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Parent dietary, physical activity and sedentary behaviors associated with child behaviors and weight status among private school children in Delhi, India: A cross-sectional study

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ABSTRACT

Background

Family can be an important socializing agent that strongly influences child and adolescent behavior. While studies have found associations between parent modeling of healthy behaviors and these behaviors in children in the US and other western countries, there is a dearth of research examining these associations among low and middle-income countries like India. This study examines the association between parent dietary, physical activity, and sedentary behaviors and child behaviors and weight status in Delhi, India.

Methods

The study was cross-sectional by design. The target population was comprised of a convenience sample of 6th and 8th grade children enrolled at 6 private schools in Delhi, India and their parents. A total of 551 child-parent dyads were used in analysis. Measures included parent and child BMI; physical activity and sedentary behavior; and dietary intake, such as weekly breakfast consumption, daily fruit and vegetable (FV) consumption, daily low-fat dairy consumption, daily energy-dense (ED) food consumption, daily sugar-sweetened beverage (SSB) consumption. Mixed-effects linear regression models were used to test for the association between parent dietary, physical activity, and sedentary behaviors (independent variables) and child dietary, physical activity and sedentary behaviors (dependent variables) while controlling for parent and child demographics.

Results

Significant, positive associations were observed between all parent and child dietary behaviors (weekly breakfast consumption, daily FV consumption, daily low-fat dairy consumption, daily ED food consumption, daily SSB consumption) after adjusting for child sex and grade, parent sex, and parent weight status ($p<0.05$, all). Parent moderate/vigorous physical activity was positively associated with child moderate/vigorous physical activity ($p=0.000$), however there was no significant association between parent and child light physical activity levels ($p=0.310$). Parent energy-dense food consumption was negatively associated with child overweight/obesity (OR=0.70, $p=0.026$), while parent sugar-sweetened beverage consumption was positively associated with child overweight obesity (OR=1.63, $p=0.018$).

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Conclusions

This study provides initial support for an association between parent and child dietary and physical activity behaviors among urban families in India. The findings highlight the need for further longitudinal investigation of this research area to elucidate temporal relationships between these variables.

INTRODUCTION

Childhood obesity has increased dramatically around the world, including high income countries (HICs) like the United States, but also in low and middle income countries (LMICs) like Mexico, Brazil, China, and India.[1] The etiology of childhood obesity is complex and multifaceted. Studies in Western countries have identified important behavioral, social, intra-personal, and environmental risk and protective factors associated with obesity in children and adolescents.[2,3] Research from the West has shown that parents play an important role in creating and shaping children and adolescents' eating and physical activity environments.[4-7] For children, parents often serve as primary behavior models, with teachers and peers also exerting a significant amount of influence.[8-10] For example, parental intake of fruits and vegetables is an important component of parental modeling. The frequency with which a child observes his or her parent consuming fruits and vegetables and enjoying them may influence the child's outcome expectations and provide the child with increased opportunities for to master the observed behavior.[8-10]

Modeling and parent intake of fruits and vegetables, soft drinks, total energy, fat intake, as well as modeling of physical activity, have been shown to be associated with child levels of these behaviors in the US and other countries in the West.[4, 11-20] Although, as children get older, they gain some autonomy regarding their food choices and physical activity practices, increasingly research is showing parents still influence adolescents' eating and physical activity environment.[21-30]

Although there is a growing body of evidence to suggest that parent behaviors and modeling are associated with child and adolescent food preferences, eating behaviors, physical activity, sedentary behavior, and weight status in high income countries, this research simply does not exist for India.[8-10, 26, 28, 31] While current child overweight and obesity prevalence levels in India may be relatively low compared to those found in higher income countries, because of the population size of India, a low prevalence still translates into a large number of individuals who are overweight or obese. Additionally, there are significant differences in prevalence levels between rural and urban areas as well as between high socioeconomic status (SES) populations compared to low-middle SES populations.[1] A 2010 study comparing middle-upper SES children (private school students) with low SES children (government-funded school children) in Delhi, found the prevalence of overweight to be 6 or 7 times higher among private school students compared to government school students.[32] Delhi is located in north India and is one of the fastest growing cities in the world. Among adults, the emerging obesity epidemic appears to be most problematic here.[33] Type-2 diabetes mellitus (T2DM) and cardiovascular risk factors are both highly prevalent in the urban areas of India [34] and the rapid rise of obesity among children in Delhi is the prime reason for increasing insulin resistance among children and adolescents.[35]

The purpose of this paper is to examine parent dietary, physical activity, and sedentary behaviors and their association with child weight status and child health behaviors in Delhi, India. Identifying particular parent behaviors associated with child and adolescent overweight/obesity could aid in designing family interventions that promote healthy eating and physical activity behaviors.

