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Obesity Risk in Urban Adolescent Girls: Nutritional Intentions and Health Behavior Correlates

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Abstract

Obesity is an expanding epidemic and minority adolescent girls are at high risk. One way to tailor interventions for obesity prevention is to target intention to engage in particular behaviors. Data collected from adolescent girls' intentions and behaviors regarding nutrition, physical activity, and sleep patterns were used to examine nutritional intentions in relation to healthy behaviors. Adolescent girls reported behaviors that increased their risks for obesity. Nutritional intentions were significantly associated with physical activity and sleep. These results suggest that healthy behaviors tend to occur in clusters, possibly extending the theory of planned behavior beyond individual behaviors to groups of related behaviors. Nurses can intervene with high-risk adolescent girls by promoting healthy diets, recommended levels of physical activity, and adequate sleep.

Overweight and obesity have reached epidemic levels in adolescent minority females (12–19 years of age) Public health and practitioner interventions to modify teens' diet and exercise behaviors have not yet proven effective in reversing this epidemic. It is very difficult to change an individual's lifestyle, developed over a lifetime of choices based on family and personal preferences, and reinforced by habit and culture.

Obesity is a growing epidemic in adolescent girls. Of all adolescent girls, 32% are obese (body mass index [BMI] > 95th percentile) or overweight (BMI between 85th and 95th percentile) (Ogden et al., 2006). This problem is even more pronounced for Black girls, 42% of whom are obese or overweight and 25% obese. This epidemic among teens is particularly troubling because adolescent girls who become obese are more likely to remain obese as adults and experience a higher level of morbidity and mortality than the general population (Singh, Mulder, Twisk, van Mechelen, & Chinapaw, 2008). This increased risk and its negative consequences could be counteracted by lifestyle changes during the adolescent years.

Unhealthy dietary patterns clearly influence adolescent overweight. Adolescent girls typically consume a diet heavy in high fat foods, refined grains, and sweetened drinks, foods that are related to increasing adiposity in black adolescent girls (Ritchie et al., 2007). Adolescent girls have a tendency to decrease their fruit and vegetable intake over time, compounding the problem of already suboptimal diets, and they rarely include healthy choices such as low-fat or whole-grain items, or fruits and legumes (Larson, Neumark-Sztainer, Hannan, & Story, 2007).

In addition to the negative effects of diet, the problem is exacerbated by decreasing levels of physical activity that occur as girls age (Belanger, Gray-Donald, O'Loughlin, Paradis, & Hanley, 2009; Singh, Kogan, Siahpush, & van Dyck, 2008). In particular, and despite its

health benefits, vigorous aerobic activity that increases the heart rate becomes less frequent in the teen years (Belanger et al., 2009). Inactive girls at all economic levels have higher levels of obesity than girls who are physically active (Singh, Kogan, et al., 2008); however, according to the Centers for Disease Control and Prevention (CDC), Black girls are more likely to be inactive than others (CDC, 2009).

Recent data also suggest that obesity risk is correlated with behaviors less well documented than diet and physical activity. Laboratory studies suggest that reduced duration of sleep up-regulates appetite by a reduction in leptin, an increase in ghrelin, and a reduction in insulin sensitivity; these changes increase the risk for obesity (Van Cauter & Knutson, 2008). Adolescent girls experience weight gain when they have insufficient sleep, especially if they sleep less than 6 hours per night (Berkey, Rockett, & Colditz, 2008).

In addition to diet, physical activity, and sleep patterns, population-based risk factors for obesity include poverty, lack of higher education, and race/ethnicity (Singh, Kogan, et al., 2008). Race/ethnicity, poverty, and sedentary lifestyle are independently related to obesity in adolescents, and in addition, there are multiple interactive or joint effects among these factors. Poor, Black adolescent girls are at risk by virtue of their minority status, and also because minorities are over-represented in impoverished populations (Mather, 2007). Furthermore, individuals under 18 are in the age group with the highest prevalence of poverty, and females under age 18 are 27% more likely to live in poverty than males.

