Epidemiology and Psychiatric Sciences (2014), **23**, 27–41. © Cambridge University Press 2013
doi:10.1017/S2045796013000516

SPECIAL ARTICLE

A comparative analysis of role attainment and impairment in binge-eating disorder and bulimia nervosa: results from the WHO World Mental Health Surveys

R.C. Kessler[1]*, V. Shahly[1], J.I. Hudson[2], D. Supina[3], P.A. Berglund[4], W.T. Chiu[1], M. Gruber[1], S. Aguilar-Gaxiola[5], J. Alonso[6], L.H. Andrade[7], C. Benjet[8], R. Bruffaerts[9], G. de Girolamo[10], R. de Graaf[11], S.E. Florescu[12], J.M. Haro[13], S.D. Murphy[14], J. Posada-Villa[15], K. Scott[16] and M. Xavier[17]

[1] *Department of Health Care Policy, Harvard Medical School, Boston, Massachusetts, USA*
[2] *Psychiatric Epidemiology Research Program, McLean Hospital and Harvard Medical School, Boston, Massachusetts, USA*
[3] *Health Economics, Outcomes Research and Epidemiology, Shire Pharmaceuticals, Wayne, Pennsylvania*
[4] *University of Michigan, Institute for Social Research, Ann Arbor, Michigan, USA*
[5] *University of California, Davis, Center for Reducing Health Disparities, School of Medicine, CTSC Building, Sacramento, California, USA*
[6] *IMIM-Hospital del Mar Research Institute, Parc de Salut Mar; Pompeu Fabra University (UPF); and CIBER en Epidemiología y Salud Pública (CIBERESP), Barcelona, Spain*
[7] *Institute of Psychiatry, University of São Paulo Medical School, São Paulo, Brazil*
[8] *Department of Epidemiologic and Psychosocial Research, National Institute of Psychiatry Ramón de la Fuente, Mexico City, Mexico*
[9] *Universitair Psychiatrisch Centrum – Katholieke Universiteit Leuven (UPC-KUL), campus Gasthuisberg, Leuven, Belgium*
[10] *IRCCS Centro S. Giovanni di Dio Fatebenefratelli Brescia, Bologna, Italy*
[11] *Netherlands Institute of Mental Health and Addiction, Utrecht, The Netherlands*
[12] *National School of Public Health, Management and Professional Development, Bucharest, Romania*
[13] *Parc Sanitari Sant Joan de Déu, CIBERSAM, University of Barcelona, Barcelona, Spain*
[14] *School of Psychology, University of Ulster, Londonderry, Northern Ireland*
[15] *Universidad Colegio Mayor de Cundinamarca, Bogota, Colombia*
[16] *Department of Psychological Medicine, Otago University, Dunedin, New Zealand*
[17] *Department of Mental Health – CEDOC and Faculdade Ciencias Medicas, Universidade Nova de Lisboa, Lisbon, Portugal*

Background. Cross-national population data from the WHO World Mental Health surveys are used to compare role attainments and role impairments associated with binge-eating disorder (BED) and bulimia nervosa (BN).

Methods. Community surveys assessed 23 000 adults across 12 countries for BED, BN and ten other DSM-IV mental disorders using the WHO Composite International Diagnostic Interview. Age-of-onset was assessed retrospectively. Ten physical disorders were assessed using standard conditions checklists. Analyses examined reciprocal time-lagged associations of eating disorders (EDs) with education, associations of early-onset (i.e., prior to completing education) EDs with subsequent adult role attainments and cross-sectional associations of current EDs with days of role impairment.

Results. BED and BN predicted significantly increased education (females). Student status predicted increased risk of subsequent BED and BN (females). Early-onset BED predicted reduced odds of current (at time of interview) marriage (females) and reduced odds of current employment (males). Early-onset BN predicted increased odds of current work disability (females and males). Current BED and BN were both associated with significantly increased days of role impairment (females and males). Significant BED and BN effects on adult role attainments and impairments were explained by controls for comorbid disorders.

Conclusions. Effects of BED on role attainments and impairments are comparable with those of BN. The most plausible interpretation of the fact that these associations are explained by comorbid disorders is that causal effects of EDs are mediated through secondary disorders. Controlled treatment effectiveness studies are needed to trace out long-term effects of BED–BN on secondary disorders.

Received 25 July 2013; Revised 28 August 2013; Accepted 28 August 2013; First published online 19 September 2013

Key words: Binge eating, bulimia nervosa, eating disorder, WHO World Mental Health Surveys.

* Address for correspondence: R.C. Kessler, Department of Health Care Policy, Harvard Medical School, 180 Longwood Avenue, Boston, MA, USA.
(Email: Kessler@hcp.med.harvard.edu)

Introduction

Binge-eating disorder (BED) is characterized by recurrent episodes of excessive food consumption with experienced loss of control and marked distress but without the inappropriate compensatory behaviours of bulimia nervosa (BN) (Hilbert *et al.* 2011; American Psychiatric Association, 2013). Preliminary research criteria for BED were introduced in the appendix of DSM-IV, but growing evidence of the syndrome's comparatively high prevalence (Hudson *et al.* 2007; Kessler *et al.* 2013), discriminant validity (Striegel-Moore *et al.* 2005; Eddy *et al.* 2009), stability (Fichter *et al.* 2008; Sysko *et al.* 2012) and clinical significance (Bulik *et al.* 2000; Wonderlich *et al.* 2009; Kessler *et al.* 2013), prompted its inclusion as a formal eating disorder (ED) in DSM-5.

Epidemiological research on BED has so far been limited largely to studies in small selected samples of adolescent females or obese individuals in Western countries (Wade *et al.* 2011). We use data from the WHO World Mental Health (WMH) initiative (Kessler & Üstün, 2008), a coordinated series of community epidemiological surveys that assessed EDs and key correlates in 12 countries, to explore functional outcomes of BED in the general population. In order to highlight differential patterns of role attainment and impairment with potential relevance for public health and healthcare spending, comparisons are made with BN, a closely related disorder with well-documented burden of illness (Striegel-Moore *et al.* 2001). Although an earlier WMH report on prevalence and correlates of BED and BN addressed this issue to some extent by documenting impairments in role functioning and time-lagged associations of temporally primary BED and BN with subsequent mental and physical disorders (Kessler *et al.* 2013), the full range of potential adverse effects of BED and BN was not investigated in that earlier report. Previous WMH reports investigated such effects for the core mental disorders assessed in all WMH surveys (Kawakami *et al.* 2012; Alonso *et al.* 2013) or for a composite measure of serious mental illness (Levinson *et al.* 2010), but BED and BN were excluded from those analyses because EDs were not core mental disorders. We correct this omission in the current report by presenting comprehensive data on the associations of BED and BN with a wide range of role attainments and role impairments in the subset of WMH surveys that assessed EDs, adjusting for a wide range of mental and physical comorbidities.

Methods

Samples

Twelve WMH surveys are considered here (Table 1). WMH surveys in France and Germany also assessed EDs, but are not included in the current report due to the fact that they assessed education in a way that could not be mapped onto the cross-national educational classification system that plays a central role in the analyses reported here. All 12 WMH surveys considered here are based on national or regional adult household probability samples. Sample sizes range from 509 (Portugal) to 7312 (New Zealand) and total 23 000, although analyses are limited to the 22 635 respondents with complete data on education, marital status, employment status and family income. Part of the analysis is restricted to the subset of 11 874 respondents ages 18–65 exclusive of those in New Zealand due to a focus on occupation and earnings. New Zealand was excluded from this part of the analysis due to income not being assessed comprehensively in that survey. Response rates across the 12 surveys were in the range 50.6–87.7% and averaged 70.7%. More details about WMH samples are reported elsewhere (Heeringa *et al.* 2008).

Interviews were administered face-to-face. Consistent interviewer training and field quality control procedures were used across surveys (Harkness *et al.* 2008; Kessler & Üstün, 2008; Pennell *et al.* 2008). Informed consent was obtained using procedures approved by the Institutional Review Boards of the collaborating organizations. Interviews had two parts. Part I, administered to all respondents, assessed core mental disorders (see below). All Part I respondents with any core disorder plus a probability subsample of other Part I respondents were administered Part II, which assessed correlates and noncore disorders. EDs were assessed in Part II. The EDs subsamples were weighted to adjust for undersampling Part II non-cases and adjust for sociodemographic and geographic discrepancies between sample and population, making the weighted Part II samples equivalent to their expected values in the population. These weights are used in all analyses reported here.

Measures

Cross-national comparability

Translation, back-translation and harmonization of the WMH interview used standardized procedures that are discussed elsewhere (Harkness *et al.* 2008).