SPECIFIC AIMS

The purpose of this study is to examine the association between parent dietary, physical activity, and sedentary behaviors (e.g. breakfast consumption, energy-dense food consumption, fruit and vegetable consumption, low fat dairy consumption, sugar-sweetened beverage consumption, frequency and intensity of exercise,

frequency and duration of television and computer use) and child dietary, physical activity, sedentary behaviors, and weight status in Delhi, India. The study also examined whether any of these associations varied by grade level (6th vs. 8th grade).

METHODS

Study Design and Subjects

The study was cross-sectional by design. The target population was comprised of 6th and 8th grade children enrolled at 6 private schools in Delhi, India who were selected as a convenience sample, and their parents. In India, Private schools cater to more affluent, middle to higher socio-economic status (SES) families.[32] Active informed consent was sought from schools and parents. Children provided informed assent. Study procedures (data collection, consent forms, and survey questionnaires) were approved by Independent Ethics Committee (IEC), Mumbai as well as Institutional Review Board (IRB), University of Texas Health Science Center.

879 parents provided consent for their child to participate. Of those, there were 551 complete parent-child survey dyads that were used in analysis. Data was only collected for one parent per child, with 54% of participant parents being the mother.

Data Collection and Measures

Anthropometric measurements

Trained project staff conducted child height and weight measurements during regular school hours using standardized protocols adapted from Lohman and colleagues to address the specific needs of the target population.[36] For measurements, children were asked to remove all excess clothing and when required, adjust their hairstyle. Weight was measured to the nearest 0.1 kg using Slater Electronic Scale (model 920). Height was measured to the nearest 0.1 cm using ASCOR manual calibrated vertical rod. Child BMI was calculated using these heights and weights. Normal (>5th percentile to <85th percentile), overweight (>85th percentile to <95th percentile), and obese (≥ 95th percentile) weight categories were defined using the new World Health Organization (WHO) growth reference.[37]

Parent height and weight were self-reported on the survey in kilograms and inches. Height was then converted into centimeters. Parent BMI was calculated using the Asian-specific BMI action- points recommended by the WHO (Overweight: ≥ 23 kg/m2, Obesity: ≥ 27.5kg/m2).[38]

Behavioral-psychosocial (BP) survey

Measures of behavioral factors related to physical activity and nutrition were adapted from instruments that were previously validated in a population of adolescents in the US (e.g. Project EAT, School Physical Activity and Nutrition (SPAN) Project).[39-41] The student and parent questionnaires included measures of dietary intake (breakfast, lunch, and dinner frequency; frequency of snack consumption; frequency of fruit and vegetable consumption; frequency of fried food and sweet food consumption; frequency of low-fat dairy consumption; frequency of squash and soft drink consumption) physical activity (frequency and duration of light and moderate/vigorous exercise; participation on sports teams), and sedentary behavior (TV time and computer usage). Student questionnaires were administered in schools by trained staff; parent surveys were sent home and returned in a sealed envelope. Description of the method used for adaptation and pilot testing of the revised instruments can be found elsewhere.[42]

Composite Variables

Several variables were combined to create composites for data analysis (Table 1). For analysis, child weight status was dichotomized to look at healthy weight vs. overweight/obese. Underweight children were not included in this variable.

Participant fried food and sweet food consumption was summed to create a composite score called *energy dense food consumption*. Participant squash and soda consumption was summed to create a composite score called *sugar-sweetened beverage consumption*. Participant *sedentary behavior* was computed by summing the number of hours per week a participant watches TV or videos and the number of hours per week children use the computer.

Table 1 Composite Variable and Score Creation for Dietary, Physical Activity and Sedentary Behaviors

Composite Variable	Original Variables	Items	Range
Energy-dense food consumption	Eat fried foods + eat sweet foods	2	0-10 times
Sugar-sweetened beverage consumption	Drink squash + drink soda	2	0-10 times
Sedentary behavior	Hours per week of TV/videos + hours per week of computer use	2	0-32 hr/week
Score			
Child Health Eating Score	Eat breakfast (daily) + eat fruit & vegetables + eat low-fat dairy (times per day)	3	0-20
Child Unhealthy Eating Score	Eat fried foods + eat sweet foods + drink squash + drink soda (times per day)	3	0-15
Child Physical Activity Score	Exercise lightly + exercise moderate to vigorously (hours per week)	2	0-23
Child Sedentary Behavior Score	Watch TV + use computer (hours per day)	2	0-23

