Eating disorders, behaviours and diagnoses: epidemiology and comorbidity in the general population.

Thesis submitted for the Degree of Doctor of Philosophy (PhD) - University College London

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I, Francesca Solmi, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Signed_____

Date_____

Abstract

Introduction: Studies investigating prevalence and comorbidity of eating disorders (ED) and disordered eating in large general population samples are limited. This thesis adds to the existing literature by employing general population studies to investigate prevalence and comorbidity of disordered eating and ED in adults and adolescents. Secondary aims were to explore occurrence of ED in relation to ethnicity and patterns of service use.

Methods: The studies included in this thesis employed three general population samples of adults (UK) and adolescents (UK and Finland) to cross-sectionally investigate the prevalence of ED and disordered eating, and their comorbidity with several psychiatric conditions.

Results: Disordered eating was highly prevalent amongst adults, especially amongst those from an ethnic minority background, and in overweight to obese individuals. Prevalence of ED was in line with previous studies although we found a high prevalence of binge eating disorder and purging disorder amongst older and younger participants, respectively. Use of purging practices was highly prevalent amongst adolescent girls, and was associated with high levels of psychiatric comorbidity. Amongst adults, those diagnosed with purging disorder had the greatest psychiatric comorbidity.

Conclusions: High prevalence of disordered eating in the general population, in specific ethnic groups, and in obese individuals, suggests the presence of socio-cultural risk factors for ED. Heightened risk-taking attitudes proper of adolescence could also act as specific risk factors for onset of purging behaviours and other comorbid conditions, such as substance use. Risk trajectories for binge eating disorder in older individuals require further exploration. Results from this thesis highlight the need for comprehensive approaches to treatment and prevention of ED in clinical practice. In the future more longitudinal research in the general population is also encouraged in

order to explore the interaction between biological and societal risk factors for the onset of ED and disordered eating.

Dedicated to my wonderful parents,
whose love means more to me than
they can possibly imagine.

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List of abbreviations

AN-BP = Anorexia Nervosa Binge/Purge type

AN-R = Anorexia Nervosa Restrictive type

AUDIT = Alcohol Use Disorders Identification Test

BED = Binge Eating Disorder

BN-NP = Bulimia Nervosa Non Purging type

BN-P = Bulimia Nervosa Purging type

BPD = Borderline Personality Disorder

CI = Confidence Interval

CMR = Crude Mortality Rate

DSM-5 = Diagnostic and Statistical Manual of Mental Disorders 5th Edition

DSM-IV = Diagnostic and Statistical Manual of Mental Disorders 4th Edition

EDNOS = Eating Disorder Not Otherwise Specified

ICD-11 = International Classification of Diseases 11th Revision

MFQ = Moods and Feelings Questionnaire

OCD = Obsessive Compulsive Disorder

OCPD = Obsessive Compulsive Personality Disorder

OR = Odds Ratio

OSFED = Other Specified Feeding or Eating Disorders

PD = Purging Disorder

PTSD = Post-Traumatic Stress Disorder

RRR = Relative Risk Ratio

SCID-I = Structured Clinical Interview for DSM-IV Axis I Disorders

SCOFF = Sick Control One stone Fat Food

SMR = Standardised Mortality Rate

WHO = World Health Organization

YSR = Youth Self Report

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Chapter 1
Background, overall aims and objectives

1.1. Chapter overview

The aim of the studies reported in this thesis is to fill some of the current research gaps existing in the literature with respect to the study of the prevalence and comorbidity of eating disorders (ED) and disordered eating in adults and adolescents, and in different ethnic groups. A secondary aim is to provide an overview of patterns of health service utilisation in individuals with ED and disordered eating.

This first chapter serves as a general overview of full- and sub-threshold ED diagnoses and their prevalence, and as a presentation of some of the methodological issues related to the use of diagnoses. Issues related to comorbidity in ED, presentation of ED in different ethnic groups, and health service use will be discussed in Chapter 2.

1.2. Background

1.2.1. Eating disorders

Eating disorders (ED) are a complex and heterogeneous set of conditions characterised by a combination of physical and psychological symptoms, which often overlap across– and yet, equally often, are not encompassed by – current diagnoses (Wildes & Marcus, 2013). Cognitions such as marked preoccupation with thoughts of food, weight and shape; behaviours such as dieting, fasting, excessive exercise, bingeing and purging; and physical correlates such as low Body Mass Index (BMI) and amenorrhea are typical features of individuals suffering from ED.

Anorexia Nervosa

Anorexia Nervosa (AN) is a condition whereby individuals develop extreme concerns with body weight and shape, accompanied by weight loss achieved either by restricting caloric intake or by extreme compensatory methods (e.g. vomiting, taking laxatives, diuretics, or slimming medications), and by efforts to

maintain a Body Mass Index (BMI) lower than the normal, healthy range. The Diagnostic and Statistical Manual for Mental Health Disorders Fourth Edition, Text Revision (DSM-IV-TR) (American Psychiatric Association, 2000) defines the necessary criteria for the classification of AN as: (i) a refusal to maintain a body weight in the normal range for the individual's age and height, which is translated in a weight lower than 85% of that expected; (ii) an intense fear of fatness which is maintained even when the individual is underweight; (iii) an undue influence of body weight and shape on self-evaluation, which often is maintained despite low weight and the concerns of others; and (iv) in post-menarcheal women, amenorrhea, defined as the absence of menstrual periods for at least three consecutive months. The DSM-IV defines two sub-types of AN, according to the methods employed to maintain low weight: (i) anorexia nervosa of the restricting type (AN-R), when the individual achieves and maintains a low weight simply by restricting caloric intake; and (ii) anorexia nervosa of the binge-purge type (AN-BP), if the individual engages in instances of binge eating and/or purging episodes (defined as vomiting or the inappropriate use of laxatives, enemas, or diuretics) to lose weight and compensate for the previous caloric intake.

In May 2013, a new edition of the Diagnostic and Statistical Manual for Mental Health Disorders (DSM-5) (American Psychiatric Association, 2013) was released, updating the diagnostic criteria for all mental health disorders, including ED. The new classification scheme has rephrased the low weight criterion for AN as "significantly low body weight in the context of age, sex, developmental trajectory and physical health" and removed the amenorrhea criterion. Both sub-types of AN have been maintained in the new version of the manual (American Psychiatric Association, 2013).

Bulimia Nervosa

Individuals with bulimia nervosa (BN) show excessive concerns with weight and shape, granting their body image an undue importance over the evaluation of their selves. Recurrent episodes of binge eating followed by compensatory behaviours to counteract the binge eating are also defining features of BN,

although low body weight (a necessary criterion for the diagnosis of AN), is not required for a diagnosis of BN. In DSM-IV, the following are listed as necessary diagnostic criteria for BN: (i) engaging in recurring binge eating episodes, defined as the consumption of an unusually large amount of food in a short period of time whilst experiencing a sense of loss of control over the amount of food eaten (i.e. not being able to stop eating even if wanting to); (ii) the binge eating episode is followed by compensatory behaviours to avoid gaining weight. Compensatory behaviours are defined as vomiting, inappropriate use of medications (i.e. laxatives, diuretics, water pills, enemas, and diet pills), fasting, or exercising excessively. (iii) Binge eating episodes are followed by inappropriate compensatory behaviours occur twice a week for at least three months; (iv) the individual places an undue influence of weight and shape on self-evaluation; (v) this disturbance does not occur only during episodes of AN.

DSM-IV distinguishes between two sub-types of BN, on the basis of the kind of compensatory behaviour(s) employed: (i) bulimia nervosa of the purging type (BN-P) if the individual recurs to self-induced vomiting, laxatives, enemas, or diuretics; (ii) bulimia nervosa of the non-purging type (BN-NP) if the individual compensates for their binge eating episodes through excessive exercise, fasting, or restricting their caloric intake. DSM-5 has brought changes to the definition of BN in two respects. First, the frequency criterion of bingeing-purging episodes has been changed to once a week for at least three months. Second, the distinction between the two sub-types of BN has been abandoned in favour of a single definition of the disorder, irrespective of the type of compensatory behaviour (American Psychiatric Association, 2013).

Eating Disorder Not Otherwise Specified (EDNOS)

In many instances, individuals can exhibit symptoms and behaviours that, whilst of clinical significance, only partially fulfil the requirements for a full ED diagnosis, in terms of their symptom presentation and/or frequency. In DSM-IV these cases, as well as less documented eating disturbances, are grouped under the residual diagnostic category of eating disorders not otherwise specified (EDNOS). DSM-IV lists six examples of when individual or clusters of ED

behaviours (e.g. loss of control eating, purging, low weight) can be included as EDNOS diagnoses. These are: when individuals with AN present all of the relevant symptoms except for either (i) amenorrhea, or (ii) low body mass index (BMI); or when individuals with BN engage in bingeing and purging episodes less frequently than twice a week for at least three months (iii). In addition, the EDNOS category can be applied to (iv) individuals who experience binge eating episodes, which are not followed by compensatory behaviours, with a frequency of two episodes per week for at least six months. In DSM-IV, this type of eating disturbance is given the name of binge eating disorder (BED) with the disclaimer that more research is needed to evaluate the evidence supporting the need for BED to be included as a separate ED category. Similarly acknowledged to be an EDNOS is (v) engaging in purging practices which do not follow bingeing episodes or that follow 'subjective bingeing episodes'. The latter occurs when a person perceives a sense of loss of control over the amount of food eaten and believes it to be a large amount despite the caloric intake does not equate to that of a binge (e.g. a couple of biscuits, a packet of crisps). Finally, (vi) individuals engaging in repeatedly chewing and spitting out food without swallowing are also considered as having an EDNOS.

Changes in diagnostic criteria introduced by DSM-5 will cause a portion of individuals who would have previously received an EDNOS diagnosis resulting from sub-threshold symptomatology (i.e. lack of amenorrhea in AN, or failure to meet the frequency criterion for BN) to now be assigned a full diagnosis (Machado, Gonçalves, & Hoek, 2013). It is also of note that DSM-5 has elevated binge eating disorder (BED) from the EDNOS category to a full ED diagnosis. In DSM-5, an individual is diagnosed with BED if: (i) in the absence of compensatory behaviours they engage in binge eating episodes, defined (similarly to BN), as consuming a large amount of food in a short period of time accompanied by a sense of loss of control over the amount of food eaten; (ii) during these episodes the individual eats more quickly than usual, until uncomfortably full, when not physically hungry, experiencing feelings of guilt, or embarrassment which often leads to eating in secret; (iii) the disorder is associated with significant distress; and, (iv) these episodes occur at least once

a week for a minimum of three months. Finally, in DSM-5, the EDNOS category has been renamed ‘Other Specified Feeding or Eating Disorders’ (OSFED).

Table 1: Summary table comparing DSM-IV and DSM-5 diagnostic criteria for ED (highlighted are criteria which have been either changed or removed)

ED Diagnosis	DSM-IV		DSM-5	
Anorexia Nervosa	• Body weight lower than 85% of that expected; • Fear of fatness even when the individual is underweight; • An undue influence of body weight and shape on self-evaluation; • Amenorrhea (in post-menarchal women), lack of menstrual period for at least 3 consecutive months.		• Significantly low body weight in the context of age, sex, developmental trajectory and physical health; • Fear of fatness even when the individual is underweight; • An undue influence of body weight and shape on self-evaluation.	
	AN–R: low weight is achieved by means of restricting food intake	AN-BP: low weight is achieved by engaging in bingeing and/or inappropriate purging methods (e.g. vomiting, laxatives)	AN–R: low weight is achieved by means of restricting food intake	AN-BP: Low weight is achieved by engaging in bingeing and/or inappropriate purging methods (e.g. vomiting, laxatives)
Bulimia Nervosa	• Eating in a short period of time an unusually large amount of food accompanied by a sense of loss of control over the quantity of food eaten (binge eating episode); • The binge is followed by inappropriate compensatory behaviours, defined as vomiting, inappropriate use of laxatives, diuretics, water pills, enemas, diet pills, fasting, or excessive exercise; • Bing-eating and compensatory behaviours occur at least twice a week for a minimum of 3 months; • An undue influence of body weight and shape on self-evaluation; • This disturbance does not occur exclusively during episodes of AN.		• Eating in a short period of time an unusually large amount of food accompanied by a sense of loss of control over the quantity of food eaten (binge eating episode); • The binge is followed by inappropriate compensatory behaviours, defined as vomiting, inappropriate use of laxatives, diuretics, water pills, enemas, and diet pills, fasting, or exercising excessively; • Bing-eating and compensatory behaviours occur at least once a week for a minimum of 3 months; • An undue influence of body weight and shape on self-evaluation; • This disturbance does not occur only during episodes of AN.	
	BN-P: Purging-type compensatory behaviours (e.g. vomiting, laxatives, diuretics)	BN-NP: Non-purging-type compensatory behaviours (e.g.: fasting, excessive exercise)	No BN subtypes	

ED Diagnosis	DSM-IV	DSM-5
Binge eating Disorder	(EDNOS diagnosis in DSM-IV) • Individual engages in binge eating episodes (see BN definition) without compensatory behaviours; • During these episodes the individual eats more quickly than usual, until uncomfortably full, or even when not physically hungry, experiences feelings of guilt, or embarrassment often leading to eating in secret; • The disorder is associated with significant distress; • These episodes occur at least twice a week for a minimum of six months.	(Official diagnosis in DSM-5) • Individual engages in binge eating episodes (see BN definition) without compensatory behaviours; • During these episodes the individual eats more quickly than usual, until uncomfortably full, or even when not physically hungry, experiences feelings of guilt, or embarrassment often leading to eating in secret; • The disorder is associated with significant distress; • These episodes occur at least once a week for a minimum of three months.
EDNOS/ OSFED	• For females, all of the criteria for AN are met except that the individual has regular menses; • All of the criteria for AN are met except that, despite significant weight loss, the individual's current weight is in the normal range; • All criteria for BN are met except that the binge eating and inappropriate compensatory behaviours occur at a frequency of less than twice a week or for a duration of less than 3 months; • The regular use of inappropriate compensatory behaviours by an individual of normal body weight after eating small amounts of food; • Repeatedly chewing and spitting out, but not swallowing, large amounts of food. • Binge eating disorder (see above)	• All of the criteria for AN are met except that, despite significant weight loss, the individual's current weight is in the normal range; • All the criteria for BN are met except that the binge eating and inappropriate compensatory behaviours occur, on average, less than once a week and/or for less than 3 months; • All criteria for BED are met except that the binge eating occurs, on average, less than once a week and/or for less than 3 months; • Purging disorder: use of recurrent purging behaviours to influence weight or shape (e.g.: self-induced vomiting; misuse of laxatives, diuretics, or other medications) in the absence of binge eating; • Night eating syndrome: recurrent episodes of night eating as manifested by eating after awakening from sleep or by excessive food consumption after the evening meal. There is awareness and recall of the eating. The night eating is not better explained by external influences such as sleep/wake cycle or by local social norms. The night eating causes significant distress and/or impairment in functioning. The disordered pattern of eating is not better explained by binge eating disorder or another psychiatric disorder, including substance use, and it is not attributable to another medical disorder, or to the effect of a medication.

1.2.2. Epidemiology of eating disorders

The reliability of ED prevalence figures has often been questioned due to methodological considerations concerning assessment and sampling of study participants, which could potentially lead to biased estimates (Hoek, 2006). Two issues characteristic of ED should be considered: (i) ED are a relatively low prevalence condition, therefore large samples are required to estimate prevalence; (ii) case-detection of ED is low due to sufferers' tendency not to disclose their problem or seek professional help, and difficulties in recognising ED symptoms at primary care level (Mond, Hay, Rodgers, & Owen, 2007). As a consequence, often, only the most serious cases reach specialised services (Hoek & van Hoeken, 2003). This means that studies based on psychiatric or outpatient registers may underestimate the true prevalence of ED (Smink, van Hoeken, & Hoek, 2012), whilst those relying on general population samples – where data is obtained either from direct interviews or surveys– might fail to detect ED cases. These limitations have been widely discussed and acknowledged by the literature, and researchers agree that a reliable design to estimate the prevalence of ED is the use of a two-stage epidemiological study (Faravelli et al., 2006; Hoek, 2006; Smink et al., 2012). In this design a screening measure is used to identify potential ED cases through a general population survey, and the screening measure is followed by a clinical assessment on a sub-sample of respondents. The main pitfalls of this method are losses to follow up, the often sub-optimal sensitivity to specificity ratio of the screener, and the often small number of people who are interviewed at the second stage of the study (Hoek, Van Hoeken, & Katzman, 2003). In what follows, I will review the literature on age of onset and prevalence of different ED diagnoses.

Anorexia nervosa
Age of onset

Anorexia nervosa typically presents during mid- to late adolescence (Attia, 2010); although variations on both ends of this age spectrum have been documented, and recent studies have shown trends towards a younger age of onset for AN (Currin, Schmidt, Treasure, & Jick, 2005; Madden, Morris, Zurynski, Kohn, & Elliot, 2009; Nicholls, Lynn, & Viner, 2011).

A study reviewing incidence rates (i.e. the number of new cases in a population in a given period) of ED between 1988 and 2000 found that the highest incidence rate for AN (34.6 per 100,000, 95%CI: 22 – 47.1 in girls; 2.3 per 100,000, 95%CI: 0-5.4 in boys) occurred between the ages of 10 and 19 (Currin et al., 2005). Similarly, a recent study found that in 2009 the highest crude incidence rate for both AN and BN diagnoses occurred between the ages of 15 and 19 years. BN had 6.0 per 100,000 (95% CI: 2.6 – 11.9) incident cases between the ages of 10-14, while AN had 24.0 per 100,000 (95% CI: 16.3 - 34.3) incident cases in that age bracket, highlighting higher proportions of younger incident cases in AN (Micali, Hagberg, Petersen, & Treasure, 2013). A study using data from the National Comorbidity Replication Study (N=9,282) found a mean age of onset for AN of 18.9 (SE=0.8) years, and no further cases signalled past the mid-twenties age band (Hudson, Hiripi, Pope Jr, & Kessler, 2007). Using data from the National Comorbidity Replication Study Adolescents Supplement (N=10,123), Swanson reported a median age of onset for AN of 12.3 years (IQR=11.2-13)(Swanson, Crow, Le Grange, Swendsen, & Merikangas, 2011).

An Australian study looking at early onset eating disorders (EOED) among children aged 5 – 13, using the Australian Paediatric Surveillance Unit (APSU) data collected between years 2002 and 2005, found an incidence rate of 1.4 per 100,000 cases (Madden et al., 2009). A similarly structured UK based study, using data from the British Paediatric Surveillance Unit (BPSU) and Child and Adolescent Psychiatric Surveillance System collected between 2005 and 2006, found an incidence of early onset AN of 1.09 cases

per 100,000 (Nicholls et al., 2011). Finally, a surveillance study conducted over 2,453 paediatricians, found an incidence rate of early onset restricting ED of 2.6 cases per 100,000 with a 'girls to boys' ratio of 6:1 (Pinhas, Morris, Crosby, & Katzman, 2011).

Prevalence

Several studies have attempted to estimate the lifetime prevalence (i.e. the proportion of population who experience the condition at some point of their lives) of AN in the general population, both according to its full diagnostic criteria and its sub-threshold version, often referred to as 'broad-AN' (i.e. all the criteria are present except for amenorrhea). This broader definition of the condition has been considered due to the predicted exclusion of the amenorrhea criterion from the diagnostic definition of AN in DSM-5. To date, general population studies have yielded lifetime prevalence estimates for AN of between 0.0% and 2.4%, depending on the type of population under study (i.e. males and females, adolescents only vs. adults, twins) and the definition of AN employed (i.e. AN or broad AN). According to two longitudinal incidence rate studies, incidence of AN appears to have remained stable in the past two decades (Currin et al., 2005; Micali, Hagberg, et al., 2013).

The National Comorbidity Replication study by Hudson et al (N= 9,282) yielded a prevalence figure for AN of 0.9% (0.3% in men, 0.6% in women) (Hudson et al., 2007), whereas the National Comorbidity Replication Survey Adolescent Supplement reported a 0.3% lifetime prevalence (both in males and females) of AN in a sample of 10,123 adolescents aged 13 to 18 years (Swanson et al., 2011). Finally, in a Finnish study of 1,863 participants aged 20-35 years, lifetime prevalence of AN was 1.3% (Lähteenmäki et al., 2013). Twin studies report higher figures ranging from 0.6% to 1.9% for DSM-IV-defined AN and from 1.2% to 2.4% for broad AN (Cynthia M Bulik et al., 2006; Keski-Rahkonen et al., 2007; Wade, Bergin, Tiggemann, Bulik, & Fairburn, 2006). These figures could be explained by the use of an all-female study population (in which ED are more prevalent) composed by twins.

Both genes and environment have been speculated to play a role in the aetiology of ED (Mazzeo & Bulik, 2009), therefore a higher prevalence could perhaps be expected in samples of twins.

Some studies used point prevalence (i.e. the proportion of the population with the condition investigated at a specific point in time) resulting in lower figures. In Germany, a study of 248,558 children and adolescents yielded a point prevalence of 0.28% for AN (Jaite, Hoffmann, Glaeske, & Bachmann, 2013). In a Portuguese sample of 996 female students, the point prevalence for AN was 0.52%, and for broad AN the prevalence was 0.53% (Machado, Machado, Gonçalves, & Hoek, 2007). Finally a 8-year longitudinal study of 496 adolescents, found an 0.8% prevalence of for AN using DSM-5 criteria (Stice, Marti, & Rohde, 2012). Most of these studies report a ratio of AN cases between females and males from 3:1 to 10:1 (Preti et al., 2009).

Bulimia Nervosa

Age of onset

Bulimia Nervosa usually has an older age of onset than anorexia nervosa, although several studies suggest that age of onset for BN may also be decreasing.

A large US-based study using data from the National Comorbidity Replication Study showed age of onset for BN to be 19.7 years (SE= 1.3), compared to18.9 (SE=0.8) for AN (Hudson et al., 2007). A World Health Organization (WHO) study of 14 countries (N= 24,124) found a mean age of onset for BN of 20.6 (Kessler et al., 2013). In a retrospective study looking at incidence of all ED between 1988 and 2000, it is of note that incidence of BN, whilst peaking similarly to that of AN, in the 10-19 age group (35.8 per 100,000, 95% CI 23.0 – 48.6), remains similarly high in the 20–39 age bracket (28.6 per 100,000, 95% CI: 21.4 – 35.8). In comparison, AN incidence declines more steeply in this later age bracket (10.5 per 100,000, 95% CI: 6.1 – 14.9) (Currin et al., 2005). The same finding was repeated in a recent study by Micali and colleagues who found incidence rates for BN, as

for AN, peaked in the age 15-19 bracket (46.8 per 100,000; 95%CI: 36.6 – 58.9), but that rates for BN remained high in the 20-29 age group (31.8 per 100,000 95%CI: 26.3 – 38.1), and in the 30 -39 group (19.2 per 100,000 5%CI: 15.0 – 24.3). This was not observed in AN, for which rates dropped to 18.9 per 100,000 (95%CI: 14.8 -23.9) and 3.0 per 100,000 (95%CI: 1.5 – 5.3) for the two age groups, respectively (Micali, Hagberg, et al., 2013). When comparing mean age of onset for the two conditions, the comparatively higher number of incident cases of BN at later ages could account for older mean age of onset reported in adult samples. In fact in a sample restricted to adolescents only, Swanson and colleagues found a mean age of onset of 12.4 years for BN, comparable to that of AN (12.3)(Swanson et al., 2011).

Nicholls and colleagues found extreme cases of early onset of BN occurring between the ages of 5 and 13, with an incidence rate of 0.09 per 100,000 (Nicholls et al., 2011). There is evidence to suggest that the mean age of onset for BN is also decreasing. In an Italian study of 793 individuals with BN, those born between 1970 and 1972 had a mean age at onset of 18.5 years, whereas those born between 1979 and 1981 had a mean age of onset of 17.1 (Favaro, Caregaro, Tenconi, Bosello, & Santonastaso, 2009). In a Dutch study of all cases of AN and BN referred by general practitioners between 1985 and 1989 and 1995-1999 the high-risk group of BN changed from 25–29 years old in the 1985–1989 period, to 15–24 years old in the 1995–1999 period (van Son, van Hoeken, Bartelds, van Furth, & Hoek, 2006). However, as Smink notes, it is not possible to conclude from these figures whether an actual shift in age of onset has occurred, or detection of cases at an earlier age has increased due to improved knowledge and awareness of the disorder (Smink et al., 2012).

Prevalence

The lifetime prevalence of BN is believed to range between 0.9% and 2.9%, though higher rates have been documented. The conventionally accepted point prevalence of BN is 1.0% (Smink et al., 2012) . Similarly to AN, several studies anticipating changes in the DSM-5 diagnostic criteria for BN, have

looked at the prevalence of broad BN, defined as cases of BN in which the individual binge-eats and purges less frequently than twice a week and for less than six months. Research suggests that incidence of the disorder has increased in the 1988-2000 decade (Currin et al., 2005) but that it has remained stable between 2000-2009 (Micali, Hagberg, et al., 2013).

Two studies have looked at the prevalence of BN in the general population using mixed men and women samples. A European based, two-stage general population cross-sectional household survey of ED (N=4,139) found a lifetime prevalence of BN of 0.51% (95% CI: 0.3 – 0.9) (Preti et al., 2009). A US-based study of 9,282 individuals a slightly higher prevalence of 1% (SE=0.2)both using a combined sample of men and women (Hudson et al., 2007).

As for AN, twin studies using all-female samples found higher lifetime prevalence for BN ranging from 1.7% and 2.9% for DSM-IV-defined BN (Keski-Rahkonen et al., 2009; Wade et al., 2006). This could be due to shared genetic and environmental factors in twin populations and higher ED prevalence in women. In fact, both the European and US studies found higher prevalence in women (1.5% and 0.9%, respectively) (Hudson et al., 2007; Preti et al., 2009), but not as high as those seen in twin studies (Keski-Rahkonen et al., 2009; Wade et al., 2006)

Amongst adolescents results are contrasting. Swanson and colleagues, in a sample of 13-18 year-olds, found the lifetime prevalence of BN to be 0.9% (SE = 0.16) (Swanson et al., 2011), whereas Stice reported a 1.6% figure for full-BN and 6.1% for partial (or broad) BN[1] in a 8-year longitudinal study of girls between 12 to 15 years of age (Stice, Marti, Shaw, & Jaconis, 2009).

[1] Partial BN was defined as at least 2 binge and purging episodes per month accompanied by weight and shape influence on self-evaluation; hence this definition would still be considered broad BN according to DSM-5 criteria.

Binge eating Disorder

Binge eating disorder has newly been assigned a full-diagnosis status in DSM-5 (American Psychiatric Association, 2013), as in DSM-IV it was included as an EDNOS requiring further investigation (American Psychiatric Association, 2000).

Age of onset

Binge eating disorder has consistently been documented to have the highest age of onset among all ED, though binge eating episodes also present at younger ages (Hudson et al., 2007). Data from the US-based National Comorbidity Survey replication (N=9,282) showed a mean age of onset for BED of 25.4 years (SE=1.2), and of any binge eating episodes of 22.4 (SE=1.1) (Hudson et al., 2007). In a WHO study of 24,124 respondents from 14 upper-middle and high-income countries, mean age of onset of BED was 23.3 years. The authors found the mean age of onset of BED to be significantly higher than that of BN (23.3 vs. 20.6, $t = 3.4$, $p<0.001$), as well as BED having a higher interquartile range for median age of onset (BN: Median: 18.0, IQR = 14.5 – 22.9 vs. BED: Median 19.3, IQR = 15.5 – 27.2) (Kessler et al., 2013). The similar median age of onset for BED and BN, although with a wider IQR for BED, suggests similar patterns of onset during adolescence for the two disorders. Older mean age of onset in BED could be explained by higher numbers of incident cases in older age groups compared to BN (and AN). In fact, Swanson in her study of 10,213 adolescents aged 13–18 years old found a mean age of onset for BED of 12.6 years (vs. 12.3 of AN and 12.4 of BN) (Swanson et al., 2011).

Prevalence

The prevalence of BED has been investigated in several general population studies. In a large US study (N=9.282), Hudson and colleagues found the lifetime prevalence of BED to be 2.8% (SE=0.4) (Hudson et al., 2007). Preti and colleagues, in a six-country study of 21,425 participants, reported a lifetime prevalence figure for BED of 1.2% (95% CI: 0.8 – 1.6) (Preti et al., 2009), whilst WHO, from a 14 country study of 24,124 participants,

reported a 1.4% (95% CI:0.8–1.9) lifetime prevalence of BED (Kessler et al., 2013). Amongst adolescents, the lifetime prevalence of BED seems to be higher than those of other ED. Swanson found a lifetime prevalence of 1.6% (SE = 0.22) for BED and of 2.5% (SE=0.26) for sub-threshold BED amongst 13–18 year old adolescents (Swanson et al., 2011). As noted by Smink and colleagues, the American studies employed a duration criteria of three months rather than six, which could partially account for the highest figures reported (Smink et al., 2012). In fact, Stice, albeit in a smaller sample (N = 496) of adolescents aged 12 to 15 years found a 1% prevalence for BED but of 4.6% for sub-threshold BED (Stice et al., 2009). The introduction of BED as a full diagnosis in DSM-5 should facilitate comparisons between future studies.

Interim conclusions

The sections above have summarised the literature on the age of onset and prevalence of the three main DSM-5 ED diagnoses.

Literature suggests that AN has the youngest age of onset and lowest prevalence when compared to BN and BED, while BED has the oldest age of onset and highest prevalence. Whilst it is too early to investigate incidence trends for the newly defined BED, there is some evidence that incidence of AN and BN has remained relatively stable in the past 2 decades. On the other hand, early onset eating disorders (age 5–13 years), especially of the restricting-type, appear to be on the rise and have been documented in different country settings.

Finally, despite increasing number of studies using general population surveys, such investigations are still limited in absolute terms, making it difficult to estimate the true prevalence of ED and to assess whether changes in prevalence and onset occur across populations. All studies have reported increased prevalence figures once diagnostic criteria were relaxed for AN

and BN to make them resemble the (at the time) hypothesised DSM-5 changes.

EDNOS/OSFED

Due to the many ways in which this category of ED can be operationalized it has proved difficult to provide prevalence estimates for EDNOS. Generally, the prevalence of EDNOS is believed to range between 2% and 5% (Fairburn & Bohn, 2005; Hay, Mond, Buttner, & Darby, 2008; Machado et al., 2007; Smink et al., 2012) with EDNOS cases constituting the majority of all ED cases diagnosed in both outpatients and general population settings, with proportions ranging from 50% to 90% (Eddy, Celio Doyle, Hoste, Herzog, & le Grange, 2008; Fairburn & Bohn, 2005; Le Grange, Swanson, Crow, & Merikangas, 2012; Turner & Bryant-Waugh, 2004; Zimmerman, Francione-Witt, Chelminski, Young, & Tortolani, 2008). The overall point prevalence for EDNOS, found by Machado and colleagues in a community study based in Portugal, was 3.13% (95% CI: 2.36 – 3.90) (Machado et al., 2007); higher than prevalence of AN 0.52% (95% CI: 0.21–0.84) and BN 0.39% (95% CI: 0.12–0.66) reported above. In a large US cohort of 8,594 adolescents prevalence of EDNOS was higher than that of any other ED: 3% among 9 to 12 year olds, and 15% among 19 to 22 year olds (A. E. Field et al., 2012); whereas Le Grange and colleagues in another US-based cross-sectional study reported a prevalence of EDNOS of 4.78% (SE = 0.39) in adolescents (N= 10,123) and 4.64% (SE = 0.37) in adults (N= 2,980). Similarly, a cross-sectional general population survey conducted in 2005 (N=3,047) in Australia found an overall prevalence for EDNOS of 4.2% (Hay et al., 2008).

The prevalence of sub-threshold ED appears to be on the rise, and evidence shows that they are far more prevalent than ED diagnoses. A recent study by Micali and colleagues using data from the General Practice Research Database (GPRD) has found that in the UK the incidence rate of EDNOS in women aged 10-49 has increased from 17.7 (95% CI: 15.5- 20.0) per 100,000 to 28.4 (95% CI: 25.6-31.4) per 100 000, and in men from 3.4 (95%

CI: 2.4-4.7) per 100 000 in 2000 to 4.2 (95% CI: 3.1-5.5) per 100,000 in 2009 (Micali, Hagberg, et al., 2013).

Purging disorder

One of the most frequently discussed EDNOS sub-categories, especially in the last decade, is the so called Purging Disorder (PD) (Keel, Haedt, & Edler, 2005). The clinical relevance of PD has increasingly been discussed in literature (Fink, Smith, Gordon, Holm-Denoma, & Joiner Jr., 2009; Haedt & Keel, 2010; Keel & Striegel-Moore, 2009; Keel, Wolfe, Gravener, & Jimerson, 2008) but the diagnostic value of the sub-category is still under scrutiny.

Purging disorder defines individuals who engage in purging behaviours which are not aimed at compensating the effects of an objective binge eating episode. Prevalence figures for the disorder appear range from 0.1% to 5.3% (Abebe, Lien, Torgersen, & von Soest, 2012; Bailly, Maitre, Amanda, Hervé, & Alaphilippe, 2012; Stice et al., 2009; Wade et al., 2006), with the highest figures reported in twin studies (Wade et al., 2006). In a sample consisting of children, adolescents and young adults between 9 to 26 years of age, Field and colleagues found it to range between 2 and 2.5%, with prevalence peaking in the 16-18 and 19-22 age groups and decreasing in the 23-26 age group (A. E. Field et al., 2012). Similarly, a Norwegian longitudinal study of 3,844 individuals aged 14 to 34 years has found that prevalence of compensatory/purging behaviours decreased, for both genders, from ages 14/16 (1.2% females, 0.2% males) to age 23 (0.3% females, 0.1% males) (Abebe et al., 2012). Two recent longitudinal general population studies on adolescents found a high prevalence of PD, ranging from 2.7% and 4.4%, and that in both cases higher rates of diagnostic cross-overs occurred from PD to other ED, than from any other ED to PD (Allen, Byrne, Oddy, & Crosby, 2013; Stice et al., 2009). These findings, lend support to the hypothesis of an onset and peak incidence of purging behaviours (and PD) occurring in mid- to late adolescence, which requires further investigation.

Disordered eating

Increasing evidence suggests that the prevalence of unhealthy weight-control practices, such as dieting, fasting, purging (i.e. vomiting, laxatives and diuretics' use, diet pills), binge eating, which can be encompassed under the umbrella-term 'disordered eating' have increased exponentially in the past two decades (Grigg, Bowman, & Redman, 1996; Jess Haines, Neumark-Sztainer, Eisenberg, & Hannan, 2006; Jones, Bennett, Olmsted, Lawson, & Rodin, 2001; Neumark-Sztainer, Story, Falkner, Beuhring, & Resnick, 1999; Tanofsky-Kraff & Yanovski, 2004). Although not all cases of disordered eating are clinically relevant, nonetheless their study bears clinical relevance as research suggests that they might be precursors of ED (Lena, Fiocco, & Leyenaar, 2004; Neumark-Sztainer, Sherwood, Coller, & Hannan, 2000).

It has been hypothesised that ED behaviours and cognitions (e.g. weight and shape concerns) could present for up to 24 months prior to the development of full-threshold ED (Lena et al., 2004), and several studies suggest that sub-threshold behaviours are associated longitudinally with increased ED symptomatology. In a study of 2,516 adolescents, the use of unhealthy weight control behaviour predicted increased odds of experiencing binge eating (OR=6.4 95% CI: 1.7-23.5 for girls; OR=5.9 95% CI: 1.3-27 for boys), purging (OR=2.5, 95% CI: 1.3–4.5 for girls; OR=4.8, 95% CI: 1.7–13.5 for boys), and overweight BMI status (OR=2.7 95% CI: 1.4–5.3 for girls; OR=3.2 95% CI: 1.8–5.5 for boys) at a 5-year follow up (Neumark-Sztainer et al., 2006). A US study based on 211 females seen in out/in-patients settings for a suspected ED, found that displaying purging behaviours at baseline was associated with a sub-threshold or threshold ED at follow-up (Ackard, Cronemeyer, Franzen, Richter, & Norstrom, 2011), while between 13% and 17% of individuals with a sub-threshold diagnosis progressed to a full-threshold diagnosis of BN or BED in a study of 496 adolescent girls (Stice et al., 2009).

Evidence suggests that up to two-thirds of elementary school girls express concern about their weight or have dieted (Neumark-Sztainer et al., 2000). Herpertz-Dahlmann et al., in a sample of 1,895 adolescents age 11 to 17, found that 29.4% of girls and 14.9% of boys reported ED behaviours (Herpertz-Dahlmann, Wille, Hölling, Vloet, & Ravens-Sieberer, 2008). In a study of 81,247 $8^{th}/12^{th}$ graders, nearly 60% of girls and 30% of boys displayed disordered eating (Croll, Neumark-Szteiner, Story, & Ireland, 2002).

Increasing evidence suggests that prevalence of disordered eating is increasing in adult populations as well. Two sequential general population cross-sectional surveys conducted in Australia in 1995 (N=3,001) and in 2005 (N=3,047) found over a two-fold increase in the prevalence of binge eating, purging and strict dieting or fasting, both in men and women (Hay et al., 2008). In a German general population study of 2,250 participants, Hilbert et al. found that 3.9% (5.9% women and 1.5% men) of participants reported ED behaviours, with younger and overweight/obese individuals at increased risk (Hilbert, de Zwaan, & Braehler, 2012). Similarly, McBride et al. using data from the National Adult Psychiatric Comorbidity Survey 2007 (N=7,001) found 9.1% of women and 3.4% of men endorsed disordered eating behaviours (McBride, McManus, Thompson, Palmer, & Brugha, 2012).

Interim conclusions

Compared to full diagnoses, sub-threshold presentations of ED are far more prevalent in both the general population and in clinical settings. Moreover, there is evidence that incidence of sub-threshold ED has increased in the past decade, affecting greater proportions of men than what previously thought. One particular EDNOS/OSFED that has received increasing attention in the past decade is purging disorder and, whilst prevalence studies on the condition are scant, relatively high prevalence figures have so far been found especially in adolescent samples. Prevalence of disordered eating and ED behaviours is higher than that of ED and sub-threshold ED. Whilst the clinical significance of disordered eating is unclear, it has been

shown that it is a risk factor for the onset of ED and thus more research is warranted in the general population. In particular, research is needed investigating these behaviours in men and in older adults since epidemiological studies focusing on these populations are scant.

1.2.3. From DSM-IV to DSM-5: limitations of categorical approaches in research

The recent publication of DSM-5 has had an ambivalent role in the ED nosology discourse. On the one hand, it has answered some of the concerns that had been raised with regards to the diagnostic criteria contained in DSM-IV. On the other, it has reignited the debate over the empirical validity and suitability of current diagnoses to define different ED, therefore posing similar conundrums to both research and clinical practice as those that had been raised by DSM-IV (Thomas et al., 2010). As Kraemer recently put it "the value of a diagnosis lies in how closely a diagnosis corresponds to a distinct disorder" (Kraemer, 2013, p.413) and much debate has, in the past years, revolved around the extent to which current diagnoses are suitable to characterise different ED. In what follows, I will review some: (i) conceptual issues attached to the notion of diagnosis and key points in the debate between continuous vs. categorical approaches to psychiatric diagnosis; and, finally; (ii) limitations of current ED classification, (iii), and literature suggesting an evidence-based approach to classification.

Psychiatric diagnoses: nature, advantages and disadvantages

The Diagnostic and Statistical Manual of mental health disorders third edition (DSM-III) with its specific sets of diagnostic criteria for the definition of mental illness has introduced a categorical understanding of psychiatric diagnoses, which on the one hand has favoured the proliferation of epidemiological research around mental health, whilst on the other, it has been argued, has limited a better understanding of psychiatric conditions.

Diagnostic manuals since DSM-III have employed categorical approaches for the definition of psychopathology through the assessment of the level of symptoms, the extent of impairment, the duration of problem, and of the exclusion of symptoms which are believed to trump/precede or otherwise explain those of the presumed diagnosis (Mirowsky & Ross, 1989). Robins and Guze have arguably pioneered such categorical approach by proposing 5 criteria of diagnostic validity: clinical description, laboratory study, distinction from other disorders, and follow-up and family study, which they have used to argue that a difference existed between good-prognosis schizophrenia and mild schizophrenia (Robins & Guze, 1970).

The introduction of such categorical understanding of psychiatric diagnosis has had numerous advantages for psychiatric research. It has broadly facilitated communication within the field as well as understanding across disciplines, such as epidemiology and public policy. Universal definitions of mental illnesses have also allowed better societal understanding of mental health and to some extent have lowered the levels of stigma attached to psychiatric illness.

Critics of the categorical approach have however highlighted the extent to which the 'reification' of psychiatric diagnosis (Mirowsky & Ross, 1989) and of the 'disease entity' paradigm somehow restrict a true understanding of psychiatric illness by limiting it to "fictitious constructs which in reality have fluid boundaries" (K. Jaspers, as quoted in (K. Jaspers, as quoted in (Maj, 2013)). Recent scientific developments in neuroscience and genetics demonstrating shared similarities amongst individuals with different conditions, as well as the concept of psychiatric comorbidity itself have been proposed as evidence of the potential limitations of applying categorical approaches to the study of mental illness (Kendell, 2003). Whereas in medicine qualitative differences allow for categorical distinctions between different conditions sharing similar symptoms, in psychiatric research (with the exception of few cases that have been identified as having defined biological aetiologies, i.e. Down syndrome) such distinction is not possible.

Within such framework, it has been argued, the application of a dimensional approach to the definition of psychopathology, one which allows for 'zones of rarity' or overlapping symptoms, could result in greater potential for the differentiation not only between different psychiatric illness, but also between psychiatric illnesses and normality (Kendell, 2003).

Some have argued against the existence of a clear distinction between illness and normality in psychiatry. In 2000, Widiger & Clark stated that "[...] the challenge facing the developers of DSM-V may not be to differentiate more clearly between normal and pathologic expressions of behavior; rather, it may be to determine whether or not a qualitative distinction can in fact be made" (Widiger & Clark, 2000) . Much of the debate which has informed the changes in diagnostic criteria for ED in DSM-5 has stemmed from studies (which are summarised in the following section) showing that lowering thresholds for the definition of ED did not yield differences in levels of comorbid behaviours.

A categorical approach has been maintained by the new diagnostic system, with advantages and disadvantages for the delivery of care. On the one hand, where impairment to the individual exists in presence of sub-threshold behaviours, but the current diagnostic systems do not allow for the formulation of a diagnosis, lack of access to treatment could significantly increase disease burden. On the other hand, the maintenance of a categorical system facilitates the selection of more severe cases avoiding an over-medicalization of society. Lower diagnostic thresholds, more consistent with dimensional approaches, could in fact result in over-diagnosis and in excessive disadvantages for the individual (i.e. stigma, unemployment) and society (i.e. expansion of treatment provision and costs associated with it).

It has been argued that categorical and continuous approaches to the definition of mental illness are not mutually exclusive and that "discrete entities and dimension of continuous variation are [...] compatible with a threshold model of disease and may account for [...] overlapping segments

of psychiatric morbidity" (Kendell, 2003, p.7). However, current diagnostic models do not yet reflect this approach although literature investigating dimensional approaches to diagnoses has flourished. In the following sections, I will review literature exposing the limitations of the current diagnostic system with respect to ED and I will present the results of studies which have attempted to endorse a dimensional approach to the understanding of ED.

Limitation of current ED diagnostic criteria

As described in the previous sections, ED are defined by a combination of cognitions, behaviours, and physical correlates. However, little empirical evidence exists to support the current clustering of symptoms and the threshold that have been employed to define clinical relevance. Whilst two of the most criticised DSM-IV requirements: amenorrhea for AN, and the frequency criteria for BN and BED; have been dropped or modified in DSM-5, concerns remain around the definition of ED symptomatology.

ED diagnoses, it has been argued, lack empirical derivation criteria (Wonderlich, Joiner Jr., Keel, Williamson, & Crosby, 2007). For instance, the choice of both specific frequency and duration cut-offs for symptoms of BN and BED in DSM-IV has been subject of much debate. The choice of a cut-off of twice a week for 3 months for BN and 6 months for BED was deemed arbitrary (Trace et al., 2012; Wilson & Sysko, 2009), and the use of a different duration criteria for the two disorders was not clear (Wilson & Sysko, 2009). Whilst DSM-5 has uniformed the above-mentioned criteria into a single one requiring episodes to occur 'once per week for at least three months', it can be argued that this change in criterion still does not reflect some of the recent findings in the literature, so is not evidence based.

Wilson and Sysko conducted a literature review of studies exploring the consequences of lowering the frequency criteria for BN and BED. They concluded that whilst the majority of studies used the proposed DSM-5

criteria to define sub-threshold variants of the two diagnoses, those investigating psychiatric comorbidity in individuals with ED symptoms present at even lower frequency did not find significant differences in this group from those seen in individuals bingeing/purging more often (Wilson & Sysko, 2009). More recently, a study by Field and colleagues on a sample of 8,594 female adolescents (mean age 12, SD 1.6) found that both BN and BED were longitudinally associated with a number of negative outcomes (e.g. binge drink frequently, start using drug, developing depressive symptoms) whether a weekly or monthly cut-off in determining bingeing and purging was used (A. E. Field et al., 2012).

DSM-5 has also replaced the 'less than 85% of expected body weight' cut off of DSM-IV for AN (American Psychiatric Association, 2000), with a new definition stating that the criterion is fulfilled if the patient is at "significantly low body weight in the context of age, sex, developmental trajectory and physical health". Significantly low weight is defined as a weight that is less than minimally normal, or, for children and adolescents, less than that minimally expected" (American Psychiatric Association, 2013). Previous literature has shown that loosening the weight criterion in AN did not result in differences in psychopathology, disorder duration, or outcome (Crow, Stewart Agras, Halmi, Mitchell, & Kraemer, 2002; McIntosh et al., 2004; Watson & Andersen, 2003). The terminology 'significantly low body weight' therefore still assigns an important role to low weight, as opposed to the psychopathology leading to weight loss, without assessing evidence of whether cognitions and co-morbid psychopathology play an equally important role in contributing to the definition of the disorder. Whilst starvation symptoms are certainly an aggravating factor in AN they do not necessarily start at a low BMI, especially when patients' premorbid weight is in the overweight or obese ranges (Lebow, Sim, & Luenzmann, 2013).

Alternatives to categorical definitions of ED

Several studies have tried to address the above-mentioned limitations of current diagnostic criteria. Clinical studies have shown that often diagnostic-cross over is only caused by the change of one symptom, whilst all others remain unchanged (Wildes & Marcus, 2013) and it has been speculated that ED dimensions might be better at explaining ED than diagnoses.

One attempt at departing from the limitations posed by diagnostic categories was advanced by Fairburn & Bohn in the shape of a singular "transdiagnostic" definition of EDs encompassing AN, BN and BED. This solution was advanced in light of the recognition 'that far more unites the various forms of eating disorder than separates them' and that patients tend to cross-over diagnoses (Fairburn & Bohn, 2005). Somehow developing this hypothesis, Franko & Omori in a study of 207 first year female college student found that comorbidity between eating pathology was associated with psychological comorbidity along a gradient of severity without a clear distinction from normality according to current diagnostic criteria (Franko & Omori, 1999). Whilst both these studies substantiate claims of a dimensional nature of ED on a continuum from normality along the lines of the hypothesis also advanced by Widiger & Clark (2000), other studies have investigated the extent to which it is possible and useful to distinguish between different ED.

Proponents of latent class analysis (LCA) have attempted to group observed data according to their unobserved common latent features. Several studies have used LCA to define common dimensions of disordered eating across their sample. A U.S.-based study of 2,163 Caucasian female twins has identified the presence of 6 classes: one characterised by normal weight, but disordered eating behaviours (e.g. binge eating, purging); two by low weight but no other disordered eating behaviours or psychopathology, and three which reflected the DSM-IV diagnoses of AN, BN and BED(C M Bulik, Sullivan, & Kendler, 2000). A clinical study of 1,179 individuals suggested

the existence of four latent classes, with class one showing features similar to AN-R; class two to AN-BP and BN-P with multiple purging methods; class three AN-R without any obsessive compulsive traits; and class four BN-P with vomiting as the only purging method (Keel et al., 2004). Results of these studies suggest that a wider range of classes could be found in general population samples and that the use of clinical sample could bias results in favour of existing diagnostic definitions. Latent class analysis has however been criticised on the grounds that optimal number of classes or dimensions is unclear (Williamson, Gleaves, & Stewart, 2005). Whilst broadening the scope for the understanding of ED, employing a LC approach to the study of ED does not surpass the inherent assumption of categorical models of the existence of well-defined groups of symptoms.

Taxometric analysis has attempted to analyse whether ED symptoms vary in type as well as in degree; in other words, whether ED dimensions can be complemented and better explained by categories. So far, results from the literature have been mixed. Williamson and colleagues have identified three latent features: 1) binge eating, 2) fear of fat- ness/compensatory behaviours, and 3) drive for thinness. Confirmatory analysis on external validators showed that whilst group 3 (corresponding to AN patients) existed on a continuum from normality, it differed from the group reporting binge eating. Therefore, they suggested the coexistence of categories alongside dimensions (Williamson et al., 2002). Others, using taxometric analyses to identify differences in the cognitive profile of ED individuals suggested that dietary restraint, body dissatisfaction, and drive for thinness happened on a continuum from normalcy, differing in degree, but not in kind, from those with lower levels of the cognitions (Holm-Denoma, Richey, & Joiner, 2010). Finally, more recently a study of 528 adults using Factor Mixture Analysis (FMA) showed the existence of 3 ED classes (2 reflecting bulimic symptoms and differentiated by greater weight phobia and purging methods and one resembling healthy individuals) and one severity dimension given by a symptom count across diagnoses (Keel, Crosby, Hildebrandt, Haedt-Matt, & Gravener, 2013).

1.3. Interim conclusions

Despite numerous calls for a change in its approach to the formulation of diagnosis from a categorical to a dimensional one, the recently released DSM-5 has failed to shift away from a categorical system. It could be argued that lowering diagnostic thresholds for the definition of ED represents a step towards the acknowledgement that psychiatric illness occurs along a continuum from normality. However, it could also be argued that the increasing number of ED diagnoses included in the new manual re-states an overarching approach in which the validity of diagnoses is given by their ability to discriminate between conditions rather than investigating commonalities and 'zones of rarity'.

More research is needed to determine whether a dimensional approach to the diagnosis of ED or a categorical one bear the greatest usefulness in terms of access and provision of treatment as well as in the definition of ED. One the one hand, categorical approaches seem to favour the clear provision of care to those that are considered more 'serious' cases; on the other this approach could exclude individuals in need of treatment from accessing it on the bases of not meeting diagnostic criteria. Some have argued that dimensional assessments (i.e ED symptoms, comorbid psychopathology, and neurobiology) could complement current categorical diagnoses in advancing treatment for ED (Wildes & Marcus, 2013).

In this thesis, I will investigate the comorbidity of disordered eating and purging behaviours as a way to investigate whether cluster of behaviours exist that are not simply conductible to ED diagnoses and that could suggest the existence of dimensions of psychopathology existing along a continuum from normality.

The following chapter will investigate issues related to: (i) psychiatric comorbidity in full and sub-threshold ED; (ii) the presentation of ED in ethnic minority groups; and (iii) patterns health service utilisation in

individuals with ED. The aim will be to highlight current knowledge and gaps in literature.

Chapter 2
Eating disorders and eating disordered behaviours in the general population

2.1. Chapter overview

This chapter will provide an overview on: (i) issues of comorbidity with eating disorders and ED behaviours; (ii) ED behaviours amongst ethnic minorities; (iii) service use in individuals with ED. This will provide the theoretical context and justification for the studies included in this thesis. Finally, I will briefly introduce the aims of each study.

2.2. Epidemiology of ED: a short summary

As detailed in Chapter 1, the prevalence of ED is low in the general population with lifetime prevalence of anorexia nervosa (AN) ranging from 0.3% and 2.4%, that of bulimia nervosa (BN) from 0.9% and 1.5%, and that of binge eating disorder (BED) from 1.2% and 1.6% (Smink et al., 2012).

There is, however, a group of individuals who manifest similar symptoms (both behavioural and cognitive) to those with a full ED diagnosis, but who do not fulfil, on a quantitative (i.e. one criterion missing) or qualitative (i.e. frequency or duration criteria) level, all of the diagnostic criteria necessary for diagnosis. These individuals are referred to as having an eating disorder not otherwise specified (EDNOS), if using DSM-IV criteria, or an other specified eating or feeding disorder (OSFED), if using DSM-5 criteria. Research has shown that the prevalence of EDNOS is higher than that of full ED diagnosis, and that it is on the rise (Micali, Hagberg, et al., 2013). Studies suggest that lifetime prevalence of EDNOS ranges between 2% and 5% (Fairburn & Bohn, 2005; Hay, Mond, Buttner, & Darby, 2008; Machado et al., 2007; Smink et al., 2012) and that EDNOS cases constitute the majority of all ED cases diagnosed in both outpatients and general population settings, with proportions ranging from 50% to 90% (Eddy, Celio Doyle, et al., 2008;

Fairburn & Bohn, 2005; Le Grange et al., 2012; Turner & Bryant-Waugh, 2004; Zimmerman et al., 2008).

In what follows, I will first introduce the concept of comorbidity, explain why it is relevant to the study of ED, and present different comorbid conditions often seen in individuals with ED, which will be further explored in the studies contained in this thesis.

2.3. Comorbidity

2.3.1. Defining comorbidity

The concept of 'comorbidity' in the context of the study of a medical condition is central to multiple domains related to health research: from epidemiology, to clinical care, to health service provision.

Comorbidity, in broad terms, can be conceptualised as the "presence of more than one distinct condition in an individual" (Valderas, Starfield, Sibbald, Salisbury, & Roland, 2009); although there are some conceptual clarifications to be made when operationalizing that definition, especially in mental health research. It is important to note that, whilst traditionally comorbidity is thought to refer to conditions which follow the index disease in its clinical course (Feinstein, 1970), in mental health such distinctions are often difficult to make. It has been suggested that 'multimorbidity' might be a more appropriate concept in psychiatric research, as it defines the co-existence of two or more conditions, whose onset might not be obviously distinguishable (Valderas et al., 2009; van den Akker, Buntinx, Metsemakers, Roos, & Knottnerus, 1998). From an epidemiological point of view, the co-existence of separate conditions without a clear temporal sequence of presentation raises several difficulties when investigating the aetiology of a specific condition. However, observing clusters of comorbid conditions can lead to hypothesise on their shared risk factors. The presence of different patterns of comorbidity could also indicate inadequateness of diagnostic systems to successfully define a specific condition (Valderas et al., 2009).

From a clinical point of view, conceptualising patients within a multimorbid framework helps to establish severity of disease, and therefore enables the provision of more targeted care. Moreover, from a healthcare provision viewpoint, identifying patterns of comorbidity within conditions might prove a cost-efficient way to allocate resources in the treatment of conditions that might otherwise be treated separately (Valderas et al., 2009).

In the study of ED, it is therefore fundamental to explore patterns of comorbidity, especially in the general population and within sub-threshold diagnoses as this could provide more information on the potential risk factors for ED which are individual to single ED or are shared across diagnoses. In turn, better understanding of ED presentation might help inform future diagnostic manuals, and lead to more efficient and cost-effective allocation of services. Thus far the majority of studies have employed clinical or ad hoc samples. More research is required to uncover patterns of ED presentation (threshold and sub-threshold) and comorbidity, in the general population, to inform future research, clinical practice and service provision.

2.3.2. Comorbidity in eating disorders

Psychiatric comorbidity with Axis I (e.g. mood and anxiety disorders, and substance abuse) (Godart et al., 2007) and Axis II (i.e. personality disorders) disorders have been documented in all ED (Cassin & von Ranson, 2005). A study on 2,436 ED female inpatients found that 97% had at least one comorbid DSM-IV diagnosis (Blinder, Cumella, & Sanathara, 2006). Hudson et al, using data from the US National Comorbidity Survey Replication with a population-based sample of 9,282 participants aged 18 or over, found that 56.2% of the participants with AN and 94.5% of those with BN met criteria for at least one other co-morbid DSM-IV disorder (Hudson et al., 2007). Similar results have been reported for BED. Two large general population studies, one based on adults (Kessler et al., 2013) and one on adolescents

(Swanson et al., 2011), found that 79% to 83% of participants with BED also endorsed one or more psychiatric conditions.

Evidence suggests that diagnosis of ED is associated with high levels of comorbidity of depression (A. E. Field et al., 2012; Grucza, Przybeck, & Cloninger, 2007; Karatzias et al., 2010; Kessler et al., 2013; O'Brien & Vincent, 2003; Sonneville et al., 2013; Swanson et al., 2011), anxiety (O'Brien & Vincent, 2003), substance use disorders (Godart et al., 2007; Grucza et al., 2007; Kessler et al., 2013; Swanson et al., 2011), suicidality (Godart et al., 2007; Grucza et al., 2007; Kessler et al., 2013; Swanson et al., 2011), and personality disorders (O'Brien & Vincent, 2003).

Although literature on sub-threshold diagnoses is not as ample as that relative to the main ED diagnoses, many studies show that individuals with EDNOS/OSFED experience similar co-morbidity to that seen in individuals with a full ED diagnosis (Eddy, Celio Doyle, et al., 2008; A. E. Field et al., 2012; Herpertz-Dahlmann et al., 2008; Hudson et al., 2007; Lavik, Clausen, & Pedersen, 1991; Le Grange et al., 2012; McBride et al., 2012; Swanson et al., 2011). Individuals with sub-threshold diagnoses have been shown to have increased odds of having comorbid mood (A. E. Field et al., 2012; Keel et al., 2005, 2008; Le Grange et al., 2012; Wade, 2007a), anxiety (Keel et al., 2005, 2008; Le Grange et al., 2012), and substance use disorders (Abebe et al., 2012; A. E. Field et al., 2012; Le Grange et al., 2012; Swanson et al., 2011), as well as suicidality (Le Grange et al., 2012; Wade, 2007a). This has been discussed in more detail below. In this review, I will present evidence related to comorbidity with sub-threshold diagnoses as well as disordered eating, although the latter are more restricted in numbers.

2.3.3. Mood Disorders

Mood disorders are a set of conditions ranging from major depressive episodes or disorder, dysthymic disorder, manic episodes, bipolar I & II disorders and cyclothymic disorder (American Psychiatric Association, 2000). Recently in DSM-5, other conditions such as mood disregulation disorder and pre-menstrual dysphoric disorder have been included within the broader group of mood disorders (American Psychiatric Association, 2013). The main symptoms of mood disorders are depressed mood, loss of interest in activities, severe weight/appetite loss/gain, insomnia, psychomotor agitation or retardation, fatigue, feelings of worthlessness or guilt, inability to concentrate and/or take decisions, and suicidal ideation. Variations in the combination and duration of symptoms determine the diagnosis of a specific mood disorder (American Psychiatric Association, 2000, 2013).

Evidence on the association between ED and mood disorders is mixed, though the majority of research suggests there is a high prevalence of depression across all ED (Preti et al., 2009). An early study by Herzog and colleagues in a clinical population found that depression was the most commonly diagnosed comorbid condition in both AN and BN (Herzog, Keller, Sacks, Yeh, & Lavori, 1992), and according to a recent literature review, mood disorders are reported in 24.1% to 90% of BN cases, and in 31% to 88.9% of AN cases (Godart et al., 2007). A clinical study of 322 ED patients diagnosed with AN-R, AN-BP, BN and BED found no differences in the prevalence of depression amongst the 4 groups (Fassino, Piero, Gramaglia, & Abbate-Daga, 2004). Similarly, a study of 2,436 ED patients (AN-R, AN-BP, BN, EDNOS) found no differences unipolar depression across ED categories (Blinder et al., 2006).