Obesity can be tackled by targeting personal choice through designing more effective interventions, such as addressing the individual's intention to engage in a particular behavior. This approach is central to the theory of planned behavior (Ajzen, 1991), which includes the construct of one's intention to participate in a particular behavior. The theory of planned behavior specifies that attitude, subjective norm, and perception of behavioral control are the three components that contribute to formation of behavioral intention (Ajzen, 2002). If a person has a positive attitude toward a behavior and a sense of social pressure to carry out the behavior, and in addition they perceive that they are able to perform that behavior, then they are more likely to carry it out. A central proposition in this theory is that the stronger a person's intention to perform a particular behavior, the more likely she will, but only if she has control over the behavior (Ajzen, 1991). In other words, assuming that control over the behavior is possible, intention is an antecedent to performance.

Nutritional intentions, measured in both adolescent and adult populations, are predictive of healthy dietary behaviors (Backman, Haddad, Lee, Johnston, & Hodgkin, 2002; Blue & Marrero, 2006; Conner, Norman, & Bell, 2002). Thus, an adolescent's intention to engage in a healthy behavior, such as eating a healthy diet, is highly correlated with actual diet (Backman et al., 2002). However, it has not been shown whether intention to engage in one health behavior, such as healthy eating, is reflective of overall engagement in good health practices in adolescents.

Adolescent girls are at risk for obesity because of factors that include both life circumstances, which are difficult to modify, and lifestyle factors such as poor patterns of sleep, high-fat diets, and low levels of physical activity that offer potential for intervention. The purpose of this secondary analysis was to describe the nutrition intentions, levels of physical activity and sleep patterns of black adolescent girls and explore the relationship between nutritional intentions, levels of physical activity and sleep patterns. The authors used data that were collected at baseline in an HIV prevention intervention with adolescent girls on the girls' intentions and behaviors regarding nutrition, physical activity, and sleep patterns (Morrison-Beedy, Carey, Crean, & Jones, 2010). We hypothesized that intention to engage in healthy behaviors, such as healthy eating, would be correlated with other healthy

behaviors, thus generalizing the behavior models beyond a single intention and behavior. Extension of the theory of planned behavior could lead to better interventions to decrease risk of obesity.

Method

Sample

For the original study (Morrison-Beedy et al., 2010), urban adolescent girls were recruited by direct and word of mouth recruitment from primary health and reproductive care clinics and from youth development programs in Western New York. Inclusion criteria for the HIV prevention intervention were: (1) female gender, (2) 15–19 years of age, and (3) sexually active with a male partner within the past 3 months. Exclusion criteria were: (1) married status, (2) pregnant, (3) delivered a child within the past 3 months, (4) anticipated relocating within the next year, (5) mentally impaired, or (6) unable to read or speak English adequately to participate in the intervention. This study was approved by the institutional review boards of the University of Rochester and Syracuse University. The protocol was reviewed and approved by the national office of Planned Parenthood. Consent was obtained from girls who were ≥ 18 years of age; girls under 18 provided assent. Parental consent was not required by the institutional review boards because the study included testing for sexually transmitted infections, which is protected health information under the reproductive rights laws in New York State.

Procedures

Participants were initially screened for age, and eligible girls completed additional screening questions in a private location at the recruitment site). Recruitment occurred between December 2004 and April 2008. Of 1,778 girls screened for the study, 765 were eligible. The primary reason for ineligibility was that they had not been sexually active within the past 3 months. A total of 748 eligible girls were interested in participating, gave consent or assent, and provided baseline data. The majority of girls who chose not to participate cited a lack of time to fully participate in the study as their reason for refusal. Immediately upon completion of the assent/consent process, girls completed an audio computer-assisted self-interview (ACASI).

Measures

Using the ACASI, a variety of measures were used to collect data from all participants at baseline: sociodemographic characteristics, nutritional intentions, and health behaviors such as physical activity and hours of sleep. The following baseline data points were used for this secondary analysis.