Scores were created for child dietary and physical activity behaviors (*child healthy eating, child unhealthy eating, child physical activity, and child sedentary behavior*) in order to look at associations between parent monitoring and encouraging these behavior groupings (Table 1). *Child healthy eating score* was created as a summation of child breakfast consumption (converted from per week to per day), fruit and vegetable consumption, and low-fat dairy consumption. *Child unhealthy eating score* was created as a summation of child fried food consumption, sweet food consumption, squash consumption, and soda consumption. *Child physical activity score* was created as hours per week of light and moderate/vigorous exercise. *Child sedentary behavior score* was created as hours per week of TV time and computer time. Higher scores were associated with higher frequency of consumption, greater number of hours spent being physically active, and greater number of hours spent in sedentary behaviors.

Statistics

Descriptive statistics were used to describe the characteristics of parents and students. Frequencies, means, and standard deviations are presented for age, sex, grade, BMI, dietary behaviors, physical activity, and sedentary activity.

Mixed-effects linear regression models were used to test for association between parent dietary, physical activity and sedentary behaviors (independent variables) and child dietary, physical activity, and sedentary behaviors (dependent variables) while controlling for parent and child demographics. Models were created to look at associations between parent dietary behaviors and child dietary behaviors (weekly breakfast consumption, daily FV consumption, daily low-fat dairy consumption, daily ED food consumption, daily SSB consumption) and then parent physical activity and sedentary behaviors with child physical activity and sedentary behaviors (light PA, mod/vig PA, hours of SB). Interaction terms between child grade and each parent behavior were examined to determine whether associations varied by grade level.

Unadjusted and adjusted odds ratios (ORs) were calculated to evaluate the association of child weight status (healthy weight vs. overweight/obese) and child dietary, physical activity, and sedentary behaviors (dependent variables) with parent dietary, physical activity, and sedentary behaviors (independent variables). Model 1 controlled for parent and child demographics (child sex, child grade, parent sex,

and parent weight status). Model 2 controlled for parent and child demographics (child sex, child grade, parent sex, and parent weight status) and parent behaviors found to be significant using backwards stepwise regression with p<.05 as the requirement for inclusion. In the final analysis of child weight status, no child behaviors were found to be significant so they were not included in Model 1 or Model 2 for these analyses.[43] Mixed-effects logistic regression models were used to test for these associations. This type of analysis is appropriate for use in studies where students are sampled within schools to adjust for clustering effects.[44]

All analyses were conducted using STATA statistical software v12.[45] Statistical tests were two-sided and considered significant at 5% level of significance.

RESULTS

Descriptive analysis

The sample size for the study was 551 child-parent dyads. Mean child age was 12.2 ±1.01 years and mean child BMI was 19.1 ± 1.01 with 29.96% of children being overweight or obese. 57% of child participants identified as male and 43% identified as female. Mean parent age was 37.7 ± 9.85 years and the mean parent BMI was 24.0 ± 4.77 kg/m^2, with 77.7% of parents being overweight or obese. 46% percent of parent participants identified as male and 54% of parent participants identified as female. The sample was composed of 51.4% 6th grade students and 48.6% 8th grade students.

There were no statistically significant differences between parent and child weekly breakfast consumption (p=1.00) or between parent and child daily fruit and vegetable consumption (p=0.41). Children had significantly higher consumption levels of low-fat dairy, ED foods, and SSBs than their parents (p=0.0193, p=0.000, p=0.000 respectively). No significant differences were found between parent and child levels of physical activity or sedentary behaviors (p=1.00 for light PA, p=0.187 for moderate/vigorous PA, p=0.535 for SB).

Association between parent and child dietary, physical activity, and sedentary behaviors

After adjusting for child sex, child grade, parent sex, and parent weight status, all parent dietary behaviors were found to be significantly and positively associated with the respective child dietary behavior. There was a significant positive association between parent and child frequency of consumption of breakfast (adjusted B=0.19, 95% CI=0.10-0.28), FV (adjusted B=0.17, 95% CI=0.006), low-fat dairy (adjusted B=0.17, 95% CI=0.026), ED foods (adjusted B=0.17, 95% CI=0.001), and SSB (adjusted B=0.18, 95% CI=0.001) (Table 2).

Parent moderate to vigorous physical activity was the only physical activity or sedentary behavior significantly and positively associated with that child behavior in the adjusted models (adjusted B=0.30, p=0.000) (Table 3). There was no significant difference in association between any behavior by child grade level (p-values ranged from 0.100 – 0.974).

