



## **The Fit Families pilot study: preliminary findings on how parental health and other family system factors relate to and predict adolescent obesity and depressive symptoms**

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This study, undergirded by family systems theory, examined the extent to which parent and family-level factors correlate with adolescent obesity and depressive symptoms. We also considered whether these variables predict unique variance in adolescent obesity and depressive symptoms. The participants were a convenience sample of 77 racially diverse, predominantly early adolescents (aged 12 to 17) and their parents. Results from a series of linear and logistic regression analyses indicated that three of the study factors (parental weight history, family resources and adolescent weight history) significantly contributed to the variance in adolescents' body mass indexes and only one of the study factors (parental depressive symptomatology) significantly contributed to the variance in adolescents' rates of depressive symptomatology. These preliminary findings clarify how parent and family system factors might inform family and school-based intervention and treatment efforts for adolescent health outcomes.

### Practitioner points

- Family environment (measured in this study as family conflict and cohesion) should continue to be evaluated as a risk factor for obesity and depressive symptoms in racial and ethnic minority and non-minority families.
- Family therapists as well as other practitioners (for example, primary care providers) should assess for family conflict when adolescents present with physical and psychological distress and disturbances.
- Family therapists and other practitioners could be more effective if they established whether adolescent patients and their family members have the resources (for example, knowledge, financial ability and skills) needed to live a healthy lifestyle, as well as the coping strategies for maintaining their physical and psychological health.

*Keywords:* family systems theory; adolescent health; parental health; obesity; depressive symptoms; body mass index; school–university partnerships.

By 2030 the crisis related to obesity is expected to worsen severely; rates of obesity in adults are expected to reach or exceed 44 per cent in every state (Trust for America's Health, 2012). The total cost of an overweight and obese society is estimated by the Surgeon General (U.S. Department of Health and Human Services, 2001) to be \$117 billion per year currently and by 2030 to be \$210 billion per year (Trust for America's Health, 2012). Recent increases in the rates of obesity have been the largest among adolescents: 'among adolescents aged 12–19 years, [obesity] has more than tripled, increasing from 5.0 percent to 16.1 percent' (Wang and Beydoun, 2007, p. 28). Obesity is a significant public health threat and obesity in childhood and adolescence serves as a precursor to obesity in adulthood (Charney, 1998; Institute of Medicine, 2005; U.S. Department of Health and Human Services, 2001). Rates of obesity continue to climb exponentially. Of particular importance to the current study, rates of obesity continue to explode in the southern region of the USA (Institute of Medicine, 2009; Trust for America's Health, 2011, 2012). Moreover, although southern and rural racial and ethnic minorities appear to be particularly vulnerable to obesity they are among the most understudied groups in the USA (Probst *et al.*, 2004, p. 1695). Explanations that may account for this public health threat and that may be targeted to eliminate adolescent obesity have remained sparse.

Of significance, intervention and treatment models for obesity that focus on individual-level factors have proven to be inadequate, particularly for racial and ethnic minority populations (Glanz *et al.*, 2005; Kirk *et al.*, 2005; World Health Organization, 1998). The need to better understand the correlates and predictors of adolescent obesity – specifically among adolescent racial and ethnic minorities, as well as their families – is urgent. For example, Stecker *et al.* (2006) contended that obesity, depression and race, taken together, engender a triple threat for chronic disease. Therefore, this current research explored

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the correlates and predictors of obesity and depressive symptoms at the level of the individual, parents and the family for early adolescent racial and ethnic minorities.

Specifically, the factors explored in the Fit Families pilot study include race and ethnicity, adolescent depressive symptoms and obesity, parental obesity, parental depressive symptoms, family socio-economic status (SES), family eating behaviour and family environment (measured as family conflict and cohesion). Depressive symptoms, both in the adolescent and in the parent, are included because obesity and depression are likely to co-occur (Hooper *et al.*, 2010; Stecker *et al.*, 2006; Stunkard *et al.*, 2003). Because all adolescent health outcomes occur and are experienced in the context of the family system, family explanatory factors must be considered in studies that try to understand and expand our knowledge about current rates of adolescent obesity (Barnhill, 1979).

### **Brief literature review**

The following sections briefly review literature on factors at the individual, parent and system levels that may relate to or predict adolescent obesity or adolescent depressive symptoms. The empirical evidence on the relation between adolescent health and factors at the levels of parents and systems is copious; therefore, a comprehensive review of the literature on these factors is beyond the scope of this article.

#### *Individual-level factors*

*Adolescent obesity and race or ethnicity.* Race appears to be associated with rates of adolescent obesity (Hanson and Chen, 2007). Obesity patterns differ for Black Americans, Latino Americans, Asian and Pacific Islander Americans and non-Hispanic White Americans (Trust for America's Health, 2011). For example, during childhood, Latino Americans and Black Americans are more likely to be overweight than their non-Hispanic White American counterparts (Haas *et al.*, 2003). Reasons for these variations have not been clearly established but some researchers have suggested that lifestyle, acculturation and various cultural beliefs may play a role (Haas *et al.*, 2003), including a cultural tolerance for obesity (Gearhart *et al.*, 2008; Palmer, 2003). Other explanations that have been put forward relate to specific food choices. In a study conducted by Davison and Birch (2001), Black

American children were found to have higher rates of fat intake than any other group. Other studies and seminal reviews have also suggested that adolescents with a low SES Black background may be especially vulnerable to obesity (Goodman, 1999; Gortmaker *et al.*, 1993; Kirk *et al.*, 2005; Trust for America's Health, 2011).