- *Sociodemographic characteristics*. Information was collected on age, race, ethnicity, free lunch status (proxy for income level), and living situation.
- *Nutritional intentions*. Four questions were developed to measure nutritional intentions, using a method in accord with the theory of planned behavior, and previously used in other, similar studies (Backman et al., 2002; Blue & Marrero, 2006; Conner, Norman, & Bell, 2002). Questions pertaining to intention to behave a certain way have been found to predict the actual behavior. The four questions assessed intentions to consume dairy products, eat fresh fruits and vegetables, include fiber in the diet, and avoid fried food. The responses were self-ratings on a 4-point Likert scale ranging from ‘definitely will do’ to ‘definitely will not do.’ Each item was examined independently to describe specific nutritional intentions and a summative score was created to assess overall nutritional intentions.

- *Health-related behaviors*. Physical activity was measured with one question asking "how many days out of the week did you get 30 or more minutes of physical activity that increased your heart rate (such as walking briskly or exercising)?" Amount of sleep was measured with one question that asked "during the past week, how many nights did you sleep 7 to 9 hours per night?" A summative health behavior variable was created that included both physical activity and hours of sleep. One other health behavior measured in this sample was the use of contraceptive measures, which, in sexually active girls would be considered a healthy behavior, as would condom use. Alternatively, if we examine behaviors such as cigarette smoking, alcohol use, or elicit drug use, those would be considered unhealthy behaviors for teens and should then be negatively correlated with healthy intentions.

Data analysis

Baseline data were analyzed using descriptive statistics, including means and standard deviations, frequencies and percentages. To evaluate the relationship between variables, further analyses were conducted using linear regression and student's-test. The girls who met the American Heart Association (AHA) recommendations for physical activity were compared to those who did not meet recommendations. SPSS version 17.0 was used for all analyses.

Results

Baseline data for the variables included in this analysis were available for the 511 girls who self-identified as African American or Black of the 748 girls who consented to participate in the study. Their average age was 16.5 years, with a range of 15–19 years (See Table 1). Over 70% reported that they participated in the free/reduced lunch government program, which indicated that they lived in poverty. It is likely that even more of them were impoverished, since high school students often do not participate in the federal lunch program, even when eligible (Gleason, 1995).

Health behaviors

The AHA recommends that adolescents participate in 30 minutes of regular physical activity daily (CDC, 1999; Singh, Kogan, et al., 2008). Fourteen percent of participants (n = 72) reported that during the past week they had met this physical activity recommendation. Thirty percent reported 30 minutes of physical activity 2–3 days out of the week, while more than 24% reported no physical activity.

Less than one-quarter of the sample (22%) met the criteria of 7–9 hours of sleep each night of the week. Five nights out of seven could be considered 'school nights' and 46% of the girls reported 7–9 hours of sleep for at least 5 days per week, while 12% reported less than 7 hours of sleep for all nights in the previous week.

Nutritional intentions

The four questions on nutritional intentions asked the girls about their intake of: (1) dairy products, (2) fruits and vegetables, (3) fiber, and (4) fried foods. Slightly more than one-third of the girls indicated they would definitely consume dairy products, although some indicated they definitely would not (See Table 2). Intention to include fruits, vegetables, and whole grains in their diets was even lower than intention for dairy intake. Avoidance of fried foods was not a priority for these adolescent girls.

Effect on healthy behaviors

Nutritional intentions were positively associated with level of physical activity and amount of sleep (see Table 3). As intentions to eat healthy foods increased, physical activity and hours of sleep also increased. Nutritional intentions were correlated with healthy behavior overall, and 6% of the variance for these healthy behaviors were accounted for by nutritional intentions ($r^2 = .06$).

The girls who met the AHA recommendations for physical activity had significantly more sleep ($p < .001$) and overall healthy behaviors ($p < .001$) compared to those who did not meet the recommendations.