Association of parent dietary, physical activity, and sedentary behaviors with child weight status

In unadjusted models, parent daily low-fat dairy and SSB consumption were the only parent dietary behavior significantly positively associated with child overweight/obesity (unadjusted OR=1.07, p=0.000 for low-fat dairy; unadjusted OR=1.13, p=0.001 for SSB).

However, neither behavior was significant after controlling for child and parent demographics. Parent moderate to vigorous physical activity was the only behavior significantly positively associated with child weight status in both unadjusted and adjusted models (adjusted OR=1.31, p=0.022). For Model 2, created using backwards stepwise regression to determine variables for inclusion, parent ED food and SSB consumption, as well as parent moderate to vigorous physical activity were found to be negative and positively significantly associated with child weight status, respectively (OR=0.70, p=0.026; OR=1.63, p=0.018, OR=1.18, p=0.011). These results are presented in Table 4.

Table 2 Association Between Parent and Child Dietary Behaviors in Delhi, India (N=551)

PARENT BEHAVIORS	Child weekly breakfast consumption	Child daily FV consumption	Child daily low-fat dairy consumption	Child daily ED food consumption	Child daily SSB consumption
	Beta (95% CI) p- value	Beta (95% CI) p- value	Beta (95% CI) p- value	Beta (95% CI) p- value	Beta (95% CI) p- value
Weekly breakfast consumption	0.19 (0.10 – 0.28)	-	-	-	-
Daily FV consumption	-	0.17 (0.05 – 0.30)	-	-	-
Daily low-fat dairy consumption	-	-	0.17 (0.02 – 0.32)	-	-
Daily energy-dense food consumption	-	-	-	0.17 (0.07 – 0.27)	-
Daily sugar-sweetened beverage consumption	-	-	-	-	0.18 (0.07 – 0.28)

Model was adjusted for parent and child demographics (child sex, child grade, parent sex, and parent weight status)

Table 3 Association Between Parent and Child Physical Activity and Sedentary Behaviors in Delhi, India (N=551)

PARENT BEHAVIORS	Child light PA	Child mod/vig PA	Child SB
	Beta (95% CI) p-value	Beta (95% CI) p-value	Beta (95% CI) p-value
Hours of light physical activity per week	0.21 (-.20 -0.61) 0.310	-	-
Hours of moderate to vigorous physical activity per week	-	0.30 (.16-.44) 0.000**	-
Hours of sedentary behaviors per day	-	-	0.057 (-.10 - .22) 0.479

Model was adjusted for parent and child demographics (child sex, child grade, parent sex, and parent weight status)

Table 4 Association Between Parent and Child Physical Activity and Sedentary Behaviors in Delhi, India (N=551)

PARENT BEHAVIORS	Unadjusted	Model 1	Model 2
	OR (95% CI) p-value	OR (95% CI) p-value	OR (95% CI) p-value
Weekly breakfast consumption	0.97 (.88-1.07) 0.540	0.98 (.90-1.07) 0.685	-
Daily fruit and vegetable	1.02 (.90-1.14)	1.08 (.88-1.34)	

consumption	0.779	0.464	
Daily low-fat dairy consumption	1.07 (1.04-1.10) 0.000**	1.09 (.99-1.21) 0.084	
Daily energy-dense food consumption	0.94 (.82-1.10) 0.472	0.89 (.77-1.03) 0.127	0.70 (.52-.96) 0.026**
Daily sugar- sweetened beverage consumption	1.13 (1.05-1.21) 0.001**	1.11 (.95-1.28) 0.185	1.63 (1.09-2.44) 0.018**
Hours of light physical activity per week	1.02 (.93– 1.21) 0.687	1.02 (.94-1.11) 0.653	
Hours of moderate to vigorous physical activity per week	1.12 (1.07-1.18) 0.000**	1.16 (1.02-1.33) 0.029**	1.18 (1.04-1.36) 0.011**
Hours of sedentary behaviors per day	1.01 (.81-1.26) .914	1.04 (.87-1.24) 0.685	

Model 1: odds of child overweight/obese = child demographics (sex, grade), parent demographics (sex, weight status)
Model 2: odds of child overweight/obese = demographics + significant parent behaviors from backwards stepwise regression

DISCUSSION

This study was one of the first to examine these associations between parent and child behaviors in India. The overall prevalence of overweight/obesity in this sample was 29.96% among children and 77.7% among parents, levels on par with those in HICs like the US and UK. Data from our prior study of lower and higher SES youth in Delhi are consistent with this high prevalence among higher SES youth.[32] Parent intake of fruits and vegetables, soft drinks, total energy, and fat intake have been shown to be positively associated with child levels of these behaviors in Western populations.[6,16,20,26,46] This study provides some initial support for these associations among private school families in Delhi, India. Parent intake of fruits and vegetables, low-fat dairy, ED foods, SSB were all positively associated with children's intake, respectively, although the effect size was small. Additionally, parent breakfast consumption was also positively associated with child breakfast consumption, further suggesting an important role for parent behaviors in addressing child unhealthy behaviors.