Other clinical studies have reported mood disorders to occur more frequently in binge/purge-types of ED (i.e. AN-BP, BN-P) than in those with restrictive-type of ED (i.e. AN-R)(Braun, Sunday, & Halmi, 1994; Fornari et al., 1992; Tozzi et al., 2005). The same finding has been replicated in general

population studies. Two large US surveys of adolescents and adults found high odds of mood disorders in individuals with BN and BED (Hudson et al., 2007; Swanson et al., 2011). The association of AN with mood disorders was non-significant in adolescents (Swanson et al., 2011). Adults with AN, on the other hand, had higher odds of having mood disorders (OR: 2.4, 95%CI: 1.2-4.7) than their healthy counterparts, although lower than those of participants with BN (OR:7.8, 95%CI: 3.6-16.8) and BED (OR:3.1, 95%CI: 1.9-4.8) (Hudson et al., 2007). It has been hypothesised that the frequently observed association between binge/purge-type (as opposed to restricting types) of ED and mood disorders could be partially explained by the higher prevalence of depression in older individuals compared to adolescents, and therefore higher levels of mood disorders being detected in BN, which is more frequently documented in older individuals than AN-R.

Studies investigating the comorbidity between mood disorders and BED have been heterogeneous in nature and results, although the majority have documented increased levels of depression in individuals with BED. Some studies found higher levels of depression in obese than in non-obese patients with BED, whereas other did not. Others have reported that individuals with BN have higher levels of mood disorders than those with BED. Differences in instruments used to measure eating disorder and depressive symptoms, age and type (e.g. community vs. clinical) of populations sampled population have been deemed possible factors explaining these inter-studies variations (Araujo, Santos, & Nardi, 2010). In fact, the majority of these studies employed clinical samples with no controls; therefore it is possible that results are biased in favour of higher rates of depression than those that would typically be found in general population settings. Large general population surveys report contrasting findings. Some studies using adults and adolescent samples seem to confirm that BED is associated with mood disorders although to a lower extent than BN (Hudson et al., 2007; Kessler et al., 2013; Swanson et al., 2011), whereas others found the opposite in adolescents (A. E. Field et al., 2012).

There is increasing evidence that sub-threshold ED diagnoses and ED behaviours are also associated with mood disorders. Several large surveys have investigated the comorbidity between EDNOS and mood disorders both in adults (Hudson et al., 2007; Le Grange et al., 2012; McBride et al., 2012) and adolescents (A. E. Field et al., 2012; Le Grange et al., 2012; Swanson et al., 2011). One study found that between 27% and 41% of participants with different types of EDNOS (i.e sub-threshold AN, sub-threshold BED and EDNOS) reported mood disorders (Le Grange et al., 2012). Binge eating types of disordered eating have been found to be associated with mood disorders in both US and UK adult samples (Hudson et al., 2007; McBride et al., 2012). In the UK, restrictive eating behaviours were also associated with mood disorders (McBride et al., 2012).

Amongst adolescents, those with sub-threshold diagnoses have been found to have higher odds of reporting mood disorders than healthy participants (A. E. Field et al., 2012; Herpertz-Dahlmann et al., 2008; Swanson et al., 2011), and those with sub-threshold AN of having higher odds of having mood disorders than those with full AN (Le Grange et al., 2012). A smaller clinical study of 85 patients (aged 13-20) taking part in a family therapy trial found that EDNOS patients had higher rates of depression than BN ones (Schmidt et al., 2008).

Amongst sub-threshold diagnoses evidence exists of increased mood disorders in individuals exhibiting purging behaviours only (i.e. without bingeing). An Australian study by Wade on 1,083 female twins, found that women with purging type of EDNOS exhibited higher levels of life-time depression than healthy participants (Wade, 2007b). In a community sample of 111 women age 18-45 mood disorders occurred more frequently amongst women with purging disorder than in healthy ones although less frequently than in women with BN (Keel et al., 2005). In another longitudinal study of 2,890 Norwegian adolescents, those who purged only were found to have higher depressive symptoms than both healthy and other ED participants (Abebe et al., 2012)

Interim conclusions

Although some studies do not find differences in comorbidity with mood disorders across ED diagnoses (Blinder et al., 2006; Fassino et al., 2004), there is some indication that the former might be more prevalent in individuals exhibiting binge/purge type of ED such as BN (Tozzi et al., 2005). Mood disorders also appear to be prevalent in individuals with sub-threshold diagnoses and more often in those with binge/purge behaviours (A. E. Field et al., 2012; Hudson et al., 2007). Individuals with purging disorder have been found to have higher levels of comorbid mood disorders than healthy controls and restricting participants, but often not higher than those seen in individuals with BN (Keel et al., 2005). More general population studies are needed to investigate comorbidity of threshold and sub-threshold ED with mood disorders. Specific attention should be given to the study of comorbidity of mood disorders with BED and PD, as fewer studies have investigated them in general population settings and across various age groups.

2.3.4. Anxiety disorders

In DSM-IV, anxiety disorders included a set of conditions such as acute stress disorder, social phobia, generalised anxiety disorder, panic attack, specific phobias, anxiety disorder due to general medical condition, agoraphobia, and anxiety disorder not otherwise specified (American Psychiatric Association, 2000); as well as post-traumatic stress disorder, and obsessive compulsive disorder (OCD), which in DSM-5 are no longer included in the category[2](American Psychiatric Association, 2013). OCD and social phobia are often found to be comorbid with ED. OCD is characterised by the presence of repetitive thoughts, impulses or images, perceived as inappropriate and causing distress, despite not being necessarily related to real life problems. The individual usually acknowledges that they are a product of their mind and tries to ignore them. Social phobia is

[2] Post-traumatic stress disorder and obsessive-compulsive disorder are presented here, as most literature to date refers to them as 'anxiety disorders' using DSM-IV criteria.

characterised by a persistent fear of social situations in which the individual is exposed to unfamiliar people or possible scrutiny by others. Exposure to such situations provokes anxiety, which is recognised by the individual to be disproportionate. Attempts are made to avoid such situations. When the latter are unavoidable, they are endured with great distress (American Psychiatric Association, 2000).

Anxiety disorders have been shown in literature to be highly co-morbid with ED and sometimes to precede the onset of the ED, leading to speculations of whether they are a risk factor for the latter (Swinbourne & Touyz, 2007). Anxiety disorders present in ED patients with proportions ranging between 6% and 65%. Obsessive compulsive disorder (OCD) and social phobia have been documented in literature as the most common anxiety disorders seen in ED patients (Blinder et al., 2006; Swinbourne & Touyz, 2007; Swinbourne et al., 2012). A study of 63 ED patients (AN=29 and BN=34) found that 83% and 71% of AN and BN patients respectively had a lifetime anxiety disorder, with social phobia being the commonest diagnosis (55% in AN and 59% in BN). Also, only AN patients were found to report OCD (16%) (Godart, Flament, Lecrubier, & Jeammet, 2000). A study by Thornton and Russell of 68 ED inpatients (AN=35, BN=33) found that 37% of AN patients compared to 3% of BN ones had lifetime OCD, and that diagnosis often preceded onset of the ED (Thornton & Russell, 1997).

Other studies show no differences between rates of OCD and social phobia amongst ED subtypes. Milos and colleagues, in a clinical sample of 237 ED patients (AN=84; BN=153), found an overall rate for OCD of 29.5% with no differences between AN and BN. They also found, however, that patients with comorbid OCD had an earlier onset and longer duration of ED (Milos, Spindler, Ruggiero, Klaghofer, & Schnyder, 2002). A study of 271 ED patients (AN-R=111, AN-BP=55, BN-NP=19, BN-P=86) and 271 healthy participants found increased rates of OCD, social phobia and generalised anxiety disorders (GAD) amongst ED individuals compared to healthy ones, but no differences across ED sub-types (Godart et al., 2003).

General population studies have yielded results showing associations comparable to those observed in clinical populations. However, information on sub-types of eating and anxiety disorders is less detailed in such studies; therefore, direct comparisons with clinical samples are often not possible. In a large European six-country study of over 20,000 individuals aged 18 and over, anxiety disorders of any kind were diagnosed in about 40% of respondents with an ED (Preti et al., 2009). Two large US general population surveys of adults (Hudson et al., 2007) and adolescents (Swanson et al., 2011) found that individuals with BN and BED had increased odds of reporting any anxiety disorder and social phobia, but not those with AN. In adolescents, individuals with BN and BED also had higher odds of having comorbid OCD, whereas no participant with AN reported OCD, which contradicts previous clinical findings (Swanson et al., 2011).

Sub-threshold ED diagnoses have also been found to be highly comorbid with anxiety disorders in both clinical and general population samples (Milos, 2009). In a clinical study of 85 adolescents with EDNOS (N=21) and BN (N=61) the former had significantly higher proportions of both current (EDNOS: 20% vs BN: 3.8%, $p < 0.05$) and past (EDNOS: 20% vs. BN: 1.9%, $p<0.05$) OCD than the latter (Schmidt et al., 2008). Similarly, a longitudinal clinical study of 231 children with OCD symptoms found the latter to be predictive of ED onset at follow up. At follow up 1.6%, 0.8%, 0.8%, and 8.4% had AN, BN, BED, and EDNOS respectively, suggesting a stronger association between the latter and OCD diagnosis in childhood (Micali, Hilton, et al., 2011).

General population studies have also found associations between sub-threshold ED diagnoses and anxiety disorders in both adults and adolescents. In a large US sample of adults, sub-threshold BED was associated with social phobia (OR: 2.5, 95% CI: 1.5-4.3), and agoraphobia without panic (OR: 5.8, 95% CI: 1.5-22.1); whereas any binge eating was associated with all sub-types of anxiety disorders, and with elevated odds of any anxiety disorder (OR: 3.7, 95% CI: 2.5 -5.5) (Hudson et al., 2007). In

another, the proportion of individuals with EDNOS reporting anxiety was lower than those with BN, but no differences existed with AN (Le Grange et al., 2012). In a UK general population sample any disordered eating was associated with higher odds of mixed anxiety and depressive disorder (McBride et al., 2012). There is also evidence that PD is associated with increased levels of anxiety compared to healthy individuals (Fink et al., 2009; Keel et al., 2005) and individuals with BN (Keel et al., 2005).

Amongst adolescents, EDNOS participants had higher proportions of comorbid anxiety than those reported by AN participants (Le Grange et al., 2012) in one study and both adolescents with sub-threshold AN (OR: 3.5, 95% CI: 1.8-6.8) and sub-threshold BED (OR: 1.7, 95%CI: 1.1 – 2.6) had higher odds of having any anxiety disorder than healthy participants in another (Swanson et al., 2011). Finally, in a German sample of adolescents, those with high scores on disordered eating questionnaires reported increased levels of both general anxiety and social phobia compared to healthy participants (Herpertz-Dahlmann et al., 2008).

Interim conclusion

Anxiety disorders appear to be a frequent comorbid condition across all ED diagnoses (Swinbourne & Touyz, 2007). There is some evidence suggesting that social phobia might be more typical of binge/purge disorders (i.e. BN and BED) and that OCD might be more typical of AN (Blinder et al., 2006; Swinbourne et al., 2012). However, some studies do not find these differences (Milos et al., 2002), although the use of small clinical samples could imply a role of chance in these findings. Large general population studies have found high odds of having any anxiety disorders in individuals with both threshold and sub-threshold diagnoses (Hudson et al., 2007; Swanson et al., 2011). In these studies the use of sub-types of anxiety and eating disorders was limited, therefore not allowing specific inferences from the results. Contrary to mood disorders, individuals with sub-threshold diagnoses have been found more frequently to have higher levels of comorbid anxiety than those of individuals with full ED (Le Grange et al.,

2012). Individuals with PD have been found to have higher levels of anxiety disorders than healthy individuals (Fink et al., 2009; Keel et al., 2005), although evidence is mixed as to whether they experience higher (Keel et al., 2005) or lower (Fink et al., 2009) levels of anxiety than individuals with other ED.

2.3.5. Post-traumatic stress disorder

Post-traumatic stress disorder (PTSD) has been given a specific category in DSM-5 of 'trauma and stressor-related disorders' (American Psychiatric Association, 2013). PTSD occurs as a consequence of experiencing a traumatic event and causes the individual to persistently re-experience the situation, despite trying to avoid stimuli associated with trauma. Symptoms of PTSD include sleep difficulties, irritability of anger outbursts, trouble concentrating, hyper vigilance, and exaggerated startle response(American Psychiatric Association, 2000, 2013).

Literature on the association between PTSD and ED is limited. Rates of co-morbid PTSD are believed to range between 11% and 52% in clinical samples (Swinbourne & Touyz, 2007). In a general population sample, 37% of women with a BN diagnosis also had a co-morbid lifetime diagnosis of PTSD (Dansky, Brewerton, Kilpatrick, & O'Neil, 1997). In another, individuals with BN (OR: 10.2, 95% CI: 5.2-20.0) and BED (OR: 5.1, 95% CI: 2.8-9.4) had increased odds of having PTSD, but not those with AN (Hudson et al., 2007).

Interim conclusions

Limited research exists on the association between PTSD and ED. There is an indication that the former might be more prevalent in BN, but more research is needed (Hudson et al., 2007).

2.3.6. Suicidality

The term suicidality refers to a group of behaviours ranging from suicidal thoughts and ideation, to suicidal attempts and completed suicide (Franko & Keel, 2006). Studies on suicidality in ED indicate that mortality due to suicide in AN is higher than that in BN, although suicide attempts occur more often in BN. To date, less is known about suicidality in relation to BED.

A review by Franko & Keel (2006) has summarised crude mortality rates (CMR) from suicide in AN to range between 0% to 5.3% in inpatients samples, and between 2.4% and 4.8% in outpatients samples. However, in general population studies, the authors found results suggesting an increased risk of suicide in non-AN patients (Franko & Keel, 2006). They explain this finding by suggesting that AN diagnosis might have not have trumped that of suicide in medical death records, and thus misclassification might have occurred to some degree (Franko & Keel, 2006). In contrast, deaths by suicide in BN are lower or null (CMR: 0.1%) (Franko & Keel, 2006). Several studies which followed this review confirmed previous results. An Italian study of 930 adolescents found that those who exhibited restrictive eating behaviours (i.e. more typical of AN) also reported higher rates of suicidality (Miotto & Preti, 2007). Finally, a recent meta-analysis of mortality in ED has found that standardised mortality rates (SMR) were 5.86 for AN, 1.93 for BN, and that 1 in 5 AN deaths were due to suicide (Arcelus, Mitchell, Wales, & Nielsen, 2011).

Results on suicide attempts and differences between diagnoses are, to date, inconsistent. Franko & Keel's review of the literature show no differences in suicide attempts between AN and BN, with only two studies reporting higher frequencies of suicide attempts in BN than in AN. However, they found that when AN patients are divided according to restrictive or binge/purge sub-types, individuals with AN-BP reported suicide attempts in higher proportions than AN-R and similar to those seen in BN (Franko & Keel, 2006).

General population studies report similar results. In a large US sample of adolescents BN was more strongly associated with suicidality than AN; with half of BN participants reporting suicide ideation, and one third reporting suicide attempts (Swanson et al., 2011). Similarly, Bodell and colleagues found BN, but not AN, to be independently associated with suicidality (Bodell, Joiner, & Keel, 2013). Finally, a study on 1,885 individuals with ED (AN: N=177; BN: N=906; EDNOS: N=802), found that BN had the highest SMR due to suicide (SMR: 6.51, 95% CI: 2.81-12.83) when compared against healthy controls, AN and EDNOS patients (Crow et al., 2009). None of these studies however employ AN sub-types and the first two use either suicide ideation and attempts (Swanson et al., 2011) or the broader concept of suicidality (Bodell et al., 2013) thus it is not possible to infer more specific associations. Evidence on comorbidity between BED and suicidality is somewhat scant due to the relative 'novelty' of the disorder, although existing studies seem to suggest increased rates of suicide in patients with BED (Grucza et al., 2007).

Suicidality has also been found to be prevalent in individuals with sub-threshold diagnoses. Crow and colleagues using registry data of 1,885 individuals with ED found that in EDNOS patients risk for death by suicide was high and statistically significant (SMR: 3.9%, 95% CI:1.07 – 10.02) as it was the case for BN (SMR: 6.51, 95% CI: 2.81-12.83), but not AN (SMR: 4.68, 95%CI: 0.12–26.05) (Crow et al., 2009). Similar findings have been found in general population studies. Two surveys in the US and Germany found that individuals with EDNOS reported higher levels of suicidal plans than those with AN, but not those with BN both in adult (Le Grange et al., 2012) and adolescents (Herpertz-Dahlmann et al., 2008; Le Grange et al., 2012) samples. Similarly, a twin-study found that women with EDNOS-purging disorder had increased levels of suicidality compared to those with AN, but not those with BN (Wade, 2007b). However, no increased odds of suicide attempts were identified amongst individuals with disordered eating in a UK sample (McBride et al., 2012).

Interim conclusions

Evidence on the association between ED and suicidality is mixed. On the one hand it appears that the risk of death from suicide is higher in individuals with AN than in those with BN. On the other, it seems that suicide attempts are more frequent in BN and AN-BP, than in AN-R (Franko & Keel, 2006). General population findings confirm a trend suggesting higher rates of suicidality in binge/purge type disorders than in AN both when considering full or sub-threshold diagnoses (Bodell et al., 2013; Swanson et al., 2011). Most of these studies do not distinguish between AN-R and AN-BP, thus, although it is possible to hypothesise on the presence of differences between the restricting and the binge-purge, it is not possible to infer more definite conclusions. More research is needed to investigate suicidality in sub-threshold diagnoses and in individuals who purge only as there is evidence that it could be more prevalent in these groups (Crow et al., 2009; Wade, 2007a).

2.3.7. Substance use

The comorbidity between substance use (i.e. cigarettes, alcohol, and drugs) and ED is frequently investigated, although the majority of evidence refers to the association with ED characteristic of binge/purge behaviours (e.g. AN-BP, BN-P, BN, and BED), as substance abuse seems to be less associated with AN-R (O'Brien & Vincent, 2003).

An early review of literature found the prevalence of substance use amongst bulimics to range between 2.9% and 48.6%. The only article investigating this association in individuals with restricting AN found a prevalence of 3% (Holderness, Brooks-Gunn, & Warren, 1994). The same results were reported in a more recent review, highlighting that comorbidity with substance abuse appears to be more frequent amongst individuals with bulimic behaviours than amongst restricting individuals (O'Brien & Vincent, 2003). A clinical study comparing rates of drug use between women with AN (N=136), and BN (N=110) found no differences between drug use in the two

groups. However, the AN group was composed of 51 AN-R participants and 85 AN-BP, and the authors acknowledge that use was more frequent amongst AN-BP patients, confirming earlier findings (Herzog et al., 2006).

Recent general population studies seem to provide contrasting findings. Two US surveys found that, amongst adults, all ED (AN=OR:3.0, 95%CI: 1.2-7.1; BN=OR:4.6, 95%CI: 2.0-10.8; BED=OR:1.2, 95%CI: 1.2-3.8) were associated with any substance use disorder (Hudson et al., 2007), whereas, amongst adolescents only BN (OR: 2.2, 95%CI: 1.3-4.0) and BED (OR:3.1, 95% CI1.3-7.2) were associated with substance use (Swanson et al., 2011). Neither study, however, reports AN sub-types; thus, it is not possible to test the hypothesis of higher proportions of substance use in AN-BP. The findings of no association between AN and substance use in the adolescent sample could be explained by higher numbers of adolescents with AN-R (which usually is more prevalent in younger ages) compared to the adult sample.

To test the hypothesis of higher substance use in binge/purge disorders, a study of 672 adolescent girls and 718 women grouped participants according to whether they exhibited restricting or bulimic behaviours. The latter reported significantly higher levels of alcohol consumption than restrictors. Individuals in the restrictive group had higher levels of cigarettes and drug consumption although differences were not significant (von Ranson, Iacono, & McGue, 2004).

An early explanation for the increased proportions of substance use observed in ED patients is that food deprivation increases the likelihood of substance use. This hypothesis, however, does not explain why restricting patients do not have similar patterns of substance use as binge/purge patients (O'Brien & Vincent, 2003). An alternative and more recent explanation is that impulsivity plays a central role as a risk factor both for bulimic-type behaviours and substance use (Dawe & Loxton, 2004; O'Brien & Vincent, 2003). However, it has been argued that different substances are

used by individuals with different ED (e.g. appetite suppressants such as cigarettes or cocaine are used more by restrictors, alcohol is used more by binge/purgers, and cannabis- use is prevalent amongst binge eaters (Krug et al., 2008)). The lack of this distinction in many studies does not allow investigating further patterns of substance use across different ED.

Evidence regarding substance use amongst individuals with sub-threshold ED is contradictory; however, not all studies explore associations with the same substances or employ the same definition of EDNOS making it difficult to compare results.

General population studies of both adults and adolescents suggest that sub-threshold ED are associated with high levels of substance use, with some indication that levels are higher in individuals with binge/purge than restricting behaviours. In two US surveys of adults and adolescents, individuals with sub-threshold BED (adults OR: 2.8, 95%CI: 1.2-6.5; adolescents OR: 2.7, 95%1.6-4.6) and those experiencing any binge eating episodes (OR: 2.8, 95%CI: 1.9-3.9) had increased odds of experiencing abuse of either alcohol or illicit drugs (Hudson et al., 2007; Swanson et al., 2011). Sub-threshold AN was not associated with substance use in adolescents (Swanson et al., 2011). A European study found that lifetime (43.7%) and current (38.3%) prevalence of alcohol use was highest amongst EDNOS patients, and that lifetime use of cannabis (42.6%) was higher amongst EDNOS patients than AN (AN-R: 27.5%, AN-BP: 40.2%), but not BN (49.8%) (Krug et al., 2008). Finally, a Canadian community study of women found that disordered eating was associated with alcohol and illicit drugs' dependence (Gadalla & Piran, 2008).

Good evidence exists on the association between purging behaviours and substance use. In a longitudinal study of Norwegian adolescents, those with purging behaviours had the higher levels of alcohol consumption (mean: 3.4, SD: 1.58) compared to binge eaters (mean: 2.67, SD: 1.64), bingers and purgers (mean: 2.77, SD: 1.63), and adolescents with non-purging (e.g.

dieting, excessive exercise) compensatory behaviours (mean: 2.86, SD: 1.63) (Abebe et al., 2012). Similarly, a US study on 391 female college students found that those with purging behaviours reported drinking more frequently in the previous month than the healthy comparison ($t(40) = 2.08$, $p = .044$, $d = .62$)(Anderson, Martens, & Cimini, 2005). Finally, a US longitudinal study of adolescents found that those who purged had increased odds of starting to binge drink frequently, whether a weekly (OR: 1.84, 95%CI: 1.28–2.65) or monthly (OR: 1.75, 95%CI: 1.34–2.27) frequency cut-off was employed(A. E. Field et al., 2012)

Contrary to these findings, a UK general population study found that alcohol use was only associated with restricting-type ED behaviours (OR: 2.77, 95%CI: 1.59–4.83), but no associations were found with drug use (McBride et al., 2012). A recent study of 11,103 adolescents using data from 2007 National Youth Risk Behaviour Survey (YRBS) found contrasting results when investigating patterns of substance use and ED behaviours amongst normal and overweight adolescents. Among normal weight adolescents smoking cigarettes, binge drinking, and cocaine use were associated with fasting, using diet pills and purging. The authors explain the seemingly contradictory result of the association of restricting behaviours with binge drinking as one in which the individual fasts or purges to compensate for the previous caloric intake from alcohol (Eichen, Conner, Daly, & Fauber, 2012). This consideration could also explain the result found by McBride and colleagues (McBride et al., 2012). Amongst overweight individuals, binge drinking was the only substance-use related behaviour whose use was associated with all three ED behaviours (Eichen et al., 2012).

Interim conclusions

There is good evidence that substance use is more prevalent in individuals with binge/purge ED than in those with AN (Herzog et al., 2006). There is some indication that restrictive ED show higher associations with use of appetite suppressants substances (cigarettes, certain illicit drugs) and those with binge/purge disorders with alcohol and cannabis (Krug et al., 2008).

However, many studies use the general definition of substance use without investigating associations with individual substances. Moreover, few studies use AN sub-types to further explore these patterns. Those who have employed AN sub-types have found similar results in AN-BP and BN (von Ranson et al., 2004). Sub-threshold ED have also been found strongly associated with substance use, with individuals with purging behaviours exhibiting the highest levels of substance use (Abebe et al., 2012; A. E. Field et al., 2012). This seems to confirm trends seen in individuals with full ED. Some indication exists that in some individuals restricting behaviours are associated with increased alcohol consumption (Eichen et al., 2012). It could be hypothesised that individuals who experience binge-drinking episodes could engage in restricting practices to compensate for high caloric intake through alcohol, rather than substance use being a feature of individuals with restricting ED types.

2.3.8. Personality disorders

Personality disorders were classified as Axis II disorders in DSM-IV, which no longer exist in DSM-5 (American Psychiatric Association, 2013). DSM-IV defines personality disorders as a maladaptive and enduring inner experience accompanied by behaviours that depart from expectations proper of the individual's culture, leading to distress or impairment. Despite a proposed re-organisation of the classification of personality disorders, the 'clusters' defined in DSM-IV were kept in DSM-5 and are organised as follows:

- ✓ Cluster A = Paranoid, Schizoid, and Schizotypal personality disorders characterised respectively by feelings of distrust of others; detachment from social relationships; and social and interpersonal deficits.
- ✓ Cluster B = Antisocial, Borderline, Histrionic, and NarCIsistic personality disorders characterised respectively by patterns of disregards for the rights of others; instability of interpersonal relationships, self-image and affect; excessive emotionality and attentions-seeking behaviours; and grandiosity and need for admiration.
- ✓ Cluster C = Avoidant, dependent, and obsessive compulsive personality disorder characterised respectively by social inhibition and feeling of inadequacy; excessive need to be taken care of and fear of separation; and excessive preoccupation with orderliness and perfectionism (American Psychiatric Association, 2000, 2013).

As it seems to be the case for other comorbid conditions, comorbidity with personality disorders is also distributed along the dichotomous lines of restricting vs. binge/purging characteristics.

A study summarising the literature on personality disorders amongst ED patients found that obsessive-compulsive personality disorder (OCPD) was present in 22% of AN-R cases (followed by 19% of avoidant personality disorder) and borderline personality disorder (BDP) was present in 25% of AN-BP and 28% of BN patients. This suggests the existence of differences between restricting and binge/purge-types of ED. The study found a more

evenly distributed occurrence of Cluster A, OCPD, and borderline disorders documented in literature on BED patients. However, OCPD seems to be the most prevalent personality disorder in individuals with BED. The authors hypothesise that this heterogeneity in Axis II presentations in BED could reflect aetiological heterogeneity of the condition (Sansone, Levitt, & Sansone, 2004). A study of 288 individuals visiting outpatients settings for AN (N=56), BN (N=132), and depression (N=100) found associations between BN patients and Cluster B personality disorders, and that AN-BP patients resemble those with BN than those with AN-R (Jordan et al., 2008). In their review of the literature, O'Brien and Vincent also concluded that evidence points towards an association between BDP and binge/purge type of ED, as opposed to OCPD and AN-R. The authors argue that impulsivity traits that are typical of individuals who develop BPD and BN might act as a shared risk factor for the two conditions; whereas OCD traits might explain the onset of AN and contribute in some cases to its maintenance. Since OCPD symptoms have also been observed in studies which included starved but not ED participants, findings could imply a self-reinforcing pattern in AN patients (O'Brien & Vincent, 2003).

Research on the association between sub-threshold ED and personality disorders is, thus far, rather limited. Nevertheless, there is some evidence that the former are associated with increased personality disorders psychopathology. A study on 233 women with borderline personality disorder (BPD) and 46 healthy controls found that 33% of the exposed women had a lifetime diagnosis of EDNOS, and, among these 76.3% of women had never crossed over to a full diagnosis of AN or BN. The authors suggest that their findings support the hypothesis of a distinctiveness of EDNOS diagnosis amongst BDP patients, which cannot be reduced to a 'residual or prodromal' form of ED (Marino & Zanarini, 2001).

Research has also investigated associations between PD and personality disorders, finding distinct associations. One study in which 39 women with a BN diagnosis were compared against 37 women with a PD diagnosis and 35

healthy participants, showed no differences between the two ED groups. However, more women with PD than healthy ones presented with any personality disorders, of which Cluster C was the most frequent despite the small sample (Keel et al., 2005). Whilst this appears in contrast with previously mentioned findings of increased cluster B diagnoses amongst bingers and purgers, some considerations are worth noting. Firstly, the paucity of studies in this area might leave room for chance in findings. Secondly, research has shown that women with PD had levels of drive for thinness and body dissatisfaction comparable of those of AN individuals (Fink et al., 2009), who more typically show Cluster C diagnoses. Therefore, it is possible that some of the phenotypical expressions of PD (such as body dissatisfaction), might express the presence of cognitions that are more similar to those usually seen in AN, rather than those observed in BN.

Interim conclusions

Findings from the literature suggest that restricting type of ED (i.e. AN-R) are more associated with OCD and that binge/purge ones (i.e. AN-BP, BN, BED) with BPD (O'Brien & Vincent, 2003). EDNOS diagnosis has also been found to be highly prevalent in BPD patients (Marino & Zanarini, 2001); however, more research is needed to investigate the association between sub-threshold diagnoses and personality disorders. Studies on PD and personality disorders show high prevalence of Cluster C personality disorders, typical of AN-R (Keel et al., 2005). To date, research on PD is scant, thus it is not possible to claim that this result is not due to chance. More research is needed to explore comorbidity with personality disorders in individuals with PD.

2.4. ED in ethnic minority groups

A major limitation of the majority of research in ED and disordered eating to date has been the employment of samples consisting mainly of women of White European or North American ethnicity. Little is known on the manifestation and epidemiology of ED behaviours in individuals from ethnic minority groups, despite a surge in research in the past decade. However, there is mounting evidence in literature that exposure to 'Western' culture, lifestyle, and beauty ideals is causing a steep rise in ED in ethnicities other than White Caucasian, both among ethnic minorities living in Western countries and among those living in their countries of origin.

Several studies have suggested that individuals of Black ethnicity and other minority groups show fewer body image issues (Kronenfeld, Reba-Harrelson, Von Holle, Reyes, & Bulik, 2010; Shaw, Ramirez, Trost, Randall, & Stice, 2003), and lower prevalence of AN (Hoek, 2006). A study on a multi-ethnic sample of 4,023 women aged 25-45, exploring differences in actual and perceived silhouettes, showed that even after controlling for BMI, women from Black and Asian ethnic backgrounds tended to choose smaller figures compared to their White counterparts (Kronenfeld et al., 2010). Traditionally, this finding has been interpreted according to a socio-cultural model of eating pathology, whereby societal pressures to be thin in White, Western cultures encourages an internalisation of the thin ideal at the basis of body dissatisfaction. Ethnic minorities, having lower exposures to these ideals, would have fewer body image issues (Shaw et al., 2003). In fact, others have argued these cultural gaps have shrunk in the recent years. A recent meta-analysis of US-based studies, uncovered differences in body satisfaction between White and Black women, but not between Asians and Hispanic, and White women (Grabe & Hyde, 2006). On the other hand, a systematic review on child mental health differences among ethnic groups in the UK, has highlighted that children of South Asian origin are consistently reported to have higher levels of eating disturbances compared to girls of other ethnicities, whereas no differences were found between

children from Black and White backgrounds (Goodman, Patel, & Leon, 2008).

The hypothesis that exposure to Western ideals might be contributing to a rise in the prevalence of ED and disordered eating in non-White populations is supported by evidence of a correlation between industrialisation, the advent of television and, thus Western culture, and a rise in ED incidence in non-Western countries. A study conducted in the Fiji islands showed an increase of ED behaviours and attitudes in school girls after prolonged exposure to Western television (Becker, Burwell, Gilman, Herzog, & Hamburg, 2002). Similarly, there is evidence of an increase in prevalence of ED in urban areas of Japan (Chisuwa & O'Dea, 2010; Pike & Borovoy, 2004), China (Getz, 2013), India (Chandra, Abbas, & Palmer, 2012), and South Africa (Szabo & Allwood, 2004). To date, country-specific literature on ED presentation is still scant.

Contrasting results have been found with regards to specific ED behaviours such as binge eating, and compensatory behaviours in members of ethnic minorities living in Western countries (Shaw et al., 2003). Some studies have found that individuals from ethnic minorities are more likely to experience binge eating with or without compensatory behaviours. A US-based general population study on 1,628 and 5,741 women of, respectively, Black and White ethnicity found that the former were more likely to have experienced recurrent binge eating and laxative/diuretics use in the 3 months prior to interview (Striegel-Moore, Wilfley, Pike, Dohm, & Fairburn, 2000). In a study on 704 male and 621 female high school students girls of Black ethnicity were found to have higher odds (OR: 11.5, 95% CI: 1.5-95.3) of using laxatives or vomiting to gain control their weight (A. E. Field, Colditz, & Peterson, 1997). Rationales for food refusal and weight loss other than body weight and shape concerns (Becker, Thomas, & Pike, 2009) have also been documented especially in individuals of South Asian ethnicity (Tareen, Hodes, & Rangel, 2005). Many studies, however, have focused mostly on Black ethnic minorities, with comparatively smaller attention devoted to

Hispanic, Native American or broader Asian groups, for instance. Therefore little is known on specific ED presentations in ethnic minority groups living in Western societies.

Several recent studies have found fewer or no differences in ED behaviours between ethnic minorities. In a US study of 5,435 college students from White, Black, Asian and Native American ethnic backgrounds, no differences were found between the four groups with respect to binge eating, although individuals of Native American and Asian ethnicity were, respectively, more and less likely to use laxatives or vomit to control their weight (Franko, Becker, Thomas, & Herzog, 2007). A similar result was produced in a US community study of 1,225 individuals of Hispanic, Asian, Black, and White ethnic backgrounds, where individuals of Asian ethnicity reported the lowest levels of purging behaviours and no differences were found between the other groups (Regan & Cachelin, 2006). Finally, a 10-year longitudinal study of American adolescents showed girls of Black ethnicity to be those less likely to use weight control behaviours (Chao et al., 2008).

Interim conclusions

There is an indication in literature that prevalence of ED and disordered eating is increasing amongst ethnic minorities and in non-Western countries. However, findings from literature are still inconsistent with respect to cross-ethnic differences in ED and ED behaviours, and more research is required with multi-ethnic samples to determine whether different ethnic groups present different concerns and eating behaviours. There is evidence showing that bulimic symptoms are more and less prevalent in individuals of Black and Asian ethnicities, respectively. However, findings are inconclusive. The majority of general population and community studies employing multi-ethnic samples have been conducted in the US. Although some research has been done in the UK (McBride et al., 2012), only a small minority of studies have employed representative, general population samples and many studies have used clinical samples and have investigated service use, which will be discussed in the following

section. Elucidating patterns of ED presentation in ethnic minorities could help identify if any risk behaviours exist that are specific to different population groups, and this in turn could lead to targeted support at primary care levels. In what follows I will discuss access to treatment amongst individuals with ED.

2.5. Health service use

As was discussed in section 1.2.2., ED prevalence estimates relying on outpatient registries are often biased, as ED cases tend to be under-reported and under-diagnosed. Both patients' difficulties in acknowledging their ED and general practitioners difficulty in recognising ED symptoms have been deemed responsible for this.

Literature has extensively described ED patients' reluctance to disclose their symptoms and seek help, both at the general medical practice level and at specialised levels. Hudson and colleagues, in a large US survey, found that although 50%-63.2% of ED participants had sought help for any emotional problems in their lifetime (mostly through general medical services), only approximately 43% had sought help for ED specifically. Even fewer people (15.6% with BN and 28.5% with BED) were reported having sought help through general medical services in the 12 months prior to assessment (Hudson et al., 2007). Another study, based on a sample of 891 senior high school students found lifetime prevalence of any full syndrome ED to be 2.3% (n=19) and of partial-syndrome ED to be 2.9% (n=23). However, only 57.9% of the former and 47.3% of the latter had received any treatment for their ED (Lewinsohn, Striegel-Moore, & Seeley, 2000). Similar proportions were found in a German general population study of 4,181 adults aged 18 – 65 years. Prevalence of ED (AN or BN) was of 0.2% (N=8) and of these cases only 47% had received even minimal treatment (Jacobi et al., 2004). A study using electronic medical records of adults aged 18-55 years, who visited primary care services in 2003 in Portland (USA), found that only 50% of individuals who were diagnosed an ED had been referred to specialist

services, despite having attended primary care more often than controls before and after the index visit (Striegel-Moore et al., 2008). Finally, a recent UK general population study employing data from the National Adult Psychiatric Morbidity Survey 2007 on 7,001 individuals found that individuals with disordered eating had increased odds of seeking treatment, although no specific information on ED diagnosis and health service use patterns is provided (McBride et al., 2012).

High comorbidity of ED with other physical and psychological factors, discussed in section 2.3, could partially account for low ED detection rates. A Study of 100 cases of ED showed that they had attended primary care practices more often than their matched controls with a set of problems such as gastrointestinal, psychological, and gynaecological complaints (Ogg, Millar, Pusztai, & Thom, 1997). In fact, individuals with ED often receive treatment for associated conditions, but not for their ED itself. For instance, a study of 5,255 women aged 18-42 years residing in the Australian Capital Territory (ACT), found that of the 159 women who were diagnosed with an ED only 40% had received treatment for an ED, whereas the remaining ones had been referred to counselling services for associated psychopathology or to weight loss plans (Mond et al., 2007).

The perceived rarity of the condition also places strain on general practitioners' (GPs) ability to identify cases. Reid et al (Reid, Williams, & Hammersley, 2009), in a qualitative study involving 20 GPs, found that the infrequency with which GPs saw patients with ED symptoms, and lack of preparation, were some of the many barriers to patients receiving treatment. Other reasons were the secrecy that surrounds ED and the reluctance of sufferers to seek help, as well as long referral waiting times and lack of funding.

Several studies have shown that members of ethnic minorities suffering from an ED are less likely to present to services to seek help, and when they do they are less likely to receive treatment than those of White ethnic

background (Becker, Franko, Speck, & Herzog, 2003; Cachelin & Striegel-Moore, 2006; Waller et al., 2009). Becker and colleagues found that in a general population sample of 9,061 participants, Latino and Native American participants were less likely than White participants to be referred for further evaluation, or be asked about ED symptoms (Becker et al., 2003). Similarly, a study of 1,887 patients referred to services in South London found that ethnic minority patients were on the one hand under-represented in the clinical sample, and on the other less likely to be offered treatment despite being more likely than White patients to be diagnosed with an ED (Waller et al., 2009).

Interim Conclusions

Literature has consistently reported that individuals with ED and sub-threshold diagnoses are less likely to present to services and to receive treatment for their ED(Hudson et al., 2007; Mond et al., 2007). High levels of comorbidity and frequent lack of visible physical symptoms in ED patients often cause patients to be treated for related conditions (e.g. anxiety, depression), or to be address to weigh-management programmes (Mond et al., 2007). Research has also shown that individuals from ethnic minorities are less likely to receive a diagnosis when presenting to a primary care or outpatient settings (Becker et al., 2003; Waller et al., 2009). It has been suggested that GPs difficulties in identifying ED, possibly due to their infrequency and their comorbidity with other conditions, might partially explain these findings (Reid et al., 2009). To date there is scant evidence from the UK on patterns of service use in ED patients (McBride et al., 2012), as studies focusing on clinical population might fail to detect individuals who do not seek treatment for ED or do not reach specialised services.

2.6. Conclusions and objectives

This chapter aimed at providing an overview of: (i) the psychiatric comorbidity of different full and sub-threshold ED; (ii) the current knowledge on presentation of ED behaviours in ethnic minorities; and (iii) the evidence on service utilisation in individuals with ED. This literature review has highlighted some overall gaps in literature, which I will summarise below.

Although in the last decade there has been a surge of studies using community samples, to date most research investigating comorbidity in ED has employed clinical or 'ad hoc' samples relying mostly on ED diagnoses (often not distinguishing between AN-R and AN-BP) to define their cases. It appears that BED and sub-threshold diagnoses have received comparatively less attention than AN and BN in literature and very little is known on PD. However, there is increasing evidence that these conditions bear similar levels of comorbidity to those seen in AN and BN. More research is needed to investigate prevalence and comorbidity of sub-threshold ED diagnoses in the general population. Gaps in literature relative to specific psychiatric conditions were discussed at the end of each relevant section.

Research focusing on ED and disordered eating in non-White populations has so far produced contradictory results and is limited. However, evidence suggests that ED might be as frequent in ethnic minorities as they are in White populations. Most of the existing studies on multi-ethnic samples have been conducted in the USA and little research is available in the UK, despite it being a largely multicultural environment, especially London. Evidence suggests that ethnic minorities are less likely to present to services for ED-related problems. Thus, because most studies employ clinical or register-based samples, ED in ethnic minority populations has the potential to go largely undetected. This is not only important on a service-provision basis, but also with regard to epidemiological and psychiatric research.

Little is known about whether ED might have different presentations in populations other than White Caucasians.

Finally, since most studies have relied on clinical samples, figures on service use amongst ED patients is still restricted, especially in the UK. It is known that ED patients are reluctant to seek help, but little research has focused on identifying how many ED patients access specialist services. To date, studies undertaken in several countries show that only a minority of ED patients receive treatment. Therefore, more data is needed to evaluate whether individuals with ED are receiving adequate levels of care in the UK.

2.7. Aims and Structure

Aims

The aim of the studies included in this thesis will thus be to contribute to partially fill these gaps in literature. In order to do so, they have several objectives:

- ✓ To employ general population samples of adults and adolescents to investigate prevalence and comorbidity of disordered eating, ED behaviours, and ED diagnoses;
- ✓ To investigate ED and disordered eating presentations in an ethnically diverse general population inner-city sample;
- ✓ To explore patterns of service use in individuals with disordered eating and ED in a general population sample;
- ✓ To assess the psychometric properties of a short screening tool normally used to detect ED in outpatient settings, in a general population sample; and to investigate whether it could be used in community screening programmes and research studies;
- ✓ To investigate the prevalence, risk factors, and comorbidity of purging behaviours in adolescents.

These issues will be explored in adult and adolescent populations making use of three general population samples: the South East London Community Health Study (adults), and the Avon Longitudinal Study of Parents and Children and the Northern Finland Birth Cohort 86 (adolescents).

Structure of the thesis

<u>Part 1: South East London Community Health Study</u>

The first part of this thesis will aim: (i) to investigate the prevalence and comorbidity of disordered eating in an ethnically-diverse inner-city sample; (ii) to validate a screening tool for ED in the general population (which it has been argued could be employed in survey setting to discern individuals with ED behaviours and disordered eating); (iii) to explore prevalence and comorbidity of ED diagnoses using a two-phase prevalence design, which, as

described above, has been identified by literature as a reliable method for prevalence estimation; (iv) to explore associations between ethnicity, and disordered eating and ED diagnoses; and, finally, (v) to investigate patterns of health service use in participants reporting disordered eating and ED.

Part 2: Avon Longitudinal Study of Parents and Children (ALSPAC) and Northern Finland Birth Cohort 1986 (NFBC86[3])

The second part of this thesis will focus on ED behaviours amongst adolescents, with a particular focus on purging behaviours. Specifically, studies investigate the prevalence and comorbidity of purging behaviours at age 16, among girls from a general population cohort (ALSPAC); and also differences/similarities with two other international cohort studies based in Finland (NFBC).

Chapters

The following chapters will be organised as follows:

- ✓ Chapter 3 will describe in detail aims and methods of the first 3 studies, which have been grouped together in the first half of this thesis because they employ the same adults dataset (the South East London community Health Study) and complement each other;
- ✓ Chapter 4 will investigate prevalence, comorbidity, and service use in eating disordered individuals;
- ✓ Chapter 5 will provide a validation of the screening questionnaire employed in Chapter 4;
- ✓ Chapter 6 will investigate prevalence, comorbidity, and service use in ED individuals;
- ✓ Chapter 7 will provide the methodology for the last two results chapters, using adolescent data from the Avon Longitudinal Study of Parents and Children (ALSPAC);

[3] There are two NFBC studies, one using the 1966 birth cohort and one the 1986 birth cohort. This thesis will use the 1986 birth cohort, but will refer to it as NFBC only from this point onwards.

- ✓ Chapter 8 will investigate the prevalence and comorbidity of purging behaviours in 16 year-old girls in ALSPAC and will compare them with findings from other 2 international cohorts of adolescents;
- ✓ Chapter 9 will discuss the overall findings and implications of this thesis.

Chapter 3

General Aims and Methodology

3.1 Chapter overview

This chapter will provide an overview of the aims and methods, which informed the research conducted in first half of this thesis focusing on the South East London Community Health (SELCoH) Study phases I & II. Section 3.2 explains the overall aims of my research as well as those of each individual study. Section 3.3 opens with an overview of the overall rationale of the SELCoH I & II surveys and continues with a detailed description of each study, their design, populations, measures employed, and analytical strategy. Section 3.4 provides a description of all measures that have been used, 3.5 of the analyses that will be undertaken. Finally, sections 3.6-3.7 will present my contribution to the studies as well as details of ethics approval, and section 3.8 some overall conclusions.

3.2 General Aims

The overall aim of the studies included in the first half of this thesis is to investigate the epidemiology and comorbidity of disordered eating and eating disorder (ED) diagnoses in a general population sample in South East London using a two-stage cross-sectional study design. The individual aims and objectives of each individual study are outlined below.

3.2.1. Study 1: Disordered eating in a general population sample in South East London (chapter 4).

The primary aim of this study was to investigate the prevalence of disordered eating and its correlates in a general population sample based in the two South East London Boroughs of Lambeth and Southwark. The secondary aim of this study was to investigate patterns of disordered eating across different ethnic groups as well as patterns of service use.

3.2.2. *Study 2: Validation of a short screening questionnaire for eating disorders in a general population sample (chapter 5).*

The aim of this study was to validate a short 5-item screening questionnaire for the detection of ED in outpatient settings in a general population sample as part of a two-phase cross-sectional prevalence study. The specific objectives were to evaluate its psychometric properties through exploratory factor analysis as well as its sensitivity, specificity, positive and negative values.

3.2.3. *Study 3: Prevalence and comorbidity of eating disorders in a South East London general population sample (chapter 6)*

The aim of this study was to estimate the prevalence of eating disorders and their comorbidity in a general population sample based in the two South East London boroughs of Lambeth and Southwark. The secondary aims were to explore the association between ethnicity and ED diagnoses as well as service use across diagnoses.

3.3 The South East London Community Health (SELCoH) Study – Phases I & II

3.3.1 SELCoHI

Study Overview

The South East London Community Health (SELCoH) study is a cross-sectional study of individuals aged 16 years or over living in the South East London boroughs of Lambeth and Southwark. The study is supported by the South London and Maudsley NHS Foundation Trust / Institute of Psychiatry, King's College London National Institute of Health Research (NIHR) Biomedical Research Centre (BRC).

The main objective of the SELCoH study was to collect epidemiological data on the mental and physical health of the population living within the predefined study area in order to investigate patterns of comorbidity and disease distribution across a number of socio-demographic indicators, as well as service use. The secondary objective was to generate a local database containing information, which could be comparable to, as well as expanding on, that of nation-wide surveys, such as the Office for National Statistics (ONS) surveys, or the British birth cohort studies (1946, 1958, 1970), and the Avon Longitudinal Study of Parents and Children (ALSPAC). Data was collected between 2008 and 2010.

Sampling procedure

The study population in SELCoHI was selected via random household sampling, the same method employed by the Office for National Statistics (ONS) surveys. The rationale for this choice was three-fold: (i) to facilitate recruitment of multiple individuals within the same household, especially amongst the harder to reach sub-populations (e.g. young, minority groups); (ii) to reduce research assistants' costs of traveling between households; (iii) to explore the relevance of household clustering in exploring variance in prevalence of mental and physical morbidity.

The sampling frame for the study, that is the complete list of units from which the sample is drawn (Kirkwood & Sterne, 2008), was the Small User Postcode Address File (PAF), which contains information on all private households in England. Commercial postcodes, defined as those receiving more than 50 mail items per day, were excluded from this dataset. Some small businesses were initially accidentally included, but subsequently excluded by the research assistants upon visiting the premises.

Sampling was stratified by borough in order to achieve a similar sample size in each of them prior to proceeding with simple random sampling of the households from the PAF. Simple random sampling is defined as the random sampling process of a population by using a random number generator or a random number table, so that each individual (or household, in this instance) in the study population has the same probability of being selected within the given sampling frame (Kirkwood & Sterne, 2008). This technique aims at reducing selection bias at the sampling stage. The primary sampling unit (PSU) for the study was therefore the household, defined as a person or a group of people sharing the same main accommodation.

Approach and Interview to Participants

After the households were selected, they were sent a letter describing the study and informing the inhabitants that researchers from the Institute of Psychiatry (IoP) would have visited the household's premises in the following weeks. Once approached, participants were asked about the household's composition. All members of the household were invited to participate to the study.

During the first visit, SELCoH researchers attempted to conduct the study interview and, when that was not possible, a further appointment was re-scheduled. If nobody was at home, a card was left to notify of a further visit. A maximum of four attempts were made for each household, after which a short questionnaire on basic socio-demographic indicators with an envelope and a stamp would be sent to all household which could not be contacted.

Prior to interview, participants were asked to provide their full contact details and to complete a consent form stating their willingness to participate in the study and to be re-contacted in the future if further stages of the surveys had been undertaken.

Participants

Initially, 2,070 households and 2,359 people were selected as eligible for participation; of these 1,075 households had at least one member participating, resulting (51,9% household participation rate) and 1,698 individuals took part (71.9% individual participation rate).

Sample Representativeness

Individuals aged 16 or over were eligible to take part in the study if residing in the boroughs of Lambeth and Southwark. Translators were provided for participants who were not fluent enough in English to understand the questionnaire.

Socio-demographic characteristics of the SELCoHI final sample were compared to those of the two boroughs of Lambeth and Southwark, London and England obtained from the 2001 and 2011 ONS Census data (Table 2).

As it is shown in Table 2, compared to the population from the SELCoHI catchment area, London and England, both in 2001 and 2011, women appeared to be over-represented in the SELCoHI sample. With respect to ethnicity, when compared to data from 2001, the SELCoH population seemed representative of its catchment area (with Black ethnicity only slightly over-represented, possibly due to the lack of a 'Mixed' ethnic category). Compared to London and the rest of England, Black ethnicity was slightly over-represented and White and Asian ones under-represented. Compared to 2011 data, White ethnicity was over-represented with respect to both Lambeth and Southwark, and London, but not England. On the other hand, Black and Asian ethnicities were under-represented compared to the study area, but not to London and England.

In the SELCoHI sample the 16-29 and 30-59 age groups were over represented compared to both 2001 and 2011 data for its catchment areas, London and England, although only slightly in 2001 for the 30-59 group. On the other hand, the 60+ age group was under-represented when compared to 2001 data, but not when compared to the 2011 census data for Lambeth and Southwark and was under-represented at both time points when compared to London and England (Table 2). Finally, economically inactive participants appeared to be over-represented with respect to the 2011 census, but estimates from the study area in 2001, and London and England both in 2001 and 2011 did not seem to differ greatly (Table 2),

The SELCoHI sample is therefore representative of its catchment area population in 2001 and to a slightly lesser degree in 2011. When compared to London and England as a whole, minority ethnic groups as well as younger age groups are over-represented.

Table 2: Socio-demographic characteristics of the SELCoHI sample, SELCoHI catchment area (Lambeth and Southwark), London, and England, from 2001 and 2011 ONS census data (adapted and updated from Hatch et al., 2011)

	SELCOHI (%)	2001 UK Census for the SELCoH study catchment area (%)	London (2001) (%)	England (2001) (%)	2011 UK Census for the SELCoH study catchment area (%)	London (2011) (%)	England (2011) (%)
Gender							
Female	56.5	50.9	50.4	51.3	50.4	50.7	50.8
Male	43.5	49.1	49.6	48.7	49.6	49.3	49.2
Ethnic groups							
White	63.4	62.7	71.2	90.9	55.7	59.5	85.2
Mixed	-*	4.3	3.2	1.3	6.9	4.5	2
Asian	3.5	4.3	12.1	4.6	8.1	18.1	7.5
Black	21.9	17.2	10.9	2.3	26.3	13	3.4
Other	11.2	7.2	2.7	0.9	2.8	2.9	0.9
Age groups							
16 – 29	34	32.6	28.5	23.3	26.5	22.5	18.8
30 – 59	51.6	50.5	50.1	49.1	44.5	42.3	40
60+	14.4	16.8	21.5	27.5	10.8	15.3	22.4
Employment**							
Economically active	69.5	68.5	67.6	66.9	75.1	71.7	69.9
Economically inactive	30.5	31.5	32.5	33.1	24.9	29.3	30.1

* In SELCoHI the 'mixed' ethnic category was not recorded, therefore 'mixed' ethnic ground participants were included as 'other'

**Economically active includes: Full time work, Part time work, Casual work, Unemployed, and Working Students. Economically inactive includes: Student, Permanent sick/disabled, Temporary sick, Retired, Looking after the home children. Economic activity in Census data refers to people aged 16 to 74.

3.3.2 SELCOHII

Study Overview

The SELCoHII study aimed at recruiting and following up all participants who had taken part in SELCoHI. The main aims of this study were to: (i) collect relevant prevalence estimates of common and less common mental health disorders as well as (ii) provide a source of potential cases and controls for future studies. In addition to these aims, which characterised the previous SELCoHI round of data collection, SELCoHII aimed to investigate: (i) health inequalities in the population; (ii) experiences of discrimination; (iii) the contribution of discrimination to inequalities in social functioning, common mental health disorders, physical functioning, and health service use; (iv) prevalence of four psychiatric conditions (Eating Disorders, Hoarding, Personality Disorders, and Psychosis), which participants had been screened for in SELCoHI. All participants were asked to complete a core computer-based assessment and selected sub-samples were invited to be interviewed in depth on the four above-mentioned specific mental health conditions. Procedures and number of participants recruited to take part to the Eating Disorder module will be discussed in section 3.3.3.

Approach and Interview to Participants

All participants in SELCoHI were invited to participate in SELCoHII if they had agreed to be re-contacted for future studies. Participants who agreed to be re-contacted were approached using the contact details they had provided in SELCoHI either by mail or email (according to what they indicated to be their preferred means of communication) with an initial introductory letter and information sheet regarding the study. The participant was then approached with a phone call to arrange an appointment for the interview. A total of four attempts at calling participants were made over a four-week period in case of difficulties in approaching them. A home visit was also attempted in cases of hard-to-

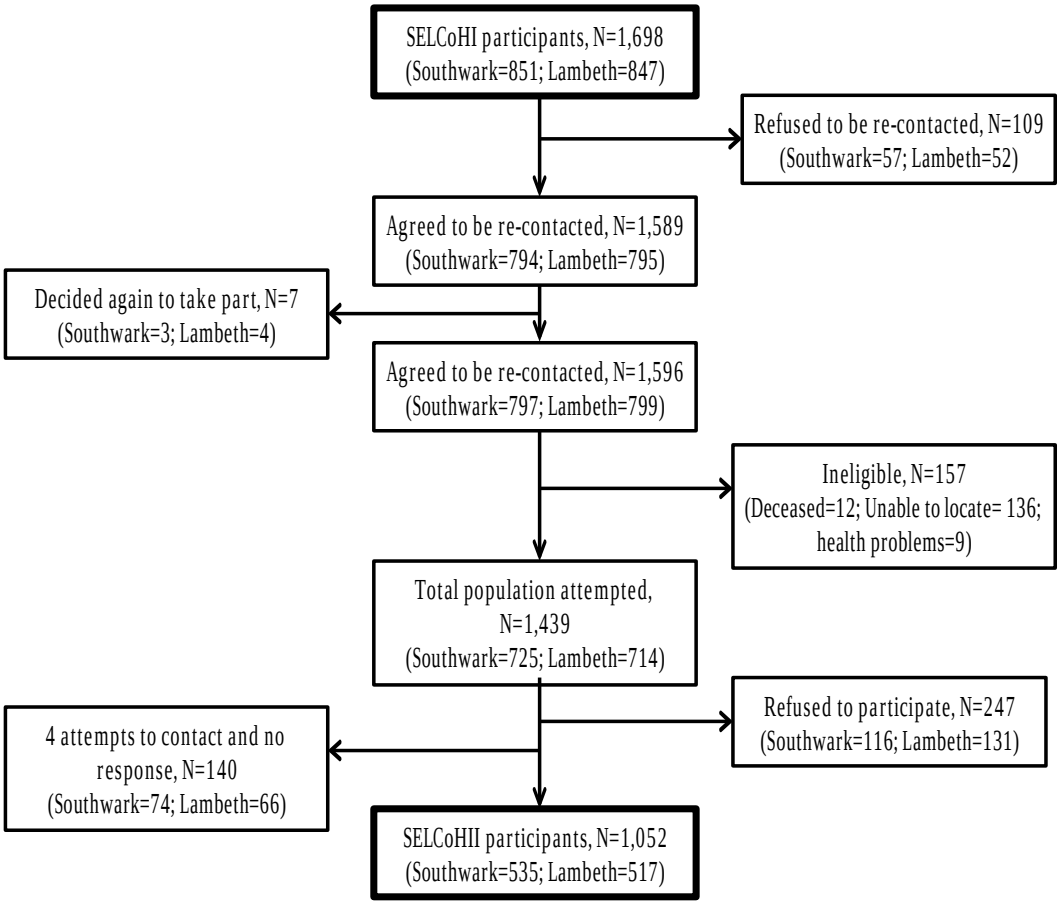
reach participants. In total, no more than five attempts at contacting them were made, including the initial informational letter.

As in SELCoHI, participants were asked to update their contact details at the opening of the interview as well as to fill a consent form in which they stated whether they agreed to participate in the study and to be re-contacted for future ones. At the end of the computer-based core interview, participants were given £15 as compensation for taking part in the study and asked, if eligible, if they were willing to take part in specific study modules (i.e. eating disorders, personality disorders, hoarding, and psychosis). More information on the eating disorders module, which pertains to the studies included in this thesis, is provided in section 3.3.3. Participants were excluded if the SELCoH team researchers considered them to be too disturbed to take part in the study on the basis of whether they: (i) showed aggressive behaviour to the researchers; (ii) appeared intoxicated.

Participants

Of the 1,698 participants who took part in SELCoHI, 1,596 (93.9%) agreed to be re-contacted. As shown in Figure 1, 157 (9.8%) were ineligible for inclusion, 247 (15.5%) refused to participate, and 140 (8.8%) could not be contacted, leaving 1,052 participants (65.9%) included in SELCoHII.

Figure 1: Flowchart of study participants in SELCoHI and SELCoHII



3.3.3 Eating disorders module

Study overview

As it was mentioned in section 3.3.2, one of the aims of SELCoHII was to estimate the prevalence in the study population of a set of mental health conditions, which had been screened for in SELCoHI. Included in the core survey for SELCoHI was a 5-item questionnaire, which will be described more in detail in section 3.4, aimed at screening for ED. The aim of SELCoHII was to interview a sub-set of SELCoHI participants determined by their screening status with a clinical interview, to investigate the prevalence of ED in the sample and validate the screener measure.

