Raudenbush and Bryk (2002). We started by fitting an "empty" model to estimate only the population mean growth trajectory as the baseline model. This "fixed-effects model" implies an equal age of onset of the first stage (first opportunity), and an equal rate of progression to the subsequent stages for all participants (e.g., first use, regular drinking, and disorder). A subsequent model was tested to determine if adding a random intercept term to the baseline model would improve model adjustment to the data. The random intercept term assumes that individual growth or trajectory lines start at different levels, but grow at the same rate over time. However, individuals are likely to have different growth trajectories with different initial levels and rates of outcome change over time (Littell et al., 2006). Therefore, "random effects models" were needed, including linear and quadratic random coefficient models to determine the fixed functions for time and the estimated mean growth rate, with their corresponding variances, allowing for accelerated transitions. This "random-effects model" estimates the mean age of onset of the first stage (first opportunity), and an average rate of progression to the subsequent stages of alcohol use involvement.

Finally, we added separately time-invariant predictors in the random-effects model to estimate their specific effect on the growth rate. All models were controlled for gender. Parameters were estimated utilizing maximum likelihood estimation with robust standard errors (MLR) (Muthén and Muthén, 2012). The criteria used to evaluate model adjustment were the Akaike Information Criterion (Akaike, 1974) and the Bayes Information Criterion (Schwarz, 1978). A smaller value of these criteria indicates a better model fit. Results of preliminary analysis suggest missing data patterns consistent with missing at random (Little and Rubin, 2002). Fifty imputations for missing data were performed with the use of the Bayesian Markov chain Monte Carlo multiple-imputation technique (Kenward and Carpenter, 2007). Multilevel modeling with complex survey data procedures was used to fit the two-level unconditional and conditional models using Mplus, version 7·0 (Muthén and Muthén, 2012).

Table 1
Socio-demographic characteristics of the study sample.

	Study sample (n = 915)	
	n	%
Sex		
Male	386	42.18
Female	529	57.82
Any chronic childhood adversity		
None	315	34.43
One	321	35.08
Two	169	18.47
Three or more	110	12.02
Any alcohol use disorder		
Among all those with any childhood adversity	144	24.00
Among females with any childhood adversity	54	21.86
Among males with any childhood adversity	90	25.50
Among those with no childhood adversity	61	19.37
Age (wave 1)		
12-13	358	39.12
14-15	303	33.11
16-17	254	27.77
Age (wave 2)		
19-20	211	23.06
21-22	341	37.26
23-24	275	30.05
25-26	88	9.63
Lives with both parents (wave 1)		
Yes (both)	576	62.95
No (one/none)	339	37.05
Lives with both parents (wave 2)		
Yes (both)	499	54.53
No (one/none)	416	45.47
Currently a student (wave 1)		
Yes	842	92.03
No	73	7.97
Currently a student (wave 2)		
Yes	228	22.74
No	687	77.26
Education level (wave 1)		
Elementary	172	18.79
Secondary	561	61.31
High School	182	19.89
University	1	0.01
Education level (wave 2)		
Elementary	33	3.60
Secondary	305	33.33
High School	379	41.42
University	198	21.63

*Study sample consists of those responding to both waves and who did not have alcohol involvement before the age of 10.

Table 2
Latent age of transition into each stage of alcohol use involvement and latent change rate for total sample and by gender.

	n	%	Estimate (years)	S.E.	Est./S.E.	P-Value	AIC	BIC
Total sample								
Opportunity (Intercept)	915	100	13.98	0.07	199.71	< .0001	14645.6	14689.1
First drink (Intercept)	878	95.95	15.45	0.06	239.51	< .0001		
Regular use (Intercept)	401	43.82	16.77	0.06	244.51	< .0001		
Alcohol use disorders (Intercept)	205	22.4	17.95	0.13	135.21	< .0001		
Linear Slope			1.54	0.07	17.51	< .0001		
Quadratic Slope			−0.07	0.03	−2.09	0.03		
Females								
Opportunity (Intercept)	529	100	13.98	0.09	155.33	< .0001	8526.3	8565.9
First drink (Intercept)	505	95.46	15.45	0.09	167.55	< .0001		
Regular use (Intercept)	238	44.99	16.7	0.09	178.41	< .0001		
Alcohol use disorders (Intercept)	81	15.31	17.74	0.14	121.69	< .0001		
Linear Slope			1.57	0.13	12.07	< .0001		
Quadratic Slope			−0.1	0.04	−2.25	0.02		
Males								
Opportunity (Intercept)	386	100	13.99	0.10	136.50	< .0001	6146	6183.4
First drink (Intercept)	373	96.63	15.47	0.100	149.25	< .0001		
Regular use (Intercept)	163	42.22	16.92	0.09	174.92	< .0001		
Alcohol use disorders (Intercept)	124	32.12	18.32	0.20	90.86	< .0001		
Linear Slope			1.51	0.16	9.39	< .0001		
Quadratic Slope			−0.02	0.06	−0.33	0.73		

