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RESEARCH REPORT
MASTERS IN PUBLIC HEALTH

School of Public Health
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Title

The relationship between weight stigma, body image, self-esteem, risk of disordered eating, and weight loss behaviours in adolescents from the Birth to Twenty cohort: Soweto-Johannesburg

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19 October 2018

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A research report submitted to the School of Public Health, University of the Witwatersrand in partial fulfillment of the requirements for the degree of Master of Public Health.
19 October 2018

Declaration

I, Preethi Mistri, declare that this research report is my original work. It is submitted in partial fulfillment of the requirements for the degree of Master of Public Health, in the field of Social and Behavior Change Communication, at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination to this or any other university.



19 October 2018

Abstract

Introduction: Overweight and obese adolescents are at risk of weight related stigmatization, which has been associated with unhealthy weight loss behaviours, and adverse psychosocial factors including poor body image, low self-esteem and the risk of disordered eating. Obesity in childhood increases the risk for adult obesity and the risk of related physical (cardiovascular diseases, diabetes, cancers) and psychosocial (poor body image, low self-esteem, depression and unhealthy weight loss behaviours) morbidity and mortality, which have been found to track from childhood to adulthood. Adolescent obesity is a growing public health concern in South Africa where a National strategy to address this concern has been formulated. Research examining weight related stigmatization in adolescent obesity while prolific in high-income countries has been minimal in South Africa. The study aimed to examine the relationship between weight stigma, body image, self-esteem, risk of disordered eating and weight loss behaviours in urban adolescents aged 13 from the Birth to Twenty cohort in Soweto-Johannesburg.

Methods: A secondary data analysis was conducted of data from an urban sample of boys and girls from the Birth to Twenty cohort in Soweto-Johannesburg at 13 years of age. Measures from the 13-year questionnaire used included questions on weight loss attempts, reasons and methods together with weight stigma (Beliefs About Obese Persons (BAOP) and a disability rating task), body image (body-esteem scale), Rosenberg Self-Esteem scale, EAT26 (disordered eating risk) measures and body mass index. Some socio-demographic characteristics of participants collected at enrolment into the study were also included. Bivariate and multivariate analyses were conducted to test for associations between the outcome measure (weight loss) and socio-demographic characteristics and weight stigma, body image, self-esteem and disordered eating risk.

Results: High weight stigma was significantly associated with weight loss attempts in girls (aOR 20.1, 95% CI 4.3-94.0, p<0001). Overweight and obese girls were significantly more likely to have attempted weight loss as compared to the reference group (aOR 5.5, 95% CI 1.2-8.5, p<0.001) and (aOR 12.9, 95% CI 4.7-9.0, p<0.001). Poor body image in girls was significantly associated with weight loss (aOR0.4, 95% CI 0.2-0.9, p=0.036). Furthermore, girls who had attempted weight loss were 2.5 times more likely to be at risk for disordered eating (aOR 2.5, 95% CI 1.4-4.5, p=0.002). High socio-economic status in girls was significantly associated with weight loss attempts (aOR 2, 95% CI 1.0-3.9, p=0.040).

No significant associations were found for weight stigma and body image in relation to weight loss for boys. Overweight and obese boys were about 11 and 13 times more likely to have attempted weight loss compared to those in the normal or underweight category (aOR 10.9, 95% CI 6.0-19.7, p<0.000 and aOR 13.4, 95% CI 5.5-32.5, p<0.001). Weight loss was more likely to have been attempted by 90% of boys with low self-esteem (aOR 0.9, 95% CI 0.9-1.0, p<0.047).

More girls than boys tried to lose weight (20.5% and 13.1% respectively). Primary reasons for weight loss were to look better (about 27.5% and 28.7% of boys and girls respectively) and their clothes were too tight (20.2% of girls and13.7% of boys). More boys (19.6%) than girls (12.9%) wanted to lose weight as they saw themselves as too fat compared to friends. More boys than girls tried to lose weigh to be healthy (16.7% and 14.6% respectively). Exercise for weight loss was the primary method chosen (74.2% boys and 49.4% of girls). Dietary restriction (eating less, skipping meals or eating one meal per day) was the favoured weight loss method by more girls (25%) than boys (17.8%).

Conclusion: This analysis found an association between weight loss behaviours and weight stigma, body image and risk for disordered eating in girls even while adjusting for BMI. The only associations with weight loss behaviours found in boys, were for BMI and self-esteem. The findings highlight the need for further investigation into weight stigma as internalised and overtly experienced and the association with unhealthy weight loss behaviours in adolescents.

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Nomenclature

BAOP	Beliefs About Obese Persons
BAOPS	Beliefs About Obese Persons Scale
BMI	Body Mass Index
Bt20	Birth to Twenty
DWCB	Disordered weight control behaviour
EAT Study	Eating Amongst Teens study
EAT26	Eating attitudes test
HIV / AIDS	Human Immunodeficiency Virus / Acquired Immune Deficiency Syndrome
IOTF	International Obesity Task Force
SANHANES	South African National Health and Nutrition Examination Survey
TB	Tuberculosis

Chapter 1: Introduction

1.1 Background

Childhood obesity has been recognized as a significant public health issue globally (1). The increase in childhood obesity prevalence while higher in high-income countries has also increased dramatically in middle and low-income countries with 2013 prevalence rates reported as 13.4% and 12.9% for girls and boys respectively (1). In 2012, the South African Nutrition and Health Examination Survey (SANHANES) estimated that the prevalence of overweight and obesity in adolescent girls between the ages of 10 and 14 was 16.7% and 5.6% respectively. In adolescent boys of the same age, the prevalence of overweight and obesity in boys was lower at 7.5% and 2.7% respectively (2).

Childhood obesity may develop into adult obesity (3-5). The risk of obesity in childhood becoming adult obesity is potentiated with increasing severity of childhood obesity, the age of the child (obesity in later adolescence is more likely to become adult obesity) and if their parents are obese (3). Evidence of the adverse physical and psychosocial outcomes of obesity during adolescence and those that persist into adulthood has been well documented (3, 5-15). Physical outcomes may include increased morbidity from cardiovascular diseases, diabetes and cancers and risk of premature mortality (3, 5, 15). Psychosocial and emotional distress have been shown to be linked to maladjusted coping mechanisms which may include increased appetite and eating to alleviate low mood (3). Furthermore, stress and depression have been shown to be associated with unhealthy eating behaviours and risk of childhood obesity (3, 7-14).

Being overweight during adolescence has been associated with greater body dissatisfaction, lower self-esteem, depression, binge eating and higher levels of weight loss behaviours like dieting (6-14). Body size and negative body image have also been found to be associated with physical inactivity (14, 16, 17). The 2012 SANHANES survey found that 17% of adolescents perceived their body mass index (BMI) to be higher than their perception of an ideal BMI and 68% of girls thought that they were fat compared to 55% of boys (2). In the same study, 15% of children had tried to gain weight and about 14% had tried to lose weight in the previous year (2).

Attributions towards perceived body image may also result in weight related stigma, which may be internalised and or overtly experienced (17-19). Weight-related stigma, has been described as negative perceptions of obese individuals related to the belief that obesity is under the obese person's control and that they are fully responsible for it (20, 21). This can be directed at the self resulting in a poor body image, or towards others which can lead to judgemental and discriminatory attitudes and behaviours (17, 22). While there is a need to address rising obesity among children and adolescents there is a risk that the focus on body size alone may lead to harmful weight loss behaviours (13, 23, 24).

Interventions for overweight and obesity may inadvertently reinforce stigmatizing notions through an emphasis on behaviour change related mostly to diet and physical activity (21, 25) thus redirecting blame back to the individual (25). The psychosocial manifestations of childhood obesity, stigma and self worth may lead to harmful weight loss behaviours (17, 22, 26). Studies from high-income countries indicate an association between weight loss behaviours in early adolescence and significant weight gain or disordered eating over time (9).

1.2 Literature Review

In this literature review, studies of weight loss behaviours, determinants of obesity and weight stigma among adolescents have been identified through an extensive literature search. Studies using different methods were sourced. The following search terms were used to search the databases (Pubmed, Google Scholar and Psychnet): "*determinants" AND "childhood obesity", childhood OR adolescent obesity, weight control, beliefs about obese persons, weight stigma, weight bias, weight victimization, weight bias internalization, body image, body dissatisfaction, self-esteem, disordered eating and eating disorder.*

1.2.1 Transition in Childhood and Adolescent Obesity

South Africa has undergone an epidemiological transition from a higher burden of infectious to more lifestyle related diseases which has been inextricably linked to the political transition of the country and socio-political legacy of Apartheid policies (27). This transition has been characterized by increasing industrialization, urbanization with a rapidly changing socio-economic climate, increasing medical coverage, and changing lifestyles and behaviours (28). Evolving public health concerns include a rise in obesity, which is a risk factor for non-communicable diseases (like diabetes,

cardiovascular disease, and cancer amongst others) alongside communicable diseases (like HIV/ AIDS and TB) (2, 28, 29).

Determinants of obesity, including childhood obesity are multifactorial involving the interplay between environmental factors, genetic predisposition (3, 30, 31) and socio-cultural influences including from school, family and community (3). Environmental factors related to shifting dietary patterns and reduced physical activity, hallmarks of the nutrition transition (32), are also evident in South Africa (2). Increased consumption of energy (calories) through high sugar and fat foods including fast foods, sugar sweetened beverages and snacks of increasing portion sizes have been postulated as environmental contributors to overweight and obesity in children (3). Dietary intake in South Africa is shifting from traditional diets to more 'western' diets and foods high in refined carbohydrates, sugar, salt and fat, and low in fibre, fruits and vegetables (2).

Socio-cultural influences include beliefs and cultural ideals related to body image (14) which are related to an individual's level of body dissatisfaction (22). A greater variety of body sizes have been noted to be acceptable amongst African American girls (22) and boys (33), however these findings have not been definitive (22). It is thought that variable levels of weight acceptance amongst different ethnicities from studies in high-income countries may be related to the changing social norms across cultures (22). In South African studies being overweight has been viewed positively as being associated with aspects of social, emotional, physical, financial well-being (34) beauty and respect (35). Additionally, body image preferences between South African mother and daughter pairs were found to resemble each other with those from Black ethnic backgrounds finding a larger body size more acceptable, while in White and Coloured pairs leanness was found to be attractive and associated with health (35). There are some indications that body image preferences may be changing amongst Black females in South Africa (36, 37). Increased cross cultural integration and weight and body image related content via various media channels have been implicated as potential vehicles for the diffusion of weight related social norms across diverse ethnicities (22).

An increase in surplus body fat is present in overweight and obesity and is commonly measured using a body mass index (BMI) (29). Anthropometric measures of weight and height are used to calculate the proportion of mass to height in BMI. Underweight, normal weight, overweight and obesity are categorized according to

BMI and this has been largely accepted as the normative measure for children aged two and above used in scientific settings (3). BMI changes significantly throughout childhood (38). Therefore Cole et al (2000), developed internationally comparable definitions of childhood overweight and obesity pooling national data from six countries and developing cut off points for overweight and obesity (38). These cut off points take into account age and sex for children 2-18 years and are linked to adult cut offs for overweight and obesity using BMI (25 and 30 kg/m^2 respectively) (38).

Adolescence is a critical transitional stage in development with physical puberty related changes and also psychosocial changes including identity development and the progression of social interactions like friendships and romantic partnerships (14). These changes during this life stage increase the vulnerability that children have to risk behaviours, including unhealthy weight loss behaviours (39). Adolescents who perceive themselves as overweight or obese and also those who are overweight or obese are more susceptible to engaging in health risk behaviours and maladaptive coping (39). Research in high-income countries indicates that being overweight in adolescence is associated with greater body dissatisfaction, low self-esteem, depression, binge eating and higher levels of weight loss behaviours like dieting (6) and that these issues are further influenced by weight related stigmatization (17).

1.2.2 Weight Control Behaviours

Weight loss behaviours include those actions designed to reduce body weight and or size and may include dietary strategies, physical activity and the use of supplements (40). In a large population based US study, the EAT (Eating Amongst Teens) study assessing weight-related behaviours in adolescents, weight loss behaviours were categorised as **healthy** (exercised, ate more vegetables and fruits and less high fat foods), **unhealthy** (skipping meals, fasting, reducing food intake, smoking cigarettes) and **extreme** (self-induced vomiting, extreme exercising, using diet pills, laxatives and diuretics) (23). Unhealthy and extreme behaviours have also been described as disordered weight control behaviours (DWCB) when these actions become harmful and have adverse health effects or put an individual at risk for adverse health effects (40).

Discordance between objective weight status and self-perceived weight status has been shown to play a role in weight loss attempts (41). Results from a longitudinal national study conducted in the US demonstrated that adolescents with self-

perceptions of being overweight gained more weight and that weight loss attempts mediated 27% the weight gain (41). Additionally, weight related concerns linked to body dissatisfaction have been associated with weight loss attempts and disordered eating (14, 42). Internalised weight stigma has also been associated with DWCB, poor body image and health related quality of life (43).

Studies from high-income countries indicate an association between DWCB in early adolescence to significant weight gain or disordered eating over time (9). In the EAT study, a 2002 cross sectional examination showed that unhealthy and extreme weight loss behaviours were associated with obese adolescents particularly girls (23). Findings from a 10-year longitudinal analysis of the EAT study, indicate that the prevalence of disordered eating behaviours in young adulthood were a continuation of the same behaviours in adolescence (10). Additionally the weight loss behaviours used by adolescents, both those that were disordered and those recommended for weight management, did not predict weight loss, though the latter were not related to weight gain (9).