Approach and Interview to Participants

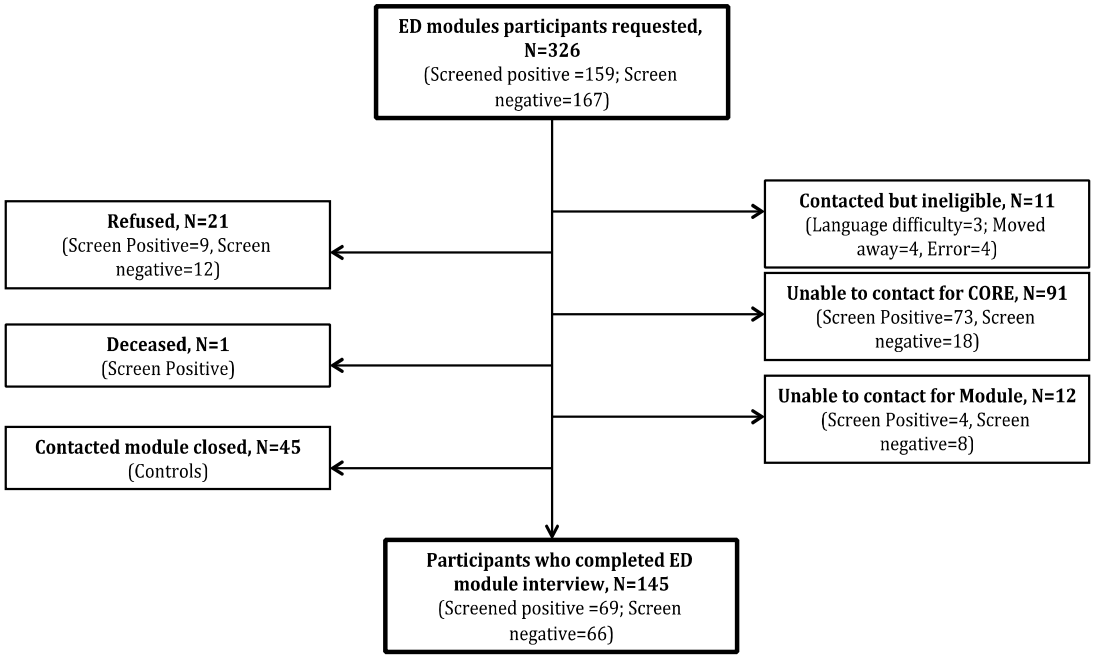
All participants who screened positive for ED in SELCoHI (N=164) and an equal number of participants randomly selected who screened negative were eligible to take part to the eating disorder module interview. This was calculated to provide a and of 90%, 80% with a hypothesised prevalence of ED of 5%, and 3%, respectively at a significance level of alpha=0.05 (two-sided). Participants who asked not to be re-contacted were not approached.

After completion of the core SELCoHII survey, participants were left an information sheet regarding the ED module and were explained its rationale. If the participant agreed to take part to the ED module, they were either interviewed at the time of the core visit or told that someone would call them to arrange a further appointment. Prior to the ED interview, the participants filled in a consent form and at the end they were given £10 as compensation for their time.

Participants

As shown in Figure 2, after excluding those who did not agree to be re-contacted, 326 participants were eligible for inclusion in the ED module and 145 (44.5%) were interviewed.

Figure 2: Flowchart of ED module recruitment



ED module participants requested in the flowchart accounts for those who did not give permission to be recontacted.

3.4 Materials and measures

3.4.1 Data collection

SELCoHI

In SELCoHI, data was obtained with a combination of self-reported measures collected through a computer-assisted interview and objective measurements (e.g. anthropometric measures, DNA samples). The core areas of the interview related to (i) socio-demographics characteristics; (ii) migration; (iii) socio-economic status (SES); (iv) psychosocial factors; (v) housing and neighbourhood; (vi) social adversities; (vii) unhealthy behaviours; (viii) physical and mental health symptoms; and (ix) health service use and access to treatment. A pilot study was undertaken in order to assess reliability, validity and feasibility of the questionnaire (Hatch et al., 2011). SELCoH team researchers conducted all core interviews.

SELCoHII

In SELCoHII, participants were again asked to complete a computer-assisted interview, although no anthropometric measurements were taken at that time. The core areas of the assessment replicated those of SELCoHI with further questions on: (i) discrimination and (ii) health inequalities. In addition to the core assessment, four sub-samples of participants were invited to participate in additional module interviews (one or more) covering specific mental health conditions ((i) Personality Disorders; (ii) Eating Disorders; (iii) Hoarding; (iv) Psychosis), which had been screened for in the core questionnaire of SELCoHI. Each module had indicated inclusion and exclusion criteria for the selection of their participants. SELCoH team researchers conducted all core interviews.

Eating disorders module

As it was described in section 3.3.3, a sub-sample of SELCoHII participants was invited to participate in the Eating Disorders (ED) Module of the study, which consisted of a clinical assessment of ED.

In SELCOHII, Francesca Solmi undertook 81 (55%) ED interviews, whilst members of the core SELCoH team undertook the remaining 66 (45%). A total of 6 team-members helped with the ED module data collection. SELCoH researchers were trained on how to use the Structured Clinical Interview for DSM-IV Axis I disorders non-patient edition (SCID-I-NP) (which was used to diagnose ED and which will be further discussed in section 3.4.3) through the use of SCID-I official training material (i.e. DVD lectures, taped sample assessments) and in a 2-day workshop run by Dr Abigail Easter and Dr Radha Kothari of the Behavioural and Brain Sciences Unit team at the Institute of Child Health (UCL) under Dr Micali's supervision. Trainers had previous extensive experience in the use of the ED section of the SCID-I. Francesca Solmi undertook additional short sessions with the SELCoH team to answer specific questions and to perform mock interviews with them.

Researchers were informed not to provide a diagnosis further to the interview, but only to fill in the SCID-I questionnaire with as much information as possible and Francesca Solmi in collaboration with the Eating Disorder team Behavioural Science Unit team at the Institute of Child Health (UCL) (Dr Nadia Micali, Dr Abigail Easter, Dr Emma Taborelli, and Dr Radha Kothari) would decide on the final diagnosis. All interviews were discussed in group 'SCID' meetings led by Dr Nadia Micali (expert clinician) to decide on the assigned diagnosis for the participant. Dr Nadia Micali independently diagnosed all cases prior to the completion of the study and final diagnosis coincided in all instances (100% agreement).

Five participants (3.5%) for whom details essential to the diagnosis was missing had to be re-contacted by phone by Francesca Solmi to obtain the relevant information.

3.4.2 Data entry

All interviews were coded and entered by Francesca Solmi. Data was anonymised in the dataset by only using participants' IDs. Participant documentation (i.e. consent forms, questionnaires, and receipt for the £10 compensation) were stored separately in locked cabinets, in order not to allow identification. The final diagnosis was given based both on DSM-IV (American Psychiatric Association, 2000) and DSM-5 (American Psychiatric Association, 2013) as the study was initiated when the former was still the diagnostic manual in use. The SELCOHII data manager (Dr David Pernet) merged the final ED dataset with that of the core SELCoHII study.

The following sections will provide a more detailed description of the measures, which were used in Studies 1-4 (Chapters 4, 5, and 6).

3.4.3 Eating disorders diagnoses and disordered eating

SCOFF (Stone Control One Fat Food) – disordered eating

The SCOFF questionnaire, a 5-item questionnaire developed by Morgan et al (Morgan, Reid, & Lacey, 1999, 2000) to screen for ED in outpatients settings, was used as a screening instrument for ED in SELCoHI. The acronym stands for the initials of the 5 main words, which are central to each of its questions:

1. Do you make yourself *Sick* because you feel uncomfortably full?
2. Do you worry you have lost *Control* over how much you eat?
3. Have you recently lost more than *One* stone in a 3 month period?
4. Do you believe yourself to be *Fat* even when others say you are too thin?
5. Would you say that *Food* dominates your life?

Each question covers a symptom or a cognition, which is central to the diagnoses of either AN, BN, or BED and can be answer as either 'yes' or 'no':

1. Purging behaviours
2. Loss of control eating
3. Weight Loss
4. Body image distortion
5. Persistent food-related thoughts

The SCOFF has been previously validated in a number of studies and settings and all studies have found that a cut off of two or more 'yes' answers to SCOFF questions is the one yielding the best sensitivity to specificity ratio. The SCOFF has been found to have good sensitivity (Se) and specificity (Sp), although low positive predictive value (PPV), especially in general population settings (Cotton, Ball, & Robinson, 2003; Garcia et al., 2010; Garcia-Campayo et al., 2005; Lähteenmäki et al., 2009; Leung et al., 2009; Luck, 2002; Mond et al., 2008; Morgan et al., 1999; Muro-Sans, Amador-Campos, & Morgan, 2008; Parker, Lyons, & Bonner, 2005).

As it is shown in Table 3, Sensitivity measures the probability of testing positive if the condition is truly present, (true positives) as diagnosed using a 'gold standard' measure whereas, specificity measures the probability of testing negative if the condition is truly absent (true negatives). Positive Predictive Value (PPV) defines the probability that a person has the condition if the screener is positive. Negative Predictive Value defines the probability that a person does not have the condition if the screener is negative. The predictive value of a test, is determined by both sensitivity and specificity, but also by the characteristics of the population studied and, namely, by the prevalence of the screened condition. High values of sensitivity suggest that a negative result is more likely to coincide with the absence of the condition (high NPV). High values of specificity suggest that a positive result is more likely to coincide with the presence of the condition (high PPV). However, when the condition is rare and thus the population is at low risk of having the condition, even if the test's specificity if high, positive results are likely to be false positives (Hennekens & Buring, 1987).

Table 3: Sensitivity, Specificity, Positive and Negative Predictive values

		Gold Standard		Total
		Positive	Negative	
Screener	Positive	a	b	a/a+b
	Negative	c	d	d/c+d
Total		a/a+c	d/b+d	a+b+c+d

a/a+c = Proportion of true positives (sensitivity)
d/b+d = Proportion of true negatives (specificity)
a/a+b = Number of correctly identified positives (positive predictive value)
d/c+d = Number of correctly identified negatives (negative predictive value)

Table 4: Summary of the findings of SCOFF validation studies to date.

Authors, year	Country	Study Population, N	Age range, years	Gender	Comparison measure	Sensitivity (%, 95%CI)	Specificity (%, 95%CI)	PPV (%, 95%CI)	NPV (%, 95%CI)
Morgan et al, 1999	UK	Community and clinical, 212 (116 clinical, 96 community)	Clinical (18-40) Community (18-39)	Female	Clinical diagnosis DSM-IV criteria	100	87.5	NR	NR
Luck et al, 2002	UK	Community, 341	18 - 50	Female	Clinical diagnosis DSM-IV criteria	84.6	89.6	24	99.3
Cotton et al, 2003	UK	Community and clinical, 233 (109 clinical, 129 community)	18-44 (community) 22 - 64 (Clinical)	Female	Q-EDD	78	88	NR	NR
Garcia-Campayo et al, 2004	Spain	Clinical, 203	15-53	Female	SCAN	97.7	94.4	81	93.1
Siervo et al 2005	Italy	Clinical, 162	16 – 35	Female	EAT – 26 TFEQ	94 77	21 50	NR	NR
Muro-Sans et al, 2008	Spain	Community, 954	10.9 – 17.3	Males, females	EDI – 2	73.1	77.8	NR	NR

Authors, year	Country	Study Population, N	Age range, years	Gender	Comparison measure	Sensitivity (%, 95%CI)	Specificity (%, 95%CI)	PPV (%, 95%CI)	NPV (%, 95%CI)
Mond et al, 2008	UK	Clinical, 257	18 – 40	Female	EDE – Q	72	73	35	NR
Leung et al, 2009	China	Community, 812	12 - 25	Males, females	EDE – Q	76.1	96.1	NR	NR
Lähteenmäki et al, 2009	Finland	Community, 541	20 – 35	Males, females	SCID-I	77.8	87.6	9.7	99.6
Duarte Garcia et al, 2010	France	Community, 400	18 – 35	Males, females	MINI	94.6	94.8	65	99
Pannocchia et al, 2011	Italy	93 Clinical, and community (62 Clinical, 31 community)	Adult (NR)	Female	EDI – 3	97	87	NR	NR

Abbreviations: NR not reported, EDE-Q Eating Disorder Examination Questionnaire; SCID-I Structured Clinical interview for DSM-IV Axis I Disorders, MINI Mini International Neuropsychiatric Interview, CIDI Composite International Diagnostic Interview, Q-EDD Questionnaire for Eating Disorder Diagnosis, SCAN Schedules for Clinical Assessment in Neuropsychiatry, EAT- 26 Eating Attitude Test, EDI – 2 Eating Disorder Inventory, TFEQ Three Factor Eating Questionnaire, PPV Positive Predictive Value

Structured Clinical Interview for DSM-IV Axis I Disorders Research Version Non-Patient edition (SCID-I-NP)– Eating Disorders Section – ED diagnoses

The Structured Clinical Interview for DSM-IV Axis I disorders research version non-patient edition (SCID-I-NP) was used in SELCOHII to interview the sub-sample of SELCOHI participants who were eligible for inclusion in the ED module.

The SCID-I is a semi-structured interview employed to diagnose DSM-IV-defined mental health disorders (American Psychiatric Association, 2000). The non-patient edition is preferred to the patient one when the individuals are not *a priori* identified as psychiatric cases (e.g. in general population studies, primary care settings). It contains a broader overview section at its beginning, as no assumption is made on a chief complaint; therefore more questions are asked to investigate the interviewee's general psychopathology.

Section H of the SCID-I, dedicated to ED, contains a series of open ended questions on the main ED symptoms (e.g. weight loss, amenorrhea, bingeing and purging behaviours) and cognitions (e.g. fear of fatness, body and shape concerns) aimed at eliciting the information necessary to allow the interviewer to establish whether each of the criteria necessary for the diagnosis of the ED is present. Each question is also followed by specific 'cue' questions designed to elicit additional information about behaviours and cognitions and help the interviewer better assessing presence or absence of the behaviours.

Each criterion-based question can be answered on a scale from 1 to 3, meaning: 1 'criterion not met', 2 'sub-threshold criterion', and 3 'criterion met'. Usually, since presence of all criteria is necessary to ascertain diagnosis, interviewers are instructed to apply skip rules when individuals do not meet threshold levels for individual criteria. However, since central to the aims of one of study 3 (chapter 6) of this thesis was to investigate

prevalence of sub-threshold diagnoses in the study population, the application of skip rules would have meant overlooking potential behaviours or cognitions happening in absence of others. Use of the SCID-I with skip rules does not allow the diagnosis of sub-threshold conditions and there is evidence that using skip rules might also underestimate the prevalence of diagnoses (Swanson et al., 2011). For instance, in the BN section, if a participant does not recall experiencing loss of control eating, they are not asked about purging or non-purging compensatory behaviours. This implies that individuals who purge or engage in excessive exercising or dieting without having binged would be missed by the interview with consequent loss of information on a participant's behaviours. Therefore, interviewers were instructed not to apply skip rules and each participant was asked each question of the AN and BN sections of the SCID-I. The BED section was asked only if the participant had reported binge eating episodes in the BN section. The words 'eating disorders' were changed into 'eating behaviours' in the information sheet, consent form, and SCID-I interview to blind participants as much as possible with respect to the outcomes investigated and minimise non-response and information biases (see Appendix II – Eating disorder module SELCoHII) for a copy of the information sheet, consent form and section H of the SCID-I interview that were used to conduct SELCoHII ED modules interviews).

Since participants were only asked to provide information on their eating behaviours at the time that they had completed the SCOFF questionnaire or behaviours that they had had since, the chronology section of the SCID-I was not employed. If a participant had reported having had one behaviour at the time of the SCOFF questionnaire (June 2008 – December 2010) and a different one afterwards (and before undergoing the SCID-I assessment: September 2011 – July 2012), the one occurring at the time of the SCOFF questionnaire was recorded. If a participant did not have an ED diagnosis at the time of the SELCoHI questionnaire, but reported symptoms relating to the interval between SELCOHI and SELCoHII, the diagnosis (or behaviours)

were recorded, but the diagnosis was not employed in study 2 (chapter 4) related to the validation of the SCOFF.

The ED module of the SCID-I questionnaire has been shown to have moderate to good inter-rater reliability. A study using 84 rater pairs from 4 different sites found a kappa coefficient of 0.77 (Zanarini & Frankenburg, 2001), another one performing test-retest analyses in a 7-10 days interval reported a kappa coefficient of 0.64 (Zanarini et al., 2000), and, finally, a study with joint scoring of SCID-I interviews which were audio-taped found a kappa coefficient of 0.61 (Lobbestael, Leurgans, & Arntz, 2011).

3.4.4 Other variables and measures

As stated above, the core SELCoH team collected all of the main socio-demographic and anthropometric measures in SELCoHI using a combination of self-reported measures obtained during a computer-assisted interview and objective measurements. In SELCoHII, no objective anthropometric measurements were undertaken. Below is a description of all variables that were employed in studies 1-3 (chapters 4-6), as they were collected in both waves of the study. Table 5 provides a summary of the variables which were employed in the studies included in this thesis. More information on each of them is provided in the following section.

Table 5: Summary of variables used, time point of collection, type of variable, and chapters in which they were employed

Variables	Time point	Type	Chapter
Socio-demographic			
Age, marital status, education	SELCoHI	Self-reported	4,6
Ethnicity	SELCoHI	Self-reported	4,5,6
Body Mass Index	SELCoHI	Derived from objective anthropometric measurements	4,6
Comorbidity			
Alcohol	SELCoHI	AUDIT	4,6
Smoke, drugs, suicidality, help-seeking	SELCoHI	Self-reported	4,6
Personality disorder	SELCoHI	SAPAS	4,6
Post-traumatic stress disorder	SELCoHI	PC-PTSD	4,6
Common Mental Disorder	SELCoHI	CI-R	4,6
Eating disorders			
Disordered eating	SELCoHI	SCOFF	4,5
ED diagnosis	SELCoHII	SCID-I-NP	5,6

Socio-demographic characteristics

Age

Age was calculated from the participants' date of birth, which was collected, in SELCOHI, as part of the core computer-based assessment.

Ethnicity

In SELCoHI participants were asked to indicate which ethnic group they identified themselves with. Possible answers were: White; Black Caribbean; Black African; other Black groups; Indian; Pakistani; Bangladeshi; Chinese; none of these.

Education

In SELCOHI, participants were asked to provide information on the highest level of education they had achieved. Possible answers were: (i) no qualifications; (ii) below General Certificate of Secondary Education (GCSE); (iii) GCSE level or equivalent (General Certificate of Education Ordinary 'O levels', National Vocational Qualification (NVQ) level 1-2); (iv) A-level or equivalent (Higher National Diploma (HND), NVQ level 3, Highers); (v) degree level qualification or above; (vi) other qualification.

Marital Status

Participants were asked in SELCoHI to choose the option which better described their marital status amongst the following: (i) single/never married; (ii) single and living with your partner; (iii) married and living with your husband/wife; (iv) married and separated from your husband/wife; (v) divorced; (iv) widowed.]

Anthropometric measures

Body Mass Index (BMI)

Objective measurements of height and weight were collected in SELCOHI. From those, a BMI variable was calculated using the formula:

$$BMI = weight/height^2 = Kg/m^2$$

Continuous BMI values obtained were subsequently categorised as a 4-level ordered categorical variable indicating whether the participant was: underweight (min >18.5), normal weight (18.5 < 25), overweight (25 < 30), or obese (30 < max), according to the World Health Organization suggested cut-offs (WHO, 1995). In the analyses Cole's BMI cut-offs for adolescents were not used given the small percentage of participants aged 16 – 18 years (1.4%), which is unlikely to bias the results (Cole, Flegal, Nicholls, & Jackson, 2007; Cole, 2000).

Comorbidity measures

Drinking

In SELCoHI patterns of alcohol consumption were assessed with the Alcohol Use Disorders Identification Test (AUDIT)(Babor, Higgins-Biddle, Saunders, & Monteiro, 2001), a screening tool created by the World Health Organization (WHO) to measure excessive drinking. The AUDIT comprises 10 questions scored on a Likert scale ranging from 0-4 points (0=never, 1=less than monthly, 2=monthly, 3=weekly, 4=daily or almost daily). Individual scores for each question are added together to generate an overall score, which is subsequently recoded into an ordered categorical variable. Suggested cut-offs are: 0-7 'healthy drinking', 8-15 'hazardous drinking', 16-19 'hazardous and harmful drinking', and 20 or more 'alcohol dependence'(Babor et al., 2001). In the studies contained in this thesis, 'hazardous and harmful drinking' and 'alcohol dependence' were merged into a single category to increase the power of the analyses. The AUDIT has been reported to be culturally appropriate and internationally applicable (Cherpitel, 1995; Conigrave, Hall, & Saunders, 1995; Ivis, Adlaf, & Rehm, 2000; Piccinelli et al., 1997; Steinbauer, Cantor, Holzer, & Volk, 1998; Volk, Steinbauer, Cantor, & Holzer 3rd, 1997), as well as to have high levels of internal consistency and reliability(de Meneses-Gaya, Zuardi, Loureiro, & Crippa, 2009) with total scores reflecting 'the extent of alcohol involvement along a broad continuum of severity'(Babor et al., 2001).

Smoking

In SELCoHI, participants were asked whether they had ever smoked or not ('have you ever smoked a cigarette? 'yes/no'). If they answered yes, they were prompted to an additional set of questions aimed at gauging their current smoking status ('do you smoke cigarettes at all nowadays? 'yes/no') and frequency of smoking ('about how many cigarettes a day do you usually smoke?). Participants were also asked how old they were when they started smoking regularly (possible answers: (i) never smoked cigarettes regularly; (ii) under 10; (iii) 10-14; (iv) 15-19; (v) 20-24; (vi) 25 or over), and, if they indicated that they did not smoke at present, how long before they had

stopped smoking cigarettes regularly (possible answers: (i) less than 6 months ago; (ii) 6 months but less than a year ago; (iii) 1 year but less than 2 years ago; (iv) 2 years but less than 5 years ago; (v) 5 years but less than 10 years ago; (vi) 10 years or more ago). From these questions, a variable identifying participants' smoking status as: (i) 'never smoked'; (ii) 'ex-smoker'; (iii) 'sporadic smoker'; and (iv) 'current smoker' was generated. This variable was subsequently recoded as a three-level categorical variable describing participants' smoking habits as: (i) 'never smoked'; (ii) 'ex-smoker'; (iii) 'current smoker' (regardless of frequency of smoking).

Drug use

In SELCoHI, participants were asked about drug consumption in the 12 months prior to assessment. Drugs included in the questionnaire are: Cannabis, Amphetamines, Cocaine, Ecstasy, Acid or LSD, Tranquillisers, Crack, and Heroin. From the individual answers a summary variable was subsequently created indicating whether the participant had tried at least one drug in the 12 months prior to assessment.

Post-traumatic stress disorder (PTSD)

The Primary Care Post-traumatic stress disorder scale (PC-PTSD), a 4-item screening measure designed for use in primary care and other medical settings (Prins et al., 2004), was employed to screen for PTSD in SELCoHI. The questionnaire was introduced by a question on whether the participant had ever had a 'bad experience' in their lives defined as "seeing bad things in a combat situation, seeing someone killed or seriously injured, a serious car accident, having a loved one die by murder or suicide, or any other experience that either put you or someone close to you at risk of serious harm or death". If the participant answered 'yes' to this first question, they were prompted to the following questions:

1. Have you had nightmares about it or thought about it when you did not want to? (Yes =1, no=0)
2. Have you tried hard not to think about it or went out of your way to avoid situations that reminded you of it? (Yes =1, no=0)

3. Have you been constantly on guard, watchful or easily startled? (Yes =1, no=0)
4. Have you felt numb or detached from others, activities, or your surroundings? (Yes =1, no=0)

A cut-off of three 'yes' answers, which was also used in this study, has been found to have good levels of sensitivity (76%-78%) and specificity (87%-93%) when validated against clinical diagnostic interviews, such as the clinician-Administered PTSD Scale (CAPS) (Bliese et al., 2008; Frissa, Hatch, Gazard, Fear, & Hotopf, 2013; Prins et al., 2004).

Personality disorders

In SELCoHI, personality disorders were screened for using the Standardised Assessment of Personality – Abbreviated Scale (SAPAS)(Moran, 2003) during the computer-assisted core questionnaire. The SAPAS is an 8-item questionnaire in which each question addresses a personality aspect and can be answered 'YES/NO' with a respective score of 1 and 0, as shown below:

1. In general, do you have difficulty making and keeping friends? (Yes =1, no=0)
2. Would you normally describe yourself as a loner? (Yes=1, no=0)
3. In general, do you trust other people? (Yes =0, no=1)
4. Do you normally lose your temper easily? (Yes =1, no=0)
5. Are you normally an impulsive sort of person? (Yes =1, no=0)
6. Are you normally a worrier? (Yes =1, no=0)
7. In general, do you depend on others a lot? (Yes =1, no=0)
8. In general, are you a perfectionist? (Yes =1, no=0)

Previous studies have identified a cut-off of 3 or 4 as maximising sensitivity and specificity of the instrument (Kongerslev, Moran, Bo, & Simonsen, 2012; Moran, 2003; Pluck, Sirdifield, Brooker, & Moran, 2012), although the extent of positive predictive value of the SAPAS in a general population sample has not been validated yet. In this study, in line with guidelines provided by the

researchers responsible for this module, a cut-off of 4 yes answers was used to define individuals with a potential personality disorder.

General psychopathology

In SELCoHI psychiatric comorbidity was measured with the Revised Clinical Interview Schedule (CI–R)(Lewis, Pelosi, Araya, & Dunn, 1992), a 14-item structured questionnaire designed to be used by lay interviewers' in non-clinical settings to assess depressive and anxiety symptoms whilst minimising observer variation (Botega, Pereira, Bio, Garcia Júnior, & Zomignani, 1995). Its questions cover a number of neurotic symptoms and are scored on a scale from 0 to 4, or 0 to 5 (in the case of the depressive ideas scale). Scores above a cut-off of 12 points indicate suspected presence of a common mental disorder (CMD) and a logarithm can be employed to derive primary and secondary diagnoses (Lewis et al., 1992; Patton, 1518). 'Primary diagnosis' was used as outcome measure in studies 1 & 3 (Chapters 4 & 6). The possible diagnoses are: no psychiatric disorders; non-specified neurotic disorder; mild generalised anxiety disorder; obsessive compulsive disorder; mixed anxiety and depressive disorder; specific isolated phobia; social phobia; agoraphobia; generalised anxiety disorder; panic disorder; mild depressive episode; moderate depressive disorder/moderate depressive episode; severe depressive episode.

Suicidality

Suicidal ideation was assessed with the question: "have you ever thought of taking your own life, even if you would not really do it?" and suicide attempt with the question: "have you ever made an attempt to take your life, by taking an overdose or in some other way?". Both of these items had been previously employed by the British National Psychiatric Morbidity surveys in 2000 and 2007 (Aschan et al., 2013; Meltzer et al., 2002; Nicholson, Jenkins, & Meltzer, 2009).

Health service use

In SELCoHI all participants were asked whether they had sought help from a GP or a therapist for a problem with anxiety, depression or another mental, nervous or emotional problem in the previous year. Those who answered positively to this first screening question were directed to a set of follow-up questions about whether they had seen a GP, therapist or counsellor, or a mental health specialist. Participants were also asked whether they had received a series of diagnoses. Each diagnosis was asked about individually to account for the possibility of multiple diagnoses.

3.5 Data Analyses

Details on specific analyses conducted will be presented in each individual result chapter, therefore this section is meant to be a general summary of analyses conducted. All analyses were conducted using Stata 12.0 (StataCorp, 2011) software and SPSS 18.0 (SPSS Inc, 2009) was employed at data entry stage.

Results are two-tailed and P-values of 0.05 and 95% Confidence Intervals were used to test the null-hypothesis of no difference between exposed and unexposed groups. All variables were tested for normality before applying parametric tests. Survey weighting were applied to the dataset (-svyset command) prior to undertaking analyses. Univariate and multivariate logistic regression analyses were employed.

Attrition will be reported in each individual results chapter. Missing socio-demographic data was assumed to be missing at random. Under this assumption, the missing mechanism is believed to depend on differences in the observed values, rather than in the unobserved ones. Therefore multiple imputation by chained equation using multivariate models with 5 imputations was used to impute missing values on BMI (missing: 3.5%), ethnicity (missing: 0.1%) and education (missing: 1.1%) socio-demographic

variables. All analyses were run on individuals with complete information on the outcomes under investigation.

3.6 Role of the researcher

SELCOH

Francesca Solmi conducted part (n=81, 55%) of the semi-structured interviews to participants to the SELCOHII study, which were used in studies 2, 3 and 4 using the Structured Clinical Interview for DSM Disorders – Fourth Edition (SCID-IV). The remaining 66 (45%) were conducted by members of the SELCOH team. Francesca Solmi created and coded the corresponding dataset, supplementing it with variables derived from the semi-structured interview; and conducted all of the data analyses under the supervision of Dr Nadia Micali and Dr Anna Pearce.

3.7. Ethics approval

Ethics committee approval was sought prior to undertaking this study, which has been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

Ethics approval was obtained from King's College (Studies 1, 2 & 3 – Chapters 4, 5 & 6) (Ethics approval codes: CREC/07/08-152 for SELCoHI and PNM/10/11-106 for SELCoHII).

3.8 Conclusions

In summary, this chapter has provided an overview of:

- ✓ the general aims of the studies 1, 2 & 3 which employ data from the SELCoHI and SELCoHII surveys;
- ✓ the aims and structure of the SELCoHI and SELCoHII surveys, as well as an description of recruitment of participants, participation rates, and data collection;
- ✓ the ED module rationale, training of interviewer and data collection;
- ✓ the measures and variables employed;
- ✓ the type of analyses conducted.

The following three chapters present the results of the studies conducted using data from the SELCoH survey, following on to the aims expressed in Section 3.2.

Chapter 4
Prevalence and correlates of disordered eating in a South East London general population sample

Parts of this chapter appear in the article Solmi, F.; Hatch, S.; Hotopf, M.; Treasure, J., Micali, N. (under review) 'Prevalence and correlates of disordered eating in a general population sample: the South East London Community Health (SELCoH) study'.

4.1. Introduction

As has been discussed in Chapter 1, disordered eating is more prevalent than full ED diagnoses in the general population, although they often go undetected for several reasons.

Prevalence of eating disorders not otherwise specified (EDNOS) (the majority of all ED cases diagnosed, in outpatient and general population settings) has been estimated to be in the range of 2% to 5%(Fairburn & Bohn, 2005; Hay et al., 2008; Machado, Machado, Gonçalves, & Hoek, 2007; Smink, van Hoeken, & Hoek, 2012). Prevalence figures for disordered eating are higher than those reported for EDNOS, in both adolescents and adults, although they appear to be higher in the former. Research has shown that, amongst adolescents, 30% to 60% of girls and 15% to 30% of boys report disordered eating practices (Croll et al., 2002; Herpertz-Dahlmann et al., 2008).

Research on adults suggests that prevalence of disordered eating is also elevated. In a study of 2,520 participants, Hilbert et al found that 3.9% of participants (5.9% women and 1.5% men) reported ED behaviours, with prevalence being higher among younger and overweight to obese individuals (Hilbert et al., 2012). Similarly, McBride et al using data from the UK National Adult Psychiatric Comorbidity Survey 2007 (N=7,001) found

9.1% of women and 3.4 of men endorsed disordered eating (McBride et al., 2012). Despite higher prevalence,

Literature suggests sub-threshold diagnoses, and ED behaviours and cognitions might be precursors of full-ED (Lena et al., 2004; Neumark-Sztainer et al., 2006); therefore achieving a better understanding of the prevalence and presentation of disordered eating in the general population could yield important information for the formulation of preventative programmes.

As discussed at greater length in Chapter 2, individuals with sub-threshold ED and disordered eating, whilst not meeting full criteria for a full ED diagnosis, have been found to have similar comorbid behaviours to those seen in individuals with full diagnoses., Evidence suggests, for instance, individuals with disordered eating have increased odds of reporting comorbid mood (Field et al., 2012; Herpertz-Dahlmann et al., 2008; Keel, Wolfe, Gravener, & Jimerson, 2008; McBride et al., 2012) and anxiety disorders (Herpertz-Dahlmann et al., 2008; McBride et al., 2012), of attempting suicide(Le Grange, Swanson, Crow, & Merikangas, 2012; Wade, 2007), and having substance use disorders (Field et al., 2012).

The majority of studies conducted in 'Western' countries have employed samples composed mostly of Caucasian women. Therefore, little is known on the manifestation, epidemiology and comorbidity of disordered eating among men (Strother, Lemberg, Stanford, & Turberville, 2012), and individuals from ethnic minority groups, especially in the UK, despite a surge in research in the past decade. Evidence presented earlier in this thesis (Chapter 2) suggests an increase of disordered eating in individuals belonging to ethnic minorities, which is often undetected in primary care (Becker, Franko, Speck, & Herzog, 2003; Strother et al., 2012).

It is documented in the literature that individuals suffering from ED do not often seek help for their condition. Several studies have reported that

approximately half of ED cases seek help through primary care and a minority of those reach specialised services (Hudson, Hiripi, Pope Jr, & Kessler, 2007; Lewinsohn, Striegel-Moore, & Seeley, 2000; Reid, Williams, & Hammersley, 2009). There is little evidence on the patterns of health service use amongst individuals with disordered eating despite evidence on its comorbidity with other psychiatric conditions.

Literature on disordered eating in the general population, its comorbidity, and its association with socio-demographic and anthropometric indicators such as gender, ethnicity, and body mass index (BMI) is limited. A better knowledge of symptomatology of disordered eating, as well as its comorbidity in the general population, could help provide better treatment and prevention programmes.

4.2. Aims and hypotheses

The main aims of this chapter are:

- ✓ To estimate the prevalence of disordered eating in a general population sample based in South East London, UK;
- ✓ To explore differences in disordered eating across gender, ethnicity, and Body Mass Index (BMI) groups;
- ✓ To investigate the comorbidity between disordered eating and a number of psychiatric conditions
- ✓ To explore patterns of service use among individuals with disordered eating.

The hypotheses driving this study are that:

- ✓ disordered eating will be highly prevalent and associated with similar comorbidity as that found in individuals with ED;
- ✓ disordered eating will be equally prevalent amongst ethnic minority groups, than amongst White Caucasians;
- ✓ most participants will have sought help for a mental health problem through their GP, although fewer from more specialised services.

4.3. Methods

4.3.1 Study design and population

This is a cross-sectional investigation of the prevalence and correlates of disordered eating using survey data from the South East London Community Health (SELCoHI) study phase 1. Full details on the sampling and recruitment procedures as well as representativeness of the sample are provided in Chapter 3.

4.3.2 Measures

SCOFF

Disordered eating was assessed using the SCOFF (Sick, Control, One Stone, Fat, Food), a 5-item questionnaire developed by Morgan and colleagues (Morgan et al., 1999, 2000) as a screening tool for individuals presenting to clinical settings with a suspected ED. As suggested by previous literature (presented in more detail in section 3.4.3) a cut-off of 2 positive answers was used to indicate the presence of ED behaviours. Both a 'SCOFF positive' status (e.g. ≥2 yes answers to the SCOFF) employed as a measure of disordered eating, and individual questions of the SCOFF were used as outcome measures when investigating associations between BMI and socio-demographic characteristics, disordered eating and individual ED cognitions and behaviours.

Previous literature has employed a screen positive status to the SCOFF as a measure of disordered eating (Herpertz-Dahlmann et al., 2008; McBride et al., 2012). The rationale for replicating this choice in this thesis stems from the necessity to differentiate any disordered eating (e.g. dieting only, or fasting only) which is extremely common in the population (as discussed in Chapter 1) from more serious presentations that are being investigated as of potential clinical relevance. Additional analyses showing associations between a positive answer to each question individually and investigated outcomes is provided in Appendix I, but will only briefly be discussed in the result section.

Psychiatric outcomes

A number of psychiatric outcomes that are known from literature to be associated with ED (presented in detail in Chapter 2) have been investigated in this study. A detailed outline of each measure is provided in Section 3.4.4. Below is a short summary of the measures that have been used for the analyses included in this chapter, as well as an explanation of how they have been recoded (if at all), and the rationale for these choices:

Common Mental Disorder (CMD) was measured using the CIS-R scale. For the purposes of this study the possible outcomes measured by the scale as 'first diagnosis' were coded into a three-level variable indicating 'no diagnosis', 'non specified neurotic disorders' and 'mood, anxiety and mixed mood, and anxiety disorders'. This was done in order to increase power of analyses given the low prevalence of the conditions.

Personality Disorders were screened for using the Standardised Assessment of Personality – Abbreviated Scale (SAPAS)(Moran, 2003), with a cut-off of four positive answers used to indicate possible presence of personality disorder.

Post-Traumatic Stress Disorder was assessed using the Primary Care Post-traumatic stress disorder scale (PC-PTSD), a 4-item screening measure designed for use in primary care and other medical settings (Frissa et al., 2013). A cut-off of three yes answers was used to derive a binary variable indicating presence or absence of PTSD.

Suicidality was measured with a binary variable indicating whether the participant had ever thought of or attempted suicide or not.

Alcohol use was measured using the Alcohol Use Disorders Identification Test (AUDIT)(Babor et al., 2001). From the 4 original categories of: 'healthy

drinking'; 'hazardous drinking'; 'hazardous and harmful drinking'; and 'alcohol dependence' a three-level variable was created by merging the last two categories (hazardous and harmful drinking and alcohol dependence). This choice was motivated by the need to increase the power of the analyses given the low prevalence of alcohol dependence.

Substance use was investigated by creating a binary variable indicating use of one or more of the following drugs in 12 months prior to interview: Cannabis, Amphetamines, Cocaine, Ecstasy, Acid or LSD, Tranquillisers, Crack, and Heroin.

Smoking was measured by creating a variable indicating whether participants were: 'non-smokers'; 'past smokers'; or 'current smokers'. The current smoker category was generated by merging sporadic and current smokers as the aim was to measure smoking status rather than frequency.

Socio-demographic characteristics and Body Mass Index

Socio-demographic characteristics (e.g. ethnicity, gender, age) as well as Body Mass Index (BMI) of study participants were investigated both as potential risk factors for disordered eating and thus used as 'exposure variables' in the analyses, and as potential 'a priori' confounders of the association between disordered eating and psychiatric comorbidity based on previous literature. All measures, except for Body Mass Index (BMI) which was objectively measured, were self-reported by participants as part of the core SELCoH assessment. A detailed description of each variable is provided in section 3.4.3. Below is a short summary of how they were coded for this study:

BMI was recoded into a 4 level variable indicating whether a subject was 'underweight'; 'normal weight'; 'overweight'; or 'obese'.

Age was used as a six-level categorical variable (16-24; 25-34; 35-44; 45-54; 55-64; 65+).

Ethnicity was simplified into a four level categorical variable indicating: 'White'; 'Black African or Caribbean'; 'Asian'; or 'Other' ethnicity.

Education was coded as a three-level categorical variable indicating whether the subject had 'no qualifications'; 'completed GCSE and/or A-levels'; or 'had a higher degree or above'.

Marital status was recoded as a four-level categorical variable indicating 'single'; 'married or cohabiting'; ' divorced or separated'; or 'widowed'.

Health service use

Questions on health service use were explained in section 3.4.4. Each question was coded as a binary 'yes/no' variable. Participants were asked if they had seen a GP or therapist for a problem with anxiety, depression or other mental condition or emotional issues in the previous year. If the answer was yes they were additionally asked if they had seen: (i) a GP; (ii) a therapist or counsellor; or a (iii) mental health specialist. Finally, whether participants received an ED diagnosis or not was recorded in a separate variable.

4.3.3 Power calculations

Given that our sample had 1,645 participants and a prevalence of exposed (participants with disordered eating) of 10% we had >79% power to detect an OR of 1.5 or above and >98% power to detect an OR of 1.7 or above for associations between predictor and common outcomes. Given an alpha level of 0.05; we had >90% power to detect OR of 2.0 or above for associations between predictors and less common (10% and 5%, respectively) outcomes given an alpha level of 0.05 (see table 6)

Table 6: Power calculation of associations between study exposure (disordered eating) and outcomes

Prevalence of exposure	Rate of outcome in exposed	Rate of outcome in unexposed	OR	Power
10%	25%	20%	1.2	30%
10%	30%	20%	1.5	79%
10%	35%	20%	1.7	98%
10%	15%	10%	1.5	46%
10%	20%	10%	2.0	92%
10%	7%	5%	1.4	17%
10%	10%	5%	2	65%
10%	13%	5%	2.4	92%

4.3.4 Data analyses

Analyses were conducted accounting for household clustering and weighted for non-response within household. In survey studies, weighting data for non-response is necessary to correct for non-response bias, and to generate accurate prevalence estimates and robust standard errors. Hatch et al have described elsewhere how inverse probability weights were calculated for the SELCOHI sample (Hatch et al., 2011, 2012).

Associations between socio-demographic variables and SCOFF positive status were described using un-weighted frequencies and weighted prevalence and 95% CI were calculated and tested for differences with Pearson's $\chi 2$ tests with Rao-Scott correction for categorical data from survey samples (Rao & Scott, 1987). Missing data on socio-demographic variables was assumed to be missing at random (MAR). Missing values for socio-demographic categorical variables (BMI: 3.5% missing; ethnicity: 0.1%

missing; education: 1.1% missing) were imputed using multiple imputation by chained equations (van Buuren, Boshuizen, & Knook, 1999) from multinomial logistic models. Five imputation models were created by substituting missing values from a set of imputations models constructed from all other correlates and outcomes used in the analyses. Distribution of imputed values was visually inspected to ensure comparability with the observed value. All analyses were run on individuals with complete outcome data.

Univariate and multivariate logistic and multinomial logistic regressions were employed to calculate Odds Ratios (OR) (for binary outcomes) and Relative Risk Ratios (RRR) (for categorical outcomes) and 95% confidence intervals (CI) for the association between disordered eating and psychological outcomes and help-seeking behaviour. In the multivariate model, analyses were adjusted for a number of socio-demographic covariates thought a priori to be potential confounders of the association between the exposure (disordered eating) and outcomes of interest (psychiatric comorbidity). In addition to socio-demographic covariates, help-seeking outcomes were also adjusted for mood and anxiety disorders, as the question asked if the participants had sought professional help for 'problems with anxiety and depression in the previous year'.

4.4. Results

4.4.1 Socio-demographic characteristics of SELCoHI sample

A total sample of 1,698 individuals (age 16 to 90) took part in SELCOHI. As shown in table 1, the majority of participants included in the analyses (96.8%) were women (56.6%), were educated at least to GCSE/A-levels (45.4%) and were from a white background (62.4%). However, the sample reflected the ethnic diversity of the studied area and included 22% of participants from a black ethnic background (African or Caribbean), 3.7% from Asian or British Asian background, and 12% from mixed or other backgrounds. Mean age for the sample was 39.6(SD: 16.8) with the age group 25-34 years being the most represented (24.1%) in the sample. The majority of the sample lived with a partner (45.8%) followed by a large proportion of participants who were single (40.3%), perhaps reflecting the young age distribution of the sample.

4.4.2 Missing data and attrition

A total of 1,645 (96.8%) participants had complete data on all of the outcomes and were therefore included in the analyses. As shown in Table 8, lowest education level ($p<0.0001$) and older (55+) age ($p<0.0001$) were associated with missingness (Table 8). Among participants included in the analyses 95% had complete data on all covariates; 3.5% had missing data on BMI, 1.1% on education, 0.1% on ethnicity..

Table 7: Socio-demographic characteristics of the SELCoHI sample

	N(%)
Total Sample	1,645
Gender	
Male	714(43.4)
Female	931(56.6)
Marital Status	
Single	665(40.3)
Married/Cohabiting	754(45.8)
Divorced/separated/widowed	226(13.8)
Ethnicity* (N=1,643)	
White	1,024(62.4)
Black	362(22)
Asian	60(3.7)
Other	197(12)
Education *(N=1,626)	
No qualification	208(12.8)
GCSE/A-level	738(45.4)
Degree Level or above	680(41.8)
BMI *(N=1,586)	
Underweight	39(2.5)
Normal weight	708(44.7)
Overweight	507(32)
Obese	332(20.9)
Age	
16-24	352(21.4)
25-34	396(24.1)
35-44	328(19.9)
45-54	252(15.3)
55-64	152(9.2)
65+	165(10.4)

* Unweighted frequencies, due to missing data might not add up to the full sample

Table 8: Distribution of socio-demographic characteristics across participants with full information or some missing information on outcome variables

	Missing N(%)	Non-missing N(%)	$p(\chi^2)$
Total	54(3.2)	1645(96.8)	
Gender			
Male	25(3.4)	714(96.6)	0.6
Female	28(2.9)	931(97.1)	
Marital Status			
Single	13(1.9)	665(98.1)	
Married/Cohabiting	32(4.1)	754(95.9)	0.06
Divorced/separated/widowed	8(3.4)	226(96.6)	
Ethnicity			
White	27(2.6)	1,024(97.4)	
Black	15(4)	362(96)	0.4
Asian	3(4.8)	60(95.2)	
Other	8(3.9)	197(96.1)	
Education			
No qualification	20(8.8)	208(91.2)	
GCSE/A-level	20(2.6)	738(97.4)	<0.0001
Degree Level or above	13(1.9)	680(98.1)	
Body Mass Index (BMI)			
Underweight	0(0)	39(100)	
Normal weight	21(2.9)	708(97.1)	0.6
Overweight	12(2.3)	507(97.7)	
Obese	7(2.1)	332(97.94)	
Age			
16-24	2(0.6)	352(99.4)	
25-34	10(2.5)	396(97.5)	
35-44	5(1.5)	328(98.5)	<0.0001
45-54	12(4.6)	252(95.5)	
55-64	13(7.9)	152(92.1)	
65+	11(6.3)	165(93.8)	

4.4.3 Prevalence of disordered eating

One hundred and sixty-four participants (N=164, 10%) reported disordered eating. The questions most frequently endorsed were question 2 related to perceived loss of control (N=215; 13.1%) and question 3 related to weight loss (N=206, 11.7%), as shown in Table 9.

Table 9: Prevalence and 95% CI of positive answers to each SCOFF question

SCOFF items	N	Prevalence (95%CI)*
Made yourself Sick	53	3.1(2.4-4.1)
Loss of Control	215	13.1(11.8-13.3)
Lost One Stone	206	11.7(10.3-13.4)
Believed to be Fat	113	6.9(5.7-8.3)
Food Dominates Life	154	9.6(8.2-11.3)

*Weighted percentages to account for survey design;

4.4.4 Disordered eating and socio-demographics

Socio-demographic characteristics and SCOFF status

As can be seen in table 9, more women (12.2%), and more participants from the youngest age group (16-24) reported disordered eating, as well as fewer individuals of White ethnicity (7.8%). Finally, more participants from the obese BMI group (13.8%; p=0.05) reported disordered eating.

Table 10: Prevalence and 95%CI for disordered eating (SCOFF score **≥2) across socio-demographic characteristics**

*Weighted percentages to account for survey design;

Socio-demographic characteristics	N	Scoff Positive		p-value**
		n	Prevalence* (95% CI)	
Total	1,645	164	10.1(8.6-11.8)	
Gender				
Male	714	42	5.9(4.3-7.9)	<0.0001
Female	931	122	12.2(10.2-14.5)	
Marital Status				
Single	665	74	11.7(9.3-14.7)	
Married/Cohabiting	754	63	8.3(6.5-10.7)	0.13
Divorced/separated/widowed	226	27	11.2(7.7-16.1)	
Ethnicity***	(1,643)			
White	1,024	80	7.9(6.2-9.8)	
Black	362	46	12.8(9.6-17)	0.001
Asian	60	9	14.8(7.5-27.2)	
Other	197	29	16.1(11.3-22.4)	
Education***	(1,626)			
No qualification	208	25	10.5(7-15.4)	
GCSE/A-level	738	87	12.4(10-15.2)	0.02
Degree Level or above	680	50	7.4(5.6-9.9)	
Body Mass Index (BMI) ***	(1,586)			
Underweight	39	4	11.4(4.4-26.3)	
Normal weight	708	58	8.2(6.3-10.6)	0.05
Overweight	507	48	9.6(7.2-12.7)	
Obese	332	47	13.9(10.4-18.3)	
Age				
16-24	352	52	16.1(12.2-20.9)	
25-34	396	42	11.7(8.6-15.6)	
35-44	328	28	9.4(6.6-13.2)	0.002
45-54	252	24	9.9(6.7-14.5)	
55-64	152	9	5.6(2.9-10.7)	
65+	165	9	5.5(2.8-10.4)	

**Pearson's c test with Rao & Scott correction for survey data.

***Unweighted frequencies, due to missing data might not add up to the full sample.

Ethnicity and disordered eating

The distribution of socio-demographic variables across individual SCOFF questions showed that mostly participants from the Asian and other ethnic background endorsed the question on purging behaviours. Participants of Asian ethnicity also mostly endorsed the loss of control eating and preoccupation with food questions, whereas participants of Black ethnicity that on weight loss (Table 11).

Strong associations were found between Black (OR: 1.7, 95%CI: 1.2-2.6), and other ethnicities (OR: 2.3, 95%CI: 1.4-3.6) and increased odds of reporting disordered eating compared to white ethnicity in the univariate model. However, once adjusting for other socio-demographic characteristics only 'other ethnic background' remained associated with the outcome (OR: 1.8, 95%CI: 1.1-3.0) (Table 12). When looking at associations between ethnic groups and individual SCOFF answers in multivariate models (Table 13) participants of Asian ethnicity had higher odds of endorsing the questions on purging (OR: 3.7, 95%CI: 1.4-9.9), loss of control (OR: 2.2, 95%CI: 1.1-4.2) and preoccupation with food (OR:3.1, 95%CI: 1.5-6.3); whereas other ethnicities reported greater odds of purging (OR:2.7, 95%CI 1.4-5.4), body image distortion (OR:2.2, 95%CI: 1.2-3.9), and preoccupation with food (OR: 2.4, 95%CI: 1.5-3.8). No associations were found between Black ethnicity and any of the SCOFF questions in multivariate models, although some evidence of association in univariate models was visible for purging, loss of control, and preoccupation with food (Table 13).

BMI and disordered eating

A greater proportion of participants with an obese or underweight BMI reported increased disordered eating (Table 6). As shown in Table 11, a greater proportion of the participants endorsing the loss of control question were from the overweight and obese categories, whereas underweight and obese participants endorsed the question on preoccupation with food in similar proportions. More underweight participants endorsed the question on purging behaviours.

In univariate models, being obese (OR: 1.7, 95%CI: 1.1-2.6), and in the multivariate models being overweight (OR: 1.5, 95%CI: 0.9-2.2) or obese (OR: 2.1, 95%CI: 1.3-3.4), was associated with disordered eating (table 6). In multivariate models being overweight was associated with loss of control (OR: 1.9, 95%CI: 1.3-2.8); whilst being obese was associated with loss of control (OR: 3.2, 95%CI: 2.2-4.9), weight loss (OR: 1.6, 95%CI: 1.0-2.5) and preoccupation with food (OR: 1.9, 95%CI: 1.2-3.2) (Table 13). A greater proportion of individuals who were underweight reported purging behaviours and preoccupation with food. However, these associations were not significant in multivariate models. It is possible that the small overall number of participants answering 'yes' to these questions were responsible for a lack of power to detect any differences.

Gender and disordered eating

Finally, female gender was associated with increased odds of having disordered eating in the multivariate model (OR: 2.1, 95%CI: 1.4-3.1) (Table 12). In univariate models, women had decreased odds of endorsing weight loss over the previous 3 months, although this association did not remain significant in multivariate models (Table 13). However, in adjusted models women had higher odds of endorsing the loss of control (OR: 1.9, 95%CI: 1.4-2.8) and body image distortion (OR: 2.5, 95%CI: 1.6-3.9) questions.

Table 11: Prevalence and 95%CI positive answers to each SCOFF item across socio-demographic characteristics of SELCoH sample (N=1,645).

Socio-demographic characteristic	Scoff Sick (Item 1)			Scoff Loss of Control (Item 2)			Scoff weight loss (Item 3)			Scoff body image distortion (Item 4)			Scoff food thoughts (Item 5)		
	n	Prevalence (95% CI)	p(χ^2)	n	Prevalence* (95% CI)	p(χ^2)	n	Prevalence* (95% CI)	p(χ^2)	n	Prevalence* (95% CI)	p(χ^2)	n	Prevalence* (95% CI)	p(χ^2)
Gender															
Male (N=714)	20	2.9(1.8-4.5)	0.7	60	8.3(6.5-10.6)	<0.0001	105	14.5(12-17.4)	0.007	29	3.7(2.6-5.3)	<0.0001	55	7.7(5.9-9.9)	0.06
Female (N=930)	33	3.2(2.3-4.6)		155	15.9(13.7-18.5)		101	10.2(8.4-12.3)		84	8.4(6.8-10.4)		99	10.5(8.7-12.7)	
Ethnicity															
White (N=1,024)	26	2.5(1.7-3.8)	0.006	115	11.5(9.6-13.7)	0.02	119	10.7(8.9-12.7)	0.01	56	5.5(4.2-7.2)	0.003	75	7.9(6.2-9.8)	<0.0001
Black (N=361)	9	2.4(1.2-5.1)		57	15.9(12.2-20.3)		64	16.4(12.8-20.9)		28	7.4(5.2-10.4)		33	9.1(6.5-12.7)	
Asian (N=60)	5	7.6(3.2-16.9)		11	22.1(13.4-34.1)		4	6.2(2.3-15.5)		5	8.4(3.1-21.1)		12	20.4(11.9-32.5)	
Other (N=197)	13	6.7(3.9-11.1)		32	16.9(12.1-23.3)		19	9.4(5.9-14.6)		24	13.6(8.9-19.9)		34	17.2(12.5-23.3)	
BMI															
Underweight (N=39)	2	5.7(1.5-19.6)	0.3	3	8.7(2.8-23.8)	<0.0001	2	4.7(1.1-17.9)	0.13	3	6.9(2.3-19.3)	0.4	5	12.7(5.4-27.2)	0.02
Normal weight (N=708)	28	3.7(2.6-5.4)		64	9.2(7.2-11.6)		83	11.1(8.9-13.5)		52	7.7(5.9-9)		55	7.6(5.8-12.2)	
Overweight (N=506)	10	2.1(1.1-3.8)		68	13.8(10.9-17.5)		57	10.6(8.2-13.6)		32	6.4(4.5-9)		45	9.1(6.8-12.2)	
Obese (N=332)	12	3.8(2-6.9)		72	21.3(17.1-26.2)		56	14.6(11.1-2)		18	4.9(2.9-8.1)		43	13.7(10.2-18.1)	
Age															
16-24 (N=352)	18	5.5(3.5-8.6)	0.06	51	16.1(12.2-21)	0.01	66	18.9(15.1-23.3)	0.0005	38	11.9(8.7-16.1)	0.002	42	12.2(9.1-16.3)	0.09
25-34 (N=396)	16	4.2(2.6-6.7)		56	15(11.6-19.1)		45	11(8.3-14.5)		25	6.7(4.6-9.8)		36	9.7(6.9-13.4)	
35-44 (N=327)	3	1.1(0.3-3.3)		39	12.3(9.1-16.5)		41	12.1(9-16.2)		23	7.4(4.9-11)		22	6.7(4.4-9.9)	
45-54 (N=252)	7	2.7(1.2-5.6)		37	15.6(11.4-20.8)		27	10.3(7.2-14.8)		19	7.7(4.9-11.8)		28	11.4(7.9-16.1)	
55-64 (N=152)	4	2.5(0.9-6.7)		23	15.7(10.6-22.8)		14	8.5(5.1-14.1)		4	2.6(0.9-7)		8	5.6(2.8-10.9)	
65+ (N=165)	5	2.5(1-6.1)		9	5.5(2.9-10.4)		13	6.7(3.9-11.4)		4	3(1.1-7.7)		18	11.4(7.3-17.2)	

*Weighted percentages to account for survey design.

Table 12: Crude and adjusted Odds ratios (ORs) and 95%CI of the association between ethnicity and BMI and disordered eating *

	N	n**	Crude OR (95% CI)	P-value	Adjusted OR*** (95% CI)	P-value
Total	1,645	164				
Ethnicity						
White	1,024	80	1.0	-	1.0	-
Black	362	46	1.7(1.15-2.61)	0.008	1.2(0.8-1.9)	0.4
Asian	60	9	2.0 (0.9-4.6)	0.08	1.9(0.9-4.6)	0.1
Other	197	29	2.3(1.4-3.6)	0.001	1.8(1.1-3)	0.02
BMI						
Underweight	39	4	1.3(0.4-3.8)	0.6	1.6(0.5-4.8)	0.3
Normal weight	708	58	1.0	-	-	-
Overweight	507	48	1.2(0.8-1.7)	0.4	1.5(0.9-2.2)	0.07
Obese	332	47	1.7(1.1-2.6)	0.01	2.1(1.3-3.4)	0.002
GENDER						
Male	714	42	1.0		1.0	
Female	931	122	2.2(1.5-3.2)	<0.0001	2.1(1.4-3.1)	<0.0001

* Multiple imputation models

** Number of SCOFF positive individuals

*** Adjusted for age, gender, BMI, marital status, ethnicity, and education

Table 13: Crude and adjusted Odds ratios (ORs) and 95%CI of the association between ethnicity and BMI and individual SCOFF answers***

Socio-demographic characteristics	SCOFF Sick (Item 1)		SCOFF Loss of Control (Item 2)		SCOFF weight loss (Item 3)		SCOFF body image distortion (Item 4)		SCOFF food thoughts (Item 5)	
	Crude OR (95% CI)	Adjusted OR§ (95% CI)	Crude OR (95% CI)	Adjusted OR§ (95% CI)	Crude OR (95% CI)	Adjusted OR§ (95% CI)	Crude OR (95% CI)	Adjusted OR§ (95% CI)	Crude OR (95% CI)	Adjusted OR§ (95% CI)
Gender										
Male (N=714)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Female (N=930)	1.1(0.6-2.0)	1.1(0.6-1.9)	2.1(1.5-2.9)**	1.9(1.4-2.8)**	0.7(0.5-0.9)*	0.6(0.4-0.8)	2.4(1.5-3.7)**	2.5(1.6-3.9)**	1.4(0.9-2)*	1.4(0.9-1.9)
Ethnicity										
White (N=1,024)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Black (N=361)	0.9(0.4-2.3)	0.9(0.4-2.3)	1.4(1-2.1)*	0.9(0.6-1.4)	1.6(1.2-2.3)*	1.2(0.8-1.8)	1.4(0.9-2.2)	1.1(0.7-1.8)	1.2(0.8-1.8)	0.9(0.6-1.6)
Asian (N=60)	3.1(1.2-8.5)*	3.7(1.4-9.9)*	2.2(1.2-4.1)*	2.2(1.1-4.2)*	0.6(0.2-1.6)	0.5(0.2-1.5)	1.6(0.5-4.8)	1.5(0.5-4.8)	3(1.5-5.9)*	3.1(1.5-6.3)*
Other (N=197)	2.8(1.4-5.5)*	2.7(1.4-5.4)*	1.6(1.0-2.4)*	1.3(0.8-2)	0.9(0.5-1.5)	0.7(0.4-1.2)	2.7(1.6-4.7)**	2.2(1.2-3.98)*	2.4(1.6-3.8)**	2.4(1.5-3.8)**
BMI										
Underweight (N=39)	1.5(0.4-6.3)	1.5(0.3-6.8)	1(0.3-3.5)	1.1(0.3-4.17)	0.4(0.1-2.3)	0.4(0.1-2.2)	0.8(0.24-2.69)	0.9(0.3-3.2)	1.6(0.6-4.4)	1.7(0.7-4.5)
Normal weight (N=708)	1.0	1.0	1.0	1.0	1.00	1.0	1.0	1.0	1.0	1.0
Overweight (N=506)	0.5(0.3-1.1)	0.5(0.3-1.2)	1.5(1.0-2.3)*	1.9(1.3-2.8)*	0.9(0.7-1.4)	1.1(0.7-1.6)	0.8(0.51-1.31)	0.9(0.6-1.6)	1.2(0.8-1.8)	1.4(0.9-2.1)
Obese (N=332)	0.9(0.5-2.0)	1.1(0.5-2.5)	2.5(1.7-3.6)**	3.2(2.2-4.9)**	1.4(0.9-2)	1.6(1.0-2.5)*	0.64(0.34-1.19)	0.7(0.4-1.4)	1.8(1.2-2.8)*	1.9(1.2-3.2)*

§ Adjusted for age, gender, BMI, marital status, ethnicity, and education

* $p \leq 0.05$

** $p \leq 0.0001$

*** multiply imputed models

4.4.5 Psychiatric comorbidity

As shown in Table 14, reporting any disordered eating was associated with having greater psychiatric comorbidity, except for substance-use, in univariate models. When adjusting for socio-demographic factors, individuals with disordered eating had increased odds of a possible PTSD (OR: 4.5, 95%CI: 2.7-7.6) and personality disorder (OR: 3.2, 95%CI: 2.1-4.8) diagnoses; of having anxiety, mood disorder, or both anxiety and mood disorders (RRR: 4.1, 95%CI: 2.7-5.9), sub-threshold neurotic disorders (RRR:2.1, 95%CI: 1.1-3.9); and of having attempted/idealised suicide (OR: 2.5, 95%CI: 1.7-3.6). Participants with disordered eating also had increased odds of reporting hazardous (RRR: 1.7, 95%CI: 1.0-3.0), and harmful and hazardous levels of drinking (RRR:2.9, 95%CI: 1.4-6.1), as well as of having used drugs in the previous year (OR:1.6, 95%CI: 1.1-2.5) (Table 14).