Unconditional random intercept model for each stage of alcohol use involvement.
Est./S.E. contains the value of the parameter estimate divided by the standard error.
S.E. standard error of the standardized parameter estimate.
P-Value gives the p-value for the z-score.
(AIC) Akaike information criterion.
(BIC) Bayesian information criterion.

3. Results

Table 1 presents the socio-demographic characteristics of the study sample at waves I and II. More than half were female; 63% lived with both parents at wave I; by wave II, 41% had finished high school and almost 22% college whereas 23% continued to study. A total of 66% of adolescents were exposed to any type of chronic childhood adversity, 35% have experienced at least one type, and 18% two types, whereas 12% have experienced three or more. Twenty-four percent of those exposed to any childhood adversity met criteria for DSM-IV alcohol abuse and/or dependence.

3.1. Transition through stages of alcohol use involvement

Table 2 shows the intercepts for each stage of involvement in alcohol consumption for the total sample and for females and males independently. By wave II, all participants had the opportunity to drink, most all (96%) had their first drink, 44% drank regularly and 22% had developed abuse or dependence. The participants reported having had their first opportunity to drink at 14 years old on average, their first drink shortly before reaching the age of 15, drinking regularly before the age of 17, and fulfilled the criteria for abuse or dependence near 18 years of age. There are no important differences between females and males in ages of onset or speed of transition.

On the top portion of Table 3 we show that the average growth rate (see linear slope estimate) was 1.36 years for each stage of involvement ($p < 0{\cdot}0001$). These results indicate that transition through stages of alcohol use involvement lasted 4.08 years (1.36*3). Below this on Table 3 shows the rates of growth for sixteen two-level conditional models with time-invariant predictors, twelve for type and four for the number of childhood adversities, all controlled for the gender. Physical abuse, sexual abuse, witnessing family violence, and life-threatening physical illness were associated with faster transitions from the first opportunity to drink to developing an alcohol disorder. In youth exposed to physical abuse the average growth rate decreased 0.59 years between stages from 1.36 to 0.77 years (1.36 - 0.59) ($p = 0.0001$), to 0.79 years (1.37- 0.58) ($p = 0.01$) for those with sexual abuse, to 0.94 years (1.36 - 0.42) ($p = 0.003$) for those witnessing family violence, and to 0.87 years (1.37 - 0.50) ($p = 0.01$) for those with a life-threatening illness. This means that, for example, a youth exposed to physical abuse the transition from opportunity to disorder took 2.31 years (0.77 * 3 stages) whereas a youth not exposed to physical abuse would transition in 4.11 years (1.37 * 3 stages).

We also present on the bottom of Table 3 the results of four models with the number of adversities as predictors. The exposure to three or more adversities was associated with accelerated progression in alcohol consumption, by decreasing latency 0.44 years between each stage from 1.37 to 0.93 years, and thus transition from opportunity to disorder in only 2.79 years. Youth not exposed to chronic childhood adversity transited more slowly through stages of alcohol use involvement increasing the latency between opportunity and alcohol use disorders from 4.11 to 4.86 years ($p = 0.01$). There were no significant gender effects on latency. These results suggest an association of childhood chronic adversity with a more rapid transition through the stages of alcohol use involvement for some types of adversity and with regard to cumulative numbers of adversities.

Table 4 shows estimates of transition rates when all adversities are entered into the model simultaneously, while controlling for gender. Latent growth rates associated with adversities do not seem to change substantially compared to those presented in Table 3, with the exception of an attenuation of the association with sexual abuse (now estimated at 0.98 years, and no longer statistically significant).

4. Discussion

The present study spans eight critical developmental years from adolescence to early adulthood. In a prospective longitudinal sample of adolescents through early adulthood, we examined how different adversities in childhood are specifically associated with the speed of transition from the first opportunity to drink alcoholic beverages to the

Table 3
Estimated rates of growth for types and numbers of childhood adversities on the accelerated transition through stages of alcohol use involvement.

			Estimate (years)	S.E.	Est./S.E.	P-Value	AIC	BIC
Empty model								
Mean			16.06	0.06	275.62	< .0001	16934.1	16952.8
Unconditional model								
Intercept			14.06	0.07	199.71	< .0001	14820.5	14863.9
Linear Slope			1.36	0.07	17.51	< .0001		
Quadratic Slope			−0.02	0.03	−0.68	0.49		
	n	%	Estimate	S.E.	Est./S.E.	P-Value	AIC	BIC
Conditional models								
Types of childhood adversities								
Physical abuse	116	12.68	−0.59	0.15	−3.98	< .0001	14808.8	14842.1
Intercept			14.19	0.09	154.04	< .0001		
Lineal slope			1.36	0.08	17.50	< .0001		
Quadratic slope			−0.02	0.03	−0.65	0.51		
Female			−0.09	0.09	−0.94	0.34		
Sexual abuse	41	4.48	−0.58	0.23	−2.42	0.01	14775.7	14853.9
Intercept			14.14	0.09	155.30	< .0001		
Lineal slope			1.37	0.07	17.64	< .0001		
Quadratic slope			−0.02	0.03	−0.72	0.46		
Female			−0.09	0.10	−0.94	0.34		
Neglect	39	4.26	−0.11	0.21	−0.53	0.59	14825.5	14893.8
Intercept			14.11	0.09	155.3	< .0001		
Lineal slope			1.37	0.07	17.64	< .0001		
Quadratic slope			−0.02	0.03	−0.73	0.46		
Female			0.08	0.10	−0.85	0.39		
Parent died	48	5.25	−0.31	0.22	−1.30	0.17	14823.5	14891.8
Intercept			14.12	0.09	155.8	< .0001		
Lineal slope			1.37	0.07	17.63	< .0001		
Quadratic slope			−0.02	0.03	−0.74	0.45		
Female			−0.08	0.10	−0.79	0.42		
Parent divorce	89	9.73	0.13	0.18	0.73	0.46	14822.9	14891.1
Intercept			14.05	0.09	153.40	< .0001		
Lineal slope			1.37	0.07	17.59	< .0001		
Quadratic slope			−0.02	0.03	−0.71	0.47		
Female			−0.08	0.10	−0.85	0.39		
Other parent loss	103	11.26	−0.001	0.16	0.02	0.97	14824.6	14892.9
Intercept			14.11	0.09	153.90	< .0001		
Lineal slope			1.37	0.07	17.62	< .0001		
Quadratic slope			−0.02	0.03	−0.73	0.46		
Female			−0.08	0.10	−0.88	0.37		
Parental mental illness	96	10.49	−0.01	0.13	−0.11	0.91	14825.6	14893.9
Intercept			14.11	0.09	150.60	< .0001		
Lineal slope			1.37	0.07	17.67	< .0001		
Quadratic slope			−0.02	0.03	−0.75	0.44		
Female			−0.08	0.10	−0.88	0.37		
Parental substance problems	38	4.15	−0.05	0.25	0.18	0.85	14825.4	14893.6
Intercept			14.11	0.09	155.20	< .0001		
Lineal slope			1.37	0.07	17.60	< .0001		
Quadratic slope			−0.02	0.03	−0.72	0.46		
Female			−0.08	0.10	−0.87	0.38		
Parental criminal behavior	42	4.59	−0.01	0.42	−0.03	0.97	14825.8	14894.0
Intercept			14.11	0.09	153.2	< .0001		
Lineal slope			1.37	0.07	17.65	< .0001		
Quadratic slope			−0.02	0.03	−0.74	0.45		
Female			−0.08	0.10	−0.85	0.39		
Witnessing family violence	142	15.42	−0.42	0.14	−3.02	0.003	14814.7	14848.0
Intercept			14.18	0.09	152.15	< .0001		
Lineal slope			1.36	0.07	17.53	< .0001		
Quadratic slope			−0.02	0.03	−0.67	0.50		
Female			−0.09	0.10	−0.97	0.33		
Physical illness	54	5.9	−0.5	0.21	−2.34	0.01	14773.3	14853.9
Intercept			14.15	0.09	155.8	< .0001		
Lineal slope			1.37	0.07	17.68	< .0001		
Quadratic slope			−0.02	0.03	−0.74	0.45		
Female			−0.109	0.10	−1.08	0.27		
Economic	230	25.14	−0.08	0.16	−1.56	0.45	14824.8	14893.1
Intercept			14.13	0.09	149.4	< .0001		
Lineal slope			1.37	0.07	17.6	< .0001		
Quadratic slope			−0.02	0.03	−0.70	0.46		
Gender			−0.08	0.10	−0.80	0.41		
	n	%	Estimate	S.E.	Est./S.E.	P-Value	AIC	BIC