BED and BN

BED and BN were assessed with the fully structured lay-administered WHO Composite International Diagnostic Interview (CIDI) (Kessler & Üstün, 2004). The diagnostic algorithms and CIDI questions used to operationalize diagnostic criteria are available at

https://doi.org/10.1017/S2045796013000516 Published online by Cambridge University Press

Table 1. *WMH sample characteristics by World Bank income categories*[a]

		Sample characteristics[b]	Sample size				
			Field dates	Age range	Part 1	Part 2[c]	Response rate[d]
I. Low and lower-middle income countries[e]							
Colombia	NSMH	All urban areas of the country (approximately 73% of the total national population)	2003	18–65	4426	1217	87.7
II. Upper-middle income countries[e]							
Brazil – São Paulo	São Paulo Megacity	São Paulo metropolitan area	2005–7	18–93	5037	2942	81.3
Mexico	M-NCS	All urban areas of the country (approximately 75% of the total national population)	2001–2	18–65	5782	1236	76.6
Romania	RMHS	Nationally representative	2005–6	18–96	2357	2357	70.9
Total					13 176	6535	77.2
III. High-income countries[e]							
Belgium	ESEMeD	Nationally representative. The sample was selected from a national register of Belgium residents	2001–2	18–95	2419	518	50.6
Italy	ESEMeD	Nationally representative. The sample was selected from municipality resident registries	2001–2	18–100	4712	900	71.3
Netherlands	ESEMeD	Nationally representative. The sample was selected from municipal postal registries	2002–3	18–95	2372	540	56.4
New Zealand[f]	NZMHS	Nationally representative	2003–4	18–98	12 790	7312	73.3
N. Ireland	NISHS	Nationally representative	2004–7	18–97	4340	1432	68.4
Portugal	NMHS	Nationally representative	2008–9	18–81	3849	509	57.3
Spain	ESEMeD	Nationally representative	2001–2	18–98	5473	1057	78.6
United States	NCS-R	Nationally representative	2002–3	18–99	9282	2980	70.9
Total					48 792	15 248	70.7
IV. Total					66 394	23 000	

[a]The World Bank (2012). Data accessed June 5, 2012 at: http://data.worldbank.org/country.

[b]Most WMH surveys are based on stratified multistage clustered area probability household samples in which samples of areas equivalent to counties or municipalities in the USA were selected in the first stage followed by one or more subsequent stages of geographic sampling (e.g., towns within counties, blocks within towns, households within blocks) to arrive at a sample of households, in each of which a listing of household members was created and one or two people were selected from this listing to be interviewed. No substitution was allowed when the originally sampled household resident could not be interviewed. These household samples were selected from Census area data in all countries other than the Netherlands (where postal registries were used to select households). Several WMH surveys (Belgium, Germany, Italy) used municipal resident registries to select respondents without listing households. Nine of the 13 surveys are based on nationally representative household samples.

[c]Sample size of the countries that assessed EDs.

[d]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. The weighted average response rate, like the sample used in analysis, is weighted by sample size rather than by population size.

[e]NSMH (The Colombian National Study of Mental Health); M-NCS (The Mexico National Comorbidity Survey); RMHS (Romania Mental Health Survey); ESEMeD (The European Study of the Epidemiology of Mental Disorders); NZMHS (New Zealand Mental Health Survey); NISHS (Northern Ireland Study of Health and Stress); NMHS (Portugal National Mental Health Survey); NCS-R (The US National Comorbidity Survey Replication). Two additional WMH surveys assessed eating disorders, France (n=466) and Germany (n = 658), but were excluded from this analysis because education was not assessed in France and the sorting of students into academic and technical tracts in the German educational system made it impossible to translate accurately between the WMH question about years of education and the distinctions made in our analysis among completed levels of education.

[f]For the purposes of cross-national comparisons, we limit the sample to those 18 + .

http://www.hcp.med.harvard.edu/ncs/diagnosis.php. Symptom questions closely parallel DSM-IV criteria with two exceptions. First, whereas DSM-IV BED requires six months of regular binge eating, the CIDI requires only three, making CIDI diagnoses of BED anti-conservative. However, a 3-month duration requirement is consistent with criteria for the new DSM-5 BED and with DSM-IV and DSM-5 BN. Second, DSM-IV requires loss of control and distress regarding binges. The CIDI assessed these symptoms with questions about attitudes and behaviors indicative of loss of control and distress rather than with direct questions, introducing some imprecision. DSM diagnostic hierarchy rules do not allow BN or BED to be diagnosed in the presence of AN or BED to be diagnosed in the presence of BN. These hierarchy rules were implemented with retrospective age-of-onset (AOO) reports based on probing methods found to improve dating accuracy (Knäuper *et al.* 1999).

Other DSM-IV disorders

We included controls for other DSM-IV/CIDI disorders in the analyses reported here based on previous evidence of strong comorbidities of BED and BN with these disorders (Kessler *et al.* 2013). The ten such disorders considered here include mood disorders (major depressive disorder and/or dysthymia, bipolar disorder), anxiety disorders (panic disorder and/or agoraphobia, specific phobia, social phobia, generalized anxiety disorder, post-traumatic stress disorder) and externalizing disorders (intermittent explosive disorder, alcohol and drug abuse with or without dependence). Diagnostic hierarchy and organic exclusion rules were used in all diagnoses other than substance abuse (diagnosed with or without dependence). AOO was assessed using the same probing method used to determine AOO of BED and BN (Knäuper *et al.* 1999). A blinded clinical reappraisal study using the Structured Clinical Interview for DSM-IV (SCID) (First *et al.* 2002) in conjunction with a number of WMH surveys found generally good concordance between diagnoses based on the CIDI and those based on the SCID (Haro *et al.* 2006).

Chronic physical conditions

In addition to the above, DSM-IV/CIDI mental disorders, we included controls for ten chronic physical conditions in the analyses reported here based on previous evidence of strong comorbidities of BED and BN with these disorders (Kessler *et al.* 2013). These conditions were assessed with a checklist based on the US National Health Interview Survey (Schoenborn *et al.* 2003; Center for Disease Control and Prevention, 2004). Respondents were asked whether they ever had a series of symptom-based conditions (e.g., chronic headaches, chronic low back pain) and whether a health professional ever told them they had a series of silent conditions (e.g., cancer, hypertension). Methodological research shows such checklists yield more accurate reports than reports derived from open-ended questions (Knight *et al.* 2001) and have good concordance with medical records (Edwards *et al.* 1994; Baker *et al.* 2001; Revicki *et al.* 2004).

Educational and role attainments

The assessment of role attainments focused on education, marriage and occupation. Educational attainment was assessed with self-reports about number of years of school completed classified into the seven categories of none, less than primary education, graduated from primary school but did not start secondary school, started but did not graduate from secondary school, graduated from secondary school but did not start post-secondary education, started post-secondary education but did not obtain a university degree, and obtained a university degree. Although timing of educational termination was not assessed, we assumed conservatively that all respondents had normative transitions for their countries (e.g., graduating from primary school in the USA at age 14 and from secondary school at age 18). Some of the seven educational attainment categories were collapsed for the different analyses based on sparse data in some categories. Current marital status (married *v.* others) and occupational status (employed, disabled, others) were assessed by self-report. Finances were assessed by asking respondents to estimate their personal earnings and total family income for the past 12 months. Reports were divided by within-country means to calibrate across currencies in different countries.

Role impairments

Impairments in current role functioning were assessed with a modified version of the WHO Disability Assessment Schedule (WHO-DAS) (Vazquez-Barquero *et al.* 2000; Von Korff *et al.* 2008; World Health Organization 2013) that asked respondents to estimate the numbers of days out of 30 in the month before interview when they were either 'totally unable to work or carry out your normal activities' because of health problems (days completely out of role), had to 'cut down on what you did or not get as much done as usual' because of health problems (cutback days), or had to 'make an extreme effort to perform up to your usual level at work or at your other normal daily activities'

https://doi.org/10.1017/S2045796013000516 Published online by Cambridge University Press

because of health problems (extreme effort days). Good concordance of reports about days completely out of role has been documented both with payroll records of employed people (Revicki *et al.* 1994; Kessler *et al.* 2003) and with prospective daily diary reports (Revicki *et al.* 2004), but we are aware of no attempts to validate reports about cutback days or extreme effort days.

Analysis methods

Discrete-time survival analysis with person-year the unit of analysis (Willett & Singer, 1993) was used to estimate cross-lagged associations of temporally primary lifetime BED and BN with subsequent educational attainment and of student status (i.e., student *v.* non-student) as well of level of education with subsequent first onset of BED and BN. These longitudinal associations were examined in the cross-sectional WMH data by using retrospective AOO reports to estimate time-lagged associations. These cross-lagged analyses controlled respondent age at interview, sex, parents' education, country and prior (to the age of the outcome) history of other DSM-IV/CIDI disorders. The latter disorders were coded as time-varying covariates. Survival coefficients and standard errors were exponentiated to create odds-ratios (ORs) with 95% confidence intervals (CIs).