Studies in HICS have found parent modeling of physical activity and sedentary behaviors to be associated with these behaviors in children and adolescents.[4,10,47] While there was not a significant association between parent and child light physical activity or sedentary behavior levels, there was a significant positive association between parent and child moderate to vigorous physical activity levels (adjusted B=0.30, p=0.000) that supports the previous findings in HICs. These findings suggest that parents and children may have similar behaviors because they are exposed to the same environment (e.g. home, community). Additionally, parents appear to be important role models for their child, as the results show children's behavior mimics that of their parents.

The study also found negative associations between certain parent behaviors (ED food consumption, SSB consumption, and moderate to vigorous physical activity) and child weight status. Therefore it may be that parents of overweight/obese children have started to model healthy behaviors (higher levels of moderate to vigorous physical activity) for their child in order to encourage them to adopt healthier behaviors and reduce their weight. If the parents only recently started this behavioral modeling, the child may not yet have adopted the behavior change or they could have already increased their levels, but we were not able to capture that collecting data at only one time point. Additionally, we may only find associations between those behaviors that are more widely understood to be associated with weight (such as ED foods, SSB consumption, and more vigorous exercise), because these are the behaviors parents are aware of and are trying to change in order to facilitate child weight loss. Behaviors that may be less well know as being

protective of weight gain, such as eating FV and low-fat dairy, engaging in low intensity exercise, and limiting sedentary behavior[48–52] may not occur to parents as potential behaviors to change and therefore we do not find associations between them and child weight status. This may suggest that interventions to address overweight/obesity in this population should incorporate more information about how FV, low-fat dairy, and low-intensity exercise can be protective against weight gain or aid in weight loss. It may also be important to share with parents the role of sedentary behavior, separate from physical activity, in contributing to child weight.

The findings from this study provide initial support for the association between parent behaviors and child behaviors and weight status among private school families in Delhi, India. However, because of the cross-sectional nature of this study, it is not possible to draw conclusions about causality of these associations. Further longitudinal research is to elucidate the temporal relationship between parent behaviors and child behaviors and weight status. Additionally, the study population was limited to wealthier private school children and their parents, so the results may not be generalizable to other populations in India. Small sample size and uneven distribution of participants across categories of potential mediators between parent behaviors and child behaviors and weight status did not allow for deeper exploration of the role parent perception of child weight status and parent concern about child weight status may play in parent-child behavior modeling. These findings suggest that in India, parents may be important behavior models for their children particularly for certain behaviors related to healthy living. Therefore, parents should be considered for inclusion as a target group for interventions addressing child obesity in India. Additional research should continue to explore the relationship between parent behaviors and child behaviors, also looking at potential mediators such as parent perception of child weight status and parent concern about child obesity, to continue to unpack these associations.

REFERENCES

1. Gupta N, Goel K, Shah P, Misra A. Childhood obesity in developing countries: epidemiology, determinants, and prevention. Endocr Rev [Internet]. 2012 [cited 2015 Aug 31]; Available from: http://press.endocrine.org/doi/abs/10.1210/er.2010-0028
2. Philippas N, Lo C. Childhood obesity: etiology, prevention, and treatment. Nutr Clin care an Off ... [Internet]. 2004 [cited 2015 Aug 31]; Available from: http://europepmc.org/abstract/med/16013226
3. Skelton J, Irby M, Grzywacz J, Miller G. Etiologies of obesity in children: nature and nurture. Pediatr Clin North ... [Internet]. 2011 [cited 2015 Aug 31]; Available from: http://www.sciencedirect.com/science/article/pii/S0031395511001106
4. Kalakanis LE, Goldfield GS, Paluch RA, Epstein LH. Parental activity as a determinant of activity level and patterns of activity in obese children. Res Q Exerc Sport [Internet]. 2001 Sep [cited 2016 May 10];72(3):202–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/11561385
5. Moore L, Lombardi D, White M. Influence of parents' physical activity levels on activity levels of young children. J ... [Internet]. 1991 [cited 2016 May 10]; Available from: http://www.sciencedirect.com/science/article/pii/S0022347605804858
6. Patrick H, Nicklas T. A review of family and social determinants of children's eating patterns and diet quality. J Am Coll Nutr [Internet]. 2005 [cited 2016 May 10]; Available from: http://www.tandfonline.com/doi/abs/10.1080/07315724.2005.10719448
7. Sallis J, Prochaska J, Taylor W. A review of correlates of physical activity of children and adolescents. ... Sport Exerc [Internet]. 2000 [cited 2015 Aug 31]; Available from: http://www.researchgate.net/profile/Judith_Prochaska/publication/12521182_A_review_of_correlates_of_physical_activity_of_children_and_adolescents/links/0fcfd509495ae32123000000.pdf
8. Resnicow K, Davis-Hearn M. Social-cognitive predictors of fruit and vegetable intake in children. Heal ... [Internet]. 1997 [cited 2016 May 10]; Available from: http://psycnet.apa.org/journals/hea/16/3/272/