1.2.3 Weight Stigma

Weight stigma has been defined as “negative weight-related attitudes and beliefs that are manifested by stereotypes, bias, rejection and prejudice toward children and adolescents because they are overweight or obese” ((17), p 558). Stereotypes about overweight and obese individuals typically documented in the literature include that they are lazy, lack willpower or self-discipline, tend to overeat, are unintelligent or unsuccessful (17) lack social skills and are unattractive (44).

These stereotypes may lead to the internalization of weight stigma and weight based discrimination, which can manifest in aspects of life at home, at work, at school, health facilities, mass media and interpersonal relationships amongst others (17). It is thought that the pervasiveness of weight stigma in high-income countries is related to the extension of weight stigma amongst overweight and obese individuals themselves (19). While other stigmatized groups have demonstrated favour of in-group members, obese individuals may internalize stereotypes against other overweight or obese adults (18, 19) and this has also been reported to be true for children (17).

In a US study of adult White women belonging to a weight loss organisation, it was found that internalisation of weight stigma was associated with unhealthy eating behaviours like binge eating (19). As a result of internalised weight stigma, these individuals were also less likely to diet and be less motivated to lose weight (19). A Spanish study involving males and females between 12-28 years of age revealed that a strong belief in the internal locus of control of obesity correlated significantly with dietary restraint (limiting food intake to control weight (45)) and perceptions of being overweight (46). Additionally, it has been reported that women at risk of disordered eating had poorer attitudes towards obese people (46). Negative stereotypes of obesity were also perpetuated amongst children when they believed obesity to be under an individual's control (17). Internalised weight stigma has been reported to be associated with unhealthy eating behaviours, avoidance of physical activity (47) and increase children's vulnerability to psychosocial consequences like maladaptive coping, low self-esteem and unhealthy eating and weight loss behaviours (17).

Weight stigma has been noted in a variety of groups including teachers, healthcare personnel, family and employers amongst others (19). In obese youth *the experience* of weight related stigmatization has consequences on psychosocial health, physical health and derivatives of both (17), Self-esteem and self-concept have been shown in obese children to be further influenced by weight-based teasing by peers and weight related criticism from parents (17). Additionally stigmatized obese children have reported lower quality of life, more symptoms of loneliness, and being less likely to spend time with friends (44). Weight-based stigmatization increases the risk of depression and suicidal ideation ('thoughts of engaging in behavior intended to end one's life' (48), p 2) in overweight and obese adolescents (17).

Weight stigma has also been shown to be instrumental in the development of poor body image in adolescents which may cascade to disordered eating and unhealthy weight loss behaviours (22). Weight teasing of overweight adolescents has been associated with feelings of inadequate physical capability and competency (16). Stigmatised overweight and obese youth have been found to avoid physical activity (14, 17) and develop negative views on sport when weight criticism occurred during physical activity (17). Additionally biological pathways associated with weight stigma-induced stress may contribute to obesity through the release of the hormone cortisol, which enhances storage of fat (39).

In a qualitative study examining perceptions of body size and weight loss in South Africa, weight based stigmatization was evident in one response on the perceived attitude that would be directed by the community towards women trying to *lose* weight (49) while in other research a thin body image was associated with stigma related to being ill with HIV or Tuberculosis (50). Perceptions regarding weight and body image also differ multi-culturally and within different ethnicities in South Africa (51). In the Birth to Twenty cohort at age 17 appraising female body silhouettes, respondents associated the obese silhouette with the 'worst', 'unhappiest' and with 'less respect' while also attributing 'clumsy' (more girls than boys) and 'strongest' (more boys than girls) to the obese figure (52).

Reports from rural boys and girls in a Mpumalanga study were mixed as the majority associated "being the worst, having more respect, having less respect, being the strongest, and being the happiest" with the overweight and obese silhouettes (53). Both boys and girls ascribed weakness and unhappiness to underweight silhouettes, with girls also considering underweight to be clumsy, while normal silhouettes were seen to be the best by girls (53). These silhouettes have been validated for use in assessing body image satisfaction (53) and not weight stigma per se but had attributes that seemed to describe perceptions towards weight and shape. There is a paucity of data in South Africa on the association of weight stigma with unhealthy weight loss attempts in overweight and obese adolescents.

1.2.4 Body-Image

During adolescence, the interplay of a host of socio-cultural factors together with changes in physical and psychological states also bring a heightened awareness of body image to children in this stage of development (14). Body image has been described as being multifaceted, encompassing perceptions and feelings about one's body and including actions taken towards one's body (14). A range of healthy and unhealthy perceptions of body image can be seen as being on a continuum with positive and accurate perceptions on one end and inaccurate negative perceptions on the other (14). Dissatisfaction with their bodies and weight concerns have been associated with the initiation of restrictive and disordered eating in adolescents (54). Furthermore, obesity and physical inactivity have been consistently associated with unhealthy body image which further influences unhealthy weight loss behaviour (14).

Being overweight or obese in adolescence is strongly related to body image and intensification of weight-related concerns (14). Concerns about weight and body dissatisfaction are related in a complex interplay with other psychological factors like self-esteem and depression (14). Further, beliefs and cultural ideals related to body image are very much influenced by significant others in the immediate environment experienced by adolescents, which could include family, peers, educators and romantic partners amongst others (14). This may make them vulnerable to the sway of peers or friends through discussion and criticism about appearance (14). The degree to which these ideals regarding body image are adopted by individuals is referred to as internalization (14). Studies have consistently shown the association between internalization and body dissatisfaction in adolescents, especially in girls (14).

Racial and sex differences in weight related concerns and behaviours examined in the EAT study found that compared to White peers, while there was a higher prevalence of obesity amongst Black American girls they also scored higher on body satisfaction (55). Additionally, high obesity prevalence was observed in Hispanic and Native American obese girls together with lower body satisfaction and higher occurrence of unhealthy weight loss behaviours (55). The lowest obesity prevalence was seen in Asian American girls many of whom reported DWCB and body dissatisfaction (55). A different pattern was observed in boys with a higher prevalence of weight-related concerns and unhealthy weight loss behaviours amongst Asian and African Americans while obesity prevalence was highest in Native Americans followed by Hispanics (55). Higher risk was found for disordered eating amongst non-White boys as compared to White peers (55). Ethnic specific norms and or social influences may play a significant role in body satisfaction (55).

Research conducted in South Africa prior to the SANHANES to understand perception of body image and body dissatisfaction in females (35-37, 50, 51, 56-58), suggests that these are complex issues. In a study of Black adolescent girls in Cape Town the majority of overweight girls perceived their weight as normal (37). Furthermore, most of the girls in the study viewed both thinness and fatness positively (37). Ethnic differences in body size and image of adolescent girls in South Africa have been demonstrated in some studies; Black girls and young adults generally perceive a larger body image as more favourable than White and Coloured girls (35-37). Black university students in Cape Town had a lower prevalence body dissatisfaction and overestimation of weight than comparative White groups (59). A

more recent study in Mpumalanga of rural teenagers 11-15 years old, further demonstrated the complexity of body image amongst adolescents in South Africa (53). This study found that only 16.5% of girls were satisfied with their body weight with the majority wanting to be thinner (58%) and 25.5% wanting to be fatter (53). Those wanting to be thinner tended to have a lower BMI and those wanting to be fatter a higher BMI (53).

Other studies have shown that dissatisfaction with body image and perceptions of slimmer body images as more desirable amongst some Black adolescents is emerging at the same time (35-37). There are indications that influence from 'western' culture and media, which emphasizes thinness, may be altering perceptions of body image of females in South Africa through the acculturation of these norms (51). Negative body images may be perpetuated when the ideal thinness is felt to be unachievable (51). Given South Africa's colonial and apartheid legacy, it may be that particularly Black youth here may be influenced by American culture and social learning through remote (geographically removed) acculturation with media being the potential vehicle (60).

1.2.5 Self-Esteem

Psychological risk factors related to emotional well-being in adolescents, namely low self-esteem and depression have also been associated with weight loss attempts, specifically restrictive and disordered eating (6, 54). Longitudinal findings from the EAT study found greater body dissatisfaction and lower self-esteem amongst overweight participants of both sexes at baseline as compared to normal weight (61). Being overweight continued to affect emotional well-being in this way over the five year period and did not seem to be resolved in the normal developmental process but rather persisted into young adulthood. For males, this included an increase in depressive mood amongst overweight participants between early and mid-adolescence (61).

A 2001 UK study examining body mass, weight loss behaviour and emotional well-being in adolescents found that self-esteem was significantly lower in obese compared to normal weight boys but was not related to BMI in girls (6). However, in the same study lower self-esteem was seen in obese Bangladeshi girls and higher self-esteem associated with obesity in Black African girls while no association was seen for obese Black British, Black Caribbean and White British girls (6). In boys

being overweight or obese reduced self-esteem in Bangladeshi and White British adolescents but not Black Caribbean or Black British boys (6). A 2006 South African study on eating attitudes and behaviours in adolescents and young adults (14-24 years) found that while race differences were not evident in those at high risk for disordered eating, weight and self-esteem were significantly associated and this association was significantly stronger in girls than boys (57).

A recent systematic review examining associations related to internalisation of weight stigma, found that self-esteem was significantly associated with weight stigma internalisation (43). In adults, this association was found to be independent of BMI while the same was not reported for youth (43). However, overt experiences of weight-related teasing and criticism by peers, parents and family have been shown to influence self-esteem and self-concept (14, 17). In adolescence complex interactions of psychological factors including self-esteem play a relational role in body dissatisfaction, weight related concerns, weight control behaviour and disordered eating (14).

1.2.6 Disordered Eating

The vulnerability of adolescents who perceive themselves as overweight or obese and those who are overweight or obese to engaging in unhealthy weight loss behaviours (39) has already been stated. A recent meta-analysis indicated that binge eating or loss of control eating was prevalent in more than a quarter of children who were overweight or obese (62). Analysis from a 10 year longitudinal study from the EAT project found that adolescents who dieted and had unhealthy weight loss behaviours had greater BMI at baseline and had greater BMI increases at the last follow up than adolescents who did not diet or engage in unhealthy weight loss practices (11). Children who were already overweight at baseline with unhealthy behaviours of were particularly worrying especially overweight girls whose BMI increased by 5.2 units over the 10 year follow up (11). Particular behaviours that predicted larger BMI increments at the last follow up for both females and males were skipping meals and stating very restricted dietary intake (11). The use of food substitutes in males and diet pills in females were other predictors of large BMI increases (11).

Psychological risk factors which include low self-esteem, depressive mood, low body satisfaction and weight related concerns have been found to be amongst a host of

risk factors for the development of an eating disorder during adolescence (54). Other risk factors are familial and social and include, inter alia, encouragement from parents to diet, dieting of peers and weight related teasing (54). Internalization of body image ideals that may form part of familial and social factors may be advanced through comparisons, judging, teasing and possibly social conflict and or exclusion and may further promote unhealthy weight loss behaviours (14).

The risk of disordered eating amongst South African adolescents was found to be similar across ethnicities (36, 57) and particularly more prevalent amongst girls (57). While eating disorders amongst the White population in South Africa had been diagnosed from the early 70's, the first eating disorder in a Black adolescent female was diagnosed in 1993 (63). Black female students in the Western Cape displayed similar prevalence of dietary restraint and risk for disordered eating as comparative White groups, however this was more prevalent amongst those with urban versus rural origins (59). Szabo and Allwood (2004) found the comparative prevalence of the risk of eating disorder between Black and White adolescent girls at a Cape Town private school (private schools were deemed at the time to be dominated by 'western' values) to be almost identical (63).

A 2011 Bloemfontein study examining the age of onset of disordered eating amongst Black and White girls from a "middle class" school, found an increase in behaviours associated with bulimia in Black but not White girls between 13-14 years, however, no reported increases in body dissatisfaction or drive for thinness were seen in Black girls (64). White girls in this study had increased risk in all the measures of disordered eating behaviours and attitudes between 16-17 years (64). A more recent paper reporting results from the aforementioned Mpumalanga study of rural 11-15 year old girls and boys found the risk of disordered eating to be between 7.1-10.6% with no significant differences between boys and girls but a higher prevalence in the early pubertal stage (53).

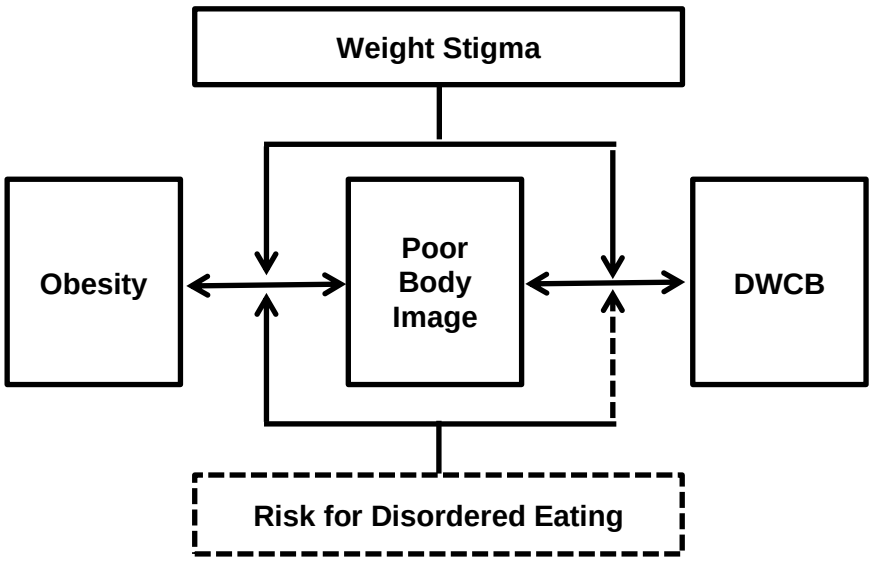
In a study of ethnically mixed adolescents in five Western Cape schools, qualitative investigation regarding disordered eating risk identified amongst impoverished Black adolescents revealed that responses to instruments measuring risk for eating pathology may have a different meaning to historical interpretations (65). In this qualitative analysis, preoccupation with food was associated with food insecurity rather than risk of eating pathology (65). Similarly, reported purging behaviours were related to ritual cleansing practices (65). While the number of participants was very

small, responses highlighted a need to assess the instruments used to measure risk of disordered eating for cultural sensitivity, and to apply caution to the interpretation of results in the absence of qualitative investigation when conducting cross-cultural research (65).