*Adolescent obesity and comorbid depression.* Many adolescents who present with obesity also experience comorbid disorders such as depression (Trust for America's Health, 2011, 2012). The Healthy People 2020 Initiative identified the treatment of major depression as a national priority (U.S. Department of Health and Human Services, n.d.). For adolescents, depression is the most common clinical disorder, with a prevalence rate of 3–9 per cent. It is an impairing disorder that leads to significant disability, morbidity and mortality (Hughes and Gullone, 2008; Trust for America's Health, 2011). Despite the poor long-term outcomes, including risk for suicide, depression in adolescents continues to be under-recognized (Hooper, 2010). Additionally, because depression and obesity are two of the most common adolescent public health issues, they are likely to co-occur (Kumanyika *et al.*, 2007; Reeves *et al.*, 2008).

With relevance to the present study, Erermis *et al.* (2004) compared adolescents who were diagnosed as obese concomitant with a mental health disorder, diagnosed as obese with no mental health disorder, and diagnosed as having a healthy weight. The researchers found significant positive associations between obesity and depressive symptomatology and between obesity and a major depressive disorder (MDD) as measured by the *Diagnostic and Statistical Manual of Mental Disorders* criteria (American Psychiatric Association, 2000). In another study, Pine *et al.* (2001), examined the link between childhood major depression and adult body mass index (BMI). This study found that SES status, MDD, and obesity during childhood were all predictors of high BMI (classified as obesity) in adulthood.

### *Parent level factors*

*Adolescent obesity and parental obesity.* Family systems researchers are traditionally interested in how family members and the family context influence outcomes for other family members, including adolescents. However, findings from obesity research suggest that the link between parental obesity and childhood obesity is equivocal (Daniels, 2006; Guo and Chumlea, 1999; Power *et al.*, 1997; Whitaker *et al.*, 1997). For

example, Daniels (2006) notes, 'The link between parental overweight and childhood obesity is likely to be both genetic and environmental, and untangling the two is often difficult' (p. 60).

Of relevance to the current study, however, the link becomes stronger as the child ages and becomes an adolescent; thus, the link between adolescent obesity and later adult obesity seems clear. In a study conducted over a 6-year period, Strauss and Knight (1999) examined race, SES factors, family climate and system factors in conjunction with the level of childhood obesity. The researchers found that children whose mothers were overweight had a '1.5-fold increased risk for obesity, and children whose mothers were obese had more than a threefold increased risk of childhood obesity' (p. 3).

*Adolescent depression and parental depression.* Prager (2009, p. 200) suggests that the most potent risk factor for depression in children and adolescents is parental depression. Empirical evidence on the relation between adolescent depression and depressive symptoms and parental depression has accumulated over the years (see Downey and Coyne, 1990; Fendrich *et al.*, 1990; Goodman and Gotlib, 1999; Hooper *et al.*, 2010; Hooper and Newman, 2011; Kane and Garber, 2004). Field *et al.* (2001) investigated the risk factors associated with adolescent depression. In their sample of 79 high school seniors a significant positive correlation was found between parental depression and adolescent depression. Interestingly, that study found a higher correlation between paternal depression and adolescent depression than between maternal depression and adolescent depression.

Findings from other studies have revealed that parents may inadvertently teach (that is, transmit to) their children depression-like coping patterns (Hooper and Newman, 2011; Sheeber *et al.*, 2001). Research has accumulated on how submissive maternal behaviour could increase the internalization of depressive symptoms in parents and among adolescents (Sander and McCarty, 2005). In general, adolescents appear to develop their cognitive style based on how their parents behave towards them, which includes signs of depression. Sheeber *et al.* identified one factor explaining how depressive symptomatology may be passed from one generation to the next: the 'failure to allow increasing autonomy and decision-making responsibilities' in the child or adolescent (Sheeber *et al.* 2001: 26).

*Family-level factors*

*Obesity and family SES.* The link between obesity and SES is unclear and ambiguous (Alleyne and LaPoint, 2004). For example, some studies have found an association between obesity and low SES (Dietz, 1998; Kumanyika and Grier, 2006; Siobhan *et al.*, 2008; Sobal and Stunkard, 1989), whereas other studies have found an association between obesity and high SES (Wang *et al.*, 2002; Zhang and Wang, 2004). The inconsistency may be due to the effects of race. For example, Gordon-Larsen *et al.* (2003) found a negative association between family SES and obesity in White American, adolescent, female participants, but a positive association between family SES and obesity for Black American, adolescent female participants. For example, Gordon-Larsen *et al.* (2003) found the direction of the relation between family SES and obesity was differentiated by race. Specifically, in their study they found a negative association between family SES and obesity in White American adolescent, female participants: as obesity increased family SES decreased; but the opposite was true for Black American adolescent female participants: as obesity increased family SES increased.

Results from the National Longitudinal Study of Youth indicated that low SES is associated with one-third of the presenting cases of depression and obesity (Goodman *et al.*, 2003). The findings suggest a connection between SES and health risks, such as obesity and depression, even for adolescents. In another study, Simon *et al.* (2006) found that those with a high BMI – especially Black participants and Hispanic participants with no more than 12 years of education (education was used as a proxy for SES) – exhibit greater odds of developing depressive symptoms and mood disorders than those with a low BMI. In sum, a family's SES or level of resources appear to correlate with adolescent health outcomes and thus ought to be included in family systems research (Brannan *et al.*, 2006; Trust for America's Health, 2011, 2012).