Discussion

The majority of girls in this sample did not meet the recommendations for regular physical activity nor sleep, and did not intend to eat a healthy diet. All three factors increase their risk of obesity. The nutritional intentions of these Black, low-income adolescent girls were correlated with their other health-related behaviors. If these girls had intentions to eat healthy food, they also had higher amounts of physical activity and sleep. These results supported the authors' hypothesis that it was possible to generalize beyond a single intention and behavior, and show that one intention was related to other behaviors. These findings suggest that the construct of intention may have a broader application beyond its common use, where one intention is related to one kind of behavior.

The correlation of a healthy intention to two health-related behaviors makes sense, since we would expect that people who engage in one healthy behavior are likely to engage in other such behaviors. For these adolescent girls, these healthy behaviors appear to occur as a cluster. Although the findings cannot be extended beyond these specific behaviors, the results suggest that behavioral theories of intention may be applied more generally to design interventions that address the "root cause," which appears to drive all behaviors in a cluster —this application of the theory of planned behavior requires further study.

Lack of physical inactivity compounds the risk for obesity faced by these girls. In this study, the majority of girls were not physically active with nearly one-fourth reporting no activity at all. Even more concerning, only 14% met the AHA recommendations for physical activity, a finding consistent with other reports that adolescent girls have low levels of physical activity (CDC, 1999; Singh, Kogan, et al., 2008). Given the decrease in activity level that occurs with age (Belanger et al., 2009), it is likely that obesity risk will escalate as these girls, who had a mean age of 16.5 years, approach adulthood. The reason for inactivity is unknown—it could be related to neighborhood safety (Bennett et al., 2007), or it could be reflective of gender expectations and peer practices.

The recommendation that adolescents get 7–9 hours of sleep per night was met by less than one-fourth of the girls in this study, although 46% reported getting adequate sleep five out of seven nights. This finding for the latter group could mean that participants had adequate sleep during the school week and just not on weekends, or it could mean that some got more sleep on the weekends. Nonetheless, over 50% are not getting adequate sleep most days of the week, which contributes to their obesity risk (Berkey et al., 2008; Van Cauter & Knutson, 2008).

The nutritional intentions reported by these adolescent girls were not protective against obesity; rather, they likely contributed to weight gain (Ritchie et al., 2007). These girls reported weak intentions of eating whole grains, fruits, and vegetables, in conjunction with almost no intention to avoid fried foods. Even with dairy products, the dietary item that

more girls reported they would definitely consume, two-thirds of the girls were not confident they would. However, it is possible that this lack of confidence is related to lactose intolerance common to African Americans: More than 70% of African Americans have the potential for experiencing symptoms of intolerance, although average-size servings are often not problematic (Byers & Savaiano, 2005). These eating intentions are consistent with actual eating behaviors that have been reported in the literature. A dietary pattern that includes low fruit and vegetable intake, minimal whole grains, and fatty and/or fried foods is common in adolescent girls (Ritchie et al., 2007).

Nearly 80% of these girls did not definitely intend to include fruits and vegetables in their diet. If these intentions are predictive of actual intake, this is very concerning, because adolescent girls have a tendency to decrease fruit and vegetable intake as they get older (Larson et al., 2007), and it has been documented that these foods help individuals to manage their weight (Weinsier, Johnston, Doleys, & Bacon, 1982).

Compounding the issues of inactivity, inadequate sleep, and poor nutritional intentions, these adolescent girls faced an increased risk for obesity due to several demographic characteristics: They were predominantly impoverished (of low socioeconomic status), of African American race, female, and less than 18 years of age. Intentions to engage in healthy eating are also limited by opportunity to obtain healthy foods and poverty can exacerbate this risk. In a 2007 survey of convenience stores located in the area of the city where many of these girls lived, it was found that 85% of the surveyed stores did not sell fresh fruits or vegetables, 76% sold white bread only, and if milk was sold, it was whole milk only (University of Rochester Medical Center, 2007).