1.2.7 Conceptual Framework

Figure 1 represents a conceptual framework adapted to demonstrate the relationships between weight stigma, body image, risk for disordered eating and DWCB. This framework is adapted from Farhat (2015) and has theoretical underpinnings from social psychology, adolescent development and behavioural neurosciences (39). It shows the relationships between weight stigma in overweight and obesity, body image, stress and risk behaviours like DWCB and the pathways between these factors. Farhat's (2015) framework suggests that weight related stigma and discrimination impacts risk behaviour by affecting body image and stress but that these associations may be moderated by the adolescents' social networks and social context (39). The framework was adapted by removing stress, social networks and social context as these relationships were not explored in this study and adding risk for disordered eating. The framework as adapted may fit well to represent the associations between obesity, weight stigma, body image, risk for disordered eating and DWCB in the South African context, which is in transition (27, 66) and appears to face public health concerns regarding obesity that are similar to high-income countries (1).

Figure 1 Conceptual Framework showing the relationships between weight stigma, obesity, body image, disordered eating risk and DWCB



1.3 Problem Statement

In South Africa, an analysis of the Birth to Twenty cohort at 13 years and 17 years, found that at 13 years 39.5% of girls and 37% of boys engaged in unhealthy weight loss behaviours (52). In this same analysis, in an appraisal of female body silhouettes, the cohort at 17 years associated the obese silhouette with the 'worst', 'unhappiest' and with 'less respect' while also attributing 'clumsy' (more girls than boys) and 'strongest' (more boys than girls) to the obese figure (52).

Such perceptions of body image are multi-factorial. South African adolescents' perceptions about body image may be increasingly influenced by 'western' ideals of thinness (36, 37, 51, 57, 66). Physical and psychological changes occurring during adolescence increase children's awareness of their body size and shape, and of the perception of others (16). Weight related stigmatization could put adolescents at risk of weight loss attempts and subsequent engagement in unhealthy weight loss behaviours (17, 22).

1.4 Justification

While a significant amount of research into weight stigma and health outcomes has been conducted in high-income countries (67, 68), there is limited research examining weight stigmatization in childhood and adolescents in South Africa and the relationship to weight loss behaviours. Examining the relationship between weight loss attempts and weight stigma, body image, self-esteem and disordered eating risk will help to provide insight as to whether weight based stigmatization should be more closely examined as a significant factor associated with unhealthy weight loss behaviours in South African adolescents.

1.5 Research Question, Aim and Objectives

Is there a relationship between weight stigma, body image, self-esteem, risk of disordered eating and weight loss behaviour in 13-year-old urban adolescents?

Aim

To examine the relationship between weight stigma, body image, self-esteem, risk of disordered eating and weight loss behaviours in urban adolescents aged 13 from the Birth to Twenty cohort in Soweto-Johannesburg.

Objectives

1. To describe perceptions of weight stigma, body image, self-esteem and eating attitudes (risk of disordered eating) in urban adolescent boys and girls aged 13.
2. To describe BMI, and weight loss behaviours in urban adolescent boys and girls aged 13.
3. To determine the association between weight stigma, body image, self-esteem, disordered eating and weight loss behaviour taking into account BMI in urban adolescent boys and girls aged 13.

2 Chapter 2: Methodology

2.1 Study Design

The primary study is a birth cohort study known as the Birth to Twenty Plus (Bt20) study. The cohort study was established in 1990 to investigate the effects of the rapidly occurring urbanisation and social and political transition at the time in order to inform future health interventions (69). This was a prospective birth cohort study design initially with a follow up of 10 years which was extended to 20 years (69) and now beyond.

The secondary data analysis presented for this report, examined data collected in the Bt20 when the children were at age 13 years in 2004. The secondary data analysis is cross-sectional in nature (70) as the focal independent variable weight stigma was measured at the same time as the weight change behaviour. Some demographic characteristics were measured at enrolment into the study.

2.2 Study Site

Soweto is an urban township in Johannesburg inhabited by just less than 1,3 million people of which about 25% between 0-14 years old (71). There are over 355 000 homes of which 55% have running water, 93% have electricity and about 92% with flush toilets (71). People living here are predominantly Black African (98.5%) and mostly isiZulu speaking (37.1%) (71). Just less than 40% of people in Soweto have attained Matric and 9.3% have had tertiary education (71). About 19% of people here have no income, while about 36% earn between R19 000 and R76 000 per annum (71).

2.3 Study Population

The study population for the primary study was all singleton children resident in Soweto-Johannesburg for at least 6 months after birth. All Infants meeting the selection criteria who were born within the seven week enrolment period in 1990 were eligible for inclusion in the primary study (69). A total of 3273 children were enrolled. Specific to the secondary data analysis, the population includes all children aged 13 in the Bt20 cohort, who were resident in Soweto, and who presented, completed a questionnaire and had their height and weight measured at their annual follow up at the study site.

2.4 Study sample

For the primary study a total of 3273 children were enrolled at birth. Significant attrition of the cohort occurred during the first two years of the study with reasons for this being due to movement of subjects out of the study area and due to maternal or child death (72). Movement of the mother and or the child continued to impact the cohort attrition both within and out of the study area for the next decade with difficulty in being able to contact the subjects further adding to the loss (72). For the data collection that occurred at the age of 13 years, the sample included 1675 adolescents boys (n=796) and girls (n=879). All participants with complete data on the key variables of interest (weight change behaviour and weight stigma) were included in the secondary data analysis. The sample size has 97% power to detect a 10% difference in weight change behaviour and weight stigma among boys and girls in the study.

2.5 Data Collection

Investigations and interviews were conducted at the Bt20 offices at the Chris Hani Baragwanath Academic Hospital (73). Collection of data presented in this research report was completed at the participants' annual visit at age 13 (73). A socio-demographic questionnaire was used to collect demographic, household and socioeconomic information at entry into the study and socioeconomic circumstances were also collected at 13 years (69). Research assistants were recruited from the same community as the study population at inception and some had remained with the study beyond the 13 year data collection (69). These research assistants were trained not only on how to conduct the questionnaire, but also in Good Clinical Practice and ethical research conduct (69). Data collected by research assistants at the age of 13 years were done using a piloted questionnaire (personal

correspondence). This 21 page long questionnaire included 22 sections which included the scales used in this analysis described in more detail below and anthropometric data (height and weight were measured) (52). Additionally, information on which caregiver the child lived with was collected using the questionnaire administered by the research assistants. Interviews were conducted with the 13-year-old adolescent and the primary caregiver and included tests or tools to measure weight stigma (measured using the beliefs about obese persons scale - BAOPS), body image (measured using the body-esteem scale), self-esteem, disability rating, weight loss behaviours and some additional components not pertinent to this investigation.

Sections of the questionnaire not used in this analysis investigated community connectedness; physical activity; school grade; life events; religious practice; tobacco, alcohol and drug use; violence; sexual knowledge and experience; friends; HIV/ AIDS; acculturation; dietary intake; pubertal assessment; bone mineral density and urinary and plasma biomarkers. The questionnaires were in English which was the primary language used in the Bt20 study, however, during the pilot process, a version of the questionnaire was created in a vernacular language for the interviewers to use to explain concepts (personal correspondence). These tools are shown in Appendix E page 59-65 of this report.

2.6 Measurement and transformation of variables

Outcome measure:

Weight Loss Behaviour: Weight loss behaviours were also determined in the participants through questions on efforts made to change their weight. If they indicated “yes” to either trying to gain or lose weight then they were asked to mark one reason why from a list of six reasons ranging from “It is healthy” to “I have a dream of being a model or movie/ TV star”. They were also permitted to specify any other reason. Participants indicating “yes” were also asked to describe what methods they used to lose or gain weight including information on diet, exercise, medication and others (52). Responses have been categorized into those who had attempted weight loss and those that had not. Reasons for weight loss attempts and methods employed have been described using frequencies and percentages.

Explanatory Measures

Weight Stigma, the focal independent variable, was measured using the BAOP scale (BAOPS). The eight questions in the scale represent notions of an internal locus of control for obesity, for example, “Most overweight teenagers get fat because they don’t get enough exercise” and also ones that place obesity outside an individual’s control, for example item 7, “Being fat is not caused by a lack of will power”. Items were originally scored on a four point Likert scale with an emphatic “YES” being given a score of 1 and an emphatic “NO” being 4. The less emphatic “Yes” and “No” were scored 2 and 3 respectively. All items except item 7 were reverse coded and summed so that a higher score represented a higher level of weight stigma, the belief that obesity is within as individual’s control and therefore a negative perception of obese people. The maximum possible score was 32 and the minimum 8. The scores were then divided into three categories of low weight stigma 8-16, moderate weight stigma 17-24 and high weight stigma 25-32. This scale has been validated for use in adults (20) and in the current study the Cronbach Alpha for the scale was 0.64 indicating fair internal consistency.

Weight stigma was further measured using a disability rating task based on the study by Richardson et al (1961) (74). Participants were presented with a set of eight cards portraying eight teenagers with a variety of physical and social characteristics, including a teenager with blindness, with crutches and a leg brace, in a wheelchair, with no hand, with a facial disfigurement (hair lip), with Albinism, one who is fat and one who comes from a poor family. Participants were asked to rank the cards in the order of the teenager they were most likely to be friends with to the one they were least likely to befriend. Responses for the likelihood of befriending a “fat teenager” were examined and further categorised into three categories with 1 being most likely to befriend, 2 might befriend and 3 not likely to befriend. Ratings of 1 and 2 were included in the first category, 3, 4 and 5 in the second category and 6, 7, and 8 in the third category.

Body Image: Body image was measured using a body-esteem scale. The 21 item scale adapted from Mendelson and Associates was used to measure three components of body-esteem which included global feelings perceived about the individual’s body (“I like what I look like in pictures”), weight satisfaction (“I’m preoccupied with trying to change my weight”) and positive assessments of appearance and the individual’s body (“People my own age like my looks”) (73). Responses ranged from ‘0=never’ to ‘4=always’ in a five point rating and negative items were reverse scored (73). Summed scores were analysed as continuous data

and noting the Poisson distribution scores were further categorised into poor, good and very good body image. The difference between the minimum and maximum scores for body image were equally divided into these three categories. For girls poor body image represented scores of 30-48, good body image 49-67 and very good body image 68-84. For boys poor body image represented scores of 27-46, good body image 47-66 and very good body image 67-84. The scale has been previously tested in adolescents and found to be consistent (75). The Cronbach Alpha for the scale in the current study was 0.86 indicating good internal consistency of this scale.

Self-Esteem: Perceived self-esteem was measured using the Rosenberg self-esteem scale (69). Responses in this ten item scale range between four points beginning with '1=a lot like me' to '4=not at all like me' to both positive and negative questions like "On the whole, I am satisfied with myself" and "I wish I could have more respect for myself". Negative questions were reverse scored meaning 'a lot like me =4' to 'not at all like me=1' (73). The scores were summed and analysed as continuous data with the minimum score possible being 10 and the maximum 40. The Rosenberg Self-Esteem scale has been found to be reliable and validated for use in adolescents in other studies (61) and has been used in other South African studies (52, 57). The Cronbach Alpha for the scale was 0.63 indicating fair internal consistency.

Disordered Eating: The Eat-26 scale was used to measure eating attitude amongst participants (52). This 26 item scale allowed for a range of 6 possible responses to each item from "Always" to "Never" (76) with 'always', 'often' and 'very often' being assigned scores 1, 2, and 3 respectively, while 'never', 'seldom' and 'sometimes' are given 0 (73). An example of an item is "I have gone on eating binges where I feel that I may not be able to stop" (76). Scores may range from 0-78 with scores greater than or equal to 20 indicating a high risk of developing an eating disorder possibly requiring referral for clinical assessment (73). Responses were summed and categorised into "risk of disordered eating" and "no risk of disordered eating" based on the aforementioned cut-off.

Szabo and Hollands (1997) found the EAT26 scores in a racially diverse group of high school girls to be similar to a previous study validating the use of the scale in adolescents (77). This scale was then used by Szabo and Allwood (2004) in South African secondary school Black and White girls where Cronbach's alpha values

obtained were 0.75 and 0.79 respectively (63). The EAT26 scale has been further translated into isiZulu and applied to rural and urban isiZulu speaking female adolescents and found to be predictive of a higher prevalence of disordered eating risk in the urban group as originally hypothesised (78). The Cronbach Alpha for the scale in the current study was 0.72 which is comparable to the aforementioned values and indicates good internal consistency.

Normality of the distribution was assessed visually using histograms of the data. The skewness and kurtosis were also assessed. Socio-demographic information was collected on sex, race, who the child lived with (both parents, mother or father only or other caregiver), maternal schooling years and socio-economic status.

Who child lives with: A composite score was generated based on whether responses indicated that participants lived with both parents, only one parent or caregivers other than parents.