*Obesity and family eating behaviour.* Nutritionists have suggested that individual and family eating patterns and behaviour can impair or enhance growth and development in adolescents (Fulkerson *et al.*, 2007; Videon and Manning, 2003). Some researchers have suggested that family meals present the opportunity to demonstrate healthier eating choices and can be an opportunity to model healthy eating habits (Brown and Ogden, 2004; Gillman *et al.*, 2001; Golan and Crow, 2004). Other findings have suggested that the presence of a

parent at meals leads to better eating patterns (Neumark-Sztainer *et al.*, 2003) and has a significant association with BMI in both adolescents and other family members.

Davison and Birch's laboratory studies have reported a strong association between parental feeding behaviour and levels of childhood BMI (Davison and Birch, 2001). Parents who report highly controlling and restrictive behaviour in their family feeding patterns have been found to have children with higher than average BMIs (Davison and Birch, 2001; Golan and Crow, 2004).

Additionally, researchers have found a link between cultural factors and family eating patterns as well. In one study, LaPoint (2003) found that Black Americans and Hispanic Americans are more likely to skip breakfast and less likely to report fruit consumption in the previous day than are non-Hispanic White Americans. LaPoint suggested that the differences in eating habits and in the associated sequelae (high BMI) between Black Americans and racial majority Americans may result from Black Americans' greater exposure to the marketing of low-nutrition foods. Consistent with LaPoint's point of view, other researchers have discussed the notion that Black Americans are likely to live in environments and communities that do not support healthy eating and physical activity (for example, where there is a lack of grocery stores selling fresh fruit and vegetables, a lack of advertising of health foods and a lack of space where families can engage in physical activity), and an abundance of stores that sell high fat food (see Dalton, 2007; Kumanyika *et al.*, 2007; Kumanyika and Grier, 2006). Consequently, Black Americans and other racial minority groups have a greater than average likelihood of having a high BMI and thus of becoming obese.

*Obesity and family conflict and cohesion.* Previous studies have found a fairly clear link between the family context and environment and child and adolescent health outcomes. For example, seminal research conducted by Burt *et al.* (2005), Wood (1993), Minuchin *et al.* (1978), McFarlane *et al.* (1995) and Davison *et al.* (2005) uncovered the fact that children and adolescents from psychosomatic, obesigenic and high-conflict families had worse health outcomes. In their work, Minuchin *et al.* found that a psychosomatic family typology is associated with overly high cohesion (termed enmeshment), rigidity, over-protectiveness and conflict avoidance. More recently, family conflict and cohesion has been shown to be related to obesity. Ebbeling *et al.* (2002) found that an adolescent who is embedded in a supportive

family environment will be more likely to experience and engage in family-related exercise and eating behaviour, whereas children in less supportive environments (for example, where parents are neglectful or unavailable due to mental illness) are more likely to experience obesity during childhood and adulthood and are less likely to engage in family-related exercise and eating behaviour.

Davison *et al.* (2005) examined how family behaviour and environment (that is, obesigenic families) was related to rates of obesity in adolescent girls. Their results demonstrated the long-term effects that the family environment has on rates of obesity. Specifically, they found that girls who were from obesigenic families reported higher rates of obesity and higher rates of poor daily eating habits (for example, the consumption of excessive amounts of fatty foods) than those from non-obesigenic families. Importantly, BMIs of all family members living in obesigenic family environments continued to increase over the course of the study. That is, both parents' and adolescents' BMIs continue to increase over the 4-year study period.

Repetti *et al.* (2002) suggest that children and adolescents reared in a home characterized by uncaring and unsupportive attitudes and conflict are more likely to experience physical illness, major health problems and obesity later in their lives. In sum, a review of the literature suggests that the family environment has many influences on adolescent health outcomes (for example, obesity and depressive symptoms) and thus should be considered in systems-focused health studies (Burt *et al.*, 2005; Hughes and Gullone, 2008).

### **The present study**

The Fit Families pilot study used a family systems framework to examine select parental health factors and other family systems factors in relation to adolescent health outcomes, specifically, obesity and depressive symptoms. Family systems theory has long been used to understand adolescent development, attachment strategies, coping mechanisms and factors related to psychological stress, mental health disorders and medical conditions (Lohman and Jarvis, 2000; Minuchin *et al.*, 1978; O'Connor *et al.*, 1998; Rothbaum *et al.*, 2002; Wood, 1993). Although families face numerous health conditions, the present study explored obesity and depressive symptoms only. Depressive symptoms – in both the adolescent and the parent – were included in this study because obesity and depression have been