9. Reynolds K, Yaroch A. Testing mediating variables in a school-based nutrition intervention program. Heal Psychol [Internet]. 2002 [cited 2016 May 10]; Available from: http://psycnet.apa.org/journals/hea/21/1/51/
10. Horst K Van Der, Oenema A. A systematic review of environmental correlates of obesity-related dietary behaviors in youth. Heal Educ … [Internet]. 2007 [cited 2016 May 10]; Available from: http://her.oxfordjournals.org/content/22/2/203.short
11. Berge J. A review of familial correlates of child and adolescent obesity: what has the 21st century taught us so far? Int J Adolesc Med Health [Internet]. 2009 [cited 2016 May 10]; Available from: http://www.degruyter.com/view/j/ijamh.2009.21.4/ijamh.2009.21.4.457/ijamh.2009.21.4.457.xml
12. Cooke L, Wardle J. Demographic, familial and trait predictors of fruit and vegetable consumption by pre-school children. Public Heal … [Internet]. 2004 [cited 2016 May 10]; Available from: http://journals.cambridge.org/abstract_S136898000400031X
13. Cullen K, Baranowski T. Availability, accessibility, and preferences for fruit, 100% fruit juice, and vegetables influence children's dietary behavior. Heal Educ … [Internet]. 2003 [cited 2016 May 10]; Available from: http://heb.sagepub.com/content/30/5/615.short
14. Gibson E, Wardle J, Watts C. Fruit and vegetable consumption, nutritional knowledge and beliefs in mothers and children. Appetite [Internet]. 1998 [cited 2016 May 10]; Available from: http://www.sciencedirect.com/science/article/pii/S0195666398901805
15. Grimm GC, Harnack L, Story M. Factors associated with soft drink consumption in school-aged children. J Am Diet Assoc [Internet]. 2004 Aug [cited 2015 Oct 7];104(8):1244–9. Available from: http://www.sciencedirect.com/science/article/pii/S0002822304009095
16. Kratt P, Reynolds K, Shewchuk R. The role of availability as a moderator of family fruit and vegetable consumption. Heal Educ Behav [Internet]. 2000 [cited 2016 May 10]; Available from: http://heb.sagepub.com/content/27/4/471.short
17. Perusse L, Tremblay A. Familial resemblance in energy intake: contribution of genetic and environmental factors. Am J … [Internet]. 1988 [cited 2016 May 10]; Available from: http://ajcn.nutrition.org/content/47/4/629.short
18. Vauthier J, Lluch A, Lecomte E. Family resemblance in energy and macronutrient intakes: the Stanislas Family Study. Int J … [Internet]. 1996 [cited 2016 May 10]; Available from: http://ije.oxfordjournals.org/content/25/5/1030.short
19. Vereecken C, Keukelier E, Maes L. Influence of mother's educational level on food parenting practices and food habits of young children. Appetite [Internet]. 2004 [cited 2016 May 10]; Available from: http://www.sciencedirect.com/science/article/pii/S0195666304000431
20. Wardle J, Carnell S, Cooke L. Parental control over feeding and children's fruit and vegetable intake: how are they related? J Am Diet Assoc [Internet]. 2005 [cited 2016 May 10]; Available from: http://www.sciencedirect.com/science/article/pii/S0002822304017122
21. Chao R. Extending research on the consequences of parenting style for Chinese Americans and European Americans. Child Dev [Internet]. 2001 [cited 2016 May 10]; Available from: http://onlinelibrary.wiley.com/doi/10.1111/1467-8624.00381/abstract
22. Chen J, Kennedy C. Factors associated with obesity in Chinese-American children. Pediatr Nurs [Internet]. 2005 [cited 2016 May 10]; Available from: http://search.proquest.com/openview/d59c7182d9b28e46785244dc9cbbafa8/1?pq-origsite=gscholar
23. Epstein L, Gordy C. Increasing fruit and vegetable intake and decreasing fat and sugar intake in families at risk for childhood obesity. Obes … [Internet]. 2001 [cited 2016 May 10]; Available from: http://onlinelibrary.wiley.com/doi/10.1038/oby.2001.18/full
24. Gable S, Lutz S. Household, parent, and child contributions to childhood obesity*. Fam Relat [Internet]. 2000 [cited 2016 May 10]; Available from: http://onlinelibrary.wiley.com/doi/10.1111/j.1741-3729.2000.00293.x/full
25. Haerens L, Craeynest M, Deforche B. The contribution of psychosocial and home environmental factors in explaining eating behaviours in adolescents. Eur J … [Internet]. 2008 [cited 2016 May 10]; Available from: http://www.nature.com/ejcn/journal/v62/n1/abs/1602681a.html