4.4.6 Disordered eating and health service use

As shown in Table 14, approximately a third (N=59, 36%) of individuals with disordered eating had sought professional help in the year prior to the interview for an anxiety or depression-related problem; the majority saw a GP (N=45, 27.4%), followed by a therapist (N=21, 12.8%), or mental health specialist (N=9, 5.5%). About a third of individuals with disordered eating reported that they did not seek help although they thought they needed it (N=52, 31.7%). Of the 164 participants endorsing disordered eating only 7 (4.4%) reported having received an ED diagnosis in the previous year compared to only 1 amongst SCOFF negative participants. Of those 8 participants, 5 (62.5%) were women and 3 (37.5%) were men; 4 were from a White (50%), 2 from a Black (25%), and 2 from other (25%) ethnic background (data not shown in table). Strong associations were found between disordered eating and service use, with individuals with disordered eating having increased odds of having sought help and of having seen a GP (OR: 2.9, 95%CI: 1.9-4.4), a mental health therapist (OR: 2.5, 95%CI: 1.5-4.2), or specialist (OR: 3.2, 95%CI: 1.4-7.1) in multivariate models adjusted for socio-demographic variables as well as for mood and anxiety disorders (Table 14).

Table 14 Odds Ratios (ORs) and Relative Risk Ratios (RRRs) and 95%CI of the association between SCOFF positive answer and negative behavioural and psychiatric outcomes*

Outcomes	N	n**	Crude RRR (95% CI)	P value	Adjusted*** RRR (95% CI)	P value
Total	1,645	164				
Alcohol Use Disorders Identification Test (AUDIT)						
No hazard	1,305	124	1.0	-	1.0	-
Hazardous	265	27	1.3(0.8-2.1)	0.3	1.7(1.0-3.0)	0.05
Hazardous and harmful	75	13	2.4(1.3-4.6)	0.007	2.9(1.4-6.1)	0.003
Smoking status						
Non-smoker	502	53	1.0	-	1.0	-
Current	704	76	1.1(0.7-1.6)	0.8	1.2(0.7-1.8)	0.5
Ex-smoker	439	35	0.7(0.5-1.2)	0.2	1.1(0.6-1.8)	0.8
Primary diagnosis						
No diagnosis	1,212	76	1.0	-	1.0	-
Non-specified neurotic disorder	108	15	2.3(1.3-4.2)	0.006	2.1(1.1-3.9)	0.02
Anxiety/mood/ anxiety+mood disorder	325	73	4.1(2.8-5.9)	<0.0001	4.1(2.7-5.9)	<0.0001

Correlates	N	n**	Crude OR (95% CI)	P value	Adjusted*** OR (95% CI)	P value
Drug use last year						
No	1,286	120	1.0		1.0	
Yes	359	44	1.4(1.0-2.1)	0.05	1.6(1.1-2.5)	0.03
Standardised Assessment of Personality – Abbreviated Scale (SAPAS)						
No	1,411	109	1.0		1.0	
Yes	234	55	3.4(2.4-4.9)	<0.0001	3.2(2.1-4.8)	<0.0001
Post-Traumatic Stress Disorder (PTSD)						
No	1,562	139	1.0		1.0	
Yes	83	25	4.7(2.8-7.7)	<0.0001	4.5(2.7-7.6)	<0.0001
Suicide attempt or ideation						
No	1,290	101	1.0		1.0	
Yes	355	63	2.4(1.7-3.5)	<0.0001	2.5(1.7-3.6)	<0.0001

* Multiple imputation models
** Number of SCOFF positive individuals
*** Adjusted for age, gender, BMI, marital status, ethnicity, and education (+alcohol adjusted for smoking and smoking adjusted for alcohol)

Table 15: Proportion of SCOFF positive and negative participants who sought help for their mental health concerns and Odds Ratios (OR) and Relative Risk Ratios (RRRs) and 95%CI of the association between ED behaviours and help seeking behaviours *

Outcome Indicator	SCOFF Negative		SCOFF positive		p-value	Crude RRR (95% CI)	p-value	Adjusted** RRR (95% CI)	p-value
	n	Prevalence (95% CI)	n	Prevalence (95% CI)					
Sought help									
No	942	62.6(59.9-65.3)	53	31.8(24.5-39.9)		1.0		1.0	
No, though I should have	314	21.6(19.4-24)	52	31.9(25.1-39.5)	<0.0001	2.9(1.9-4.4)	<0.0001	2.1(1.3-3.3)	0.002
Yes	225	15.7(13.8-17.8)	59	36.3(29.1-44.3)		4.6(3.1-7.1)	<0.0001	3.2(1.9-5.2)	<0.0001
						Crude OR (95% CI)	p-value	Adjusted** OR (95% CI)	p-value
Seen a GP									
No	1,319	88.6(86.7-90.3)	119	72.6(64.9-79.1)	<0.0001	1.0		1.0	
Yes	162	11.4(9.7-13.2)	45	27.4(20.9-35.1)		2.9(1.9-4.4)	<0.0001	2.9(1.9-4.4)	<0.0001
Seen a therapist									
No	1,387	93.7(92.2-94.9)	143	86.9(80.6-91.5)	0.002	1.0		1.0	
Yes	94	6.3(5.1-7.8)	21	13.1(8.6-19.5)		2.2(1.3-3.7)	0.003	2.5(1.5-4.2)	0.001
Seen a mental health specialist									
No	1,459	98.4(97.6-94.7)	155	94.7(90-97.2)	0.001	1.0		1.0	
Yes	22	1.6(1-2.4)	9	5.3(2.8-9.9)		3.5(1.6-7.9)	0.003	3.2(1.4-7.1)	0.005
ED diagnosis									
N/A	1,255	84.8(82.8-86.6)	105	64(56.3-71.1)					
No	215	14.6(12.9-16.5)	47	29.5(22.8-37.3)	<0.0001				
Yes	1	-	7	4.4(2.1-8.9)					

* OR employed for binary outcomes and RRR for categorical outcomes, multiply imputed models
**Adjusted for age, gender, BMI, marital status, ethnicity, education, and primary diagnosis.

4.5. Discussion

This study aimed to determine the prevalence and correlates of disordered eating in a general population sample based in South East London, UK.

4.5.1 Prevalence of disordered eating

Ten per cent of the participants (N=164) reported disordered eating in the year prior to interview. Of these 26% were men and 74% were women.

Two recent studies employed the SCOFF questionnaire to estimate disordered eating in the general population (Herpertz-Dahlmann et al., 2008; McBride et al., 2012). McBride et al (McBride et al., 2012), employing data from the UK National Adult Psychiatric Morbidity Survey 2007 found a prevalence of 6.3%. This figure was slightly lower than the one reported in this study. The differences in the population studied, a UK-wide sample versus an inner-city sample in this case, is likely to account for this finding, as the prevalence of ED and psychiatric disorders are known to be higher in urban settings (Favaro, 2003; Hoek et al., 1995). A higher prevalence of disordered eating (29.4% in girls and 14.4% in boys) was reported by Herpertz-Dahlmann et al (Herpertz-Dahlmann et al., 2008) in a sample of 1,895 German adolescents. The difference in prevalence between the latter study and this one could be due to the different age groups of the samples. Some ED (e.g. AN) are more typical of adolescence, therefore it is possible that a higher prevalence of disordered eating is detected in younger populations. A recent longitudinal study whose participants' ages ranged from 14 to 34 years, found prevalence of many ED behaviours (e.g. purging, bingeing) decreasing from late adolescence to adulthood (Abebe et al., 2012).

In this sample, the most commonly endorsed disordered eating symptoms were loss of control eating and weight loss, which could indicate a high prevalence of binge eating behaviours characteristic of BED. The hypothesis of high prevalence of binge eating behaviours in this sample is supported by and

consistent with findings relative to the socio-demographic composition of the sample, which have been shown in literature to be associated with bingeing (de Zwaan, 2001; Striegel-Moore & Franko, 2003; Striegel-Moore & Smolak, 2000). Firstly, with 55.5% of the sample being 35 or older, the age distribution of this sample is higher than that of most studies relative to binge eating or ED. As was discussed in section 1.2.2, whilst prevalence of disorders such as AN and BN peaks in adolescence and young adulthood, much debate exists with regards to the age group in which the prevalence of BED peaks. Some studies have shown a higher age of onset for BED (Striegel-Moore et al., 2006) and longer duration of the condition compared to AN and BN (Pope et al., 2006), suggesting that binge eating could be more prevalent in older populations. However, the great majority of studies focus on samples composed of female adolescent and young adults making it difficult to estimate the true prevalence of the disorder in older individuals. Results presented in Table 11 show that loss of control eating (central to the definition of BED) was similarly prevalent in the 45 – 64 age groups that it was in the 16 – 24 age group, which could partially confirm the hypothesis of a higher prevalence of bingeing in older age groups.

Secondly, loss of control/binge eating has been found to be highly prevalent in individuals of Black ethnicity (A. E. Field et al., 1997; Striegel-Moore et al., 2000), which, in this sample, was better represented (22%) than in most ED studies. These analyses showed participants of Black ethnicity being a group in which the loss of control question was frequently endorsed (15.9%), although participants of Asian ethnicity (22.1%) where those who had the highest prevalence of these behaviours despite being represented in smaller proportions (3.7%) in the sample. Some literature exists suggesting that binge eating is common in Asian populations (Nicdao, Hong, & Takeuchi, 2007), although reliance of full-threshold diagnoses in most studies has made it difficult to provide better estimates of the prevalence of sub-threshold binge eating behaviours.

Finally, the question on weight loss, was endorsed mostly by participants from overweight/obese (25.4%) BMI categories. Restrained eating (i.e. dieting) has

been associated with binge eating and higher BMI. One study found that binge eaters were more likely to start one or more diets within the year prior to assessment, as well as to exhibit more eating restraint than non-binge eaters (Kinzl, Traweger, Trefalt, Mangweth, & Biebl, 1999). Binge eating is also frequent in overweight and obese individuals (de Zwaan, 2001), who in this sample make up 52.9% of total participants. The age and ethnic structure of the population coupled with the BMI distribution in the sample, are all characterised by features that have been found in literature to correlate with bingeing. Therefore, the finding of this study, that the question on loss of control eating and dieting, in turn associated with bingeing, were the most frequently endorsed leaves room to speculate that our findings lend support to previous literature on prevalence and correlates of bingeing.

Although disordered eating was more common amongst women, there were no differences in the prevalence of males or females endorsing each of the SCOFF questions apart from the weight loss question, which was associated with male gender. Recent literature has suggested an increasing awareness among men of body image issues due to societal pressures to adhere to specific models, which might reflect in higher rates of disordered eating and ED behaviours amongst men than those of previous decades (Strother, Lemberg, Stanford, & Turberville, 2012). Men, however, are more likely to endorse ED behaviours (e.g. excessive exercise, use of steroids) and cognitions (e.g. desire to be more muscular), which differ from those that are typical of women (e.g. vomiting, dieting, drive for thinness). It is increasingly debated whether traditional ED screening tools, such as in this instance the SCOFF, have a 'gender-bias' and some have argued that new questionnaires should be developed to assess presence of ED in men with more gender-specific questions (Stanford & Lemberg, 2012; Strother et al., 2012). In this study, the questionnaire employed was not able to detect further differences between genders, possibly due to the broad nature of the questions asked.

4.5.2 Ethnicity and disordered eating

Previous literature has argued that ethnic minorities might have a decreased risk of developing ED due to lower societal and cultural preferences for thin figures (Kronenfeld et al., 2010; Shaw et al., 2003). Older studies reported mixed findings; results have shown lower levels of bulimic symptoms among Black and Asian minorities (A. E. Field, Camargo, Taylor, Berkey, & Colditz, 1999; Nevo, 1985), higher levels of purging behaviours in Black minorities only (A. E. Field et al., 1999; Striegel-Moore & Smolak, 2000) and higher prevalence of binge eating in ethnic minorities' women (M D Marcus, Bromberger, Wei, Brown, & Kravitz, 2007). More recent findings seem to suggest an overall levelling of the differences between ethnicities with respect to ED (Franko et al., 2007; Regan & Cachelin, 2006).

This study did not uncover differences among ethnicities with respect to overall disordered eating symptoms; however it showed that participants of Asian ethnicity had high odds of reporting cognitions such as 'loss of control' and 'preoccupation with thoughts of food', and behaviours such as self-induced vomiting. These results are in line with some recent studies, showing disordered eating to be frequent in individuals of Asian ethnicity. A qualitative study investigating ethnic differences in women's responses of mainstream beauty standards, found that Asian women were more likely than women of Black ethnicity to endorse them in a similar fashion to white women, as well as experiencing greater body dissatisfaction (Chin Evans & McConnell, 2003). Moreover, a systematic review focusing on children's mental health issues in the UK has highlighted that children and adolescents from an Asian background had the highest levels of ED behaviours amongst all other ethnic minorities in 6 out of the 7 studies included (Goodman et al., 2008). Finally, a recent South London-based study (Waller et al., 2009) on a clinical sample of 648 patients assessed for an ED, found that a greater proportion of individuals diagnosed with BN were from ethnic minority groups, of which individuals of Asian ethnic backgrounds were the most prevalent.

Although individuals of Black ethnicity had high prevalence of disordered eating (12.8%), and the highest prevalence of positive answers to the loss of control (15.9%) and weight loss (16.4%) questions, these associations did not prove significant in adjusted logistic regression models. As explained in the previous section, recent literature has reported high prevalence of bingeing in Black ethnic minorities (M D Marcus et al., 2007). This study does not seem to support this finding. Although Black ethnicity was associated with disordered eating, loss of control, and weight loss in univariate analyses, when adjusting for socio-demographic characteristics and BMI the ORs decreased for all three outcomes and associations were no longer statistically significance. This suggests that some of the association could be explained by higher BMI in this population sub-group (which has been documented in literature (Flegal, Carroll, Ogden, & Curtin, 2010)), which is associated with bingeing. Participants from a Black ethnic background had the lowest prevalence of purging behaviours (in line with some previous findings, but not others (Shaw et al., 2003)) and low prevalence of body image distortion, which has also been documented in literature (Shaw et al., 2003). In regression models however, none of these associations was significant.

Individuals of White ethnic background reported the lowest levels of disordered eating and comparatively low levels of each behaviours and cognitions signalled in the SCOFF, which is contrary to what most literature has found to date. One possible explanation, is that the low levels of eating disturbances identified amongst White participants reflect AN or BN, which are rarer disorders compared to BED. The findings of much higher proportions of participants of Asian or 'Other' ethnic backgrounds reporting self-induced vomiting, which also might refer to anorexia nervosa binge-purge (AN-BP) or bulimia nervosa of the purging type (BN-P), is more difficult to interpret. One possible explanation is that ED behaviours in some ethnic groups could be more frequent although at frequencies not allowing an 'Other Specified Feeding or Eating Disorders (OSFED)' diagnosis. Alternatively, it is possible that ED are often undetected in these populations at primary care levels (which has been documented in literature (Becker et al., 2003; Cachelin & Striegel-Moore, 2006)) and that this

study showed more realistic approximations of their prevalence. These findings thus suggest that binge/purge and bingeing behaviours might be commoner in Asian and Black communities respectively, than in White ones. Thus, disordered eating and ED manifestation in ethnic minorities, usually underplayed, and their association with BMI, need further investigation especially in multi-ethnic and inner city settings, where they are more prevalent. It is possible to speculate that environmental and societal factors might play a distinct role in the aetiology of disordered eating in these groups. Stressful life events and discrimination might also influence this association. Although this was not investigated in this study, there is evidence that experience of discrimination (Striegel-Moore, 2002) and stressful events (Grilo et al., 2012; Rojo, Conesa, Bermudez, & Livianos, 2006) are associated with onset (Rojo et al., 2006; Striegel-Moore, 2002) or relapse (Grilo et al., 2012) of ED. Further research should focus on better understanding these links. Finally, disordered eating was associated with the 'other ethnic background' category; however, given the broad range of ethnicities included it is not possible to make specific inferences about associations with some ethnic backgrounds over others.

4.5.3 BMI and disordered eating

Overweight and obese BMI categories were associated with disordered eating in general, and with loss of control and preoccupation with food. Previous studies have shown that binge eating is associated with higher BMI (M D Marcus et al., 2007) and that loss of control eating is associated with anxiety and overweight BMI status (Goossens, Braet, Van Vlierberghe, & Mels, 2009). Moreover restrained eating, which could be related to persistent thoughts about food (e.g. calories counting), and is often associated with loss of control eating, has also been shown to be associated with higher BMI trajectories (Snoek, Engels, van Strien, & Otten, 2013). Whilst from this study it is neither possible to disentangle these associations nor to assign a BED diagnosis, it is nonetheless interesting to have replicated previous findings suggesting an association between BMI, and disordered eating and loss of control. Finally, although the differences did not reach statistical significance, possibly due to smaller overall

numbers of participants endorsing self-induced vomiting and body image dissatisfaction, more individuals in the underweight and normal weight BMI categories endorsed those questions. These behaviours might index disorders such as AN and BN, which are less common than BED (Swanson et al., 2011).

4.5.4 Psychiatric comorbidity

This study found increased odds of comorbidity with possible personality disorders and PTSD; suicidal ideation and attempts; anxiety, mood, or mixed mood and anxiety disorders; and hazardous levels of drinking and drug use, in individuals with disordered eating. These results confirm previous findings that disordered eating, irrespective of whether full diagnosis is reached, is associated with important comorbidity. This finding is in line with those of previous literature showing that individuals with sub-threshold diagnoses have comparable levels of mood and anxiety (A. E. Field et al., 2012; Hudson et al., 2007; Swanson et al., 2011), and suicidality (Crow et al., 2009; Herpertz-Dahlmann et al., 2008; Le Grange et al., 2012; Wade, 2007a) to those of individuals with threshold ED diagnoses when compared to healthy individuals/controls. Whilst fewer studies have investigated personality disorders amongst disordered eating participants, evidence seems to suggest an association between the two conditions (Keel et al., 2005; Marino & Zanarini, 2001) which this study also found. Substance use has also been documented in individuals with disordered eating and, in particular, amongst those with binge/purge type behaviours (Abebe et al., 2012; Hudson et al., 2007; Krug et al., 2008; McBride et al., 2012; Swanson et al., 2011).

4.5.5 Disordered eating and health service use

One of the features central to ED presentation the efforts of the people affected by an ED to conceal their condition (Blinder et al., 2006; Hudson et al., 2007). As it was indicated in section 2.5 this often results in only a fraction of all cases presenting to services; suggesting the overall proportion of individuals with an ED that reach specialised care is not representative of how many people

actually suffer from the condition (Mond et al., 2007). This study found that although about 30% of participants with disordered eating reported having seen a GP for problems such as anxiety or depression, only 13% had seen a mental health therapist and 5% a mental health specialist.

These findings might reflect the UK 'gatekeeper' system where mental health specialists need GP referral. Low percentages of disordered eating patients reaching specialist care might signal failure to identify patients with an ED by general practitioners. Individuals with BN, who differently from those with AN are not necessarily characterised by low weight, are known to be more difficult to detect (Sim et al., 2010). Similarly, in individuals with binge eating disorder, due to common comorbid high BMI, the psychological dimension of their condition could be missed and a referral to a dietician rather than a mental health specialist is likely to occur (Mond et al., 2007). It has been noted in a qualitative study on UK GPs, that the perceived infrequency with which ED cases are seen in primary care, might make detection of diagnoses (and perhaps of sub-threshold diagnoses), hard to detect (Reid et al., 2009). In fact, these findings could also represent a decreased likelihood of less severe cases to attend services, or that members of ethnic minorities are less likely to receive an ED diagnosis, as has been documented in previous literature (Becker et al., 2003; Cachelin & Striegel-Moore, 2006; Waller et al., 2009). Since only 7 (4.4%) individuals with disordered eating reported having been diagnosed with an ED, the last two hypotheses seem plausible. Finally, another explanation could lie in long referral times and in the tendency of individuals with ED to non-adherence to treatment (Reid et al., 2009). However, because of the nature of the questions asked by the ED screener and by those relative to health service use, it is not possible to further disentangle these patterns.

4.5.6 Strengths and limitations

These results should be interpreted in light of some limitations. This study found strong associations between disordered eating and psychiatric comorbidity; however, these high levels of comorbidity (especially with anxiety and mood disorders) are known from the literature. This means that it is often difficult to untangle the aetiology of the disorders and establish causality. Some psychiatric conditions (e.g. depression) are associated with losses of appetite and weight loss, which in a screener measure could be detected as ED symptoms. One of the questions in the SCOFF, which has been commonly endorsed, asks about weight loss and could therefore capture behaviours secondary to other psychiatric or physical health conditions, and not just intentional weight loss within an ED framework. It could be speculated that this question could be the least specific to ED. This study, given its cross-sectional nature, was unable to determine temporality, and did not explore further associations between each SCOFF item and mental and physical health conditions, as individual questions have not been validated. Whilst the following chapter (Chapter 5) will provide a psychometric evaluation of the SCOFF, future studies should also focus on testing each question against external validators (i.e. mental and physical health).

Secondly, although 37.6% of our sample was from a non-White ethnic background it was not possible to investigate in detail differences amongst ethnic minorities, due to low numbers and a high proportion (12%) of participants from 'other' ethnic background, which was not possible to further identify. The Black African and Black Caribbean ethnic groups were merged in order to increase sample size and power of the analyses, and it was therefore not possible to investigate differences between the two groups. Nevertheless, the sample size required to detect differences between these populations would have had to be increased given the small prevalence of ED, hence this can be interpreted as a first attempt to explore differences amongst ethnic groups in a general population sample.

Finally, some of the measures employed to explore comorbidity were also screening measures, therefore it was not possible to explore in more detail, the associations highlighted (e.g. which personality disorders were associated with disordered eating).

This study had some important strengths. Firstly, it employed a large general population sample, representative of the population in the study catchment area, including a high proportion of participants from ethnic minorities, increasing the potential for the generalizability of the results. Secondly, the SCOFF questionnaire was used to determine disordered eating, and whilst it is not possible to gauge diagnoses from this instrument, it nevertheless captured a group of participants who showed strong associations with co-morbid behaviours, adding to the evidence that sub-threshold presentations might have a similar psychiatric burden to full diagnoses.

4.6 Conclusions and policy implications

Summary of findings and conclusions

Whilst these are only preliminary findings based on screening measures, they seem to suggest high prevalence of disordered eating and behaviours related to binge eating and over-eating in this population. It is of note that more participants from the overweight to obese, compared to the underweight and normal weight BMI categories, reported these behaviours.

Ethnic minorities, especially participants of Asian ethnicity, were found to have higher prevalence of disordered eating such as binging, purging and body image distortion, highlighting the need for further research in risk factors specific to these populations; especially in light of findings showing that fewer people who presented to services were referred to specialist services for a suspected ED if belonging to an ethnic minority group (Waller et al., 2009).

Participants with disordered eating were more likely to present to services, although fewer participants saw a mental health therapist or specialist rather

than a GP. This finding highlights the need for more training among general practitioners on recognising potential early ED manifestations, and perhaps the usefulness of introducing short screening questionnaires to be administered to individuals presenting with eating and/or weight related problems. Moreover, it highlights the potential presence of long waiting times for referral which should be address at a health policy level in terms of resource allocation.

Finally, great comorbidity was found in participants with disordered eating attitudes suggesting that when presenting to services with eating-related problems, GPs should not only should investigate the presence of an ED, but also screen for psychiatric comorbidity. Similarly, given high levels of comorbidity found, GPs should screen for ED pathology in patients presenting associated psychopathology, as these might be individuals at higher risk of also having or developing and ED.

Policy and clinical implications

These results have significant clinical and policy implications as they highlight the importance of screening for disordered eating in primary care when individuals present with suspected disordered eating pathology or with comorbid conditions which are known to be associated with it. This not only could allow to better detect individuals with ED, but also to identify individuals at risk of having or developing other psychiatric conditions. Findings on lower rates of specialist care attendance in participants displaying disordered eating points to the need for better referral systems at GP level, whereas high proportions of participants who reported not having sought help despite feeling the need to suggest perhaps the necessity for better community education on mental health and the stigma associated with it. This study found high levels of disordered eating in participants of Asian ethnicity, which is scarcely documented in literature. This suggests that it is possible that fewer individuals of Asian ethnicity seek help for mental health problems and that studies relying on clinical registers to detect ED might underestimate their prevalence in this population. Evidence exists of high levels of stigma in Asian communities

towards mental health (Leong & Lau, 2001; Ng, 1997), therefore this hypothesis seems plausible. Public health programmes targeted at specific ethnic minorities to increase knowledge on mental health conditions could improve rates of ED detection and knowledge on ED presentations in these communities. Future studies should also employ longitudinal intervention studies to assess the impact of screening programmes at community (e.g. schools, GP) level on referral rates and mental health morbidity amongst eating disordered participants.

Chapter 5

Validation of the SCOFF questionnaire in a general population sample

Parts of this chapter appear in the article Solmi, F.; Hatch, S.; Hotopf, M.; Treasure, J., Micali, N. (under review) 'Validation of the SCOFF in a multi-ethnic, inner-city sample'.

5.1. Introduction

Eating disorders (ED) are low prevalence conditions, often difficult to detect in the general population. This has negative implications for both health service provision, as individuals with ED are less likely to obtain appropriate treatment. The use of effective screening tools could help in detecting ED and disordered eating in the general population, with research, health policy and clinical advantages. Improved detection rates at primary care levels could ensure better and targeted service provision. On the other hand, improved detection of ED in the general population could help to obtain better estimates of their prevalence and establish further associations with risk factors or outcomes.

There is some evidence that individuals with ED tend not to disclose their condition and/or seek professional help, with only the most serious cases presenting to services and reaching specialist care (Wolfe, 2005). Sub-threshold or unusual ED presentations in the general population often go undetected at primary care level. Moreover, as detailed in sections 2.4 and 2.5, whilst to date limited research is available on ED behaviours and presentations in ethnic minorities, there are some indications that prevalence of ED and disordered eating in these populations might not differ greatly to the prevalence observed in Caucasian populations. However, literature has shown that members of ethnic minorities are less likely than individuals of White ethnic background to present to services, or be referred for specialist treatment, despite being more likely to be diagnosed with an ED when they do (Becker et al., 2003; Cachelin & Striegel-Moore, 2006; Waller et al., 2009). This could result

in the underestimation of prevalence and burden of ED in these populations. Relying on primary care to detect ED and disordered eating might prove largely ineffective at ensuring access to care, especially in multi-ethnic populations.

In research settings the paucity of quick diagnostic tools which can be used by lay interviewers places several constraints on the availability of studies able to detect individuals with ED in the general population. Traditional diagnostic tools for ED are unfit for use in these large epidemiological studies, due to often being too lengthy and focusing on diagnoses while overlooking sub-threshold behaviours in individuals who do not meet the former (Morgan et al., 2000). Thus large population surveys providing estimates of ED are still limited.

The introduction of the SCOFF (Sick, Control, One stone, Fat, Food)(Morgan et al., 2000) as an orally-deliverable screening tool for ED in outpatient settings could make it possible to quickly screen for ED in clinical settings, in screening programmes in schools, and in general population surveys. The brevity of the questionnaire, and results showing high levels of agreement in predicting ED between the oral and the written versions (93.8%; k: 0.8; $p < 0.001$)(Perry et al., 2002), suggest it could be suitable for these uses. As was described more in detail in Chapter 3 Section 3.4.3, the SCOFF has been validated in several general population studies with overall moderate to good levels of sensitivity (73% - 100%) and specificity (78% to 96%)(Garcia et al., 2010; Lähteenmäki et al., 2009; Leung et al., 2009; Luck, 2002; Muro-Sans et al., 2008). Positive predictive value, on the other hand, was found to be low (i.e. lowest 9.7%), which is partly due to the low prevalence of ED. With the exception of one (Luck, 2002) most of these studies[4] assessed young populations (age range 12 – 35), that were ethnically homogenous. The SCOFF has not yet been tested on older and multi-ethnic samples; therefore, we do not know whether findings from these previous studies are generalizable to different populations.

[4] Studies involving a combination of clinical and community samples have wider age ranges (Cotton et al., 2003; Garcia-Campayo et al., 2005).

Very few studies have investigated the psychometric properties of the SCOFF. One study using exploratory factor analysis (EFA) in a community sample of 945 adolescents aged 10.9 -17.3 years, suggested the existence of two factors underlying the structure of the SCOFF, at least when considering the total sample and girls only. The first factor consisted of Item 1 (purging behaviours) and Item 3 (weight loss); and the second factor consisted of Item 2 (loss of control eating), item 4 (body image distortion) and item 5 (food intrusive thoughts) (Muro-Sans et al., 2008). This finding was replicated using Confirmatory Factor Analysis in a Finnish study of 1,891 adolescents aged 14-16, which found that goodness of fit of a two-factor model was similar to that of a single-factor model, and slightly better when considering girls only (Hautala et al., 2009). Only a mixed clinical/community study of ED based on an adult female population found a one-factor solution was the best fitting for the SCOFF (Pannocchia, Fiorino, Giannini, & Vanderlinden, 2011). Whilst these studies seem to highlight the presence of two-factors within the SCOFF questionnaire, more research is needed to evaluate the internal consistency of this measure and the implications of employing a one-factor vs. a two-factor solution.

5.2. Aims and hypotheses

The aim of this study was to test the psychometric properties of the SCOFF questionnaire in an ethnically diverse, adult population, and validate it against the SCID-I clinical interview.

The hypotheses driving this study were that:

- ✓ A two-factor model will provide the best fit for the data;
- ✓ The SCOFF will have good sensitivity and specificity, but low positive predictive value.

5.3. Methods

5.3.1. Study design and population

The design was a two-phase cross-sectional prevalence study. The study on the psychometric properties of the SCOFF employed data from the SELCoHI study (n=1,669), which was previously described in section 3.3.1. The validation of the SCOFF was based on a sub-set (N=145) of the original SELCoHI sample, which was interviewed again in SELCoHII. A more complete description of the recruitment and interview process, and a flowchart of study participation, is provided in section 3.3.2.

5.3.2. Measures

Eating disorders

The SCOFF (Sick, Control, One stone, Fat, Food) (Morgan et al., 2000) questionnaire was employed to investigate the prevalence of ED behaviours in phase I of the SELCoH study.

As explained in detail in section 3.4.3, the SCOFF is a questionnaire developed by Morgan and colleagues (Morgan et al., 1999, 2000) as a screening tool for individuals presenting to services with a suspected ED. It comprises 5 questions (Do you make yourself *Sick* because you feel uncomfortably full? Do you worry you have lost *Control* over how much you eat? Have you recently lost more than *One* stone in a 3 month period? Do you believe yourself to be *Fat* even when other say you are too thin? Would you say that *Food* dominates your life?) aimed at covering some of the main behaviours and cognitions typical of ED (i.e. purging behaviours, loss of control, dieting, body-image issues and control over food). Each item can be answered with *yes* (1 point) or *no* (0 points), with a maximum score of 5. Literature has shown that a cut-off of 2 points yields the best balance (i.e. the highest levels of both) between sensitivity and specificity (Morgan et al., 1999, 2000).

Eating disorder diagnosis was obtained using the ED section of the Structured Clinical Interview for DSM-IV Axis I disorders, research non-patient edition (SCID-I-NP)(First, Spitzer, Miriam, & Williams, 2002). The ED section of the SCID-I is composed of 3 parts aiming at assessing the presence of AN, BN, or BED. Each section contains a set of questions assessing the presence of behaviours and cognitions central to each condition, which can be scored as 'present/threshold', 'sub-threshold', or 'absent'. Interviewers were instructed not to apply skip rules, in order to capture all behaviours and cognitions, making it possible to diagnose sub-threshold conditions. A more complete description of the interview process was provided in section 3.4.3, and a copy of the SCID-I is available in Appendix I. All diagnoses referred to the time period in which the SCOFF questionnaire was administered, which was roughly 3 years prior to SCID-I interview. If a participant disclosed sub-threshold ED behaviours in the period which followed the SELCoHI interview, they were recorded as behaviours, but not considered a diagnosis. The rationale for this was to ensure consistency in the validation of the SCOFF.

For the purposes of this validation study, ED diagnoses were grouped together into a binary variable indicating whether a participant had an ED or not.

Socio-demographic characteristics

All the measures employed in this study to describe the study sample were collected in either SELCoHI or SELCoHII and described in detail in Section 3.4.4. Below is a brief overview of the variables and how they were coded for the purposes of this study:

Age was collected in the SELCoHII study as 'age at interview'. In this study it was used as a continuous variable and described using mean and standard deviations. This was due to the smaller sample, and therefore the smaller number of people which would have been included in each of the age categories employed in the previous study.

Gender was coded as either male or female.

Ethnicity was measured with information gathered in SELCoHI due to the unchangeable nature of the characteristic measured. As in the previous study,

the variable was recoded as a four-level categorical variable indicating: White; Black (African or Caribbean); Asian; and Other ethnic background.

Education was coded as a three-level categorical variable according to whether the subject had 'no qualifications'; 'completed GCSE and/or A-levels'; or' had a higher degree or above'.

5.3.3. Data analyses

Cronbach's alpha (α) was calculated for the whole scale. Cronbach's alpha measures the internal consistency of a scale, namely how closely related the items of a scale are. High values of alpha (≥ 0.7) are taken as evidence that the items in the scale measure a latent construct, although not necessarily a one-dimensional one (Zyl, Neudecker, & Nel, 2000).

Corrected Item Total Correlation (CITC), and Alpha coefficients if item is deleted were investigated for individual items. CITC test calculates Pearson correlations between the item score and the average of the scores of the remaining items and it is conducted to check for inconsistencies between individual items in the scale and all other items (Churchill, 1979). Alpha coefficients if the item is deleted provide an estimate of the internal consistency of the scale for each item if the latter is removed from the scale. Higher coefficients indicate improvements in the consistency of the scale if the item is removed from the measure.

A scree plot was employed to visually inspect eigenvalues. This method advises retention of all factors 'above the elbow' – that is where the curve bends – as factors which explain the largest amount of variance (Cattell, 1966). Factor's eigenvalues and their contribution to explaining proportion of total variance were also inspected. Since disagreement exists in literature on whether the Kaiser's rule of retaining all eigenvalues ≥1 is applicable to factor analysis as well as principal component analysis (Conway & Huffcutt, 2003; Costello & Osborne, 2005; A. Field, 2000), a mixture of the two methods (i.e. eigenvalues and scree plot) was employed to decide the number of factors to retain.

Exploratory Factor Analysis (EFA) was conducted using principal factor analysis and non-orthogonal oblique rotation under the assumption that factors would relate to each other.

Receiver Operating Characteristics (ROC) analysis was employed to define the SCOFF score yielding the optimal trade-off between Sensitivity (Se) and Specificity (Sp) in correctly detecting case status (i.e. ED diagnosis, healthy subject), as well as the area under the curve (AUC). ROC analysis was complemented by calculation through appropriate Stata command of Se and Sp, as well as positive predictive value (PPV) and negative predictive value (NPV) for all possible SCOFF cut-offs for the overall sample and by ethnicity (i.e. White vs non-White). All analyses were run in Stata12.

5.4. Results

5.4.1. Reliability Analysis

As can be seen in Table 16, Cronbach's α coefficient for the SCOFF scale was 0.41 with Item 2 (loss of control) showing the highest CITC of 0.67 and the lowest 'α if deleted' (0.27). Item 1 (purging behaviours) had the lowest CITC (0.41), while Item 3 (weight loss) displayed the highest impact on the overall scale α if removed (0.45).

Table 16: Summary of Cronbach's α and items' Corrected Item Total Correlation (CITC) and 'α if deleted' (N=1,669)

Items	CITC	**α if item is** deleted
Item 1 *Purging*	0.41	0.38
Item 2 *Loss of control eating*	0.67	0.27
Item 3 *Weight loss*	0.52	0.45
Item 4 *Body image distortion*	0.53	0.34
Item 5 *Food intrusive thoughts*	0.58	0.33
Total scale		0.41

5.4.2. Exploratory Factor Analysis

Factors' eigenvalues were visually inspected through a scree plot (Figure 3) to investigate the numbers of factors to retain for rotation (Cattell, 1966). Both the scree plot and tabulation of factors' eigenvalues converged in suggesting the retention of one factor only.

Factor loadings provided in Table 17 show that all items except Item 3 (weight loss) are above the commonly accepted cut-off point of 0.3.

Figure 3: Scree plot of eigenvalues for SCOFF questionnaire

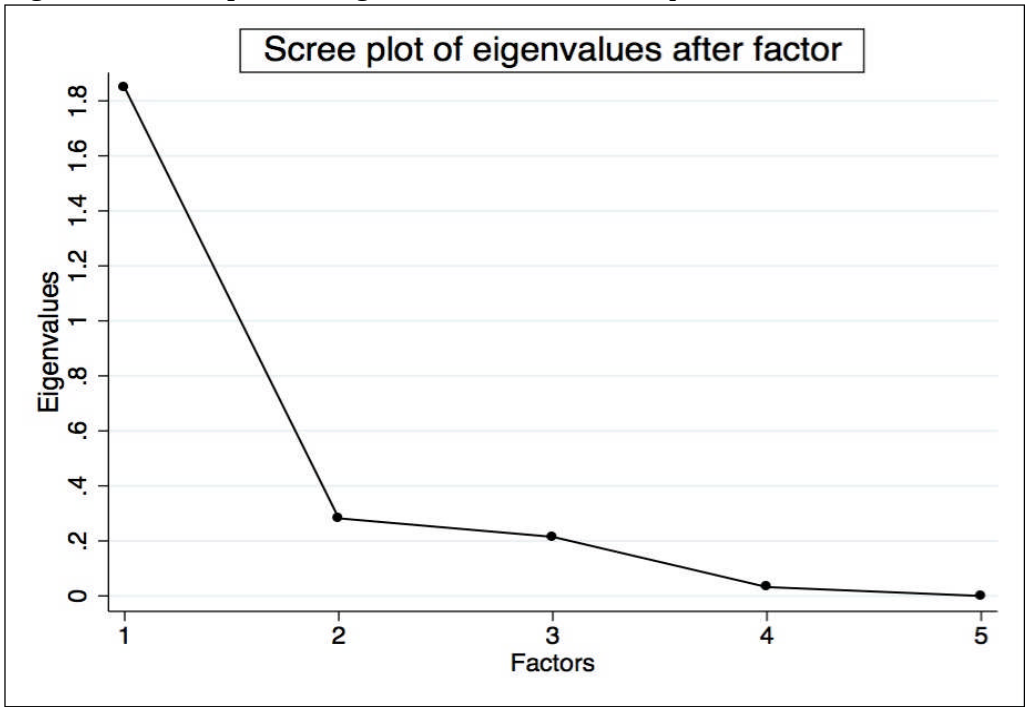


Table 17: Principal factor analysis of SCOFF items

Items	Factor 1*
Item 1 *Purging*	0.58
Item 2 *Loss of control eating*	0.79
Item 3 *Weight loss*	0.28
Item 4 *Body image distortion*	0.55
Item 5 *Food intrusive thoughts*	0.62
Eigenvalue	1.8
Percentage of variance explained	78%

*Factor loadings after non-orthogonal oblique rotation.

5.4.3. Sample characteristics and missing values

Socio-demographic characteristics

Of the 326 participants who were eligible to take part in the ED module (159 screen positive, 167 screen negative, as described in Section 3.3.3), a total of 145 participants (44.8%) were assessed using the SCID-I interview. Of these, 76(52.4%) were SCOFF negative and 69(47.6%) were SCOFF positive. Overall, 31(21.4%) of the 145 participants interviewed received an ED diagnosis, whether threshold or sub-threshold.

Table 18 summarises the socio-demographic characteristics of the sample. The majority of participants were women, of White ethnic background, and educated to at least GCSE/A-level/vocational training level. Nobody was underweight at the time of interview and most participants were of normal weight.

Missing data

Because of the design of the ED module, whereby SCOFF positive participants were all invited to participate to the ED module, but SCOFF negative ones were randomly selected to match the numbers of SCOFF positive as the study progressed, there was not a defined sub-sample of participants to recruit for the ED module from the onset of the study. Therefore, it was only possible to measure attrition between SCOFF screen positive participants who took part to the ED module and those who did not (i.e. refused to be re-contacted, it was not possible to locate).

Table 19, shows that only ethnicity was associated with missingness (i.e. not taking part in the ED module).

Table 18: Socio-demographic characteristics of participants in ED module SELCoHII

Socio-demographic characteristics	N(%)
Total	145(100%)
Gender	
Male	36(24.8)
Female	109(75.2)
Ethnicity	
White	83(57.2)
Black	42(29)
Asian	4(2.8)
Other	16(11)
Education	
No qualification	14(9.7)
GCSE/A-level	70(48.3)
Degree Level or above	61(42)
BMI	
Underweight	0(0)
Normal weight	75(54.3)
Overweight	31(22.5)
Obese	32(23.2)
	Mean (SD)
Age	38.8(15.04)

Table 19: Socio-demographic characteristics of SCOFF positive participants who took part in the ED module and those who did not

Socio-demographic characteristics	Present N(%)	Missing[1] N(%)	P(χ^2)
Total	69	97	
Gender			
Male	13(30.9)	29(69.1)	0.1
Female	56(45.2)	68(54.8)	
Ethnicity			
White	39(48.8)	41(51.3)	
Black	21(44.7)	26(55.3)	0.05
Asian	3(30)	7(70)	
Other	6(20.7)	28(79.3)	
Education			
No qualification	10(37.0)	17(63)	
GCSE/A-level	40(45.9)	47(54.2)	0.6
Degree Level or above	19(38)	31(62)	
BMI			
Underweight	0(0)	4(100)	
Normal weight	30(50.9)	29(49.2)	0.06
Overweight	23(47.9)	25(52.1)	
Obese	15(31.9)	32(68.1)	
	Mean (SD)	Mean(SD)	F(p)
Age	34(15)	36(16)	0.6(0.4)

[1]Includes those who asked not to be contacted again and those whom it was not possible to locate

5.4.4. Criterion validity of the SCOFF

SCOFF scores

As shown in Table 19, mean SCOFF score was higher amongst participants who received an ED diagnosis (2.4, SD=0.8), compared to those who did not receive an ED diagnosis (0.9, SD=1.1). Mean SCOFF scores for both participants who received an ED diagnosis and those who did not was higher among non-White participants.

Sensitivity, specificity, positive predictive value, and negative predictive value

As is shown in Table 5 and Table 20, a cut-off of 2 positive answers provided the best fit for the data, maximising the trade-off between Se and Sp. Sensitivity was 90.3 % (95% CI: 74.2 – 98) whereas Specificity was lower at 64% (95% CI: 54.5 – 72.8). The SCOFF also had a low PPV of 40.6% (95%CI: 28.9 – 53.1), and high NPV of 96.1% (95%CI: 88.9 – 99.2). The AUC was of 0.88, which suggests that the questionnaire has a good ability to discriminate between individuals with an ED and those without (Bewick, Cheek, & Ball, 2004).

When dividing the sample by ethnic background Table 22, the 2+ cut-off still appears to be the best fitting, although a cut off of 1+ in the White sample yields the highest sensitivity with only moderate effect on the specificity of the measure. A cut-off of 2+ amongst non-White participants yielded 100% sensitivity and NPV at the expenses of slightly lower specificity and PPV than those observed in the White sample.

Table 20: Mean SCOFF score and Standard Deviation according to SCID-I ED diagnosis.

	N	ED Mean (SD)	No ED Mean (SD)	F(p)
Total score	145	2.4(0.8)	0.9(1.1)	57.2(<0.0001)
Ethnicity				
White	83	2.4(0.9)	0.8(1.1)	37.7(<0.0001)
Non-white	62	2.6(0.7)	1(1.1)	20.7(<0.0001)
		ED Median (IQR)	No ED Median (IQR)	
Total score	145	2.5(2-3)	0(0-2)	
White	83	2.5(2-3.5)	0(0-2)	
Non-white	62	2.5(2-3.5)	1(0-2)	

Figure 4: ROC curve for the SCOFF

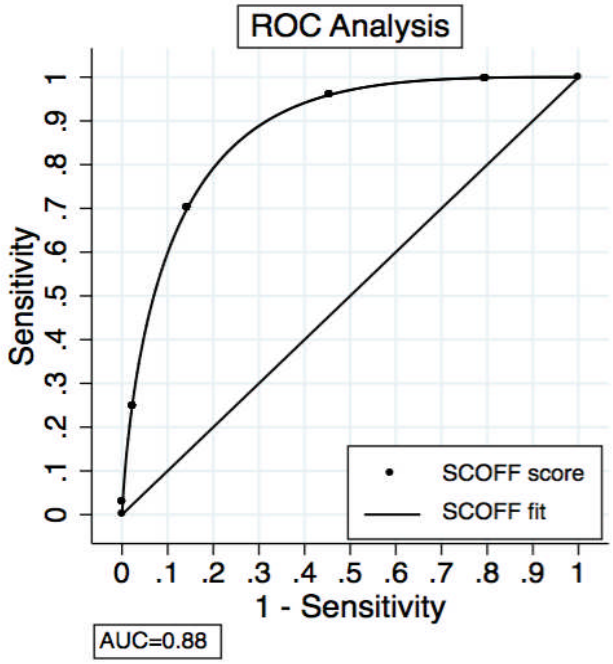


Table 21: Sensitivity, Specificity, Positive Predictive Value and Negative Predictive Value with 95% Confidence Intervals for all possible SCOFF cut-offs

SCOFF cut-offs	Sensitivity (95% CI)	Specificity (95% CI)	Positive Predictive Value (95% CI)	Negative Predictive Value (95% CI)
1+	100 (88.8 – 100)	54.4 (44.8 – 63.7)	37.3 (27 – 48.7)	100(94.2 - 100)
2+	90.3 (74.2 – 98)	64 (54.5 – 72.8)	40.6 (28.9 – 53.1)	96.1 (88.9 – 99.2)
3+	41.9 (24.5 – 60.9)	93.9 (87.8 – 97.5)	65 (40.8 – 84.6)	85.6 (78.2 -91.2)
4+	12.9 (3.6 – 29.8)	99.1 (95.2 -100)	80 (28.4 – 99.5)	80.7 (73.2 – 86.9)

Table 22: Sensitivity, Specificity, Positive Predictive Value and Negative Predictive Value with 95% Confidence Intervals for all possible SCOFF cut-offs by ethnicity (White/non-White)

SCOFF cut-offs	Sensitivity (95% CI)	Specificity (95% CI)	Positive Predictive Value (95% CI)	Negative Predictive Value (95% CI)
White				
1+	100(83.9-100)	61.3(48.1-73.4)	46.7(31.7-62.1)	100(90.7-100)
2+	85.7(63.7-97)	66.1(53-77.7)	46.2(30.1-62.8)	93.2(81.3-98.6)
3+	38.1(18.1-61.6)	93.5(84.3-98.2)	66.7(34.9-90.1)	81.7(70.7-89.9)
4+	14.3(3.1-36.3)	100(94.2-100)	100(29.2-100)	77.5(66.8-86.1)
Non white				
1+	100(69.2-100)	46.2(32.2-60.5)	26.3(13.4-43.1)	100(85.8-100)
2+	100(69.2-100)	61.5(47-74.7%)	33.3(17.3-52.8)	100(89.1-100)
3+	50(18.7-81.3)	94.2(84.1-98.8)	62.5(24.5-91.5)	90.7(79.7-96.9)
4+	10(0.3-44.5)	98.1(89.7-100)	50(1.3-98.7)	85(73.4-92.9)

5.5. Discussion

The aims of this study were to investigate the psychometric properties of the SCOFF questionnaire and tovalidate it against diagnoses obtained with the SCID-I interview, considered a 'gold standard' for the diagnosis of mental health conditions.

5.5.1. SCOFF psychometric properties

This investigation does not provide support to previous literature advancing the hypothesis of a two-factor structure for the SCOFF.

Reliability

The internal consistency of the SCOFF was very low (Cronbach's α = 0.40) which is in line with values found by previous literature. A study comparing the psychometric properties of the EDE-Q questionnaire and the SCOFF in a sample of 257 female attending primary care services found a Cronbach's α of 0.44 for the SCOFF (Mond et al., 2008), whereas an Italian clinical study based on 93 participants found a slightly higher coefficient of 0.64 (Pannocchia et al., 2011). No other validation studies of the SCOFF reported Cronbach's α values, which, it is possible to hypothesise, could indicate presence of publication bias, as negative findings tend to be underreported in published literature. The small number of items in the scale can also explain low Cronbach's α values. Of all the 5 SCOFF items, Item 3 related to weight loss was the one which increased the most the value of α if deleted, which suggests it might be poorly correlated with the other items, or not very specific in detecting ED behaviours.

Factor analysis

Exploratory factor analysis suggested the presence of a single factor underlying the structure of the SCOFF. The single factor solution was able to explain 78% of the overall variance with good factor loadings for all items, with the exception of item 3 (weight loss) which had a relatively low loading (0.28). This result contradicts the findings of two major studies which found a

2-factor solution to be the one best-fitting their data (Hautala et al., 2009; Muro-Sans et al., 2008), whilst replicating the findings of a smaller study based on an Italian clinical sample (Pannocchia et al., 2011). As detailed in the introduction, Muro-Sans and colleagues in their population based study of 945 adolescents, had found a two-factor solution to be the best fitting for the SCOFF (Factor 1: Purging, weight loss; Factor 2: loss of control, body image distortion, food intrusive thoughts) (Muro-Sans et al., 2008). This finding was replicated using Confirmatory Factor Analysis in a Finnish study of adolescents (Hautala et al., 2009).

A smaller study based on a clinical sample of 93 women in Italy, similarly to the findings of this study, found a single factor solution to be the best fitting one, with the weight loss item bearing the smallest factor loading (0.33). The authors suggest this result could potentially be explained by the nature of its content, in that it concerns an objective factor (weight loss), as opposed to subjective perceptions (Pannocchia et al., 2011). This suggestion however, falls short of considering that Item 1 (related to purging behaviours) also refers to an objective factor rather than an ED cognition. Another related explanation could be that weight loss is not an ED-specific behaviour, especially in adult populations such as that of SELCoHI. The majority of the population used in this study (52.9%) belonged to the overweight to obese BMI categories, as opposed to the normal weight category (44.7%), as was shown in Table 26, Chapter 4. In fact, in a set of analyses conducted for Study 1 of this thesis, which were not reported in chapter 4 (see Appendix III), the question on weight loss was the one bearing the fewest and smallest associations with co-morbid behaviours and psychopathology typical of ED behaviours when regression models were fitted.

A possible explanation for the difference noted between this study and those of Muro-Sans et al and Hautala et al, is that both of the latter studies employed an adolescent study population, as opposed to SELCoH, which is a predominantly adult population-based study. In SELCoH only 21% of the population belonged to the 16 – 24 age range, which, in turn, only includes

older adolescents. It has recently been suggested by a Norwegian longitudinal study of 3,844 adolescents that purging behaviours might decrease from adolescence to adulthood (Abebe et al., 2012). If it could be argued that purging behaviours for weight loss are more common in adolescence, this could explain the 'clustering' of the two questions related to these behaviours in adolescent samples. More research is needed to clarify these issues and potentially replace or rephrase the weight loss item.

Criterion validity of the SCOFF

In line with previous research, this study found a cut-off of two positive answers to be the one maximising the trade-off between sensitivity and specificity, yielding a sensitivity of 90.3% and a specificity of 64%.

As was show in Section 3.3.3, most studies conducted to date have displayed higher levels of sensitivity than specificity for the SCOFF, although this difference varies in magnitude. The value of sensitivity found in this study does not differ greatly from those of clinical samples (Garcia-Campayo et al., 2005; Pannocchia et al., 2011; Siervo, Boschi, Papa, Bellini, & Falconi, 2005). Some studies based on adult samples in the community have found similar results (Garcia et al., 2010; L. S. Hill, Reid, Morgan, & Lacey, 2010; Luck, 2002) and other lower values (Lähteenmäki et al., 2009; Leung et al., 2009; Mond et al., 2008; Muro-Sans et al., 2008; Parker et al., 2005) with no clear pattern. The specificity found in the SELCoH population is lower than all of those found in previously conducted studies with the exception of one (Siervo et al., 2005). Not all studies validating the SCOFF reported values for PPV and NPV, however, the PPV value found here, despite being low (40%) in absolute terms, was higher than those found in most other papers (L. S. Hill et al., 2010; Lähteenmäki et al., 2009; Luck, 2002; Mond et al., 2008), albeit lower than others (Garcia et al., 2010; Garcia-Campayo et al., 2005; Parker et al., 2005). NPV (90.6%) was in line with that reported in all of the other studies.

Differently from other studies this study population had a wider age range (16-90) and included participants from different ethnic backgrounds (42.8%).

It may be that low specificity reflects the presence of behaviours captured by the measure that are not specific to ED, perhaps more common in ethnic minorities, or high levels of sub-threshold conditions. As a further confirmation of these hypothesis, the study of the diagnostic properties of the SCOFF according to ethnic background, highlights that a cut-off of 2+ questions maximises sensitivity and specificity in both samples, although in the non-White sample sensitivity is higher than in the White (100% vs. 85.7%), but the specificity is slightly lower (61.5% vs. 66.1%). The low PPV found in this and other studies can be generally attributed to the low prevalence of ED as well as to the low specificity of the SCOFF, as it was discussed in Chapter 3, section 3.4.3. The lower PPV amongst ethnic minorities could be an indication that ED are more rare in these populations, although it was not possible to investigate each ethnicity separately due to the otherwise low numbers of participants in each group, and thus this figure could represent an over- or underestimation for specific ethnic groups.

5.5.2. Strengths and limitations

This study has several strengths. First, the sample employed to perform EFA was larger (N=1,698) than those used by previous studies, ensuring greater statistical power for analyses. Second, the sample was also ethnically diverse and belonging to different socio-economic statuses and education levels, meaning results are more generalizable to diverse populations. It was not possible, however, to conduct sub-group analyses for adolescents as one of the inclusion criteria for the study was to be 16 years of age or older. Third, diagnoses were made using a clinically sound instrument, and when a diagnosis was debatable the participants were re-contacted.

Nevertheless, some limitations due to the design of this study should be acknowledged. First, there were substantial losses to follow up, with only about 45% of all those which were eligible for the ED module being interviewed. Since individuals who had screened negative at the SCOFF were randomly selected as the study was running to match the exposed ones,

it is not possible to run an overall attrition analysis showing whether differences occurred between those who were selected for participation but did not attend and those who did. It was possible, however, to investigate socio-demographic differences between SCOFF positive individuals who did and did not take part to the ED module and no differences were found, suggesting that it is unlikely that estimates might be biased. Nevertheless, differential follow up based on the outcome under study could have occurred, but could not be observed.

Second, participants were asked about their eating behaviours at the time of SCOFF interview up to 3 years afterwards; therefore, it is possible that some recall bias took place. If a participant disclosed ED behaviours which started after the SCOFF interview, they were not coded as present at time of interview, but a separate variable was generated to indicate that the symptoms (e.g. vomiting, bingeing, misuse of laxatives/diet pills, restricting, or over exercising) were present at least at one point in time. Similarly, if the participant disclosed having had an ED prior to SCOFF interview, this was coded as 'past ED'. This procedure should have limited scope for misclassification of participants as 'false positives' (Type I error). Due to the nature of ED it is possible that some scope for classification of individuals 'false negative' (Type II error) exists, as often – as described previously – individuals with an ED fail to disclose their condition.

Finally, although diagnostic properties of the SCOFF were investigated by ethnic background, because the overall sample was relatively small, it was not possible to calculate sensitivity, specificity, PPV, and NPV for each group. Doing so could help assess the stability of the measure across ethnic and cultural groups. Future studies should attempt to validate the SCOFF in a wider and larger multi-ethnic sample.

5.6. Conclusions and policy implications

The results of this study highlight both advantages and disadvantages of using the SCOFF questionnaire in a general population of adults.

The first study based on factor analysis highlighted two interesting findings. First, it appears that Item 3 on weight loss bears the smallest correlation with the other Items and the smallest factor loading in EFA. This suggests that the question might not be appropriate to identify individuals with an ED. The reasons for this were discussed in section 5.5 and could be related to weight loss *per se*, not indicating an ED, or to the question not being phrased appropriately to gather whether weight loss is due to an ED. Cultural differences proper of this multicultural sample could also explain this difference.

Second, in contrast to two previous studies based on adolescent samples (Hautala et al., 2009; Muro-Sans et al., 2008), this study did not find a two-factor solution to fit the data. Finding a correlation between weight-loss and purging behaviours in adolescent samples might indicate higher prevalence of purging and body dissatisfaction among younger participants, rather than differences being a feature of the questionnaire itself. Future studies should address these issues to investigate whether any changes to the SCOFF are necessary in order to improve its validity in different populations.

Concerning the criterion validity of the SCOFF, this study found very high levels of sensitivity, but relatively low specificity and, as one would perhaps expect, high NPV, but low PPV. If a test has a high Se, it implies that a negative result most certainly means absence of the condition – which is reflected in the high NPV that was found here. In general, for screening measures, a high sensitivity is preferred to a high specificity as the latter tends to be preferred in a 'gold standard measure'. In fact, when a test has high specificity it means that a positive result is likely to indicate the presence of a condition. However, it is also true, that low specificity could result in a high number of unnecessarily referred patients, which could represent an economic burden on

the health system. Policy-wise, these results seem to confirm that the SCOFF could be used as a quick screening tool for ED in the general population, perhaps in school settings to alert families of possible ED problems, since a positive result is not a guarantee of positive ED status. Considering the relatively high costs of investigating further presence of an ED through referral the use of the SCOFF might be a less viable solution to screen for ED, for instance, in general practices. These results suggest that research studies should employ the SCOFF with caution as low specificity might result in differential misclassification of participants and, ultimately, in biased results. Nevertheless, given the results presented in chapter 4 of this thesis, it seems that the SCOFF is suitable at detecting broad disordered eating behaviours in the population, which, although not specific of an ED diagnosis, can signify important comorbidity.

Chapter 6
Prevalence and correlates of eating disorders in a general population sample

Parts of this chapter appear in the article Solmi, F.; Hatch, S.; Hotopf, M.; Treasure, J., Micali, N. (under review) 'Eating disorders in a multi-ethnic inner-city UK sample: prevalence, comorbidity and service use'

6.1. Introduction

ED prevalence and comorbidity

As discussed in Chapter 1, the point prevalence of eating disorders (ED), is relatively low (point prevalence of Anorexia Nervosa (AN): 0.0%-1.5%; Bulimia Nervosa (BN): 0.37%-3.0%, and Binge eating Disorder (BED): 0.4%-1.0%) (Smink et al., 2012; Striegel-Moore et al., 2006). The relaxation of some criteria previously contained in the DSM-IV, in the new DSM-5, will likely cause a reduction in the prevalence of sub-threshold diagnoses, as individuals previously diagnosed with an eating disorders not otherwise specified (EDNOS) will now shift to full-threshold diagnoses and to the newly introduced diagnosis of BED (Machado et al., 2013).

Prevalence figures for Other Specified Feeding or Eating Disorders (OSFED) are not yet available due to the recent introduction of the category upon release of DSM-5 in May 2013 (American Psychiatric Association, 2013). Prevalence of EDNOS has been difficult to estimate with precision due to the many ways in which its definition can be operationalized. However, it is believed to be higher than those of full-threshold diagnoses, especially in general population settings, accounting for 50%-90% of all ED cases (Machado et al., 2013). A study on young females found point prevalence of EDNOS to be 2.4% (Machado et al., 2007). Amongst the EDNOS 'diagnoses' Purging Disorder (PD) has been the focus of increased attention in the past decade, and its prevalence has been estimated in the range of 2.5% to 5.3% (Allen et al., 2013; A. E. Field et al., 2012; Wade et al., 2006).

As was discussed in detail in Chapter 2, despite relatively low prevalence, the burden of disease associated with ED is substantial. Comorbid psychiatric conditions are frequent across the whole ED spectrum, with visible trends in comorbidity patterns occurring when dichotomising ED into restricting (i.e. AN-R) versus binge/purging-type (i.e. AN-BP, BN, BED). Mood disorders are possibly the condition most often diagnosed amongst individuals with ED. Early literature suggested that mood disorders are more frequent in individuals with BN (Braun et al., 1994), whereas more recent studies have shown a comparable occurrence across AN, BN, and BED (Godart et al., 2007). Similarly, anxiety disorders are often comorbid with and precede the onset of ED, and it has been speculated that anxiety may play a role in the aetiology of ED (Micali, Simonoff, & Treasure, 2011; Swinbourne & Touyz, 2007). However, while some studies (Godart et al., 2000; Thornton & Russell, 1997) have suggested the presence of specific patterns in the association of anxiety disorders with ED (e.g. AN-R mostly associated with OCD and BN with social phobia), others (Preti et al., 2009; Swanson et al., 2011) have not detected these differences. Only PTSD, which in DSM-5 is no longer classified as an anxiety disorder, has been consistently found to be associated with BN (Dansky et al., 1997; Hudson et al., 2007). With regards to suicidality, evidence suggests increased risk of suicides in AN (Arcelus et al., 2011; Miotto & Preti, 2007), and of suicidal attempts in BN (Bodell et al., 2013; Stein, Lilenfeld, Wildman, & Marcus, 2004). Substance use has mostly been reported in BN and AN-BP (Holderness et al., 1994). Finally, high rates of personality disorders have been shown amongst individuals with both AN and BN, although AN appears to be more associated with OCPD, and BN with BPD (Sansone et al., 2004).

When compared to literature on major diagnoses, fewer studies have looked at the association of EDNOS conditions with comorbid conditions, although, those that have, report similar levels of comorbidity, and markedly higher levels of comorbidity than in healthy controls. In individuals with EDNOS mood and anxiety disorders are similarly present, particularly amongst adolescents, and to a lesser extent amongst adults (Le Grange et al., 2012; Swanson et al., 2011).

Individuals with PD in particular, display higher associations with mood and anxiety disorders than controls in some studies (Keel et al., 2005, 2008; Wade, 2007b), but also than those with BN in others, especially amongst adolescents (Abebe et al., 2012). Studies have also shown increased suicidality amongst individuals with EDNOS, in comparison to healthy controls and at levels comparable with those seen in BN (Crow et al., 2009). High levels of substance use have also been reported in EDNOS, although with different patterns across the category subtypes. Individuals with sub-threshold AN had no association with substance use, whereas several studies found associations between sub-threshold BED and purging behaviours and substance use (Hudson et al., 2007; Swanson et al., 2011), a finding, which mirrors patterns found in full-threshold diagnoses. Finally, little research has been devoted to personality disorders amongst individuals with ED behaviours and EDNOS; however, results of research so far seem to indicate higher levels of personality disorders (Marino & Zanarini, 2001).

As discussed in Section 2.3, accurate figures on ED prevalence and comorbidity amongst ethnic minorities are still scant in the literature, and often results have yielded contrasting findings. Whilst members of ethnic minorities appear to have fewer body image issues (Kronenfeld et al., 2010; Shaw et al., 2003) and higher tendency to binge (Striegel-Moore et al., 2000), these results have not been found applicable across all ethnic groups, and recent literature shows that some of these differences might be attenuating (Franko et al., 2007; Grabe & Hyde, 2006).

Whilst literature indicates BED and AN to be, respectively the most and least prevalent ED amongst Black communities (Franko et al., 2012; Hoek & van Hoeken, 2003), no consensus has been reached with regards to purging behaviours. Several studies have found Black and Asian ethnic groups to be those least likely to use purging behaviours (Chao et al., 2008; Franko et al., 2007; Regan & Cachelin, 2006), whilst others have found BN to be the most frequent diagnosis amongst members of ethnic minorities (12% of overall sample, of whom 34% were Asian, 47% Black) (Waller et al., 2009).

Finally, despite not being a criterion for its diagnosis, overweight and obese BMI, often more prevalent in members of ethnic minorities, (Flegal et al., 2010) have frequently been associated with BED (Franko et al., 2012; Marsha D Marcus & Wildes, 2009). Binge eating has been estimated to occur in 21% to 48% of overweight and obese populations (de Zwaan, 2001; Decaluwé, Braet, & Fairburn, 2003; Latner, Wetzler, Goodman, & Glinski, 2004), nevertheless exploratory literature on the inter-relationship between ethnicity, BMI and ED is still scant.

It has been widely documented that few women with BN and BED receive specialist treatment, with reported rates of access to treatment ranging from 7% to 40% in women with both sub-types of BN, and BED (Hudson et al., 2007; Mond et al., 2007). The lack of visible symptoms such as the low weight typical of AN, the ego-syntonicity of these ED, and general practitioners limited knowledge about the different physical and psychological symptoms of ED, have been deemed to be amongst the causes of these findings (Mond et al., 2007; Reid et al., 2009). In fact, amongst women with BN or BED diagnoses, those with BN of the purging type seem to be most likely to gain access to specialised services. This might be due to higher levels of impairment, but also to relative more ease to recognise symptoms (e.g. vomiting). On the other hand, there is increasing evidence that women with BN of the non-purging type, or BED are referred to services concerning weight management problems such as dieticians or slimming programmes (Mond et al., 2007). When considering the high levels of psychiatric comorbidity typical of ED, poor figures related to access to specialised treatment are concerning. Studies investigating service utilisation in individuals with ED are sporadic and, with the exception of a few (Hudson et al., 2007; Preti et al., 2009; Swanson et al., 2011), they involve very small ad hoc samples. Therefore, more research is needed in assessing patterns of service utilisation in the general population.

6.2. Aims and Hypotheses

Drawing from the literature reviewed above, the aims of this study are to employ data derived from the SELCoH sample to:

- ✓ Investigate the prevalence of ED in a multi-ethnic community-based sample in South-London (UK);
- ✓ Investigate the psychological comorbidity of ED diagnoses; in particular mood and anxiety disorders, substance use, PTSD, suicidality and personality disorders;
- ✓ Investigate patterns of service use amongst ED individuals.

In light of the findings highlighted in the literature reviewed in Chapter 1 and 2, the hypotheses driving these analyses are that:

- ✓ The prevalence of ED diagnoses will be in the range of 0.3%-5%. OSFED is hypothesised to be the most prevalent condition.
- ✓ Individuals of Black ethnicity will be more likely to engage in binge/purge disorders, whilst these behaviours should be low amongst Asian participants.
- ✓ ED diagnoses will be associated with the set of comorbid conditions under study. In particular higher comorbidity levels are expected in individuals with BN and, to a lesser extent PD, especially with regards to suicidality, mood disorders and substance use.
- ✓ Individuals with ED will be likely to have sought help through a GP, although fewer people will have been seen by specialist services.

6.3. Methods

6.3.1. Study Design and population

The study design was a two-stage cross-sectional prevalence study.

The study on the prevalence of ED diagnoses in the SELCoH study population employed data from the SELCoHI wave of data collection (n=1,669), which was previously described in section 3.3.1; and from a sub-sample (N=145) of the original SELCoHI sample, which was interviewed again in SELCoHII using the

SCID-I interview, described in sections 3.3.2 and 3.3.3. A more complete description of the recruitment and interview process, as well as a flowchart of study participation, is provided in sections 3.3.1 – 3.3.3.

6.3.2. Measures

Eating Disorder diagnosis

Eating disorders were diagnosed using the Structured Clinical Interview for DSM-IV Axis I disorders non-patient edition (SCID-I-NP)(First et al., 2002). As explained in section 3.4.3, the ED section of the SCID-I is composed of 3 parts aimed at assessing the presence of AN, BN, or BED. Each section contains a set of questions covering the behaviours and cognitions central to each condition, which can be scored as 'present/threshold', 'sub-threshold', or 'absent'. Researchers were instructed to elicit from participants information on ED behaviours concurrent to the time when the latter had been interviewed using the SCOFF (Sick, Control, One stone, Fat, Food), in order to measure comorbidity using SELCoHI measures. Interviewers were also instructed not to apply 'skip rules' which are proper of the instrument, as evidence suggests that using skip rules might result in underestimating the prevalence of diagnoses due to EDNOS not being diagnosed (Swanson et al., 2011). Original diagnoses were made with DSM-IV criteria, and then updated using DSM-5 criteria. For the purposes of this study, DSM-5 diagnoses were employed; PD was kept as a separate OSFED diagnosis in order to determine its prevalence and correlates and, therefore, clinical significance. A PD diagnosis was given to individuals who engaged in purging behaviours (e.g. vomiting, or inappropriate use of laxative and diuretics) in the absence of an objective binge at least twice a week for 3 months. All diagnoses referred to the time period in which the SCOFF questionnaire was administered. If a participant disclosed threshold ED behaviours in the period which followed the SELCoHI interview, they were recorded as behaviours, but not considered a diagnosis.

Outcomes

A set of psychiatric outcomes, which had already been used in study 1, chapter 4, have been investigated in this study, due to their association with ED as suggested by the literature. A detailed explanation of each measure is provided in Section 3.4.4. Measures of comorbidity collected in SELCoHI were employed in the analyses, as ED diagnosis obtained using the SCID-I clinical interview refers to the time point in which the SCOFF questionnaire was administered (i.e. during the SELCoHI round of data collection).

Since all measures have previously been described in Section 3.4.3, below I will only provide a summarised version of that section, highlighting, which variables were recoded:

Common Mental Disorder (CMD) was measured using the CI-R scale and coded into a three-level variable indicating 'no diagnosis', 'non specified neurotic disorders' and 'mood, anxiety and mixed mood and anxiety disorders'. The rationale for this was to increase power of the analyses given the low prevalence of some of the conditions.

Personality Disorders were screened for using the Standardised Assessment of Personality – Abbreviated Scale (SAPAS)(Moran, 2003).

Post-Traumatic Stress Disorder was assessed with the Primary Care Post-traumatic stress disorder scale (PC-PTSD) (Frissa et al., 2013).

Suicidality was measured with a binary variable indicating whether the participant had ever thought of or attempted suicide or not.

Alcohol use was measured with the Alcohol Use Disorders Identification Test (AUDIT)(Babor et al., 2001). From the 4 original categories of: 'healthy drinking'; 'hazardous drinking'; 'hazardous and harmful drinking'; and 'alcohol dependence' a two-level variable was generated indicating safe levels of alcohol consumption and any "hazardous, hazardous and harmful drinking, and alcohol dependence" levels of alcohol consumption. The choice was motivated by the need to increase the power of the analyses given the low prevalence of alcohol dependence, the small sample employed to diagnose ED (N=145) and the small prevalence of ED.

Drug use was investigated by creating a binary variable indicating use of one or more of the following drugs in the 12 months prior to interview: Cannabis, Amphetamines, Cocaine, Ecstasy, Acid or LSD, Tranquillisers, Crack, and Heroin.

Smoking was measured by creating a variable indicating whether participants had ever smoked. The original four-level variable indicating: 'never smoked', 'ex-smoker', 'current smoker', 'sporadic smoker', was recoded into a two-level variable by merging the last three categories. The final dichotomous variable discriminates between individuals who had smoked at any points of their lives against those who never smoked.

Socio-demographic characteristics

Socio-demographic characteristics of study participants were also collected during SELCoHI. All measures were self-reported by participants as part of the core SELCoHI assessment, whereas BMI was objectively measured. A detailed description of each variable is provided in section 3.4.4. Below is a short summary:

BMI was measured with the categories 'underweight'; 'normal weight'; 'overweight'; or 'obese'.

Age was used as a continuous variable to describe the sample interviewed in SELCoHII.

Ethnicity was coded as: 'White'; 'Black African or Caribbean'; 'Asian'; or 'Other' ethnicity.

Education was used as a three-level categorical variable indicating whether the subject had 'no qualifications'; 'completed GCSE and/or A-levels'; or' had a higher degree or above'.

Marital status was recoded as a four-level categorical variable indicating 'single'; 'married or cohabiting'; ' divorced or separated'; or 'widowed'.

Health service use

Questions on health service use were explained in section 3.4.3. Participants were asked if they had seen a GP or therapist for a problem with anxiety or depression in the previous year and if the answer was yes they were additionally asked if they had seen: (i) a GP, (ii) a therapist or counsellor; (iii) a mental health specialist. Each question was coded as a binary 'yes/no' variable.

6.3.3. Data analyses

The dataset was weighed to account for household clustering and non-response within household at initial recruitment, and for losses to follow up at the second stage of the study. Inverse probability weights for both SELCoHI & II studies were calculated by the data manager of the SELCoH study and a detailed explanation of how this was done is provided in several papers produced by the core SELCoH team (Hatch et al., 2011, 2012).

Prevalence of ED was calculated for DSM-IV and DSM-5 diagnoses; however, all of the regressions models were undertaken using DSM-5 diagnoses. Purging disorder was kept as a separate category amongst DSM-5 diagnoses, given recent trends in literature suggesting a distinct clinical relevance of the purging disorder diagnosis.

Prevalence of socio-demographic variables in the whole sample were calculated using un-weighted frequencies on complete outcome cases; therefore, differences exist in total number of participants for whom the information existed. Weighted prevalence of ED and 95% CI were calculated, and differences in socio-demographic variables and outcomes were tested using Pearson's $\chi 2$ tests with Rao-Scott correction for categorical data from survey samples (59).

Missing data on socio-demographic variables (BMI: 3.5%; ethnicity; 0.1%) was assumed to be missing at random (MAR). Missing values for categorical variables were imputed using multiple imputation by chained equations (van Buuren et al., 1999) from multinomial logistic models. Five imputation models were created by substituting missing values from a set of imputations models

constructed from all other correlates and outcomes used in the analyses. Distribution of imputed values was visually inspected to ensure comparability with the observed value. All regression analyses were run on individuals with complete outcome data. Participants who were SCOFF positive in SELCoHI, but who were not interviewed in SELCoHII despite being eligible, were dropped from the analyses on the assumption that they could be ED cases and could bias estimates of associations in the unexposed group.

Odds Ratios (OR), Relative Risk Ratios (RRR) and 95% confidence intervals (CI) for the association between ED behaviours, psychopathology, and help-seeking behaviours were calculated using univariate and multivariate logistic and multinomial logistic regressions according to whether the outcome variable was binary or categorical in nature. In the multivariate model, analyses were adjusted for a number of socio-demographic covariates identified as potential confounders of the association between ED and psychiatric comorbidity outcomes. Covariates were included if associated with exposure and outcome (i.e. age, gender), if they predicted differences between individuals who were retained in the study and those who were loss to follow up (i.e. ethnicity and BMI), and finally, if they were associated with the outcomes and were known from literature to be associated with ED (education, marital status). Models using help-seeking behaviours as outcomes were also adjusted for mood and anxiety disorders, given the nature of the question asking whether individuals had sought help for 'problems with anxiety and depression in the previous year'.

6.3.4. Power calculations

Based on findings of ED prevalence in mixed samples, presented in section 6.1, point prevalence of ED was assumed to be between 1% and 4%. Assuming a sample of SCOFF positive and negative of 166 and 1,534 participants respectively, with an alpha of 0.05 power calculations were as follows:

Table 23: Power calculation to detect 1-4% prevalence of ED in the initial planned sample

Prevalence of ED	SCOFF +	SCOFF -	Alpha	Power
1%	166	1,534	0.05	58%
2%	166	1,534	0.05	81%
3%	166	1,534	0.05	91%
4%	166	1,534	0.05	96%

Based on the final sample of SCOFF positive interviewed (N=69) and SCOFF negatives (N=1,503[5]), with an alpha of 0.05, power calculations were as follows:

Table 24: power calculations to detect a prevalence of ED of 1-4% in the actual final sample

Prevalence of ED	SCOFF +	SCOFF -	Alpha	Power
1%	69	1,503	0.05	41%
2%	69	1,503	0.05	62%
3%	69	1,503	0.05	74%
4%	69	1,503	0.05	83%

As can be seen in table 2, the final sample had a power of 74% to detect an overall ED prevalence of 3% and a power of 41% to detect a prevalence <3% (i.e. those of each individual ED).

[5] SCOFF + were dropped from these

Given 1,601 participants in our sample and an un-weighted prevalence of total exposure (all-ED) of 2% we had >90% power to detect an OR of 2.5 and 3.5 and above for very common (20%) and common (10%) outcomes; we had >90% power to detect OR of 5 or above for uncommon (5%) outcomes. Given the low power to detect small differences in the sample using the whole exposed group to ED, regression analyses for neither this group nor for each ED sub-group were undertaken

Table 25: Power calculations of associations between study exposure (eating disorders) and outcomes

Prevalence of exposure	Rate of outcome in exposed	Rate of outcome in unexposed	OR	Power
2%	25%	20%	1.2	8%
2%	30%	20%	1.5	24%
2%	35%	20%	1.7	46%
2%	40%	20%	2.0	67%
2%	50%	20%	2.5	94%
2%	15%	10%	1.5	13%
2%	20%	10%	2.0	37%
2%	30%	10%	3.0	81%
2%	35%	10%	3.5	93%
2%	7%	5%	1.4	5%
2%	10%	5%	2.0	20%
2%	15%	5%	3.0	52%
2%	20%	5%	4.0	78%
2%	25%	5%	5.0	91%

6.4. Results

6.4.1. Socio-demographic characteristics of the SELCoHI and SELCoHII 'ED module' samples

In SELCoHI, a total of 1,698 individuals (age range: 16 to 90) were interviewed. Of these, 326 were eligible to take part in the ED module, and 145 (44.8%) were assessed using the SCID-I interview (SCOFF negative: N=76 (52.4%) and SCOFF positive: N=69 (47.6%)). A description of the socio-demographic characteristics of the SELCoHI sample was provided in section 3.3.1.

The majority of individuals who were interviewed in SELCoHII for the ED module were female, single, and educated at least to GCSE/A level. None of the participants were underweight and the majority were of normal BMI. The mean age of the sample was 36.4 years (SD: 15.1), as shown in Table 26.

Table 26: Socio demographic characteristics of the participants of the SELCoHII ED module

	SELCoHII – ED module sample N(%)
Total	145
Gender	
Male	36(24.8)
Female	109(75.2)
Marital status	
Single	32(22.1)
Married/cohabiting	74(51)
Divorced/ Widowed	12(8.3)
Other	27(18.6)
Ethnicity	
White	83(57.2)
Black	42(28.9)
Asian	4(2.8)
Other	16(11.1)
Education	
No qualifications	14(9.7)
GCSE/A levels	70(48.3)
University degree or higher	61(42.1)
BMI (n=138)	
Underweight	0(0)
Normal	75(54.3)
Overweight	31(22.5)
Obese	32(23.2)
	Mean (SD)
Age	36.4(15.1)

6.4.2. Missing data and attrition

It was not possible to interview a total of 181 (55.2%) participants in SELCoHI who were eligible for enrolment in the SELCoHII ED module.

All individuals who screened positive on the SCOFF, and an equal number of individuals who screened negative were eligible for inclusion. However, whilst all of the screen positive participants were identifiable from onset of recruitment, screen negative participants were randomly selected and approached as the study progressed to match the number of screen positive participants interviewed; therefore there was not a pre-established group identified from onset of the study. Due to this design issue, it was not possible to compare the participants who were interviewed against the whole sample of those who were eligible, but lost to follow up. Missing data analysis was thus conducted comparing the screen positive participants who were interviewed again in SELCOHII, against screen positive individuals who were lost to follow up on basic demographic characteristics. The latter group of individuals, as explained in the data analysis section above, were subsequently dropped from all of the analyses.

No differences were found between individuals who were lost to follow up and those who were retained in the study, among those who had screened positive (Table 27).

Table 27: Socio-demographic characteristics of SCOFF screen positive individuals who were interviewed in SELCoHII and who were lost to follow up

	Lost to follow up N(%)	Interviewed N(%)	P(χ^2)
N	97	69	
Gender			
Male	29(69.1)	13(31)	0.12
Female	68(54.8)	56(45.2)	
Marital status			
Single	40(54.1)	34(45.9)	
Married/cohabiting	40(61.5)	25(38.5)	0.6
Divorced/ Widowed	17(63)	10(37)	
Ethnicity			
White	41(51.3)	39(48.7)	
Black	26(55.3)	21(44.7)	0.05
Asian	7(70)	3(30)	
Other	23(79.3)	6(20.7)	
Education			
No qualifications	17(63)	10(37)	
GCSE/A levels	47(54)	40(46)	0.6
University degree or higher	31(62)	19(38)	
BMI			
Underweight	4(100)	0(0)	
Normal	29(49.2)	30(50.8)	0.06
Overweight	25(52.1)	23(47.9)	
Obese	32(68.1)	15(31.9)	
Age			
16-24	31(59.6)	21(40.4)	
25-34	23(54.7)	19(45.2)	
35-44	17(60.7)	11(39.3)	0.6
45-54	12(48)	13(52)	
55-64	6(66.7)	3(33.3)	
65+	8(80)	2(20)	
Primary diagnosis			
No diagnosis	46(59.7)	31(40.3)	
Non-specified neurotic disorder	8(53.3)	7(46.7)	0.9
Anxiety/mood disorder	43(58.1)	31(41.9	

6.4.3. Prevalence of ED diagnoses

Amongst those who were interviewed in SELCoHII, 31 (21.3%) participants had either a DSM-IV or DSM-5 ED diagnosis. Prevalence was calculated over the whole sample using survey sample weights, as described in section 0 for both DSM-5 and DSM-IV diagnoses.

As can be seen in Table 28, no cases of AN were found in the sample, whether DSM-IV or DSM-5 criteria were employed to diagnose ED. When using DSM-IV criteria prevalence of EDNOS was higher (1.7%) then when using DSM-5 (1.0%). This is due to two participants now meeting criteria for BED diagnosis and 4 participants being given a PD diagnosis. If PD participants had been kept included as OSFED, the prevalence of the latter would have not changed much (1.5%) compared to that of DSM-IV EDNOS (1.7%). No differences in the prevalence of BN were found, with the only difference being the loss of the two sub-types. The OSFED category included individuals who, according to DSM-5 criteria, had sub-threshold presentations of BN and BED, or presented with non-compensatory purging behaviours in the absence of bingeing and could therefore not be assigned to a diagnosis.

Table 28: Prevalence of DSM-5 and DSM-IV diagnoses in the SELCoH sample (N=1,601)

	Sample n=1,601	
ED	N	%(95% CI)
DSM 5		
No ED	1,570	96.6(95.2-97.7)
BN	6	0.8(0.3-1.7)
BED	11	1.1(0.6-2.0)
PD	4	0.5(0.2-1.2)
OSFED	10	1.0(0.6-1.9)
DSM-IV		
No ED	1,570	96.6(95.2-97.7)
BN-NP	3	0.4(0.1-1.2)
BN-P	3	0.4(0.1-1.2)
BED	9	0.9(0.5-1.7)
EDNOS	16	1.7(1.1-2.8)

Given the final size of the sample (N=59 SCOFF positive and N=1,532 controls, of whom 76 interviewed) we had a power of 71% with an alpha of 0.05 and of 73% with an alpha of 0.1 to estimate an overall 3% prevalence.

6.4.4. ED diagnoses and socio-demographics

As shown in Table 29, no differences were found in the distribution of socio-demographic characteristics across ED diagnoses, with the exception of gender. More women than men (p=0.02) were diagnosed with an ED, with only 2 men diagnosed with BED. No participants from a Black ethnic background were diagnosed with PD, whereas the only Asian participant who reported an ED was diagnosed with PD.

No underweight participants were diagnosed with an ED, whereas overweight or obese BMI categories were frequent across most diagnoses (100%, 75%, and 50% in BED, PD, and BN respectively). More participants with an ED did not have a university degree, although all of those with PD or an OSFED were educated to at least GCSE levels.

Mean age was the highest for BED (Mean: 46.3; SE: 7.5; range: 22-68, median: 50) and lowest for PD (mean 28.6, SE: 4.4, range 20-45, median: 26). Notably, 7 BED participants (0.7%, 95% CI: 0.3-1.5) belonged to the 45-54 age group and 1 (1.0%, 95%CI: 0-0.8) to the over 65 one; whereas half of the BN participants were 45 years of age or older. Three out of four participants with PD were younger than 34 years (Table 26).

Table 29: Prevalence (and 95%CI) of socio-demographic characteristics across ED diagnoses

Socio-demographic	N	n	No ED % (95% CI)	n	BN % (95% CI)	n	BED % (95% CI)	n	PD % (95% CI)	n	OSFED % (95% CI)	P(χ^2)
Gender												
Male	686	684	99.4(97.6-99.8)	0	-	2	0.6(0.2-2.4)	0	-	0	-	
Female	870	841	95.2(93.0-96.7)	6	1.2(0.5-2.6)	9	1.4(0.7-2.7)	4	0.7(0.3-1.8)	10	1.6(0.9-2.9)	0.02
Marital status												
Single	626	615	96.4(93.6-97.9)	4	1.4(0.5-3.7)	2	0.6(0.1-2.2)	1	0.3(0.0-2.3)	4	1.3(0.5-3.5)	
Married/cohabiting	718	704	96.9(94.9-98.2)	1	0.2(0.0-1.3)	5	1.1(0.5-2.7)	2	0.5(0.1-1.9)	6	1.3(0.6-2.8)	0.3
Divorced/ Widowed	212	206	95.9(91.1-98.2)	1	0.9(0.1-6.5)	4	2.5(0.9-6.6)	1	0.6(0.0- 4.1)	0	-	
Ethnicity (n=1,554)												
White	988	967	96.5(94.6-97.8)	4	0.8(0.3-2.3)	9	1.4(0.7-2.7)	2	0.3(0.0-1.3)	6	0.9(0.4-1.9)	
Black	339	333	96.6(92.5-98.5)	2	1.0(0.3-4.1)	2	1.1(0.3-4.5)	0	-	2	1.3(0.3-4.9)	0.4
Asian	53	52	96.7(80.7-99.5)	0	-	0	-	1	3.2(0.5-19.3)	0	-	
Other	174	171	96.8(90.6-98.9)	0	-	0	-	1	1(0.1-1.2)	2	2.2(0.5-8.4)	
Education												
No qualifications	195	191	96.3(90.4-98.6)	1	1.1(0.2-7.6)	3	2.6(0.8-7.8)	0	-	0	-	
GCSE/A levels	695	674	94.8(92.1-96.6)	4	1.2(0.4-3.1)	8	1.9(0.9-3.7)	3	0.7(0.2-2.3)	6	1.4(0.6-3.2)	0.1
University degree	649	643	98.4(96.5-99.3)	1	0.3(0.0- 1.9)	0	-	1	0.3(0.0-2.1)	4	1.0(0.4-2.7)	
BMI (n=1,501)												
Underweight	35	35	100	0	0	0	-	0	-	0	-	
Normal	682	672	97.3(94.9-98.5)	3	0.9(0.3-2.9)	0	-	1	0.3(0.0-2.0)	6	1.5(0.7-3.4)	0.1
Overweight	482	472	96.6(93.8-98.2)	1	0.4(0.0-2.6)	5	1.7(0.7-3.9)	3	1(0.3-3.1)	1	0.4(0.0-2.7)	
Obese	302	291	94.1(89.5-96.8)	2	1.3(0.3-5.2)	6	3.2(1.4-6.8)	0	-	3	1.5(0.5-4.5)	
			No ED Mean (SE)		BN Mean (SE)		BED Mean (SE)		PD Mean (SE)		OSFED Mean (SE)	
Age			42.6(0.67)		35.4(7.5)		46.3(3.8)		28.6(4.4)		31.1(3.4)	<0.0001

Table 30: Prevalence and 95%CI of ED by age group

ED	N	Age groups											
		n	16-14 % (95% CI)	n	25-34 % (95% CI)	n	35-44 % (95% CI)	n	45-54 % (95% CI)	n	55-64 % (95% CI)	n	65+ % (95% CI)
No ED	1,570	315	18.7(16.3-21.5)	377	18.8(16.5-21.6)	312	17.8(15.4-20.5)	241	13.8(11.8-16.1)	158	14.1(11.7-16.7)	167	13.3(10.9-16.2)
BN	6	3	0.4(0.1-1.2)	0	-	0	-	2	0.2(0-0.8)	1	0.2(0-1.1)	0	-
BED	11	2	0.2(0-0.9)	0	-	1	0.1(0-0.9)	7	0.7(0.3-1.5)	0	-	1	0.1(0-0.8)
PD	4	1	0.1(0-0.9)	2	0.2(0-0.9)	0	-	1	0.1(0-0.7)	0	-	0	-
OSFED	10	2	0.3(0-0.9)	4	0.4(0.1-1.1)	3	0.3(0-0.9)	1	0.1(0-0.6)	0	-	0	-

$p(\chi^2)= 0.007$

6.4.5. Comorbidity of ED diagnoses

Descriptive models

Eating disorder diagnoses were associated with several of the outcomes under study in descriptive models, as is shown in Table 31.

Participants with PD had high levels (77.3%) of hazardous, or harmful and hazardous levels of alcohol consumption. Differences across groups were significant according to Chi square test. The BED group was the one with the highest proportion of individuals who had ever smoked (84.2%), and lowest proportion of illegal drugs use (19.2%); however, Chi square tests did not show significant differences between groups. All individuals with PD had smoked at some point of their lives.

Differences between groups existed for suicidality, personality disorders, PTSD, and CMD. Participants with PD had a 72.6% prevalence of suicidality and personality disorder positive screenings. Post-traumatic stress disorder was most prevalent in individuals with BN (54.4%) and PD (49.9%). A total of 18.7% and 69.8% of participants with BN had a comorbid non-specified neurotic disorder and mood/anxiety disorder diagnosis, respectively. Mood and anxiety disorders were also frequent in individuals with BED (66.9%).

Table 31: Prevalence (and 95%CI) of psychiatric comorbidity across ED diagnoses (N=1,556)

Outcome (Selcoh1)	N		No ED		BN		BED		PD		OSFED	P(χ^2)
		n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	%(95%CI)	n	% (95% CI)	
Alcohol use (AUDIT)												
Regular	1,238	1,215	81.5(78.8-83.9)	4	65.9(25.7-91.6)	10	91.9(59.2-98.9)	1	22.7(2.9-74.0)	8	78.3(43.0-94.5)	0.03
Hazardous/ Hazardous to harmful	318	310	18.5(16.1-21.2)	2	34.0(8.5-74.3)	1	8.1(1.1-40.8)	3	77.3(25.9-97.1)	2	21.8(5.5-57.0)	
Smoke ever												
Never	470	462	30.3(27.1-33.8)	3	48.0(15.3-82.6)	2	15.8(3.9-46.7)	0	-	3	27.7(8.9-59.9)	0.4
Smoker	1,086	1,063	69.7(66.2-72.9)	3	52.0(17.5-84.7)	9	84.2(53.3-96.1)	4	100	7	72.3(40.1-91.0)	
Any drug use (last year)												
No	1,220	1,197	80.5(77.7-82.9)	4	66.0(25.8-91.6)	9	80.9(47.6-95.2)	2	50.4(12.4-87.9)	8	76.4(40.6-93.8)	0.5
Yes	336	328	19.5(17.0-22.3)	2	34.0(8.5-74.3)	2	19.2(4.8-74.3)	2	49.6(12.0-87.6)	2	23.6(6.1-59.4)	
Suicide												
No	1,234	1,216	77.8(74.9-80.4)	3	51.4(17.1-84.4)	6	51.7(24.5-77.9)	1	27.4(3.7-78.5)	8	79.0(44.0-94.7)	0.02
Yes	322	309	22.2(19.6-25.1)	3	48.6(15.6-82.9)	5	48.3(22.0-75.5)	3	72.6(21.5-96.3)	2	20.9(5.3-56.0)	
SAPAS												
No	1,348	1,332	86.5(84.1-88.7)	3	51.4(17.1-84.4)	6	52.9(25.4-78.9)	1	27.4(3.7-78.5)	6	57.9(27.7-83.2)	<0.0001
Yes	208	193	13.5(11.3-15.9)	3	48.6(15.6-82.9)	5	47.0(21.2-74.6)	3	72.6(21.5-96.3)	4	42.1(16.9-72.3)	
PTSD												
No	1,483	1,458	95.2(93.6-96.5)	3	45.6(14.11-81.0)	10	88.9(50.4-98.4)	2	50.1(12.2-87.8)	10	100	<0.0001
Yes	73	67	4.8(3.5-6.4)	3	54.4(19.0-85.9)	1	11.2(1.6-49.6)	2	49.9(12.1-87.8)	0	-	
CMD												
No diagnosis	1,168	1,155	73.5(70.4-76.5)	1	11.5(1.5-52.9)	3	25.3(8.2-56.2)	2	50.1(12.2-87.9)	7	69.6(36.8-89.9)	
Non-specified neurotic disorder	101	98	7.4(5.8-9.3)	1	18.7(2.6-66.6)	1	7.8(1.1-40.0)	0	-	1	9.1(1.2-44.3)	0.0003
Mood/anxiety disorder	287	272	19.1(16.6-21.8)	4	69.8(28.9-21.8)	7	66.9(37.0-87.5)	2	49.9(12.1-87.8)	2	21.3(5.3-56.5)	

6.4.6. ED diagnoses and health service use

As shown in Table 31, a minority of individuals without an ED (16.3%) sought help from a medical professional for problems with their mental health in the year prior to assessment. Whilst all of the participants with BN sought help, only half of participants with PD, and about a third of those with BED and OSFED did so.

The majority of ED participants, who had sought help, had done so through their GP (66.7%, 26.7%, 49.9%, and 30.6% for BN. BED, PD, and OSFED respectively). Fewer participants had seen a mental health therapist (33.3%, 17.9%, 22.2% and 9.2% for BN, BED, PD, and OSFED respectively) and even lower numbers had seen a specialist (15.4% and 9.5% for BN and BED and no participants with PD and OSFED), despite the high levels of psychopathology (highlighted in the previous section 6.4.5). Of all participants, only 3 had received an ED diagnosis, two of whom were from the group who had screened negative at the SCOFF.

Table 32: Proportion of ED participants who sought help for their a problem with depression, anxiety, mental health or emotional issue in the past year

Outcome	N	No ED		BN		BED		PD		OSFED	
		n	% (95% CI)	n	% (95% CI)	n	% (95% CI)	n	%(95%CI)	n	% (95% CI)	P(χ^2)
Sought help												
No	964	956	60.3(56.9-63.6)	0	-	3	25.8(8.4-56.9)	2	50.1(12.2-87.9)	3	31.1(10.3-63.9)	
No, though I should have	339	331	23.5(20.7-26.4)	0	-	4	38.0(15.1-67.9)	0	-	4	38.3(14.7-68.9)	<0.0001
Yes	253	238	16.3(0.1-18.8)	6	100	4	36.2(14.1-66.2)	2	49.9(12.1-87.8)	3	30.6(10.1-63.4)	
Seen a GP												
No	1374	1355	87.7(85.4-89.7)	2	33.3(8.2-73.7)	8	73.3(41.9-91.3)	2	50.1(12.2-87.8)	7	69.4(36.6-89.9)	0.0001
Yes	182	170	12.3(10.3-14.6)	4	66.7(26.3-91.8)	3	26.7(8.7-58.1)	2	49.9(12.1-87.8)	3	30.6(10.1-63.4)	
Seen a therapist												
No	1,450	1425	93.4(91.6-94.8)	4	66.7(26.3-91.8)	9	82.0(49.3-95.5)	3	77.8(26.6-97.1)	9	90.8(55.5-98.7)	0.03
Yes	106	100	6.6(5.2-8.4)	2	33.3(8.2-73.7)	2	17.9(4.5-50.6)	1	22.2(2.8-73.4)	1	9.2(1.3-44.5)	
Seen a mental health specialist												
No	1528	1499	97.8(96.6-98.6)	5	84.6(38.9-97.9)	10	90.5(54.7-98.7)	4	100	10	100	0.09
Yes	28	26	2.1(1.3-3.4)	1	15.4(2.1-61.1)	1	9.5(1.3-45.2)	0	-	0	-	
ED diagnosis												
No	239	225	98.9(95.5-99.7)	6	100	4	100	4	100	2	68.8(16.2-96.2)	0.002
Yes	3	2	11.3(2.7-45.3)	0	0	0	0	0	0	1	16.2(0.5-50.1)	

6.5. Discussion

This chapter aimed at determining the prevalence, comorbidity and service use pattern of individuals with DSM-5 ED diagnoses (and DSM-IV for prevalence) using a two-phase prevalence design within a multi-ethnic, inner city general population study (SELCoHI).

6.5.1. Prevalence of ED

Using DSM-5 criteria, this study found a prevalence of 0.8% (0.3%-1.7%) for BN, 1.1% (0.6%-2.0%) for BED, 0.5% (0.2%-1.2%) for PD, and 1.0% (0.6% - 1.9%) for OSFED. None of the participants interviewed reported AN. Using DSM-IV criteria, this study found a prevalence of 0.4% (0.1%-1.2%) for both BN sub-types (purging and non-purging), 0.9% (0.5%-1.7%) for BED, and 1.7% (1.1%-2.8%) for EDNOS.

Differences in types of study design, populations, and diagnostic criteria often make comparisons of prevalence across studies arduous to undertake. The prevalence estimates found in this study were generally in line with those reported in previous literature investigating point prevalence of ED (Striegel-Moore et al., 2006), both when using DSM-IV and DSM-5 criteria. The number of BN cases remained unchanged when the new diagnostic system was used to diagnose ED, which means that lowering the frequency criteria for BN did not alter prevalence of the condition in this sample. On the other hand, prevalence of BED increased, as two participants who previously did not meet the DSM-IV frequency criteria, were now given a full diagnosis. Prevalence of OSFED did not change greatly from that of EDNOS once accounting for participants with PD, who were intentionally kept as a separate category in DSM-5 diagnoses. The lack of differences in this sample, however, cannot be taken as indicative that the DSM-5 will not cause more participants to be diagnosed with AN, BN, and BED as opposed to OSFED, as described in the introduction. The small size of sample employed in this study, and thus chance, could account for the finding.

Prevalence of BN in this sample is in line with findings suggesting a point prevalence figure of BN of around 1.0% (Smink et al., 2012; Striegel-Moore & Franko, 2003). Lower (0.4%) and higher (1.5%) estimates have been found in female only samples of adolescents and adults (Kinzl et al., 1999; Machado et al., 2007), whereas mixed samples of adults have found comparable prevalence figures (0.9%) (Hay et al., 2008).

Comparing the prevalence of BED found in this sample with those of previous studies is more complicated, as the vast majority have reported lifetime prevalence figures for the disorder, which are believed to range between 1.2% to 2.8% (Hudson et al., 2007; Preti et al., 2009). Because it accounts for everyone who has ever had the disorder at some point in their lives, lifetime prevalence is thus likely to be higher than point prevalence. However, some studies have used point prevalence. An all-female community sample found a 3.3% prevalence of BED (Kinzl et al., 1999), whilst an Australian general population survey of males and females found a point prevalence of 2.3% (Hay et al., 2008). These estimates, however, are not directly comparable. The first study uses only women, among whom ED are more prevalent. The second study employed an over inclusive definition of BED, which is likely to inflate estimates. The authors included as having BED participants who: (i) 'on average' binged weekly; (ii) did not use extreme weight-reducing behaviours 'regularly'; and (iii) reported minor weight and shape concerns (Hay et al., 2008). In this study, participants exhibiting those behaviours would have been categorised as EDNOS/OSFED. It is possible to hypothesise that point prevalence for BED found in this study could compare to that of other samples, both when using DSM-IV and DSM-5 criteria, as a mixed sample and more stringent diagnostic criteria would have resulted in lower estimates in other studies.

Purging disorder was intentionally kept as a separate category in order to investigate its prevalence, due to the increasing interest that this condition has received in the literature, despite it not having been granted a full-diagnosis status in DSM 5 (Abebe et al., 2012; Fink et al., 2009; Haedt & Keel, 2010; Keel et

al., 2005, 2008). Studies investigating prevalence of PD are, to date, rare. A study based on a cohort of 9 to 22 year olds found a point prevalence of PD between 2 and 2.5% (A. E. Field et al., 2012), whilst a recent longitudinal investigation of ED behaviours from adolescence to adulthood found a lower point prevalence for PD of 1.2% (female) and 0.1% (males) at age 17 and of 0.3% (females) and 0.1% (males) at age 23 and over (Abebe et al., 2012). Finally, a study on university students aged 16-40 years found a point prevalence of PD of 0.6% (Haedt & Keel, 2010). This study found a lower prevalence compared to that seen in adolescent samples (Abebe et al., 2012; A. E. Field et al., 2012), but more similar to that seen in Haedt & Keel's study (2010), which included older participants. The SELCoH sample is mostly composed of adults, which could explain the lower prevalence found compared to that of adolescent samples. In fact, individuals with PD had the lowest mean age of all ED groups, which suggests the condition could be more prevalent in younger ages.

DSM-IV defined EDNOS are believed to be the most prevalent ED, accounting for 50% to 90% of all ED diagnoses seen in clinical and general population settings (Eddy, Celio Doyle, et al., 2008; Fairburn & Bohn, 2005; Le Grange et al., 2012; Turner & Bryant-Waugh, 2004; Zimmerman et al., 2008). In this study, they were the most prevalent condition according to DSM-IV criteria and prevalence remained high, although to a lower extent, when OSFED criteria were applied. Comparing these prevalence figures with those of previous investigations is difficult, as different definitions of EDNOS have been employed in different studies. A point prevalence of 2.4% for EDNOS was found in a sample of adolescent girls (Machado et al., 2007), whilst a lower one (1.9%) was found in an Australian sample of adults males and females (Hay et al., 2008). The populations and definition used in these studies, make our results only partially comparable. Whilst similarly keeping BED separate from EDNOS, the Australian study (as it was mentioned earlier) had included in the BED category individuals who would have been included in the EDNOS one according to our criteria. If our criteria had been applied to Hay's and colleagues' study, the latter would have yielded a higher prevalence. The use of adult and adolescent

samples and of a female only vs. a male and female sample also makes the scope for comparisons limited. The higher prevalence of EDNOS in Machado and colleagues' study could indicate higher prevalence of ED and sub-threshold ED in younger ages and in females. On the other hand, potentially higher cases in the Australian sample, could suggest that our sample was underpowered to detect more cases or that socio-cultural differences exists between the two samples.

Prevalence of OSFED (1.5% accounting for PD) did not differ greatly from that of EDNOS, since, as mentioned earlier, only two participants were re-classified from having a sub-threshold diagnosis to having BED. It has been hypothesised that DSM-5 will allow more individuals to receive a full diagnosis (Machado et al., 2013). Although this effect was small in this sample, it nonetheless suggests that the new diagnostic system could bring clinical benefits for ED patients, as more people could be able to access treatment due to being diagnosed with a full ED.

Finally, this study did not find any cases of AN. Despite being a condition with early onset and peak in adolescent years, the absence of AN individuals in this sample is unusual, as the average point prevalence in females has been estimated to be around 0.29% (Hoek & van Hoeken, 2003). The lack of AN in this population, and the high prevalence of BED, may be a reflection of the age structure of the sample, but also of its ethnic composition; 43% of the participants were from non-White ethnic backgrounds, with 29% of Black ethnicity. Numerous studies have reported that Black women have fewer body image issues (Shaw et al., 2003) and are less likely to diet (George & Franko, 2010; Striegel-Moore & Smolak, 2000; Striegel-Moore, 2003), making them less susceptible to the development of AN. On the other hand, equally consistently, binge eating has been reported to be common among Black women (Franko et al., 2012). However, the opposite, that is the lack of differences between rates of AN in White and non-White women, has also been demonstrated. In particular, one study that had hypothesised to find lower rates of AN in Caribbean women in Curacao compared to those seen in White 'Western' women, found instead

incidence rates of AN to be comparable (Hoek, van Harten, van Hoeken, & Susser, 1998). These contrasting findings on the role of ethnicity and culture in the development of AN suggest that alternative factors could account for the lack of AN cases in our sample. Another plausible hypothesis is that AN women were lost to follow up. Table 27 showed that 4 underweight participants who had screened positive to the SCOFF were not interviewed in the ED module of SELCoHII. Of these women, two had endorsed the question on purging behaviours (one also reporting loss of control and the other persistent food-related thoughts). Another one had reported loss of control and having recently lost one stone; and, finally, another one had shown body image distortion and persistent food-related thoughts. The first three women reported individual symptoms conducible to full or partial AN (restrictive or binge-purge), whereas the latter showed more general ED symptoms, which could nonetheless signal full or sub-threshold AN. Notably, the three women with more pronounced symptoms were of White ethnicity, which seem to confirm the hypothesis of higher prevalence of AN in White populations. Since differential follow up, and thus loss to follow up bias are not uncommon in longitudinal studies, it is possible to speculate that participants with more serious ED symptomatology might have decided not to take part in the study. If these were AN women, the fact that they have not been retained in the study affects ED prevalence estimates. Moreover, it does not allow further investigations on comorbidity with AN, which could have provided for interesting comparisons with other diagnoses, although the low numbers would not have guaranteed high precision of the estimates.

6.5.2. Socio-demographic correlates of ED

This study confirms some of the previous findings in the literature, whilst contradicting others. In this study, more women than men reported ED, which reflects the epidemiology of ED, usually more prevalent amongst women. The only men who reported an ED were diagnosed with BED. Binge eating disorder is the most common ED diagnosis amongst men and it is believed that males contribute up to 25% of all BED cases (Weltzin et al., 2005). Axis I comorbidity

has been also found to be higher in men with BED than in females with BED (Tanofsky, Wilfley, Spurrell, Welch, & Brownell, 1997).

Descriptive analyses did not show significant inter-group differences with respect to ethnicity; nevertheless, given the small size of the ED sample, it is not possible to assess differences more conclusively. Participants of White ethnicity had highest prevalence of BED, but not of the other disorders. Participants of Black ethnicity reported BN, BED and OSFED in similar proportions. It has previously been shown that individuals of Black ethnicity are more likely to engage in binge eating with or without purging, and to make higher use of laxatives and diet pills to control their weight (A. E. Field et al., 1997; Striegel-Moore et al., 2000). This study appears to confirm this trend in results. The finding that no individuals of Black ethnicity were diagnosed with PD could indicate that the use of purging methods in participants of Black ethnicity is more prevalent after episodes of binge eating. Previous studies had also indicated low prevalence of purging behaviours in individuals of Asian ethnicity (Franko et al., 2007; Regan & Cachelin, 2006). This study found that the only Asian participant with an ED had PD, whilst results from chapter 4 indicated that the SCOFF question relative to purging behaviours was endorsed most frequently by Asian participants. These findings could be attributable to chance, especially in this study looking at ED diagnoses given the small size of the sample. However, since most previous studies were conducted in the US, they could also indicate cultural differences between individuals of Asian ethnic background living in the US and the UK. It is possible that environmental factors could influence eating behaviours in ethnic minority groups as well as their cultural norms. Finally, it could also suggest that ED in Asian communities are more likely to go undetected. Future studies should investigate ED and ED behaviours in ethnic minorities across different settings in order to further explore these associations.

No differences in BMI were found across ED diagnoses, although some trends were evident. All participants with BED were in either the overweight or obese BMI categories. Although high BMI is not a diagnostic criterion for BED, the

latter has often been found to be correlated with overweight and obese BMI categories (Goossens et al., 2009; Grucza et al., 2007; M D Marcus et al., 2007); therefore, the results of this study replicate previous findings. Participants in the PD category belonged more to the overweight BMI category. While this finding could appear counter-intuitive for individuals who purge without bingeing, it has been documented before (Haedt & Keel, 2010; Wade, 2007b). One potential explanation for this it is that the PD definition of individuals who purge in the absence of binge eating includes individuals who purge after overeating, since the feature distinguishing an overeating episode from a binge eating one is the presence of loss of control eating. Moreover, the use of self-induced vomiting, diuretics and laxatives might not result in actual weight loss, especially in normal/overeaters, which could then be reflected in the maintenance of a normal or even overweight BMI, which is also observed in BN.

Finally, mean age was lowest in PD (28.6) and highest in BED (46.3), respectively. This finding echoes those of previous studies. As it was discussed in detail in section 1.1.3, BED has the highest age of onset amongst all ED (Hudson et al., 2007; Kessler et al., 2013). A study on 910 individuals, found that those who screened positive for BED (N=60) had a mean age of 44 years (SD=14, median 46) (Grucza et al., 2007). Peak age of onset and prevalence of BED still require investigation in samples comprising both adults and adolescents. Binge eating has been found to be associated in a number of studies with emotional eating (Danner, Evers, Stok, van Elburg, & de Ridder, 2012; Goossens et al., 2009; Masheb & Grilo, 2006), especially in women (Tanofsky et al., 1997). One possible explanation could be that older individuals might experience increased stress from life events and therefore (whether they have experienced an ED or not earlier in their lives) higher rates of emotional eating and bingeing later in life. Nevertheless, these are hypothesised risk mechanisms, and more research is needed to disentangle these relationships.

The few studies on PD to date using general population samples, as discussed in section 1.2.2 have shown higher prevalence of the disorder in young age groups (Abebe et al., 2012; A. E. Field et al., 2012; Wade et al., 2006). Whilst only the

result of preliminary studies, these findings suggest that PD, perhaps similarly to AN, is an ED more prevalent in younger age groups. It is possible that for adolescents with body image concerns it could be easier to resort to purging methods rather than restricting ones to lose weight, especially in familial settings where parents can still control their children's food intake. The decrease of PD among young adults could therefore reflect the shift from the home environment to a more independent one, where purging practices might be replaced by food restriction. Another explanation could be that impulsive (and thus risk-taking) traits are more pronounced amongst adolescents, who might therefore engage in risky weight-control practices as part of the range of risk-taking behaviours characteristic of adolescence. The low prevalence of PD compared to other ED diagnoses encountered in this sample, might also reflect the higher age range in this sample.

6.5.3. Comorbidity of ED

This study found that individuals with ED could have high levels of comorbid substance use, suicidality, and psychiatric comorbidity such as personality disorders, PTSD and mood and anxiety disorders. Whilst the same associations were not found across the whole ED spectrum, it is possible to identify some trends that confirm previous findings in the literature.

Purging disorder, albeit the diagnosis with the lowest observed prevalence (apart from AN, which was absent) in the SELCoH sample, was the one with the highest levels of comorbid substance use (alcohol, cigarettes, drugs). Previous studies have found increased rates of substance use in women with PD compared to healthy controls (Abebe et al., 2012; Anderson et al., 2005; A. E. Field et al., 2012). Increased levels of impulsivity and risk taking attitudes in individuals PD, documented for instance in other disorders with a purging dimension such as BN and Anorexia Binge Purge (Favaro et al., 2004), could explain these associations. Neither BN nor BED were associated with alcohol use in adjusted models, despite individuals with BN having higher proportions and odds of alcohol use than those with BED. This suggests that the association between BN and substance use could be driven by the same risk factors which drive the purging, rather than the bingeing, side of the condition.

Purging disorder was the diagnosis with the highest proportion of suicide attempts or suicidal ideation (72.6%), followed by BN and BED in similar proportions (48.6% and 48.3%), although the association with suicidality was not significant in adjusted models for PD. Research has so far produced mixed results with regards to suicidality in ED. Neverhteless it has been argued that whilst suicides might be more frequent in AN patients, attempted suicides and injurious behaviours are more associated with BN and AN-BP (Franko & Keel, 2006). This pattern could be explained by higher impulsive and self-injurious traits amongst individuals with these conditions (Stein et al., 2004) suggesting the presence differences between ED relating more to behaviours (binge/purge vs. restricting) than diagnoses. Unfortunately, this sample is too small to conclusively argue in favour of higher rates in one group compared to another.

Similarly, both individuals with BN and PD had a high prevalence of screen positive statuses for PTSD, but not those with BED or OSFED. Again, this suggests that the condition could be a risk factor for the onset of bingeing and purging behaviours and that a greater association could exist with the onset of purging. Literature is limited with respect to the association between ED and PTSD, as it was explained in section 2.3.5, thus these results should be interpreted as exploratory.

All of the ED diagnoses had high prevalence of comorbid screen positive status to personality disorders. The finding of an association between each ED diagnosis and screening positive for a personality disorder confirms previous literature, as they have been found to be highly comorbid with ED. It has been suggested that OCPD is more associated with AN-R, and BPD with BN, and AN-BP (Sansone et al., 2004). Unfortunately, it was not possible to explore these associations further in this study.

Finally, individuals with BN and BED had high prevalence of mood and anxiety disorders, and so did, to a lower extent, individuals with PD. Mood disorders have been documented in BN and BED (Tozzi et al., 2005) and some studies have suggested that they might be more prevalent in the former (Araujo et al., 2010). This study seems to confirm those findings, although the small sample size and thus chance could account for these results. Chance could account for the findings of lower anxiety and mood disorders amongst individuals with PD as well. However, one explanation for our findings could be that depression is more prevalent in older ages. Participants with PD were younger than those with other ED (i.e. BN, BED, and OSFED), thus this result could be a reflection of higher prevalence of mood disorders in older ages, hypothesis which has been put forth previously in literature (Godart et al., 2007). Evidence from literature also suggests that individuals with PD could have less difficulty with affect regulation than those with BN who express it through binge eating(Keel et al., 2008). Current and lifetime anxiety disorders have been found to be more prevalent in individuals with PD compared to BN(Keel et al., 2005, 2008), although the former presented with lower levels of State anxiety(Keel et al.,

2008). It has been hypothesised that purging could act as a means to reduce the anxiety about weight gain induced by bingeing, thus resulting in lower state anxiety in individuals who purge in the absence of bingeing(Keel et al., 2008).The impossibility to divide anxiety and mood disorder due to the low power of the analyses makes it impossible to further test this hypothesis. The absence of anxiety and mood disorders in individuals with sub-threshold diagnoses is difficult to justify, as it has been previously documented in literature (Hudson et al., 2007; Le Grange et al., 2012; Schmidt et al., 2008; Swanson et al., 2011). It is possible that chance could account for the finding.

6.5.4. ED and service use

The majority of participants with an ED had sought help for a problem related to anxiety, depression or any other mental or emotional problem in the year prior to assessment, although a steep decrease was observed between participants who were seen in primary care and those who had accessed specialised services.

It is of note that whilst all of the six participants with BN had sought help for a mental health condition such as anxiety or depression in the 12 months prior to interview, only 33% and 15% of BN participants had seen a mental health therapist or specialist, respectively. Since two participants with BN reported not having seen a GP, despite having sought help, it can be hypothesised that these participants had sought helped from specialised services privately. Fifty per cent of participants with PD saw a GP, but only 22% saw a therapist. However, no participants with PD were seen by a mental health specialist despite being the group with the highest psychiatric comorbidity. Low rate of specialised service attendance in the face of high levels of comorbidity in these ED groups reported in section 6.4.5 could be explained by several reasons. First, it has been documented that contrary to AN, which is characterised by very low weight, BN and PD might not be easily detected in primary care settings (Sim et al., 2010; Walsh, Wheat, & Freund, 2000) especially in participants who suffer from non-purging forms of BN (i.e. bingeing followed by fasting, excessive

exercise). Therefore, this could account for under-detection of these disorders. Secondly, it is possible that other comorbid conditions are not detected at primary care. Long waiting lists could have prevented participants from accessing specialised care (Reid et al., 2009).

Only about a third of participants with BED and OSFED saw a GP for a mental health concern, and about a half of those saw a therapist. Several factors could account for this finding. Firstly, it has been suggested that individuals with BED might suffer from higher levels of stigma in discussing their ED problems, due to it often being associated and mis-diagnosed with 'weight' issues (Hepworth & Paxton, 2007). Therefore, this could account for lower proportions of help seeking compared to BN and, to a lower extent PD. Secondly, it has been suggested in literature that often patients with BED are re-addressed to weight-loss programmes, rather than psychological services (Mond et al., 2007). In this sample BED was associated with increased odds of having mood and anxiety disorders. It is possible that the above-mentioned perception of stigma could have prevented participants to seek help despite high levels of comorbid mood and anxiety disorders with BED. Under-detection and long waiting times could also account for low attendance of specialised services. Participants with OSFED had comparatively lower levels of comorbidity in this sample especially with regards to alcohol use, suicidality, PTSD, and depression. It seems plausible that, in this group, lower health service attendance could be accounted for by lower overall comorbidity as well as by under-detection.

Only 2 participants (1 who did not receive an ED diagnosis and 1 OSFED) had been diagnosed with an ED in the 12 months prior to SCOFF administration, and both were positive at the SCOFF. The participant who received a 'healthy' diagnosis in the SCID-I interview had reported that their symptoms had occurred prior to SCOFF interview. Although they reported some ED cognitions present at the time in which the SCOFF was administered, those were not significant enough for a diagnosis. Since the health service use question refers to the 12 months prior to SCOFF administration it is possible that the participant was in remission by the time it was interviewed in SELCoHI,

although maintaining some disordered eating behaviours or cognitions. Some elements of recall bias could have happened also at both stages of interview. In SELCoHI the participant could have been more willing to disclose their ED diagnosis even if it had occurred more than 12 months before the interview. The perceived importance of the diagnosis could have caused the participant to disclose the information. On the other hand, it could be that the participant gave us a wrong timeline of their ED history at the time in which she was interviewed in SELCoHII. From the data available it is not possible to assess this.

6.5.5. Strengths and limitations

This study has several strengths. Firstly, it employed a sample representative of both its catchment area and of the wider London area, and it used a two-stage prevalence design where individuals who screened positive for an eating disorder were interviewed in depth using a clinical interview. It was possible to investigate comorbidity with a large number of conditions and socio-demographic indicators. Diagnoses were adapted to DSM-5 criteria, meaning that results can be used to inform future research as well as current clinical practice.

Nevertheless, some limitations should also be accounted for. A large proportion of participants were lost to follow up. Thus results could be over- or underestimating the prevalence of ED diagnoses in the sample. However, when comparing screen positive participants who were recruited for the follow up interview, and those who were lost to follow up, it was not possible to detect any socio-demographic differences. The probability of biased estimates based on observed differences should be minimal. However, it was reported that 4 potential participants with AN were lost to follow up. Unfortunately, since the information which might be responsible for lost to follow up is not observable it is not possible to establish whether differential follow up according to ED diagnosis occurred. Nevertheless, given the low prevalence of both exposure and outcomes, estimates of associations were underpowered.

Participants who had screened positive on the SCOFF, but were lost to follow up were dropped from the analyses. This was done to exclude potential ED cases from the unexposed sample, which could bias results. Given the low specificity of the SCOFF found in the previous chapter it is possible to assume that only a minority of those participants would have been an ED case. However, since only about 6% of participants were dropped from the analyses this is unlikely to bias the results. When measuring comorbidity, both the PTSD and SAPAS questionnaires used to assess comorbidity with ED are screener measures; therefore their positive predictive value should be assessed before conclusively inferring an association between the conditions and the above-mentioned ED.

Finally, given the design of the study where participants were asked about their eating behaviours in the past 3 years, but with specific focus on the time in which the SCOFF was administered, results could suffer from some form of recall bias. It is difficult to speculate the direction in which this could have affected the results. Participants could be more likely to recall recent events and misattribute those memories to the time of the SCOFF interview; this could result in an overestimation of the point prevalence of ED at the time in which the SCOFF was administered, but could still provide useful information about comorbidity of ED. In a similar fashion, participants who had recovered from an ED could be reluctant to remember or disclose symptoms which occurred in the past, potentially resulting in an underestimation of the prevalence of ED, and comorbidity.

6.5.6. Conclusions and implications

This study found a 3.3% (95%CI: 2.3-4.7) point-prevalence of ED in a multi-ethnic, inner city general population sample. Despite the small sample of individuals interviewed with the SCID-I some clear distinctions between ED diagnoses, with respect to socio-demographic characteristics and psychiatric disorders were individuated. Mean age of BED and PD individuals, in particular, confirmed earlier hypotheses on the epidemiology of these two disorders suggesting their higher prevalence in older and younger groups, respectively.

Future research should focus on investigating age-specific risk factors for these two conditions.

Despite the initial sample being relatively large, estimates included in this study were underpowered due to the low prevalence of ED and outcomes examined. Therefore, inferences about associations between ED and socio-demographic correlates as well as psychiatric outcomes should be made with caution. However, it is the only ED prevalence study based in the UK in the past 10 years attempting to look at ethnic differences in relation to ED as well as comorbidity and thus it can be considered as hypothesis building-study indicating that future research in the area is warranted.

Although some of the findings were not significant in regression models, this may be due to low statistical power in the analyses. Descriptive statistics showed an increased prevalence of psychiatric comorbidity in individuals with ED. Whilst consistent across diagnoses, comorbidity was higher in BN and PD compared to other diagnoses, highlighting that purging behaviours might be associated with higher psychopathology than bingeing ones. It was not possible, however, to test for differences between restricting ED such as AN of the restricting type and binge/purge type ED, as no cases of the former were detected in this population. Such comparison would help to test some of the findings that have been highlighted in the literature. The high comorbidity found in PD, despite its low prevalence, provides support to claims of its clinical significance. To date, individuals with PD are not considered to have a full-threshold ED, and thus they are less likely to receive appropriate treatment. Although obtaining conclusive evidence on the presentation and comorbidity of PD was beyond the scope of this investigation, the latter nonetheless highlighted the need for more studies investigating its trajectories and presentations in order to target treatment and preventative strategies. Future studies should investigate prevalence and risk factors of PD longitudinally in order to better establish the needs/consequences? (not relevance) of its potential inclusion in future diagnostic manuals.

Finally, only a minority of ED cases sought help and an even smaller proportion received specialist care, despite the high levels of psychopathology observed across diagnoses. Whilst this finding could be due to the secretive nature of ED, it could also highlight problems intrinsic to the UK referral system (i.e. low detection rates in primary care, long waiting lists for specialist treatment). Future studies should investigate the nature of the barriers to treatment faced by individuals with ED. Community trials based on increasing education on mental health and reducing stigma could help testing whether the problem lies with poor performance of the health service or whether poor education and levels of stigma (documented especially in ethnic minority communities (Knifton et al., 2010)) are effectively reducing access to care.

Chapter 7
Part II: Aims and Methodology

7.1. Chapter overview

This chapter provides an overview of the aims and objectives of the second part of this thesis in an attempt to fill some of the gaps in literature relative to prevalence and comorbidity of purging behaviours, which were discussed in Chapters 1 and 2. Moreover, this chapter will describe the characteristics of the two samples that will be used in chapter 8 (Avon Longitudinal Study of Parents and Children (ALSPAC); Northern Finland Birth Cohort (NFBC)), and tackle issues of representativeness, missing data and attrition at sample level. It will describe in detail which measures were used in the studies undertaken, data analyses, role of the researcher and ethics approval.

7.2. General aims

The overall aim of the study included in the second half of this thesis is to investigate the prevalence and comorbidity of purging behaviours amongst adolescents. The hypotheses driving this study stem from indications in literature (described in Chapter 1 and 2) that purging behaviours could be more prevalent amongst adolescents and carry clinically relevant levels of comorbidity. Below I will thus explain in detail the specific aims contained in the study undertaken in chapter 8 of this thesis.

7.2.1. Study four: Prevalence of purging at age 16 and association with negative outcomes among girls in three community-based cohorts (Chapter 8)

Literature suggests that age of onset and peak prevalence of purging behaviours occurs in mid- to late adolescence (Abebe et al., 2012; A. E. Field et al., 2012) and that is associated with high comorbidity (Abebe et al., 2012). Nevertheless, most studies to date have investigated purging behaviours in samples of young adult women using diagnostic thresholds, which are not empirically derived.

The aim of this study is to examine the prevalence of purging behaviours among 16 year old girls using data from two large cohort studies based in different countries (UK and Finland) as this appears to be the age in which incidence and prevalence of purging behaviours peaks. The availability of data and the interest in exploring whether socio-cultural environment might affect the prevalence of purging behaviours motivated the choice of these two datasets. This study also aimed at investigating the association of purging behaviours (irrespectively of their frequency and binge eating) with psychiatric comorbidity such as depressive symptoms and substance use.

As highlighted in Chapter 1 the vast majority of studies to date employ clinical or medical registries to derive ED diagnoses for participants in their samples. This causes prevalence estimates and comorbidity to be often biased, as most serious cases, which constitute the minority of all ED presentations, are those who are most likely to receive specialised treatment. Limitations exist with regards to the generalizability of such studies. In order to investigate prevalence i and comorbidity of a condition it is important to employ general population studies in which various degrees of severity are represented. In order to do so, study 4 used data from the Avon Longitudinal Study of Parents and Children (ALSPAC) and the Northern Finland Birth Cohort (NFBC), both large longitudinal cohorts. Below I will describe the ALSPAC and NFBC cohorts more in detail.

7.3. Avon Longitudinal Study of Parents and Children

7.3.1. Study overview

The Avon Longitudinal Study of Parents and Children (ALSPAC), also known to its participants as the 'Children of the '90s' study, is an on-going longitudinal population-based study of over 14,000 women and their children started in the early '90s. The overall aim of the study was to explore the genetic and environmental determinants of children and parents' health (Fraser et al., 2013).

The study population was drawn from the old administrative county of Avon and, specifically, from the three District Health Authorities (DHA) of Southmead, Frenchay, and Bristol & Weston. This area in 1991 had a population of circa 0.9 million inhabitants and was an advantageously defined geographic area with services located around Bristol. The Avon area had low levels of outward migration and a heterogeneous set of social backgrounds, housing types and urban and rural areas (Golding, 2004).

7.3.2. Recruitment procedures

All pregnant women living in the Avon area whose expected date of delivery fell between 1st April 1991 and 31st December 1992 were eligible for inclusion in ALSPAC. Women who migrated into the catchment area before delivery were included, but those migrating out of the catchment area were included only if they had completed the third trimester questionnaire (Fraser et al., 2013).

ALSPAC recurred to *ad hoc* recruitment using a number of methods to solicit participation to the study of pregnant women:

- ✓ Posters with the 'Children of the 90s' logo were placed in locations which were likely to be visited by pregnant women (e.g. chemist, pre-school playgroups, General Practitioners' waiting rooms etc...);
- ✓ ALSPAC staff members approached pregnant women when the latter attended regular ultrasound examinations;
- ✓ Hospitals sent mothers information about the study;
- ✓ Midwives were trained to discuss and give mothers information on the study at their first appointment;
- ✓ Local and national media covered the study to gauge the public's attention;
- ✓ ALSPAC staff approached mothers who delivered a baby, but whom had not been previously enrolled.

Regardless of the way in which they were approached the first time, mothers had to return a card to ALSPAC with their contact details, last menstrual period and expected date of delivery. The ALSPAC team then sent them a brochure

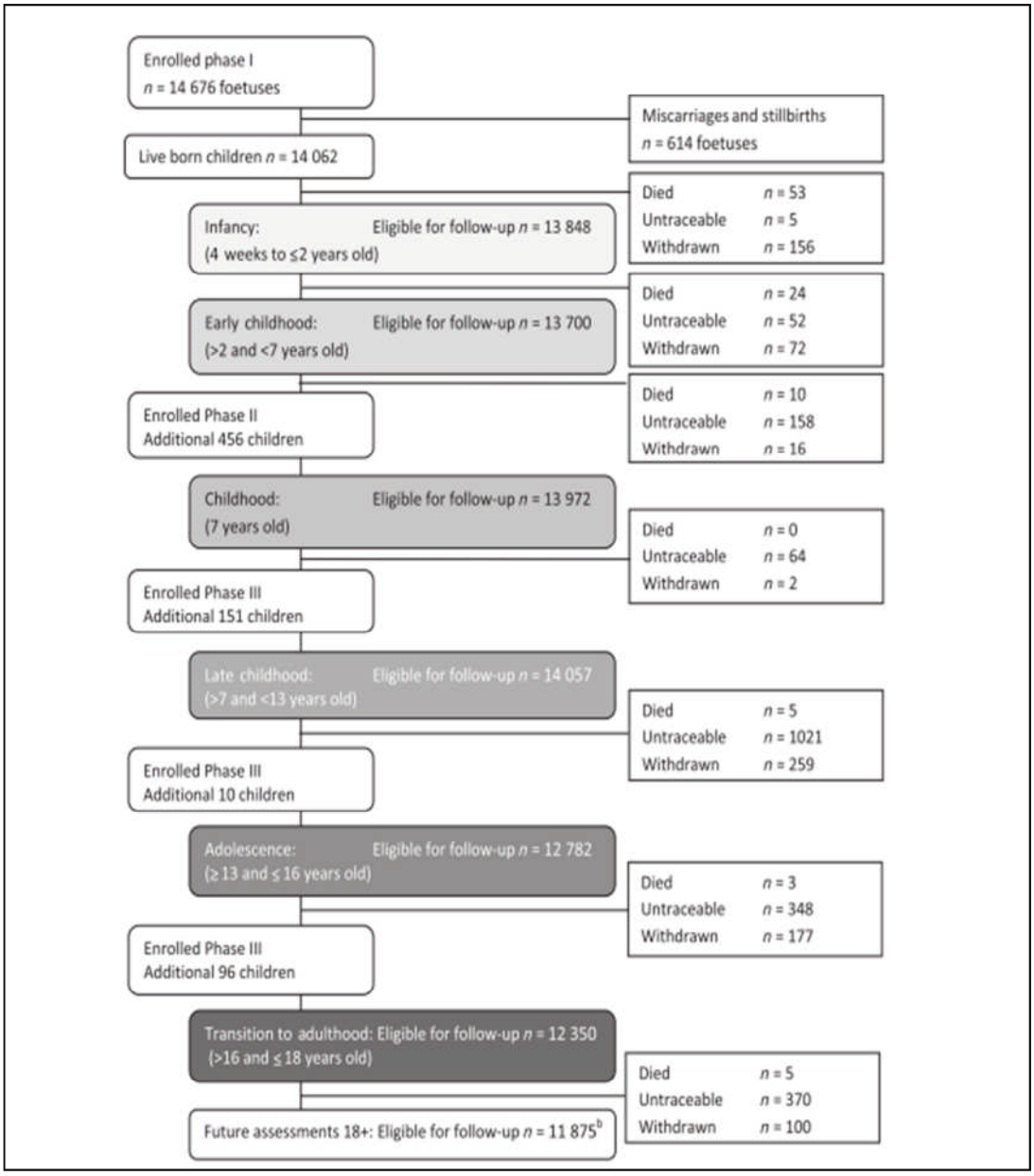
explaining the aims and the importance of the study as well as standard privacy and confidentiality issues. A telephone helpline was also set up to deal with any concerns that mothers could have.

7.3.3. Study participants

The children of the mothers who were originally enrolled in phase I of the study (described in section 7.3.2), plus additional 456 children not included in the original cohort (Boyd et al., 2012), which were enrolled in phase II and III, constitute the current overall ALSPAC sample, as it is shown in Figure 5.

- ✓ Phase I: Of the total 20,248 eligible pregnancies, 14, 541 (71.8%) women were recruited in the study, although 68 had to be excluded due to an unknown pregnancy outcome. The final number of women who took part in ALSPAC was 14,472 for a total of 14,676 known foetuses. Of these, 14,062 were live-born and 13,988 were still alive at the end of the first year and, therefore, constituted the final ALSPAC sample (Boyd et al., 2012; Fraser et al., 2013).
- ✓ Phase II: In the second phase of recruitment an additional 456 children (2.2%) were enrolled from eligible pregnancies to attend 'Focus @7/children in focus" Clinics assessments conducted when the children were 7 years of age.
- ✓ Phase III: in this phase (age 8 – 18) another 257 children (1.2%) from 254 eligible pregnancies were recruited to participate in ALSPAC.

Figure 5: Flowchart of children participation in ALSPAC (taken from Boyd, et al. 2012)

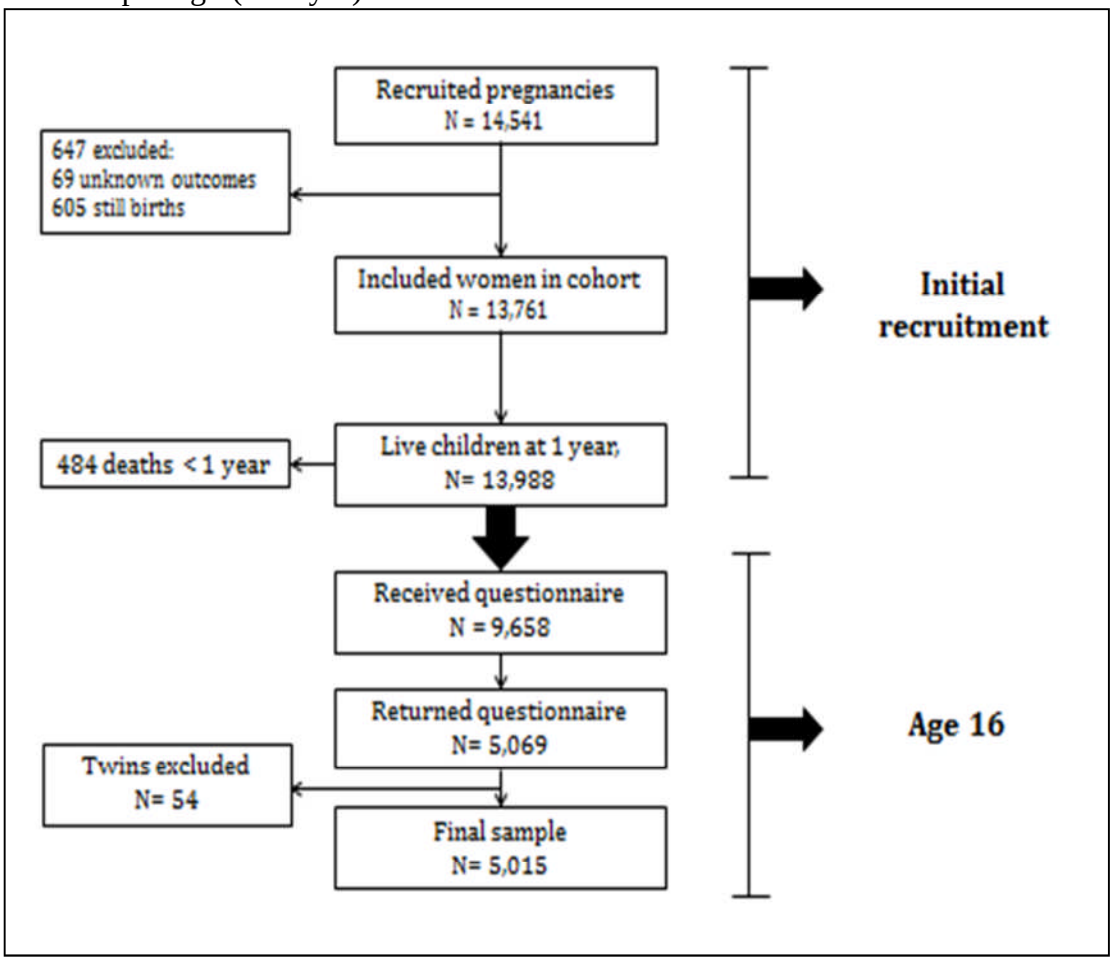


Inclusion and exclusion criteria

For the purposes of these studies only singleton deliveries were included in the analyses as shared genetic characteristics and environmental exposures between siblings can affect developmental trajectories for multiple births thus making them different from those of singleton births.

In Study 4 (Chapter 8), out of all those who had completed the questionnaire, only girls with complete data on the exposure, covariates and outcomes measured were eligible for inclusion out of the sample of adolescents who had returned the questionnaire (Figure 6). More detailed information will be provided in the relevant chapter's methodology.

Figure 6: Flowchart of ALSPAC recruitment and participation at 16 years follow up stage (study 4)*



*Final sample includes boys and girls, whereas analyses will be restricted to girls and inclusion criteria will be discussed in the methodology of study 4.

7.3.4. Representativeness

Around 85% of all mothers who registered an interest in taking part to the ALSPAC study were included and returned at least one questionnaire (Golding, 2004). As it is shown in Table 33, data from the 1991 census was used to investigate representativeness of the ALSPAC sample when compared to mothers with <1-year-old babies from both the Avon catchment area and the whole of Great Britain.

Compared to both mothers in the Avon area and in Great Britain, ALSPAC mothers were more likely to own a house and a car, to be married and to be from a White ethnic background. Nevertheless, in contrast with the other socio-economic indicators, but perhaps signalling lower rates of lone parenthood, ALSPAC mothers were also more likely to live in houses inhabited by more than one person per room (Boyd et al., 2012). Growth standards (i.e. weight, length) of ALSPAC children sample were compared against data from the UK 1990 children population with measurements taken at birth, 1 and 2 years. The two sample were highly similar (ALSPAC, 2013).

At age 16, adolescents were compared with a UK wide-sample of adolescents on socio-demographic indicators and school attainment taken from the National Pupil Database (NPD) 'Key Stage 4' (KS4) dataset, a census of pupils in government-maintained establishments (GMEs). Data of 14,878 'eligible' ALSPAC children were linked to a subset of the NPD KS4 records. The NPD KS4 is a census of all pupils of mean age 16 enrolled in GMEs recording socio-demographic and assessment grades. The response rate for this census is of 89.5% (Boyd et al., 2012).

As seen in Table 34, children enrolled in ALSPAC at age 16 were more likely to be from a White background, from higher socio-economic status. Results shown in Table 35 (taken from Boyd and colleagues' descriptive paper on the ALSPAC sample of children (Boyd et al., 2012)) suggest that ALSPAC adolescents performed better academically then pupils enrolled in GMEs. However, given the overlap in IQR this difference might not be significant. There were no

differences in gender between children in the NPD KS4 and those in ALSPAC. Children in ALSPAC, it can be thus inferred, are not fully representative of those of the general UK population.

Table 33: Socio-demographic characteristics of ALSPAC mothers compared to those in Avon, and Great Britain according to 1991 UK census

Characteristic	ALSPAC, %	Avon, %	Great Britain, %
Owner occupied house	79.1	68.7	63.4
>1 person per room	33.5	26.0	30.8
Car in household	90.8	83.7	75.6
Married couple	79.4	71.7	71.8
Non-White mother	2.2	4.1	7.6

Table 34: Comparison on socio-demographic characteristics between the children who have completed any ALSPAC questionnaire or clinical assessment since enrolment and National Pupil Database (NPD) (source: Boyd et al., 2012)

Characteristic	Category	National NPD KS4 GME sample[a]	Enrolled in ALSPAC[b]	ORs (95% CI)	P (χ^2)
		%(n/n)	*%(n/n)*		
Gender	Female	49.2% (871,375/1,770,654)	49.7% (5,470/11,008)	1.02 (0.98-1.06)	0.3
Ethnicity	White	86.5% (1,508,926/1,744,429)	96.1% (10,505/10,933)	3.85 (3.50-4.24)	<0.0001
Low income	FSM	12.5% (218,033/1,745,353)	6.2% (682/10,959)	0.46 (0.43-0.50)	<0.0001

[a] All pupils, excluding those in ALSPAC, from English GMEs who sat their KS4 assessments during the same academic years as the ALSPAC cohort (academic years 2007–09).

[b] All pupils, from English GMEs, who are from families that have enrolled in ALSPAC by completing an ALSPAC questionnaire or clinical assessment.

Table 35: Comparison of academic attainment between the children who have completed any ALSPAC assessment since enrolment and National Pupil Database (NPD) (source: Boyd et al., 2012)

Indicator	National NPD KS4 GME sample[a]	Enrolled in ALSPAC[b]
Academic attainment		
N	1,759,174	11,008
Mean Score (IQR)	308 (266-374)	317 (242-350)

[a] All pupils, excluding those in ALSPAC, from English GMEs who sat their KS4 assessments during the same academic years as the ALSPAC cohort (academic years 2007–09).

[b] All pupils, from English GMEs, who are from families that have enrolled in ALSPAC by completing an ALSPAC questionnaire or clinical assessment.

7.3.5. Measures

Since birth there have been 68 rounds of data collection:

- ✓ Mother completed questionnaires (MCQs) (n=25): sent to the mothers (or the main caregiver) from enrolment.
- ✓ Child completed questionnaires (CCQs) (n=34): 24 sent to children from the age of 5 years on multiple domains and 9 focusing on pubertal development;
- ✓ ALSPAC 'Children in focus clinics' (n=1): 10% sub-sample of the cohort invited to attend these clinics' assessments up until the age of 7.
- ✓ ALSPAC focus clinics (n=9): from age 7 onwards all ALSPAC children were invited to attend clinics' assessments on a number of domains such as: biosamples; health; literacy/numeracy; measures; motor skills; and physiological, psychological, puberty, and social. (Boyd et al., 2012).

Children

Data collected through CCQs and Focus clinics span over 6 phases of the child's life: (i) infancy (≥4 weeks and ≤2 years); (ii) early childhood (>2 years and <7 years); (iii) childhood (7 years); (iv) late childhood (>7 years and < 13 years); (v) adolescence (≥13 years and <16 years); (vi) transition to adulthood (>16 years and ≤18 years) (Boyd et al., 2012). The study contained in this thesis, employed data collected through CCQs and focus clinics in the adolescence and transition to adulthood age bands. A summary of participation numbers and type of variables taken from each round of data collection employed in these studies is provided in Table 36.

Table 36: Summary of assessments (variables/time-point/method of data collection) employed in this thesis and participation rates

Assessment	Type	Mean age, years	Returned/ attendance	Variables extracted
Teen Focus 3	Clinical Assessment	15.5	5,515	✓ BMI
Life of a 16+teenager	CCQ	16.5	5,131*	• Substance use (alcohol, drugs, cigarettes) • Psychological morbidity (Moods and feelings questionnaire, depressive symptoms)

* Total number of questionnaires is noted as 5,069, due to additional questionnaires returned past the date indicated on the dataset

Purging behaviours

Eating and weight control behaviours at age 16 were investigated via CCQs using a set of questions adapted from the Youth Risk Behaviour Surveillance System (YRBSS) questionnaire (Kann et al., 1996). The YRBSS is a questionnaire that has been administered bi-annually to all high school students in the USA and it has been developed to monitor 6 types of health risk behaviours, namely: (i) behaviours that contribute to unintentional injuries and violence; (ii) sexual behaviours leading to unintended pregnancy and sexually transmitted diseases; (iii) alcohol and drug use; (iv) tobacco use; (v) lack of physical activity; and (vi) unhealthy eating behaviours (Brener, Collins, Kann, Warren, & Williams, 1995; Kann et al., 1996, 2004).

Adolescents were asked:

- ✓ "During the past year, how often did you make yourself throw up (vomit) to lose weight or avoid gaining weight? Possible answers were: (i) never; (ii) less than once a month; (iii) 1-3 times a month; (iv) once a week; (v) 2 – 6 times a week; (vi) every day.
- ✓ During the past year did you take laxatives or tablets or medicines (diet pills or water tablets) to lose weight or avoid gaining weight? Possible answers were: (i) yes, laxatives; (ii) yes, other; (iii) never. A positive answer (to either 'laxatives' or 'other') would prompt the adolescent to a follow up question asking: "How often?". Participants could choose from the following answers: (i) never; (ii) less than once a month; (iii) 1-3 times a month; (iv) once a week; (v) 2 – 6 times a week; (vi) every day.

These questions have been validated amongst girls, with high sensitivity (93%) and negative predictive values (99%)of self-reported purging and binge eating (A. E. Field, Taylor, Celio, & Colditz, 2004).

Binge eating

Binge eating was assessed at age 16 with a two-part question. First, adolescents were explained what an eating binge is and then asked whether they had ever experienced one with the following question:

- ✓ "Sometimes people will go on an "eating binge", where they eat an amount of food that most people would consider to be very large, in a short period of time. During the past year, how often did you go on an eating binge?" Possible answers were: (i) less than once a month; (ii) 1-3 times a month; (iii) once a week; (iv) more than once a week; (v) never.

Girls reporting overeating (i.e. any answer different from 'never') were directed to a follow-up question asking whether they felt a sense of loss of control (LOC) during those episodes, such as they could not stop eating even if they wanted. They were asked:

- ✓ "Did you feel out of control, like you couldn't stop eating even if you wanted to stop?" Possible answers were: (i) yes, usually; (ii) yes, sometimes; (iii) no.

Binge eating was defined as eating a very large amount of food in a short amount of time at least monthly and feeling out of control during the eating episode.

Binge drinking

Binge drinking was assessed in ALSPAC using 'item 3' of the Alcohol Use Disorders Identification Test (AUDIT), a World Health Organization (WHO) (Babor et al., 2001) screening tool developed to screen for excessive drinking, which asks "How often do you have 6 or more drinks on one occasion?" and answers are scored on a Likert scale ranging from 0-4 points (0=never, 1=less than monthly, 2=monthly, 3=weekly, 4=daily or almost daily). As it was discussed in 3.4.4 the AUDIT has been found to be culturally appropriate and internationally applicable.

The rationale for choosing this question only and not the whole scale, stemmed from the necessity to harmonise the sets of questions asked in the two cohort studies used in study 4 in order to ensure the highest levels of comparability.

Drug use

Adolescents were asked whether they had used any of the following substances in the past year: cannabis, cocaine, Lysergic Acid Diethylamide (LSD), ecstasy, amphetamines, mushrooms, heroin, ketamine, crack, steroids. They could choose an answer from: (i) no; (ii) <5 times; (iii) > 5 times. A dichotomous variable was created for each substance indicating whether adolescents had used or not drugs in the previous year. Subsequently, all variables (coded 0 for 'no' and 1 'yes') were added together and participants scoring ≥1 were classified as "having used at least one drug in the previous year". Cannabis was not grouped with the previous drugs on the a priori knowledge of its association with overeating (A. E. Field et al., 2012). A binary variable was created indicating whether participants had tried cannabis at least once in the past year as it was initially done for each of the other drugs.

Smoking

Adolescents were asked whether they had smoked since their 15th birthday and the answer was coded as a 'yes/no' binary variable. Those giving a positive answer were prompted to a follow up question investigating frequency of smoking, but that question was not included in this study.

Psychopathology

The Short Moods and Feelings Questionnaire (Messner et al., 1995) (SMFQ), a 13-item questionnaire developed as a screening tool to detect symptoms of depressive disorders in children and adolescents between age 6 and 17, was used to measure depressive symptoms at age 16. Each item in the questionnaire is scored on a scale from 0 to 2 (0=true, 1=sometimes true, 2=true). A cut-off score of 8 was used to identify clinically depressive states, as shown in previous literature (Kuo, Stoep, & Stewart, 2005; Messner et al., 1995). The SMFQ has good internal construct validity in both clinical (Kent, Vostanis, & Feehan, 1997;

Messner et al., 1995) and general population samples (Sharp, Goodyer, & Croudace, 2006).

Body Mass Index

In ALSPAC, Body Mass Index (BMI) [Kg/m²] was obtained from objective weight and height measurements at the TF3 (age 16) focus clinic taken with a Harpenden stadiometer and a Tanita Body Fat Analyser model TBF 305. Since it was used as a continuous variable, Cole's suggested cut-offs for adolescent BMI were not employed (Cole et al., 2007; Cole, 2000).

Mothers

After enrolment in the ALSPAC study and throughout pregnancy, women received questionnaires pertaining to their specific gestational ages. Table 37 summarises the data that was employed from pregnancy questionnaires that was used in this thesis.

Table 37: ALSPAC Mother Completed Questionnaires

Questionnaire	Time-point (weeks)	Variables extracted in this thesis	Response rate
Your environment	8 weeks gestation	• Relationship status	13,548
Your pregnancy	32 weeks gestation	• Maternal education • Child gender	12,423

Maternal marital Status

Information on mothers' marital status was collected at enrolment (32 weeks gestation) and dichotomised as either 'married or cohabiting' or 'single parent'. This information was available for 90.7% of enrolled mothers.

Maternal education

At enrolment (32 weeks gestation) mothers were asked about their highest education level from the following: (i) Certificate of Secondary Education (CSE)/No qualifications, (ii) vocational, (iii) O-Level or equivalent, (iv) A-levels or equivalent, (v) University degree. This information was available for 94.2% of the mothers. The variable was dichotomised as 'Up to O level or equivalent' (obtained at 16 years) or 'A levels (obtained at 18 years) or above' (secondary school level exams and University degree). Women who ticked the "not known" answer were grouped with individuals in the 'CSE/no qualification' category, as it was assumed that their qualification did not match any of those presented in the questionnaire.

Child gender
Child gender was collected at birth and dichotomised as 'male' or 'female' and was available for 100% of the children in the cohort.

7.3.6. Cohort-level attrition

Figure 5 shows the level of permanent attrition (that is participants who have died or that it has not been possible to locate) at each stage of ALSPAC recruitment, which reduces the pool of available participants at each stage of the study.

Boyd and colleagues have compared adolescents with different degrees of participation in ALSPAC on school attainment scores and those who are still eligible for follow up against those who are lost to attrition on some socio-demographic characteristics. As shown in Table 38, adolescents retained in the study (who had either recently participated or were still eligible for follow up) had higher mean academic attainment scores compared to those who had either not participated recently or those who had been lost to follow up. The latter were those with the lowest levels of academic attainment compared to the other categories. As shown in Table 38, when comparing ALSPAC adolescents who are eligible for follow up against those who were lost to attrition, more girls were be eligible for and more adolescents from a low-income family had been lost to attrition. More participants from a non-White ethnic background had been lost to follow up, although the result was not significant.

Table 38: Comparison of mean academic attainment for ALSPAC adolescents grouped according to the extent of their participation in the study at age 16 (adapted from Boyd et al., 2012)

Indicator	Enrolled in ALSPAC[b]	No recent participation	Recent participation	Eligible for follow up	Lost to attrition
			Academic attainment		
N	11,008	5,473	5,535	9,452	1,556
Mean Score (IQR)	317 (242-350)	287 (242-350)	347 (314-398)	324 (290-380)	278 (224-350)

Table 39: Socio-demographic characteristics of adolescents who remain eligible for follow up at age 16 and those lost to attrition. (Taken from Boyd et al., 2012)

Characteristic	Category	Enrolled in ALSPAC[b]	Lost to attrition	ORs (95% CI)	P (χ^2)
		% (n/n)	*% (n/n)*		
Gender	Female	49.7% (5,470/11,008)	46.7% (726/1,556)	0.86 (0.77-0.96)	0.01
Ethnicity	White	96.1% (10,505/10,933)	95.4% (1,473/1,545)	0.81 (0.62-1.05)	0.1
Low income	FSM	6.2% (682/10,959)	11.5% (177/1,544)	2.28 (1.91-2.74)	<0.0001

7.3.7. Study-level attrition

Sent/returned questionnaires

At age 16 the number of questionnaires returned was a portion of those that had been sent out. The tables below compare adolescents who returned questionnaires (regardless of missingness within the questionnaire) at the age 16 follow up on several socio-demographic indicators.

As it is shown in Table 40, adolescents who did not return the questionnaire were more likely to be male, with a single mother with lower education level.

Table 40: Socio-demographic characteristics of adolescents who returned and those who did not return the questionnaire at age 16

Characteristic	Questionnaire		$P(\chi^2)$
	Returned N(%)	Not returned N(%)	
Gender			
Male	1,934(41.3)	2,753(58.7)	<0.0001
Female	2,742(58.22)	1,968(41.8)	
Maternal education			
Up to O levels	2,381(43.1)	3,148(56.9)	<0.0001
GCSE or higher	2,216(62.2)	1,346(37.8)	
Maternal marital status			
Single	792(41.8)	1,103(58.2)	<0.0001
Married or cohabiting	3,832(52.2)	3,512(47.8)	

7.4. The Northern Finland Birth Cohort 1986 (NFBC86)

7.4.1. Study overview

The Northern Finland Birth Cohort (NFBC) 1986 (which was also known to participants as "The mother-child cohort study of morbidity and mortality during childhood with the special purpose of preventing mental and physical handicap") is an on-going longitudinal study aimed at investigating the genetic and environmental dimensions of long-term morbidity as well as intermediate disease markers. Specifically, the aims of the study were to record and investigate disease symptoms from childhood, through adolescence and adulthood, as well as social wellbeing, with the purpose of identifying risk groups and biological markers. The study population was drawn from the two northern-most provinces of Oulu and Lapland.

7.4.2. Recruitment procedures

All Finnish-speaking pregnant women expecting to deliver between 1st July 1985 and 30th June 1986 were recruited via antenatal services and invited to participate. Antenatal health care in Finland is tax-paid, guaranteeing almost universal coverage. It has been estimated that less than 2% of the population does not have access to the service (Rodriguez et al., 2007).

7.4.3. Study participants

The children of mothers who were enrolled in the study formed the NFBC cohort 1986. A small percentage of the births from mothers enrolled in the study occurred towards the end of June 1985 and begin of July 1986; they were nonetheless included in the study.

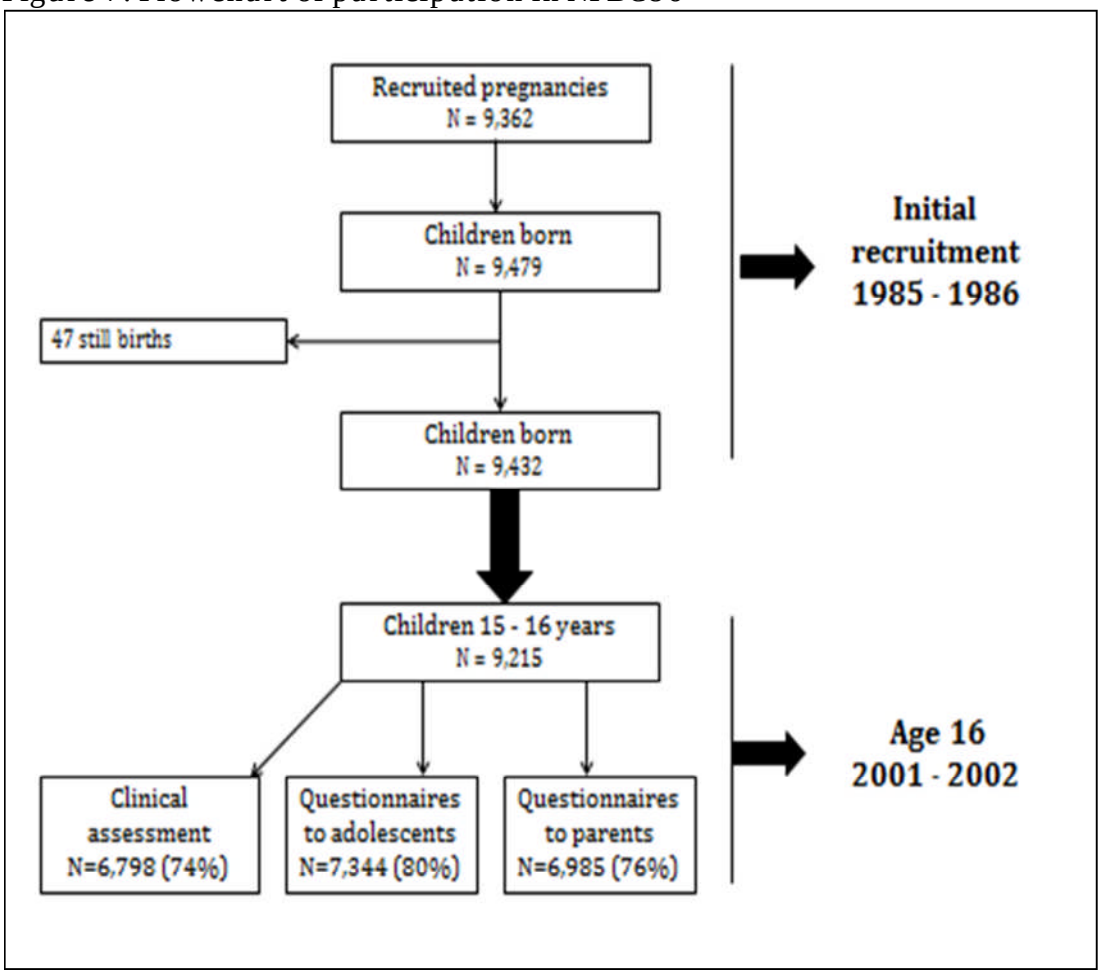
A total of 9,362 (99% of all the deliveries expected within the study period) were recruited in the study. Altogether, 9,749 children were born in the cohort of whom 47 were still-births and 9,432 live births (Oulu, n.d.). The original cohort has been followed up since and no more children were added into the study. At age 16, 9,215 adolescents and parents were sent a postal

questionnaire and 7,344 (80%) returned it (Kantomaa et al., 2013; Kantomaa, Tammelin, Demakakos, Ebeling, & Taanila, 2010). At follow up participants were located through national registries using their personal identification number, allowing tracing participants who had moved away from the original catchment areas within Finnish territory (Rodriguez et al., 2007). A summary of participation is provided in Figure 7.

Inclusion and exclusion criteria

Similarly to ALSPAC, only singleton girls who had complete information on study exposure, covariates, and outcomes were included in the study.

Figure 7: Flowchart of participation in NFBC86



7.4.4. Representativeness

The population in Finland is generally homogeneous, therefore not only both the populations of the two provinces are comparable, but also the overall study sample is representative of the general Finnish population (Lukkari et al., 2013). However, it was not possible to retrieve more detailed information on direct comparison between the socio-demographic of the sample and those of the catchment area and Finland, as these data were not available on the NFBC website or in any previous publications. Comparison of the cohort with the most recent Finnish census was deemed inappropriate give the time difference between the two data collection points and the possible effect of time on the structure of the population.

7.4.5. Measurements

To date, four rounds of data collection were undertaken as part of NFBC. Women were followed up from the 12th week and interviews and postal questionnaires were completed from the 24th gestational week. Pregnancy and pregnancy outcomes were monitored through patient records

Both children and mothers were followed up at 6/12 months, 7/8 years and 14/16 years in three rounds of data collection. Between 2001 and 2003, the 14/16 year data collection was accompanied by clinical data collection on neuro-behavioural, mental disorders, spirometry, skin prick tests, physical fitness, anthropometry, blood samples. Clinics and questionnaire data was supplemented by registry data linkage (e.g.: hospital discharge register, death register, social benefits register for fully reimbursed medicines, pension, as well as information on education and occupation. Table 41: Summary of assessments (variables/time-point/method of data collection) employed in this thesis and participation rates at the 15/16 follow up. Table 41 provides a summary of the type of variables employed in Study 4 (Chapter 8) and numbers of children and mothers who returned the questionnaire.

Table 41: Summary of assessments (variables/time-point/method of data collection) employed in this thesis and participation rates at the 15/16 follow up

Assessment	Type	Returned/ attendance	Variables extracted
Clinical	Clinical Assessment	6,798	• BMI (from anthropometric measurements) • BMI (self-reported) • Substance use (alcohol, drugs, cigarettes) • Psychological morbidity (Youth Self-Report, Internalising/externalising behaviours)
Child-completed questionnaire	Postal questionnaire	7,344	

Purging behaviours

Presence of purging behaviours in adolescents was assessed with the following question:

- ✓ "Have you ever used any of the following methods to lose/control your weight:" followed by a list of possible purging methods (e.g. vomiting, laxatives) asked in individual questions. To generate the variable on purging behaviours the questions used were those related to: vomiting and laxatives/other slimming medications use. Possible answers were 'never' 'occasionally', and 'often'.

A combined variable was generated measuring whether any of these methods had been used at the frequencies asked in the question. Subsequently a binary variable was created indicating whether participants had engaged in any purging behaviours in the previous year.

Binge eating

At age 16, adolescents were asked:

- ✓ "How often do you devour a large amount of food in a short period of time?" Possible answers were: (i) 'never'; (ii) 'hardly ever'; (iii) 'occasionally'; (iv)'once a month'; (v) 'once a week'; (vi) '2/3 times per week'; and (vii) 'daily'.

The variable was dichotomised separating girls who had answered 'never' to 'occasionally' from those who reported binge eating 'once a month or more'. This choice was made a priori by the need to account for the absence of a measure for loss of control (LOC), essential in defining binge eating. The rationale for this classification was to attempt to discriminate more common episodes of overeating from real binge eating episodes.

Binge-drinking

Girls were asked how many times in the past month they had consumed more than 4 drinks in one occasion, with the question:

"Think back for the past 30 days. If you are a girl, how many times during that time have you drunk four drinks or more on the same occasion?" (boys were given a higher threshold of 6 drinks). Frequency was recorded as (i) never; (ii) 1-2 times, (iii) 3-5 times; (iv) 6-9 times; (v) 10-19 times; (vi) 20-39 times; (vii) 40 times or more. Subsequently they were recoded as a three-level categorical variable indicating: (i) 'never'; (ii) 'less than weekly'; or (iii) 'more than weekly'.

Drug use

At age 16 girls were asked if they had ever tried using: (i) 'sedatives, sleeping pills, pain killers without alcohol'; (ii) 'alcohol and pills together'; and (iii) 'ecstasy, heroin, cocaine, amphetamines LSD or other similar drugs'. Possible answers were: (i) never; (ii) Once; (ii) 2 – 4 times; (iii) 5 times or more; (iv) regularly. Each question was then dichotomised into a 'yes' or 'no' answer according to whether girls had never tried using each of these substances or they had tried them at least one. As it had been the case in ALSPAC, a new variable was then generated by adding together each of the drug-use related questions with a possible score ranging from 0 to 3. Subsequently, a summary

binary variable was created indicating whether the adolescent had used (score '≥1') or not (score '0') at least one of the drugs indicated in the question. Cannabis use was similarly coded and used as a separate variable based on the same rationale explained for this choice in the ALSPAC cohort (Section 7.3.5).

Smoking

Adolescents were asked whether they currently smoked cigarettes with the question:

- ✓ "Do you smoke now?" Possible answers were: (i) not at all; (ii) occasionally; (iii) one day a week; (iv) 2- 4 days a week; (v) 5 – 6 days a week; (vi) 7 days a week.

Answers were recoded as 'yes' (if they had reported at least occasional use of cigarettes) or 'no'.

Psychopathology

The 'problems' section of the Youth Self-Report (Achenbach, 1991) (YSR) questionnaire was used to identify the presence of internalising (anxious/depressed; withdrawn/depressed; somatic complaints; thoughts problems; attention problems) and externalising (social problems; rule-breaking behaviours; aggressive behaviours) behaviours among adolescents. It consists of 112 questions rated on a three-point Likert Scale ('0='not true'; 1='somewhat or sometimes true'; 2='very true or often true'). The overall score for each sub-scale was recoded into a three-level ordinal variable indicating: normal, sub-clinical and clinical ranges. The cut-off points employed, circa 84th and 90th percentile, had been employed in previous studies based on the NFBC cohorts (Kantomaa et al., 2010; Kantomaa, Tammelin, Ebeling, & Taanila, 2008). The YSR has been shown to have very good internal consistency (total scale's Cronbach's alpha=0.95) and moderate to good test-retest reliability (0.68-0.86 for individual scales and 0.89 for the overall score) (Ridge, Warren, Burlingame, Wells, & Tumblin, 2009). (The complete questionnaire is available in Appendix V).

Body Mass Index (BMI)

BMI was calculated from health examination conducted at the age of 16 years that included measured weight and height (n=3,290) and complemented by self-reported weight and height for those girls who had self-reported their height and weight in the questionnaire but had not taken part in the clinical examination (n=423). The correlation coefficient between BMI derived from measured and self-reported data (for those who had data available for both measurements) was r=0.7 and thus was deemed acceptable.

Mothers

Mothers were followed up antenatally, and at: 6/12 months, 7/8 years and 14/16 years in four rounds of data collection.

Table 42: NFBC mother completed questionnaires

Assessment	Type	Returned/ attendance	Variables extracted
Mother-completed questionnaire	Postal questionnaire	6,185	• Maternal marital status • Maternal education

Marital status of the main child provider

Information on family structure was obtained from mothers at the 16-year follow-up with the question:

- ✓ "Which of the following alternatives best describes the marital status of the child's main provider". Possible answer were: (i) Married cohabiting with the child's biological father/mother; (ii) Divorced, single provider; (iii) divorced, joint custody; (iv) Divorced, re-married; (v) Unmarried; (vi) widowed.

In order to harmonise answers with those of ALSPAC the variable was coded as 'married or cohabiting' or 'single'.

Maternal Education

Information on maternal education was collected with the questionnaire sent to mothers at age 16. Mothers were asked

- ✓ "What is the highest level of education of the mother?" Possible answers were: (i) less than 9 years of comprehensive school; (ii) comprehensive school /elementary school; (iii) matriculation examination.

The first two answers correspond to basic compulsory education, whereas the latter to upper secondary education. Whilst marital status was recorded for the main child provider, education was asked for mothers and fathers individually. In the absence of a comparable question, it was decided to use maternal education as most children indicated the mother as the main provider.

7.4.6. Attrition

Cohort level attrition was minor at age 16. Of the total 9,432 children included, only 217 (2.3%) did not take part in the study at 16, because they were either deceased or were not possible to locate. At 16 years, 1,871 (20.3%) had not returned the questionnaire. A variable indicating which participants had returned the questionnaire was not available in the dataset at the time of data analyses; therefore, it was not possible to conduct attrition analyses. Girls with complete outcomes included in the study were compared against the whole sample of girls in Chapter 8.

7.5. Data preparation

The data used in chapter 8 had been already collected, cleaned and coded prior to use. Variables that have been additionally recoded for the purposes of the current investigations will be described in the methodology sections proper of each study.

7.6. Data Analyses

As it had been previously specified in Chapter 3 Section 3.5, study-specific analyses will be presented in each individual result chapter. All analyses were conducted using Stata 12.0 (StataCorp, 2011) software.

Two-tailed analyses and P-values of 0.05 and 95% Confidence Intervals were used to test the null-hypothesis of no difference between exposed and unexposed groups. All variables were tested for normality before applying parametric tests.

Study 4 (Chapter 8) employed only girls. The decision was justified by the higher prevalence of purging behaviours amongst girls at that age and statistical power considerations. Associations between exposure variables and outcomes

were investigated using univariate and multivariate logistic and multinomial regression analyses, according to whether the outcome variable was binary or categorical in nature, respectively. In both studies, multivariate models were adjusted for: socio-demographic variables (e.g. age, maternal education and marital status) known a priori to be associated with both the exposure and the outcome of interests from literature and to be associated with attrition in the cohort. In study 4, models were additionally adjusted for Body Mass Index, identified as an a priori confounder on the basis of it being associated with exposure in our analyses and outcomes from literature (Stice, 2002), and binge eating, as the aim was to explore the how much of the association with the outcomes was attributable to purging irrespectively of bingeing. All analyses were run on individuals with complete information on the outcomes under investigation (Sterne et al., 2009).

7.7. Role of the researcher

ALSPAC and NFBC

The ALSPAC team at the University of Bristol and NFBC team at University of Oulu collected all of the data on adolescent behaviours, socio-demographic characteristics and psychopathology. Francesca Solmi was responsible for conducting all data analyses concerning ALSPAC and NFBC under the supervision of Dr Nadia Micali and Dr Anna Pearce.

7.8. Ethics approval

Ethics committee approval was sought prior to undertaking the study (which has been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments) from the ALSPAC Law and Ethics committee, and local research ethics committees. NFBC has been approved by the the ethical committee of Northern Ostrobotnia Hospital District, Oulu University Hospital. (Study 4– Chapter 8).

Chapter 8

Prevalence of Purging at age 16 and associations with negative outcomes among girls in two community-based cohorts

Parts of this chapter appear in the paper: Solmi, F., Sonneville, K.R., Easter, A., Horton, N.J., Crosby, R.D., Treasure, J., Rodriguez, A., Jarvelin, M-R., Field*, A.E., Micali, N. (under review) 'Prevalence of Purging at age 16 and association with negative outcomes among girls in three community-based cohorts'

8.1. Introduction

As described in Chapter 1, purging behaviours are defined as the inappropriate use of laxatives, diuretics, and slimming medications, as well as self-induced vomiting to control weight. Purging commonly co-occurs with other eating disordered behaviours and cognitions, as described in diagnostic definitions of AN-BP or BN (American Psychiatric Association, 2013). However, evidence suggests that some individuals engage in purging, but do not have AN nor do they engage in binge eating. It has been suggested that these individuals have 'purging disorder' (PD)(Fink et al., 2009; Keel et al., 2005; Keel & Striegel-Moore, 2009). Due to the paucity of studies on PD it is not an official eating disorder (ED) in the Diagnostic and Statistical Manual for Mental Disorders version 5 (DSM-5), but rather it remains in the heterogeneous group of Other Specified Feeding or Eating Disorders (OSFED)(American Psychiatric Association, 2013). This appears to somehow underplay evidence on the increasing prevalence of purging behaviours in both clinical and non-clinical populations and on their associated comorbidity (Ackard et al., 2011; A. E. Field et al., 2012).

Compared to healthy women, those who *only* purge have a higher prevalence of depression (Keel et al., 2005, 2008; Wade, 2007a), anxiety (Keel et al., 2005,

2008), impulsivity (Fink et al., 2009), impaired psychosocial functioning (Haedt & Keel, 2010; Spoor, Stice, Burton, & Bohon, 2007), alcohol consumption (Abebe et al., 2012; Anderson et al., 2005; A. E. Field et al., 2012), general Axis I&II psychopathology (Keel et al., 2005), drive for thinness and body dissatisfaction (Fink et al., 2009), as well as decreased self-esteem (Wade, 2007a) .

Whilst shedding light on the comorbidity of purging behaviours, these studies share similar theoretical and methodological assumptions. Firstly, they use frequency and duration cut-offs to define individuals who purge (Anderson et al., 2005; Fink et al., 2009; Haedt & Keel, 2010; Keel et al., 2005, 2008; Spoor et al., 2007; Wade, 2007a). Whilst useful in clinical settings, these cut-offs, which have not been empirically defined, are not helpful in defining and describing presentations of purging behaviours occurring at the general population level. Secondly, they mostly employ an adult study population, despite evidence, presented in Chapter 2, that purging is more frequent in adolescents. A recent study (Abebe et al., 2012) showed the prevalence of compensatory behaviours decreasing from the age of 14-16 to 23 and that purging was associated, particularly in adolescent girls, with the most severe comorbidity. Girls engaging only in purging behaviours had higher levels of image dissatisfaction, anxiety, depression, alcohol consumption, instability of self-concept, loneliness, and higher scores in the EAT-12 and BITE-30, two ED screening scales (Abebe et al., 2012). Therefore, focusing on adult populations might miss the more severe behaviours and psychopathology typically seen in adolescents.

Several studies have provided an indication that the prevalence of purging behaviours might peak in adolescence. A recent longitudinal general population study on 1,383 adolescents, found a prevalence of 2.7% for threshold or partial PD at age 14, and that at age 20 no adolescents with any prior ED diagnosis had PD (Allen et al., 2013). Another study found it to range between 2% and 2.5% in a cohort of 9 to 26 year olds, with prevalence peaking in the 16-18 and 19-22 age groups and decreasing at ages 23-26 (A. E. Field et al., 2012). On the other hand, an 8-year longitudinal study following 496 adolescents found the age of peak onset for PD to be 18-20 years (Stice et al., 2012), suggesting a slightly

later onset. Finally, studies investigating prevalence of ED behaviours found prevalence estimates for purging behaviours of up to 12-13% amongst adolescents (Ackard, Neumark-Sztainer, Hannan, French, & Story, 2001; Neumark-Sztainer, Wall, Larson, Eisenberg, & Loth, 2011a).

However, to date, most adolescent studies have focused on US populations and little is known on the prevalence of purging behaviours in different countries and cultures. Research investigating differences in presentations of full-threshold ED (i.e. AN and BN) in 'Western' vs. 'Non-Western' countries has suggested that socio-cultural factors might play a fundamental role in the aetiology of ED. The socio-cultural model of ED development posits that exposure to Western ideals of beauty in non-Western cultures, as a consequence of development, urbanization and industrialisation, might increase the risk of ED. On the other hand, it also argues that different cultures might give rise to different ED presentations; non-fat phobic AN in Asian cultures is an example (Anderson-Fye & Becker, 2004; Makino, Tsuboi, & Dennerstein, 2004; Vander Wal, Gibbons, & Grazioso, 2008). Similarly, research has also shown that prevalence of ED might be higher in urban versus rural settings (Hoek et al., 1995). Studying the prevalence of purging behaviours in adolescence employing samples from different geographical and cultural backgrounds could shed more light and help generate hypotheses on the impact of socio-cultural factors in their onset and development.

8.2 Aims and Hypotheses

This study investigates the prevalence and correlates of purging behaviours, regardless of their frequency, amongst adolescents using population samples based in different countries. The primary aim of this paper was to explore the prevalence of purging behaviours and their association with adverse outcomes (alcohol, cigarette, drug use, depressive symptoms, and internalising and externalising behaviours) in 16 year-old girls across 2 general population samples based in the UK, and Finland. The secondary aim was to investigate

whether the prevalence of purging behaviours varies across countries, which could suggest a role of cultural factors in influencing purging behaviours.

Based on the findings of previous studies we hypothesised to find:

- ✓ prevalence of purging behaviours higher than those reported for PD and more in line with those found in studies not employing diagnostic definitions;
- ✓ engaging in purging practices to be associated with a number of negative outcomes;

Given the exploratory nature of the study it is not possible to hypothesise whether differences in prevalence of purging behaviours will be present between the UK and the Finnish sample.

8.3. Methods

8.3.1. Study design

This study is a cross-sectional investigation of 16 year-old adolescent girls.

8.3.2. Samples

This study employed data from two general population cohort studies.

ALSPAC

The Avon Longitudinal Study of Parents and Children (ALSPAC) is a longitudinal study of women and their children. More details on the study are given in Chapter 7. At age 16, 10,388 adolescents were sent a postal questionnaire.

NFBC

The Northern Finland Birth Cohort (NFBC) 1986 a longitudinal study of mothers and their offspring. More details on the cohort were provided in Chapter 7. At age 16 9,215 adolescents were sent a postal questionnaire.

8.2.3. Measures

All measures have been described in detail in Chapter 7 sections 7.3.5 and 7.4.5. Below is a short summary.

Purging behaviours

ALSPAC

ALSPAC assessed eating and weight control behaviours using questions adapted from the Youth Risk Behaviour Surveillance System questionnaire (Kann et al., 1996), as was explained in Chapter 7. Participants were asked how often, in the previous year, they had made themselves vomit or had taken laxatives or other slimming medications to lose weight or avoid gaining weight. The two variables were combined and dichotomised into a binary variable indicating whether the adolescent had engaged in any purging behaviours or not in the previous year.

NFBC

Adolescents were asked if they had ever vomited, taken laxatives or slimming medications in the previous year to lose weight. Possible answers were 'never' 'occasionally', and 'often'. The three variables were combined and subsequently dichotomised, indicating whether any of these methods had been used at least occasionally in the previous year.

Outcomes

ALSPAC

Binge drinking: Binge drinking was assessed in ALSPAC using item 3 of the Alcohol Use Disorders Identification Test (AUDIT), described in Chapter 7. (Babor et al., 2001) Possible answers were coded as a 3-level ordinal variable measuring frequency as never, monthly or less than monthly, and weekly or more than weekly.

Drug use: A binary variable was generated from original questions, indicating whether adolescents had made any use of any of the following: cannabis, cocaine, LSD, ecstasy, amphetamines, mushrooms, heroin, ketamine, crack, and steroids in the previous year. The procedure to generate the variable was described in Chapter 7. A binary variable for Cannabis use was generated as well, but was not grouped with the previous drugs on the a priori knowledge of its association with overeating (A. E. Field et al., 2012).

Smoking: Girls were asked whether they had smoked or not in the previous year.

Depressive symptoms: The Short Moods and Feelings Questionnaire (Messner et al., 1995) (SMFQ), was used to measure depressive symptoms. A cut-off score of 8 was used to identify clinically depressive states, as shown in previous literature (Kuo et al., 2005; Messner et al., 1995). More details on the scale were given in chapter 7.

NFBC

Binge-drinking: Girls were asked how many times in the past month they had consumed more than 4 drinks in one occasion. Frequency was coded into a 3-

level categorical variable indicating 'never', 'less than weekly', or 'more than weekly'.

Drug-use: Questions were asked on the frequency of using 'sedatives, sleeping pills, pain killers without alcohol', 'alcohol and pills together' and of 'ecstasy, heroin, cocaine, amphetamines LSD or other similar drugs'. As in ALSPAC, a summary binary variable was created indicating whether the adolescent had used (score '≥1') or not (score '0'). Cannabis use was similarly coded and used as a separate variable.

Smoking: Girls were asked if they currently smoked.

Psychopathology: The 'problems' section of the Youth Self-Report (Achenbach, 1991) (YSR) questionnaire was used to measure internalising (anxious/depressed; withdrawn/depressed; somatic complaints; thoughts problems; attention problems) and externalising (social problems; rule-breaking behaviour; aggressive behaviours) behaviours in girls. For each scale, a 3-level ordinal variable was generated indicating: normal, sub-clinical and clinical ranges, as indicated in previous studies (Kantomaa et al., 2010, 2008).

Covariates

ALSPAC

Binge eating: Binge eating was assessed with a 2-part question. Participants were first asked about the frequency during the past year of eating a very large amount of food. Girls reporting overeating were directed to a follow-up question asking whether they felt loss of control (LOC) during these episodes, such as they could not stop eating even if they wanted. Girls experiencing LOC whilst eating large amounts of food were classified as having had binge eating episodes. More details on the variable were given in chapter 7.

Body Mass Index: In ALSPAC, Body Mass Index (BMI) [Kg/m^2] was obtained from objective weight and height measurements and used as a continuous variable.

Socio-demographic: In ALSPAC, information on mothers' marital status was collected at enrolment and coded into a binary variable indicating whether the woman was 'married or cohabiting' or 'single parent'. Maternal education was also collected at enrolment and dichotomised as 'O level or equivalent'

(obtained at 16 years) or 'A levels (obtained at 18 years) or above' (secondary school level exams and University degree).

NFBC

Binge eating: Adolescents were asked how often they ate a large amount of food in a short period of time. A binary variable was created separating participants who had reported binge eating frequency ranging from 'never' to 'occasionally' from those reporting having done it at least 'once a month'. As it was explained in section 7.4.5 this choice was motivated by the need to discriminating bingeing from overeating episodes in the absence of a measure of loss of control eating.

Body Mass Index: BMI was calculated from health examination conducted at the age of 16 years that included measured weight and height (n=3,290) and complemented by self-reported weight and height for those girls not participating in the examination (n=423). The correlation between BMI derived from measured and self-reported data was r=0.7.

Socio-demographic: Family structure and maternal education were obtained from the main child provider at the 16-year follow-up and coded, as in the other cohorts, either 'married or cohabiting' versus 'single parent'; and 'basic compulsory education' versus 'upper secondary education or above' (secondary school exams and university degrees).

8.3.4. Data Analyses

For each study, univariate and multivariate logistic and multinomial logistic regressions were used to calculate odds ratios (ORs) (for binary outcomes) and Relative Risk Ratios (RRRs) (for categorical outcomes) and 95% confidence intervals (CI) for the association between purging behaviours and the outcomes under study, and the potential confounding role of a number of covariates. After fitting a univariate model for the association between each outcome and the exposure (purging behaviours), three additional models were fit, adjusting for: (1) binge eating; (2) 1 plus age, BMI and maternal education and marital status in ALSPAC and NFBC; (3) 2 plus smoking adjusted for binge drinking and vice

versa, given the high co-occurrence of the two. Binge eating was used as a covariate as the aim of the study was to investigate the association of purging with a number of outcomes independently from binge eating, co-occurring in some participants (i.e. with full or threshold presentations of BN). Maternal education and marital status were chosen as proxy measurement for socio-economic status (the former) and because literature suggests that they are associated with both eating disorders and the outcomes under study. Analyses were also adjusted for age given the age difference in the two cohorts, and for BMI given the association in one of the two cohorts (ALSPAC) with the exposure, and knowledge from literature of its association with substance use (Barry & Petry, 2009), and depression (de Wit, van Straten, van Herten, Penninx, & Cuijpers, 2009; Dragan & Akhtar-Danesh, 2007).

Girls with any missing data on the variables included in the models were excluded and all models were based on complete case analyses. Prevalence of purging reported in the study was calculated over the number of complete cases. Differences in prevalence of purging behaviours across the two samples were calculated with a z test for difference in proportions. In both studies differences in socio-demographic characteristics between exposed and unexposed girls were investigated for the sub-sample of adolescents that were included in the analyses using cross-tabulations and ANOVA depending on the nature of the variables. Girls with complete data included in the analyses were compared against those who had been sent the questionnaire at 16 and either had partial missingness on the outcomes included or had not returned the questionnaire. Variables to be included as covariates in regression models were identified through a priori assumptions of associations with exposure and outcomes based on previous literature.

8.4. Results

8.4.1. Missing data and attrition

In ALSPAC, 4,462 girls were sent the questionnaire at 16. Of these, 2,742 (61.5%) girls returned it and 1,608 (36%) had complete information on exposure, outcomes and covariates. Lower maternal education ($p<0.0001$), having a single mother ($p<0.0001$) and higher BMI ($p=0.03$) were associated with not having complete information on outcomes and covariates.

As it was explained in chapter 7, it was not possible to identify from the dataset girls who had been sent and retuned the questionnaires. Therefore, complete cases were compared against the whole sample of girls in the dataset. In NFBC, complete data on purging, co-morbid behaviours, and socio-demographic variables was available for 2,306(53%) of girls. Participants' older age ($p<0.0001$), lower maternal education ($p=0.003$), having a single mother ($p<0.0001$), and higher BMI ($p=0.02$) were associated with not having complete information on outcomes and covariates.

Table 43: Demographic characteristics of the ALSPAC and NFBC samples (girls) (N=complete cases)

	ALSPAC N (%)	NFBC§ N (%)
Number of questionnaires returned	2,742 (61.5%)	-
Complete cases	1,608 (36%)	2,306 (52.6%)
Any purging in the previous year*	157(9.7%)	81(3.5%)
Purging without binge eating**	89(59.7%)	58(71.6%)
Child's ethnicity		
White	1,539(96.9%)	100(100%)
Non-white	49(3.09%)	0(0%)
Maternal education		
Up to O level (ALSPAC); Comprehensive level (NFBC)	821(51.1%)	1,499(65%)
A level or more (ALSPAC); Matriculation exam (NFBC)	787(48.9%)	807(35%)
Parental marital status		
Single (single parent/divorced/widowed)	261(16.2%)	281(12.2%)
Married or cohabiting	1,347(83.8%)	2,025(87.8%)

	ALSPAC *Mean (SD)*	NFBC *Mean (SD)*
Age (years)	16.7(0.2)	15.2(0.5)
BMI	21.6(3.5)	21.1(3.1)

*Prevalence of purging calculated over the number of complete cases. Prevalence on the overall sample of girls who returned the questionnaire was 5.7% for ALSPAC, and 2.3% for NFBC.

** Proportion of girls who only purge calculated over the number of girls who purge irrespectively of other behaviours (i.e. bingeing and purging).

§ Because, as explained in chapter 7, it was not possible to identify girls who had returned the questionnaire from the dataset the percentage of complete cases is calculated over the total number of girls in the sample.

Table 44: Comparison of socio-demographic characteristics of girls with complete cases and those with missing data on the variables used in the analyses.

Socio-demographic characteristic	ALSPAC			NFBC§		
	Missing	Present (complete cases)	$p(\chi^2)$	Missing	Present (complete cases)	$p(\chi^2)$
	N(%)	N(%)		N(%)	N(%)	
N	1,134	1,608		2,072	2,306	
Maternal Education						
Up to O level (ALSPAC)/ Comprehensive level (NFBC)	1,787(68.5)	821(31.5)	<0.0001	646(30.1)	1,499(69.9)	0.003
A level or more(ALSPAC); Matriculation exam (NFB)	929(54.1)	787(45.9)		270(20.4)	807(79.6)	
Parental marital Status						
Single (single parent/divorced/widowed)	630(70.7)	261(29.3)	<0.0001	188(40.1)	281(59.9)	<0.0001
Married or cohabiting	2,154(61.5)	1,347(38.5)		729(26.5)	2,025(73.5)	
	Mean (SD)	Mean (SD)	F(p)	Mean (SD)	Mean (SD)	F(p)
Age	16.7(0.23)	16.7(0.23)	0.19 (0.6)	15.4(0.6)	15.2(0.5)	42.1(<0.0001)
BMI	21.9(3.7)	21.6(3.5)	3.72 (0.03)	21.3(3.7)	21.1(3.1)	5.3(0.02)

§ Because, as explained in chapter 7, it was not possible to identify girls who had returned the questionnaire from the dataset complete cases in NFBC were compared against all girls in the sample.

Study participants and socio-demographic characteristics

In ALSPAC, of the 1,608 girls who were included in the analyses the majority were of White ethnicity, had a mother who was married or cohabiting, and who had studied up to O-levels. The mean age and BMI in the sample were 16.7(SD=0.2) years and 21.6 (3.5) (Table 43). In NFBC, the totality of girls was from a White ethnic background, and the majority had a mother who had studied up to comprehensive levels and was married. Mean age and BMI were 15.2 (SD=0.5) years and 21.1 (SD=3.1) (Table 43).

Purging frequency and methods

In ALSPAC 157 (9.8%) girls reported any purging in the previous year and, of these 89 (56.7%) reported purging in the absence of binge eating. Overall prevalence in the sample of girls who returned the questionnaire was 5.7%. In NFBC, 81 (3.5%) girls purged at least once in the previous year and 58 (71.6%) of these did so in the absence of binge eating. Prevalence of purging was higher in ALSPAC compared to NFBC (z=8.05, p=0.0002). (Table 43)

In ALSPAC, girls who purged differed from those who did not on maternal education (p=0.007) and BMI (p=0.01), but not on other socio-demographic variables. In NFBC, purging was not found to be associated with any of the socio-demographic variables (Table 45).

Table 45: Differences in socio-demographic characteristics between girls who purge and those who did not purge in ALSPAC and NFBC

	ALSPAC (n=1,608)			NFBC (n=2,306)		
	Purging, N(%)	Non-purging, N(%)	$p(\chi^2)$	Purging, N(%)	Non-purging, N(%)	$p(\chi^2)$
Child's Ethnicity						
White	149(95.5)	1,390(97.1)	0.3	-	-	-
Non-white	7(4.5)	42(2.9)		-	-	
Maternal education						
Up to O level(ALSPAC); Comprehensive level (NFBC)	64(40.7%)	757(52.2%)	0.007	53(65.4%)	1,446(65%)	0.9
A level or more(ALSPAC); Matriculation exam(NFBC)	93(59.2%)	694(47.8%)		28(34.6%)	779(35%)	
Maternal marital status**						
Single(single parent/ divorced/widowed)	26(16.6%)	235(16.2%)	0.9	14(17.3%)	267(12%)	0.1
Married or cohabiting	131(83.4%)	1,216(83.8%)		67(82.7%)	1,958(88%)	
	ALSPAC			NFBC		
	Purging, Mean(SD)	Non-purging, Mean(SD)	F(p)	Purging, Mean(SD)	Non-purging, Mean(SD)	F(p)
Age (years)	16.6(0.23)	16.7(0.23)	1.3(0.2)	15.3(0.6)	15.2(0.5)	0.75(0.4)
BMI	22.3(3.6)	21.6(3.5)	6.3(0.01)	21.5(2.8)	21.1(3.1)	1.64(0.2)

8.4.2. Association between purging substance use and psychiatric comorbidity

ALSPAC

In univariate models, and models only adjusted for binge eating, girls who purged had increased risk of binge drinking less than monthly and weekly or more, and higher odds of having smoked cigarettes and cannabis; having used one or more drugs in the past year; and having depressive symptoms, as is shown in Table 46 and Table 47. In the multivariate model, after adjusting for age, BMI, binge eating, maternal education and maternal marital status (as well as smoking for drinking and drinking for smoking), girls who purged had higher risk of binge drinking (both at a lower frequency, i.e. less than monthly (RRR=3, 95%CI:1.6-5.8) and at a higher frequency: weekly or more (RRR=4.2, 95%CI: 1.9-8.9)); higher odds of having smoking cigarettes (OR=2.6, 95%CI:1.7-3.8) and cannabis in the previous year (OR=2.9, 95%CI:2.1-4.2); of having used any other drug use (OR=2.9, 95%CI:1.8-4.7) (Table 46) and of having depressive symptoms (OR=2.2, 95%CI:1.5-3.1) Table 47. For all outcomes, with the exception of smoking cigarettes and binge drinking, adjusting for binge eating reduced the ORs and RRRs, although only moderately. ORs for the smoking and RRRs for the drinking outcomes were reduced in the final model, possibly due to the hypothesised high co-occurrence of the two (Table 46).

NFBC

In the univariate model and in that adjusted for binge eating, girls who purged had higher risk of binge drinking less and more than weekly; higher odds of being smokers; of having used cannabis in the previous year; and of having used other drugs (Table 46). In multivariable models accounting for socio-demographic variables, girls who purged had increased odds of binge drinking more (but no longer less) than weekly (RRR=4.5, 95%CI:1.7-11.9), of smoking cigarettes (OR=2.9, 95%CI:1.7-4.8) and cannabis (OR=4.5, 95%CI:2.5-7.9), and of using drugs (OR=4.1, 95%CI: 2.6-6.6) (Table 46).

As shown in Table 47, in univariate models, girls who had engaged in any purging episodes in the year prior to assessment had higher risk of having all of the measured outcomes with the exception of social problems at both sub-

clinical and clinical levels, and sub-clinical levels of thought problems. In multivariate models adjusted for binge eating and socio-demographic variables, girls who had purged in the previous year were at higher risk of reporting internalising behaviours [such as sub-clinical (RRR: 6.3, 95%CI: 3.1-12.7), and clinical levels of anxiety (RRR:11.2, 95%CI:3.9-31.7), somatic (sub-clinical= RRR:3.6, 95%CI:1.9-6.9, clinical= RRR:20.1, 95%CI:6.5-65.3), and attention problems (clinical=RRR:19.4, 95%CI:4.3-88.2)], and externalising behaviours [such as rule-breaking (sub-clinical= RRR:5.9, 95%CI: 3.5-10.1; clinical= RRR: 12.1, 95%CI:5.9-24.9) and aggressiveness (sub-clinical= RRR:2.8, 95%CI:1.2-6.7)] (Table 47).

As with ALSPAC, adjustment for binge eating lowered caused the greater decrease in estimates of experiencing the outcome in exposed girls, although the reduction was moderate. Adjusting smoking for drinking and vice versa resulted in a substantial reduction of the risk of drinking and odds of smoking (Table 46).

Table 46: Crude and adjusted Odds Ratios (ORs) and Relative Risk Ratios (RRR) and 95%CI for the risk of binge drinking, using drugs, and smoking in girls who purged (vs. those who did not)

Cohort	Crude RRR/OR (95% CI)	Adjusted[1] RRR/OR (95% CI)	Adjusted[2] RRR/OR (95% CI)	Adjusted[3] RRR/OR (95% CI)
ALSPAC (n=1,608)				
Binge				
No binge drinking	1.0	1.0	1.0	1.0
Less than monthly	4.6(2.5-8.8)**	4.3(2.3-8.1)**	4.3(2.3-8.1)**	3(1.6-5.8)**
Weekly or more	9.1(4.5-18.5)**	7.3(3.5-15.1)**	7.3(3.6-15.2)**	4.2(1.9-8.9)**
Any Smoking				
No	1.0	1.0	1.0	1.0
Yes	3.6(2.5-5.2)**	3.4(2.3-5)**	3.4(2.3-5.1)**	2.6(1.7-3.8)**
Cannabis use (previous year)				
No	1.0	1.0	1.0	-
Yes	3.2(2.3-4.5)**	2.9(2.1-4.2)**	2.9(2.1-4.2)**	-
Drug use (*Used one or more* since age 15)				
No	1.0	1.0	1.0	-
Yes	3.3(2.1-5.1)**	2.8(1.8-4.5)**	2.9(1.8-4.7)**	-
NFBC (n=2,306)				
Binge drinking				
No binge drinking	1.0	1.0	1.0	1.0
Less than weekly	2.7(1.7-4.3)**	2.5(1.5-3.9)**	2.4(1.5-3.9)**	1.6(0.9-2.7)
More than weekly	10.4(4.3-25.6)**	8.6(3.9-21.6)**	8.6(3.4-21.7)**	4.5(1.7-11.9)**
Any Current smoking				
No	1.0	1.0	1.0	1.0
Yes	4.3(2.6-6.3)**	3.8(2.4-6.1)**	3.8(2.4-6.1)**	2.9(1.7-4.8)**
Cannabis use (previous year)				
No	1.0	1.0	1.0	-
Yes	5.2(2.9-9.1)**	4.6(2.6-8.1)**	4.5(2.5-7.9)**	-
Any Drug use (previous year)				
No	1.0	1.0	1.0	-
Yes	4.8(3.1-7.6)**	4.1(2.6-6.7)**	4.1(2.6-6.6)**	-

*p≤0.05, **p≤0.01 ***RRR

1) Adjusted for binge eating

2) Adjusted for (i) binge eating, age, BMI, maternal education, parental marital status

3) Binge drinking analysis additionally adjusted for smoking; smoking analysis additionally adjusted for binge drinking.

Table 47: Odds Ratios (ORs)and Relative Risk Ratios (RRR) and 95%CI for psychiatric co-morbity in girls who purged vs. those who did not purge

Cohort	Crude RRR/OR (95% CI)	Adjusted[1] RRR/OR (95% CI)	Adjusted[2] RRR/OR (95% CI)
ALSPAC (n=1,608)			
Depressed Mood (previous month)			
No	1.0	1.0	1.0
Yes	2.9(2.1-4.1)**	2.2(1.5-3.1)**	2.2(1.5-3.1)**
NFBC (n=2,306)***			
Anxiety			
Absent	1.0	1.0	1.0
Sub-clinical	7.9(4-15.5)**	6.4(3.2-12.9)**	6.3(3.1-12.7)**
Clinical	14.7(5.4-39.4)**	10.5(3.7-29.7)**	11.2(3.9-31.7)**
Withdrawn			
Absent	1.0	1.0	1.0
Sub-clinical	8(3.4-19.2)**	6.8(2.7-16.7)**	6.5(2.6-16.1)**
Clinical	3.7(0.5-30.1)**	2.1(0.2-17.5)	2.1(0.2-18.1)
Somatic			
Absent	1.0	1.0	1.0
Sub-clinical	4.7(2.5-8.8)**	3.7(1.9-7.1)**	3.6(1.9-6.9)**
Clinical	26(8.7-77.2)**	19.4(6.2-60.6)**	20.1(6.5-65.3)**
Social Problems			
Absent	1.0	1.0	1.0
Sub-clinical	1.5(0.4-6.5)	1.4(0.3-6.1)	1.4(0.3-5.9)
Clinical	-		
Thought Problems			
Absent	1.0	1.0	1.0
Sub-clinical	1.8(0.6-5.2)	1.6(0.8-5.1)	1.6(0.6-4.5)
Clinical	3.4(0.7-14.9)**	2.2(0.4-10.1)	2.4(0.5-11.2)
Attention problems			
Absent	1.0	1.0	1.0
Sub-clinical	2.6(1.2-5.6)*	2.1(0.9-4.6)	2.1(0.9-4.6)
Clinical	18.2(4.3-77.8)**	18.8(4.2-84.2)**	19.4(4.3-88.2)**
Rule breaking behaviour			
Absent	1.0	1.0	1.0
Sub-clinical	6.7(4.1-11.3)**	5.9(3.5-10.1)**	5.9(3.5-10.1)**
Clinical	15.2(7.6-30.5)**	12.5(6.1-25.6)**	12.1(5.9-24.9)**
Aggressiveness			
Absent	1.0	1.0	1.0
Sub-clinical	3.7(1.6-8.5)**	2.8(1.2-6.7)*	2.8(1.2-6.7)*
Clinical	4.4(1.5-12.7)**	2.6(0.8-7.9)	2.5(0.8-7.9)

*p≤0.05, **p≤0.01, ***RRR

1) Adjusted for binge eating

2) Adjusted for (i) binge eating, age, BMI, maternal education, parental marital status.

8.5. Discussion

This is the first study looking at associations between purging behaviours, irrespective of their frequency and binge eating, and several negative outcomes (smoking, binge drinking, drug use, psychopathology) across two population cohorts during adolescents.

8.5.1. Prevalence of purging behaviours

The results from these two samples share important similarities and some differences. The prevalence of purging in the year prior to assessment was high in both cohorts (9.8% ALSPAC, 3.5% in NFBC), although higher in the UK than in the Finnish one (ALSPAC>NFBC). This finding could indicate differences in disordered eating behaviours across countries due to cultural differences. Data for ALSPAC, and NFBC were collected in the early 2000s, therefore an effect of time on these results seems unlikely. Mean age in NFBC was 15.2 years compared to 16.7 years in ALSPAC, which could support the hypothesis of a slightly later peak age of onset in line with findings of some previous studies (A. E. Field et al., 2012; Stice et al., 2009), but not others (Allen et al., 2013). In both cohorts, the majority of girls who used purging methods did so in the absence of binge eating (ALSPAC: 56.7%, NFBC: 71.6%).

Compared to previous studies (Abebe et al., 2012; Allen et al., 2013; A. E. Field et al., 2012), we found a higher prevalence of purging behaviours. However, those studies used a diagnostic threshold to define purging, whereas the aim of this study was to investigate prevalence of even minimal presentations of purging behaviours, which could explain this difference. In fact, a longitudinal study following 1,258 Canadian girls for 10 years found that in mid-adolescence prevalence of any use of extreme weight control behaviours (i.e. vomiting, laxatives, diet pill, and diuretics) ranged between 8.4% (in group of girls who was younger when entering the cohort: mean age 12.8±0.7 years at baseline and 23.2±1.0 years at follow-up) and 12.6% (in those who were older, mean age 15.9±0.8 at baseline and 26.2±0.9 years

at follow-up) (Neumark-Sztainer et al., 2011a). These findings are arguably in line with those observed in ALSPAC, although higher than those reported in NFBC; however, they could support some of the hypotheses advanced in this study.

First, the difference in prevalence between our NFBC results, and those seen in ALSPAC and in Neumark-Sztainer's study could be due to cultural and societal differences between countries of Anglo-Saxon cultures and Scandinavian ones. A 2007 United Nation International Children's Emergency Fund (UNICEF) report on child's wellbeing and inequality in the UK compared to Sweden (which shares with Finland a rather homogeneous population (Mortensen et al., 2008)) found that, compared to Sweden, in the UK parents found it harder to spend time with their children. Moreover, the report found that media, clothing advertisement had a stronger influence on children, and that "*parents found it very hard to challenge the commercial pressures around them and their children*" (UNICEF, 2007). The findings from this report provide support for the hypothesis that strong media pressure (Ata, Ludden, & Lally, 2006; Knauss, Paxton, & Alsaker, 2007; Stice, Schupak-Neuberg, Shaw, & Stein, 1994), and family inability to protect against societal and media messages (Haworth-Hoeppner, 2000) might be a risk factor for the development of disordered eating. However, the finding could also mirror, as explained above, the tendency of purging behaviours to peak in mid- to late adolescence (in the Canadian study prevalence of extreme weight control behaviours increased between early and mid-adolescence (Neumark-Sztainer, Wall, Larson, Eisenberg, & Loth, 2011b)), and the Finnish sample was younger than the UK one.

8.5.2. Comorbidity of purging behaviours

In line with the results of previous studies that had looked at psychological correlates of PD (i.e. impulsivity, body dissatisfaction, drive for thinness, Axis I comorbidity) (Fink et al., 2009; Haedt & Keel, 2010; Keel et al., 2005, 2008; Spoor et al., 2007; Wade, 2007a), and with those investigating the

association between PD and a number of comorbid conditions (i.e. binge-drinking, smoking, overweight status, drug use, depressive symptoms) (Abebe et al., 2012; A. E. Field et al., 2012) this study found that purging behaviours are associated with a number of negative outcomes, making a compelling point for the clinical relevance of PD. In both cohorts, purging was associated with smoking, binge-drinking, cannabis, and other drug use. In ALSPAC, purging was associated with depressive symptoms, and in NFBC with a number of internalising and externalising behaviours. What is noteworthy of this however is that, whereas previous studies have used frequency thresholds to identify individuals who purged, it showed that these associations are present irrespective of the frequency of purging.

It appears from these findings that purging alone could share many comorbidity aspects with AN-BP and BN-P, such as high levels of depression and substance use. Both of these comorbidities, as was highlighted in section 2.3, are not seen as commonly in AN-R (although different substance use patterns are typical of restricting vs. binge/purge individuals (Krug et al., 2008), making absolute comparisons arduous). In fact, an Australian longitudinal study on 982 girls enrolled at age 14/15 years old showed that girls with binge/purge behaviours had higher odds of experiencing onset of depression or anxiety, binge-drinking, and smoking daily which were not observed in sub-threshold presentations of AN (Patton et al., 1998). Some studies, however, have observed higher comorbidity among young adult women who binge-eat and purge (i.e., full or partial bulimia nervosa), than in those who do not engage in either behaviours or purge only (Fink et al., 2009; Keel et al., 2008). This study suggests that purging alone, even at low frequency, is associated with substantial comorbidity, as most of the girls who purged did not binge-eat and adjusting for binge eating did not alter the association between purging and the outcomes investigated. Two studies based on adolescent samples showed that participants with PD had higher

(Abebe et al., 2012) or similar (A. E. Field et al., 2012)[6] odds of experiencing comorbid behaviours which were also investigated in this study, suggesting that perhaps purging in adolescence could be indicative of more dangerous comorbidity thus justifying the results of this study irrespectively of bingeing.

The Australian study by Patton and colleagues found that whilst sub-threshold binge/purge eating behaviours did not persist past their teen-age years, other comorbid conditions (i.e. depression, alcohol abuse) did (Patton et al., 1998). Although their study included girls who binged and purged, our findings of similar comorbidity between PD and BN, could serve to hypothesise that this finding could apply also to girls who purge only. More large general population studies should thus be aimed at comparing girls with different ED presentations (including PD) across a number of dimensions and perhaps cross-overs between diagnoses to investigate shared risk factors and locate similarities.

8.5.3. Strengths and limitations

These results should be interpreted in light of some limitations. Firstly, data were analysed cross-sectionally, and therefore causal relationships cannot be inferred. Regardless of temporality however, our findings reveal a clustering of risky behaviours amongst adolescents, which may have important implications for prevention and intervention. Second, the information was gathered by self-report questionnaire; however, the ALSPAC measure has been validated and has excellent specificity and negative predictive value (A. E. Field et al., 2004). Third, in both cohorts ethnic and socio-economic diversity is under-represented. The majority of participants in ALSPAC, and all participants in NFBC, were from a White ethnic background. Whilst this in NFBC is representative of the general white Northern Finnish population, the same cannot be said for ALSPAC

[6] In Field et al. (2012) PD≥ monthly had lower OR than BN≥ for drugs and alcohol use, but PD≥ weekly had lower OR than BN≥ weekly only for drug use.

with regards to the UK population, despite being representative of the Avon area. Therefore, inferences on the generalizability of these results to adolescents from different ethnic backgrounds or lower socio-economic status should be made with caution. Fourth, different measures were used across the cohorts. We focused on *any* purging in the previous year as the main exposure. Similarly, outcomes were re-coded in order to make them as comparable as possible. The similarity of results observed despite measurement differences, seems to suggest the presence of commonalities proper of exposed individuals regardless of differences in measurements. Finally, a longitudinal investigation would have provided a more comprehensive picture of prevalence (and changes in prevalence) of purging behaviours across adolescence as well as their prospective associations with psychiatric comorbidity. Nevertheless, the Finnish cohort did not have intermediate follow-up points like ALSPAC, and it was not possible to perform the same analyses on both samples. Using data from the 16 year old follow up, however, provides a good starting point to investigate prevalence and comorbidity of purging behaviours given indications from previous studies that this might be an age at which these behaviours tent to peak.

Despite these limitations, this study has important strengths. It employed two large population-based cohorts, with several advantages. It is known that a minority of people with an ED receive treatment (Swanson et al., 2011), thus the generalizability from clinical samples is questionable. In population-based cohorts (where behaviours and not full-diagnoses are used as exposure) less severe cases are likely to be included in the sample. This can attenuate results since the minority of "cases" will meet clinical thresholds. The strong associations we observed adds to the evidence that even low frequency and low level purging behaviours during adolescence (amongst individuals that might not present to services) might have negative consequences.

Secondly, our samples were larger than those employed by previous studies. This increases the power of our analyses and reduces the role of chance in

the results. Thirdly, our samples all surveyed 16-year old adolescents. Disordered eating behaviours are known to appear in adolescence and early adulthood; therefore, this study is an important first step in investigating the prevalence of early symptoms and their associations, and to lay the groundwork for future longitudinal research aimed at investigating whether individuals experiencing disordered eating behaviours are more likely to develop full scale diagnoses in the future or adverse consequences across a range of psychological, behavioural and social domains.

8.5.4. Conclusions and implications

The results of this study have several important implications. Firstly, they provide more evidence on the clinical relevance of purging and the necessity of its further study in light of the formulation of future diagnostic manuals, since inclusion in DSM-5 as a separate diagnosis did not occur. They suggest that at a population level individuals who purge are likely to have a series of concurrent risk-taking and psychopathological behaviours. Whilst rather ample literature exists on substance abuse and addiction in BN (Goebel, Scheibe, Grahling, & Striegel-moore, 1995; Holderness et al., 1994; Kaye et al., 1996; O'Brien & Vincent, 2003; Stice, Burton, & Shaw, 2004; Wiederman & Pryor, 1996), only a small number of papers have focused on substance abuse in individuals who purge only (Abebe et al., 2012; Anderson et al., 2005), although recent findings suggest that adolescent girls who purge are those at highest risk of having this type of comorbidity (Abebe et al., 2012).

Secondly, our results on the association between even sporadic purging and smoking/drinking and substance use found by this study might point to an underlying trait common to all behaviours. The role of impulsivity, for instance, has been widely investigated in relation to BN (Favaro et al., 2004; Fischer, Smith, & Anderson, 2003; Welch & Fairburn, 1996; Wiederman & Pryor, 1996; Wonderlich et al., 2005). However, the same degree of research has not been undertaken among individuals who purge in the absence of binge eating (Fink et al., 2009). Results from this investigation on the association between purging behaviours in adolescents girls and attentions problems in the Finnish cohort, also echo those of a recent study finding that children of mothers with lifetime purging symptoms only (i.e. no binge eating) were more likely to show lower levels of sustained attention (Kothari, 2012). Another study by Micali et al found that maternal self-reported BN diagnosis was predictive of inattention/hyperactivity in children at age 3 (Micali, Stahl, Treasure, & Simonoff, 2013). When considering that research has also shown that Attention Deficit Disorders are predictive of substance abuse in adolescence and adulthood (Pingault et al., 2012; Urcelay & Dalley, 2012), this seem to suggest the possibility of the

existence of an underlying attention-deficit phenotype common to attention deficit disorders, substance abuse and purging behaviours. Therefore, more longitudinal research disentangling these associations is needed.

Our findings indicate that adolescents who engage in a risky behaviour such as purging could also more generally be considered an adolescent 'at risk' because of the clustering of risky behaviours. Public health initiatives focused on reducing risky behaviour amongst adolescents need to take into account the high co-occurrence of behaviours and should be directed at these 'at risk' adolescents who engage in any combination of risky behaviours. Incorporating several risk behaviours, such as purging, substance use, and depressive symptoms, rather than focusing on one behaviour at a time, might also enhance the impact of population level strategies focusing on preventing risky behaviours among adolescents.

Chapter 9

Synthesis of findings and general discussion

9.1. Chapter Overview

This chapter contains an overall discussion of this thesis. It will present a short summary of findings for each chapter, as well as an overarching summary of the interpretation of the results. It will then continue with a discussion of the overall strengths and limitations of the thesis. Finally, it will conclude with some recommendations for future research, implications for clinical practice and policy, and a discussion of what this thesis adds to the literature.

9.2. Synthesis of findings

9.2.1. Prevalence and correlates of disordered eating in a South East London general population study (Chapter 4)

The aim of this study was to investigate the prevalence and comorbidity of disordered eating in a multi-ethnic, inner-city general population sample, as well as patterns of primary and secondary/tertiary service use.

This study found a high prevalence (10%) of disordered eating, and although neither Black nor Asian ethnicity was associated with the overall measure of disordered eating, Asian ethnicity was found to be associated with higher odds of endorsing behaviours such as purging, and cognitions such as loss of control and preoccupation with food-related thoughts. Participants of Black ethnic background had high odds of reporting loss of control eating, although when fitting regression models investigating the association between ethnicity and behaviours, adjusting for BMI appeared to moderate the association. Overweight and obese BMI categories were associated with the general measure of disordered eating as well as specific cognitions such as loss of control and preoccupation with food. Individuals reporting disordered eating had higher odds of experiencing mood and

anxiety disorders, possible PTSD, a probable personality disorder diagnosis, suicidality, and substance use. Finally, only 30% of participants who reported disordered eating sought help for a problem related to mental health through primary care, and only 13% and 5% received treatment from a therapist or mental health specialist, respectively.

9.2.2. Validation of the SCOFF questionnaire in a general population sample (Chapter 5)

This study aimed at validating an ED screening measure, the SCOFF (Sick, Control, One stone, Fat, Food), employed in Chapter 4 to define disordered eating, against a golden standard clinical assessment, the semi Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I). A sub-sample of participants screened with the SCOFF in SELCoHI was interviewed in SELCoHII with the SCID-I. Of the total 326 participants who were eligible for inclusion (159 screen positive, 167 screen negative) 145 (44.5%, n=76 SCOFF negative and n=69 SCOFF positive) were interviewed.

Contrary to the hypothesis of a two-factor solution based on previous literature, Exploratory Factor Analysis (EFA) showed that a one-factor solution was the best fit for the questionnaire, explaining 78% of the variance between items. However, Item 3 (related to weight loss) had a low factor loading suggesting that this question correlates poorly with the other items and is not a useful measure to describe the overall underlying structure captured by the instrument. Sensitivity of the instrument was high, but specificity was low, meaning that some individuals who did not have an eating disorder may have been captured by the measure as screening positive. The positive predictive value was in fact low, which is also to be expected given the low prevalence of ED; nevertheless, negative predictive value was high, which is a positive feature for a screening measure as it means that participants who screen negative are likely not to have the condition. When assessing sensitivity and specificity by broad ethnic groups, sensitivity was higher for minority ethnic groups, but

specificity was lower although not to a vast degree. This suggests that in both groups some of the features captured by the measure identify either sub-threshold diagnoses not reaching diagnostic status (and therefore were not captured by the SCID-I interview in SELCoHII), or behaviours which are not specific to ED.

9.2.3. Prevalence and correlates of eating disorders in a general population sample (Chapter 6)

The aim of this chapter was to estimate the prevalence of SCID-derived DSM-5 ED diagnoses in the SELCoH sample and investigate their psychiatric comorbidity, as well as service use.

Point prevalence of ED found in the sample was within the range previously reported in literature (3.2%), although notably no cases of anorexia nervosa (AN) were detected and prevalence of purging disorder (PD) was lower than that which has been reported using samples of young women. Binge eating disorder (BED) was the most frequently diagnosed ED and the only one, which was diagnosed in men, followed by Other Specified Feeding or Eating Disorders (OSFED), the 'residual' ED category for all the individuals who did not meet full diagnostic criteria. Individuals from White ethnic background were those with the highest prevalence of BED, whereas BN and OSFED were diagnosed mostly in participants of black ethnicity and PD in participants of Asian ethnicity. On the one hand, this supports previous literature showing high prevalence of bingeing in Black communities, but disproved hypotheses of lower prevalence of purging in Asian communities. Lack of AN in the sample could indicate very low prevalence of the condition in individuals of Black and Asian ethnic backgrounds, who make up33% of the sample interviewed in SELCoHII[7]). This has previously been

[7] 11% of the sample belonged to the heterogeneous group of 'Other ethnic backgrounds'. Whilst it is not possible to identify specific ethnicities within this category, it is possible to speculate that it could contain individuals of 'mixed' ethnic background (which was included in SELCoHII, but was not used in these analyses because fewer participants had information on the that variable given the

documented. Potential differential losses to follow up, give that all 4 underweight women who screened positive to the SCOFF were lost to follow up in SELCoHII may also explain the lack of participants with AN. Of these, two reported vomiting (one with loss of control and the other with persistent thoughts about food), one reported loss of control and weight loss, and one body image distortion and persistent thoughts about food. The first three of these women, notably all of White ethnicity, reported individual symptoms conducible to full or partial AN (restrictive or binge-purge), whereas the latter (of 'Other' ethnic background) showed more general ED symptoms, which could nonetheless signal full or threshold AN.

High psychiatric comorbidity was found in the sample, especially with respect to PD and substance use (e.g. alcohol, cigarettes, and drugs), personality and post-traumatic stress disorder (PTSD) screeners, and sub-threshold mood disorder; some indication of an association with suicidality was found, but it was not significant. BN was mostly associated with PTSD and mood disorders, and BED with personality and mood disorders. However, findings could be partially driven by the low power of the analyses and thus chance.

With respect to service use, participants with BN were those who had mostly sought help, followed by those with PD, and to a much lower extent BED and OSFED. Nevertheless, only a small minority of BN and BED participants had received specialised treatment, and no participants with PD and OSFED saw a mental health specialist.

9.2.4. Prevalence of Purging at age 16 and association with negative outcomes among girls in two community-based cohorts (Chapter 8)

The aim of this study was to investigate the prevalence and the comorbidity of purging behaviours in adolescent girls (16 years) in two cohorts, one

losses to follow up experienced in SELCoHII), which could bear similarities with Black or Asian ethnic backgrounds.

based in the UK (The Avon Longitudinal Study of Parents and Children), and the other Finland (the Northern Finland Birth Cohort).

Research has shown that purging behaviours are frequent in adolescence. A recent study has found that lifetime prevalence of purging disorder by age 20 was the highest of all ED diagnoses (Stice et al., 2012) whilst another has shown a decrease in prevalence of purging behaviours between adolescence and adulthood, coupled with highest comorbidity in adolescents who purged compared to those engaging in other behaviours (Abebe et al., 2012). My study found a high prevalence of purging behaviours in both cohorts, although higher in the UK (9.7% in ALSPAC, 3.5% in NFBC). Cultural and geographical differences, and higher mean age in ALSPAC compared to NFBC, could partially explain this difference. Nevertheless, in both cohorts, girls engaging in purging behaviours in the year prior to assessment had higher odds of presenting with comorbid conditions such as substance use (ALSPAC and NFBC), depressive mood (ALSPAC) and externalising and internalising behaviours (NFBC), regardless of bingeing and frequency of purging.

9.3. Overall considerations and research implications

The first three studies of this thesis, contained in Chapters 4-6, complement each other with the aim of presenting an overview of the epidemiology of ED and disordered eating in a community sample in South London, as well as investigating the research potential of the SCOFF as an ED screening questionnaire in general population samples. The results of the study presented in chapter 8 add to the previous three by examining the prevalence and comorbidity of even minimal presentations of purging behaviours in adolescence, which has been suggested to be the time during which their prevalence peaks. Since findings for each study were discussed in detail in each of their relative chapters, in what follows I will present some of the overarching threads that emerge.

Chapters 4 and 6 investigated the prevalence and comorbidity of disordered eating and ED. The results from these studies showed a prevalence of disordered eating (10%) nearly three times higher than that of ED diagnoses (3.2%). This finding confirms those of previous research suggesting that disordered eating and sub-threshold ED diagnoses are be more prevalent than full diagnoses. Prevalence of sub-threshold diagnoses has been estimated to range between 2% - 5% (Allen et al., 2013; Bailly et al., 2012; Wade et al., 2006), and disordered eating measured using the SCOFF has yielded figures of up to 6.3% and 20% in mixed samples of adults (McBride et al., 2012) and adolescent, respectively (Herpertz-Dahlmann et al., 2008). Our results suggest that disordered eating might be more prevalent in adults living in inner-city settings compared to the general population although less than in adolescents. Findings presented in this thesis suggest that some ED behaviours could have a high prevalence amongst adolescents.

The study in chapter 8 found a high prevalence of purging behaviours for weight loss amongst 16 year old girls regardless of whether the former were following binge-eating episodes (9.7% ALSPAC, 3.2% NFBC) or not (5.5% in ALSPAC, 2.5% in NFBC). These figures are higher than some reported in studies using diagnostic thresholds to define purging in mixed samples (Abebe et al., 2012; A. E. Field et al., 2012), but not others using female-only samples[8] (Stice et al., 2009; Wade et al., 2006). However, they are comparable to a certain extent to those observed in studies based on adolescent samples of females who both binged and purged or purged only that did not employ diagnostic thresholds to define purging. These studies found a prevalence of purging behaviours of approximately 12%-13% (Ackard et al., 2001; Neumark-Sztainer et al., 2011b). As was discussed in Chapter 8, differences in prevalence of purging between ALSPAC, NFBC, and other studies based in different countries, suggest that socio-cultural factors

[8] Stice and colleagues report a 4.4% prevalence of PD, whereas Wade and colleagues a prevalence of 5.3%, although both are lower than the prevalence seen in ALSPAC, these figures are higher than those seen in NFBC.

could play a distinctive role in the onset of ED and differences could not be attributable to sampling variability only. The older mean age of the girls in the ALSPAC sample (in which prevalence of purging behaviours was higher) compared to that of the girls in the Finnish sample, could also be an indication that peak incidence of purging behaviours might occur in mid/late adolescence and stabilise or decrease through young adulthood. The finding of a lower mean age of participants with PD and BN compared to that of participants with BED (PD<BN<BED) in chapter 6 seems to confer some strength to this hypothesis.

It has been suggested, however, that specific purging behaviours, such as use of diet pills and laxatives, might be increasingly prevalent amongst adults (Neumark-Sztainer et al., 2011b; Pomeranz, Taylor, & Austin, 2013; Roerig, Steffen, Mitchell, & Zunker, 2010). Self-induced vomiting has been shown to decrease from adolescence to adulthood, but not the use of diet pills and laxatives (Neumark-Sztainer et al., 2011b). Because of the questions asked in chapter 4 and the design of the study it was not possible to investigate this hypothesis further as participants were only asked about whether they engaged in self-induced vomiting. Of the 3.1% who reported the behaviour, approximately 65% of participants who endorsed this question were younger than 34 years of age and nearly 40% under the age of 25. Although this shows a higher prevalence in younger ages, it also suggests that these behaviours might occur in older age groups. One explanation is that prevalence of PD, and not of purging per se, could decrease between adolescence and young adulthood. This has been documented in the literature (Abebe et al., 2012; A. E. Field et al., 2012; Neumark-Sztainer et al., 2011b). The declining prevalence of PD in young adulthood could be a symptom of a relative instability of the condition. Individuals with PD could be more likely to 'migrate' to another ED diagnosis, for instance BN, which has been shown to have higher rates of incident cases in older age groups. One longitudinal study shows that individuals with PD were more likely to cross-over to a BN or BED than participants with BN or BED to cross-over to PD (Stice et al., 2009). It could

then be possible that within this process some individuals change type of purging behaviours. This hypothesis would still be congruent with that of peak incidence of purging behaviours and PD in adolescence. Finding a 0.4% prevalence of PD in a mostly adult population in chapter 6 could be indicative of this higher prevalence of PD in individuals of younger ages, which was not captured by our study.

Onset of purging behaviours in adolescence could be understood as part of the broader pattern of heightened risk-taking attitudes proper of this age group. High levels of sensation-seeking have been increasingly recognized as typical of the neurodevelopmental stages of adolescence and it is believed that they could act as risk factors for a number of risky behaviours (i.e. alcohol and drug use, reckless driving) (Chein, Albert, O'Brien, Uckert, & Steinberg, 2011; Reyna, Rivers, & Steinberg, 2008; Steinberg, 2007). It is thus possible that heightened risk-taking attitudes could act as risk factors for the onset of unhealthy and dangerous weight control practices, such as purging. It has also been documented that the effects of peer pressure are amplified during adolescence. The increased availability of 'over the counter' medications such as laxatives, diuretics, and more recently the booming marketing of 'herbal remedies', detox programmes (Pomeranz et al., 2013), and diet advertisements might subject adolescents to higher levels of societal and peer-influence in initiating unhealthy practices for weight-control. The relative high prevalence of purging behaviours in young adults could be a consequence of earlier onset and of the relative stability of purging behaviours (Abebe et al., 2012; Allen et al., 2013) regardless of a PD or BN diagnosis. More research is needed to identify patterns of onset and diagnostic cross-over between ED diagnoses including PD, as this could not only improve treatment, but also could help investigate similarities between different ED and, thus, their shared risk factors.

The high comorbidity with substance use found with PD in chapter 6 and with engaging in any purging behaviours in chapter 8 provides strength for the hypothesis that risk-taking attitudes typical of adolescence could ask as

risk factor for purging behaviours. The presence of a cluster of risky behaviours in adolescence and young adulthood also suggests that this might be a time in which preventative measures could be most effective. It has been suggested that increased risk taking in adolescence, because it is biologically driven, might be, to some extent, inevitable (Steinberg, 2007). However, policies could be implemented to reduce the harm which might derive from them. Firstly, the proliferating marketing of 'detox' products and herbal remedies should be reduced, and access to certain medications such as laxatives and diuretics could be subjected to age-restrictions. Whilst evidence suggests that use of these substances might be higher in adulthood, there is no research investigating whether their use has increased over time amongst adolescents. Secondly, increased mental health support could be provided at school level, in order to facilitate access to specialised services. Screenings for mental health conditions in schools and programmes targeted to families could also be implemented. The high prevalence of purging behaviours seen in the ALSPAC sample, and its association with a range of comorbid conditions from depression to substance use suggests that policies targeting ED behaviours, should be included in broader interventions aimed at limiting the negative outcomes associated with behaviours such as drinking and drug-use. Finally in clinical settings, adolescents who present with substance use problems or depressive symptoms should also be screened for ED and vice versa, given high levels of comorbidity between these behaviours.

Results presented in chapters 4 and 6 suggest that binge eating and BED could be highly prevalent in overweight to obese individuals and in older age groups. Whilst causal associations are not possible given the cross-sectional nature of the investigation, several hypotheses could explain these results. Binge-eating is a known risk factor for obesity at younger ages (A. E. Field et al., 2012); thus, high prevalence of obesity amongst binge eaters could be a consequence of their ED. However, it has also been hypothesised that increasing levels of obesity in both young and older ages could represent a risk factor for the onset of binge-eating and disordered eating

(Decaluwé & Braet, 2003; Goossens, Braet, & Bosmans, 2010; Neumark-Sztainer, 2005; Polivy & Herman, 1985; Stice, Presnell, & Spangler, 2002). The hypothesised risk mechanism is that self-imposed dietary restraint to lose weight could trigger binge-eating episodes and disordered eating (Goossens et al., 2010; Tuschl, 1990; Woods, Racine, & Klump, 2010). Research has shown that overweight adolescents are more likely to engage in disordered eating practices (J Haines & Neumark-Sztainer, 2006), but the extent to which increased pressures to dieting in overweight and obese adults could be a trigger for disordered eating is still largely unaccounted for in research. Neither the study in Chapter 4 in relation to the question of loss of control eating, not the study in Chapter 6 in relation to BED was able to test these risk mechanisms. However, studies in this thesis confirm that the high concurrency of binge-eating and obesity should be warranted more attention by researchers and clinicians. General practitioners are the first point of contact of individuals with disordered eating seeking help. Low levels of access to treatment found in chapters 4 and 6 suggest that more attention should be paid in primary care to the co-occurrence of these conditions. The acknowledgment of BED as a full ED in DSM-5 could improve its detection and decrease the 'weight stigma' (hypothesised in section 6.5.4 to contribute to low levels of help-seeking) often associated with it.

Research investigating ED in older individuals is also scant. Two of the studies contained in this thesis found high prevalence of loss of control eating and higher prevalence of BED in older individuals. The study in chapter 6 found a prevalence of BED of 0.8% (N= 8) in participants older than 45 years of age. Similarly, table 10 (chapter 4) showed that similar proportions of individuals aged 15-34 and 45-64 years experienced loss of control eating. In comparison, purging behaviours were twice as prevalent in younger individuals. Factors other than those hypothesised above relative to high BMI could account for this finding. First, higher levels of stress could be more characteristic of older ages, making individuals more susceptible to episodes of emotional eating, a known risk factor for binge eating (Goossens

et al., 2009; Masheb & Grilo, 2001). Secondly, BED has been hypothesised to be a relatively stable condition compared to other ED. A study on a community sample comparing the stability of lifetime diagnoses of ED, showed that mean lifetime duration of BED was 14.4 years (SD=13.9), which was significantly longer than BN (mean=5.8 years, SD=9.1) and AN (mean=5.9 years, SD=7.4) (Pope et al., 2006). Therefore, although onset of binge eating episodes or diagnoses could occur early in life, longer duration of the condition could result in a higher prevalence of the condition in individuals of older ages. It has been shown that high degrees of diagnostic crossover occur between AN and BN, and that whilst individuals with AN-R are likely to migrate to an AN-BP or a BN-P diagnosis, the reverse is more unlikely (Eddy, Dorer, et al., 2008). Given the higher prevalence of purging behaviours (characteristic of AN-BP and BN-P) in younger ages, binge eating behaviours and BED could thus represent a 'final diagnosis' for individuals with previous histories of ED. Data on history of ED and ED behaviours was not collected; therefore, it was not possible to further investigate this hypothesis. Further studies should employ general population samples with participants of broad age groups to test both this hypothesis and whether individuals transitioning to BED from previous diagnoses differ in terms of comorbid psychopathology from those developing the condition at younger ages.

Bulimia nervosa was also prevalent in individuals aged 45 to 64 years, although to a lower extent (N=3, 0.4%). As shown in table 10, 2 of these individuals suffered from BN-P and one from BN-NP. Although earlier on in this section it was argued that the use of purging behaviours could be more typical in younger age groups, several hypotheses may explain this finding. Firstly, these participants could suffer from more chronic forms of their ED or differ from those who either remit or stop engaging in purging behaviours but might continue to binge. Secondly, the fact that two thirds employed purging methods to compensate for binges could be a reflection of the increased use of laxatives, slimming and detox products by adults mentioned earlier in this section. Whilst many abused weight-control products are marketed for such purposes, others are only believed to aid in

weight control and thus their harmful consequences might not be evident (Pomeranz et al., 2013). A recent review has highlighted that whilst many laxative/detoxifying product users are individuals with ED, onset of abuse of these products in older individuals has been documented as resulting from initial medical needs turned into disordered use, or from publicity-induced belief in their health benefits (Roerig et al., 2010). It is possible that changes at societal levels might be changing patterns of ED presentation, but more research is needed to test this hypothesis in the future, and to investigate the extent to which risk factors for onset of ED and ED behaviours in adolescents and adults might be comparable.

Studies presented in this thesis also suggest that ethnic minorities could be at increased risk of developing disordered eating and ED in urban settings. Trends were observed in both Chapters 4 and 6 with respect to the association between ethnicity and ED behaviours and cognitions (Chapter 4) and ED diagnoses (Chapter 6). Results from both studies suggest that the hypothesis of increased prevalence of purging-type behaviours in individuals of Asian ethnicity could be plausible; although low numbers of participants (particularly in Chapter 6) limited the potential for the study of these associations with higher degrees of confidence. Literature has previously shown high prevalence of bingeing in Black communities (Franko et al., 2012), whereas purging amongst individuals of Asian ethnicity have been traditionally believed to be low (Regan & Cachelin, 2006). In the study conducted in Chapter 4, the association between Black ethnicity and specific behaviours such as loss of control (i.e. bingeing) and weight loss was not significant in adjusted analyses accounting for BMI and education level amongst other socio-demographic indicators. Whilst from these analyses it was not possible to disentangle these associations, it is possible that interventions aimed at addressing obesity or at improving education in this group might have an effect in lowering the prevalence of these ED behaviours. On the other hand, individuals of Asian ethnicity had higher odds of reporting both loss of control eating and purging behaviours (table 10, chapter 4). Several studies have hinted to the hypothesis (driven by low

rate of referral to specialist treatment in individuals of Asian ethnic background despite presence of an ED diagnosis) that purging-type disorders in these participants might be caused by poor case-detection (Franko et al., 2007; Waller et al., 2009). In fact, evidence suggests that disordered eating might be increasingly prevalent, but undetected, in Asian countries as well (Muazzam & Khalid, 2008). It could be possible that cultural biases at population level act as barriers for seeking help, which could cause an artificially low prevalence of ED, both when assessed in surveys and through medical records. From these studies it was not possible to explore this hypothesis further, nor was it possible to establish what could constitute risk factors in this population; thus more research is needed to explore these associations.

The study conducted in chapter 5, aimed at validating a quick diagnostic instrument for ED, the SCOFF. The aim of the study was to evaluate the potential for its use in research and clinical settings in detecting individuals with ED. When validated against SCID-I diagnoses, the SCOFF showed high levels of sensitivity (90%), although somewhat low levels of specificity (64%), meaning that about 40% of individuals who did not have an ED had been classified as potentially having an ED by the SCOFF. This result has several theoretical and research implications as it suggests that some of the questions asked might not capture ED-specific behaviours and cognitions and thus systematic misclassification might occur. From a clinical and a research view point this type of misclassification might reflect in unneeded referrals resulting in high costs and biased results, respectively.

In light of the evidence presented earlier suggesting that attempts at weight loss could trigger binge-eating episodes, a better question to assess disordered eating behaviours could elicit information on both actual and attempted weight loss. Attempts to lose weight could be conceptualised as a proxy measure for eating restraint which has been identified as a risk factor for binge eating and disordered eating (Stice, 2002). Research has shown that binge eating occurs in 21% to 48% of overweight and obese

populations (de Zwaan, 2001; Decaluwé et al., 2003; Latner et al., 2004), and that binge eaters exhibit more eating restraint than non-binge eaters (Kinzl et al., 1999). Changing the question on weight loss to reflect current knowledge on binge-eating behaviours might help to improve precision of the instrument and result in fewer false positives. Adding a question on portion size to the question on loss of control could also provide a better indication of whether the experience of loss of control refers to an actual or a subjective binge. The lack of these specifications in the SCOFF questions might be due to the fact that when the measure was created BED was not yet a diagnosis. Finally, question 1 on purging behaviours should include use of laxatives, diet pills, diuretics and slimming products, as evidence suggests that up to 60% of individuals with ED might abuse of these medications (Pomeranz et al., 2013; Roerig et al., 2010).

A separate note concerns the ascertainment of ED in men. Nearly 6% (N=42) of men screened positive at the SCOFF, whilst only 0.2% (N=2) had an ED. There is evidence that ED behaviours in men are more prevalent than previously thought, although they might present differently than they do in women (Stanford & Lemberg, 2012; Strother et al., 2012; Weltzin et al., 2005). While women aspire to leaner bodies, men seek more muscular, bigger ones (Strother et al., 2012). Therefore, the current SCOFF question screening for body distortion could have a gender bias, as it only asks whether the participant believes they are fat. Adding a question reflecting males' body concerns (e.g. ' do you believe to be too thin even when others tell you that you are muscular) or adding substances such as steroids or protein shakes to the question related to purging behaviours could improve detecting these pathological behaviours in men (Stanford & Lemberg, 2012; Strother et al., 2012).

These potential changes to the SCOFF to reflect male-specific ED behaviours would not, however, improve sensitivity or specificity of the measures since diagnostic manuals, and thus clinical interviews such as the SCID, do not include 'male-specific' ED questions in the first place. This means that it is

not possible to diagnose men with ED, unless the latter resemble the 'traditional' presentations of AN or BN. Therefore, a validation of a potential 'modified SCOFF' should be undertaken with modified versions of clinical questionnaires as well. This difficulty in diagnosing ED in men means that many people might not be able to receive treatment for their condition (Strother et al., 2012). Research on ED in men is flourishing, but lack of recognition of these symptoms in DSM-5 means that further research is needed to justify their inclusion in future manuals. Screening measures such as a 'modified SCOFF' could provide a good opportunity for exploratory studies on prevalence of behaviours such use and misuse of steroids and/or protein shakes or cognitions such as male body image distortion in the general population. Low of specificity of the SCOFF could therefore also indicate inability of clinical interviews to detect ED who might have presentations different from those of AN, BN, and now BED. Whilst in our study PD was kept as a separate diagnosis and skip rules were not applied in order to determine potential sub-threshold behaviours, specific criteria to describe different presentations of ED in men were not applied. It is possible that some men who screened positive at the SCOFF (i.e. by experiencing loss of control and thoughts about food) could have been ED cases, but it was not possible to investigate this further.

Despite findings of low specificity of the SCOFF the strong associations found between disordered eating and several psychiatric comorbidities suggests that minimal presentations of disordered eating: (a) might signal a pathological relationship with food and body image; (b) are of clinical relevance; (c) could detect an 'at risk' group for the onset of more pronounced behaviours or ED (Stice, 2002) even when ED symptoms could be the consequence of other psychiatric morbidity. ED are comorbid with a number of disorders, however in psychiatry it is often difficult, and sometimes impossible, to identify which one is the index condition preceding the others (Valderas et al., 2009). However, research has shown that ED behaviours and cognitions could precede the development of full-threshold ED (Lena et al., 2004), thus making individuals with disordered

eating presentation and comorbid psychiatric conditions at higher risks of developing more serious forms of ED.

9.4. Strengths and limitations

Strengths and limitations of the studies contained in this thesis were discussed in each chapter. In what follows I will provide a summary of the main points that arise from this thesis as a whole.

All studies included in this thesis employed secondary data, with the exception of studies 2 and 3 (Chapter 5 and 6), which also relied on data collected for the purposes of this thesis (SCID-I clinical interviews for ED). Employing data from large surveys, such as SELCoH, or large cohort studies, such as ALSPAC, allows ease of access to information related to multiple outcomes (Sorensen, Sabroe, & Olsen, 1996). However, it can also limit the scope for investigation, as access to data is constrained to what has already been collected, and to the time points at which it has been collected. Some measures of comorbidity employed in Chapter 4 and 6 were screening measures, which, depending on their levels of sensitivity and specificity, might result in an underestimation or overestimation of the prevalence of comorbid disorders. Similarly, in Chapter 8 it was not possible to employ the same measurements in both ALSPAC and NFBC, as questions asked in the two studies were slightly different, limiting comparability of results. Nevertheless, given the paucity of these studies, which are very expensive to conduct, the importance of having access to large datasets should not be underestimated, as it allows individuating associations which are more generalizable to general populations.

One problem arising from longitudinal study designs, which has emerged both when using SELCoH and ALSPAC data, is attrition. Sample size, and therefore statistical power, was dramatically reduced in phase two of the SELCoH study meaning that results obtained, although mirroring what has been previously found in literature, could be due to chance or bias. The small sample size of SELCoHII means the analyses had low power to detect associations and thus increased scope for findings due to chance. Moreover, it is possible that differential participation at follow up occurred. As an example, it was hypothesised that AN cases might not have agreed to take

part in the second wave of data collection. Severity of the condition could explain their lack of retention in the study. However, since non-participation was hypothesised on the basis of unobserved characteristics, it is not possible to speculate whether that could have had an effect on our results. It is also possible, that population retained in the study was no longer representative of the original sample and, thus, of the population who originated it. As explained in chapter 6, differences could only be assessed with respect to SCOFF positive participants retained in the study and those lost to follow up. Similarly in ALSPAC, not all girls who were sent the questionnaire at 16 returned it. This suggests that non-response or loss-to-follow-up bias could have occurred. It could be hypothesised that girls with more severe outcomes (e.g. ED, other psychiatric or physical conditions) decided to opt-out of the study. Our analyses showed differences in some socio-demographic measures in ALSPAC (e.g. maternal education), but not in NFBC. However, differences could lie in unobserved values as well.

Another problem associated with the use of cohorts (or one/two-phases surveys) in the study of ED is their scarce suitability for the investigation of rare outcomes, such as ED. Cohort studies in fact are only appropriate for the study of such outcomes with the latter have high levels of attributable risk, that is when, although rare the general population, they might be highly prevalent in specific exposed groups (Hennekens & Buring, 1987). Results from this thesis seem to confirm this. In Chapter 8 analyses based on ALSPAC data seemed powered to detect associations in exposed (i.e. purging) individuals. On the other hand, wide confidence intervals around estimates of associations in NFBC suggested that the sample was perhaps too small to estimate associations with high precisions. A case-control study would have been unsuitable for the current design. Since participants would have had to be selected on the basis of their outcomes, it would have not been possible the range of outcomes investigated in this study. Moreover, case-control studies are unsuitable for the study of rare exposures, such as ED. The choice of a general population longitudinal study and a two-phase survey over a case-control study thus represents an

attempt to overcome some of the limitations of selection bias with the attempt to obtain results as generalizable as possible.

A great strength of using the SELCoH dataset was that data referred to a study population which is highly representative of its catchment area and London; and to a lesser extent, the UK as a whole. A representative sample increases the chances that findings are generalizable to the wider population. Unfortunately, although it is a large cohort, ALSPAC is not representative of the UK population as ethnic diversity is highly under-represented. Therefore, it was not possible to investigate differences in such a large sample across ethnic groups, which was attempted using data from SELCoH. The small numbers of participants followed up in SELCoHII limited the scope for more in depth analyses.

Finally, all analyses were cross-sectional. Whilst cross-sectional investigations are important when examining prevalence and comorbidity, they are not informative as to causal associations. Nevertheless they are appropriate, and often fundamental, for the process of hypotheses generating as well as for health care planning, as they often give an accurate picture of service use.

9.5. What the findings contribute to the existing literature: theoretical implications and future directions

The aim of the studies presented in this thesis was to investigate the epidemiology of ED, ED behaviours, and disordered eating in two general population samples. Most literature so far has focused on full-threshold diagnoses using clinical or ad-hoc samples, with few studies investigating broad ranges of ED presentations at population level.

Diagnostic criteria are essential in order to identify clinically relevant presentations of ED. In some countries, where health care is delivered through insurance plans, receiving a diagnosis might be the only way in which individuals can access treatment. The fifth edition of the Diagnostic and Statistical Manual of mental health disorders (DSM-5), introduced in May 2013 has changed diagnostic criteria for ED to reflect evidence suggesting that behaviours occurring at lower thresholds are of clinical significance. Notably, whilst BED was included as a full-threshold diagnosis, PD was not. To date, only a small number of studies have investigated the prevalence and clinical relevance of the latter. Despite several limitations, findings presented in this thesis have shown that PD should be warranted more research, as preliminary results show that individuals exhibiting these behaviours are likely to experience a wide range of other negative comorbid outcomes. The International Classification of Diseases 11th Revision (ICD-11) is now due by 2015, thus there is a window of opportunity for the recognition of this disorder in the new World Health Organization (WHO) manual. Although the studies presented were exploratory in nature, their results call for more thorough, perhaps longitudinal, investigation of PD presentations, especially in the general population.

Several studies have investigated prevalence of disordered eating and ED behaviours in the population (Ackard et al., 2011; McBride et al., 2012; Mond et al., 2006) although fewer have investigated their association with

psychiatric comorbidity (Herpertz-Dahlmann et al., 2008; McBride et al., 2012). The results presented in this thesis not only showed that disordered eating and ED behaviours, both in adult and adolescent samples, were highly prevalent, but also that they were associated with high levels of psychiatric comorbidity. Whilst some degree of misclassification could have occurred, meaning that disordered eating identified in some individuals could be the result of other conditions, the high co-occurrence of disordered eating with a number of comorbid psychiatric conditions calls for a better understanding of their shared aetiology. Disordered eating could indicate higher levels of psychopathology, whilst also representing a risk factor for the development of full ED. More longitudinal studies are needed to investigate these risk pathways. Employment of multi-ethnic samples could help elucidate whether different patterns of comorbidity or ED presentations are present in specific populations. Increased knowledge on the existence of population-specific risks could be of importance not only in research settings, but mostly for health provision, as more targeted prevention strategies could be put in place.

Our findings provide some scope for arguing in favour of an increasing comorbidity between obesity, disordered eating, and ED (chapter 4 and 6). Recently, researchers have raised the issue of whether policies aimed at curbing the growing 'obesity epidemic' are having the unintended 'side-effect' of increasing the prevalence of disordered eating and thus, potentially, of ED (J Haines & Neumark-Sztainer, 2006; A. J. Hill, 2007; Neumark-Sztainer, Story, Hannan, Perry, & Irving, 2002; Neumark-Sztainer, 2005; Wilksch, Wade, Paxton, Byrne, & Austin, 2013). The ever-growing marketization of detox products (which ultimately are laxatives or diuretics) as 'healthy' choices, coupled with the wide availability of over the counter medications has been hypothesised to be contributing to onset of disordered eating in individuals seeking to lose weight (Pomeranz et al., 2013; Roerig et al., 2010). Our results cannot conclusively argue in favour of the presence of such trends, although they do confer plausibility to these hypotheses. Prospective studies should be designed to test these risk pathways.