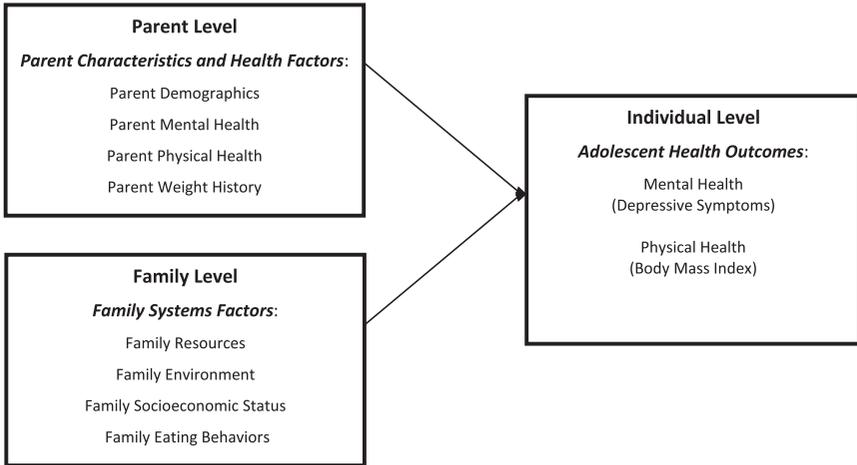


Figure 1. Exploratory family systems model for understanding adolescent health outcomes: obesity and depressive symptoms.

found likely to co-occur (Stunkard *et al.*, 2003). Given the extant literature base, three exploratory hypotheses were tested in our investigation (see Figure 1):

- Hypothesis 1: There will be significant associations among parental factors (socio-demographic, obesity and depressive symptoms), family systems factors (family resources, family conflict and family cohesion) and adolescent physical and mental health outcomes (BMI scores and depressive symptomatology scores).
- Hypothesis 2: The study predictor variables (see Table 1) significantly and uniquely predict adolescent physical health outcomes (BMI scores).
- Hypothesis 3: The study predictor variables (see Table 1) significantly and uniquely predict adolescent mental health outcomes (depressive symptomatology scores).

## Method

### *Participants*

Participants in the Fit Families pilot study constituted a sample of 77 parent–child dyads from a community in Alabama. Specifically, the participants were a convenience sample of 77 early adolescents;

TABLE 1 *The Fit Families study's constructs and variables of interest*

Construct	Conceptualized	Measured	Type of variable
Parent socio-demographic factors	Age	Demographic questionnaire	Predictor
	Years of education		
Parent health	Depressive symptoms	Beck depression inventory	Predictor
	Obesity status	Current body mass index	
	Perception of long-term weight history	Birch child questionnaire	
Family environment	Daily available resources	Family resource scale	Predictor
	Family level of cohesion	Family environment scale	
	Family level of conflict		
Family eating behaviour	Eating-related behaviour among family members (for example, pressure to eat)	Birch child questionnaire	Predictor
Adolescent health	Depressive symptoms	Beck depression inventory	Outcome/criterion
	Obesity status	Current body mass index	

primarily Black Americans (67.9% Black Americans and 28.6% non-Hispanic White Americans) and 77 parents (one parent per adolescent) from selected schools in Alabama. The student participants were primarily female (58%;  $n = 48$ ) and attended middle or high school. Adolescent participants ranged in age from 12 to 17 years, with a mean age of 12.80 years ( $SD = 1.12$ ). Almost half of the early adolescents were either overweight or obese (specifically, 23% were overweight, and 23% were obese). Parent participants were also primarily female (73%) and nearly three-quarters of them were either overweight or obese (specifically, 27% were overweight, and 46% were obese). Parent participants ranged in age from 25 to 66 years, with the total adult sample's mean age being 40.41 years ( $SD = 8.53$ ). Adolescent participants came from schools composed of primarily Black American students whose family SES ranged from high to medium

poverty, based on the schools' percentages of children and adolescents who receive free or reduced-cost lunch services.

### *Procedure*

The principal investigator and the Fit Families research team members had several planning meetings with the personnel of the various schools to determine how to reach the maximum number of families in their schools. After several meetings and joint efforts with the schools, four schools agreed to be a part of the study. Letters of invitation and flyers announcing the school community-approved research study were sent home with all students in grades 7 to 12. Upon approval from the University of Alabama Institutional Review Board's guidelines for research with human subjects, the Fit Families study recruitment took place from March to May 2006.

### *Measures*

*Participants' characteristics.* One form, which was created for the study, asked adolescents for information regarding their year in school, their race, ethnicity, current age, weight and height. A separate form, also created for the study, asked parents to report on their own years of education completed, age, weight and height.

*Family environment scale (FES).* The FES (Moos and Moos, 1986) was used to obtain current information about the participants' family characteristics, environment and climate. The FES is a 90-item self-report measure comprising 10 subscales. Scores derived from the subscales create a profile or typology of the participants' family environment and interaction patterns. The FES is widely used to measure family climate, context and behaviour (Moos and Moos, 1986) and the stability of the FES scores has been shown to produce reliability values ranging from .50 to .90 (Boyd *et al.*, 1997; Chipuer and Villegas, 2001; Loveland-Cherry, 2006; Santisteban *et al.*, 2003; Waldron *et al.*, 1990).

For the current study two subscales from the FES were used to assess the family environment, relationships and interaction patterns: family cohesion and family conflict. Participants were asked to indicate how much they agreed with each of 10 statements using a six-point Likert scale ranging from 1 (strongly agree) to 6 (strongly disagree). Higher scores on the family cohesion and family conflict subscales indicate, respectively, a greater level of family cohesion and a greater

level of family conflict. Out of concern for participant burden, we used these two subscales only. Cronbach's alpha for the sample was .78 and .60 for family cohesion and family conflict, respectively.

