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The epidemiology of alcohol use disorders cross-nationally: Findings from the World Mental Health Surveys

Meyer D. Glantz^{a,*}, Chrianna Bharat^b, Louisa Degenhardt^b, Nancy A. Sampson^c, Kate M. Scott^d, Carmen C.W. Lim^e, Ali Al-Hamzawi^f, Jordi Alonso^{g,ai,aj}, Laura Helena Andrade^h, Graca Cardosoⁱ, Giovanni De Girolamo^j, Oye Gureje^k, Yanling He^l, Hristo Hinkov^m, Elie G. Karam^{n,ak,al}, Georges Karam^{o,al}, Viviane Kovess-Masfety^p, Victor Lasebikan^q, Sing Lee^r, Daphna Levinson^s, John McGrath^{t,am,an}, Maria-Elena Medina-Mora^u, Constanta Mihaescu-Pintia^v, Zeina Mneimneh^w, Jacek Moskalewicz^x, Fernando Navarro-Mateu^y, José Posada-Villa^z, Charlene Rapsey^{aa}, Juan Carlos Stagnaro^{ab}, Hisateru Tachimori^{ac}, Margreet Ten Have^{ad}, Nathan Tintle^{ae}, Yolanda Torres^{af}, David R. Williams^{ag}, Yuval Ziv^{ah}, Ronald C. Kessler^c, on behalf of the WHO World Mental Health Survey Collaborators

^a Division of Epidemiology, Services, and Prevention Research (DESPR), National Institute on Drug Abuse (NIDA), National Institutes of Health (NIH), Bethesda, MD, USA

^b National Drug and Alcohol Research Centre (NDARC), UNSW, Sydney, Australia

^c Department of Health Care Policy, Harvard Medical School, Boston, MA, USA

^d Department of Psychological Medicine, University of Otago, Dunedin, Otago, New Zealand

^e Queensland Centre for Mental Health Research and Queensland Brain Institute, The University of Queensland, St. Lucia, Queensland, Australia

^f College of Medicine, Al-Qadisiya University, Diwaniya governorate, Iraq

^g Health Services Research Unit, IMIM-Hospital del Mar Medical Research Institute, Barcelona, Spain

^h Núcleo de Epidemiologia Psiquiátrica - LIM 23, Instituto de Psiquiatria Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo, Brazil

ⁱ Lisbon Institute of Global Mental Health and Chronic Diseases Research Center (CEDOC), NOVA Medical School, Faculdade de Ciências Médicas, Universidade Nova de Lisboa, Lisbon, Portugal

^j Unit of Epidemiological and Evaluation Psychiatry, Istituti di Ricovero e Cura a Carattere Scientifico (IRCCS)-St. John of God Clinical Research Centre, Brescia, Italy

^k FRCPsych, Department of Psychiatry, University College Hospital, Ibadan, Nigeria

^l Shanghai Mental Health Center, Shanghai Jiao Tong University, School of Medicine, Shanghai, China

^m National Center of Public Health and Analyses, Sofia, Bulgaria

ⁿ Department of Psychiatry and Clinical Psychology, Faculty of Medicine, Balamand University, Beirut, Lebanon

^o Department of Psychiatry and Clinical Psychology, St George Hospital University Medical Center, Balamand University, Faculty of Medicine, Beirut, Lebanon

^p Ecole des Hautes Etudes en Santé Publique (EHESP), EA 4057, Paris Descartes University, Paris, France

^q Department of Psychiatry, College of Medicine, University of Ibadan, Ibadan, Nigeria

^r Department of Psychiatry, Chinese University of Hong Kong, Tai Po, Hong Kong

^s Mental Health Services, Ministry of Health, Jerusalem, Israel

^t Queensland Centre for Mental Health Research, The Park Centre for Mental Health, Wacol, Queensland, Australia

^u National Institute of Psychiatry Ramón de la Fuente Muñiz, Mexico City, Mexico

^v National School of Public Health, Management and Professional Development, Bucharest, Romania

^w Survey Research Center, Institute for Social Research, University of Michigan, Ann Arbor, MI, USA

^x Institute of Psychiatry and Neurology, Warsaw, Poland

^y UDIF-SM, Subdirección General de Planificación, Innovación y Cronicidad, Servicio Murciano de Salud, IMIB-Arrixaca, CIBERESP-Murcia, Murcia, Spain

^z Colegio Mayor de Cundinamarca University, Faculty of Social Sciences, Bogota, Colombia

^{aa} PGDipClinPsych, University of Otago, Dunedin School of Medicine, Department of Psychological Medicine, New Zealand

^{ab} Departamento de Psiquiatria y Salud Mental, Facultad de Medicina, Universidad de Buenos Aires, Argentina

^{ac} National Institute of Mental Health, National Center for Neurology and Psychiatry, Kodaira, Tokyo, Japan

^{ad} Trimbos-Instituut, Netherlands Institute of Mental Health and Addiction, Utrecht, the Netherlands

^{ae} Department of Mathematics, Statistics and Computer Science, Dordt College, Sioux Center, Iowa, USA

^{af} Center for Excellence on Research in Mental Health, CES University, Medellin, Colombia

^{ag} Department of Social and Behavioral Sciences, Harvard T.H. Chan School of Public Health, Boston, MA, USA

^{ah} Mental Health Services, Israeli Ministry of Health, 39 Yermiyahu St, Jerusalem 9101002, Israel

^{ai} CIBER en Epidemiología y Salud Pública (CIBERESP), Spain

^{aj} Pompeu Fabra University (UPF), Barcelona, Spain

^{ak} Department of Psychiatry and Clinical Psychology, St George Hospital University Medical Center, Beirut, Lebanon

^{al} Institute for Development Research Advocacy and Applied Care (IDRAAC), Beirut, Lebanon

* Corresponding author.

E-mail address: mglantz@nida.nih.gov (M.D. Glantz).

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^{am} Queensland Brain Institute, University of Queensland, St. Lucia, Queensland, Australia
^{an} National Centre for Register-Based Research, Aarhus University, Aarhus, Denmark

HIGHLIGHTS

- Alcohol use and alcohol use disorder (AUD) prevalence rates varied across countries.
- Mean lifetime prevalences were 80% for alcohol use and 8.6% for AUD.
- Risk of AUD onset began in adolescence, with 15% of all cases developed by age 18.
- Comorbidity was high, with other mental disorders most often preceding AUD onset.
- Patterns of AUDs and correlates were consistent across counties.

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ABSTRACT

Background: Prevalences of Alcohol Use Disorders (AUDs) and Mental Health Disorders (MHDs) in many individual countries have been reported but there are few cross-national studies. The WHO World Mental Health (WMH) Survey Initiative standardizes methodological factors facilitating comparison of the prevalences and associated factors of AUDs in a large number of countries to identify differences and commonalities.

Methods: Lifetime and 12-month prevalence estimates of DSM-IV AUDs, MHDs, and associations were assessed in the 29 WMH surveys using the WHO CIDI 3.0.

Results: Prevalence estimates of alcohol use and AUD across countries and WHO regions varied widely. Mean lifetime prevalence of alcohol use in all countries combined was 80%, ranging from 3.8% to 97.1%. Combined average population lifetime and 12-month prevalence of AUDs were 8.6% and 2.2% respectively and 10.7% and 4.4% among non-abstainers. Of individuals with a lifetime AUD, 43.9% had at least one lifetime MHD and 17.9% of respondents with a lifetime MHD had a lifetime AUD. For most comorbidity combinations, the MHD preceded the onset of the AUD. AUD prevalence was much higher for men than women. 15% of all lifetime AUD cases developed before age 18. Higher household income and being older at time of interview, married, and more educated, were associated with a lower risk for lifetime AUD and AUD persistence.

Conclusions: Prevalence of alcohol use and AUD is high overall, with large variation worldwide. The WMH surveys corroborate the wide geographic consistency of a number of well-documented clinical and epidemiological findings and patterns.

1. Introduction

Alcohol Use Disorders (AUDs) are serious psychiatric conditions often leading to major adverse consequences. The 2018 World Health Organization's (WHO) Global Status Report on Alcohol and Health determined that in 2016 harmful use of alcohol caused approximately 3 million deaths (or 5.3% of all deaths), more than hypertension and diabetes combined. The WHO report estimated that 5.1% of the global burden of disease and injury, equivalent to 132.6 million Disability-adjusted Life Years (DALYs), was caused by alcohol use (World Health Organization, 2018). In 2016, an estimated 2.3 billion people were current drinkers and 283 million people aged 15+ years had an AUD (5.1% of adults). The economic burden of alcohol use has been estimated to be more than 1% of the gross national product in middle and high income countries (Rehm, Mathers, Popova, et al., 2009). Alcohol use was the 7th leading risk for early death and disability (GBD 2016 Alcohol Collaborators, 2018). Despite some decrease in per capita alcohol use in some WHO regions, worldwide per capita alcohol consumption is predicted to increase over the next 10 years with a possible increase in disease burden (World Health Organization, 2018). Multi-country epidemiologic data on AUDs can enable better understanding of patterns and characteristics of AUDs providing necessary information for prevention and treatment implementation and policy. There is little cross-national standardized data available (Baxter, Patton, Scott, et al., 2013; Steel, Marnane, Iranpour, et al., 2014). It is difficult to compare findings from different studies as they generally have not used equivalent assessments, administrations, diagnostic systems, sampling and analysis approaches. A few limited multi-country or regional studies using a standardized assessment have been conducted. One early notable effort used the Diagnostic Interview Schedule (Robins, Helzer, Croughan, et al., 1981) which includes an assessment of DSM-III (American Psychiatric Association, 1980) alcohol abuse and

dependence to assess samples in coordinated studies in 10 different cultural regions (Helzer & Canino, 1992). There was wide variation in the lifetime prevalence rates of DSM-III alcohol abuse and/or dependence ranging from 0.45% in Shanghai to 22% in Korea and 23% in United States native Mexican Americans although there was similarity in a number of associated variables.