Experimental studies could also be considered at the community level to test prevention programmes based on hypotheses of shared risk factors. Finally pricing policies, age-restrictions, or medical prescriptions on weight loss products could have an impact in reducing their use.

The study included in chapter 4 of this thesis was first in using the SCOFF in a general population whose participants ranged between 16 and 90 years of age. Results from chapter 5 showed that in such populations it might systematically misclassify individuals without an ED diagnosis, thus making it unsuitable as an instrument to diagnose ED in research settings or as a general screener. However, findings from the studies included in this thesis have allowed for the formulation of hypotheses on potential modifications to its questions which could improve its validity for such purposes. Future studies should evaluate whether modifying SCOFF questions in order to make them applicable to a new range of behaviours (e.g. men-specific ED behaviours) and conditions (e.g. BED and PD), which the original measure was not accounting for when it was initially devised, could improve its validity.

Finally, this thesis was the first study in the past 10 years providing an estimation of the prevalence of DSM-5-defined ED employing a multi-ethnic and inner-city general population sample in the UK. Its results implied that in an adult and ethnically diverse sample the prevalence of BED is elevated, and PD might be more prevalent than AN despite the former not being an official diagnosis. Future studies should aim to recruit larger samples in order to ensure higher precision in prevalence estimates and more statistical power when investigating comorbidity.

9.6. Concluding remarks

These studies suggest that minimal presentations of ED pathology can be associated with a high burden of disease. However, in a society which is arguably increasingly normalising pathological behaviours (i.e. dieting, use of slimming products) and cognitions (i.e. preoccupation with body weight and shape) in its everyday discourse, it is important to avoid the risk of 'pathologising' normal behaviours. In this respect, research can play an important role. Employing wider definitions for ED in research studies can help identifying diagnostic thresholds which are evidence-based and thus representative of broader ranges of ED presentations in the community. The changes introduced in DSM-5 represent an important step in this direction and suggest that future research could successfully help to inform criteria which are reflective of 'new' pathologies that are not yet recognised; ED behaviours in men and PD are a case in point. One of the major challenges which researchers and psychiatric face is to identify whether these are indeed new disorders or whether they represent broader manifestations of dimensions of psychiatric illness which are not yet defined. This thesis has somewhat employed the current understanding of psychiatric diagnosis as a categorical system as a term of comparison, but by investigating behaviours which occur irrespectively of diagnosis has attempted to take a step towards an understanding of psychiatric illness which transcends categorical diagnoses and explore dimensions of psychopathology. Another challenge that researchers and clinicians alike face is the ability to identify changes at societal level, which might redefine patterns of risks at the individual level, such as, for instance, rising levels of obesity. For this reason it is of paramount importance that clinicians employ comprehensive approaches to treatment and recognise symptoms that might indicate the coexistence of different mental and physical health problems.

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Appendix I – SELCoHI questionnaire

Variable name	Question
Socio-demographic section	
I am going to start by asking you few questions regarding your age, civil status, living accommodation and education.	
qid_1_01	What is your date of birth? _____
qid_1_02	What was your age on your last birthday? _____
qid_1_03	Are you • single, that is, never married • single and living with your partner • married and living with your husband/wife • married and separated from your husband/wife • divorced • or widowed?
qid_1_09	To which of the following groups do you consider you belong? • White • Black - Caribbean • Black - African • Black - Other Black Groups • Indian • Pakistani • Bangladeshi • Chinese • None of these
qid_1_13	Degree level qualification or above
qid_1_14	'A'Level or equivalent (HNDs, NVQ level 3,

	Highers)
qid_1_15	GSCE level or equivalent (O'levels, NVQ level 1-2)
qid_1_16	Below GCSE level
qid_1_17	No qualifications
qid_1_18	Other qualifications
qid_1_19	(specify)_____
qid_3_01	CIR section
Treatment and service use section The thoughts and feelings we just talked about are very important.	
qid_19_01	In the past 12 months, have you spoken to a GP or family doctor, a psychological therapist/counsellor or other sources of help on your own behalf, either in person or by telephone about being anxious or depressed or a mental, nervous or emotional problem? • No (had the problem but didn't see anybody) • Yes • Does not apply (never had this kind of problem)
Yes ➔ Which one? Please code all that apply	
qid_19_02	GP
qid_19_03	Psychological therapist/counsellor
qid_19_04	Mental health specialist
qid_19_05	Other, specify
qid_19_06	Specify
qid_19_07	In the past 12 months did you go and see

	anybody close to you (ie friends and family, non health professionals) about being anxious or depressed or a mental, nervous or emotional problem? • No (had the problem but didn't see anybody) • Yes • Does not apply (never had this kind of problem)
qid_19_22	Eating disorder

PTSD section

The next few questions are about bad experiences that might have happened to you at any time in your life. When I use the term "bad experience" I mean the things that things that we just talked about (if needs prompting: like seeing bad things in a combat situation, seeing someone killed or seriously injured, a serious car accident, having a loved one die by murder or suicide, or any other experience that either (READ SLOWLY) put-you-or-someone-close-to-you-at-risk-of-serious-harm-or-death).

Show card (This should be a laminated card, not on the computer).

qid_27_01	Has anything like this ever happen to you at any time in your life? • No (If NO, skip section) • Yes (If YES, go to qu. 2)
Yes➔ In relation to that/these horrible experience in the PAST MONTH, have you:	
qid_27_02	Had nightmares about it or thought about it when you did not want to? • No • Yes

Appendix II – Eating disorder module SELCoHII

Information sheet

KING'S College LONDON
University of London

INFORMATION SHEET FOR PARTICIPANTS

REC Protocol Number: PNM/10/11-106
Study title: Estimation of prevalence of eating habits in the South East London Community Health (SELCoHI) study - SELCoHII

YOU WILL BE GIVEN A COPY OF THIS INFORMATION SHEET

You have been asked to participate in this research project organised by King's College London and funded by the Economic and Social Research Council and the National Institute for Health Research funded Biomedical Research Centre Nucleus.

You have already received an information sheet highlighting the South East London Community Health (SELCoH) study's emphasis on understanding the mental and physical health of residents in southeast London. To assist in this endeavour, the SELCoH study II will be allowing a series of sub-studies to take place within its framework, each focusing on a particular mental or physical health issue.

This information sheet will detail one of these specific areas of questioning, which you are invited to take part in. You should only participate in this sub-study if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve.

Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you wish to know more.

What is the purpose of this study?

Eating disorders are mental health conditions that often go undetected for several reasons. However, eating disorders are serious illnesses that affect the quality of life and every day functioning of sufferers.

Good treatments are available for eating disorders; however not all sufferers are able to access treatment. We want to know how many people suffer from eating disorders in South London, so that we can work out whether services available for sufferers in South East London are enough. This will help people with eating disorders access help more readily and receive adequate treatment.

Why have I been invited?

You have been invited because you took part to the first phase of the South East London Community Health (SELCoH) study and completed a questionnaire on eating habits, and you are currently participating in the second phase of the SELCoH study. You have been randomly selected among all participants to take part in a follow up screening on eating habits. In this phase of the study we will include two groups of people: 1) People who might be at risk for an eating disorder; 2) People who are not at risk for an eating disorder. The interviewers are not aware of what group you are in, nor are they aware of how you answered the questions on eating habits in the first phase of the SELCoH study.

Do I have to take part?

No, it is up to you to decide. We will describe the study and go through this information sheet, which we will then give to you. If you would like to participate, we will then ask you to sign a consent form to show you have agreed to take part. You are free to withdraw at any time, without giving a reason.

What will I be asked if I take part in the study?

If you agree to participate you will be asked to complete an interview, which will take about 20/30 minutes.

The interview will include questions regarding your eating habits and weight history.
We will describe the study and go through this information sheet, which we will then give to you. If you would like to participate, we will then ask you to sign a consent form to show you have agreed to take part. You are free to withdraw at any time, without giving a reason.

What are the possible benefits of taking part?

We believe that by participating and allowing us to conduct this study, you will contribute to the greater good by providing real statistics regarding mental and physical health problems to allow the health service to You will also be rewarded 10£ upon completion of the interview as a compensation for your participation in our study.

What are the possible risks of taking part?

There are no major risks involved – all we want to do is ask you questions about your health and various stresses and strains you might be under. Some of these questions touch on sensitive areas. If you feel uncomfortable with any of the questions you do not have to answer them. If you want to stop the interview you can do so at any time without giving us any reason.

Is Confidentiality guaranteed?

We take confidentiality very seriously. As in the main SELCoH study, all personal information about you is regarded as strictly confidential. Only the researcher asking these questions and the study leader will be able to trace the information you have given us to your personal details. All the information about you will be coded; you will not be identifiable in any research outcome (e.g. publication). This ensures that suitable standards of security and confidentiality are applied. All information collected will be securely held in King's College London.

Additional Information

The research is being organised by the Eating Disorder Research Unit (Institute of Psychiatry, King's College London) and the Department of Child and Adolescent Psychiatry (Institute of Psychiatry, King's College London), Nadia Micali, Janet Treasure, Francesca Solmi. This sub-study is funded as part of the South East London Community Health (SELCoH) study II. This is a government-funded project supported by the Economic and Social Research Council and the National Institute of Health Research funded Biomedical Research Centre Nucleus.

If this study has harmed you in any way, or if you would like to contact us for more information, please feel welcome to contact us at the information below. Thank you for taking the time to read this document and consider participation in this research.

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Consent form

KING'S College LONDON

CONSENT FORM

Please complete this form after you have read the Information Sheet and/or listened to an explanation about the research.

Title of Study: **Estimation of prevalence of eating habits in the South East London Community Health (SELCoHI) study - SELCoHII**

Principal Investigator: Dr. Nadia Micali

King's College Research Ethics Committee Ref:

Household number: | | | | | | | |

Id_number: |

Thank you for considering taking part in this research. The person organising the research must explain the project to you before you agree to take part. If you have any questions arising from the Information Sheet or explanation already given to you, please ask the researcher before you decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

Necessary consents to participate in this study:	**Please tick boxes**	
* I have read the information sheet and I have been given a copy. I was given the opportunity to ask questions. I understand why the research has been done and the risks involved	YES	NO
* I understand that if I decide at any time during the research that I no longer wish to participate in this project, I can notify the researchers involved and withdraw from it immediately without giving any reason. Furthermore, I understand that I will be able to withdraw my data up to one month after completing the interview.	YES	NO
* I consent to the processing of my personal information for the purposes of this research study. I understand that such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998. I understand that confidentiality might be breached only when my life might be considered at risk. This could happen in situation such as ascertainment by the research team of intense suicidal feelings. In these extreme cases the principal investigator might choose to contact me *and/or* make contact with my GP directly.	YES	NO
* I understand that the information I provide will be published as a report and that confidentiality and anonymity will be maintained and it will not be possible to identify me from any publications.	YES	NO
* I understand that I will receive £10 only upon completion of the interview as a compensation for taking part to this study	YES	NO

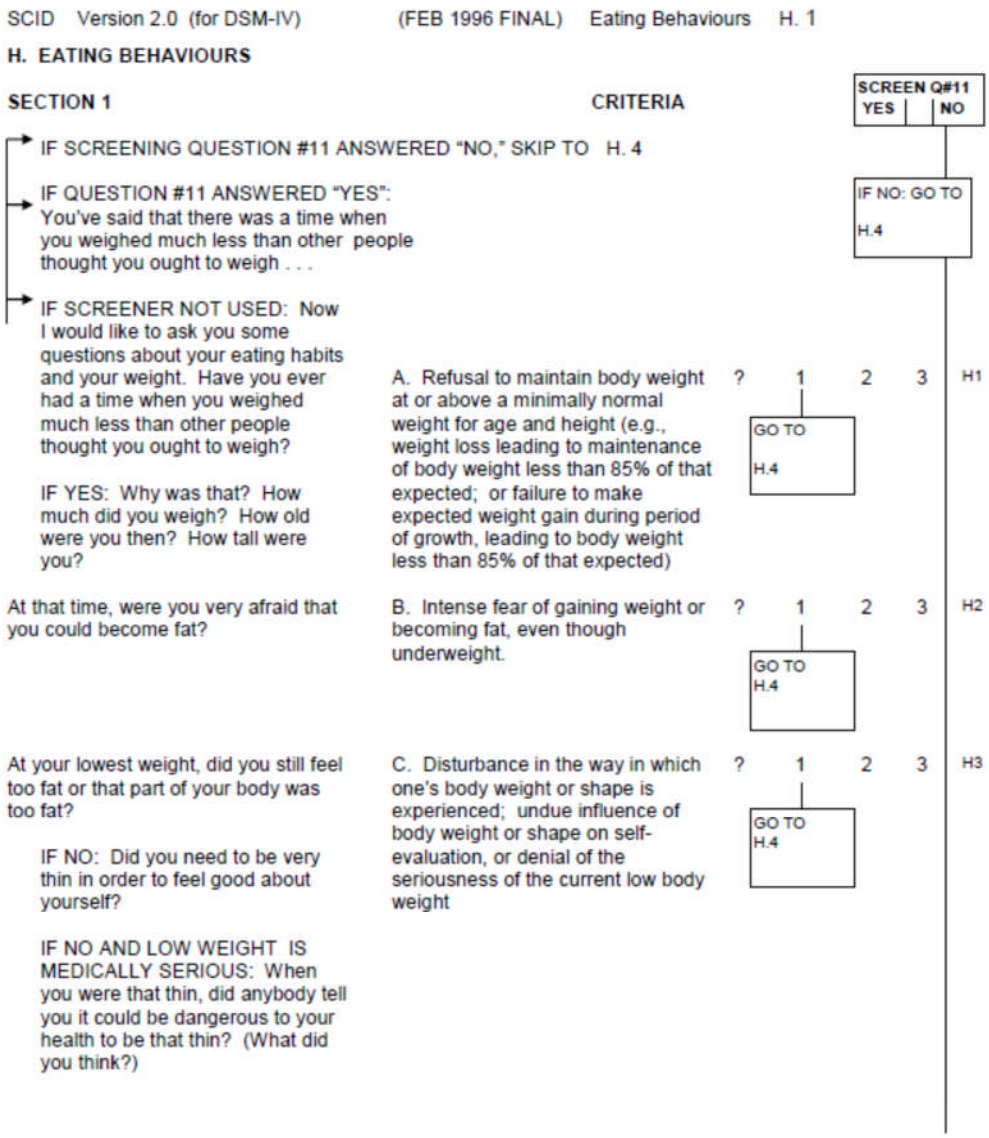
I would / would not like to receive information on the outcome of the study (delete whichever does not apply).

Participant's Statement: I _____ agree that the research project named above has been explained to me to my satisfaction and I agree to take part in the study. I have read both the notes written above and the Information Sheet about the project, and understand what the research study involves.

.....	.....	.....
Name of participant	Signature	Date

Investigator's Statement: I _____ confirm that I have carefully explained the nature, demands and any foreseeable risks (where applicable) of the proposed research to the volunteer.

.....	.....	.....
Name of researcher	Signature	Date



SCID Version 2.0 (for DSM-IV) (FEB 1996 FINAL) Eating Behaviours H. 1

H. EATING BEHAVIOURS

SECTION 1

CRITERIA

SCREEN Q#11 YES | NO

IF SCREENING QUESTION #11 ANSWERED "NO," SKIP TO H. 4

IF NO: GO TO H.4

IF QUESTION #11 ANSWERED "YES": You've said that there was a time when you weighed much less than other people thought you ought to weigh . . .

IF SCREENER NOT USED: Now I would like to ask you some questions about your eating habits and your weight. Have you ever had a time when you weighed much less than other people thought you ought to weigh?

IF YES: Why was that? How much did you weigh? How old were you then? How tall were you?

A. Refusal to maintain body weight at or above a minimally normal weight for age and height (e.g., weight loss leading to maintenance of body weight less than 85% of that expected; or failure to make expected weight gain during period of growth, leading to body weight less than 85% of that expected)

? 1 2 3 H1

GO TO H.4

At that time, were you very afraid that you could become fat?

B. Intense fear of gaining weight or becoming fat, even though underweight.

? 1 2 3 H2

GO TO H.4

At your lowest weight, did you still feel too fat or that part of your body was too fat?

IF NO: Did you need to be very thin in order to feel good about yourself?

IF NO AND LOW WEIGHT IS MEDICALLY SERIOUS: When you were that thin, did anybody tell you it could be dangerous to your health to be that thin? (What did you think?)

C. Disturbance in the way in which one's body weight or shape is experienced; undue influence of body weight or shape on self-evaluation, or denial of the seriousness of the current low body weight

? 1 2 3 H3

GO TO H.4

FOR FEMALES: Before this time, were you having your periods? Did they stop? (For how long?)

D. In postmenarchal females, amenorrhea, i.e., the absence of at least three consecutive menstrual cycles. (A woman is still considered to have amenorrhea if her periods occur only following hormone, e.g., estrogen, administration)

? 1 2 3 H4

1 → GO TO H.4

IF CRITERIA A, B, C, AND D ARE CODED "3" H5

1 → GO TO H.4

3

(Do you have eating binges in which you eat a lot of food in a short period of time and feel that your eating is out of control? (How often?)

IF NO: What kinds of things have you done to keep weight off? (Ever make yourself vomit or take laxatives, enemas, or water pills?) (How often?)

SUBTYPE CURRENT EPISODE: During the current episode of AN, the person has regularly engaged in binge-eating or purging behavior (i.e., self-induced vomiting or misuse of laxatives, diuretics, or enemas)

1 → R

3 → BP

SECTION 2 **CRITERIA**

SCREEN Q#12 YES | NO

IF: CRITERIA CURRENTLY MET FOR PREVIOUS SECTION, CHECK HERE ___ AND SKIP TO THE NEXT MODULE.

IF SCREENING QUESTION #12 IS ANSWERED "NO," SKIP TO NEXT MODULE.

IF NO: GO TO NEXT MODULE

IF QUESTION #12 ANSWERED "YES": You've said that you've often had times when your eating was out of control. Tell me about those times.

IF SCREENER NOT USED: Have you often had times when your eating was out of control? Tell me about those times.

A. Recurrent episodes of binge eating. An episode of binge eating is characterized by BOTH of the following:

(2) a sense of lack of control over eating during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating)

? 1 2 3 H11

1 → GO TO NEXT MODULE

IF UNCLEAR: During these times, do you often eat within any two hour period what most people would regard as an unusual amount of food? Tell me about that.

(1) eating, in a discrete period of time (e.g., within any two hour period), an amount of food that is definitely larger than most people would eat during a similar period of time and under similar circumstances.

? 1 2 3 H12

1 → GO TO NEXT MODULE

Did you do anything to counteract the effects of eating that much? (Like making yourself vomit, taking laxatives, enemas or water pills, strict dieting or fasting, or exercising a lot?)

B. Recurrent inappropriate compensatory behavior in order to prevent weight gain, such as: self-induced vomiting; misuse of laxatives, diuretics, enemas, or other medications; fasting; or excessive exercise.

? 1 2 3 H13

1 → GO TO H. 7

How often were you eating that much (AND COMPENSATORY BEHAVIOR)? (At least twice a week for at least three months?)

C. The binge eating and inappropriate compensatory behaviors both occur, on average, at least twice a week for three months.

? 1 2 3 H14

1 → GO TO H. 7

Were your body shape and weight among the most important things that affected how you felt about yourself?

D. Self-evaluation is unduly influenced by body shape and weight. ? 1 2 3 H15

1 → GO TO NEXT MODULE

E. The disturbance does not occur exclusively during episodes of AN ? 1 2 3 H16

1 → GO TO NEXT MODULE

CRITERIA A, B, C, D AND E ARE CODED "3" 1 3 H17

1 → GO TO NEXT MODULE

3 → BN

SPECIFY TYPE:
During the current episode of BN, the person has regularly engaged in self-induced vomiting or the misuse of laxatives, diuretics, or enemas 1 3

1 → NP

3 → P

SECTION 3	CRITERIA					
During these binges . . .	B. The binge-eating episodes are associated with three (or more) of the following:					
. . . did you eat much more rapidly than normal?	(1) eating much more rapidly than normal	?	1	2	3	H23
. . . eat until you felt uncomfortably full?	(2) eating until feeling uncomfortably full	?	1	2	3	H24
. . . eat large amounts of food when you didn't feel physically hungry?	(3) eating large amounts of food when not feeling physically hungry	?	1	2	3	H25
. . . eat alone because you were embarrassed by how much you were eating?	(4) eating alone because of being embarrassed by how much one is eating	?	1	2	3	H26
. . . feel disgusted with yourself, depressed, or feel very guilty after overeating?	(5) feeling disgusted with oneself, depressed or very guilty after overeating	?	1	2	3	H27
	AT LEAST 3 "B" SXS CODED "3"		1		3	H28
			GO TO NEXT MODULE			
Was it very upsetting to you that you couldn't stop eating or control what or how much you were eating?	C. Marked distress regarding binge eating is present	?	1	2	3	H29
			GO TO NEXT MODULE			
IF UNKNOWN: How often did you binge? (For how long?) (At least two days a week for at least six months?)	D. The binge eating occurs, on average, at least 2 days a week for 6 months	?	1	2	3	H30
			GO TO NEXT MODULE			

E. The binge eating is not associated with the regular use of inappropriate compensatory behaviors (e.g., purging, fasting, excessive exercise) and does not occur exclusively during the course of AN or BN

? 1 2 3 H31

GO TO NEXT MODULE

CRITERIA A, B, C, D, AND E ARE CODED "3"

1 3 H32

GO TO NEXT MODULE

BED

Appendix III: crude and adjusted associations of each SCOFF question with outcomes included in the study

Table 48: ORs, RRRs and 95%CI of the association between positive SCOFF Q1 answer and psychiatric outcomes

Outcome	Crude RRR (95% CI)	Adjusted[1] RRR (95% CI)
Drinking (AUDIT)		
Hazardous	1.7(0.8-3.6)	2.4(0.9-5.6)*
Hazardous and harmful	3.1(1.1-7.8)*	3.4(1.1-10.1)*
Smoking status		
Current	1.4(0.7-2.7)	1.6(0.7-3.3)
Ex-smoker	0.6(0.2-1.5)	0.7(0.2-2)
Primary diagnosis		
Non-specified neurotic disorder	0.2(0.03-1.8)	0.2(0.03-1.9)
Anxiety/mood/anxiety+mood disorder	2.9(1.6-5.4)**	3.3(1.8-6)**

Outcome	Crude OR (95% CI)	Adjusted[1] OR(95% CI)
Drug use ever	0.9(0.5-1.6)	1.1(0.6-2.2)
Drug use last year	1.9(1.1-3.5)*	2.3(1.2-4.2)**
SAPAS	4.1(2.3-7.3)**	3.8(2.1-6.9)**
PTSD	3.5(1.5-8)**	4(1.7-9.3)**
Suicide attempt or ideation	1.8(0.9-3.4)*	2(1-4)*

** p≤0.05 **p≤0.01*

[1]Adjusted for Adjusted for age, gender, BMI, marital status, ethnicity, and education (+alcohol adjusted for smoking and smoking adjusted for alcohol)

Table 49: ORs, RRRs and 95%CI of the association between positive SCOFF Q2 answer and psychiatric outcomes

Outcome	Crude RRR (95% CI)	Adjusted[1] RRR (95% CI)
Drinking (AUDIT)		
Hazardous	1.7(1.2-2.5)**	2.5(1.5-4)**
Hazardous and harmful	3(1.7-5.4)**	5(2.7-9.3)**
Smoking status		
Current	1(0.7-1.5)	1.2(0.8-1.8)
Ex-smoker	0.8(0.5-1.3)	1.2(0.7-1.8)
Primary diagnosis		
Non-specified neurotic disorder	3.3(1.9-5.6)**	3.3(1.8-5.8)**
Anxiety/mood/anxiety+mood disorder	3.5(2.5-4.9)**	3.1(2.2-4.4)**
Outcome	Crude OR (95% CI)	Adjusted[1] OR(95% CI)
Drug use ever	1.3(0.9-1.8)	1.6(1.1-2.4)**
Drug use last year	1.4(1-1.9)*	1.7(1.2-2.5)**
SAPAS	2.9(2.1-4.1)**	3.3(2.2-4.5)**
PTSD	4.2(2.5-6.8)**	3.8(2.2-6.5)**
Suicide attempt or ideation	2.5(1.8-3.5)**	2.4(1.7-3.4)**

** p≤0.05 **p≤0.01*

[1]Adjusted for Adjusted for age, gender, BMI, marital status, ethnicity, and education (+alcohol adjusted for smoking and smoking adjusted for alcohol)

Table 50: ORs, RRRs and 95%CI of the association between positive SCOFF Q3 answer and psychiatric outcomes

Outcome	Crude RRR (95% CI)	Adjusted[1] RRR(95% CI)
Drinking (AUDIT)		
Hazardous	0.9(0.6-1.5)	0.9(0.6-1.6)
Hazardous and harmful	1.4(0.7-2.6)	0.9(0.5-2.1)
Smoking status		
Current	1(0.7-1.5)	1(0.7-1.5)
Ex-smoker	1.1(0.7-1.6)	1.5(0.9-2.3)
Primary diagnosis		
Non-specified neurotic disorder	1.6(0.9-2.7)	1.6(0.9-2.9)
Anxiety/mood/anxiety+mood disorder	2.1(1.5-3)**	2.1(1.5-3.1)**
Outcome	Crude OR (95% CI)	Adjusted[1] OR(95% CI)
Drug use ever	1.2(0.9-1.6)	1.2(0.9-1.8)
Drug use last year	1.3(0.9-1.9)	1.1(0.7-1.5)
SAPAS	1.5(1-2.3)*	1.5(0.9-2.7)
PTSD	2.3(1.3-3.9)**	2.1(1.2-3.9)**
Suicide attempt or ideation	1.4(0.9-1.9)*	1.4(0.9-2)*

** p≤0.05 **p≤0.01*

[1]Adjusted for Adjusted for age, gender, BMI, marital status, ethnicity, and education (+alcohol adjusted for smoking and smoking adjusted for alcohol)

Table 51: ORs, RRRs and 95%CI of the association between positive SCOFF Q4 answer and psychiatric outcomes

Outcome	Crude RRR (95% CI)	Adjusted[1] RRR(95% CI)
Drinking (AUDIT)		
Hazardous	0.6(0.3-1.2)	0.7(0.3-1.5)
Hazardous and harmful	2.1(0.9-4.5)*	2.2(0.9-4.9)*
Primary diagnosis		
Non-specified neurotic disorder	2.6(1.4-4.9)**	2.8(1.5-5.3)**
Anxiety/mood/anxiety+mood disorder	2.8(1.8-4.2)**	2.5(1.6-4)**
Outcome	Crude OR (95% CI)	Adjusted[1] OR(95% CI)
Smoking status		
Current	1.5(0.9-2.3)	1.5(0.9-2.5)
Ex-smoker	0.8(0.4-1.4)	1.4(0.7-2.6)
Drug use ever	0.8(0.5-1.2)	0.8(0.5-1.2)
Drug use last year	1.3(0.7-2.1)	1.1(0.6-1.8)
SAPAS	2.9(1.9-4.5)**	2.9(1.9-4.7)
PTSD	3.2(1.7-5.9)**	2.4(1.2-4.8)*
Suicide attempt or ideation	2.1(1.4-3.2)**	1.8(1.2-2.7)**

** p≤0.05 **p≤0.01*

[1]Adjusted for Adjusted for age, gender, BMI, marital status, ethnicity, and education (+alcohol adjusted for smoking and smoking adjusted for alcohol)

Table 52: ORs, RRRs and 95%CI of the association between positive SCOFF Q5 answer and psychiatric outcomes

Outcome	Crude RRR (95% CI)	Adjusted[1] RRR(95% CI)
Drinking (AUDIT)		
Hazardous	1(0.6-1.7)	1.4(0.8-2.4)
Hazardous and harmful	0.9(0.4-2.3)	1.1(0.4-2.9)
Smoking status		
Current	0.8(0.5-1.2)	0.9(0.6-1.5)
Ex-smoker	0.9(0.6-1.5)	1.2(0.6-1.9)
Primary diagnosis		
Non-specified neurotic disorder	1.2(0.6-2.4)	1.1(0.5-2.3)
Anxiety/mood/anxiety+mood disorder	2.2(1.5-3.2)**	2(1.4-3.1)**
Outcome	Crude OR (95% CI)	Adjusted[1] OR(95% CI)
Drug use ever	1.1(0.7-1.5)	1.7(1.1-2.6)**
Drug use last year	1.3(0.8-1.9)	1.7(1.1-2.6)**
SAPAS	2.3(1.5-3.4)**	1.9(1.2-3)**
PTSD	1.6(0.8-2.9)	1.3(0.6-2.7)
Suicide attempt or ideation	1.5(1.1-2.2)	1.6(1.1-2.4)*

** p≤0.05 **p≤0.01*

[1]Adjusted for Adjusted for age, gender, BMI, marital status, ethnicity, and education (+alcohol adjusted for smoking and smoking adjusted for alcohol)

Appendix IV – ALSPAC 'Life of a 16+ teenager' questionnaire (sections used)

Questionnaire Number

Life of a 16+ Teenager

02/08/2007

27832

ABOUT THIS QUESTIONNAIRE

- Thank you for filling in this questionnaire.

- We realise it is quite long but a lot of interesting things are happening to you!

- ALL your answers are confidential. They are kept under code numbers, not your name, so no-one can find out what you have said.

- We realise how sensitive and personal some of the questions are, but it is important for scientific research to find out what is happening to teenagers and how they really think and feel.

- You might want to talk to someone about some of the subjects in this questionnaire, so we have included details of confidential Helplines on a separate sheet.

FILLING IN THE QUESTIONNAIRE

Use black or blue pen

Answer questions with a cross in the box, like this:

If you are writing words make sure they are inside the box, like this:

If you make a mistake, shade the box in like this

then cross the correct box.

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SECTION F: ALCOHOL USE

The next questions are about drinking alcohol (this includes beer, wine, "alcopops", cider and spirit drinks like vodka).

F1. Have you ever drunk alcohol?

Yes 1 ☐ → **If yes, go to F2 below**

No 2 ☐ → **If no, go to section G on page 22**

F2. How old were you when you **first** drank alcohol **without** an adult's permission?

i) What age were you? ☐☐ years

OR

ii) Mark this box if you have **never** drunk alcohol **without** an adult's permission 1 ☐

F3. Think back over the **last 30 days**. How many full drinks (if any) of the following types of alcohol have you had? Mark **one** box for each line.
Please use the separate DRINKOGRAM sheet to help you.

	Number of full drinks						
	0	**1-2**	**3-5**	**6-9**	**10-19**	**20-39**	**40 or more**
a) Beer (do not include low alcohol beer), lager, cider or "alcopops"	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
b) Wine	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
c) Spirits (whisky, cognac, vodka etc., also include spirits mixed with soft drinks)	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐

F4. The next question refers to up to the **first 5 times** you ever had a drink of alcohol:

a) Up to the **first 5 times** you ever had a drink of alcohol did it make you feel drunk or tipsy, or like you had a buzz?

Yes 1 ☐ No 2 ☐ Don't know 9 ☐

If yes,

(i) How many drinks did it take for this to happen? ☐☐

b) Up to the **first 5 times** you ever had a drink of alcohol did it make you feel dizzy or make your speech slurred?

Yes 1 ☐ No 2 ☐ Don't know 9 ☐

If yes,

(i) How many drinks did it take for this to happen? ☐☐

c) Up to **the first 5 times** you ever had a drink of alcohol did it make you stumble or fall or did you find it difficult to walk properly?

Yes 1 ☐ No 2 ☐ Don't know 9 ☐

If yes,

(i) How many drinks did it take for this to happen? ☐☐

d) Up to the **first 5 times** you ever had a drink of alcohol did it make you pass out or fall asleep when you didn't want to?

Yes 1 ☐ No 2 ☐ Don't know 9 ☐

If yes,

(i) How many drinks did it take for this to happen? ☐☐

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F5. a) How often do you have a drink containing alcohol?

Never	1 ☐	Monthly or less	2 ☐	2-4 times a month	3 ☐
go to Section G on page 22		2-3 times a week	4 ☐	4 or more times a week	5 ☐

b) How many units of alcohol do you drink on a typical day when you are drinking? **One unit of alcohol is: ½ pint average strength beer/lager OR one glass of wine OR one single measure of spirits. Note: a can of high strength beer or lager contains 3-4 units. Please use the separate DRINKOGRAM sheet to help you.**

1 or 2	1 ☐	3 or 4	2 ☐	5 or 6	3 ☐
7, 8 or 9	4 ☐	10 or more	5 ☐		

c) How often do you have six or more units of alcohol on one occasion?

Never	1 ☐	Less than monthly	2 ☐	Monthly	3 ☐
Weekly	4 ☐	Daily or almost daily	5 ☐		

d) How often during the last year have you found that you were not able to stop drinking once you had started?

Never	1 ☐	Less than monthly	2 ☐	Monthly	3 ☐
Weekly	4 ☐	Daily or almost daily	5 ☐		

e) How often during the last year have you failed to do what was normally expected from you because of drinking?

Never	1 ☐	Less than monthly	2 ☐	Monthly	3 ☐
Weekly	4 ☐	Daily or almost daily	5 ☐		

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F5. f) How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?

Never	1 ☐	Less than monthly	2 ☐	Monthly	3 ☐
Weekly	4 ☐	Daily or almost daily	5 ☐		

g) How often during the last year have you had a feeling of guilt or remorse after drinking?

Never	1 ☐	Less than monthly	2 ☐	Monthly	3 ☐
Weekly	4 ☐	Daily or almost daily	5 ☐		

h) How often during the last year have you been unable to remember what happened the night before because you had been drinking?

Never	1 ☐	Less than monthly	2 ☐	Monthly	3 ☐
Weekly	4 ☐	Daily or almost daily	5 ☐		

i) Have you or someone else been injured as a result of your drinking?

No	1 ☐	Yes, but not in the last year	2 ☐	Yes, during the last year	3 ☐

j) Has a relative or friend or doctor or another health worker been concerned about your drinking or suggested you cut down?

No	1 ☐	Yes, but not in the last year	2 ☐	Yes, during the last year	3 ☐

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SECTION G: TOBACCO AND OTHER SUBSTANCES

The next set of questions is about cigarettes (including roll-ups).

G1. Have you ever smoked a cigarette (including roll-ups)?

Yes 1 ☐ → **If yes, go to G2 below**

No 2 ☐ → **If no, go to G7 below**

G2. Please mark the box next to the statement that describes you the best:

- I have only ever tried smoking cigarettes once or twice 1 ☐
- I used to smoke sometimes but I never smoke cigarettes now 2 ☐
- I sometimes smoke cigarettes but I smoke less than one a week 3 ☐
- I usually smoke between one and six cigarettes a week 4 ☐
- I usually smoke more than six cigarettes a week, but not every day 5 ☐
- I usually smoke one or more cigarettes every day 6 ☐

G3. How old were you when you first smoked a cigarette?

Less than 10 years old 1 ☐ | 10-12 years old 2 ☐ | 13-14 years old 3 ☐ | 15-16 years old 4 ☐

G4. How many cigarettes have you smoked **in total** in your lifetime?

Less than 5 1 ☐ | 5-19 2 ☐ | 20-49 3 ☐ | 50-99 4 ☐ | 100 or more 5 ☐

G5. Have you smoked any cigarettes **since your 15th birthday**?

Yes 1 ☐ | No 2 ☐

G6. If you smoke on a **daily** basis, how many cigarettes do you smoke per day, on average?

1-5 1 ☐ | 6-10 2 ☐ | 11-20 3 ☐ | More than 20 daily 4 ☐ | Do not smoke 5 ☐

G7. Have you **ever** used or taken nicotine patches or nicotine gum?

No 1 ☐ | Yes, less than 10 times in total 2 ☐ | Yes, more than 10 times in total 3 ☐

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The next set of questions is about cannabis.

G8. Have you ever tried **cannabis** (also called marijuana, hash, dope, pot, skunk, puff, grass, draw, ganja, spliff, joints, smoke, weed)?

Yes 1 ☐ → **If yes, go to G9 below**

No 2 ☐ → **If no, go to G20 on page 26**

G9. Please mark the box next to the statement that describes you best:

I have only ever tried cannabis once or twice	1 ☐
I used to sometimes use or take cannabis but I never do now	2 ☐
I sometimes use or take cannabis but less often than once a week	3 ☐
I usually use or take cannabis between one and six times a week	4 ☐
I usually use or take cannabis more than six times a week, but not every day	5 ☐
I usually use or take cannabis every day	6 ☐

G10. How old were you when you first tried cannabis?

Less than 10 years old 1 ☐	10-12 years old 2 ☐	13-14 years old 3 ☐	15-16 years old 4 ☐

G11. How many times have you used or taken cannabis **in total**?

Less than 5 times 1 ☐	5-20 times 2 ☐	21-60 times 3 ☐	61-100 times 4 ☐	More than 100 times 5 ☐

G12. What type of cannabis have you **most commonly** used or taken?

Marijuana (also called grass, green, herbal, skunk)	1 ☐
Resin (also called solid, soap-bar, black, hash)	2 ☐
Other	3 ☐
Don't know	9 ☐

G13. How have you **most commonly** used or taken cannabis?

Smoking joints or spliffs	1 ☐
Smoking it in pipes or bongs	2 ☐
Eaten	3 ☐
Other	4 ☐
Don't know	9 ☐

G14. If you have ever smoked joints/spliffs, or used a pipe or bong, was the cannabis **most commonly** mixed with tobacco?

Most commonly smoked cannabis mixed with tobacco	1 ☐
Most commonly smoked cannabis by itself	2 ☐
Never smoked cannabis	3 ☐
Don't know	9 ☐

G15. What is the **most** number of joints/spliffs, pipes or bongs that you smoked in a single day?

Less than 3 in a single day	1 ☐
3 or more in a single day	2 ☐
Never smoked cannabis	3 ☐

G16. Over the past **three months** how much cannabis have you **personally** used?

None	0 ☐
Less than a £10 bag (around 16th of an ounce)	1 ☐
A £10 bag	2 ☐
Between a £10 bag and an 8th of an ounce	3 ☐
Between an 8th and a quarter of an ounce	4 ☐
Between a quarter and a half of an ounce	5 ☐
Between a half ounce and an ounce	6 ☐
More than an ounce	7 ☐

G17. Have you ever had any of the following experiences **within 1 hour** of using or taking cannabis? (You **can** mark **more** than **one** answer)

i)	Feeling sick and sweaty	1 ☐
ii)	Feeling calm and relaxed	1 ☐
iii)	Feeling very anxious or panicky	1 ☐
iv)	Feeling that people are spying on you, or trying to harm you	1 ☐
v)	Feeling that you want to laugh at everything around you	1 ☐
vi)	Hearing voices that other people couldn't hear	1 ☐
vii)	Seeing things that other people couldn't see	1 ☐
viii)	Feeling more sociable and friendly	1 ☐

G18. Have you used or taken cannabis **since your 15th birthday?**

Yes 1 ☐ No 2 ☐ → **If no, go to G20 on page 26**

G19. The next questions are about your use of cannabis **since your 15th birthday.**

	Never	Rarely	From time to time	Fairly often	Very often
a) Have you ever used cannabis before midday?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐
b) Have you ever used cannabis when you were alone?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐
c) Have you ever had memory problems when you used cannabis?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐
d) Have friends or members of your family ever told you that you ought to reduce your cannabis use?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐
e) Have you ever tried to reduce or stop your cannabis use without succeeding?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐
f) Have you ever had problems because of your use of cannabis (argument, fight, accident, bad result at school, other problems)?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐

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The next questions are about other drugs that people sometimes take.

G20. Have you ever tried inhaling or sniffing any of the following **since your 15th birthday?** (Mark **one** box on each line)

		No	Yes, less than 5 times	Yes, more than 5 time
a)	**Aerosols**	1 ☐	2 ☐	3 ☐
b)	**Gas** (butane and lighter refills)	1 ☐	2 ☐	3 ☐
c)	**Glue**	1 ☐	2 ☐	3 ☐
d)	**Solvents** (including petrol and paint thinners)	1 ☐	2 ☐	3 ☐
e)	**Poppers** (also called amyl nitrates, liquid gold, rush)	1 ☐	2 ☐	3 ☐

G21. Have you tried, taken or used any of the following drugs **since your 15th birthday?** (Mark **one** box on each line)

		No	Yes, less than 5 times	Yes, more than 5 tim
a)	**Amphetamines** (also called speed, uppers, whizz, sulphate, billy, crystal meth)	1 ☐	2 ☐	3 ☐
b)	**Ecstasy** (also called 'E' pills, MDMA)	1 ☐	2 ☐	3 ☐
c)	**LSD** (also called acid, tabs, trips, dots)	1 ☐	2 ☐	3 ☐
d)	**Magic mushrooms** (also called shrooms)	1 ☐	2 ☐	3 ☐
e)	**Spanglers** (also called spangs)	1 ☐	2 ☐	3 ☐
f)	**Cocaine** (also called Charlie, 'C', coke)	1 ☐	2 ☐	3 ☐
g)	**Crack** (also called rock, stone)	1 ☐	2 ☐	3 ☐
h)	**Heroin** (also called brown, smack, gear, junk, 'H')	1 ☐	2 ☐	3 ☐
i)	**Ketamine** (also called Green, K, special K, super K, vitamin K)	1 ☐	2 ☐	3 ☐
j)	**Steroids** (not prescribed by a doctor)	1 ☐	2 ☐	3 ☐
k)	**White widows**	1 ☐	2 ☐	3 ☐

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SECTION H: MOODS AND FEELINGS

These questions are about how you may have been feeling or acting recently. For each question, please say how much you think you have felt or acted this way in the **past two WEEKS.**

	In the past 2 weeks:	True	Sometimes true	Not true
H1.	I felt miserable or unhappy	1 ☐	2 ☐	3 ☐
H2.	I have been having fun	1 ☐	2 ☐	3 ☐
H3.	I didn't enjoy anything at all	1 ☐	2 ☐	3 ☐
H4.	I felt so tired that I just sat around and did nothing	1 ☐	2 ☐	3 ☐
H5.	I was very restless	1 ☐	2 ☐	3 ☐
H6.	I felt I was no good any more	1 ☐	2 ☐	3 ☐
H7.	I cried a lot	1 ☐	2 ☐	3 ☐
H8.	I felt happy	1 ☐	2 ☐	3 ☐
H9.	I found it hard to think properly or concentrate	1 ☐	2 ☐	3 ☐
H10.	I hated myself	1 ☐	2 ☐	3 ☐
H11.	I enjoyed doing lots of things	1 ☐	2 ☐	3 ☐
H12.	I felt I was a bad person	1 ☐	2 ☐	3 ☐
H13.	I felt lonely	1 ☐	2 ☐	3 ☐
H14.	I thought nobody really loved me	1 ☐	2 ☐	3 ☐
H15.	I thought I could never be as good as other kids	1 ☐	2 ☐	3 ☐
H16.	I felt I did everything wrong	1 ☐	2 ☐	3 ☐
H17.	I have had a good time	1 ☐	2 ☐	3 ☐

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SECTION J: EATING PATTERNS

J1. a) During the **past year**, did you go on a diet to lose weight or keep from gaining weight?

Always on a diet 1 ☐ Often 2 ☐ Several times 3 ☐

A couple of times 4 ☐ Never 5 ☐ → **If never, go to J2 below**

b) How long did you stay on the diet(s)?

Less than a week 1 ☐ 1-3 weeks 2 ☐ 1-3 months 3 ☐ 3-6 months 4 ☐ 6-12 months 5 ☐

c) Did you lose weight on the diet(s)?

Yes, more than 10 pounds (more than 5 kilos) 1 ☐ Yes, 6-10 pounds (3-5 kilos) 2 ☐

Yes, 1-5 pounds (½-2½ kilos) 3 ☐ No 4 ☐ → **If no, go to J2 below**

d) Did you gain back any of the weight you lost on the diet?

No, did not regain any of the weight 1 ☐ Gained back a little of the weight 2 ☐ Gained back most of the weight 3 ☐ Put on more than I lost 4 ☐

J2. a) During the **past year**, how often did you do any exercise (going to the gym, brisk walking or any sports activity)?

5 or more times a week 1 ☐ 1-4 times a week 2 ☐ 1-3 times a month 3 ☐

less than once a month 4 ☐ never 5 ☐ → **If never, go to J3 on page 34**

b) Was it difficult for you to do your work or school work because of the amount of time that you were exercising?

Yes, sometimes 1 ☐ Yes, frequently 2 ☐ No 3 ☐

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J2. c) Did you exercise in order to lose weight or avoid gaining weight?

Yes, sometimes 1 ☐ Yes, frequently 2 ☐ No 3 ☐

If yes, go to J2d below **If no, go to J3 below**

d) Do you feel guilty after missing an exercise session?

Yes, sometimes 1 ☐ Yes, frequently 2 ☐ Do not miss any exercise sessions 3 ☐

J3. During the **past year**, how often did you fast (not eat for at least a day) to lose weight or avoid gaining weight?

Never 1 ☐ Less than once a month 2 ☐ 1-3 times a month 3 ☐

Once a week 4 ☐ 2 or more times a week 5 ☐

J4. During the **past year**, how often did you make yourself throw up (vomit) to lose weight or avoid gaining weight?

Never 1 ☐ Less than once a month 2 ☐ 1-3 times a month 3 ☐

Once a week 4 ☐ 2-6 times a week 5 ☐ Every day 6 ☐

J5. a) During the **past year**, did you take laxatives or other tablets or medicines (diet pills or water tablets) to lose weight or avoid gaining weight?

Yes, laxative 1 ☐ Yes, other 2 ☐ Never 3 ☐ → **If never, go to J6 on page 35**

If yes, go to J5b) on page 35

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J5. b) How often?

Never 1 ☐	Less than once a month 2 ☐	1-3 times a month 3 ☐
Once a week 4 ☐	2-6 times a week 5 ☐	Every day 6 ☐

J6. Sometimes people will go on an "eating binge", where they eat an amount of food that most people would consider to be **very** large, **in a short period of time**. During the **past year**, how often did you go on an eating binge?

Less than once a month 1 ☐	1-3 times a month 2 ☐	once a week 3 ☐
More than once a week 4 ☐	Never 5 ☐ → **If never, go to J9 on page 36**	

J7. These questions refer to when you were on a binge.

		Yes usually	Yes sometimes	No
a)	Did you feel out of control, like you couldn't stop eating even if you wanted to stop?	1 ☐	2 ☐	3 ☐
b)	Did you eat very fast or faster than you normally do?	1 ☐	2 ☐	3 ☐
c)	Did you eat until your stomach hurt or you felt sick to your stomach?	1 ☐	2 ☐	3 ☐
d)	Did you eat really large amounts of food when you didn't feel hungry?	1 ☐	2 ☐	3 ☐
e)	Did you eat by yourself because you did not want anyone to see how much you ate?	1 ☐	2 ☐	3 ☐
f)	Did you feel really bad about yourself or feel guilty after eating a lot of food?	1 ☐	2 ☐	3 ☐

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J8. a) In the **past year**, if there was a period of time when you went on eating binges **at least once a week**, how long did you do this altogether?

1 month 1 ☐ 2 months 2 ☐ 3 or more months 3 ☐

Didn't do this at least once a week 4 ☐ ⟶ **Go to J9 below**

b) **During that time**, did you do any of the following?

(i) exercise a lot to burn off the calories you had eaten during the eating binges?

Yes 1 ☐ No 2 ☐

(ii) use laxatives to keep from gaining weight?

Yes 1 ☐ No 2 ☐

(iii) make yourself throw up to keep from gaining weight?

Yes, monthly 1 ☐ Yes, weekly 2 ☐

Yes, 2 or more times a week 3 ☐ No 4 ☐

J9. Has anyone ever **told** you that they thought you had an eating disorder, such as anorexia nervosa or bulimia? (you **can** mark **more** than one answer)

a) No 1 ☐

b) Yes, a friend 1 ☐

c) Yes, a parent 1 ☐

d) Yes, a doctor, nurse, or other health care provider 1 ☐

J10. Have you ever been **treated** for an eating disorder by a doctor, nurse or other health care provider?

No 1 ☐ Yes, in the past 2 ☐ Yes, am being treated now 3 ☐

J11. Do you ever have strong cravings for food, or find food difficult to resist?

Never 1 ☐ Occasionally 2 ☐ Sometimes 3 ☐ Always 4 ☐

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Appendix IV – NFBC questionnaires

NFBC questionnaire

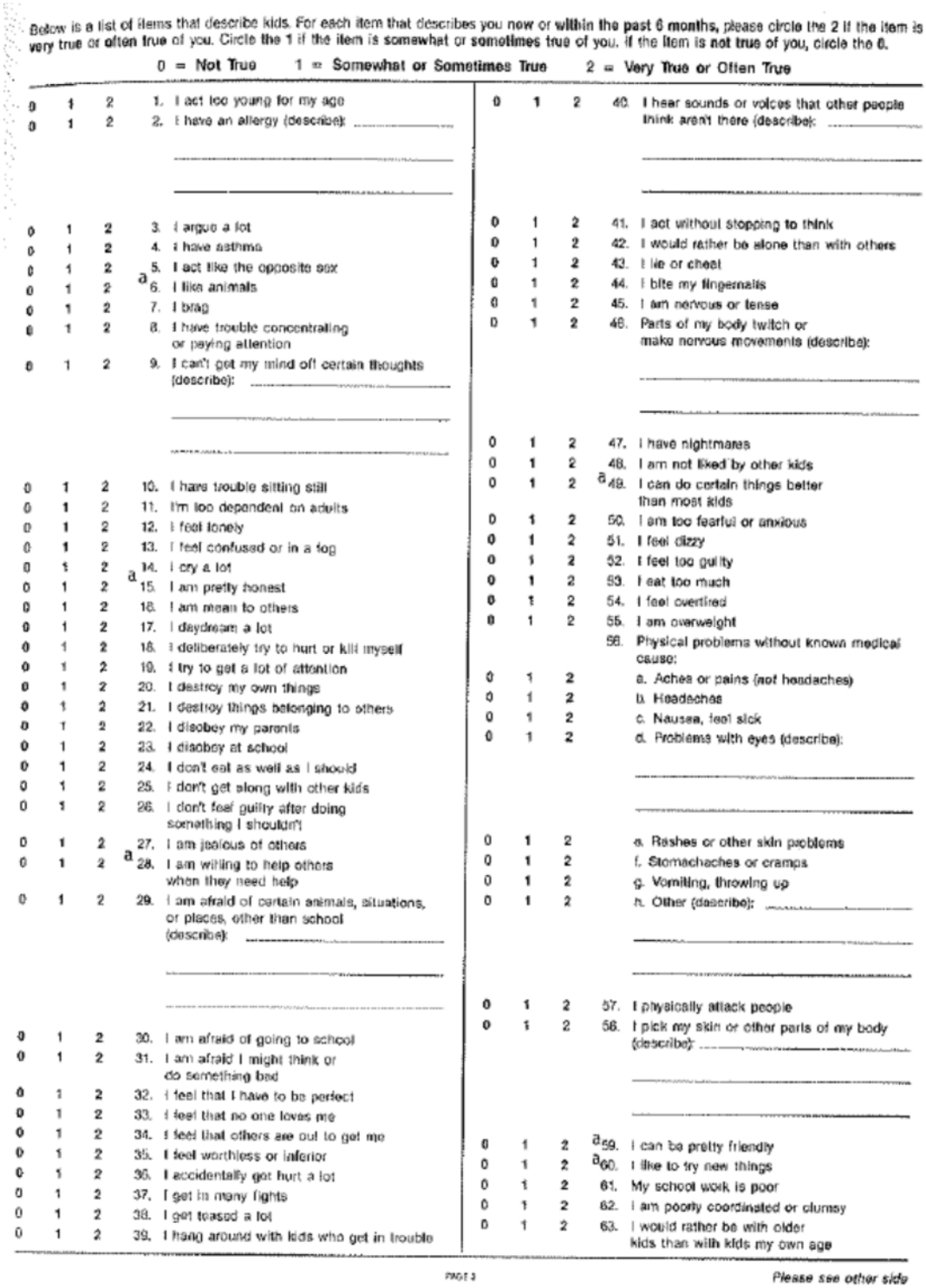
Description/question	Age	Coding/Measure
Gender		1=Male 2=Female
Weight	16	Kg
Height	16	Cm
Weight	16	Kg

Do you use some of the following to control your weight? Vomiting	16	1= Never 2=Occasionally 3=Often
Do you use some of the following to control your weight? Laxatives or other medicines/ slimming medication	16	1= Never 2=Occasionally 3=Often
Do you ever devour large amount of food?	16	1=no 2=yes
How often do you devour large amount of food?	16	1= I never devour food 2=hardly ever 3=occasionally 4= once a month 5=Once a week 6=2/3 times a week 7=daily
Do you smoke now?	16	1= Not at all 2=occasionally 3=one day a week 4= 2-4 days a week 5=5-6 days a week 6=7 days a week

Think back to the past 30 day. If you are a GIRL, how many times have you had four drinks or more in the same occasion?	16	1=never 2=1-2 times 3=3-5 times 4=6-9 times 5=10-19 times 6=20-39 times 7=40 times or more

Have you ever tried or used any of the following substances for intoxication? Medicines (sedatives, sleeping pills, pain killers without alcohol)	16	1=Never 2=Once 3=2-4 times 4=5 times or more 5=regularly
Have you ever tried or used any of the following substances? Alcohol and pills together	16	1=Never 2=Once 3=2-4 times 4=5 times or more 5=regularly

Have you ever tried or used any of the following substances? Ecstasy, heroin, cocaine, amphetamine, LSD or other similar drugs	16	1=Never 2=Once 3=2-4 times 4=5 times or more 5=regularly



Below is a list of items that describe kids. For each item that describes you now or **within the past 6 months**, please circle the 2 if the item is **very true** or **often true** of you. Circle the 1 if the item is **somewhat** or **sometimes** true of you. If the item is **not true** of you, circle the 0.

0 = **Not True** 1 = **Somewhat or Sometimes True** 2 = **Very True or Often True**

0 1 2 1. I act too young for my age
0 1 2 2. I have an allergy (describe): _____
0 1 2 3. I argue a lot
0 1 2 4. I have asthma
0 1 2 [a] 5. I act like the opposite sex
0 1 2 [a] 6. I like animals
0 1 2 7. I brag
0 1 2 8. I have trouble concentrating or paying attention
0 1 2 9. I can't get my mind off certain thoughts (describe): _____
0 1 2 10. I have trouble sitting still
0 1 2 11. I'm too dependent on adults
0 1 2 12. I feel lonely
0 1 2 13. I feel confused or in a fog
0 1 2 14. I cry a lot
0 1 2 [a] 15. I am pretty honest
0 1 2 16. I am mean to others
0 1 2 17. I daydream a lot
0 1 2 18. I deliberately try to hurt or kill myself
0 1 2 19. I try to get a lot of attention
0 1 2 20. I destroy my own things
0 1 2 21. I destroy things belonging to others
0 1 2 22. I disobey my parents
0 1 2 23. I disobey at school
0 1 2 24. I don't eat as well as I should
0 1 2 25. I don't get along with other kids
0 1 2 26. I don't feel guilty after doing something I shouldn't
0 1 2 27. I am jealous of others
0 1 2 [a] 28. I am willing to help others when they need help
0 1 2 29. I am afraid of certain animals, situations, or places, other than school (describe): _____
0 1 2 30. I am afraid of going to school
0 1 2 31. I am afraid I might think or do something bad
0 1 2 32. I feel that I have to be perfect
0 1 2 33. I feel that no one loves me
0 1 2 34. I feel that others are out to get me
0 1 2 35. I feel worthless or inferior
0 1 2 36. I accidentally get hurt a lot
0 1 2 37. I get in many fights
0 1 2 38. I get teased a lot
0 1 2 39. I hang around with kids who get in trouble
0 1 2 40. I hear sounds or voices that other people think aren't there (describe): _____
0 1 2 41. I act without stopping to think
0 1 2 42. I would rather be alone than with others
0 1 2 43. I lie or cheat
0 1 2 44. I bite my fingernails
0 1 2 45. I am nervous or tense
0 1 2 46. Parts of my body twitch or make nervous movements (describe):
0 1 2 47. I have nightmares
0 1 2 48. I am not liked by other kids
0 1 2 [a] 49. I can do certain things better than most kids
0 1 2 50. I am too fearful or anxious
0 1 2 51. I feel dizzy
0 1 2 52. I feel too guilty
0 1 2 53. I eat too much
0 1 2 54. I feel overtired
0 1 2 55. I am overweight
56. Physical problems without known medical cause:
0 1 2 a. Aches or pains (not headaches)
0 1 2 b. Headaches
0 1 2 c. Nausea, feel sick
0 1 2 d. Problems with eyes (describe):
0 1 2 e. Rashes or other skin problems
0 1 2 f. Stomachaches or cramps
0 1 2 g. Vomiting, throwing up
0 1 2 h. Other (describe): _____
0 1 2 57. I physically attack people
0 1 2 58. I pick my skin or other parts of my body (describe): _____
0 1 2 [a] 59. I can be pretty friendly
0 1 2 [a] 60. I like to try new things
0 1 2 61. My school work is poor
0 1 2 62. I am poorly coordinated or clumsy
0 1 2 63. I would rather be with older kids than with kids my own age

PAGE 2

Please see other side

Figure 1-2. Problem and socially desirable Items 1-63 of the YSR. Superscript *a* indicates socially desirable items.

0 = Not True 1 = Somewhat or Sometimes True 2 = Very True or Often True

0 1 2 64. I would rather be with younger kids than with kids my own age
0 1 2 65. I refuse to talk
0 1 2 66. I repeat certain actions over and over (describe): _____
0 1 2 67. I run away from home
0 1 2 68. I scream a lot
0 1 2 69. I am secretive or keep things to myself
0 1 2 70. I see things that other people think aren't there (describe): _____
0 1 2 71. I am self-conscious or easily embarrassed
0 1 2 72. I set fires
0 1 2 [a] 73. I can work well with my hands
0 1 2 74. I show off or clown
0 1 2 75. I am shy
0 1 2 76. I sleep less than most kids
0 1 2 77. I sleep more than most kids during day and/or night (describe): _____
0 1 2 [a] 78. I have a good imagination
0 1 2 79. I have a speech problem (describe): _____
0 1 2 [a] 80. I stand up for my rights
0 1 2 81. I steal at home
0 1 2 82. I steal from places other than home
0 1 2 83. I store up things I don't need (describe): _____
0 1 2 84. I do things other people think are strange (describe): _____
0 1 2 85. I have thoughts that other people would think are strange (describe): _____
0 1 2 86. I am stubborn
0 1 2 87. My moods or feelings change suddenly
0 1 2 [a] 88. I enjoy being with other people
0 1 2 89. I am suspicious
0 1 2 90. I swear or use dirty language
0 1 2 91. I think about killing myself
0 1 2 [a] 92. I like to make others laugh
0 1 2 93. I talk too much
0 1 2 94. I tease others a lot
0 1 2 95. I have a hot temper
0 1 2 96. I think about sex too much
0 1 2 97. I threaten to hurt people
0 1 2 [a] 98. I like to help others
0 1 2 99. I am too concerned about being neat or clean
0 1 2 100. I have trouble sleeping (describe): _____
0 1 2 101. I cut classes or skip school
0 1 2 102. I don't have much energy
0 1 2 103. I am unhappy, sad, or depressed
0 1 2 104. I am louder than other kids
0 1 2 105. I use alcohol or drugs for nonmedical purposes (describe): _____
0 1 2 [a] 106. I try to be fair to others
0 1 2 [a] 107. I enjoy a good joke
0 1 2 [a] 108. I like to take life easy
0 1 2 [a] 109. I try to help other people when I can
0 1 2 110. I wish I were of the opposite sex
0 1 2 111. I keep from getting involved with others
0 1 2 112. I worry a lot

Please write down anything else that describes your feelings, behavior, or interests