*Child feeding questionnaire (CFQ).* The CQF (Birch *et al.*, 2001) was used to assess specific perceptions of family-focused (that is, parent and child) eating behaviour and weight history. Two subscales of the instrument were used for the analyses in the present study. Parents responded to questions related to their own weight history using a five-point Likert scale ranging from 1 (underweight) to 5 (markedly overweight). The instrument includes a similar set of questions related to the adolescent participants' weight history as well.

Consistent with other studies, the reliability (Cronbach's alpha values) of the scores of the two subscales used in the current study was as follows: the parents' perception of their own weight history was .60; the parents' perception of the adolescents' weight history was .59. In previous studies the CFQ scores have reported reliability in a range of .58 to .69 (Birch *et al.*, 2001; Kaur *et al.*, 2006).

*Family resource scale (FRS).* The FRS (Dunst and Leet, 1987), a 31-item self-report survey, was developed to assess the extent to which various resources are adequately available to families. Dunst and Leet explained that the FRS measures the extent to which families have adequate – both tangible and intangible – daily resources using a five-point scale that ranges from (1) not at all adequate to (5) almost always adequate. Higher scores on the FRS reflect higher levels and quantities of resources being available to families.

The psychometric properties of the FRS evinced in previous studies have suggested that the FRS is both valid and reliable. The FRS demonstrates good validity (correlated with and predictive of hypothesized variables, for example, caregiver strain, family problem-solving, family income) and sound reliability scores with very few exceptions; Cronbach's alphas ranged from .67 to .90. Cronbach's alpha was very good in the current study ( $\alpha = .90$ ), slightly higher than alpha values evidenced in other studies (Dunst and Leet, 1987).

*Beck depression inventory (BDI).* The BDI (Beck *et al.*, 1996) is composed of 21 self-report questions that screen for depressive symptomatology. Scores for each item range from 0 to 3, which are summed to create a total score. The maximum possible total score is 63, where higher scores reflect greater severity of depression symptomatology and a

greater likelihood of MDD. The BDI is one of the most widely used instruments for measuring depressive symptomatology. Scores from this instrument have been shown to have good reliability and validity.

In the present study the BDI was used to capture depressive symptomatology in accordance with the *DSM-IV* (American Psychiatric Association, 2000) for both adolescent and parent participants. Cronbach's alpha was .91 for parent participants and .92 for adolescent participants.

*Body mass index.* BMI was calculated and used to quantify weight status and to operationalize obesity among the study participants. All participants were asked to self-report their height (in feet and inches) and weight (in pounds). For both the adolescents and adults in the present study, BMI was calculated using the following standardized formula:  $BMI = \text{weight (in kg)} \div \text{height squared (in m)}$ . For the adolescent participants the age-adjusted  $z$  score for BMI was used in all analyses. For adolescent participants 'overweight or obese' was categorized as a BMI greater than the 85th percentile, consistent with guidelines set by the Centers for Disease Control and Prevention (2006, n.d.). For parent participants the BMI was calculated and then categorized as defined by Centers for Disease Control and Prevention (2006) in the following way: a 'normal weight' refers to a BMI between 18.5 and 24.9; 'overweight' refers to a BMI between 25 and 29.9 and 'obese' refers to a BMI greater than 30.

### *Analysis strategy*

All analyses were performed using SPSS vers. 17.0 (SPSS, Chicago, IL, USA). We employed the following procedures to examine the data. Firstly, descriptive data (means and standard deviations) for all study variables were examined (see Table 2). Secondly, we used scatter plots and Pearson product-moment correlation coefficients to determine the strength of the relations between the continuous variables (see Table 3). Following an examination of the bivariate relations among study variables, we divided the family system variables into three groups: parent characteristics and health factors (parent's gender, parent's race, parent's current BMI, parent's age, parent's depressive symptoms and parent's perception of own weight history), family system variables (family cohesion, family conflict, family resources and parent education) and family eating behaviour (parental pressure for the adolescent to eat, parental restriction of adolescent eating and

TABLE 2 *Descriptive statistics for study variables (N = 77 parent–adolescent pairs)*

Study variable	Mean	SD
Parent BMI	31.25	7.40
Parent age	40.59	8.53
Parent BDI	10.53	11.05
Parent perception of own weight history	3.19	0.48
Family cohesion	3.06	1.24
Family conflict	2.71	1.67
Family resources	5.09	0.68
Parent years of education	13.37	2.37
Pressure for adolescent to eat	2.94	1.13
Parental food restriction	3.65	1.02
Parental concern over adolescent's weight	3.88	1.17
Adolescent BMI	23.34	6.09
Adolescent BDI	11.70	12.71

*Note:* BDI, Beck depression inventory score; BMI, body mass index.

parental concern over adolescent's weight). To examine the third and fourth hypothesis we used an omnibus test to explore the relation between the collection of variables and each measure of adolescent health. To control the inflation of experiment-wide error rates, we only examined the influence of specific variables if the test of the entire collection was significant.

After separating our study variables into the aforementioned theoretically relevant groups, we used linear regression and logistic regression models to determine the unique and combined abilities of these variables to explain adolescent health, measured as adolescent BMI and adolescent depressive symptoms. All analysis models included subjects with non-missing values for the appropriate scales. Only observed values were used; no imputation was performed.