Maternal schooling years were derived from (the demographic questionnaire conducted at baseline) where participants indicated whether they had had any formal schooling and were scored 1 for no formal education, 2=up to standard 3, 3=standard 4-5, 4= standard 6-8, 5=standard 9-10 and 6=post school training. These data were then recoded using the midpoints of each category to derive a continuous score. For the purposes of this analysis maternal schooling was categorised to 1 = 0-9 years of schooling (primary school education) and those that had more than 9 years (secondary and post matric).

Socioeconomic status: was measured based on the assets that participants owned and included for example, the type of home, electricity at home, television, car, fridge, washing machine, and phone to comprise a wealth score. The wealth score was calculated using an index from 0 (lowest) to 7 (highest) and was then grouped into quintiles with 1=poorest and 5=wealthiest. Scores of 0, 1 or 2 were categorised into quintile 1; 3 into quintile 2, 4 into quintile 3, 5 into quintile 4 and 6 and 7 into quintile 5.

Body Mass Index: A fixed wall stadiometer was used to measure height to the nearest millimetre and a digital scale measured weight to the closest 100 grams (73). Measurements were done with participants lightly clothed with shoes off (73). Body mass index (BMI) was calculated using height and weight measurement with the

following formula: BMI = weight (kg) / (height (m))^2 which provides continuous data (38). International Obesity Task Force (IOTF) values were used as cut offs to define overweight and obesity based on sex and to create a categorical variable (38). For girls a BMI less than 22.57 kg/m^2 was categorised as "underweight or normal weight", overweight was 22.58-27.75 kg/m^2 and obese 27.75-45 kg/m^2. For boys a BMI less than 21.9 kg/m^2 was categorised as "underweight or normal weight", overweight was 21.91-26.82 kg/m^2 and obese 26.84-45 kg/m^2 (38).

2.7 Data Management

For the primary study Microsoft Access was used to capture the data, which was first imported to Excel and then for the secondary analysis into STATA version 13 (Texas, USA). Data checking was undertaken to identify any potential errors or inexplicable values for example being scored yes for weight loss rather than building muscle and then indicating methods for building muscle and nothing for weight loss. These kind of errors were corrected. Data collected at 13 years were cross referenced (using Vlookup in Excel) to demographic data that was collected at baseline and only identification numbers for which demographic information was available was included in the analysis to ensure that the sex of the participants was available. Cleaned data in Excel was imported into STATA and further errors identified during analysis were corrected in STATA. Variation in sample size per variable included in the 13-year questionnaire were due to some incomplete responses and therefore if the full scale had not been completed, it was not included in the analysis.

2.8 Statistical analysis

The outcome variable of interest was weight loss behaviour. The potential explanatory variables were weight stigma, body image, self-esteem and a measure of risk for disordered eating. BMI was treated as a potential confounder as it is associated with both the outcome, weight loss and with the exposure variable, weight stigma, and is not on the causal pathway. Covariates include the sex, race, who the child lives with, maternal schooling years and socio-economic status measured by wealth quintiles.

Table 1 shows the variables and analysis by objectives. Descriptive statistics were calculated. A proportion and frequency were used for categorical variables such as sex, race, and BMI (categories included underweight or normal weight, overweight and obese). Furthermore, means scores for weight stigma, self-esteem, and body

image were calculated and presented with the standard deviation. Categorical data for weight stigma, BMI, body image, disordered eating, and weight bias has also been described in tables.

Chi squared tests were used to test for differences between the proportions by groups for categorical data (weight loss attempts, categorical versions of BMI, weight stigma, body image and disordered eating (EAT26)). Fishers Exact tests were employed for demographic variables race and who the child lives with and explanatory variables weight stigma and body image in boys where smaller numbers were prevalent in the groups. Independent t-tests were utilized to test for differences between the groups with respect to self-esteem (continuous data).

Table 1 Statistical Analysis by Objectives

Data Analysis Plan			
Objective		**Variables**	**Analysis**
1.	To describe perceptions of weight stigma, body image, self-esteem and eating attitudes (risk of disordered eating) in urban adolescent boys and girls aged 13.	BAOP (continuous score) BAOP was also categorized for descriptive and reporting purposes as follows: • Low 8-16 • Moderate 17-24 • High 25-32 Weight stigma – friendship rating (categorical by ranking) Body image (continuous) Body image was also categorized for descriptive and reporting purposes as follows: Boys • Poor 27-46 • Good 47-66 • Very good 67-84 Girls • Poor 30-48 • Good 49-67 • Very good 68-84 Self-esteem (continuous) Risk of disordered eating was categorized as follows: • > 20 risk • < 20 no risk	Mean with standard deviations were used to describe continuous data such as the BAOP score, self-esteem and body image. Frequency was used to describe the categorical BAOP, weight sigma by ranking, categorical body image and disordered eating risk.

2.	To describe BMI, and weight loss behaviours in urban adolescent boys and girls aged 13.	BMI (continuous) BMI was also be categorized for descriptive and reporting purposes. BMI (kg/m^2): Boys • Underweight/ Normal weight < 21.9 • Overweight 21.91-26.82 • Obese 26.84-45 Girls • Underweight/ Normal weight < 22.57 • Overweight 22.58-27.75 • Obese 27.75-45 Weight loss attempts (categorical) • Yes • No Weight loss reasons (categorical): ○ Health related ○ Look better ○ Clothes fit tight ○ Unhappy with self ○ Aspirations of being a star ○ Other Weight loss methods (categorical): ○ Exercise ○ Healthy Diet ○ Dietary restriction ○ Fasting ○ Pills ○ Drinking water ○ Other	Mean with standard deviations were used to describe continuous BMI,. Categorical BMI, weight loss attempts, reasons and methods were presented as frequencies and proportions
3.	To determine the association between weight stigma, body image, self-esteem, disordered eating and weight loss behaviour taking into account BMI in urban adolescent boys and girls aged 13.	Weight loss attempts (categorical) • Yes • No BAOP: • Low 8-16 • Moderate 17-24 • High 25-32 Weight stigma – friendship rating (categorical by ranking) BMI (kg/m^2): Boys • Underweight/ Normal weight < 21.9	Chi squared tests were used to test for differences between weight loss attempts, categorical BAOP, weight stigma - friendship rating, body image, BMI, and disordered eating data.

		• Overweight 21.91-26.82 • Obese 26.84-45 Girls • Underweight/ Normal weight < 22.57 • Overweight 22.58-27.75 • Obese 27.75-45 Body image: Boys • Poor 27-46 • Good 47-66 • Very good 67-84 Girls • Poor 30-48 • Good 49-67 • Very good 68-84 Risk of disordered eating: • > 20 risk • < 20 no risk Sex (categorical) • Female • Male BAOP (continuous score) BMI (continuous) Body-image (continuous) Self-esteem (continuous)	T-tests for independent samples were employed to test for differences in distributions of continuous BAOP, BMI, body image and self-esteem. Logistic regression models were built for outcome variable (weight loss attempts). Explanatory variables included those which had a p-value <0.2

Logistic regression models were used to test the associations between weight loss attempts and weight stigma, body image, self-esteem and disordered eating risk, please see Appendix F for more on logistic regression. For girls, weight loss attempts were modelled with weight stigma, body image, disordered eating risk, and demographic variables such as who the child lives with and socio-economic status as the key explanatory variable, while controlling for BMI. In the case of boys the logistic regression model tested associations between weight loss attempts and weight stigma, BMI, body image, self-esteem and disordered eating.

2.9 Ethics

The Ethics Committee on Human Subjects at the University of the Witwatersrand granted clearance to the primary study, the Bt20 research program, which included all data collection, Protocol M010556 (Appendix A). Data for the primary study were collected annually by appointment with the family and informed assent and consent

was obtained from both the child and the caregiver (73). Permission to use this data was obtained from the Director of the Bt20 research program (Appendix B). Approval from the Human Research Ethics Committee (Medical) was further obtained for the secondary data analysis, Protocol M170748 (Appendix C).

3 Chapter 3: Results

3.1 Analytical Sample

Nearly half (48.8%) of the children originally enrolled in the Bt20 study were not available for data collection at age 13. Of those who were not available 30% were lost to follow up and the remaining while still in contact with the study, were not available for data collection within the 12 months for the 13-year follow up. The socio-demographic characteristics of participants that were not included in the study sample from baseline to 13 years are presented in Table 2. Statistically significantly more Indian (87%) and White (77.8%) participants did not contribute data at age 13. Furthermore, a significantly higher percentage of individuals in the wealthiest quintile (53.3%) were not available. The mean number of maternal schooling years for children who were not retained in the study at 13 years was significantly lower (9.4 years) than those who were available (9.7 years). There were no statistically significant differences in the sex of adolescents who were not a part of the analytical sample.

Table 2 Description of sample and those without data at 13 years

		Analytical Sample		**No data at 13 years**		
Variables		**n**	**%**	**n**	**%**	**p-value**
Sex	Boys	796	49.9	798	50.1	
	Girls	879	52.4	799	47.6	0.162*
Total		**1675**	**51.2**	**1597**	**48.8**	
Race	Black	1427	55.6	1140	44.4	
	Coloured	187	48.8	196	51.2	
	Indian	15	13.0	100	87.0	
	White	46	22.2	161	77.8	0.000*
Total		**1675**	**51.2**	**1597**	**48.8**	
Socio-economic status	Quintile 1 (poorest)	238	44.0	303	56.0	
	Quintile 2	258	56.6	198	43.4	
	Quintile 3	518	59.5	352	40.5	
	Quintile 4	312	58.7	220	41.3	

	Quintile 5 (wealthiest)	215	46.7	245	53.3	0.000*
Total		**1541**	**53.9**	**1318**	**46.1**	
		Mean	**SD**	**Mean**	**SD**	
Maternal schooling years		9.7	2.7	9.4	3.3	0.002

***Chi Square Test**

3.2 Socio-demographic characteristics of the adolescents at 13 years

The socio-demographic characteristics for the adolescents in this analysis are presented in Table 3. Just over half of the participants were female (52%) and the majority of the group were Black (85%) with Coloureds (11%), Whites (3%) and Indians (1%) being the minority. Less than 40% of participants lived with both parents while 40.1% lived with their mothers only, 5.1% with their fathers only and 15.5% with other caregivers. The average number of maternal schooling years in this group was nine years with only 38.8% of participants' mothers having more than 10-14 years of formal education. Nearly a third of participants (31%) were from the middle wealth quintile with those in the poorest quintile following at (22.2%). The smallest percentage was represented in the wealthiest quintile (almost 12.8%).

Table 3 Description of study sample

Characteristics		**n**	**%**
Sex (n=1675)	Female	879	52
	Male	796	48
Race (n=1675)	Black	1427	85
	Coloured	187	11
	Indian	15	1
	White	46	3
Who the child lives with (n=1645)	Both	647	39.3
	Mother	660	40.1
	Father	83	5.1
	Other	255	15.5
Wealth (n=1675)	Quintile 1 (poorest)	372	22.2
	Quintile 2	258	15.4
	Quintile 3	518	30.9
	Quintile 4	312	18.6
	Quintile 5 (wealthiest)	215	12.8
Maternal Schooling Years (n=1675)	0-9	1025	61.2
	10-14	650	38.8
Maternal Education (n=1675)		**Mean**	**SD**
		9.0	3.6

Table 4 presents the body mass index (BMI) profile of the participants and the explanatory variables investigated in this study including a measure of weight stigma, how likely individuals would be to befriend a "fat teenager", body image, self-esteem, and risk of disordered eating. BMI is represented as both a continuous measure and also categorised. The majority of adolescents fell into the normal or under weight category, boys about 87.4% and girls about 76.8% with a mean BMI of 18.6 and 20.5 kg/m^2 for boys and girls respectively. A higher proportion of girls were overweight or obese (16.5% and 6.7% respectively) than boys (9% and 3.6% respectively).
The mean scores for weight stigma were similar for boys and girls, 21.7% and 21.6% respectively, however, for both sexes a greater proportion were likely to befriend an overweight teenager than those not likely to. Mean self-esteem scores for both sexes were relatively high at about 32 (40 being the maximum possible score). The minimum self-esteem score for girls was 16 and the maximum 40 while for boys the lowest and highest scores were 19 and 40 respectively. However, a higher percentage of girls (4.7 - 26.5%) had poor or good body images than boys (1.6 - 22.5%) and a higher proportion were at a risk of disordered eating (11.1%) than boys (9.4%).

Table 4 Description of explanatory variables

	Boys			**Girls**		
Variables	**n**	**Mean**	**SD**	**n**	**Mean**	**SD**
Weight Stigma	775	21.7	4.4	855	21.6	4.3
BMI ($kg/m^{2)}$	779	18.6	3.2	861	20.5	4.3
Body image	772	71.7	9.4	855	70.7	10.7
Self-esteem	786	32.4	4.1	866	32.7	4.5
		n	**%**		**n**	**%**
Weight stigma						
Low		78	10.1		91	10.6
Moderate		496	64.0		558	65.3
High		201	25.9		206	24.1
Total		**775**	**100**		**855**	**100**
Friendship rating						
Likely befriend		294	37.6		336	38.7
Might befriend		230	29.5		242	27.9
Not likely befriend		257	32.9		290	33.4
Total		**781**	**100**		**868**	**100**
Body image						
Poor		12	1.6		40	4.7
Good		174	22.5		227	26.5
Very good		586	75.9		588	68.8
Total		**772**	**100**		**855**	**100**

Disordered eating						
Risk		71	9.35		93	11.1
No risk		688	90.65		741	88.9
Total		**759**	**100**		**834**	**100**
	kg/m^2	**n**	**%**	**kg/m^2**	**n**	**%**
BMI						
Underweight/ Normal	(<21.9)	681	87.4	(<22.57)	661	76.8
Overweight	(>= 21.9 <=26.83)	70	9.0	(>=22.58 <=27.75)	142	16.5
Obese	(>=26.84)	28	3.6	(>=27.76)	58	6.7
Total		**779**	**100**		**861**	**100**

3.3 Description of weight loss attempts: reasons and methods

Weight loss reasons and methods are presented in Table 5. More girls than boys tried to lose weight (20.5% and 13.1% respectively). About half of the boys (50.4%) responded yes to wanting to gain muscle while only 14.3% of girls said the same. A fair number of adolescents selected health as the reason for weight loss, however, over a quarter wanted to lose weight to look better (about 27.5% and 28.7% of boys and girls respectively) and 20.2% of girls said yes to weight loss as their clothes were too tight versus 13.7% of boys. More boys (19.6%) than girls (12.9%) wanted to lose weight as they saw themselves as too fat compared to friends.