26. Patrick H, Hennessy E. Parenting styles and practices in children's obesogenic behaviors: Scientific gaps and future research directions. Child ... [Internet]. 2013 [cited 2016 May 10]; Available from: http://online.liebertpub.com/doi/abs/10.1089/chi.2013.0039
27. Raudsepp L. The relationship between socio-economic status, parental support and adolescent physical activity. Acta Paediatr [Internet]. 2006 [cited 2016 May 10]; Available from: http://onlinelibrary.wiley.com/doi/10.1111/j.1651-2227.2006.tb02187.x/full
28. Verzeletti C, Maes L, Santinello M. Food-related family lifestyle associated with fruit and vegetable consumption among young adolescents in Belgium Flanders and the Veneto Region of Italy. Appetite [Internet]. 2010 [cited 2016 May 10]; Available from: http://www.sciencedirect.com/science/article/pii/S0195666309006874
29. Wilson D, Ampey-Thornhill G. The role of gender and family support on dietary compliance in an African American adolescent hypertension prevention study. Ann Behav Med [Internet]. 2001 [cited 2016 May 10]; Available from: http://link.springer.com/article/10.1207/S15324796ABM2301_9
30. Zabinski M, Norman G, Sallis J. Patterns of sedentary behavior among adolescents. Heal ... [Internet]. 2007 [cited 2016 May 10]; Available from: http://psycnet.apa.org/journals/hea/26/1/113/
31. Cislak A, Safron M, Pratt M, Gaspar T, Luszczynska A. Family-related predictors of body weight and weight-related behaviours among children and adolescents: a systematic umbrella review. Child Care Health Dev [Internet]. 2012 May [cited 2015 Aug 5];38(3):321–31. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21752064
32. Stigler MH, Arora M, Dhavan P, Tripathy V, Shrivastav R, Reddy KS, et al. Measuring obesity among school-aged youth in India: A comparison of three growth references. Indian Pediatr [Internet]. 2010 Aug 1 [cited 2015 Aug 31];48(2):105–10. Available from: http://link.springer.com/10.1007/s13312-011-0041-x
33. Agrawal P. Emerging obesity in northern Indian states: A serious threat for health. IUSSP Conf Bangkok [Internet]. 2002 [cited 2016 May 10]; Available from: https://www.researchgate.net/profile/Praween_Agrawal2/publication/255591872_Emerging_Obesity_in_Northern_Indian_States_A_Serious_threat_for_Health/links/5444f6410cf2e6focofbfae1.pdf
34. Gupta A, Gupta R, Sharma K. Prevalence of diabetes and cardiovascular risk factors in middle-class urban participants in India. BMJ open diabetes ... [Internet]. 2014 [cited 2016 Mar 25]; Available from: http://drc.bmj.com/content/2/1/e000048.short
35. Bhardwaj S, Misra A, Khurana L. Childhood obesity in Asian Indians: a burgeoning cause of insulin resistance, diabetes and sub-clinical inflammation. Asia Pac J Clin ... [Internet]. 2008 [cited 2016 Mar 25]; Available from: http://apjcn.nhri.org.tw/server/APJCN/17 Suppl 1/172.pdf
36. Lohman T, Roche A, Martorell R. Anthropometric standardization reference manual. 1988 [cited 2015 Aug 31]; Available from: http://agris.fao.org/agris-search/search.do?recordID=US201300646503
37. Onis M, Onyango A. Development of a WHO growth reference for school-aged children and adolescents. Bull World ... [Internet]. 2007 [cited 2016 May 10]; Available from: http://www.scielosp.org/scielo.php?pid=S0042-96862007000900010&script=sci_arttext&tlng=pt
38. WHO E. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. Lancet (London, England) [Internet]. 2004 [cited 2016 May 10]; Available from: http://www.ncbi.nlm.nih.gov/pubmed/14726171
39. Thiagarajah K, Fly A, Hoelscher D. Validating the food behavior questions from the elementary school SPAN questionnaire. J Nutr ... [Internet]. 2008 [cited 2015 Aug 31]; Available from: http://www.sciencedirect.com/science/article/pii/S1499404607008299
40. Neumark-Sztainer D, Wall M, Perry C, Story M. Correlates of fruit and vegetable intake among adolescents: Findings from Project EAT. Prev Med (Baltim) [Internet]. 2003 [cited 2015 Aug 31]; Available from: http://www.sciencedirect.com/science/article/pii/S0091743503001142
41. Hoelscher D, Day R, Kelder S, Ward J. Reproducibility and validity of the secondary level School-Based Nutrition Monitoring student questionnaire. J Am ... [Internet]. 2003 [cited 2015 Aug 31]; Available from:

http://www.sciencedirect.com/science/article/pii/S0002822302000354
42. Arora M, Nazar G. Association of breakfast intake with obesity, dietary and physical activity behavior among urban school-aged adolescents in Delhi, India: results of a cross-. BMC Public ... [Internet]. 2012 [cited 2016 May 10]; Available from: http://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-12-881
43. Greene-Cramer B, Harrell M, Hoelscher D, Sharma S, Ranjit N, Arora M, et al. Association between parent and child weight status among private school children in Delhi, India. Glob Health Promot.
44. Raudenbush S, Bryk A. Hierarchical linear models: Applications and data analysis methods [Internet]. 2002 [cited 2015 Aug 31]. Available from: https://books.google.com/books?hl=en&lr=&id=uyCV0CNGDLQC&oi=fnd&pg=PR17&dq=raudenbush+%26+Bryk&ots=qA4FRo-4TC&sig=gRPcyksf_iw5USCcQwT_AZMI9NQ
45. StataCorp. Stata Statistical Software: Release 11. College Station, TX: StatCorp LP; 2009.
46. Matheson D, Robinson T. Do Mexican-American mothers' food-related parenting practices influence their children's weight and dietary intake? J Am ... [Internet]. 2006 [cited 2016 May 10]; Available from: http://www.sciencedirect.com/science/article/pii/S0002822306018281
47. Park H, Kim N. Predicting factors of physical activity in adolescents: a systematic review. Asian Nurs Res (Korean Soc Nurs Sci) [Internet]. 2008 [cited 2016 May 10]; Available from: http://www.sciencedirect.com/science/article/pii/S1976131708600353
48. Tohill BC, Seymour J, Serdula M, Kettel-Khan L, Rolls BJ. What Epidemiologic Studies Tell Us about the Relationship between Fruit and Vegetable Consumption and Body Weight. Nutr Rev [Internet]. The Oxford University Press; 2004 Oct 1 [cited 2016 Feb 24];62(10):365–74. Available from: http://nutritionreviews.oxfordjournals.org/content/62/10/365.abstract
49. Vioque J, Weinbrenner T, Castelló A, Asensio L, Garcia de la Hera M. Intake of fruits and vegetables in relation to 10-year weight gain among Spanish adults. Obesity (Silver Spring) [Internet]. 2008 Mar [cited 2016 May 4];16(3):664–70. Available from: http://www.ncbi.nlm.nih.gov/pubmed/18239583
50. Poddar KH, Hosig KW, Nickols-Richardson SM, Anderson ES, Herbert WG, Duncan SE. Low-fat dairy intake and body weight and composition changes in college students. J Am Diet Assoc [Internet]. 2009 Aug [cited 2016 May 10];109(8):1433–8. Available from: http://www.sciencedirect.com/science/article/pii/S0002822309006270
51. Epstein LH, Wing RR, Koeske R, Valoski A. A comparison of lifestyle exercise, aerobic exercise, and calisthenics on weight loss in obese children. Behav Ther [Internet]. 1985 Sep [cited 2016 May 10];16(4):345–56. Available from: http://www.sciencedirect.com/science/article/pii/S0005789485800022
52. Must A, Tybor DJ. Physical activity and sedentary behavior: a review of longitudinal studies of weight and adiposity in youth. Int J Obes [Internet]. Nature Publishing Group; 2005 Sep 1 [cited 2016 May 10];29:S84–96. Available from: http://www.nature.com/ijo/journal/v29/n2s/full/0803064a.html?message=remove&WT.mc_id=LP_IJO_1401_anniversary