Finally, our sample size is somewhat small, so caution must be given to any non-significant effects. However, we can be confident about any significant relations that we observe, because a small sample size 'cannot increase the probability of getting spuriously significant results' (Zuckerman, Hodgins, Zuckerman and Rosenthal, 1993, p. 53).

## Results

### *Bivariate relations among study variables*

Table 3 indicates significant correlations between many of the study variables. However, when discussing these correlations we will focus

TABLE 3 Correlations among the Fit Families study variables (N = 77)

Study variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age (parent)	.23Jd*												
2. Years of education (parent)	.16	.17											
3. Family resources (parent)	-.11	-.15	-.15										
4. Family conflict (parent)	.38**	.30**	.08	-.05									
5. Family cohesion (parent)	-.03	.14	-.14	.21	-.09								
6. Perception of own weight history (parent)	.13	.10	.17	.15	.14	.25*							
7. Perception of adolescent's weight history (parent)	.05	-.27*	-0.21	-.01	-.03	-.16	.11						
8. Pressure for adolescent to eat (parent)	.06	-.12	-.09	.20	.09	.11	.53**	.44**					
9. Restriction of food to adolescent (parent)	.04	-.47**	-.12	.23*	-.02	.47**	.20	-.01	.19				
10. BMI (continuous) (parent)	-.31**	-.24*	-.28*	.33**	-.25*	-.02	.02	-.02	.12	.12			
11. BDI - depressive symptoms (parent)	.02	.03	.26*	.34**	-.08	.32**	.32	-.12	.21	.16	.11		
12. BMI (continuous) (adolescent)	-.04	-.01	-.03	.25*	-.06	-0.02	-.12	.08	.15	-.09	.30**	.19	
13. BDI - depressive symptoms (adolescent)													

\*P < 0.05; \*\*P < 0.01.

on the variables related to BMI and depressive symptoms scores; the primary variables of interest for the study. As evidenced in the results, we see that parents with higher BMIs typically experience more family conflict and are more likely to perceive themselves as having had weight problems in the past. Parents showing more symptoms of depression are typically younger and less educated, have fewer family resources, and experience greater family conflict and lower family cohesion. Adolescents with higher BMIs typically come from families with greater resources and more conflict and they typically have parents who have perceived themselves as having weight problems in the past. Of interest, adolescent BMI is not significantly related either to the parent's perception of the child's weight or to the parent's own current BMI. Adolescents showing more depressive symptoms come typically from families with more conflict and they typically have parents who are showing more depressive symptoms. We additionally performed  $\chi^2$  tests of independence to estimate the bivariate relations of adolescent BMI with parent gender and parent race. Both tests were not significant (both  $P$ -values  $> 0.35$ ).

#### *Relating parent characteristics and health factors to adolescent health*

A logistic regression analysis indicated that the collection of parent characteristics and health variables is able to explain a significant amount of variability in adolescent BMI, ( $\chi^2 [6] = 14.81, P = 0.02$ ). When we examined the unique contribution of the individual variables, the only one that was significantly related to BMI was parental perception of their own weight history (odds ratio = .10,  $\chi^2 [1] = 9.49, P = 0.002$ ). Adolescents who were overweight in the study tended to have parents who reported a problematic weight history. Using linear regression we found that the collection of variables is also able to explain a significant amount of variability in adolescent depressive symptoms ( $F[6, 68] = 2.62, P = 0.02$ ). The only significant coefficient in the regression model is the parental level of depression symptoms, which is positively related to adolescent depressive symptoms (beta = .356,  $t[68] = 3.02, P = 0.003$ ).

#### *Relating family system factors to adolescent health*

A logistic regression analysis indicated that the collection of family system variables is able to explain a significant amount of the

variability in adolescent BMI ( $\chi^2 [4] = 9.44, P = 0.05$ ). Of the individual variables, the only one significantly related to BMI is family resources (odds ratio = .29,  $\chi^2 [1] = 7.67, P = 0.006$ ). Adolescents who were found to be overweight tended to come from families with greater resources. Regression analyses indicated that the collection of family system variables is not able to explain a significant amount of variability in adolescent depressive symptoms ( $F[4, 51] = .59, P = 0.67$ ).

#### *Relating family eating behaviour to adolescent health*

A logistic regression analysis indicated that the collection of family eating behaviour variables is able to explain a significant amount of the variability in adolescent BMI, ( $\chi^2 [3] = 16.00, P < 0.001$ ). When we examined the contributions of the individual variables, it appears that only parental perception of the adolescent's weight history (odds ratio = .53,  $\chi^2 [1] = 5.66, P = 0.02$ ) is related to adolescent BMI – such that a parent's perception of an adolescent's problematic weight history is typically greater when the child is overweight. Regression analyses indicated that the collection of family eating behaviour variables is unable to explain a significant amount of variability in adolescent depressive symptoms ( $F[3, 73] = 1.95, P = 0.13$ ).

#### *Combined model predicting adolescent BMI*

Although only a single variable, that is, parental depressive symptoms, was found capable of predicting adolescent depressive symptoms the analyses above revealed a number of variables that are able to predict adolescent BMI. We therefore performed a logistic regression predicting adolescent BMI from the five variables that we found to be significant predictors ( $P < 0.05$ ) – that is, family resources, parent perception of adolescent's weight history and parent perception of own weight history – to determine the ability of each of these variables, separately and together, to explain adolescent BMI. This collection of variables was able to explain a significant amount of variability in adolescent BMI ( $\chi^2 [3] = 21.90, P < 0.001$ ). Significant independent effects were found for family resources (odds ratio = .27,  $\chi^2 [1] = 7.10, P = 0.008$ ), for parents' perceptions' of adolescent's weight history (odds ratio = .09,  $\chi^2 [1] = 8.15, P = 0.004$ ) and parent perception of their own weight history (odds ratio = .14,  $\chi^2 [1] = 4.99, P = 0.03$ ).