Logistic regression analysis (Hosmer & Lemeshow, 2001) was used to estimate associations of lifetime BED and BN as of age of completing education with current (at the time of interview) marital and occupational status controlling respondent sex, education, time since completing education, parents' education, country and lifetime history of other DSM-IV/CIDI disorders as of the time of completing education. Logistic regression coefficients and standard errors were exponentiated to create ORs with 95% confidence intervals (CIs).

Generalized linear models (GLM) (Dobson, 2010) were used to estimate associations of lifetime BED and BN as of age of completing education with current income and earnings, again controlling respondent sex, education, time since completing education, parents' education, country, and lifetime history of other DSM-IV/CIDI disorders as of time of completing education. A variety of link functions and error structures were examined using standard diagnostic procedures to select a best specification (Buntin & Zaslavsky, 2004). Based on these explorations, the equation for personal earnings used a linear link function and constant normally distributed error variance structure, while the equations for other household income and total household income used a log-link function and a Poisson error variance structure. Metric regression coefficients and 95% CIs are reported.

Poisson regression analysis (Cameron & Trivedi, 1998) was used to estimate multivariate associations of 12-month BED, BN, other 12-month DSM-IV/CIDI disorders and 12-month chronic physical conditions with days completely out of role, cutback days, and extreme effort days. Poisson regression coefficients and standard errors were exponentiated to create incidence density ratios (IDRs) and 95% CIs. IDRs represent mean days of role impairment among respondents with EDs relative to those of respondents without EDs net of control variables.

All regression analyses took into consideration the fact that BED and BN are highly comorbid with other mental and physical disorders by investigating the extent to which the coefficients associated with BED and BN change when controls are introduced for such comorbidities.

Standard errors of coefficients in all models were estimated using the Taylor series linearization method (Wolter, 1985) in SAS (SAS Institute Inc., 2008) to adjust for data weighting and clustering. Multivariate significance of predictors was evaluated using Wald χ^2 tests based on design-corrected coefficient variance–covariance matrices. Statistical significance was consistently evaluated using two-sided 0.05-level tests.

Results

Prevalence and AOO

The earlier WMH report documented that BED lifetime prevalence averages (mean) 1.9% across WMH countries compared with 1.0% for BN (Kessler *et al.* 2013) and that 12-month prevalence averages 0.8% for BED and 0.4% for BN. Both lifetime and 12-month prevalence estimates were higher for BED than BN in virtually all countries. Median AOO averages 19.3 years for BED and 18.0 for BN.

Reciprocal time-lagged associations of BED and BN with educational attainment

Looking first at the associations of student status and educational attainment as predictors of subsequent first onset of EDs, we see that respondents who are no longer students have significantly lower risk of onset of BED ($\chi^2_4 = 12.1$, $p = 0.017$) and BN ($\chi^2_4 = 13.0$, $p = 0.011$) than students of the same age controlling sex, parents' education, country and prior (to the age of the outcome) history of other DSM-IV/CIDI disorders (Table 2). These significant associations are for the most part confined to females (ORs 0.4–0.8 compared with 0.2–1.5 among males) and somewhat

https://doi.org/10.1017/S2045796013000516 Published online by Cambridge University Press

Table 2. *Associations (odds-ratios (ORs)) of educational attainment level[a] among nonstudents (NS) v. students with subsequent onset of DSM-IV/CIDI bulimia nervosa (BN) and binge-eating disorder (BED) by sex in the WMH surveys (n = 22 635)[b]*

	Total		Female		Male	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
I. BN						
NS Not graduated primary	0.5*	(0.3–0.8)	0.6	(0.3–1.0)	0.2*	(0.0–0.9)
NS Graduated primary but not secondary	0.6*	(0.4–0.9)	0.6*	(0.3–0.9)	0.6	(0.3–1.3)
NS Graduated secondary but not University	0.8	(0.5–1.2)	0.8	(0.5–1.4)	0.7	(0.3–1.7)
NS Graduated University	0.5*	(0.2–0.9)	0.5	(0.2–1.1)	0.4	(0.1–1.5)
Still a student	1.0	–	1.0	–	1.0	–
χ^2_4	13.0*		8.5		4.8	
II. BED						
NS Not graduated primary	0.5*	(0.3–0.8)	0.4*	(0.3–0.7)	1.0	(0.5–2.0)
NS Graduated primary but not secondary	0.7	(0.5–1.1)	0.6*	(0.4–1.0)	1.1	(0.5–2.3)
NS Graduated secondary but not University	0.9	(0.6–1.3)	0.7	(0.5–1.1)	1.5	(0.7–3.2)
NS Graduated University	0.7	(0.4–1.2)	0.7	(0.4–1.2)	0.9	(0.3–2.6)
Still a student	1.0	–	1.0	–	1.0	–
χ^2_4	12.1*		12.9*		2.0	

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

[a]In the total sample, 1.3% of respondents had no education, 9.4% began but did not graduate from primary school, 6.5% graduated from primary school but had no secondary education, 24.1% began but did not graduate from secondary school, 26.8% graduated from secondary school but had no post-secondary education, 15.5% had some post-secondary education but did not graduate from university, and 16.3% graduated from university. These seven categories were collapsed into four for purposes of the analyses reported here due to sparse data in some categories.

[b]Based on discrete-time survival models with person-year the unit of analysis controlling person-year, age at interview, sex, parents' education, country and prior history of other DSM-IV/CIDI disorders. The prior disorders were coded as time-varying covariates. Chronic physical conditions were not controlled due to a preliminary finding that they are not strongly related to eating disorders at this point in the life course and their inclusion has no effect on the results reported here. A total of 23 000 respondents were assessed for eating disorders in the 12 WMH surveys considered here, but the respondents included in the analysis are limited to the 22 635 with complete data on education, marital status, employment status and earnings.

more pronounced for BED (ORs 0.4–0.7; $\chi^2_4 = 12.9$, $p = 0.012$) than BN (ORs 0.5–0.8; $\chi^2_4 = 8.5$, $p = 0.075$). Associations among males are not significant (ORs 0.9–1.5, $\chi^2_4 = 2.0$, $p = 0.74$ for BED; ORs 0.2–0.7, $\chi^2_4 = 4.8$, $p = 0.31$ for BN). Among respondents who are no longer students, in comparison, no significant associations exist between level of educational attainment and risk of onset of either BED or BN in the years after completing education.

Looking next at the associations of temporally prior EDs among students with subsequent educational attainment, we find that those with BED and BN have significantly *higher* levels of subsequent education than other students controlling sex, parents' education, country and prior (to the age of the outcome) history of other DSM-IV/CIDI disorders. (Table 3) However, these significant associations are confined to females, among whom BED and BN are associated with significant elevated ORs of 1.5 and 1.3, respectively, pooled across all years of education. Comparable ORs among males are insignificant (1.1–0.9). Disaggregation across years of education shows ORs consistently elevated for both BED and BN (compared with people without either disorder) across all major educational transitions among females other than for BN not being associated with elevated odds of primary school graduation.

Associations of early-onset BED and BN with role attainments

Based on the education findings, subsequent analyses of role attainments and impairments focused on lifetime BED and BN that began while respondents were still students, which we refer to below as *early-onset* EDs, controlling sex, level of educational attainment, time since completing education, parents' education and country. Early-onset BED was found to be associated with significantly reduced odds of currently (i.e., at the time of interview) being married among females (0.5) but not males (0.8) and with significantly reduced odds of currently being employed among males (0.4) but not females (1.0). (Table 4) Early-onset BN, in comparison, is significantly associated with elevated odds

https://doi.org/10.1017/S2045796013000516 Published online by Cambridge University Press

Table 3. *Associations (odds-ratios) of lifetime early-onset DSM-IV/CIDI Bulimia Nervosa (BN) and binge-eating disorder (BED) with subsequent educational attainment by sex in the WMH surveys (n = 22 635)*[a]

	Total				Female				Male			
	BN		BED		BN		BED		BN		BED	
Educational attainment[b]	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Graduated primary	0.6	(0.3–1.2)	2.2	(0.8–5.82)	0.8	(0.4–1.7)	5.1*	(1.2–21.3)	0.6	(0.3–1.5)	1.5	(0.5–4.4)
Started secondary	1.6	(0.9–2.9)	1.4*	(1.0–2.05)	1.9	(0.8–4.4)	2.2*	(1.1–4.2)	1.7	(0.8–3.3)	1.1	(0.8–1.4)
Graduated secondary	0.9	(0.6–1.4)	1.1	(0.8–1.52)	1.2	(0.7–2.0)	1.2	(0.7–2.0)	0.6	(0.4–1.2)	1.0	(0.7–1.4)
Started University	1.6*	(1.0–2.5)	1.5	(0.8–2.63)	1.4	(0.8–2.4)	1.6	(0.8–3.3)	1.8	(0.8–4.1)	1.1	(0.5–2.8)
Graduated University	0.9	(0.4–2.0)	1.4*	(1.0–2.10)	1.1	(0.5–2.3)	1.4	(0.9–2.3)	0.4	(0.1–2.5)	1.5	(0.7–3.3)
Total education	1.1	(0.9–1.3)	1.3*	(1.1–1.4)	1.3*	(1.1–1.4)	1.5*	(1.3–1.7)	0.9	(0.7–1.2)	1.1	(0.9–1.3)

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

[a]Based on discrete-time survival models with person-year the unit of analysis controlling person-year, age at interview, sex (in total-sample models), parents' education, country and prior history of other DSM-IV/CIDI disorders. The prior disorders and eating disorders were coded as time-varying covariates. Chronic physical conditions were not controlled due to a preliminary finding that they are not strongly related to eating disorders at this point in the life course and their inclusion has no effect on the results reported here. A total of 23 000 respondents were assessed for eating disorders in the 12
WMH surveys considered here, but the respondents included in the analysis are limited to the 22 635 with complete data on education, marital status, employment status and earnings. Analyses of the different outcomes were *nested*; that is, the model to predict starting secondary school was estimated only among those who graduated primary score, whereas the model to predict graduating secondary school was estimated only among those who started secondary school.