The WHO World Mental Health (WMH) Survey Initiative (Kessler & Üstün, 2004) standardizes survey design and implementation procedures that facilitate the comparison of estimates of prevalence and correlates of AUDs in a large number of participating countries (Kessler, Abelson, Demler, et al., 2004; Kessler, Heeringa, Pennell, et al., 2018; Kessler & Üstün, 2004), making the study especially useful for investigating cross-national characteristics of disorders (Glantz, Medina-Mora, Petukhova, et al., 2014). This paper reports findings on the prevalences and correlates of AUDs in the WMH countries.

2. Methods

Data for this paper come from 29 WMH surveys carried out in 27 countries or country regions between 2001 and 2015. The list of participating countries, their World Bank income classification (World Bank, 2012), and the sample characteristics for each country including the sample sizes are shown in Table 1.

Mental and substance use disorders were assessed using the WHO Composite International Diagnostic Interview (CIDI) Version 3.0, a validated fully-structured lay-administered interview (Haro, Arbabzadeh-Bouchez, Brugha, et al., 2006) generating lifetime and 12-month prevalence estimates of DSM-IV-TR (American Psychiatric Association, 2000) mood, anxiety, behavioral, and substance use disorders (Kessler & Üstün, 2004). The CIDI assesses AUDs by asking a series of questions that operationalize the DSM-IV symptom criteria for Alcohol Abuse (ALA) and Alcohol Dependence (ALD). Respondents who met criteria for either ALA or ALD were

Table 1
WMH sample characteristics by World Bank income categories.^a

Country	Sampling	Field dates	Age range ^b	Sample size		Response rate ^c
				Part 1	Part 2	
Low and lower-middle income countries						
Colombia	All urban areas of the country (about 73% of the total national population)	2003	18–65	4426	2381	87.7%
Iraq	Nationally representative	2006–7	18–96	4332	4332	95.2%
Nigeria	21 of the 36 states in the country (about 57% of the national population)	2002–4	18–100	6752	2143	79.3%
China	Beijing and Shanghai metropolitan areas	2001–3	18–70	5201	1628	74.7%
Peru	All urban areas of the country	2004–5	18–65	3930	1801	90.2%
Ukraine	Nationally representative	2002	18–91	4725	1720	78.3%
<i>Total</i>				29,366	14,005	82.8%
Upper-middle income countries						
Brazil	São Paulo metropolitan area	2005–8	18–93	5037	2942	81.3%
Bulgaria	Nationally representative	2002–6	18–98	5318	2233	72.0%
Colombia	Medellin metropolitan area	2011–12	19–65	3261	1673	97.2%
Lebanon	Nationally representative	2002–3	18–94	2857	1031	70.0%
Mexico	All urban areas of the country (about 75% of the total national population)	2001–2	18–65	5782	2362	76.6%
Romania	Nationally representative	2005–6	18–96	2357	2357	70.9%
South Africa	Nationally representative	2002–4	18–92	4315	4315	87.1%
High income countries						
Argentina	Nationally representative	2015	18–98	3927	2116	77.3%
Australia	Nationally representative	2007	18–85	8463	8463	60.0%
Belgium	Nationally representative	2001–2	18–95	2419	1043	50.6%
France	Nationally representative	2001–2	18–97	2894	1436	45.9%
Germany	Nationally representative	2002–3	19–95	3555	1323	57.8%
Israel	Nationally representative	2003–4	21–98	4859	4859	72.6%
Italy	Nationally representative	2001–2	18–100	4712	1779	71.3%
Japan	Eleven metropolitan areas	2002–6	20–98	4129	1682	55.1%
The Netherlands	Nationally representative	2002–3	18–95	2372	1094	56.4%
New Zealand	Nationally representative	2004–5	18–98	12,790	7312	73.3%
North Ireland	Nationally representative	2005–8	18–97	4340	1986	68.4%
Poland	Nationally representative	2010–11	18–65	10,081	4000	50.4%
Portugal	Nationally representative	2008–9	18–81	3849	2060	57.3%
Spain	Nationally representative	2001–2	18–98	5473	2121	78.6%
Spain	Murcia region	2010–12	18–96	2621	1459	67.4%
United States	Nationally representative	2001–3	18–99	9282	5692	70.9%
<i>Total</i>				85,766	48,425	63.1%
<i>Overall sample</i>				144,059	79,343	69.2%

^a The World Bank (2018) Data. Accessed August 2018 at: <http://data.worldbank.org/country>. Some of the WMH countries have moved into new income categories since the surveys were conducted. The income groupings above reflect the status of each country at the time of data collection. The current income category of each country is available at the preceding URL.

^b For the purposes of cross-national comparisons we limit the sample to those 18+.

^c The response rate is calculated as the ratio of the number of households in which an interview was completed to the number of households originally sampled, excluding from the denominator households known not to be eligible either because of being vacant at the time of initial contact or because the residents were unable to speak the designated languages of the survey.

considered to have an AUD. Consistent with DSM-IV, any respondents who met criteria for both AUD disorders were diagnosed with ALD.

In an effort to reduce respondent burden a two-part sampling design was used in which all respondents were administered a Part I interview that contained questions about disorders of primary interest to the WMH investigators. A Part II sample, consisting of 100% of the Part I respondents who met lifetime criteria for any of the disorders assessed in Part I plus a probability sample (typically in the range between 20% and 33% depending on the country) of other Part I respondents were administered Part II of the survey. The Part II sample included questions about disorders of secondary interest along with questions about risk factors and consequences of disorders. The non-certainty respondents in the Part II sample were weighted by the inverse of their probability of selection so that weighted prevalence estimates of Part I disorders in the Part II sample are identical to unweighted estimates of these disorders in the Part I sample. Weights were also used to match the samples to population socio-demographic distributions. As discussed in detail elsewhere, (Heeringa, Wells, Hubbard, et al., 2008) the sequence of steps in calculating analysis weights was the same across WMH surveys but differed in exact procedures depending on the sample frame and access to population data for post-survey adjustments. A total of 123,237 respondents across the 29 surveys were assessed for AUDs. The

Part II sample includes 79,343 respondents. Further details on the WMH surveys are summarized in the Appendix Methods.

3. Data analysis

All analyses were based on weighted data, accounting for stratification and clustering. Standard errors were estimated using Taylor series linearization as implemented in Statistical Analysis System® (SAS) Version 9.4 (SAS Institute Inc, 2019). SAS PROC LIFETEST was used to produce life-table estimates of the age-of-onset (AOO) distributions of AUD and are reported as weighted prevalences. The associations of sociodemographic variables (see Appendix Methods for full list) with lifetime AUD prevalence as of given ages were assessed using discrete-time logistic regression analyses with person-year the unit of analysis. Similar analyses using standard logistic regression were used to investigate correlates of past year AUD among non-abstainers defined as those who report at least some use of alcohol in their lifetimes. Results are presented as odds ratios (OR) and 95% confidence intervals (CI). Tests of significance were evaluated using Wald *F* tests based on design-corrected coefficient variance-covariance matrices with statistical significance defined at the 2-tailed 0.05 level.

Table 2
Prevalence of lifetime alcohol use, alcohol abuse and alcohol dependence in the World Mental Health Surveys.