Although the findings of this study are not strong enough to definitively determine that one health intention is predictive of other health related behaviors, the findings about the behaviors and intentions of adolescent girls are very worrisome. Nurses have a responsibility to assess the individual risk in any girls they provide care for—their intentions for healthy eating and their levels of physical activity and sleep. The challenge to nurses is to develop creative ways to encourage girls to adopt healthy behaviors. Nurses can intervene by promoting healthy diets, recommended levels of physical activity, and adequate sleep. Furthermore, nurses can become active at the local, regional, and statewide level to promote access to healthy foods and safe environments that promote healthy lifestyles.

This study had some limitations. First, all data were based on self-report, which can be subject to both recall and social desirability bias. Second, the measurements we had were limited to one time point, so intentions and later behaviors in the same domain could not be measured. The sample was limited to sexually active girls who represent a high-risk group of black adolescents, which limits generalizabilty. There was no self-report of actual dietary behaviors to link to report of, nor were there intentions for physical activity or sleep to link to report of these actual behaviors. Nevertheless, this study of a large sample of impoverished adolescent girls provided a unique opportunity to examine the health behaviors of this at-risk population and gain some understanding of interrelationships among these behaviors.

Black adolescent girls as a group face multiple health challenges connected to obesity and overweight. Interventions that help these girls overcome these challenges are critically needed, so they and the healthcare system are not forced to contend with the even more overwhelming challenges of the obesity epidemic when these adolescents become adults. The girls in this study were at risk for obesity by virtue of their age, race/ethnicity, gender, and socioeconomic status. Furthermore, there is a lack of intention to engage in behaviors

that might reduce that risk, as well as their self-reported suboptimal sleep and physical activity, all of which compound the chance that their future will be spent battling obesity.

Implications

The collection of risk factors for obesity in this population represents a high level of disparity that deserves further research to create interventions tailored for this population. Our findings suggest that interventions require a multifaceted approach that incorporates lifestyle changes around physical activity, diet, and sleep as well as consideration of access to healthy foods. Healthcare providers have the opportunity to assess risk and counsel patients about healthy diet, physical activity, and sleep habits. However, such counseling is time consuming and often not effective. Programs are needed to promote healthy behaviors that extend beyond obesity prevention, and address the adolescent's intention to embrace a healthy life by adopting a full repertoire of interrelated healthy behaviors

If, as our data suggest, healthy behaviors tend to occur in clusters, then adolescent girls who engage in, or intend to engage in, one set of healthy behaviors may also engage in others. Further research is needed to clarify if behavioral theories can be extended to predict constellations or clusters of health behaviors from a single related behavioral intention. Extension of these theories to look at clusters of behaviors could enhance both practice and research that examines intentions to engage in behaviors and actual behaviors.

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Table 1

Demographic and health behavior characteristics of adolescent girls

Sample size	**(n = 742)**
Age	16.52 (± 1.27)
Race	
Black	512 (69%)
Mixed/multiracial	80 (11%)
White	67 (9%)
Other	83 (11%)
Ethnicity	
Hispanic	126 (17%)
Living situation	
Family apartment/home	618 (83%)
Own apartment	53 (7%)
Other	71 (10%)
Poverty (reduced/free lunch participation)	516 (70%)
Days/week ≥ 30 mins of physical activity	3.03 ± 2.42
Nights/week got 7–9 hours of sleep/night	3.92 ± 2.39
Nutritional intention (score range = 4–16)	10.45 ± 2.64

Table 2

Nutritional intentions of adolescent girls

Nutritional intentions	Responses to nutritional intention questions (%) (n = 742)			
	Definitely will do	Somewhat likely to do	Somewhat unlikely to do	Definitely will not do
Consume dairy products	35	35	17	13
Consume fresh fruit and vegetables	20	36	32	12
Consume fiber	22	39	28	11
Avoid fried foods	8	31	30	31

Table 3

Prediction of behaviors by nutritional intentions

	b	p
Physical activity	.183	< .001
Sleep	.154	< .001
Seatbelt use	.066	< .001
Healthy behaviors (summative)	.337	< .001