## Discussion

The purpose of the Fit Families pilot study was to examine the relations between the study predictor variables and adolescent health outcomes, as well as the predictive strength of the study variables – parental obesity, parental depressive symptoms, family SES, family eating behaviour, and family environment – in relation to adolescent depressive symptoms and adolescent obesity. Based on Stecker *et al.*'s (2006) proposition that obesity, depression and race together engender a triple threat for health outcomes, we used a convenience sample of primarily Black American adolescents and their parents. We first discuss the results of our bivariate analyses, followed by a discussion of the results of our predictive models.

As hypothesized, bivariate analyses revealed significant relations between adolescent health outcomes (that is, depressive symptoms and BMI) and the variables in the study that focused on parents and family. Our findings indicate that adolescent participants who reported a higher BMI also reported higher levels of family conflict and family resources. Specifically, analyses revealed that higher rates of family of resources, higher rates of family conflict and parents' self-reported weight history are positively associated with adolescent participants' BMI. The positive association between family conflict and BMI also held true for the parent participants. In accord with previous research, our results related to the importance of family environment add to the empirical research that has found a link between family conflict and BMI in individual family members (Davison *et al.*, 2005; Henry and Borzekowski, 2011; Papadopoulos, 1995). Consistent with the recommendations put forward by numerous researchers (for example, Dalton, 2007; Davis *et al.*, 2005; Kumanyika *et al.*, 2007) these findings suggest that assessing family environment and possibly targeting family conflict as a factor in interventions with Black American families may be useful.

Correlational tests also revealed significant relations between the levels of family conflict and parental depressive symptoms and the level of depressive symptomatology among adolescent participants. Likewise, family conflict and cohesion, parent participants' characteristics, and family resources were all found to be related to depressive symptoms in the parent participants. No link between BMI and depressive symptoms was observed in either the current early adolescent sample or the parent sample. These findings are consistent with the work of Davis *et al.* (2005) who found no relation between BMI

and depressive symptoms in their sample of 113 Black American women. Surprising, however, these non-significant findings are also consistent with the results of other researchers investigating the link between obesity and depressive symptoms (see Carpenter *et al.*, 2000; Siegel *et al.*, 2000). Importantly, there are several studies that are not consistent with our results and those of Carpenter *et al.* (2000), Siegel *et al.* (2000), Davis *et al.* (2005) and Dietz (1998). Specifically, there are other studies that *have* demonstrated a link between BMI and depressive symptoms in parents and adolescents (for example, see Davis *et al.*, 2005; Markowitz *et al.*, 2008; Simon *et al.*, 2006). Taken together, these mixed findings point to the need for additional studies using a rigorous methodology such as longitudinal research designs and multiple, cross-informant data collection procedures (for example, see Hammen *et al.*, 1991).

Overall, the Fit Families pilot study offers mixed support for the tested models. Regarding the parent factors, the overall model was statistically significant; together these factors were able to explain 25 per cent of the variance in adolescent BMI, although only one variable made a unique contribution: parent perception of own weight history. We can concur with Harkaway (2000): systems-focused research and the study of the transmission of obesity and other health conditions across generations is complex. The null findings in this study add to other studies that have found no association between parental obesity and childhood obesity (Daniels, 2006; Guo and Chumlea, 1999; Hooper *et al.*, 2010; Power *et al.*, 1997; Whitaker *et al.*, 1997). Additionally, some scholars have indicated that the relation between parent obesity and childhood obesity often grows stronger as the child ages (Vogt Yuan, 2007). Given our early adolescent sample, it could be that our null findings are due to the age of our adolescent sample, although we are cautious in ascribing meaning to our findings, given the small sample size. This null finding supports the need for additional research into the interrelations of obesity, BMI and depressive symptoms among older adolescents, as well as other systems factors.

Like the parent system model, the other two overall models were significant. Specifically, the family systems factors and family eating behaviour models were significant, explaining 20 per cent and 26 per cent of the variance, respectively. However, in both of these tested models, few of the variables were able to account for the unique variance in adolescent BMI. Consistent with other studies (Brannan *et al.*, 2006) the level of family resources was significantly related to

adolescent BMI. With regard to the relations and predictive strength of the theoretically relevant groups of systems constructs (parent and family systems) and adolescent depressive symptoms, the overall parent health and characteristics model was significant but parent's level of depressive symptoms was the only variable that made a significant, unique contribution to the variance in adolescent depressive symptoms. Similar to findings in other studies, parent depressive symptoms were a strong predictor of adolescent depressive symptoms (Prager, 2009).

### *Strengths and limitations of the study*

Filling a gap in the literature, the current study supports the benefit of including parent and family systems factors when examining adolescent health outcomes. In spite of the preliminary and informative nature of our findings, several limitations merit consideration in conjunction with the current study's results.