Country	N	Lifetime alcohol use		Lifetime DSM-IV alcohol abuse		Lifetime DSM-IV alcohol dependence		Lifetime DSM-IV alcohol use disorder		DSM-IV abuse among lifetime users		DSM-IV dependence among lifetime users		DSM-IV use disorder among lifetime users	
		%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Low-Lower middle income countries	29,366	68.0	0.4	4.4	0.2	1.5	0.1	5.9	0.2	6.5	0.2	2.2	0.1	8.6	0.3
Colombia	4426	94.3	0.5	6.9	0.5	2.5	0.4	9.4	0.6	7.3	0.6	2.7	0.4	10.0	0.7
Iraq	4332	3.8	0.4	0.5	0.2	0.2	0.1	0.7	0.2	13.8	5.2	5.4	2.9	19.2	5.7
Nigeria	6752	55.8	0.8	1.9	0.2	0.3	0.1	2.2	0.2	3.4	0.3	0.6	0.3	4.0	0.3
Peru	3930	97.1	0.3	4.3	0.3	1.5	0.2	5.7	0.4	4.4	0.3	1.5	0.2	5.9	0.4
PRC China	5201	67.3	1.2	3.7	0.3	1.1	0.2	4.7	0.4	5.5	0.5	1.6	0.3	7.0	0.6
Ukraine	4725	96.4	0.4	10.0	0.7	3.7	0.4	13.7	0.8	10.4	0.7	3.8	0.4	14.2	0.9
Upper-middle income countries	27,339	73.9	0.4	4.7	0.2	2.4	0.1	7.2	0.2	6.4	0.3	3.3	0.2	9.7	0.3
Brazil	5037	86.6	0.5	6.6	0.5	3.3	0.3	9.8	0.6	7.6	0.6	3.8	0.4	11.3	0.7
Bulgaria	5318	77.8	0.6	2.2	0.2	0.9	0.1	3.2	0.3	2.9	0.3	1.2	0.2	4.1	0.4
Colombia (Medellin)	1673	87.1	1.5	8.0	1.2	4.8	0.8	12.8	1.4	9.2	1.3	5.5	1.0	14.6	1.6
Lebanon	2857	55.5	2.5	1.2	0.3	0.4	0.2	1.6	0.3	2.1	0.5	0.7	0.3	2.8	0.6
Mexico	5782	85.7	0.6	4.2	0.3	3.8	0.4	8.0	0.6	4.9	0.4	4.4	0.5	9.4	0.6
Romania	2357	83.2	1.0	2.4	0.3	0.7	0.2	3.1	0.3	2.9	0.3	0.8	0.2	3.8	0.3
South Africa	4315	40.6	1.2	8.8	0.7	2.7	0.4	11.5	0.8	21.6	1.4	6.7	0.9	28.3	1.7
High income countries	66,532	87.7	0.2	7.7	0.1	2.6	0.1	10.3	0.2	8.8	0.2	3.0	0.1	11.8	0.2
Argentina	2116	82.1	1.3	7.0	0.7	1.2	0.3	8.2	0.7	8.6	0.8	1.4	0.3	10.0	0.9
Australia	8463	94.1	0.4	18.7	0.6	4.0	0.3	22.7	0.6	19.9	0.7	4.2	0.3	24.1	0.7
Belgium	2419	91.1	1.2	6.6	0.8	1.7	0.5	8.3	0.9	7.2	0.9	1.9	0.6	9.1	0.9
France	2894	92.8	0.7	5.5	0.5	1.6	0.3	7.1	0.5	6.0	0.6	1.7	0.3	7.6	0.5
Germany	3555	95.1	0.7	4.9	0.4	1.5	0.3	6.5	0.6	5.2	0.5	1.6	0.3	6.8	0.6
Israel	4859	58.3	0.8	3.9	0.3	0.4	0.1	4.3	0.3	6.7	0.5	0.7	0.2	7.4	0.5
Italy	4712	75.4	1.5	0.9	0.1	0.3	0.1	1.3	0.2	1.2	0.2	1.7	0.1	1.7	0.3
Japan	1682	88.6	1.1	6.5	0.7	0.9	0.2	7.3	0.7	7.3	0.8	1.0	0.2	8.3	0.8
New Zealand	12,790	94.8	0.3	7.5	0.3	4.6	0.2	12.1	0.4	7.9	0.3	4.9	0.2	12.8	0.4
Northern Ireland	1986	83.1	1.0	10.7	0.9	2.5	0.4	13.2	1.0	12.9	1.1	3.0	0.5	15.9	1.2
Poland	4000	86.3	0.6	8.8	0.4	2.2	0.2	11.1	0.5	10.2	0.5	2.6	0.3	12.8	0.5
Portugal	2060	85.4	1.3	8.7	1.0	1.3	0.3	10.0	1.0	10.2	1.1	1.6	0.3	11.8	1.2
Spain	5473	87.3	0.6	3.0	0.4	0.6	0.1	3.6	0.4	3.5	0.5	0.7	0.1	4.1	0.5
Spain (Murcia)	1459	89.4	1.3	4.9	0.7	1.5	0.5	6.4	0.6	5.5	0.7	1.6	0.6	7.1	0.7
The Netherlands	2372	94.1	0.7	7.4	0.8	1.5	0.3	8.9	0.9	7.9	0.8	1.6	0.3	9.5	0.9
The United States	5692	91.6	0.9	7.8	0.4	6.0	0.4	13.8	0.6	8.5	0.4	6.5	0.4	15.0	0.6
All countries combined	123,237	80.0	0.2	6.3	0.1	2.3	0.1	8.6	0.1	7.8	0.1	2.9	0.1	10.7	0.1
WHO regions ^a															
Region of the Americas	28,656	89.7	0.3	6.2	0.2	3.5	0.2	9.7	0.3	6.9	0.2	3.9	0.2	10.8	0.3
African Region	11,067	49.9	0.6	4.6	0.3	1.3	0.1	5.9	0.3	9.2	0.6	2.5	0.3	11.7	0.7
Western Pacific Region	28,136	89.1	0.4	10.1	0.3	3.6	0.1	13.7	0.3	11.3	0.3	4.0	0.2	15.3	0.3
Eastern Mediterranean Region	12,048	38.0	0.8	2.0	0.2	0.3	0.1	2.4	0.2	5.4	0.4	0.9	0.2	6.3	0.4
Western European Region	26,930	87.4	0.4	5.0	0.2	1.2	0.1	6.2	0.2	5.7	0.2	1.4	0.1	7.1	0.2
Eastern European Region	16,400	86.0	0.3	6.1	0.2	2.0	0.1	8.1	0.3	7.1	0.3	2.3	0.1	9.4	0.3
Comparison between countries ^b		F(28,5333) = 347.8		F(28,5333) = 72.3		F(28,5333) = 34.7		F(28,5333) = 96.4		F(28,5333) = 51.4		F(28,5333) = 27.1		F(28,5333) = 66.7	
		P < .0001		P < .0001		P < .0001		P < .0001		P < .0001		P < .0001		P < .0001	

(continued on next page)

Table 2 (continued)

Country	N	Lifetime alcohol use	Lifetime DSM-IV alcohol abuse	Lifetime DSM-IV alcohol dependence	Lifetime DSM-IV alcohol use disorder	DSM-IV abuse among lifetime users	DSM-IV dependence among lifetime users	DSM-IV use disorder among lifetime users
		%	%	%	%	%	%	%
		SE	SE	SE	SE	SE	SE	SE
Comparison between low, middle and high income country groups ^b		F(2,5359) = 993.8 P < .0001	F(2,5359) = 140.6 P < .0001	F(2,5359) = 46.1 P < .0001	F(2,5359) = 160.5 P < .0001	F(2,5359) = 49.0 P < .0001	F(2,5359) = 16.5 P < .0001	F(2,5359) = 48.3 P < .0001
Comparison between WHO regions ^b		F(5,5356) = 1116.7 P < .0001	F(5,5356) = 149.9 P < .0001	F(5,5356) = 128.7 P < .0001	F(5,5356) = 252.4 P < .0001	F(5,5356) = 56.0 P < .0001	F(5,5356) = 68.1 P < .0001	F(5,5356) = 98.3 P < .0001

^a Region of the Americas (Argentina, Brazil, Colombia, Medellin, Mexico, Peru, the United States); African region (Nigeria, South Africa); Western Pacific region (Australia, Japan, New Zealand, PRC China (Beijing and Shanghai)); Eastern Mediterranean region (Iraq, Israel, Lebanon); Western European region (Belgium, France, Germany, Italy, The Netherlands, Northern Ireland, Portugal, Spain, Spain(Murcia)); Eastern European region (Bulgaria, Poland, Romania, Ukraine).

^b Wald design-corrected F-tests were used to determine if there is variation in prevalence estimates across countries.

4. Results

4.1. Lifetime prevalence

Table 2 shows the lifetime prevalence of alcohol use, ALA, ALD and AUDs for each of the surveys, the countries combined, the countries grouped by World Bank income levels, and the WHO regions. There are significant differences in base rate prevalences of lifetime alcohol use and all DSM-IV diagnoses across countries, income levels and regions, as well as significant differences in prevalences when considered only among non-abstainers.

The mean lifetime prevalence of alcohol use in all countries combined was 80%, ranging from 3.8% in Iraq to 97.1% in Peru. The average lifetime prevalence of ALA for all countries was 6.3%, ranging from 0.5% in Iraq to 18.7% in Australia. The average lifetime prevalence of ALD for all countries was 2.3%, ranging from 0.2% in Iraq to 6.0% in the United States. As expected, the lifetime prevalence of ALD was lower than ALA cross-nationally and for all within-country comparisons. The lifetime prevalence of AUDs for all countries combined was 8.6% and ranged from 0.7% in Iraq to 22.7% in Australia.

The lifetime prevalence of AUDs among non-abstainers for all countries combined was 10.7%. Once conditioned upon lifetime alcohol use, there was a noticeable shift in the ordering of prevalence across surveys. When excluding lifetime alcohol abstainers, the highest prevalence of lifetime AUD was found in South Africa (28.3%) exceeding that of Australia (24.1%) which had the highest unconditioned AUD prevalence. The lowest conditional prevalences were found for Italy with estimates of 1.2% for ALA, 0.5% for ALD, and 1.7% for AUD. When all survey participants were considered, Iraq had the lowest prevalence of AUDs. However, once conditioning on lifetime use, Iraq fell in the top three of all surveys for AUD prevalence indicating a low level of overall use but a high risk of AUD among users.

Unconditional lifetime prevalence of AUDs shows a clear positive trend with country income level, increasing from 5.9% for AUDs in low/lower-middle income countries to 7.2% in upper-middle income countries and 10.3% in high-income countries. Comparisons of AUD diagnoses by income group remain significant when conditioning upon lifetime use of alcohol but the trend was less consistent. Comparing between WHO regions, prevalence rates of AUDs were lowest among the Eastern Mediterranean surveys and highest among the Western Pacific surveys, regardless of whether conditioning on alcohol use or not.

4.2. Past-year prevalence

Table 3 shows the prevalences of past-year alcohol use, ALA, ALD and AUDs for all countries, income levels and WHO regions, as well as past-year diagnoses conditional on past-year use. There were significant differences in unconditional and conditional past-year alcohol use and diagnoses across countries. The average 12-month prevalence of alcohol use was 52.3%, ranging from 1.7% in Iraq to 76.9% in Australia. The average 12-month prevalence of ALA for all countries was 1.3% and ranges from 0.1% in Iraq and Japan to 3.7% in the Ukraine. Similar to observations among lifetime prevalences, within-survey comparisons show past-year rates of ALA most often exceed past-year ALD. The average past-year prevalence of AUDs for all countries combined was 2.2% and ranges from 0.1% in Iraq to 5.9% in the Ukraine.

Conditioning on past year alcohol use, the average past year prevalence for all countries combined was 2.6% for ALA, 1.8% for ALD, and 4.4% for AUD. Iraq had the highest past year prevalence rate (joint with New Zealand) of any survey for AUDs among past-year users (7.3%) which sharply contrasts with its unconditional past-year AUD estimate in which it reported the lowest of any survey (0.1%). The lowest conditional past year prevalence of AUDs was from Japan (1.1%).

There were significant differences in past-year prevalence estimates

Table 3
Prevalence of past-year alcohol use, alcohol abuse and alcohol dependence in the World Mental Health Surveys.