[b]In the total sample, 1.3% of respondents had no education, 9.4% began but did not graduate from primary school, 6.5% graduated from primary school but had no secondary education, 24.1% began but did not graduate from secondary school, 26.8% graduated from secondary school but had no post-secondary education, 15.5% had some post-secondary education but did not graduate from university, and 16.3% graduated from university. These seven categories were collapsed into five purposes of the analyses reported here due to sparse data in some categories. Given that the outcomes were *nested*, the contrast categories vary across rows. The first outcome is graduating from primary school among all respondents, with those having no schooling and less than primary school graduation both defined as not having the outcome. The second outcome is starting secondary school among primary school graduates, the third graduating from secondary school among secondary school starters, the fourth starting university among secondary school graduates, and the fifth graduating from university among starters. The last outcome is a summary measure of total years of education.

of current work disability, with ORs comparable for females (3.9) and males (4.1) but statistically significant only among females. (Table 4) Early-onset BED and BN are not associated significantly with earnings or income. Importantly, the significant associations of early-onset EDs with disability, employment and marriage become somewhat smaller and statistically insignificant, even though their sign pattern is retained, when additional controls are added to the models for other early-onset lifetime mental disorders.

Associations of current BED and BN with role impairments

Twelve-month BED and BN are both significantly and positively associated with days completely out of role, cutback days and extreme effort days controlling age, sex, education, parents' education and country. (Table 5) No evidence was found for differential effects by gender. IDRs are in the range 2.2–2.5 for BED and 2.6–3.6 for BN, indicating that people with these disorders have between 2.2 and 3.6 times as many days of role impairment as people without these disorders. However, these significant associations disappear (0.9–1.3) when additional controls are introduced for the other 12-month DSM-IV/CIDI mental disorders and 12-month chronic physical conditions assessed in the WMH surveys.

IDRs for these other 12-month disorders are presented in Table 5 for comparative purposes. Focusing on total days with impairments, we see that IDR is 1.2 for BED and BN, both of which coefficients are insignificant. Two other disorders (social phobia and arthritis) have IDRs of 1.2 that are statistically significant and a third (respiratory disorders) has an even lower IDR (1.1) that is statistically significant due to

https://doi.org/10.1017/S2045796013000516 Published online by Cambridge University Press

Table 4. *Associations of lifetime early-onset DSM-IV/CIDI bulimia nervosa (BN) and binge-eating disorder (BED) with subsequent marital, occupational and financial attainments by sex in the WMH surveys*[a]

	Total					Female					Male				
	BN		BED			BN		BED			BN		BED		
	Est[b]	(95% CI)	Est[b]	(95% CI)	(*n*)[c]	Est[b]	(95% CI)	Est[b]	(95% CI)	(*n*)[c]	Est[b]	(95% CI)	Est[b]	(95% CI)	(*n*)[c]
I. Without controls for comorbid disorders															
A. Marital[d]															
Married	1.1	(0.6–1.7)	0.6*	(0.4–1.0)	(11 874)	1.0	(0.6–1.9)	0.5*	(0.3–0.9)	(6997)	0.8	(0.3–2.0)	0.8	(0.4–1.8)	(4877)
B. Occupational[d]															
Disabled	3.9*	(1.7–8.7)	1.0	(0.4–2.5)	(11 874)	3.9*	(1.4–10.7)	1.3	(0.6–2.9)	(6997)	4.1	(0.9–18.7)	0.6	(0.1–6.3)	(4877)
Employed	0.9	(0.5–1.5)	0.8	(0.5–1.4)	(11 874)	0.7	(0.4–1.4)	1.0	(0.6–1.8)	(6997)	1.9	(0.3–12.0)	0.4*	(0.2–1.0)	(4877)
C. Financial															
Earnings/employed	0.05	(−0.1–0.2)	0.08	(−0.1–0.3)	(7893)	0.08	(−0.1–0.3)	0.05	(−0.2–0.3)	(3999)	−0.07	(−0.4–0.3)	0.15	(−0.2–0.5)	(3894)
Other household income	0.07	(−0.4–0.5)	0.07	(−0.2–0.4)	(11 874)	−0.00	(−0.5–0.5)	0.08	(−0.3–0.5)	(6997)	0.37	(−0.4–1.1)	0.10	(−0.4–0.6)	(4877)
Total household income	0.04	(−0.1–0.2)	−0.02	(−0.2–0.1)	(11 874)	0.02	(−0.2–0.2)	−0.07	(−0.3–0.2)	(6997)	0.13	(−0.2–0.5)	0.07	(−0.1–0.3)	(4877)
II. With controls for comorbid disorders															
A. Marital[d]															
Married	1.2	(0.7–1.9)	0.7	(0.4–1.1)	(11 874)	1.1	(0.6–2.2)	0.6	(0.3–1.0)	(6997)	0.9	(0.3–2.2)	0.9	(0.4–2.1)	(4877)
B. Occupational[d]															
Disabled	2.2	(0.8–6.0)	0.6	(0.3–1.5)	(11 874)	2.6	(0.8–9.2)	0.7	(0.2–1.9)	(6997)	2.0	(0.5–7.6)	0.4	(0.1–2.2)	(4877)
Employed	1.0	(0.6–1.8)	1.0	(0.6–1.7)	(11 874)	0.8	(0.4–1.4)	1.1	(0.6–2.0)	(6997)	2.3	(0.5–10.2)	0.6	(0.2–1.5)	(4877)
C. Financial															
Earnings/employed	0.07	(−0.1–0.2)	0.11	(−0.1–0.3)	(7893)	0.09	(−0.1–0.3)	0.07	(−0.2–0.3)	(3999)	−0.06	(−0.4–0.3)	0.19	(−0.2–0.5)	(3894)
Other household income	0.06	(−0.4–0.5)	0.06	(−0.2–0.4)	(11 874)	0.03	(−0.4–0.5)	0.10	(−0.3–0.5)	(6997)	0.26	(−0.4–1.0)	0.03	(−0.4–0.5)	(4877)
Total household income	0.07	(−0.1–0.2)	0.01	(−0.1–0.2)	(11 874)	0.04	(−0.1–0.2)	−0.04	(−0.2–0.2)	(6997)	0.16	(−0.2–0.5)	0.10	(−0.1–0.3)	(4877)

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

[a]Based on generalized linear models (GLMs) with controls for sex (in the total-sample models), education, time since completing education, parents' education, country and lifetime DSM-IV mental disorders as of the age of completing education. The equations for married, disabled and employed used a logistic link function. The equations for personal earnings used a linear link function and a constant error variance structure. The equations for income used a log link function and a Poisson error variance structure. Coefficients reported are ORs for the dichotomous outcomes and metric regression coefficients for the continuous outcomes.

[b]Coefficient estimates (Est) are ORs for the dichotomous outcomes and metric regression coefficients for the continuous outcomes.

[c]The sample was limited to subsample of respondents from the total sample ($n = 22\,635$) in the age range 18–65 due to the focus on employment and earnings. In addition, New Zealand was excluded from the analysis in this table due to earnings and other family income not being assessed in the New Zealand survey.

[d]In the total sample, 7.8% of respondents reported being disabled, 69.8% employed, and 67.0% married.