Firstly, one should be somewhat cautious about the results of our pilot study, due to the sample size and lack of racial diversity. Our sample was primarily composed of Black American families – and although this was both a strength and limitation, the results may not be generalizable to families in other racial and ethnic groups. The sample size may have underpowered the study's ability to detect significant associations between BMI and study variables.

Secondly, the data in the present study were all derived from a single-source information design and thirdly, data were cross-sectional and retrospective in nature. Thus, we cannot unequivocally link the significant relations evinced in the current study with adolescent health outcomes. Moreover, it is not possible to draw any conclusions about the causality of these relationships. Self-reporting of current weight status among study participants – compared with actual measured weight – could have significantly influenced the results of the study. Under-reporting or over-reporting of weight status can happen (Davis and Gergen, 1994; Strauss, 1999; Tienboon *et al.*, 1992). However, it is not uncommon to use self-reported height and weight to calculate BMI (Vaughan and Halpern, 2010).

Finally, the study used only one dimension of family assessment: paper-and-pencil questionnaires. A multidimensional approach, including family interviews and observation of family interactions would be likely to provide a more comprehensive view of family systems dynamics.

*Implications for clinical practice*

Keeping in mind the cross-sectional nature of the present study, our preliminary findings have the potential to inform family-focused clinical practice. More specifically, the findings of this study offer an empirical basis for three areas that clinicians may target when working with families in adolescent health: parental health (that is, depressive symptomatology), family conflict and family resources.

A review of the clinical and empirical literature suggests that adolescent patients who present with physical health conditions and psychological distress often have parents – both mothers and fathers – with a history of physical health conditions and psychological distress (Prager, 2009). In our study we found a moderate correlation between parent depressive symptoms and adolescent depressive symptoms. Prager suggests that the most ‘potent risk factor’ for depression in children and adolescents is parental depression (Prager, 2009, p. 200). Thus, the importance of including questions about the parents’ mental health histories when working with adolescent patients cannot be overstated. Although our cross-sectional findings did not show a relation between parent BMI and adolescent BMI, providers should not stop adhering to the clinical recommendation that they conduct a comprehensive assessment of family-focused medical histories (Institute of Medicine, 2009). Although the clinical research findings are mixed regarding the associations of parent BMI and adolescent BMI with depressive symptoms, our findings should not diminish the importance of the associations found in other studies (for example, Kowaleski-Jones and Mizell-Christie, 2010). Additionally, interventions that target physical and mental health considerations alike may afford adolescent patients the most effective and optimal care.

The clinical literature is rich with examples of how family conflict can engender disturbances in eating and mood (Ebbeling *et al.*, 2002; Lohman and Jarvis, 2000; Minuchin *et al.*, 1978; Wood, 1993). Our study found that family conflict relates to both BMI and depressive mood in both parents and adolescents. Therefore, another way in which our findings contribute to clinical practice (assessment, intervention and prevention) is by showing the need for family therapists as well as other providers (for example, primary care providers) to assess for family conflict when adolescents present with physical and psychological distress and disturbances. For example, Fisher and Weihs (2000) suggested that addressing family relationships may improve outcomes in chronic disease for all family members.

In addition to family therapists, primary care providers and mental healthcare providers implementing school-based programmes it may be useful to take a systems approach to clarifying the risk factors (family conflict) and protective factors (family resilience) evidenced in families (Walsh, 1998). Conducting systems-focused assessments in school may be an efficient way to direct treatment and referral efforts. Additionally, obesity and depression prevention programmes could target family functioning, particularly among early adolescents. Importantly, interventions must consider both protective and risk factors evidenced among family members (for example, family conflict and family cohesion). Beyond assessing for family functioning, the results of this study suggest that intervention efforts directed towards family resources could benefit adolescents and their family members.

### **Conclusions and directions for the future**

Overall the Fit Families pilot study sheds light on the importance of including factors from multiple systems that could influence adolescent health outcomes. In particular, family environment (measured in this study as family conflict and cohesion) should continue to be evaluated as a risk factor for obesity and depressive symptoms in racial and ethnic minority and non-minority families. Future studies should continue to explore the extent to which parental and familial factors influence adolescent health outcomes, although researchers may want to broaden their aims and consider additional systemic factors, such as community and societal factors, which could impinge upon adolescent health outcomes. The current study was limited to a few select parent and family system factors, and countless other factors and systems (for example, family, school and neighbourhood) could be considered. Additionally, it would be beneficial – consistent with a family systems perspective – to consider the bidirectional and reciprocal effects of obesity and depressive symptoms (Hooper and Newman, 2011; Hooper *et al.*, 2012; Hughes and Gullone, 2008; Kitzmann *et al.*, 2008). With regard to depressive symptoms, it could be that parents' depressive symptoms are exacerbated by or follow their adolescents' depressive symptoms, rather than the converse. Parents shape the family environment and the health behaviour and outcomes of family members. The converse is probably true as well: children and adolescents shape the family environment and the health behaviour among family members (Davison *et al.*, 2005; Henry and Borzekowski, 2011; Hooper and Britnell Brandt, 2012; National Institute for Clinical

Excellence, 2005). Findings from these nascent studies have suggested that children and adolescents may influence rates of obesity in family members as much as parents do. This study, among others, is a small attempt to further identify factors related to obesity and depressive symptomatology. We hope that by including parent and family systems factors in this and future investigations, study results might inform family-based, culturally tailored intervention and treatment efforts for adolescent health outcomes such as obesity and depression.

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