(*continued on next page*)

Table 3 (*continued*)

			Estimate (years)	S.E.	Est./S.E.	P-Value	AIC	BIC
Conditional models								
Number of childhood adversities								
0	315	34.43	0.25	0.10	2.4	0.01	14819.3	14852.6
Intercept			14.02	0.09	144.45	< .0001		
Lineal slope			1.37	0.07	17.64	< .0001		
Quadratic slope			−0.02	0.03	−0.75	0.44		
Female			−0.08	0.10	−0.81	0.41		
1	321	35.08	0.07	0.10	0.72	0.46	14825.0	14893.2
Intercept			14.08	0.09	142.79	< .0001		
Lineal slope			1.37	0.07	17.68	< .0001		
Quadratic slope			−0.02	0.30	−0.75	0.44		
Female			−0.09	0.10	−0.90	0.36		
2	169	18.47	−0.18	0.13	−1.42	0.15	14823.0	14891.2
Intercept			14.14	0.09	150.53	< .0001		
Lineal slope			1.37	0.07	17.60	< .0001		
Quadratic slope			−0.02	0.03	−0.72	0.47		
Female			−0.08	0.10	−0.81	0.41		
3+	110	12.02	−0.44	0.16	−2.74	0.006	14816.2	14884.4
Intercept			14.17	0.09	154.10	< .0001		
Lineal slope			1.37	0.07	17.55	< .0001		
Quadratic slope			−0.02	0.03	−0.69	0.49		
Female			−0.102	0.10	−0.99	0.32		

Two-level conditional models with invariant predictors controlled for gender.
Est./S.E. contains the value of the parameter estimate divided by the standard error.
S.E. standard error of the standardized parameter estimate.
P-Value gives the p-value for the z-score.
(AIC) Akaike information criterion.
(BIC) Bayesian information criterion.

development of alcohol use disorders. Social permissiveness and high contextual availability of alcohol among young people in Mexico City likely contribute to the high estimate of alcohol abuse and dependence in this sample. Physical illness, physical abuse, sexual abuse and witnessing family violence were found to be associated with an accelerated transition through the stages of alcohol involvement. Moreover, the evidence indicates that these childhood adversities might cut in half the average transition period between stages of alcohol use involvement, which has tremendous implications in terms of arrested development, injuries, and other social problems, to mention only a few. The transition from opportunity to alcohol use disorders may be related to intensified sensitization induced by stress and regular alcohol use in reward mechanisms, allostatic changes in stress systems and their relationship with negative mediated reinforcement by the amygdala, and a greater sensitivity or reactivity of noradrenergic systems (Lijffijt et al., 2014). There are likely to be many other factors associated with the speed of transition between stages of alcohol involvement, some of which may also be related to chronic adversities, and might either confound or better explain theses associations. Potential factors are prior individual psychopathology, such as externalizing disorders (Behrendt et al., 2011) and early internalizing symptoms (Menary et al., 2017), prior or concomitant use of other substances, or social contextual factors like access to alcohol, social norms and peer groups, though no research of which we are aware has examined the impact of

Table 4
Age of first opportunity, latent change rate across stages of alcohol involvement, and change of rate associated with each adversity controlling for sex.

Variable name	Estimate (years)	S.E.	Est./S.E.	p-value	AIC	BIC
Age of first opportunity	14.27	0.10	134.90	< 0.001	14831.5	15036.3
Latent change rate	1.38	0.07	17.92	< 0.001		
Change rate squared	−0.25	0.03	−0.84	0.39		
Physical abuse	−0.49	0.18	−2.65	0.01		
Sexual abuse	−0.40	0.24	−1.63	0.10		
Neglect	−0.05	0.22	−1.24	0.80		
Parent died	−0.15	0.25	−0.61	0.53		
Parent divorce	0.18	0.21	0.86	0.38		
Other parent loss	0.06	0.16	0.36	0.71		
Parental mental illness	0.11	0.17	0.67	0.50		
Parental substance problems	0.15	0.33	0.46	0.64		
Parental criminal behavior	0.05	0.19	0.30	0.76		
Witnessing family violence	−0.32	0.15	−2.02	0.04		
Physical illness	−0.46	0.22	−2.04	0.04		
Economic adversity	−0.09	0.12	−0.78	0.43		
Female gender	−0.11	0.10	−1.09	0.27		

Two-level model with all variables entered simultaneously.
Est./S.E. contains the value of the parameter estimate divided by the standard error.
S.E. standard error of the standardized parameter estimate.
P-Value gives the p-value for the z-score.
(AIC) Akaike information criterion.
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these factors of speed of transition.