Table 5. *Associations (incidence density ratios [IDR]) of 12-month DSM-IV/CIDI bulimia nervosa (BN), binge-eating disorder (BED), and other 12-month mental and chronic physical disorders with numbers of days in the past 30 having impairments in role performance (n = 22 635)*[a]

	Days completely out of role		Cutback days		Extreme effort days		Total days with impairment	
	IDR	(95% CI)	IDR	(95% CI)	IDR	(95% CI)	IDR	(95% CI)
I. Without controls for comorbid disorders								
BN	3.6*	(2.6–5.0)	2.6*	(1.8–3.8)	3.8*	(2.6–5.5)	3.3*	(2.5–4.3)
BED	2.4*	(1.8–3.4)	2.2*	(1.6–3.0)	2.5*	(1.9–3.4)	2.4*	(1.9–3.0)
II. With controls for comorbid disorders								
BN	1.3	(0.9–2.0)	0.9	(0.6–1.3)	1.2	(0.8–1.7)	1.2	(0.9–1.6)
BED	1.3	(0.9–1.8)	1.1	(0.9–1.4)	1.2	(0.9–1.5)	1.2	(1.0–1.5)
III. Other mental disorders								
Major depressive episode	1.7*	(1.4–2.0)	1.6*	(1.4–1.9)	1.9*	(1.6–2.2)	1.7*	(1.5–1.9)
Bipolar disorder	1.2	(1.0–1.5)	1.0	(0.8–1.3)	0.9	(0.7–1.1)	1.1	(0.9–1.3)
Generalized anxiety disorder	1.2	(1.0–1.5)	1.4*	(1.2–1.7)	1.3*	(1.1–1.6)	1.3*	(1.1–1.6)
Panic disorder	1.4*	(1.1–1.8)	1.1	(0.9–1.2)	1.2	(1.0–1.4)	1.3*	(1.1–1.4)
Social phobia	1.1	(0.9–1.3)	1.3*	(1.1–1.5)	1.4*	(1.1–1.6)	1.2*	(1.0–1.4)
Specific phobia	1.4*	(1.1–1.7)	1.2*	(1.1–1.4)	1.5*	(1.2–1.8)	1.3*	(1.1–1.5)
Post-traumatic stress disorder	1.3*	(1.0–1.6)	1.3*	(1.1–1.6)	1.2*	(1.0–1.5)	1.3*	(1.1–1.5)
Intermittent explosive disorder	1.0	(0.7–1.3)	1.3	(1.0–1.8)	1.1	(0.8–1.5)	1.1	(0.9–1.3)
Alcohol abuse/dependence	1.3	(1.0–1.7)	1.2	(1.0–1.5)	1.3	(1.0–1.6)	1.3*	(1.0–1.5)
Drug abuse/dependence	1.5	(1.0–2.1)	1.2	(0.9–1.6)	1.5*	(1.1–2.1)	1.4*	(1.1–1.8)
IV. Chronic physical disorders								
Insomnia	1.2	(1.0–1.4)	1.4*	(1.2–1.6)	1.5*	(1.3–1.9)	1.3*	(1.2–1.5)
Chronic headaches	1.1	(1.0–1.4)	1.4*	(1.2–1.6)	1.3*	(1.2–1.5)	1.3*	(1.1–1.4)
Arthritis	1.1	(0.9–1.3)	1.3*	(1.2–1.5)	1.4*	(1.2–1.6)	1.2*	(1.1–1.3)
Musculoskeletal	2.3*	(1.9–2.7)	2.1*	(1.8–2.4)	2.3*	(2.0–2.7)	2.2*	(2.0–2.4)
Cardiovascular	1.4*	(1.2–1.6)	1.4*	(1.2–1.7)	1.4*	(1.2–1.6)	1.4*	(1.2–1.6)
Respiratory	1.1	(0.9–1.2)	1.2*	(1.0–1.3)	1.1*	(1.0–1.3)	1.1*	(1.0–1.2)
Diabetes	1.6*	(1.3–2.0)	1.2	(1.0–1.5)	1.3*	(1.0–1.7)	1.5*	(1.2–1.7)
Digestive	1.4*	(1.1–1.8)	1.3*	(1.0–1.6)	1.3	(1.0–1.7)	1.3*	(1.1–1.6)
Neurological	1.3	(1.0–1.9)	1.4*	(1.1–1.9)	1.6*	(1.1–2.3)	1.4*	(1.1–1.7)
Cancer	1.2	(0.9–1.5)	1.2	(1.0–1.5)	1.2	(0.9–1.5)	1.2	(1.0–1.4)

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

[a]Based on multivariate Poisson regression models with controls for age at interview, sex, education, parents' education, employment status and country. A total of 23 000 respondents were assessed for eating disorders in the 12 WMH surveys considered here, but the respondents included in the analysis are limited to the 22 635 with complete data on education, marital status, employment status and earnings.

the fact that these disorders are much more common than BED or BN. An additional 14 disorders (seven mental and seven physical) have statistically significant IDRs that are higher (1.3–2.2).

Discussion

The above results must be interpreted in the context of several limitations. Response rates varied considerably across surveys, raising the possibility of sample bias. Lifetime BED and BN were assessed retrospectively using fully-structured rather than semi-structured interviews, presumably introducing imprecision into estimates of prevalence and associations. It is noteworthy that an earlier version of CIDI was found to underdiagnose EDs (Thornton *et al.* 1998). Although the more recent version of CIDI used here included probes to address this problem (Kessler & Üstün, 2004), absence of validation data makes it impossible to reject the possibility of continued underestimation, although WMH prevalence estimates are broadly consistent with those of previous community surveys (Hay, 1998; Kinzl *et al.* 1999; Preti *et al.* 2009; Wade *et al.* 2011).

Within the context of these limitations, we present the first data on the associations of BED with role

https://doi.org/10.1017/S2045796013000516 Published online by Cambridge University Press

attainments and impairments across a wide range of countries. The findings regarding education are intriguing, as they decompose the more commonly reported positive association between student status and EDs (Striegel-Moore *et al.* 1989; Gerner & Wilson, 2005; Jones & Crawford, 2006; Cain *et al.* 2008; Helfert & Warschburger, 2013) into rather complex significant cross-lagged associations by considering student status and level of educational attainment simultaneously. An earlier analysis of the WMH data that examined associations of education with ED without controlling student status missed these complex associations (Kessler *et al.* 2013).

Of the two positive cross-lagged associations between EDs and education, the easier to interpret is that between student status and elevated risks of subsequent onset of BED and BN. This pattern is indirectly consistent with the widely accepted notion that student peer norms play an important role in maladaptive eating behaviours (Striegel-Moore *et al.* 1989; Gerner & Wilson, 2005; Jones & Crawford, 2006; Cain *et al.* 2008; Helfert & Warschburger, 2013). The fact that this pattern was found only among females is consistent with previous findings that females are more vulnerable than males to appearance-related social pressures and body dissatisfaction (Jones & Crawford, 2006; Forrester-Knauss & Zemp Stutz, 2012; Helfert & Warschburger, 2013).

The more unique of the two significant positive cross-lagged associations between EDs and education is the positive one between history of EDs and subsequent increased educational attainment among females. We are aware of no previous research that has examined this association. However, this association is indirectly consistent with previous findings that both academic performance (Leenaars & Lester, 2006; Eum & Rice, 2011) and EDs (Cain *et al.* 2008; Ferrier-Auerbach & Martens, 2009; Fragkos & Frangos, 2013) are associated with perfectionism. More detailed analysis than possible in the WMH data would be required to investigate this possibility directly, noting that evidence exists for separate types of positive and negative perfectionism that might be differentially related to educational achievement and EDs (Glynn Owens & Slade, 2008).

The findings regarding associations of early-onset EDs with adult role attainments are for the most part without precedent, although, as noted in the introduction, similar analyses were carried out previously on associations involving core WMH mental disorders (Levinson *et al.* 2010; Kawakami *et al.* 2012; Alonso *et al.* 2013). The finding that early-onset BED but not BN is associated with subsequent low odds of being married among women but not men might be related to disadvantages in the marriage market previously found for other mental disorders (Breslau *et al.* 2011). Why the association is significant for BED but not BN and for women but not men is unclear, but might involve differential effects of BED *v.* BN on weight and differential effects of weight on marriage among women *v.* men, although absence of information on weight throughout the life course makes it impossible to evaluate this possibility and previous research has yielded inconsistent results on patterns of being overweight in BED and BN (Fairburn *et al.* 2000; Zachrisson *et al.* 2008).

We are unaware of any previous research on long-term associations between early-onset EDs and occupational roles. Our finding that early-onset BN is associated with elevated odds of subsequent work disability among both females (3.9) and males (4.1) is consequently surprising, especially given that comparable associations with BED are insignificant (0.6–1.3). An important clue to interpreting these effects comes from the fact that the ORs associated with BN attenuate substantially (2.0–2.2) when controls are introduced for early-onset mental and physical disorders, suggesting that a substantial part of the gross effect of BN on disability might be mediated through temporally secondary disorders that more proximally lead to work disability. A formal comparison between effects of temporally primary *v.* intermediate control disorders was not carried out and would doubtlessly shed more light on this issue, but was not carried out here due to concerns that imprecision introduced by retrospective recall bias in AOO reports would undercut the accuracy of such an exercise.