Other reasons for wanting to lose weight included feeling unhappy with their weight thinking they were too fat (44% of girls and 16.7% of boys), being teased or made fun of by friends and family members (16.7% of girls and 5.6% of boys), and desiring to improve physical mobility related to sporting performance (33.3% of boys and 22.2% of girls). Boys also stated being uncomfortable with their bodies (16.7%) which girls didn't specify. A small number of responses on reasons for weight loss included being unhappy with themselves or dreaming of being a model or movie star.

About three quarters of boys and half of the girls chose exercise as the primary method for weight loss while a quarter of girls and just under a fifth of boys stipulated dietary restriction. Drinking water for weight loss featured in girls only but drinking other beverages like water with vinegar, lemon, herbal tea, milk and juice was stated by a minority of boys and girls. Eight times more girls than boys mentioned healthy diet for weight loss and more girls (2.9%) than boys (2%) said fasting. About 4% of girls and boys cited using pills for weight loss.

Table 5 Description of weight loss attempts, reasons and methods

	Boys		Girls	
Variable	**n**	**%**	**n**	**%**
Lose Weight Yes	104	13.1	181	20.5
Lose Weight No	687	86.9	693	79.5
Total			**874**	**100**
Gain Muscle Yes	397	50.4	123	14.3
Gain Muscle No	391	49.6	738	85.7
Total			**861**	**100**
Reasons for Weight Loss				
Healthy	17	16.7	26	14.6
Look better	28	27.5	51	28.7
Clothes too tight	14	13.7	36	20.2
Too fat compared with friends	20	19.6	23	12.9
Unhappy with self	3	2.9	9	5.1
Dreams of being a model	2	2.0	6	3.4
Other	18	17.6	27	15.1
Total	**102**	**100**	**178**	**100**
Other reasons for Weight Loss				
Uncomfortable with body	3	16.7	-	-
Think I'm fat/ don't like my weight	3	16.7	8	44.4
Friends / Family make fun of me/ tease me/ tell me I have gained weight	1	5.6	3	16.7
To improve physical activity/ mobility	6	33.3	3	16.7
Other (to be stronger, no specific reason, for fun, illness, feel better)	5	27.8	4	22.2
Total	**18**	**100**	**18**	**100**
Weight Loss Methods				
Exercise	75	74.2	85	49.4
Healthy Diet (eating a balanced meal, plenty of fruit and veg,)	1	1.0	14	8.1
Dietary Restriction (skipped meals, ate less, dieting, ate one meal a day	18	17.8	43	25.0
Fasting	2	2.0	5	2.9
Pills	4	4.0	6	3.5
Drinking water			16	9.3
Other: drinking vinegar or lemon or eat lots of lemons, drinking milk, drinking juice only, drink herbal tea, don't eat after 8pm, sleeping less, consulting a dietitian	1	1.0	3	1.8
Total	**101**	**100**	**172**	**100**

3.4 Associations between weight loss behaviours and socio-demographic characteristics

Associations between weight loss attempts amongst both sexes were examined in relation to socio-demographic variables and are presented in Table 6. Just less than 8% more girls (20.7%) than boys (13.2%) had attempted weight loss.

Statistically significant differences were found between girls who had tried to lose weight as an outcome and who they lived with as a predictor. A higher percentage of girls living with their father only or living with both parents had attempted weight loss (p=0.045) compared to those living with their mother only or other caregivers. Boys living with both parents were more likely, though not significantly, to have tried weight loss compared to those that lived with single parents or other caregivers.

Girls from the middle to high wealth quintile were statistically significantly more likely to have attempted weight loss (p=0.016) compared to the lowest two quintiles. A similar pattern was observed for boys, though the differences in the proportions was not statistically significant.

Maternal schooling years did not seem to influence weight loss attempts amongst these adolescents. There were no apparent patterns in weight loss amongst the different ethnic groups that were similar between boys and girls. A higher percentage of Indian and White girls had tried to lose weight compared to Black and Coloured girls, however these differences were not significant.

Table 6 Associations between socio-demographic characteristics and attempts to lose weight

Variable	Boys			Girls		
	Tried to lose weight n (%)	Not tried to lose weight n (%)	p-value	Tried to lose weight n (%)	Not tried to lose weight n (%)	p-value
Race						
White	3 (12)	22 (88)	0.379*	7 (36.8)	12 (63.2)	0.140*
Black	91 (13.5)	583 (86.5)		148 (19.9)	597 (80.1)	
Coloured	8 (9.4)	77 (90.6)		23 (22.6)	79 (77.5)	
Indian	2 (28.6)	5 (71.4)		3 (37.5)	5 (62.5)	
Total	**104 (13.2)**	**687 (86.8)**		**181 (20.7)**	**693 (79.3)**	
Lives with Caregiver						
Both parents	49 (15.6)	266 (84.4)	0.467*	78 (23.6)	252 (76.4)	0.045*
Mother only	36 (12.0)	265 (88.0)		71 (19.8)	287 (80.2)	
Father only	5 (11.9)	37 (88.1)		13 (31.7)	28 (68.3)	
Other	13 (10.6)	110 (89.4)		19 (14.4)	113 (85.6)	
Total	**103 (13.2)**	**678 (86.8)**		**181 (21.0)**	**680 (79.0)**	
Wealth Quintile						
1 – poorest	22 (11.6)	168 (88.4)	0.499◆	30 (16.8)	149 (83.2)	0.016◆
2	12 (10.0)	108 (90.0)		23 (16.8)	114 (83.2)	
3	32 (13.3)	209 (86.7)		52 (18.8)	224 (81.2)	
4	22 (14.8)	127 (85.2)		39 (24.1)	123 (75.9)	
5 – wealthiest	16 (17.6)	75 (82.4)		37 (30.8)	83 (69.2)	
Total	**104 (13.2)**	**687 (86.8)**		**181 (20.7)**	**693 (79.3)**	
Maternal Schooling Years						
0-9	65 (13.9)	401 (86.1)	0.350◆	106 (20.9)	402 (79.1)	0.776◆
10-14	34 (11.6)	259 (88.4)		69 (21.7)	249 (78.3)	
Total	**99 (13.1)**	**660 (86.9)**		**175 (21.2)**	**651 (78.8)**	

*Fishers Exact Test due to small sample size

◆ Chi Square Test used

3.5 Associations between motivational factors and weight loss attempts

Associations between motivational factors and weight loss are shown in Table 7. Significant associations were found for weight stigma, BMI, body mage and risk of disordered eating with weight loss attempts for girls. Similarly, significant associations were found for boys' BMI, body image and risk for disordered eating with weight loss attempts but not for weight stigma. Furthermore, a significant relationship was seen for self-esteem and weight loss behaviour in boys.

Of the children who had tried to lose weight, a significantly higher proportion of adolescents in the overweight and obese categories attempted weight loss for both boys (47.1% and 57.1% respectively) and girls (44% and 67.2% respectively) than the underweight or normal category. Less than half of boys (47.1%) and girls (44%) in the overweight category had attempted weight loss compared with those who had not, while more than half of obese boys (57.1) and girls (67.2) had tried to lose weight compared to those that had not.

About a third of boys who had poor body image had tried to lose weight, while over half of girls with poor body image had tried to lose weight. In the groups that had tried to lose weight, significantly greater proportions of these adolescents had poor and good body images for both boys (33.3% and 24.1% respectively) and girls (52.5% and 32.6% respectively) compared to those with very good body image (9.6% and 13.9% for boys and girls respectively).

Almost twice the proportion of girls (36.6%) who had attempted weight loss were at risk of disordered eating compared to boys (19.7%). A significantly higher proportion of both boys (19.7%) and girls (36.6%) who had tried to lose weight were at risk of disordered eating compared to those who were not at risk (12.4% and 18.7% for boys and girls respectively).

No significant results were found for the likelihood of befriending a “fat teenager” for both boys and girls. In both sexes for adolescents that had tried to lose weight, there were slightly higher percentages for those that were likely to or might befriend a “fat teenager” than not likely.

The mean self-esteem for boys who had tried to lose weight was significantly lower than boys who had not tried to lose weight, while no significant differences were seen in the mean self-esteem scores for girls in both groups.

Table 7 Associations between motivational factors, BMI and attempts to lose weight

	Boys			Girls		
Variable	**Tried to lose weight**	**Not tried to lose weight**	**p-value**	**Tried to lose weight**	**Not tried to lose weight**	**p-value**
	n (%)	**n (%)**		**n (%)**	**n (%)**	
Weight stigma						
Low	9 (11.5)	69 (88.5)	0.166*	2 (2.2)	89 (97.8)	0.000*
Moderate	60 (12.1)	436 (87.9)		112 (20.1)	446 (79.9)	
High	35 (17.5)	165 (82.5)		61 (29.6)	145 (70.4)	
Total	**104 (13.4)**	**670 (86.6)**		**175 (20.5)**	**680 (79.5)**	
Friendship Rating						
Likely befriend	42 (14.3)	252 (85.7)	0.229◆	77 (22.9)	259 (77.1)	0.307◆
Might befriend	34 (14.8)	196 (85.2)		50 (20.7)	192 (79.3)	
Not likely befriend	26 (10.1)	231 (89.9)		52 (17.9)	238 (82.1)	
Total	**102**	**679**		**179 (20.6)**	**689 (79.4)**	
BMI						
Under or normal	51 (7.5)	627 (92.5)		77 (11.7)	580 (88.3)	0.000◆
Overweight	33 (47.1)	37 (52.9)	0.000◆	62 (44.0)	79 (56.0)	
Obese	16 (57.1)	12 (42.9)		39 (67.2)	19 (32.8)	
Total	**100 (12.9)**	**676 (87.1)**		**178 (20.8)**	**678 (79.2)**	
Body image						
Poor	4 (33.3)	8 (66.7)	0.000*	21 (52.5)	19 (47.5)	0.000◆
Good	42 (24.1)	132 (75.9)		74 (32.6)	153 (67.4)	
Very good	56 (9.6)	529 (90.4)		82 (13.9)	506 (86.1)	
Total	**102 (13.2)**	**669 (86.8)**		**177 (20.7)**	**678 (79.3)**	
Disordered Eating						
No risk	85 (12.4)	603 (87.6)	0.079◆	138 (18.7)	602 (81.4)	0.000◆
Risk	14 (19.7)	57 (80.3)		34 (36.6)	59 (63.4)	
Total	**99**	**660**		**172 (20.7)**	**661 (79.3)**	
	Mean (SD)	**Mean (SD)**	**p-value**	**Mean (SD)**	**Mean (SD)**	**p-value**
Weight stigma	22.4 (4.5)	21.6 (4.3)	0.0810	23.1 (3.7)	21.2 (4.3)	0.0000
Self-esteem	31.5 (4.6)	32.5 (4.0)	0.0207	32.4 (4.9)	32.8 (4.4)	0.4007
Body image	66.6 (10.7)	72.4 (8.9)	0.0000	64.8 (12.2)	72.3 (9.7)	0.0000
BMI (kg/m^2)	22.3 (4.4)	18.1 (2.6)	0.0000	24.3 (5.3)	19.5 (3.4)	0.0000

*Fishers Exact Test

◆Chi Square Test

3.6 Associations between motivational factors and BMI

Investigation into any associations between motivational factors and BMI are presented in Table 8. Significant associations were found for body image and BMI in

both boys and girls, p=0.000. The majority of children in our sample had very good body image scores (90.3% of boys and 83.8% of girls). A higher proportion of children with poor body image (boys 75% and girls 44.7%) had a normal BMI or was underweight than overweight or obese. For boys there were no respondents with low self-esteem that were overweight. However, a higher percentage of boys (25%) and girls (29%) who were obese and a higher percentage of overweight girls (26.3%) had poor body image compared to good or very good body images.

Self-esteem and disordered eating risk were significantly associated with BMI in girls (p=0.050 and p=0.048 respectively) but not in boys. Overweight and obese girls had a significantly lower mean score for self-esteem as compared to those in the normal or underweight category. However, disordered eating risk in girls was highest in the underweight or normal weight group (72%) while still featuring in the overweight (15.1%) and obese (12.9%) groups. No significant associations were found between weight stigma, friendship rating and BMI for both boys and girls.