While this study is novel in its estimation of the impact of childhood adversities on the speed of transitions through stages of alcohol involvement, the findings should be considered in light of important limitations. First, a synthetic cohort spanning a period of eight years was constructed based on age when the four stages of alcohol use took place, using the responses at the baseline and follow up surveys. Although there is a small chance in the present analyses, mortality/survival bias is possible in this type of studies. Second, recall errors with regard to the age of onset of each stage of alcohol involvement are possible. However, there is no reason to suspect that potential recall errors would be different for those who experienced and did not experience childhood adversities. The WMH-CIDI has shown fairly good diagnostic concordance (Haro et al., 2006) for alcohol use disorders, but the sensitive nature of these disorders and childhood adversities may lead to underreporting (Herrera et al., 2017). Third, childhood adversities are assumed to be temporally prior to alcohol involvement as they are considered to be chronic experiences throughout childhood, and the elimination of participants that had the opportunity to drink prior de age 10 strengthened that assumption. Finally, even in a study with a large epidemiologic sample of this size, the fact that conditional analyses were required translates into potential small-cell issues, including the possibility that some non-significant effects could be due to the lack of statistical power.

Our findings might be understood within the framework recently proposed by Sheridan and McLaughlin (2014); 2016) of a dimensional approach to childhood adversity that distinguishes between dimensions of threat and deprivation. These authors suggest that while the literature to date on childhood adversities is mostly based on an accumulative risk approach, which has been beneficial for elucidating the public health importance of childhood adversities, it is limited to explain the mechanisms linking these experiences to deleterious outcomes (Sheridan and McLaughlin, 2014;McLaughlin and Sheridan, 2016). The proposed dimensional approach to childhood adversity classifies adverse experiences into two specific dimensions, whose influences on cognitive, neurobiological and emotional development are at least partially distinct, namely, threat and deprivation. The threat dimension includes experiences such as observing community violence, witnessing domestic violence, and being a victim of physical or sexual abuse and is associated to changes in neural circuits that underlie emotional learning; whereas deprivation experiences include poverty, neglect and institutional rearing and impacts development through absence of cognitive and social inputs. Although, children rarely experience deprivation and threat independently, future research is required to examine their differences separately, to identify those that have unique effects on neurological development and accelerated progression in the consumption of substances (McLaughlin and Sheridan, 2016). The four childhood adversities that we found to accelerate the stages of alcohol use involvement, namely, physical and sexual abuse, witnessing family violence and a life-threatening illness, could be considered along the threat dimension, whereas the other adversities we included (i.e., economic adversity, neglect, parental death, parental divorce, other parental loss, parental mental health problems, substance use and criminal behavior) are more likely to fall along the deprivation dimension. Future research would benefit from exploring this hypothesis of threat and deprivation, providing evidence of specific associations between the type or number of adversities and the accelerated progression in alcohol consumption.

While protecting children from family violence and abuse is paramount, our findings suggest the need for increased surveillance and interventions focused on the detection of children exposed to experiences of threat and the opportunity to consume alcohol. Our results show that the window of opportunity to provide these interventions is narrow as the transition from opportunity to alcohol use disorders can range from 18 to 30 months in individuals exposed to both opportunity and threat-related adversity, with mean age of first opportunity at age 14.

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Contributors

Omar Del Valle Tena performed the literature search, did the data analysis, and contributed to data interpretation, and writing. Corina Benjet was responsible for obtaining funding, implementation of the survey, and wrote the first draft of the manuscript. María Elena Medina-Mora contributed to the study protocol, design and implementation and provided critical feedback to the drafting of the manuscript. Guilherme Borges was responsible for quality control during field- work and made a significant intellectual contribution to the study design, interpretation of data, and drafting of the manuscript. Fernando A Wagner contributed to the study design, data analysis, data interpretation, and writing. All authors have read and approved the final manuscript.

Declaration of Competing Interest

No conflict declared.

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