A previous WMH report documented more generally that other early-onset DSM-IV/CIDI disorders continue to have significant associations with subsequent work disability in multivariate models (Kawakami *et al.* 2012). A number of these disorders are strongly related to EDs, including adult ADHD, major depressive disorder, and bipolar disorder, each of which had an OR of about 2.0 predicting disability in the WMH analysis. In addition, comorbid early-onset mental disorders, which are very common among people with BN, were found in previous WMH analyses to have strong ORs (3.1–7.1) with subsequent work disability, raising the possibility that the gross association of BN with disability is mediated by these comorbidities. But this would not explain why only BN, not BED, predicts disability in the WMH data, as BN and BED have quite similar comorbidities with other mental disorders. One possibility is that the purging found in BN but not BED has adverse physical effects that lead to disability. A good deal of clinical research is consistent with this possibility (Pomeroy & Mitchell, 2002), as in the finding in previous WMH analyses that BN but not BED predicts subsequent

https://doi.org/10.1017/S2045796013000516 Published online by Cambridge University Press

cardiovascular disorders that, in turn, predict subsequent work disability (Kawakami *et al.* 2012).

The findings that BED and BN are associated with significant elevations in days out of role, cutback days, and extreme effort days are consistent with the three previous studies of which we are aware that examined comparable associations, although those earlier studies were limited either in focusing on symptoms rather than diagnoses of BED and BN (Mond & Hay, 2007; Striegel *et al.* 2012) or in examining the association between *lifetime* BED and *recent* days out of role (Perez & Warren, 2012). Furthermore, none of those previous studies investigated the implications of controlling for a wide range of comorbid mental and physical disorders. As we saw in our analysis, the gross associations of BED and BN with days of role impairment become insignificant when comorbidities are controlled. This finding is indirectly consistent with the results of previous WMH analyses of responses to questions asking respondents to rate the impairments caused by their different disorders (Ormel *et al.* 2008). Those analyses found that people rated EDs as less severe than most other mental and physical disorders. While this finding taken alone might be taken to reflect the well-known tendency for people with EDs to minimize or conceal the severity of their symptoms, our current finding that the significant gross associations of BED and BN with days of role impairment disappear after controlling comorbidity is inconsistent with that methodological interpretation. The more plausible interpretation is that the significant gross associations of BED and BN with current role impairments are largely mediated by comorbid disorders. It is noteworthy in this regard that we found a number of other mental and physical disorders to be associated more powerfully than BED and BN with role impairment.

The above results add to the evidence presented in the earlier WMH report on the clinical and public health importance of BED relative to BN. While that earlier report documented relatively similar associations of BED and BN with secondary comorbid mental and physical disorders (with the exception of stronger associations of BN than BED with later cardiovascular disorders), the current results extend these findings to document significant associations of both early-onset BED and early-onset BN with adult role attainments and broadly comparable associations of current BED and BN with role impairment. These results add to the evidence in other studies (Striegel-Moore & Franko, 2008; Keel *et al.* 2011) that supported the elevation of BED from a provisional entity to a formal diagnosis in DSM-5 (American Psychiatric Association, 2013).

To the extent that comorbidity explains the significant associations of BED and BN with adult role attainments and impairment due to indirect effects of EDs mediated by secondary disorders, a question can be raised whether successful early intervention to treat BED and BN might either prevent the onset or reduce the severity of these secondary disorders. This is a question of considerable public health importance given the strength of the gross associations of BED and BN with these outcomes. We lack an answer due to the fact that very little is known about the long-term effects of timely detection and treatment of early-onset mental disorders of any type, including but not limited to EDs (Kessler & Price, 1993). We have a somewhat stronger basis for hypothesizing the existence of causal effects of BED and BN on secondary physical disorders, as clinical studies document a number of plausible biological pathways that could account for such associations (Brambilla & Monteleone, 2003; Mitchell & Crow, 2006). Even here, though, we are hampered by the paucity of long-term epidemiological studies on time-lagged associations of early-onset EDs with later physical disorders (Herzog *et al.* 1997; Johnson *et al.* 2002; Hudson *et al.* 2010) and the complete absence of long-term controlled studies on the effects of early ED treatment on the prevention of later physical disorders. Given the relatively high prevalence of BED and BN in student populations (Quick & Byrd-Bredbenner, 2013), the strong associations documented here between these disorders on later role incumbency and functioning, and the availability of effective treatments (Brownley *et al.* 2007; Shapiro *et al.* 2007), the time might be right to launch large-scale controlled treatment effectiveness studies of early-onset BED and BN in student populations to trace out long-term preventive effects on secondary disorders.

Acknowledgements

The analysis for this paper was carried out in conjunction with the World Health Organization World Mental Health (WMH) Survey Initiative. These activities were supported by the United States National Institute of Mental Health (R01MH070884) and the Mental Health Burden Study (Contract number HHSN271200700030C) with supplemental support from Shire Pharmaceuticals. The São Paulo Megacity Mental Health Survey is supported by the State of São Paulo Research Foundation (FAPESP) Thematic Project Grant 03/00204-3. The Colombian National Study of Mental Health (NSMH) is supported by the Ministry of Social Protection. The ESEMeD project is funded by the European Commission (Contracts QLG5-1999-01042; SANCO 2004123 and EAHC 20081308), (the Piedmont Region (Italy)), Fondo de Investigación Sanitaria, Instituto de Salud Carlos III, Spain (FIS 00/0028),Ministerio de Ciencia y Tecnología, Spain (SAF 2000-158-CE), Departament

de Salut, Generalitat de Catalunya, Spain, Instituto de Salud Carlos III (CIBER CB06/02/0046, RETICS RD06/0011 REM-TAP), and other local agencies and by an unrestricted educational grant from GlaxoSmithKline. The Mexican National Comorbidity Survey (MNCS) is supported by The National Institute of Psychiatry Ramon de la Fuente (INPRFMDIES 4280) and by the National Council on Science and Technology (CONACyTG30544- H), with supplemental support from the PanAmerican Health Organization (PAHO). Te Rau Hinengaro: The New Zealand Mental Health Survey (NZMHS) is supported by the New Zealand Ministry of Health, Alcohol Advisory Council, and the Health Research Council. The Northern Ireland Study of Mental Health was funded by the Health & Social Care Research & Development Division of the Public Health Agency. The Portuguese Mental Health Study was carried out by the Department of Mental Health, Faculty of Medical Sciences, NOVA University of Lisbon, with collaboration of the Portuguese Catholic University, and was funded by Champalimaud Foundation, Gulbenkian Foundation, Foundation for Science and Technology (FCT) and Ministry of Health. The Romania WMH study projects 'Policies in Mental Health Area' and 'National Study regarding Mental Health and Services Use' were carried out by National School of Public Health & Health Services Management (former National Institute for Research & Development in Health), currently The National School of Public Health, Management and Professional Development, Bucharest, Romania with technical support of Metro Media Transilvania, the National Institute of Statistics-National Centre for Training in Statistics, SC. Cheyenne Services SRL, Statistics Netherlands and were funded by Ministry of Public Health (former Ministry of Health) with supplemental support of Eli Lilly Romania SRL. The US National Comorbidity Survey Replication (NCS-R) is supported by the National Institute of Mental Health (NIMH; U01-MH60220) with supplemental support from the National Institute of Drug Abuse (NIDA), the Substance Abuse and Mental Health Services Administration (SAMHSA), the Robert Wood Johnson Foundation (RWJF; Grant 044708), and the John W. Alden Trust. A complete list of all within-country and cross-national WMH publications can be found at http://www.hcp.med.harvard.edu/wmh/.

Financial Support

In the past three years, Dr Kessler has been a consultant for Janssen Pharmaceuticals, the Lake Nona Institute, Sanofi-Aventis Groupe, Shire US Inc. and Transcept Pharmaceuticals. In the past 3 years, Dr Hudson has been a consultant for Genentech, Healthcore, Pfizer, Roche and Shire; and has received research grant support from Lilly, Otsuka and Shire. Dr Supina is an employee of Shire Pharmaceuticals. The remaining co-authors report no biomedical financial interests or potential conflicts of interest. The views and opinions expressed in this article are those of the authors and should not be construed to represent the views of any of the sponsoring organizations, agencies or US government.

Conflict of Interest

None.

References

Alonso J, Chatterji S, He Y, ed. (2013). *The Burdens of Mental Disorders: Global Perspectives from the WHO World Mental Health Surveys*. Cambridge University Press: New York, NY.

American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders (DSM-V)*. American Psychiatric Association: Arlington, VA. (5th edn.)

Baker M, Stabile M, Deri C (2001). What do self-reported, objective, measures of health measure? *Journal of Human Resources* **39**, 1067–1093.

Brambilla F, Monteleone P (2003). Physical complications and physiological aberrations in eating disorders: a review. In *Eating Disorders* (ed. M Maj, K Halmi, JJ Lopez-Ibor and N Sartorius), pp. 139–193. John Wiley & Sons: New York, NY.

Breslau J, Miller E, Jin R, Sampson NA, Alonso J, Andrade LH, Bromet EJ, de Girolamo G, Demyttenaere K, Fayyad J, Fukao A, Galaon M, Gureje O, He Y, Hinkov HR, Hu C, Kovess-Masfety V, Matschinger H, Medina-Mora ME, Ormel J, Posada-Villa J, Sagar R, Scott KM, Kessler RC (2011). A multinational study of mental disorders, marriage, and divorce. *Acta Psychiatrica Scandinavica* **124**, 474–486.

Brownley KA, Berkman ND, Sedway JA, Lohr KN, Bulik CM (2007). Binge eating disorder treatment: a systematic review of randomized controlled trials. *International Journal of Eating Disorders* **40**, 337–348.

Bulik CM, Sullivan PF, Kendler KS (2000). An empirical study of the classification of eating disorders. *American Journal of Psychiatry* **157**, 886–895.

Buntin MB, Zaslavsky AM (2004). Too much ado about two-part models and transformation? Comparing methods of modeling Medicare expenditures. *Journal of Health Economics* **23**, 525–542.

Cain AS, Bardone-Cone AM, Abramson LY, Vohs KD, Joiner TE (2008). Refining the relationships of perfectionism, self-efficacy, and stress to dieting and binge eating: examining the appearance, interpersonal, and

academic domains. *International Journal of Eating Disorders* **41**, 713–721.

Cameron AC, Trivedi PK (1998). *Regression Analysis of Count Data*. Cambridge University Press: New York, NY.

Center for Disease Control and Prevention (2004). *Health, United States, 2004*. National Center for Health Statistics: Atlanta, GA.

Dobson AJ (2010). *An Introduction to Generalized Linear Models*, 2nd edn. CRC Press: Boca Raton, FL. (2nd edn.)

Eddy KT, Crosby RD, Keel PK, Wonderlich SA, le Grange D, Hill L, Powers P, Mitchell JE (2009). Empirical identification and validation of eating disorder phenotypes in a multisite clinical sample. *Journal of Nervous and Mental Disease* **197**, 41–49.

Edwards WS, Winn DM, Kurlantzick V, Sheridan S, Berk ML, Retchin S, Collins JG (1994). Evaluation of National Health Interview Survey diagnostic reporting. *Vital and Health Statistics* **2**, 1–116.

Eum K, Rice KG (2011). Test anxiety, perfectionism, goal orientation, and academic performance. *Anxiety, Stress, and Coping* **24**, 167–178.

Fairburn CG, Cooper Z, Doll HA, Norman P, O'Connor M (2000). The natural course of bulimia nervosa and binge eating disorder in young women. *Archives of General Psychiatry* **57**, 659–665.

Ferrier-Auerbach AG, Martens MP (2009). Perceived incompetence moderates the relationship between maladaptive perfectionism and disordered eating. *Eating Disorders* **17**, 333–344.

Fichter MM, Quadflieg N, Hedlund S (2008). Long-term course of binge eating disorder and bulimia nervosa: relevance for nosology and diagnostic criteria. *International Journal of Eating Disorders* **41**, 577–586.

First MB, Spitzer RL, Gibbon M, Williams JBW (2002). *Structured Clinical Interview for DSM-IV Axis I Disorders, Research Version, Non-patient Edition (SCID-I/NP)*. Biometrics Research, New York State Psychiatric Institute: New York, NY.

Forrester-Knauss C, Zemp Stutz E (2012). Gender differences in disordered eating and weight dissatisfaction in Swiss adults: which factors matter? *BMC Public Health* **12**, 809.

Fragkos KC, Frangos CC (2013). Assessing eating disorder risk: the pivotal role of achievement anxiety, depression and female gender in non-clinical samples. *Nutrients* **5**, 811–828.

Gerner B, Wilson PH (2005). The relationship between friendship factors and adolescent girls' body image concern, body dissatisfaction, and restrained eating. *International Journal of Eating Disorders* **37**, 313–320.

Glynn Owens R, Slade PD (2008). So perfect it's positively harmful? Reflections on the adaptiveness and maladaptiveness of positive and negative perfectionism. *Behavior Modification* **32**, 928–937.

Harkness J, Pennell BE, Villar A, Gebler N, Aguilar-Gaxiola S, Bilgen I (2008). Translation procedures and translation assessment in the World Mental Health Survey Initiative. In *The WHO World Mental Health Surveys: Global Perspectives on the Epidemiology of Mental Disorders* (ed. RC Kessler and TB Üstün), pp. 91–113. Cambridge University Press: New York, NY.

Haro JM, Arbabzadeh-Bouchez S, Brugha TS, de Girolamo G, Guyer ME, Jin R, Lepine JP, Mazzi F, Reneses B, Vilagut G, Sampson NA, Kessler RC (2006). Concordance of the Composite International Diagnostic Interview Version 3.0 (CIDI 3.0) with standardized clinical assessments in the WHO World Mental Health surveys. *International Journal of Methods in Psychiatric Research* **15**, 167–180.

Hay P (1998). The epidemiology of eating disorder behaviors: an Australian community-based survey. *International Journal of Eating Disorders* **23**, 371–382.

Heeringa SG, Wells JE, Hubbard F, Mneimneh Z, Chiu WT, Sampson N (2008). Sample designs and sampling procedures. In *The WHO World Mental Health Surveys: Global Perspectives on the Epidemiology of Mental Disorders* (ed. RC Kessler and TB Üstün). Cambridge University Press: New York, NY.

Helfert S, Warschburger P (2013). The face of appearance-related social pressure: gender, age and body mass variations in peer and parental pressure during adolescence. *Child and Adolescent Psychiatry and Mental Health* **7**, 16.

Herzog W, Deter HC, Fiehn W, Petzold E (1997). Medical findings and predictors of long-term physical outcome in anorexia nervosa: a prospective, 12-year follow-up study. *Psychological Medicine* **27**, 269–279.

Hilbert A, Pike KM, Wilfley DE, Fairburn CG, Dohm FA, Striegel-Moore RH (2011). Clarifying boundaries of binge eating disorder and psychiatric comorbidity: a latent structure analysis. *Behaviour Research and Therapy* **49**, 202–211.

Hosmer DW, Lemeshow S (2001). *Applied Logistic Regression*, 2nd edn. Wiley & Sons: New York, NY.

Hudson JI, Hiripi E, Pope HG Jr., Kessler RC (2007). The prevalence and correlates of eating disorders in the National Comorbidity Survey Replication. *Biological Psychiatry* **61**, 348–358.

Hudson JI, Lalonde JK, Coit CE, Tsuang MT, McElroy SL, Crow SJ, Bulik CM, Hudson MS, Yanovski JA, Rosenthal NR, Pope HG Jr. (2010). Longitudinal study of the diagnosis of components of the metabolic syndrome in individuals with binge-eating disorder. *American Journal of Clinical Nutrition* **91**, 1568–1573.

Johnson JG, Cohen P, Kasen S, Brook JS (2002). Eating disorders during adolescence and the risk for physical and mental disorders during early adulthood. *Archives of General Psychiatry* **59**, 545–552.

Jones DC, Crawford JK (2006). The peer appearance culture during adolescence: gender and body mass variations. *Journal of Youth and Adolescence* **35**, 243–255.

Kawakami N, Abdulghani EA, Alonso J, Bromet EJ, Bruffaerts R, Caldas-de-Almeida JM, Chiu WT, de Girolamo G, de Graaf R, Fayyad J, Ferry F, Florescu S, Gureje O, Hu C, Lakoma MD, Leblanc W, Lee S, Levinson D, Malhotra S, Matschinger H, Medina-Mora ME, Nakamura Y, Oakley Browne MA, Okoliyski M, Posada-Villa J, Sampson NA, Viana MC, Kessler RC (2012). Early-life mental disorders and adult household income in the World Mental Health Surveys. *Biological Psychiatry* **72**, 228–237.

Keel PK, Brown TA, Holm-Denoma J, Bodell LP (2011). Comparison of DSM-IV versus proposed DSM-5 diagnostic criteria for eating disorders: reduction of eating disorder not otherwise specified and validity. *International Journal of Eating Disorders* **44**, 553–560.

Kessler RC, Price RH (1993). Primary prevention of secondary disorders: a proposal and agenda. *American Journal of Community Psychology* **21**, 607–633.

Kessler RC, Üstün TB (2004). The World Mental Health (WMH) Survey Initiative Version of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI). *International Journal of Methods in Psychiatric Research* **13**, 93–121.

Kessler RC, Üstün TB (2008). *The WHO World Mental Health Surveys: Global Perspectives on the Epidemiology of Mental Disorders*. Cambridge University Press: New York, NY.

Kessler RC, Ormel J, Demler O, Stang PE (2003). Comorbid mental disorders account for the role impairment of commonly occurring chronic physical disorders: results from the National Comorbidity Survey. *Journal of Occupational and Environmental Medicine* **45**, 1257–1266.

Kessler RC, Berglund PA, Chiu WT, Deitz AC, Hudson JI, Shahly V, Aguilar-Gaxiola S, Alonso J, Angermeyer MC, Benjet C, Bruffaerts R, de Girolamo G, de Graaf R, Haro JM, Kovess-Masfety V, O'Neill S, Posada-Villa J, Sasu C, Scott K, Viana MC, Xavier M (2013). The prevalence and correlates of binge eating disorder in the World Health Organization World Mental Health Surveys. *Biological Psychiatry* **73**, 904–914.

Kinzl JF, Traweger C, Trefalt E, Mangweth B, Biebl W (1999). Binge eating disorder in males: a population-based investigation. *Eating and Weight Disorders* **4**, 169–174.

Knäuper B, Cannell CF, Schwarz N, Bruce ML, Kessler RC (1999). Improving accuracy of major depression age-of-onset reports in the US National Comorbidity Survey. *International Journal of Methods in Psychiatric Research* **8**, 39–48.

Knight M, Stewart-Brown S, Fletcher L (2001). Estimating health needs: the impact of a checklist of conditions and quality of life measurement on health information derived from community surveys. *Journal of Public Health Medicine* **23**, 179–186.

Leenaars L, Lester D (2006). Perfectionism, depression, and academic performance. *Psychological Reports* **99**, 941–942.

Levinson D, Lakoma MD, Petukhova M, Schoenbaum M, Zaslavsky AM, Angermeyer M, Borges G, Bruffaerts R, de Girolamo G, de Graaf R, Gureje O, Haro JM, Hu C, Karam AN, Kawakami N, Lee S, Lepine JP, Browne MO, Okoliyski M, Posada-Villa J, Sagar R, Viana MC, Williams DR, Kessler RC (2010). Associations of serious mental illness with earnings: results from the WHO World Mental Health surveys. *British Journal of Psychiatry* **197**, 114–121.

Mitchell JE, Crow S (2006). Medical complications of anorexia nervosa and bulimia nervosa. *Current Opinion in Psychiatry* **19**, 438–443.

Mond JM, Hay PJ (2007). Functional impairment associated with bulimic behaviors in a community sample of men and women. *International Journal of Eating Disorders* **40**, 391–398.

Ormel J, Petukhova M, Chatterji S, Aguilar-Gaxiola S, Alonso J, Angermeyer MC, Bromet EJ, Burger H, Demyttenaere K, de Girolamo G, Haro JM, Hwang I, Karam E, Kawakami N, Lepine JP, Medina-Mora ME, Posada-Villa J, Sampson N, Scott K, Üstün TB, Von Korff M, Williams DR, Zhang M, Kessler RC (2008). Disability and treatment of specific mental and physical disorders across the world. *British Journal of Psychiatry* **192**, 368–375.

Pennell B-E, Mneimneh Z, Bowers A, Chardoul S, Wells JE, Viana MC, Dinkelmann K, Gebler N, Florescu S, He Y, Huang Y, Tomov T, Vilagut G (2008). Implementation of the World Mental Health Surveys. In *The WHO World Mental Health Surveys: Global Perspectives on the Epidemiology of Mental Disorders* (ed. RC Kessler and TB Üstün), pp. 33–57. Cambridge University Press: New York, NY.

Perez M, Warren CS (2012). The relationship between quality of life, binge-eating disorder, and obesity status in an ethnically diverse sample. *Obesity* **20**, 879–885.

Pomeroy C, Mitchell JE (2002). Medical complications of anorexia nervosa and bulimia nervosa. In *Eating Disorders and Obesity: A Comprehensive Handbook* (ed. KD Brownell and CG Fairburn), pp. 278–285. The Guilford Press: New York, NY.

Preti A, Girolamo G, Vilagut G, Alonso J, Graaf R, Bruffaerts R, Demyttenaere K, Pinto-Meza A, Haro JM, Morosini P (2009). The epidemiology of eating disorders in six European countries: results of the ESEMeD-WMH project. *Journal of Psychiatric Research* **43**, 1125–1132.

Quick VM, Byrd-Bredbenner C (2013). Eating Disorders Examination Questionnaire (EDE-Q): norms for US college students. *Eating and Weight Disorders* **18**, 29–35.

Revicki DA, Irwin D, Reblando J, Simon GE (1994). The accuracy of self-reported disability days. *Medical Care* **32**, 401–404.

Revicki DA, Rentz AM, Dubois D, Kahrilas P, Stanghellini V, Talley NJ, Tack J (2004). Gastroparesis Cardinal Symptom Index (GCSI): development and validation of a patient reported assessment of severity of gastroparesis symptoms. *Quality of Life Research* **13**, 833–844.

SAS Institute Inc (2008). *SAS Software Version 9.2*. SAS Institute Inc. Cary, NC.

Schoenborn CA, Adams PF, Schiller JS (2003). Summary health statistics for the U.S. population: National Health Interview Survey, 2000. *Vital and Health Statistics* **10**, 1–83.

Shapiro JR, Berkman ND, Brownley KA, Sedway JA, Lohr KN, Bulik CM (2007). Bulimia nervosa treatment: a systematic review of randomized controlled trials. *International Journal of Eating Disorders* **40**, 321–336.

Striegel RH, Bedrosian R, Wang C (2012). Comparing work productivity in obesity and binge eating. *International Journal of Eating Disorders* **45**, 995–998.

Striegel-Moore RH, Franko DL (2008). Should binge eating disorder be included in the DSM-V? A critical review of the state of the evidence. *Annual Review of Clinical Psychology* **4**, 305–324.

Striegel-Moore RH, Silberstein LR, Frensch P, Rodin J (1989). A prospective study of disordered eating among

college students. *International Journal of Eating Disorders* **8**, 499–509.

Striegel-Moore RH, Cachelin FM, Dohm FA, Pike KM, Wilfley DE, Fairburn CG (2001). Comparison of binge eating disorder and bulimia nervosa in a community sample. *International Journal of Eating Disorders* **29**, 157–165.

Striegel-Moore RH, Franko DL, Thompson D, Barton B, Schreiber GB, Daniels SR (2005). An empirical study of the typology of bulimia nervosa and its spectrum variants. *Psychological Medicine* **35**, 1563–1572.

Sysko R, Roberto CA, Barnes RD, Grilo CM, Attia E, Walsh BT (2012). Test-retest reliability of the proposed DSM-5 eating disorder diagnostic criteria. *Psychiatry Research* **196**, 302–308.

Thornton C, Russell J, Hudson J (1998). Does the Composite International Diagnostic Interview underdiagnose the eating disorders? *International Journal of Eating Disorders* **23**, 341–345.

Vazquez-Barquero JL, Vazquez Bourgon E, Herrera Castanedo S, Saiz J, Uriarte M, Morales F, Gaite L, Herran A, Üstün TB (2000). [Spanish version of the new World Health Organization Disability Assessment Schedule II (WHO-DAS-II): initial phase of development and pilot study. Cantabria disability work group]. *Actas Espanolas de Psiquiatria* **28**, 77–87.

Von Korff M, Crane PK, Alonso J, Vilagut G, Angermeyer MC, Bruffaerts R, de Girolamo G, Gureje O, de Graaf R, Huang Y, Iwata N, Karam EG, Kovess V, Lara C, Levinson D, Posada-Villa J, Scott KM, Ormel J (2008). Modified WHODAS-II provides valid measure of global disability but filter items increased skewness. *Journal of Clinical Epidemiology* **61**, 1132–1143.

Wade TD, Keski-Rahkonen A, Hudson JI (2011). Epidemiology of eating disorders. In *Textbook of Psychiatric Epidemiology*, 3rd edn (ed. MT Tsuang, M Tohen and P Jones). John Wiley & Sons: New York, NY.

Willett JB, Singer JD (1993). Investigating onset, cessation, relapse, and recovery: why you should, and how you can, use discrete-time survival analysis to examine event occurrence. *Journal of Consulting and Clinical Psychology* **61**, 952–965.

Wolter KM (1985). *Introduction to Variance Estimation*. Springer-Verlag: New York, NY.

Wonderlich SA, Gordon KH, Mitchell JE, Crosby RD, Engel SG (2009). The validity and clinical utility of binge eating disorder. *International Journal of Eating Disorders* **42**, 687–705.

World Bank (2012). Countries and economies. Data accessed June 5, 2012 at: http://data.worldbank.org/country.

World Health Organization (2013). WHO Disability Assessment Schedule 2.0. Accessed July 23, 2013 at: http://www.who.int/icidh/whodas/index.html.

Zachrisson HD, Vedul-Kjelsas E, Gotestam KG, Mykletun A (2008). Time trends in obesity and eating disorders. *International Journal of Eating Disorders* **41**, 673–680.

https://doi.org/10.1017/S2045796013000516 Published online by Cambridge University Press