Table 8 Associations between motivational factors and BMI

	Boys				Girls			
BMI (kg/m^2)	**Under-weight / Normal Weight**	**Over-weight**	**Obese**	**p-value**	**Under-weight / Normal Weight**	**Over-weight**	**Obese**	**p-value**
	<21.9)	**>= 21.9 <=26.83**	**>=26.84**		**<21.9**	**>= 21.9 <=26.83**	**>=26.84**	
Variables	**% (n)**	**% (n)**	**% (n)**		**% (n)**	**% (n)**	**% (n)**	
Weight Stigma								
Low	88.0 (66)	12.0 (9)	0.0 (0)	0.302*	78.7 (70)	16.9 (15)	4.4 (4)	0.201*
Moderate	87.7 (430)	8.2 (40)	4.1 (20)		78.5 (430)	15.0 (82)	6.5 (36)	
High	86.2 (169)	10.2 (20)	3.6 (7)		70.5 (141)	21.0 (42)	8.5 (17)	
Total	87.4 (665)	9.1 (69)	3.5 (27)		76.6 (641)	16.6 (139)	6.8 (57)	
Friendship Rating								
Likely befriend	85.6 (249)	9.6 (28)	4.8 (14)	0.547*	75.9 (252)	17.8 (59)	6.3 (21)	0.315
Might befriend	88.3 (197)	9.4 (21)	2.3 (5)		73.3 (173)	18.2 (43)	8.5 (20)	
Not likely befriend	89.0 (226)	7.8 (20)	3.2 (8)		80.6 (229)	13.4 (38)	6.0 (17)	
Total	87.5 (672)	9.0 (69)	3.5 (27)		76.8 (654)	16.4 (140)	6.8 (58)	

Body image								
Poor	75.0 (9)	0.0 (0)	25.0 (3)	0.000 *	44.7 (17)	26.3 (10)	29.0 (11)	0.000
Good	77.1 (131)	15.3 (26)	7.6 (13)		63.7 (144)	22.1 (50)	14.2 (32)	
Very good	90.3 (521)	7.6 (44)	2.1 (12)		83.8 (480)	13.6 (78)	2.6 (15)	
Total	87.1 (661)	9.2 (70)	3.7 (28)		76.6 (641)	16.5 (138)	6.9 (58)	
Disordered Eating								
Risk	87.0 (60)	8.7 (6)	4.3 (3)	0.866 *	72.0 (67)	15.1 (14)	12.9 (12)	0.048
No risk	87.3 (589)	9.3 (63)	3.4 (23)		77.4 (562)	16.5 (120)	6.1 (44)	
Total	87.2 (649)	9.3 (69)	3.5 (26)		76.8 (629)	16.4 (134)	6.8 (56)	
Self-esteem	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**p-value**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**p-value**
	32.4 (4.1)	32.9 (3.8)	32.2 (4.5)	0.528	32.8 (4.4)	32.7 (4.8)	31.7 (5.4)	0.050
n	673	70	28		650	140	58	

*Fishers Exact Test

3.7 Relationship between weight loss attempts and weight stigma

Logistic regression modelling was conducted to test the whether weight stigma beliefs, body image, disordered eating risk and demographic variables related to whom the child lived with and socio-economic status were associated with the girls' weight loss attempts. This association was tested while controlling for BMI (as a confounder). The results with unadjusted and adjusted odds ratios are shown in Table 9.

Girls with high notions of weight stigma were about 20 times more likely to have attempted weight loss than those with low weight stigma (aOR 20.1, 95% CI 4.3-94.0, p<0001). While those in the moderate weight stigma group were about 14 times more likely (aOR 14.3, 95% CI 3.1-65.3, p=0.001). BMI was also positively associated with weight loss attempts. Both overweight and obese girls were significantly more likely to have attempted weight loss as compared to the reference group.

Girls with very good body image scores were 60% less likely to try to lose weight as compared to girls with poor body image scores (aOR0.4, 95% CI 0.2-0.9, p=0.036). Furthermore, girls who had attempted weight loss were 2.5 times more likely to be at risk for disordered eating (aOR 2.5, 95% CI 1.4-4.5, p=0.002). Living with a

caregiver other than parents was associated with weight loss attempts, however, was no longer significant once adjusted for in the model. Girls in the wealthiest quintile were significantly more likely to have tried to lose weight as compared to the poorest quintile (aOR 2, 95% CI 1.0-3.9, p=0.040).

Table 9 Logistic regression model showing the relationship between weight loss behaviour and weight stigma among 13-year-old girls while controlling for other motivational factors, socio-demographic characteristics and BMI

Variables Weight loss	**Adjusted OR**	**95% CI**		**P- value**	**OR**	**95% CI**		**p-value**
Weight Stigma								
Low	Ref.							
Moderate	14.3	3.1	65.3	<0.001	11.2	2.7	46.1	<0.001
High	20.1	4.3	94.0	<0.001	18.7	4.5	78.5	<0.000
BMI								
Normal / underweight	Ref.							
Overweight	5.5	3.5	8.7	<0.001	5.9	1.2	8.5	<0.001
Obese	12.9	6.5	25.7	<0.001	15.5	4.7	9.0	<0.001
Body image								
Poor	Ref.							
Good	0.7	0.3	1.7	0.479	0.4	0.2	0.9	<0.017
Very good	0.4	0.2	0.9	0.036	0.1	0.1	0.3	<0.000
Disordered Eating								
No risk	Ref.							
At Risk	2.5	1.4	4.5	0.002	2.5	1.6	4.0	<0.001
Lives with								
Both	Ref.							
Mother only	1.1	0.7	1.8	0.567	0.8	0.6	1.1	0.227
Father only	1.6	0.7	3.9	0.297	1.5	0.7	3.0	0.260
Other	0.8	0.4	1.6	0.562	0.5	0.3	0.9	0.029
Wealth Quintile								
1 (poorest)	Ref.							
2	1.0	0.5	2.1	0.919	1.0	0.6	1.8	0.995
3	1.1	0.6	1.9	0.865	1.2	0.7	1.9	0.573
4	1.2	0.6	2.4	0.548	1.6	0.9	2.7	0.095
5 (wealthiest)	2.0	1.0	3.9	0.040	2.2	1.3	3.8	0.005

Similar to the girls, logistic regression modelling was used to test the association between weight stigma, body image, self-esteem and disordered eating risk with weight loss behaviours in boys, while controlling for BMI (as a confounder),. The results are represented in Table 10. Self-esteem was included for boys as there was a significant association with weight loss, while socio-demographic variables related

to with whom they lived and socio-economic status were excluded as there were no significant associations found with weight loss in boys.

No significant associations were found for weight stigma and body image in relation to weight loss for boys. While boys with higher weight stigma scores were more likely to have tried weight loss than those with lower stigma scores, this association was not significant (aOR 1.7, 95% CI 0.7-4.5, p<0.247). Additionally, very good body image was negatively associated with boys' attempts to lose weight, however, this association was no longer significant when adjusted in the model (aOR 0.5, 95% CI 0.1-2.4, p<0.345). Similarly, boys with disordered eating risk were 1.7 times more likely to have tried to lose weight compared to those without risk, however, this association was no longer significant when adjusted for in the model (aOR 1.7, 95% CI 0.8-3.5, p=0.162).

BMI and self-esteem were both significantly associated with weight loss attempts. Overweight and obese boys were about 11 and 13 times more likely to have attempted weight loss compared to those in the normal or underweight category (aOR 10.9, 95% CI 6.0-19.7, p<0.000 and aOR 13.4, 95% CI 5.5-32.5, p<0.001). Weight loss was more likely to have been attempted by 90% of boys with low self-esteem (aOR 0.9, 95% CI 0.9-1.0, p<0.047).

Table 10 Logistic regression model showing the relationship between weight loss behaviour and weight stigma among 13-year-old boys while controlling for other motivational factors and BMI

Variables Weight loss	**Adjusted OR**	**95% CI**		**p-value**	**OR**	**95% CI**		**p- value**
Weight Stigma								
Low	Ref.							
Moderate	1.0	0.4	2.5	<0.952	1.1	0.5	2.2	<0.888
High	1.7	0.7	4.5	<0.247	1.6	0.7	3.6	<0.224
BMI								
Normal/ underweight	Ref.				Ref.			
Overweight	10.9	6.0	19.7	<0.000	11.0	6.3	19.0	<0.000
Obese	13.4	5.5	32.5	<0.000	16.4	7.4	36.5	<0.000
Body image								
Poor	Ref.				Ref.			
Good	0.9	0.2	4.7	<0.908	0.6	0.2	2.2	<0.478
Very good	0.5	0.1	2.4	<0.345	0.2	0.1	0.7	<0.013
Self-esteem								
Self-esteem	0.9	0.9	1.0	<0.047	0.9	0.9	1.0	<0.021
Disordered Eating								

No risk	Ref.				Ref.			
At risk	1.7	0.8	3.5	<0.162	1.7	0.9	3.3	<0.083

4 Chapter 4: Discussion

It had been postulated that adolescents' perceptions about obese people (presence of weight stigma), body image, self-esteem and eating attitudes may be associated with an individual's attempts at weight loss while considering socio-demographic characteristics. The analysis presented in this report has examined the relationship among a cohort of girls and boys living in Soweto, South Africa. This chapter presents a discussion of the results in the context of the literature reviewed. Limitations of this investigation will be discussed at the end of this chapter.

This analysis examined associations between weight loss behaviours, weight stigma, body image, self-esteem and risk for disordered eating while adjusting for BMI in boys and girls enrolled in the Birth to Twenty Study at age 13. We found that there was an association between weight loss behaviours and weight stigma, body image and risk for disordered eating in girls even while adjusting for BMI. Additionally socio-economic status was related to weight loss attempts in girls with those in the wealthiest quintile being more likely to have tried to lose weight. The only associations with weight loss behaviours found in boys, was for BMI and self-esteem.

4.1 Prevalence of overweight and obesity among adolescent boys and girls

The prevalence of overweight and obesity in this study sample is comparative to a national average for overweight girls as reported in the SANHANES (2012 – eight years later) (16.5% and 6.7% compared to 16.7% and 5.6% respectively). A greater proportion of boys in our sample were overweight and obese compared to the SANHANES (9% and 3.6% compared to 7.5% and 2.7% respectively). A higher prevalence would be expected for the study sample as compared to a national average given that this is an urban cohort while the national average would include rural adolescents in whom the prevalence of overweight and obesity is lower (2). However, the data for our sample was collected in 2004, eight years prior to the SANHANES publication, which may account for the similarity in prevalence figures. The greater proportion of overweight and obesity among girls compared to boys during adolescence has been reported elsewhere ((2, 79-81).

4.2 Weight Loss Behaviours

Weight Loss Methods

While they were a minority, it is noteworthy that weight loss behaviours described in the literature as unhealthy weight loss behaviours (severe dietary restriction, taking pills and fasting) are featuring in early adolescence in this urban cohort. This may be indicative of the transitioning state of the country and transitioning views on weight and body size and image. Being overweight or obese in our study was associated with poor body image in girls and with attempts at weight loss. Furthermore, girls who had attempted weight loss were 2.5 times more likely to be at risk for disordered eating. This is consistent with literature that describes the complexities involving body size, body image and negative health behaviours which may include disordered eating, lack of physical activity and dysfunctional exercise (14). The manifestation of poor body image and resultant DWCBs in overweight and obese individuals may persist into adulthood perpetuating obesity and consequent negative health behaviours (8-11, 42, 61).

Both sexes primarily used exercise and dietary restriction for weight loss, which have been described as healthy weight loss behaviours (23, 82). This is consistent with results from the aforementioned SANHANES analysis (82). It's possible that this may also be indicative of general weight management related communication that the adolescents may have been exposed to at school, through healthcare workers or in media that emphasises diet and physical activity for weight loss, however this requires further investigation.

Studies in high-income countries have outlined the potential extreme exercise that may be undertaken by adolescents attempting to lose weight described as unhealthy weight loss behaviours (23, 82) . This analysis did not investigate exercise as a part of weight loss behaviour, but given the high percentage of children choosing exercise as the primary method for weight loss, this may warrant deeper investigation.

Weight Loss Reasons

The primary reasons for weight loss in both sexes were to look better, their clothes were too tight, to be healthy and because they felt they were too fat compared to their friends. Of the girls who stipulated other reasons, the majority didn't like their weight and felt fat, and equal proportions of girls said that family and friends tease them about their weight, and they wanted to improve their physical mobility. A larger proportion of boys than girls wanted to lose weight as they felt too fat compared with

friends. Boys also stated being uncomfortable with their bodies and being unhappy with their weight.

Three of the primary reasons for weight loss in these adolescents were related to their appearance, which is indicative of the heightened awareness of appearance during this transitional developmental stage. Weight loss reasons described may also reflect the increased awareness of body size and weight related concerns in these young adolescents, which has been empirically established in high-income countries and also in South African females. Adolescents in our study stipulating feeling fat and not liking their weight is further testimony to weight and fat related concerns amongst this age group and was of greater concern in girls than boys which is consistent with research in high-income countries ((7, 14). Girls generally undergo puberty earlier than boys (38), which may account for the greater weight related concern amongst girls than boys. A larger proportion of boys than girls were concerned about their weight in relation to sporting performance, which may relate to boys' desire for muscularity and associated body ideals. Research has shown girls and boys differ in body ideals with girls aspiring towards a thin body ideal, while boys strive towards muscular body ideals (14). The relative importance given to appearance by these adolescents may have contributed to their vulnerability to weight stigma.

4.3 Weight Stigma and Weight Loss

Weight Stigma and Weight Loss

This investigation explored the beliefs that adolescents had about obese persons as a measure of weight stigma rather than *experiences* of weight stigma. Therefore, it will be discussed in the context of an internalisation of weight bias as described in the literature. As anticipated, associations were different between the sexes. Significant associations were seen between weight stigma, BMI, body image and disordered eating risk with weight loss in girls. Weight loss in boys was significantly related to BMI and self-esteem, but not weight stigma, body image and risk for disordered eating.

Average weight stigma scores were almost the same for boys and girls in this study with about a third of both sexes reporting they would not be likely to befriend a "fat teenager" and moderate weight stigma being the largest proportion of scores for both sexes. The lack of sex differences in weight stigma has been reflected in some

research in high-income countries where no differences were found in boys' and girls' expressions of weight stigma (17). Other studies showed that girls were more negative in their ratings of overweight and average weight silhouettes as compared to thin individuals implying the prevalence of a thinness ideal amongst girls, while boys rated overweight drawings negatively (17).