Country	N	Past-year alcohol use ^c		Past-year DSM-IV alcohol abuse		Past-year DSM-IV alcohol dependence		Past-year DSM-IV alcohol use disorder		Past-year DSM-IV abuse among past-year users ^c		Past-year DSM-IV dependence among past-year users ^c		Past-year DSM-IV use disorder among past-year users ^c	
		%	SE	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
Low-lower middle income countries	29,366	42.4	0.6	1.2	0.1	0.8	0.1	2.0	0.1	1.9	0.2	1.5	0.2	3.4	0.3
Colombia	4426	58.3	1.0	1.3	0.2	1.3	0.3	2.6	0.4	2.3	0.4	2.2	0.5	4.5	0.6
Iraq	4332	1.7	0.3	0.1	0.0	0.0	0.1	0.7	0.1	6.6	5.0	0.7	0.5	7.3	4.9
Nigeria	6752	-	-	0.5	0.1	0.2	0.1	0.7	-	-	-	-	-	-	-
Peru	3930	69.4	0.7	1.0	0.2	0.6	0.1	1.6	0.2	1.5	0.3	0.8	0.1	2.3	0.3
PRC China	5201	-	-	0.8	0.2	0.6	0.2	1.5	0.2	-	-	-	-	-	-
Ukraine	4725	-	-	3.7	0.4	2.2	0.2	5.9	0.5	-	-	-	-	-	-
Upper-middle income countries	27,339	45.8	0.5	1.4	0.1	0.9	0.1	2.3	0.1	2.2	0.2	1.9	0.2	4.1	0.3
Brazil	5037	43.4	0.7	1.8	0.2	1.3	0.2	3.1	0.4	4.1	0.7	3.1	0.3	7.2	0.8
Bulgaria	5318	62.9	0.8	0.2	0.2	0.3	0.1	1.1	0.2	1.3	0.3	0.5	0.1	1.7	0.3
Colombia (Medellin)	1673	45.7	2.9	1.5	0.3	1.7	0.4	3.2	0.5	3.8	0.8	3.8	0.9	7.1	1.2
Lebanon	2857	31.0	2.4	0.3	0.2	0.3	0.1	0.6	0.2	1.0	0.5	0.9	0.5	1.9	0.7
Mexico	5782	43.4	1.0	1.0	0.2	1.2	0.3	2.2	0.4	2.3	0.5	2.8	0.6	5.0	0.8
Romania	2357	36.2	1.5	0.4	0.2	0.3	0.1	0.8	0.3	1.2	0.5	1.0	0.4	2.2	0.7
South Africa	4315	-	-	3.5	0.4	1.3	0.2	4.7	0.4	-	-	-	-	-	-
High income countries	66,532	58.4	0.4	1.4	0.1	0.8	0.0	2.2	0.1	2.9	0.1	1.9	0.1	4.8	0.2
Argentina	2116	57.9	2.1	1.3	0.2	0.3	0.1	1.6	0.2	2.2	0.3	0.5	0.2	2.7	0.4
Australia	8463	76.9	0.7	2.6	0.2	1.4	0.2	4.1	0.3	3.4	0.3	1.9	0.2	5.3	0.4
Belgium	2419	-	-	1.4	0.4	0.3	0.1	1.7	0.4	-	-	-	-	-	-
France	2894	-	-	0.7	0.2	0.5	0.2	1.3	0.3	-	-	-	-	-	-
Germany	3555	-	-	0.8	0.2	0.3	0.1	1.1	0.2	-	-	-	-	-	-
Israel	4859	51.8	0.8	1.0	0.1	0.1	0.1	1.1	0.2	2.0	0.3	0.3	0.1	2.2	0.3
Italy	4712	-	-	0.1	0.0	0.1	0.0	0.2	0.1	-	-	-	-	-	-
Japan	1682	64.3	1.6	0.5	0.2	0.2	0.1	0.7	0.2	0.8	0.3	0.4	0.1	1.1	0.3
New Zealand	12,790	40.8	0.6	1.5	0.1	1.5	0.1	3.0	0.2	3.6	0.4	3.7	0.3	7.3	0.5
Northern Ireland	1986	68.9	1.5	2.3	0.4	0.7	0.2	3.1	0.5	3.4	0.6	1.1	0.3	4.4	0.7
Poland	4000	65.5	0.9	2.2	0.3	1.2	0.2	3.5	0.3	3.4	0.4	1.9	0.3	5.3	0.4
Portugal	2060	62.3	1.6	1.3	0.2	0.3	0.1	1.6	0.3	2.1	0.4	0.4	0.2	2.5	0.4
Spain	5473	-	-	0.6	0.1	0.1	0.1	0.7	0.2	-	-	-	-	-	-
Spain (Murcia)	1459	65.9	2.5	0.6	0.3	0.3	0.2	0.9	0.4	1.0	0.5	0.5	0.3	1.4	0.6
The Netherlands	2372	-	-	1.5	0.3	0.4	0.1	1.9	0.3	-	-	-	-	-	-
The United States	5692	62.3	1.4	1.6	0.1	1.7	0.2	3.3	0.3	2.6	0.2	2.7	0.3	5.3	0.4
All countries combined	123,237	52.3	0.3	1.3	0.0	0.8	0.0	2.2	0.1	2.6	0.1	1.8	0.1	4.4	0.1
WHO regions ^b															
Region of the Americas	28,656	54.2	0.5	1.4	0.1	1.2	0.1	2.6	0.1	2.5	0.2	2.2	0.2	4.7	0.2
African Region	11,067	-	-	1.7	0.2	0.6	0.1	2.3	0.2	-	-	-	-	-	-
Western Pacific Region	28,136	55.9	0.5	1.6	0.1	1.2	0.1	2.9	0.1	3.3	0.2	2.5	0.2	5.8	0.3
Eastern Mediterranean Region	12,048	28.9	0.7	0.5	0.1	0.1	0.0	0.6	0.1	1.8	0.3	0.4	0.1	2.2	0.3
Western European Region	26,930	65.6	1.1	0.9	0.1	0.3	0.0	1.2	0.1	2.3	0.3	0.7	0.2	3.0	0.3
Eastern European Region	16,400	58.4	0.6	1.9	0.1	1.1	0.1	3.0	0.2	2.1	0.2	1.1	0.1	2.2	0.2
Comparison between countries ^{b,c}															
		F(18,4939) = 230.8		F(28,5333) = 20.5		F(28,5333) = 19.4		F(28,5333) = 31.9		F(18,4939) = 6.5		F(18,4939) = 15.9		F(18,4939) = 16.3	
		P < .0001		P < .0001		P < .0001		P < .0001		P < .0001		P < .0001		P < .0001	

(continued on next page)

Table 3 (continued)

Country	N	Past-year alcohol use ^c	Past-year DSM-IV alcohol abuse	Past-year DSM-IV alcohol dependence	Past-year DSM-IV alcohol use disorder	Past-year DSM-IV abuse among past-year users ^c	Past-year DSM-IV dependence among past-year users ^c	Past-year DSM-IV use disorder among past-year users ^c
		%	%	%	%	%	%	%
Comparison between low, middle and high income country groups ^b		F(2,4955) = 309.5 P < .0001	F(2,5359) = 1.5 P = .2155	F(2,5359) = 0.8 P = .4309	F(2,5359) = 2.0 P = .1422	F(2,4955) = 8.1 P = .0003	F(2,4955) = 1.3 P = .2677	F(2,4955) = 7.9 P = .0004
Comparison between WHO regions ^b		F(4,4953) = 252.7 P < .0001	F(5,5356) = 29.4 P < .0001	F(5,5356) = 58.7 P < .0001	F(5,5356) = 72.9 P < .0001	F(4,4953) = 6.2 P < .0001	F(4,4953) = 32.8 P < .0001	F(4,4953) = 25.4 P < .0001

^a Region of the Americas (Argentina, Brazil, Colombia, Medellin, Mexico, Peru, the United States); African region (Nigeria, South Africa); Western Pacific region (Australia, Japan, New Zealand, PRC China (Beijing and Shanghai)); Eastern Mediterranean region (Iraq, Israel, Lebanon); Western European region (France, Germany, Italy, The Netherlands, Northern Ireland, Portugal, Spain, Spain(Murcia)); Eastern European region (Bulgaria, Poland, Romania, Ukraine).

^b Wald design-corrected F-tests were used to determine if there is variation in prevalence estimates across countries.

^c 12-Month alcohol use was not assessed within Nigeria, PRC China, Ukraine, South Africa and ESEMED countries (Belgium, France, Germany, Italy, The Netherlands and Spain) and is represented by a dash (-).

across WHO regions. The Eastern Mediterranean region had the lowest prevalence estimates among WHO regions for alcohol use (28.9%), ALA (0.5%), ALD (0.1%), and AUD (0.6%) and this pattern was consistent when conditioning upon past-year use ALA (1.8%), ALD (0.4%), and AUD (2.2%). The highest unconditional past year prevalence estimates of alcohol use were from the Western European Region (65.6%), the highest prevalence of ALA was from the Eastern Europe region (1.9%) the highest prevalence of ALD was from the Western Pacific and Region of the Americas (1.2%), and the highest prevalence of AUD was from the Eastern Europe region (3.0%). When excluding alcohol abstainers, the Western Pacific surveys had the highest prevalence estimates for past year ALA (3.3%), ALD (2.5%) and AUD (5.8%).

There were significant differences between income groups for ALA and AUDs but not ALD when alcohol abstainers were excluded, though there were no significant differences when they were included. Unconditional AUD prevalence ranged from 2.0% in low/lower-middle income surveys to 2.3% in upper-middle income surveys while conditional AUD prevalences ranged from 3.4% in lower income surveys to 4.8% in high income surveys.

4.3. Remission

Remission among people with lifetime AUD was defined at time of interview as having had more than 12 months, or at least two birthdays, since the last disorder related problem. Table 4 shows prevalence of remission at the time of interview among lifetime ALA, ALD and all AUD cases as well as among AUD cases that had at least one non-substance use mental disorders (MHD). For all conditional groups, there were significant differences in the prevalence of AUD remission across countries, income levels and regions. The average prevalence of ALA remission for all countries was 79.5% and 59.7% for ALD. The average prevalence of AUD remission was 75.2%, ranging from 58.2% in Ukraine to 89.3% in Japan. When conditioning on specific disorders, the average remission prevalence was higher among ALA (79.5%) compared to ALD (59.7%) cases, with this same trend consistent within most survey-specific comparisons. Among those with at least one MHD, the average prevalence of AUD remission was 72.5%, ranging from 47.9% in Lebanon to 94.5% in Spain.

4.4. Gender

Table 5 shows 12-month and lifetime prevalences for AUD by gender. The average past year prevalence of AUD for all countries was 0.9% for women, ranging from no past year cases in Iraq and Nigeria to 2.6% in Australia. The average past year prevalence for all countries was 3.6% for men ranging from 0.2% in Iraq to 11.6% in the Ukraine. Among women, the average lifetime prevalence of AUD for all countries was 3.4% ranging from no lifetime cases in Iraq to 12.1% in Australia. The average lifetime prevalence of AUDs for men was 14.1% for all countries and ranges from 1.4% in Iraq to 33.4% in Australia. In all surveys, the prevalence estimates of both lifetime and 12-month AUDs were higher for men than women.

4.5. Disorder persistence

Using the retrospective data on determinations of past AUD it is possible to compute an indirect indicator of disorder persistence as the proportion of lifetimes cases of ALA, ALD and AUDs among subjects who also met criteria for the same diagnosis in the 12 months before interview (Table 6). Significant differences can be seen across countries, survey income groups and WHO regions. Overall, a quarter of respondents who had ever had an AUD continued to have at least some symptoms of the disorder in the past year. For all countries combined, the rates of past-year persistence were 21.4% for ALA, 36.7% for ALD and 25.5% for AUD. There was significant variation for all diagnoses across countries with AUD persistence ranging from 10% in Japan to

Table 4
Prevalence of remission from alcohol use disorders among those with specific disorders.^a

Country	Remission among DSM-IV abuse cases		Remission among DSM-IV dependence cases ^c		Remission among all DSM-IV use disorder cases ^c		Remission from an AUD among those with DSM-IV alcohol use disorder and at least one other mental disorder ^{b,c}	
	%	SE	%	SE	%	SE	%	SE
Low-Lower middle income countries	74.4	1.5	46.2	2.7	67.3	1.4	62.2	3.2
Colombia	84.0	2.8	49.5	5.6	74.7	3.0	68.6	4.7
Iraq	78.4	11.9	93.9	5.2	82.8	9.8	60.0	27.1
Nigeria	76.1	2.8	32.6	10.7	69.7	2.8	63.2	8.4
Peru	76.6	3.9	62.5	6.2	73.0	2.6	73.1	6.2
PRC China	78.5	3.3	39.9	8.3	69.9	3.7	52.7	11.3
Ukraine	65.0	2.7	40.0	4.1	58.2	2.3	50.0	6.9
Upper-middle income countries	71.5	1.7	59.1	2.9	67.0	1.5	65.5	2.5
Brazil	74.0	3.1	61.3	3.8	69.8	2.5	66.1	3.7
Bulgaria	67.3	5.6	68.1	7.3	67.5	4.0	75.1	7.9
Colombia (Medellin)	83.4	3.8	65.3	7.3	76.6	3.6	78.0	4.2
Lebanon	74.6	9.7	29.0	10.9	63.3	9.5	47.9	10.3
Mexico	76.9	4.3	–	–	–	–	–	–
Romania	82.3	7.0	38.6	11.5	72.6	7.4	56.2	17.5
South Africa	61.1	3.4	54.0	6.7	59.4	3.0	58.4	4.9
High income countries	82.9	0.7	67.2	2.0	80.8	0.8	77.6	1.5
Argentina	82.4	2.5	79.0	7.7	81.9	2.4	84.5	4.1
Australia	86.4	1.2	64.3	3.5	82.5	1.3	76.8	2.7
Belgium	79.9	4.3	82.9	3.8	80.5	3.6	78.9	6.7
France	87.3	2.7	66.2	8.7	82.7	3.5	88.6	3.9
Germany	85.3	2.8	78.8	6.7	83.8	3.0	85.3	7.1
Israel	74.1	3.2	68.4	10.7	73.5	3.0	67.1	6.7
Italy	91.3	5.0	73.8	9.0	86.4	4.5	79.3	12.8
Japan	92.4	2.8	66.3	9.2	89.3	2.9	91.1	3.9
New Zealand	80.5	1.7	–	–	–	–	–	–
Northern Ireland	79.8	3.4	69.8	7.2	77.9	3.1	78.0	3.7
Poland	77.0	2.8	44.4	5.8	70.5	2.3	63.5	4.1
Portugal	85.4	3.2	80.5	7.9	84.7	3.0	81.1	3.8
Spain	81.4	4.0	82.5	9.9	81.6	3.9	94.5	4.0
Spain (Murcia)	86.8	6.9	79.4	13.5	85.2	5.7	75.2	7.6
The Netherlands	81.4	3.8	71.8	8.1	79.8	3.3	74.6	8.3
The United States	80.3	1.6	–	–	–	–	–	–
All countries combined	79.5	0.6	59.7	1.5	75.2	0.6	72.5	1.2
WHO regions ^c								
Region of the Americas	79.4	1.2	60.1	2.7	74.0	1.4	72.8	2
African Region	65.0	2.6	50.6	6.0	61.8	2.4	58.8	4.5
Western Pacific Region	84.1	0.9	61.1	3.2	81.5	1.2	76.8	2.6
Eastern Mediterranean Region	74.6	3.0	63.2	9.1	72.9	2.9	63.5	6.5
Western European Region	83.3	1.3	75.7	2.8	81.8	1.2	80.8	1.9
Eastern European Region	70.5	1.8	45.3	3.1	64.3	1.5	58.2	3.7
Comparison between countries ^d	F(28,5333) = 4.3 P < .0001		F(25,5070) = 3.7 P < .0001		F(25,5070) = 6.9 P < .0001		F(28,5070) = 3.3 P < .0001	
Comparison between low, middle and high income country groups ^d	F(2,5359) = 26.4 P < .0001		F(2,5093) = 17.6 P < .0001		F(2,5093) = 53.4 P < .0001		F(2,5093) = 14.4 P < .0001	
Comparison between WHO regions ^d	F(5,5356) = 15.7 P < .0001		F(5,5090) = 10.5 P < .0001		F(5,5090) = 26.2 P < .0001		F(5,5090) = 8.7 P < .0001	

^a Remission is defined as having reported more than 12 months, or at least two birthdays, since the last disorder related problem.

^b Includes lifetime presence of any of the following: major depressive disorder, dysthymic disorder, bipolar disorder, panic disorder, generalized anxiety disorder, agoraphobia, social phobia, specific phobia, childhood or adult separation anxiety, posttraumatic stress disorder, attention deficit/hyperactivity disorder, conduct disorder, intermittent explosive disorder, and oppositional defiant disorder.

^c Region of the Americas (Argentina, Brazil, Colombia, Medellin, Mexico, Peru, the United States); African region (Nigeria, South Africa); Western Pacific region (Australia, Japan, New Zealand, PRC China (Beijing and Shanghai)); Eastern Mediterranean region (Iraq, Israel, Lebanon); Western European region (Belgium, France, Germany, Italy, The Netherlands, Northern Ireland, Portugal, Spain, Spain(Murcia)); Eastern European region (Bulgaria, Poland, Romania, Ukraine).

^d Wald design-corrected F-tests were used to determine if there is variation in prevalence estimates across countries.

^e Remission from dependence could not be assessed in the United States, New Zealand and Mexico (see eMethods).

43.3% in the Ukraine. Significant variation was also observed between income groups, with persistence highest for ALA among upper-middle income countries at 29.6% and for ALD and AUD among low/lower-middle income countries at 53.8% and 34.1%, respectively. Although Tables 2 and 3 show ALA as being a more prevalent disorder than ALD, the estimates presented in Table 6 show ALD to be a more persistent disorder.

4.6. Age of onset

Figure 1 displays AUD AOO curves among those with a lifetime AUD by survey income group. The earliest 15% of lifetime AUD cases across all survey income groups combined had onset before 18 years of age, which means that of those individuals who will develop an AUD at some time in their life, 15% will do so before age 18. For higher

Table 5
Prevalence of alcohol use disorders among women and men by country.

Country	Lifetime DSM-IV alcohol use disorder among women		Lifetime DSM-IV alcohol use disorder among men		Past-year DSM-IV alcohol use disorder among women		Past-year DSM-IV alcohol use disorder among men	
	%	SE	%	SE	%	SE	%	SE
	Low-Lower middle income countries	1.1	0.1	10.9	0.4	0.4	0.1	3.7
Colombia	2.3	0.4	18.0	1.3	0.5	0.2	5.1	0.7
Iraq	–	–	1.4	0.5	–	–	0.2	0.2
Nigeria	0.1	0.1	4.5	0.4	–	–	1.4	0.2
Peru	0.9	0.2	10.9	0.7	0.3	0.1	2.9	0.3
PRC China	0.5	0.2	8.5	0.8	0.2	0.1	2.6	0.5
Ukraine	2.9	0.4	26.9	1.5	1.3	0.2	11.6	1.0
Upper-middle income countries	2.3	0.2	12.5	0.4	0.8	0.1	4.0	0.3
Brazil	4.0	0.5	16.4	1.1	1.2	0.3	5.3	0.6
Bulgaria	0.6	0.2	5.9	0.6	0.3	0.1	2.0	0.3
Colombia (Medellin)	5.3	0.7	21.4	2.8	1.4	0.4	5.3	1.0
Lebanon	0.4	0.3	2.8	0.6	0.4	0.3	0.8	0.3
Mexico	1.3	0.3	15.4	1.1	0.2	0.2	4.3	0.7
Romania	0.2	0.1	6.4	0.6	0.1	0.1	1.6	0.5
South Africa	5.0	0.6	19.0	1.4	2.0	0.3	8.0	0.9
High income countries	4.8	0.1	16.3	0.3	1.1	0.1	3.4	0.1
Argentina	3.0	0.5	14.1	1.4	0.7	0.2	2.6	0.4
Australia	12.1	0.7	33.4	1.1	2.6	0.3	5.6	0.5
Belgium	2.1	0.6	14.6	1.6	0.5	0.2	2.9	0.7
France	2.0	0.3	12.7	1.0	0.2	0.1	2.4	0.5
Germany	1.7	0.3	11.6	1.1	0.4	0.1	1.9	0.4
Israel	1.1	0.2	7.8	0.6	0.3	0.1	2.0	0.3
Italy	0.2	0.1	2.4	0.4	0.1	0.1	0.3	0.1
Japan	2.5	0.7	12.9	1.3	0.2	0.1	1.3	0.4
New Zealand	7.2	0.4	17.4	0.6	1.8	0.2	4.3	0.3
Northern Ireland	5.8	0.6	21.2	1.8	1.5	0.3	4.7	0.9
Poland	3.4	0.4	18.9	0.9	0.6	0.1	6.4	0.5
Portugal	2.3	0.4	18.4	1.9	0.4	0.2	2.8	0.6
Spain	1.0	0.2	6.5	0.8	0.1	0.0	1.4	0.3
Spain (Murcia)	1.2	0.4	11.4	1.3	0.1	0.0	1.8	0.7
The Netherlands	3.7	0.6	14.3	1.6	1.0	0.3	2.8	0.6
The United States	7.8	0.5	20.5	1.0	1.9	0.3	4.8	0.4
All countries combined	3.4	0.1	14.1	0.2	0.9	0.0	3.6	0.1
WHO regions ^a								
Region of the Americas	3.5	0.2	16.6	0.5	0.9	0.1	4.4	0.2
African Region	2.1	0.3	10.0	0.6	0.8	0.1	3.9	0.3
Western Pacific Region	7.3	0.3	20.2	0.5	1.7	0.1	4.2	0.2
Eastern Mediterranean Region	0.6	0.1	4.3	0.3	0.2	0.1	1.1	0.2
Western European Region	1.9	0.1	10.8	0.4	0.4	0.1	2.0	0.2
Eastern European Region	1.9	0.2	15.0	0.5	0.6	0.1	5.7	0.3

A dash indicates a zero cell count.

^a Region of the Americas (Argentina, Brazil, Colombia, Medellin, Mexico, Peru, the United States); African region (Nigeria, South Africa); Western Pacific region (Australia, Japan, New Zealand, PRC China (Beijing and Shanghai)); Eastern Mediterranean region (Iraq, Israel, Lebanon); Western European region (Belgium, France, Germany, Italy, The Netherlands, Northern Ireland, Portugal, Spain, Spain(Murcia)); Eastern European region (Bulgaria, Poland, Romania, Ukraine).

percentages of AUDs, AOO generally decreased as survey income level increased. The median AOO for AUDs was 21 years in high-income survey countries, 23 years in upper-middle income countries and 24 years in low/lower-middle income countries.

4.7. Demographics

Consistent with previous studies, men were significantly more likely

than women to have a lifetime or past year persistent AUD (Table 7). The odds for men having a lifetime AUD were 4.6 (95% CI 4.3–4.9) times the odds for women and, among those with a lifetime AUD, the odds for a past year AUD among men were 1.2 (95% CI 1.0–1.4) times the odds for women.

Based on age at interview, younger cohorts were more likely to have a lifetime AUD and past year AUD persistence, with respondents aged 18–29 years having the highest odds for both lifetime (OR 10.4, 95% CI 9.2–11.7) and persistent past-year (OR 3.1, 95% CI 2.2–4.3) AUD compared to those aged 60 or over at time of interview. Employment status was significantly associated with development and persistence of AUD, with students less likely to develop a lifetime AUD (OR 0.8, 95% CI 0.7–1.0) but significantly more likely to persist once developing the disorder (OR 1.5, 95% CI 1.1–2.1) compared to those in employment. Marital status was significantly associated with lifetime and past year persistence of AUD, with divorced, separated or widowed respondents associated with the greatest odds of lifetime AUD (OR 1.6, 95% CI 1.5–1.7) and the never-married at elevated odds of both lifetime (OR 1.3, 95% CI 1.2–1.4) and persistent past-year AUD (OR 1.9, 95% CI 1.7–2.2) compared to those married at time of interview. Education level was significantly associated with lifetime AUD and past year AUD among lifetime cases, with a general trend of an inverse association between educational attainment and likelihood of an AUD. Household income was a significant predictor of lifetime AUD, with those from low (OR 1.2, 95% CI 1.2–1.3) and low-average (OR 1.1, 95% CI 1.1–1.2) income households significantly more likely to develop the disorder compared to persons living in high income households.

4.8. Onset relative to other mental disorders

AUDs are highly comorbid with MHD (Table 8). Among respondents with a lifetime AUD, 43.9% had at least one other lifetime MHD, and among those who had ever experienced any MHD, 17.9% had a lifetime AUD. Of those with a past year AUD, 58.6% had at least one other lifetime MHD and 42.9% had at least one other MHD in the same 12-month period (Appendix Table 1). Regarding the ordering of onset of these disorders, the MHD most often preceded the onset of the AUD, as was the case for dysthymia, agoraphobia, social phobia, specific phobias, separation anxiety, ADHD, conduct disorder, intermittent explosive disorder (IED) and oppositional defiant disorder (ODD). The exceptions were bipolar disorder, panic disorder, and generalized anxiety disorder (GAD) where no significant trend in temporal order of onset was observed, and major depressive disorder (MDD), where AUD onset most often occurred prior to disorder onset.

5. Discussion

The mean lifetime prevalence of AUDs in the 29 WMH surveys combined was 8.6%, ranging from 0.7% in Iraq to 22.7% in Australia. The combined mean 12-month AUD prevalence was 2.2%, ranging from 0.1% in Iraq to 5.9% in the Ukraine. This is a high level of disorder prevalence given the substantial health and economic burdens associated with AUDs (Moskalewicz, Room, & Thom, 2016; Peacock, Leung, Larney, et al., 2018; Webb, Bromet, Gluzman, et al., 2005). Although the AUD prevalence estimates range widely across the WMH countries, these estimates and the variations are consistent with findings from other national and regional surveys (Mathers & Ayuso-Mateos, 2003; Adlaf, Begin, & Sawka, 2005; Bromet, Gluzman, Paniotto, et al., 2005; Chen & Yin, 2008; Cochrane, Chen, Conigrave, et al., 2003; Hasin, Stinson, Ogburn, et al., 2007; Lukassen & Beaudet, 2005; Rehm, Room, Van Den Brink, et al., 2005; Taylor, 2007; Ulaş, Binbay, Kurlu, et al., 2017; Wittchen & Jacobi, 2005). There was also a relatively wide cross-national range of AUD prevalence estimates among lifetime non-abstainers. The combined lifetime prevalence of AUDs among non-abstainers was 10.7%, ranging from 1.7% in Italy to 28.3% in South Africa and the combined 12-month prevalence of AUDs among non-abstainers

Table 6
Prevalence of past-year alcohol use disorders among those with lifetime alcohol use disorders in the World Mental Health Surveys.

Country	N	Past-year DSM-IV abuse among lifetime DSM-IV alcohol abuse cases		Past-year DSM-IV dependence among lifetime DSM-IV alcohol dependence cases		Past-year DSM-IV use disorder among lifetime DSM-IV alcohol use disorder cases	
		%	SE	%	SE	%	SE
Low-Lower middle income countries	29,366	27.5	1.6	53.8	2.8	34.1	1.4
Colombia	4426	19.1	3.2	50.6	6.3	27.6	3.2
Iraq	4332	21.6	11.9	6.1	5.2	17.2	9.8
Nigeria	6752	24.8	2.9	67.4	10.7	31.0	2.9
Peru	3930	24.2	3.5	37.5	6.2	27.6	2.3
PRC China	5201	22.8	3.4	60.1	8.3	31.1	3.7
Ukraine	4725	37.1	2.8	60.0	4.1	43.3	2.3
Upper-middle income countries	27,339	29.6	1.8	38.3	2.7	32.5	1.5
Brazil	5037	27.1	3.2	41.2	3.4	31.8	2.5
Bulgaria	5318	35.4	5.4	31.9	7.3	34.3	4.0
Colombia (Medellin)	1673	18.7	4.2	36.5	7.5	25.4	3.8
Lebanon	2857	25.4	9.7	71.0	10.9	36.7	9.5
Mexico	5782	23.6	4.4	31.5	5.7	27.3	3.9
Romania	2357	17.6	6.6	50.3	13.1	24.8	7.3
South Africa	4315	39.9	3.3	45.8	6.6	41.3	3.0
High income countries	66,532	17.8	0.7	31.8	1.3	21.4	0.7
Argentina	2116	18.1	2.6	26.6	7.5	19.3	2.5
Australia	8463	14.1	1.2	36.2	3.5	18.0	1.4
Belgium	2419	20.7	4.2	19.2	4.0	20.4	3.6
France	2894	13.4	3.0	33.8	8.7	17.9	3.6
Germany	3555	15.4	3.1	21.2	6.7	16.8	3.2
Israel	4859	25.9	3.2	31.6	10.7	26.5	3.0
Italy	4712	8.7	5.0	26.2	9.0	13.6	4.5
Japan	1682	7.6	2.8	27.8	8.6	10.0	2.7
New Zealand	12,790	19.7	1.8	32.3	2.1	24.6	1.5
Northern Ireland	1986	21.7	3.8	29.6	7.1	23.2	3.5
Poland	4000	25.0	2.8	56.0	5.8	31.3	2.3
Portugal	2060	15.1	3.3	19.5	7.9	15.7	3.1
Spain	5473	19.5	4.0	17.5	9.9	19.2	3.9
Spain (Murcia)	1459	13.2	6.9	20.6	13.5	14.8	5.7
The Netherlands	2372	20.0	3.9	28.2	8.1	21.3	3.4
The United States	5692	20.9	1.6	27.7	2.5	23.9	1.6
All countries combined	123,237	21.4	0.6	36.7	1.1	25.5	0.6
WHO regions ^a							
Region of the Americas	28,656	22.0	1.2	34.6	1.9	26.6	1.1
African Region	11,067	36.0	2.6	49.2	5.9	38.9	2.4
Western Pacific Region	28,136	16.3	1.0	35.1	1.8	21.2	0.9
Eastern Mediterranean Region	12,048	25.4	3.0	36.8	9.1	27.1	2.9
Western European Region	26,930	17.5	1.3	24.5	2.8	18.9	1.3
Eastern European Region	16,400	31.5	1.9	54.2	3.1	37.1	1.6
Comparison between countries ^b		F(28,5333) = 4.5 P < .0001		F(28,5333) = 3.8 P < .0001		F(28,5333) = 6.5 P < .0001	
Comparison between low, middle and high income country groups ^b		F(2,5359) = 29.7 P < .0001		F(2,5359) = 21.8 P < .0001		F(2,5359) = 46.2 P < .0001	
Comparison between WHO regions ^b		F(5,5356) = 17.2 P < .0001		F(5,5356) = 11.0 P < .0001		F(5,5356) = 25.0 P < .0001	

^a Region of the Americas (Argentina, Brazil, Colombia, Medellin, Mexico, Peru, the United States); African region (Nigeria, South Africa); Western Pacific region (Australia, Japan, New Zealand, PRC China (Beijing and Shanghai)); Eastern Mediterranean region (Iraq, Israel, Lebanon); Western European region (Belgium, France, Germany, Italy, The Netherlands, Northern Ireland, Portugal, Spain, Spain (Murcia)); Eastern European region (Bulgaria, Poland, Romania, Ukraine).

^b Wald design-corrected F-tests were used to determine if there is variation in prevalence estimates across countries.

was 4.4% ranging from 1.1% in Japan to 7.3% in Iraq and New Zealand. Both AUD remission and persistence were common. The average prevalence of remission for at least the last year was 79.5% for ALA, 59.7% for ALD, and 75.2% for AUD while the average prevalence of past-year persistence was 21.4% for ALA, 36.7% for ALD and 25.5% for AUD.

The rank ordering across countries of lifetime prevalence estimates in the total population and non-abstainers was the same or similar for most countries but notably dissimilar in a few countries. For example, among all WMH surveys, Iraq had the lowest population prevalence of both past year and lifetime AUDs but for the subgroup of non-lifetime abstainers, Iraq had the highest 12-month prevalence and the third highest prevalence of lifetime AUDs. Iraq's general population had a relatively low risk for AUDs which may suggest that AUDs are not a significant concern in Iraq. However, among those who had ever used alcohol, the risk for AUDs was comparatively high (19.2%). A large difference was also found in South Africa comparing the AUD

prevalence in the general population (11.5%) and among users (28.3%).

There were significant differences in AUD prevalence across the WHO Regions. The Eastern Mediterranean region which had the lowest per capita alcohol consumption and the lowest proportion of drinkers also had the lowest past year and lifetime AUD prevalences. Presumably low consumption and high abstention are limiting factors on the development of AUDs in the general population of a country or region. Supporting this, the range of AUD prevalences across the WHO Regions narrows when considering only lifetime alcohol non-abstainers. However, the limiting effect of low consumption and high abstention may exert more influence at lower levels of alcohol consumption. While the annual per capita alcohol consumption of both France and Australia is relatively high at 12.2 liters/l of pure alcohol (World Health Organization, Management of Substance Abuse Unit, 2014), the lifetime prevalence of AUDs was 7.1% for France and 22.7% for Australia.

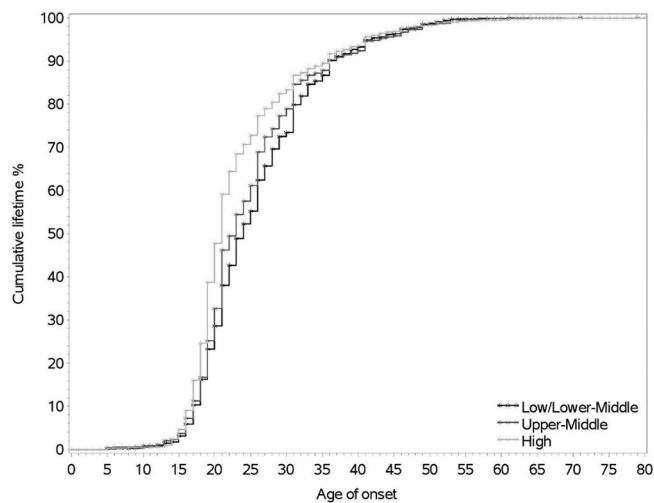


Figure 1. Age of DSM-IV alcohol use disorder onset distributions among those with a diagnosis by survey income groups.

There are probably a number of contributors to this difference, but one possible factor might be a difference in the prevalence of heavy episodic or binge drinking which has been found to have relatively more severe

consequences and association with AUDs than temperate patterns (Rehm, Rehm, Room, et al., 2003). Studies have found that France has the lowest level of binge drinking in Europe (Leifman, 2002) while Australia has comparatively high rates (Toumbourou, Beyers, Catalano, et al., 2005; Yang, Zhao, & Srivastava, 2016). Some view heavy episodic drinking as a primary indicator of severe alcohol use problems and have recommended that AUDs, particularly dependence, be measured via heavy drinking over time with diagnosis thresholds set in average per day consumption of alcohol (Rehm, 2016; Rehm & Room, 2017; Wood, Kaptoge, Butterworth, et al., 2018). The WMH findings suggest that alcohol consumption measures may enhance understanding of psychiatric epidemiological findings.

Other potentially limiting contextual factors may account for and possibly reflect some of the cross-national variation in prevalence of AUDs. Some of these may include social-cultural influences (Gordon, Heim, & Macaskill, 2012; Savic, Room, Mugavin, et al., 2016) such as parental involvement, drinking culture, and stigma while other factors may be more policy related (Babor, Caetano, Casswell, et al., 2010; Simpura, Karlsson, & Leppänen, 2002) such as legal sanctions, enforcement of prohibitions and alcohol availability, all of which may be subject to change over time. The possible influence of these factors is important to interpretation of the country AUD prevalences and to inferences about explanations for the varying AUD prevalences. However, interpretations should not assume simple causality and speculations must be cautious regarding how prevalences might change if different

Table 7
Bivariate associations between sociodemographic correlates and DSM-IV alcohol use disorder.

Prevalence of AUD according to...	Lifetime DSM-IV alcohol use disorder ^a		Past-year DSM-IV alcohol use disorder among lifetime alcohol use disorder ^b	
	% (SE)	OR (95% CI)	% (SE)	OR (95% CI)
Gender				
Male	14.1 (0.2)	4.6* (4.3–4.9)	25.6 (0.6)	1.2* (1.0–1.3)
Female	3.4 (0.1)	1	25.3 (1.1)	1
F-value [p]		2608.0* [< 0.001]		5.7* [0.017]
Age-cohort				
18–29	9.1 (0.2)	10.4* (9.2–11.7)	41.0 (1.2)	3.1* (2.2–4.3)
30–44	9.8 (0.2)	6.0* (5.5–6.6)	23.6 (0.9)	1.8* (1.3–2.4)
45–59	9.4 (0.2)	3.4* (3.1–3.8)	17.5 (0.9)	1.7* (1.3–2.3)
60+	4.6 (0.2)	1	7.8 (0.8)	1
F-value [p]		551.5* [< 0.001]		22.0* [< 0.001]
Employment status				
Student	5.9 (0.5)	0.8* (0.7–1.0)	40.4 (3.7)	1.5* (1.1–2.1)
Homemaker	3.6 (0.2)	0.9* (0.8–1.0)	22.4 (2.0)	1.0 (0.8–1.3)
Retired	4.7 (0.2)	0.8* (0.7–0.9)	10.7 (1.2)	0.9 (0.7–1.1)
Other	11.6 (0.4)	1.5* (1.4–1.6)	34.3 (1.6)	1.4* (1.2–1.6)
Employed	10.2 (0.2)	1	24.9 (0.6)	1
F-value [p]		36.8* [< 0.001]		5.4* [< 0.001]
Marital status				
Never married	10.6 (0.3)	1.3* (1.2–1.4)	38.4 (1.1)	1.9* (1.7–2.2)
Divorced/separated/widowed	9.2 (0.3)	1.6* (1.5–1.7)	19.5 (1.2)	1.1 (0.9–1.3)
Currently married	7.6 (0.1)	1	19.7 (0.7)	1
F-value [p]		80.9** [< 0.001]		44.1* [< 0.001]
Education level				
No education	2.4 (0.3)	1.2 (0.9–1.6)	35.1 (6.3)	2.5* (1.3–5.0)
Some primary	7.1 (0.4)	1.7* (1.5–2.0)	22.0 (1.9)	1.3 (0.9–1.7)
Finished primary	6.4 (0.3)	1.7* (1.5–1.9)	25.5 (2.1)	1.3 (1.0–1.8)
Some secondary	9.9 (0.2)	1.7* (1.6–1.9)	27.2 (1.2)	1.3* (1.1–1.6)
Finished secondary	8.9 (0.2)	1.4* (1.2–1.5)	26.4 (1.0)	1.2 (1.0–1.4)
Some college	11.5 (0.3)	1.4* (1.3–1.5)	26.5 (1.3)	1.3* (1.1–1.6)
Finished college	7.7 (0.3)	1	22.5 (1.3)	1
F-value [p]		25.7* [< 0.001]		2.2* [0.042]
Household income				
Low	9.9 (0.2)	1.2* (1.2–1.3)	27.9 (1.1)	1.3* (1.1–1.5)
Low-average	9.5 (0.2)	1.1* (1.1–1.2)	25.5 (1.2)	1.1 (1.0–1.3)
High-average	9.2 (0.2)	1.0 (1.0–1.1)	25.1 (1.1)	1.1 (0.9–1.3)
High	10.2 (0.3)	1	23.8 (1.1)	1
F-value [p]		15.0* [< 0.001]		2.5 [0.060]

* Significant at the 0.05 level, 2-sided test.

^a Estimates are based on discrete-time logistic regression analyses controlling for age-cohorts, gender, person-years and country.

^b Estimates are based on logistic regression model adjusted for time since AUD onset, gender and country.

Table 8
Prevalence of other mental disorders onset before and after the onset of AUDs in the subset of respondents with lifetime alcohol use disorders.

Lifetime disorder	% of AUD among mental disorder cases		AUD onset after mental disorder		AUD and mental disorder onset in the same year (B)		AUD prior to onset of mental disorder (C)		Comparison between columns A and C (B excluded)		p-Value	
	% of mental disorders among AUD cases	% of AUD among mental disorder cases	N	%	N	%	N	%	F-value	SE		
Mood disorders												
Major depressive disorder	19.5	16.5	904.0	41.3	1.3	220.0	10.0	0.8	1139.0	48.6	1.3	F(1,361) = 8.7
Dysthymic disorder ^a	2.9	25.0	159.0	51.5	2.9	28.0	11.1	2.8	128.0	37.4	2.6	F(1,59) = 9.0
Bipolar disorder ^b	8.1	37.8	348.0	43.8	2.2	122.0	13.2	1.3	374.0	43.0	2.3	F(1,165) = 0.04
Any mood disorder	26.2	19.1	1264.0	42.4	1.2	342.0	10.9	0.7	1495.0	46.7	1.2	F(1,448) = 3.7
Anxiety disorders												
Panic disorder	4.8	24.4	288.0	48.7	2.7	50.0	11.3	1.9	242.0	40.0	2.6	F(1,97) = 3.0
Generalized anxiety disorder	7.2	21.1	356.0	43.3	1.8	78.0	9.6	1.2	381.0	47.0	1.9	F(1,134) = 1.1
Agoraphobia	3.1	20.4	220.0	67.3	2.0	23.0	7.1	1.2	82.0	25.6	1.8	F(1,56) = 107.6
Social phobia ^c	12.2	25.9	1176.0	84.1	1.0	69.0	4.4	0.5	151.0	11.5	0.9	F(1,224) = 725.6
Specific phobia ^d	15.9	15.6	1195.0	92.4	0.7	16.0	0.8	0.1	87.0	6.8	0.7	F(1,224) = 1025.2
Childhood/Adult Separation Anxiety ^e	12.1	22.4	366.0	59.7	2.1	29.0	5.3	0.9	207.0	35.0	2.1	F(1,97) = 34.0
Any anxiety disorder	27.6	18.4	2513.0	77.7	0.9	125.0	3.9	0.3	540.0	18.4	0.8	F(1,485) = 777.7
Externalizing disorders												
Attention deficit/hyperactivity disorder ^f	5.9	32.7	294.0	99.5	0.3	1.0	0.0	0.0	2.0	0.5	0.3	F(1,49) = 795.2
Conduct disorder ^g	7.6	46.0	384.0	89.3	1.3	23.0	4.3	1.1	22.0	6.4	0.8	F(1,64) = 620.4
Intermittent explosive disorder ^h	10.6	29.0	430.0	75.4	1.3	42.0	8.0	0.8	97.0	16.6	1.3	F(1,80) = 329.0
Oppositional defiant disorder ⁱ	7.3	37.6	338.0	93.2	0.7	17.0	4.2	0.6	8.0	2.6	0.4	F(1,63) = 1149.5
Any externalizing disorder	11.3	31.6	1066.0	87.5	0.8	51.0	4.3	0.5	97.0	8.3	0.7	F(1,185) = 1029.4
Any disorder	43.9	17.9	3574.0	72.6	0.8	277.0	5.5	0.4	1074.0	21.9	0.8	F(1,674) = 792.2

SE - standard error. N is the unweighted sample size. All prevalence estimates are weighted based on Part II weights. Each row includes respondents who met lifetime criteria for AUD and the specified DSM-IV disorder. ^a ESEMED excluded.

^b Not assessed in ESEMED, Ukraine or South Africa.

^c Not assessed in Israel.

^d Not assessed in Ukraine, Israel, South Africa and Australia.

^e Not assessed in Japan, Ukraine, Israel, New Zealand, South Africa, Iraq, Poland and Australia.

^f Not assessed in China, Japan, Nigeria, Ukraine, Israel, New Zealand, South Africa and Australia.

^g Not assessed in Japan, Israel, New Zealand, South Africa, Iraq and Australia.

^h Not assessed in ESEMED, Mexico, Israel, New Zealand, Australia, Murcia and Medellin.

ⁱ Not assessed in China, Japan, Lebanon, Nigeria, Ukraine, Israel, New Zealand, South Africa, Bulgaria, Iraq and Australia.

^j Wald design-corrected F-tests were used to determine if there is variation in prevalence between onset of DUD prior to mental disorder onset versus onset of DUD after mental disorder onset.

environmental and social conditions were instituted.

There is evidence that in Europe, North America, and Australia adolescent levels of drinking have declined in recent years, perhaps in relation to changing socio-environmental factors (De Looze, Raaijmakers, Ter Bogt, et al., 2015; Group, 2016; Kuntsche, Kuntsche, Knibbe, et al., 2011; Livingston, 2014; Miech, Johnston, O'malley, et al., 2017). However, alcohol consumption is stable or increasing in other regions (World Health Organization, 2018) and there are reports that abstaining or moderate alcohol using adolescents often considerably increase consumption to heavy drinking as young adults (Jager, Keyes, & Schulenberg, 2015; White, Castle, Chen, et al., 2015; World Health Organization, 2018) and that middle-age and older adults may be increasingly engaging in binge drinking (Gruza, Sher, Kerr, et al., 2018).

Despite changes in alcohol use in different ages and regions, varying sociocultural environments, and the range of AUD prevalences, the multinational WMH results confirm a number of well-documented clinical and epidemiological findings from more local studies. For example, AUD prevalences are much higher for men than women (Obot & Room, 2005). Risk for onset of AUD begins in adolescence with half of all lifetime cases beginning by age 23 although new onsets continue through later life (Ystrom, Kendler, & Reichborn-Kjennerud, 2014). Being married (Leonard & Rothbard, 1999) and more educated (Barr, Salvatore, Maes, et al., 2016) is associated with lower risk for AUD. Comorbidity with other mental disorders is common (Lai, Cleary, Sitharthan, et al., 2015) and mental health disorders often precede AUDs (Swendsen, Conway, Degenhardt, et al., 2010). Despite the harms and impairments associated with AUDs, there is a low prevalence of treatment (Grant, Goldstein, Saha, et al., 2015). The consistency of the patterns of AUDs and correlates across the surveyed countries provides an informative perspective on the relatively consistent nature of AUDs. AUD prevalences were much higher for men than women with the odds for men having a lifetime AUD being 4.6 times the odds for women. Risk for onset of AUD began in adolescence with 15% of all lifetime cases developing before age 18 although new onsets continued through later life. Being older at time of interview, being married, being more educated, and having a higher household income were all associated with a lower risk for AUD and for AUD persistence.

The WMH findings also corroborate and extend previous research on AUD – MHD comorbidities (Grant et al., 2015; Grant, Stinson, Dawson, et al., 2004; Jan-Llopis & Matytsina, 2006; Lai et al., 2015; Merikangas, Mehta, Molnar, et al., 1998). Comorbidity with MHDs is common with 43.9% of individuals with a lifetime AUD having had at least one lifetime MHD. Among respondents with a lifetime MHD, 17.9% had a lifetime AUD. For most of the MHD categories considered (dysthymia, all phobias, separation anxiety, ADHD, conduct disorder, IED, and ODD) when there were MHD – AUD comorbidities, the onset of the MHD most often preceded the onset of the AUD. No significant trends in order of onset were observed for bipolar disorder, panic disorder, and GAD. The onset of AUD most often preceded the onset of only one disorder, MDD.

Onsets of MHD and AUD disorders are often not discrete events occurring at a single point in time and developing symptoms of comorbid disorders may reciprocally influence each other (Glantz, 1992; Glantz & Leshner, 2000). This complicates assessment of the exact temporal order of the onset of emerging disorders. In addition, research suggests that AUDs and mood, anxiety and other impulse-control related mental disorders may share common underlying influences or pathways (Hasin et al., 2007; Kessler, Ormel, Petukhova, et al., 2011). There is growing interest in characterizations of mental illness that rely on dimensional rather than categorical frameworks (Caspi, Houts, Belsky, et al., 2014; Conway, Forbes, Forbush, et al., 2019; Kotov, Krueger, Watson, et al., 2017). Proposals such as these, most notably the Hierarchical Taxonomy of Psychopathology - HiTOP, are in the early stages of formulation and empirical validation but might facilitate understanding of comorbidities, underlying influences, and common

transdiagnostic factors. The cross-national findings of prevalent comorbidities in the WMH surveys lend support for further explorations of dimensional approaches. In addition, the WMH findings corroborate local findings and affirm the potential value of further understanding of MHD – SUD comorbidities which is planned for future WMH research.

Limitations of the WMH surveys must be considered. As data come from 27 countries there is not a full representation of all regions, income levels and other country characteristics. Response rates and the year in which the surveys were administered varied across surveys, and cross-national differences in willingness to disclose personal information about alcohol use and associated problems are possible. The respondent information is subject to the limitations of retrospective reporting. The WMH surveys rely solely on household surveys. Data from subgroups that may differ from the larger national populations in terms of AUD prevalences and correlates were not included such as the homeless, people in jails, prisons, hospitals, halfway houses, SUD inpatient treatment facilities, or living on military bases. Although the WMH sampling does not include individuals who were residing in inpatient treatment facilities at the time of the interview, the sampling does not exclude individuals who were either in outpatient treatment at the time of the interview or who received either outpatient or inpatient treatment at any time prior to the interview. Nevertheless, if the WMH had specifically included current clinical AUD samples it is likely that more severe cases would have been identified (Rehm, Allamani, Aubin, et al., 2015).

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Declaration of Competing Interest

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.addbeh.2019.106128>.

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