In the current study, while greater proportions of boys and girls with higher scores for weight stigma had tried to lose weight, the presence of weight stigma in girls significantly predicted their weight loss attempts with those with higher weight stigma scores being significantly more likely to attempt weight loss. This association was significant even when controlling for BMI, in fact no significant associations were found between weight stigma and BMI. The largest proportion of children with high weight stigma scores where in the normal or underweight BMI category, though this result was not significant. Girls may be more vulnerable to overweight and obesity stereotypes in this early stage of adolescents, which may be further perpetuated by exposures to media in which thinness is lauded (17, 56). Internalised weight stigma in children has been associated with engagement in unhealthy weight loss practices, and increased vulnerability to poor body image and low self-esteem (17).

The same results regarding weight stigma, body image and eating attitudes was not seen for adolescent boys. Only BMI and self-esteem were significantly associated with weight loss attempts. Overweight and obese boys were considerably more likely to have exercised weight loss practices than normal or underweight boys. The majority of boys with low self-esteem were also more likely to have tried weight loss. However, no significant associations were found for weight stigma, body image or disordered eating in boys. More boys with high weight stigma scores and poor body image scores had attempted weight loss but these associations were not significant in the model. Similarly boys who had attempted weight loss tended to have a higher risk for disordered eating but these results were not significant.

4.4 Relationship between BMI and weight loss

BMI was independently and bi-directionally associated with weight loss attempts for both boys and girls. There appeared to be a body size related response in terms of BMI and weight loss behaviours. As one would expect, as BMI increased, so did the likelihood of attempts at weight loss. This was true for both boys and girls and it was bidirectional - those with higher BMIs were likely to have tried to lose weight and also

those who had tried to lose weight had higher BMIs. This is consistent with both local and international research in childhood obesity (6, 7, 23).

As may be expected, more girls than boys in our study tried to lose weight, which may be due to the higher prevalence of overweight and obesity in girls, but may also relate to the increased vulnerability of girls to weight related and body image concerns. The fact that a greater proportion of obese children in our study tried to lose weight as compared to overweight adolescents may be an indication that overweight adolescents did not accurately estimate their body size or that an overweight body size was deemed more acceptable than an obese body. Overweight and obese participants 15 years and older in the SANHANES analysis underestimated their body size and at the same time wanted to be thinner (82). This could be a further mark of transitioning views on body size which however, would require further investigation.

4.5 Body Image

Poor body image as a representation of body dissatisfaction was found in our study to be significantly associated with attempts at weight loss for both boys and girls. Adolescents with very good body image scores comprised the smallest proportion of children who had tried to lose weight, and this proportion increased with decreasing body image scores. BMI was found to be significantly associated with body image, however, this association remained significant for girls but not for boys after adjusting for BMI in the model. More girls than boys had lower body image scores. Overweight and obese girls and those with poor body image were significantly more likely to attempt weight loss and be at risk for disordered eating.

The results for girls are consistent with local and international studies, which have demonstrated the interplay between psychosocial factors, body dissatisfaction and weight loss behaviours (6, 7, 13, 14, 23, 36, 57). Research from high-income countries has shown that body dissatisfaction in girls may be related to ideals of thinness, while in boys it may be related to ideals of muscularity (14). More than half of the boys in our study wanted to gain muscle compared to a relatively small proportion of girls. This may explain the sex differences seen in our study with about a third of boys with poor body image attempting weight loss compared with more than half of girls with poor body image.

Awareness of body size and image and perception is heightened in adolescence as there are developmental transitions occurring. These notions are further perpetuated through societal and or cultural norms on acceptable or preferred body size and weight. Indeed amongst the ethnic diversity in South Africa overweight and obesity may be viewed either positively (a sign of affluence, health and beauty especially regarding women) or unfavourably (82). Similarly thinness may be stigmatised (a sign of illness and HIV) or seen as being more attractive (50, 82). Ethnic differences in this regard translate to a larger body size deemed to be favourable in the Black population while thinner body size is seen to be more favourable in the 'westernised' and White populations (82). In a country that has undergone or is undergoing transition including an epidemiological and nutritional transition, it could be that views on body size and image are also changing which may be further influenced via media consumption, especially foreign media consumption from high-income countries like the USA. This may be true especially for girls, which increases their vulnerability to weight loss attempts using methods that may be unhealthy or extreme.

4.6 Self-esteem

Self-esteem was significantly associated with weight loss attempts in boys with those who had attempted weight loss having a lower mean self-esteem score. No significant association was found for self-esteem and weight loss in girls. However, self-esteem was significantly related to BMI in girls and not boys with obese girls having a lower mean self-esteem score than overweight and normal or underweight girls. BMI associated with self-esteem in adolescence has been established in other studies with overweight and obese children having lower self-esteem (13, 14, 61). Association between low self-esteem in girls and risk of disordered eating has been demonstrated locally (57), however, associations between self-esteem and weight loss behaviours is thought to be influenced by body dissatisfaction (13, 14).

4.7 Risk for Disordered Eating

Most of the children in this study chose exercise and diet as the primary methods of weight loss, which have been described in the literature as healthy weight loss behaviours (55, 82). This is further reflected in the low prevalence of risk of disordered eating in this sample, while girls had a higher prevalence of risk than boys even at this early stage of adolescence. Risk for disordered eating in girls in our study was found to be significantly associated with higher BMI. The largest proportion of girls at risk, were in the underweight or normal weight BMI category

followed by overweight and obese girls. This finding seems counterintuitive and warrants further investigation. A 2011 South African study of adolescent girls found no association between disordered eating risk and BMI (36). Other research investigating risk factors associated with disordered eating have found that results regarding the association of BMI to disordered eating have been variable (83). Rather body dissatisfaction has been thought to influence the variability in associations between BMI and disordered eating risk (83). In a UK longitudinal study following girls from age 7 to 12 years it was found that body image finally elucidated the initial finding of an association between BMI and risk for disordered eating.

Items in the EAT26 scale investigate an individual's pre-occupation with food and food in relation to their feelings about their body image and weight loss, quantities and qualities of food eaten and tendencies towards purging behaviours. Some authors have questioned the use of this scale in South Africa in terms of cultural sensitivity of the instrument and understanding of the language used (65). For example preoccupation with food could be related to household food insecurity in low income households and purging behaviours related to cultural cleansing practices (65). Therefore, the application of caution has been recommended when interpreting results regarding the prevalence of risk for disordered eating (57). These same authors have recommended a review of methodologies investigating the risk of disordered eating (65). Qualitative investigation alongside the use of the EAT26 quantitative scale could help provide further insight into how adolescents comprehend these questions and to help create a frame of reference for the interpretation of the results. Therefore, even though the prevalence of disordered eating risk was fairly low in our study, it may be argued that this remains an overestimation of risk in this sample.

4.8 Socio-demographic Factors and Weight Loss Behaviour

Girls in the wealthiest quintile were significantly more likely to try to lose weight and while no longer significant once adjusted for in the model, girls living with both parents or their fathers only were more likely to have attempted weight loss, which could indicate a more secure socio-economic status. Girls in the wealthier quintiles were likely to have a television, phone and a car and may therefore have had more exposure to media and both local and international television programming. They may have been more vulnerable to the influence of "western" ideals through potential

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4.9 Limitations

Several limitations were encountered in this analysis. A great deal of research conducted in high-income countries has explored the consequences of overt forms of weight stigma experienced by overweight and obese individuals on negative health behaviours and outcomes (14, 16, 17, 21, 22, 25, 26, 67, 84, 85). Experiences of weight stigma in adolescence, which have been shown in the literature to result in significant adverse public health consequences, were not explored in this study. This limited the investigation to reported internalised weight bias. Additionally, further investigation is required to unpack exercise in the context of weight loss to examine whether adolescents' engagement in physical activity for weight loss is healthy or tending towards unhealthy or dysfunctional in nature.

A large proportion of the cohort did not contribute data at 13 years. Significant differences were found in race, maternal schooling and socio-economic status between the analytical sample and those that did not have data at 13 years. This may have introduced bias. However, the analytical sample represents Black adolescent boys and girls aged 13 years. The study was conducted in an urban settlement area, which was historically predominantly populated by Black ethnic groups, which may have accounted for the numbers of other ethnic groups being low. While these results are not generally applicable to adolescents in South Africa, they may be relevant to urban settings given that Johannesburg may be seen as one of the most urbanised cities here and therefore likely to potentiate a great degree of acculturation through exposures to weight related communications and information.

Validation studies for the appropriateness of the scales used in this investigation to examine weight stigma, body image and self-esteem in South African adolescents could not be found. While several studies discussed the consistent and comparable results obtained for the EAT26 scale in South African adolescents (63, 77, 78), authors conclude that more research is necessary to either refine current tools or compile alternative measures to improve culture-specific exploration of eating related psychopathologies (78). Cronbach Alpha were conducted for scales measuring weight stigma, body image, self-esteem and disordered eating risk to assess internal validity. While fair to good internal consistency was found for these scales, future investigations of South African adolescents in these areas of study may benefit from possible adjustments and validations of measures used.

The cross sectional nature of the study limits the opportunity to establish cause-effect relationships and which warrant longitudinal investigation in order to establish the persistence of factors associated with weight related concerns and behaviours through development into adulthood. Additionally, responses to the various scales used in this study were self-reported and administered by research assistants which may have introduced a social desirability bias in adolescents' responses.

Furthermore, reverse causality between risk for disordered eating and weight loss attempts as well as BMI and weight loss attempts makes application of the findings to interventions challenging. Moreover, findings of wide confidence intervals in the logistic regression models may be indicative of the sample of children attempting weight loss being too small and therefore results should be interpreted with caution. Lastly, the large number of statistical tests done may have introduced the possibility of spurious results.

5 Chapter 5: Conclusions and Recommendations

5.1 Conclusions

Our study found sex differences in the associations between weight stigma, body image, self-esteem, risk for disordered eating and weight loss behaviour in 13-year old urban adolescents.

Significant associations were seen between weight stigma, BMI, body image and disordered eating risk with weight loss in girls. Weight loss in boys was significantly

related to BMI and self-esteem, but not weight stigma, body image and risk for disordered eating. This study provides further evidence for weight related concerns emerging in early adolescence with girls being particularly vulnerable to internalised weight bias and poor body image which relates to increased risk for disordered eating and weight loss attempts. This is of particular concern as the prevalence of overweight and obesity in adolescents in South Africa has increased progressively in the last two decades, with prevalence in girls being significantly higher than boys. The prevalence of adult obesity is also increasing with women significantly more overweight and obese than men. Weight stigma and the related public health risk maybe perpetuated into adulthood and can worsen obesity and health outcomes (10).

5.2 Recommendations

Public health interventions for overweight and obesity may inadvertently reinforce stigmatizing notions through an emphasis on behaviour change related to diet and physical activity (21, 25). Focus on intervention related only to nutrition and physical activity may not have desired results and consequentially potentially reinforce obesity stigma by redirecting blame back to the individual. Indeed research in overweight and obese adults has demonstrated greater self-efficacy to lose weight when causal attributions of obesity emphasised the role of the food environment (86). Attributions related to personal responsibility were not related to self-efficacy to lose weight and were associated with self-blame and internalised weight bias (86).

South Africa has been described as a country undergoing transition in risk of chronic disease with a growing prevalence of overweight and obesity in youth (81). Several studies have demonstrated evidence for the complex and changing views on body size and image of adolescents in South Africa (35-37, 50, 51, 53, 56-59). The recognition of the need for intervention in preventing the concomitant disease burden with overweight and obesity has precipitated the compilation of the national strategy for the prevention and control of obesity in South Africa (29). This strategy has acknowledged the ineffectiveness of behaviour change approaches based solely on the individual and has strategized policy, context and environmental approaches to obesity (29). Two of the six goals set out in this strategy directly emphasise diet and exercise while two others indirectly incorporate diet and exercise (29).

Efforts have been made in this strategy to stipulate context and environmental approaches through fiscal and regulatory approaches (29), however, caution needs to be applied in obesity interventions that involve improving knowledge and education regarding obesity prevention and control. Mckhize et al (87) have recommended the incorporation of socio-cultural aspects of obesity in the Strategy for the Prevention and Control of Obesity in order to address the complex and changing views on body image and weight related stereotypes that may have adverse public health consequences if not addressed (87). It has been proposed that communication interventions in this regard help to educate and empower South Africans on achieving a healthy BMI utilising a shift in historically used terminology from 'losing or gaining weight' to a focus on health benefits of a healthy BMI (87).

Other South African national policies addressing adolescent health include the National Adolescent and Youth Health Policy (NAYHP) and the Integrated School Health Policy (ISHP) (88, 89). The NAYHP was built in response to the global recognition of the specific health needs of this age group and with a strong focus on adolescent sexual and reproductive health in the context of high HIV burden (89) which can be seen reflected in the ISHP (88). Non-communicable disease related risk factors have also been highlighted in both policies including an objective on promoting healthy nutrition and reduction of obesity in the NAYHP (89) and nutritional assessment and nutrition education in the ISHP (88).

With more attention currently being given to prevention in the context of the rising burden of non-communicable diseases in South Africa and the increasing prevalence of obesity amongst adolescents (particularly females), this may be an opportune time to augment policies oriented to adolescent health with evidence based guidelines to promote healthy behaviours for healthy weight status and management. Additionally, in light of the psychosocial manifestations of obesity, stigma and self worth, interventions to address obesity may need to be evaluated to ensure that there are built in anti-stigma mechanisms that promote health rather than appearance (21), build self-esteem and address psychological aspects of weight related concerns and pressures together with diet and lifestyle interventions (14). Thus additional research is required in South Africa to further elucidate weight related beliefs and obesity causal attributions associated with self-efficacy in weight management that may help inform communication for behaviour change.

Importantly, research and intervention in children and adolescents whose views on causal attributions on obesity may be less entrenched would be useful to inform obesity prevention interventions (86). Future research in this regard should incorporate overt experiences of weight stigma in children, the sources of this stigma and the potential association with weight control behaviours. Additionally, body size and image related acculturation should be more comprehensively explored to understand not only body image attributions via the use of silhouettes, but also children's media ideals of body image, media consumption and food preferences to help separate cultural factors and social norms from acculturation on body image.

Future investigations in adolescents' risk of disordered eating may benefit from the inclusion of qualitative research to help elucidate eating attitudes that are a part of socio-cultural practice and or are risk factors for unhealthy weight loss behaviours. Physical activity as a means to weight management in children warrants further investigation given that it was the predominant method for weight loss chosen by adolescents and also an integral part of the government strategy to address obesity prevention and control. Longitudinal studies incorporating the aforementioned variables would be particularly valuable in helping to establish causal relationships and track the relevance of these factors through development into adulthood. This may be particularly significant at this critical stage in development during which weight stigma, body size, body image and weight loss behaviours may determine adult weight and health consequences.

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Appendix A

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

COMMITTEE FOR RESEARCH ON HUMAN SUBJECTS (MEDICAL)
Ref: R14/49 Richter

CLEARANCE CERTIFICATE **PROTOCOL NUMBER** M01-05-56

PROJECT Birth To Twenty: A Longitudinal Population-Based Study of Reproductive And Psychosocial Maturation In Urban South African Youth Aged 10 To 20 Years

INVESTIGATORS Prof LM Richter

DEPARTMENT School of Clinical Medicine, CH Baragwanath Hospital

DATE CONSIDERED 01-05-25

DECISION OF THE COMMITTEE *

Approved unconditionally

DATE 01-07-09 **CHAIRMAN**.....(Professor P E Cleaton-Jones)

* Guidelines for written "informed consent" attached where applicable.

c c Supervisor:
Dept of ,

Works2\Iain0015\HumEth97.wdb\M 01-05-56
==========
DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and ONE COPY returned to the Secretary at Room 10001, 10th Floor, Senate House, University.

I/we fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be
PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix B

From: Shane Norris <Shane.Norris@wits.ac.za>
Subject: RE: Research Protocol Approval Request: Secondary Analysis - Weight Stigma
Date: 28 May 2017 at 9:17:24 PM SAST
To: Preethi Mistri <9201170m@students.wits.ac.za>
Cc: Sumaya Mall <Sumaya.Mall@wits.ac.za>, Nicola Christofides <Nicola.Christofides@wits.ac.za>, Nicola Christofides <nicola.chris@gmail.com>

Hi Preethi - a very nice proposal!

Please see attached my comments and edits. I am happy for you to submit.

Also, you have permission to access the Bt20 data (please attach email as confirmation of approval).

Best wishes,
Shane

From: Preethi Mistri [9201170m@students.wits.ac.za]
Sent: 24 May 2017 04:28 PM
To: Shane Norris
Cc: Sumaya Mall; Nicola Christofides; Nicola Christofides
Subject: Research Protocol Approval Request: Secondary Analysis - Weight Stigma

Dear Prof Shane

I hope this email finds you well?

I've been working on the research protocol for weight stigma and have been guided by both Nicola and Sumaya through several revisions thereof and also to ensure it meets the structural requirements within the MPH guidelines.

I would like to request your approval on this draft, as I would like to make the submission deadline of this Monday 29 May for the next Assessor Group meeting (in June).

Also, please could you also assist me with the permission and other documentation required to use the BT20 data to submit with my protocol or advise whom I could reach out to for this?

Thank you and best wishes,

Preethi

Appendix C

R14/49 Ms P Mistri

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M170748

NAME: (Principal Investigator)	Ms P Mistri
DEPARTMENT:	School of Public Health
PROJECT TITLE:	The relationship between self-esteem, body image, weight stigma and weight control behaviours and physical activity in adolescents from the Birth to 20 cohort: Soweto-Johannesburg
DATE CONSIDERED:	28/07/2017
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Profs SA Norris & N Christofides
APPROVED BY:	Professor PE Cleaton-Jones, Chairperson, HREC (Medical)
DATE OF APPROVAL:	11/10/2017

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on 3rd floor, Phillip V Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/We fully understand the conditions under which I am/we are authorised to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated from the research protocol as approved, I/we undertake to resubmit to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. in this case, the study was initially reviewed in **July** and will therefore be due in the month of **July** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature

14 OCTOBER 2017
Date

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix D

WITS School of Public Health

Plagiarism declaration for written work: MSc/MPH

I Preethi Mistri (Student number: 9201170M) am a postgraduate student registered for the MPH in the Field of Social and Behaviour Change Communication in the School of Public Health. I am submitting my written work for assessment for the module: Research Report COMH7175 (course name and code).

I hereby declare the following:

- I am aware that plagiarism is the use of someone else's work without their permission and/or without acknowledging the original source).
- I am aware that plagiarism is wrong.
- I confirm that the work submitted for assessment for the above course is my own unaided work except where I have explicitly indicated otherwise.
- I have followed the required conventions in referencing the thoughts and ideas of others.
- I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I have failed to acknowledge the source of the ideas or words in my writing.

Signature:  Date: 19 October 2018

Appendix E



University of the Witwatersrand
Department of Paediatrics and Child Health

BIRTH TO TWENTY BARA SITE: 13TH YEAR ADOLESCENT QUESTIONNAIRE

DATE : Day ☐☐ **Month** ☐☐ **Year** ☐☐☐☐

BTT ID NUMBER : ☐☐☐☐☐☐☐

BONE STUDY ID NUMBER : ☐☐☐

WEIGHT CHANGE ATTEMPTS

1. Have you tried to **lose weight** during the past year? | Yes | No |

2. If yes, what was the **most important** reason (**mark only one**)?

It is healthy	
I want to look better	
My clothes were too tight	
I am too fat compared to my friends	
I am unhappy with myself	
I have a dreams of being a model or movie/TV star	
Any other reason, specify	

3. If you did try to **lose weight**, describe all the methods you have tried. Include any information on diet, exercise, pills or anything else that you have tried.

1.
2.
3.
4.
5.

Appendix E Continued:

WEIGHT CHANGE ATTEMPTS

4. Did you try to **build more muscles** or grow bigger during the past year?

Yes	No

5. If yes, what was the most important reason (mark only one)?

It is healthy	
I want to look better	
I have too little muscles compared to my friends	
I am unhappy with myself	
I have a dreams of being a model or movie/TV star	
Any other reason, specify	

6. If you did **try to build more muscles**, describe all the methods you have tried. Include any information on diet, exercise, pills or anything else that you have tried.

1.
2.
3.
4.
5.

Appendix E Continued:

BELIEFS ABOUT OBESE PERSONS SCALE (BAOP)

Please mark each statement below according to how much you agree or disagree with it.

No	Question	YES!	Yes	No	NO!
1	Overweight teenagers eat because they don't get love or attention				
2	In many cases overweight teenagers are fat because of a biological or health problem.				
3	Over-weight teenagers get fat because of overeating.				
4	Most overweight teenagers get fat because they don't get enough exercise.				
5	Most overweight teenagers eat more than non-overweight teenagers.				
6	The majority of overweight teenagers have bad eating habits that cause them to be fat.				
7	Being fat is not caused by a lack of will power.				
8	Teenagers can be addicted to food as others are addicted to drugs and alcohol and teenagers that are addicted to food usually become overweight/fat.				

DISABILITY RATING TASK

Place the cards in order from the child you are most likely to be friends with to the one you least likely to be friends with.

Teenager who is blind	
Teenager with crutches and leg brace	
Teenager sitting in a wheelchair	
Teenager with no hand	
Child with facial disfigurement (hair lip)	
A teenager who is an Albino	
A fat teenager	
A teenager who comes from a poor family	

Appendix E Continued

BODY ESTEEM SCALE FOR ADOLESCENTS

	Never	Seldom	Sometimes	Often	Always
1. I like what I look like in pictures	0	1	2	3	4
2. Other people consider me good looking	0	1	2	3	4
3. I'm proud of my body	0	1	2	3	4
4. I'm preoccupied with trying to change my body weight	0	1	2	3	4
5. I like what I see when I look in the mirror	0	1	2	3	4
6. There are lots of things I'd like to change about my looks if I could	0	1	2	3	4
7. I am satisfied with my weight	0	1	2	3	4
8. I wish I looked better	0	1	2	3	4
9. I really like what I weigh	0	1	2	3	4
10. I wish I looked like someone else	0	1	2	3	4
11. People my own age like my looks	0	1	2	3	4
12. My looks upset me	0	1	2	3	4
13. I'm as nice looking as most people	0	1	2	3	4
14. I'm pretty happy about the way I look	0	1	2	3	4
15. I feel I weigh the right amount for my height	0	1	2	3	4
16. I feel ashamed of how I look	0	1	2	3	4
17. Weighing myself depresses me	0	1	2	3	4
18. My weight makes me unhappy	0	1	2	3	4
19. I worry about the way I look	0	1	2	3	4
20. I think I have a good body	0	1	2	3	4
21. I'm looking as nice as I'd like to	0	1	2	3	4

Appendix E Continued

ROSENBERG SELF-ESTEEM SCALE

	A lot like me	A bit like me	Not very like me	Not at all like me
1. On the whole, I am satisfied with myself	1	2	3	4
2. At times I think I am no good at all	1	2	3	4
3. I feel that I have a number of good qualities	1	2	3	4
4. I am able to do things as well as most other people	1	2	3	4
5. I feel I do not have much to be proud of	1	2	3	4
6. I certainly feel useless at times	1	2	3	4
7. I feel that I am a person of worth, at least on an equal plane with others	1	2	3	4
8. I wish I could have more respect for myself	1	2	3	4
9. All in all, I am inclined to feel that I am a failure	1	2	3	4
10. I take a positive attitude towards myself	1	2	3	4

Appendix E Continued

EATING ATTITUDES TEST

Please make a cross under the column which applies best to the way you feel next to each statement.

	Always	Very often	Often	Sometimes	Seldom	Never
1. I am terrified *(very scared)* about being overweight						
2. I avoid eating *(try not to eat)* when I am hungry						
3. I find myself preoccupied with food *(think about food a lot)*						
4. I have gone on eating binges *(a lot of food in a short time)* where I feel that I may not be able to stop						
5. I cut my food into small pieces						
6. I am aware of the calorie/ *kilojoule (energy)* content of foods that I eat						
7. I particularly avoid foods with a high carbohydrate *(starch)* content *such* as bread, potatoes, rice *and pap*						
8. I feel that others would prefer *(like it)* if I ate more						
9. I vomit *(bring up food / throw up)* after I have eaten						
10. I feel extremely guilty *(I've done wrong)* after eating						
11. I am preoccupied with a desire to be thinner *(think about being thinner a lot)*						
12. I think about burning up calories/ kilojoules *(energy)* when I exercise						
13. Other people think I am too thin						
14. I am preoccupied with the thought of having fat on my body *(think about having fat on my body a lot)*						
15. I take longer than other people to eat my meals *(food)*						
16. I avoid *(try not to eat)* foods with sugar in them						
17. I eat "diet" foods *(special foods to lose weight)*						
18. I feel that food controls my life						
19. I display self control around food *(I can control my eating if there is a lot of food available)*						
20. I feel that others put pressure on me to eat						
21. I give too much time and thought to food						
22. I feel uncomfortable *(not good)* after eating sweets						
23. I engage in dieting behaviour *(try to lose weight)*						
24. I like my stomach to be empty *(I like the feeling)*						
25. I enjoy trying new rich (*creamy/ fatty*) foods						
26. I have the impulse *(need)* to vomit after meals						

Appendix E Continued

PARENT WHEREABOUTS

1. Are you living with both your parents? No 0 Yes 1

If No,

Do you live with your mother No 0 Yes 1

If not living with mother,

Since what age in years have you not lived with your mother?

Do you see your mother? No 0 Yes 1

If Yes, how often

Never 0	See her very seldom 1	More than once a year 2	More than once a month 3	More than once a week 4

Do you live with your father No 0 Yes 1

If not living with father,

Since what age in years have you not lived with your father?

Do you see your father? No 0 Yes 1

If Yes, how often

Never 0	See him very seldom 1	More than once a year 2	More than once a month 3	More than once a week 4

Appendix F

Logistic Regression

Logistic regression analysis is used to test hypotheses and examine potential associations between explanatory or predictor variables and outcome variables that are categorical and binary in nature (90) in this case weight loss (yes or no). It is a statistical tool utilising the mathematical concept of “the natural logarithm of an odds ratio” (Peng et al, p 3) (90). Logistic regression helps to mathematically calculate the odds of the outcome being associated with the explanatory variable (90) in this case BMI, BAOP, body image, risk of disordered eating and self-esteem. The output of interest for the mathematical calculation within a logistic regression model is the odds ratio which may be adjusted for other variables built into the model (70). In this case, what were the odds of weight loss (yes) being associated with weight stigma when adjusted for BMI and body image for example.

Appendix G

R14/49 Ms P Mistri

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M170748

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CONDITIONS:	
SUPERVISOR:	Profs SA Norris & N Christofides
APPROVED BY:	Professor PE Cleaton-Jones, Chairperson, HREC (Medical)
DATE OF APPROVAL:	11/10/2017

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Principal Investigator Signature

14 OCTOBER 2017
Date

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES