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Abstract

African Americans, Hispanics, and those with low income experience disproportionate health problems that can be prevented by physical activity and a lower fat diet. In this descriptive cross-sectional study, antecedents of diet and exercise within the Health Promotion/Transtheoretical Model were examined among low-income African American and Hispanic seventh-grade students ($n = 127$). Total support was associated with higher physical activity for girls. African Americans perceived greater social support for activity than Hispanics. Family models and support for physical activity and low-fat diet were greater as family income increased. However, higher family role models and lower dietary fat were found among the lowest income Hispanic students' residing ZIP code with a higher concentration of Hispanics and greater availability of Hispanic foods and culture. A school-based approach may be useful to build peer support for physical activity and lower dietary fat. Parish nurse or clinic settings may be most appropriate for building family role models and support. Living in a neighborhood with traditional Hispanic culture and foods appears to have ameliorated the harmful effects of lower income, although further study with larger samples followed over time is needed.

Disparities in nutritional status, including consuming large amounts of dietary fat, track through adolescence into adulthood placing members of racial and ethnic minority groups at increased risk of chronic diseases, such as cardiovascular disease, hypertension, type II diabetes, obesity, and certain cancers (Bronner, 1996). Nearly half of the American youths aged 12–21 years lack vigorous activity on a regular basis. For this group, inactivity is more common among girls (14%) than boys (7%) and among black girls (21%) than white girls (12%) (National Center for Chronic Disease Prevention & Health Promotion, 2001). Activity declines 26–37% during adolescence, with 85% of middle school students reporting a decrease in activity by the time they are in high school (Aaron, Storti, Robertson, Kriska, & LaPorte, 2002).

Prior studies have demonstrated the usefulness of Health Promotion/Transtheoretical Model (HP/TM) constructs in predicting dietary fat intake among low income, culturally diverse middle school students (Frenn & Malin, 2003; Frenn, Malin, & Bansal, 2003). In those studies, antecedents included HP constructs: demographics, benefits/ barriers, self-efficacy, and access, as well as TM constructs: stage, decisional balance, temptation, and processes. The prior studies did not include HP variables of social support or role models that might further explain exercise and nutrition behavior of early adolescents. As recommended by De Bourdeaudhuij and Sallis (2002), additional studies are needed to develop consensus as to the role and types of models and social support needed to promote physical activity among various age and cultural groups.

Social support and environmental context also have been correlated with exercise and diet. For example, Fang, Madhavan, Bosworth, and Alderman (1998) found that all cause mortality, as well as cardiovascular mortality, for African Americans and Caucasians varied by racial segregation within ZIP

codes. Saelens, Sallis, and Frank (2003) recommend consideration of potential interactive effects of psychosocial and environmental variables in physical activity research. As recommended by De Bourdeaudhuij and Sallis (2002), additional studies are needed to develop consensus as to the role and types of models and social support needed to promote physical activity among various age and minority groups.

The purpose of this investigation was to examine HP/TM antecedents for physical activity and dietary fat among low income, African American, and Hispanic seventh-grade students. Research questions were:

1. What variables from the HP/TM (stage, social support, and role models) predict physical activity and low-fat diet?
2. To what extent do the above variables differ based on race, gender, age, income, and ZIP code?

Methods

A descriptive correlational design was used. Paper and pencil questionnaires were collected on computer scantron sheets in classroom settings by graduate research assistants and were analyzed using spss version 11.0. Descriptive statistics, multiple regression, and General Linear Model were used to answer the research questions.

Setting and sample.

The study was done in a Midwestern urban middle school. A total of 178 seventh-grade students (all the students of two Science teachers) were invited to participate. Following review for Protection of Human Subjects, the project was described and a consent form (in English and Spanish) sent home with students. A one-dollar school bookstore coupon was given for return of the signed consent regardless of answer and another dollar coupon for completion of data. Five students' parents declined permission to participate, 46 students did not return permission forms. No data are available about those who declined to participate, indicating that they differed from those who returned consents. The total sample included 127 students for a 71% response rate. The instrument completion rate was 83–100%, depending on the instrument. Because the predominant groups were African American (n = 40; 18 girls) and Hispanic (n = 60; 34 girls), this analysis was confined to those groups. The mean age of the sample was 12.75 years. Of those eligible for free lunch, 38 were African Americans and 41 were Hispanic.

Measures.

Outcome variables

The Child and Adolescent Activity Log (CAAL) was used to collect the physical activity data. Reliability and validity of the CAAL have been previously reported (Garcia et al., 1995) and deemed adequate for similar instruments measuring activity (Booth, Okely, Chey, & Bauman, 2001; Sallis et al., 1996; Sallis & Saelens, 2000). This 22-item daily log of activities engaged in by youth requires that subjects circle the number of minutes they spent the previous day in each activity. Subjects completed the logs for Sunday, Monday, and Tuesday. Moderate and vigorous activities were summed to create a dependent variable for regression analysis, because moderate and vigorous activity are the focus of Healthy People 2010 objectives.

The Food Habits Questionnaire was used to measure percentage fat in diet (Greene, Rossi, Reed, Willey, & Prochaska, 1994). Estimates of reliability and validity have been reported (Rossi et al., 1996). This instrument includes a 21-item series of items about frequency of consumption of high and low-fat foods with a 5-option response format. Low-fat items were reverse scored and an algorithm used to calculate percentage of fat, such that the resulting total score indicated percentage of fat in food consumed during the last month.

Independent variables

Constructs from the Health Promotion Model as used by Garcia et al. (1995) included Models (family, friend and classmate) and social support (family and friend). The only Transtheoretical Model variable included in this study was stage of change. Instruments measuring these variables were included for both physical activity and dietary fat intake.

The social support scale was designed to elicit information about the degree to which family, friends, and classmates provided support. A 5-item Likert scale was used concerning encouragement to eat fruits and vegetables; praise for eating a healthy amount of food; complaints about eating high-fat foods; eating healthy foods with the student; and not bringing high-fat foods to the student. The scale was developed for this study using a format similar to the physical activity support scale (Garcia et al., 1995). Reliability estimates for these scales and the role model scales are summarized in Table 1.

Table 1. *Coefficient Alpha and Test–Retest Reliability for Measures*

Measure	**Number of items**	**Coefficient alpha**	**Test–retest *R* (*p*)**
Models			
Family	9	0.73	0.735 (0.000)
Friends	6	0.83	0.763 (0.000)
Social support			
Family	5	0.79	0.650 (0.000)
Friend	5	0.87	0.650 (0.000)
Classmates	5	0.87	0.553 (0.000)

The role model scale focused on whether or not the subjects' mother, father, sisters/brothers, friends, or classmates eat 5–6 servings of fruits and vegetables each day; eat whole grain breads and cereals; and eat high-fat foods. The response options consisted of a 5-point Likert scale with options: never to always, or they did not know. It was developed with a similar format to the physical activity models scale (Garcia et al., 1995) used in this study. Staging questions used by Greene et al. (1994) were used. Subjects report the length of time they have been eating low-fat foods or when they intend to start. The exercise-staging question is a single item categorizing subjects based on the length of time they have been physically active or their intent to become physically active.

Neighborhood environment

To better understand how activity and diet might differ based on environment of residence, a windshield survey (Stanhope & Lancaster, 2000) of each ZIP code was conducted. The second ZIP code occupies the west and the south borders of the first. Windshield surveys were done by senior nursing students in their community health nursing practicum.

Results

Exercise and diet stage of change.

Exercise stage in this sample was: maintenance = 62 (18.3%); action = 39 (11.5%); preparation = 11 (3.2%); contemplation = 6 (4.7%); and precontemplation = 16 (4.7%). Subjects' stage of change for dietary fat intake were: precontemplation = 56 (16.5%); contemplation = 44 (13%); preparation = 25 (7.4%); action = 7 (2.1%); and maintenance = 4 (1.2%). Six subjects describing themselves in the action or maintenance stages of change were re-staged to precontemplation because their fat intake exceeded 30% according to the Rossi et al. (1994) algorithm.

Data were analyzed to answer the research questions as follows:

Question 1) What variables from the HP/TM (demographics, stage of change, social support, and role models) predict physical activity and low-fat diet?

Moderate/vigorous activity was regressed on total support and total model scores along with exercise stage and the demographic variables. The model explained 17% of the variance in activity [Adj. R^2 = 0.17; F (7, 54) = 2.793; p = 0.015]. Gender was the only significant predictor (Beta = −0.303; p = 0.014). A separate regression for females yielded significant results [Adj. R^2 = 0.26; F (6, 25) = 2.801; p = 0.032]. For girls race/ethnicity (Beta = −0.374; p = 0.029) and total (family, friend, and classmate combined) support for physical activity (Beta = 0.566; p = 0.007) were significant. Race and gender scores for social support are shown in Fig. 1.

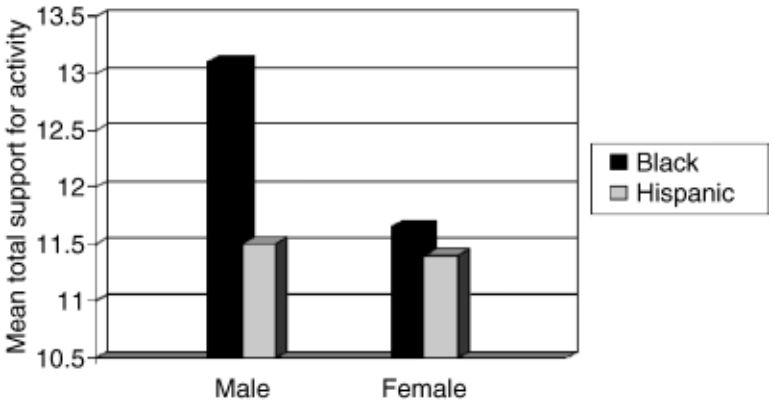

Figure 1 Mean Total Support for Physical Activity by Gender and Race.

Percentage fat in diet was regressed on HP/TM variables: demographics, stage, social support (family, friend, and classmate), and models (family and friend). The model predicted 24% of the explained variance in percentage dietary fat [Adj. R^2 = 0.24; F (10, 42) = 2.658; p = 0.013]. Lower stage of change (as shown in Fig. 2—Beta = −0.387; p = 0.006) and lower friend low-fat role models (Beta = −0.299; p = 0.046) predicted higher dietary fat intake.

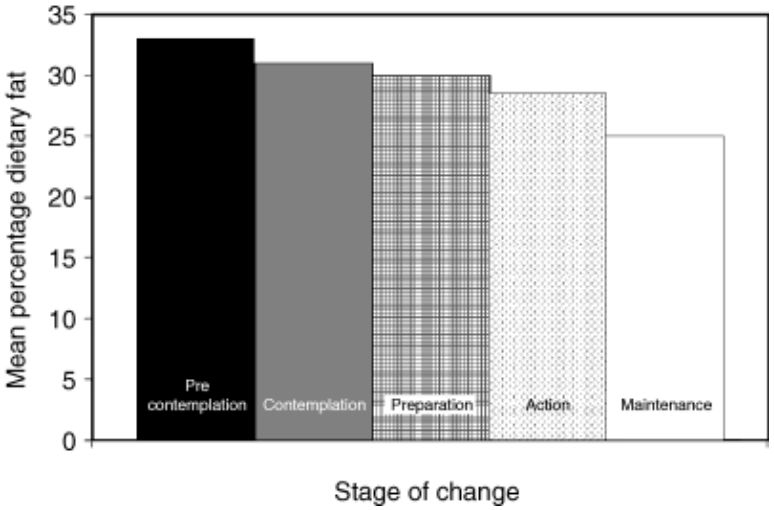

Figure 2 Mean Percentage of Dietary Fat by Stage of Change.

Question 2) To what extent do HP/TM variables differ based on race, gender, age, income, and ZIP code?

General Linear Model was used to examine HP/TM model variables (stage; social support from family, friends, and classmates; and Models from family and friends) by gender as a factor and race, age, income, and ZIP code as covariates. Only vigorous activity differed by gender, with males reporting significantly more activity ($F = 4.801$; $p = 0.038$). The only significant difference by age was less mild activity among the 14-year-old seventh-grade students ($F = 13.779$; $p = 0.001$). There were no significant differences in any physical activity variables between the African American and the Hispanic students in this sample. Models of family activity were greater as family income (indicated by free lunch status) increased ($F = 4.697$; $p = 0.04$) as shown in Fig. 3. There were no significant differences in study activity variables between the two largest ZIP codes of student residence.

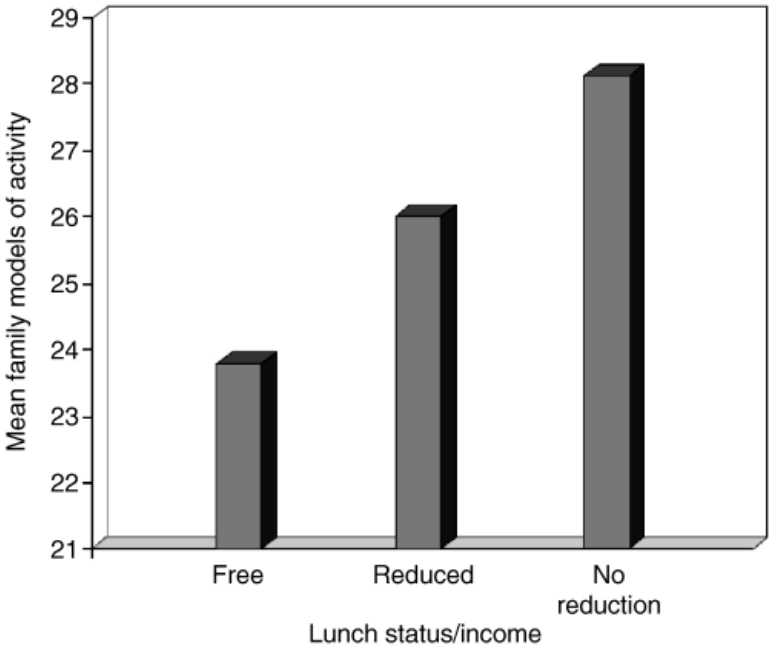

Figure 3 Family Models of Physical Activity by Income (Free-lunch Status).

Dietary fat intake did not differ by gender, race, or age for any study variables. Both family models for low-fat diet ($F = 7.448$; $p = 0.012$) and family support ($F = 7.007$; $p = 0.014$) were lower for those with low income. Lower family models ($F = 7.448$; $p = 0.012$) and higher dietary fat ($F = 6.354$; $p = 0.019$) were found among students residing in the second ZIP code compared to the first as shown in Fig. 4.

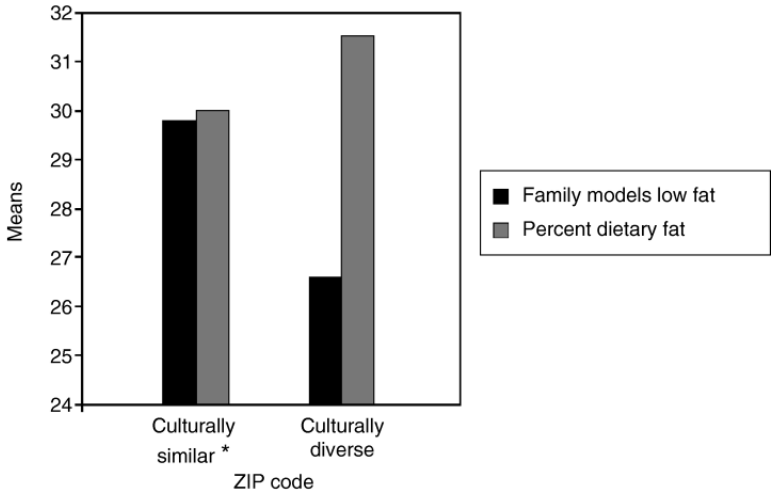

Figure 4 Family Models and Student Dietary Fat by ZIP Code. *ZIP code 1 has Lower Income and Hispanic Food Markets.

Chi-square was used to examine the demographic variables by ZIP code. The second ZIP code had significantly more students with sufficient family income so as not to be eligible for free lunch ($x^2 = 5.191$; $p = 0.023$), but there were no significant differences by ZIP code in gender, age, or race. Most students in both ZIP codes described themselves as Hispanic (31 in one and 32 in the second with three African American students residing in each ZIP code).

Windshield surveys indicated higher proportions of Hispanics and more grocery stores and open-air markets consistent with Hispanic culture in the first ZIP code compared to the second. Census data provided further support for these impressionistic data. In 2000, the total population for the first ZIP code was 42,382, of which Hispanic or Latino was 64.8%. The second ZIP code had 54,950 total population, of which Hispanic or Latino was 38.4%. These findings are similar to those of Fang et al. (1998) that better health was associated with greater cultural congruence. There also were more accommodation and food services in the first ZIP code (94 establishments with sales of $25,000–49,999). The second ZIP code included 85 establishments with sales of $10,000–24,999 [1997 Economic Census and 2002 U.S. Census (available at: http://www.census.gov/epcd/www/zbp_base.html)].

Discussion

The purpose of this investigation was to examine HP/TM antecedents for physical activity and dietary fat among low income, African American and Hispanic seventh-grade students. Findings indicated that total support was a significant predictor for females' physical activity. Similarly, peer support was the only consistent predictor of objectively measured vigorous physical activity across age and sex subgroups in first- to twelfth-grade students (Sallis, Taylor, Dowda, Freedson, & Pate, 2002).

Hispanic females in the current study perceived less support for activity than African Americans. Similar racial differences for provision of transportation to activity locations have been reported (Hoefer, McKenzie, Sallis, Marshal, & Conway, 2001). The only significant gender difference in the current study for activity was in vigorous activity where boys clearly exceeded girls. Mild activity was less among the older seventh-grade students. Santos, Guerra, Ribeiro, and Duarte (2003) reported similar findings using accelerometry, rather than self-report.

Social support was not predictive of percentage fat in diet for subjects in the current study. De Bourdeaudhuij and Brug (2000) similarly found there was no significant effect for social support in dietary changes among adolescents.

Stage of change contributed to understanding dietary behavior. This was similar to findings for fruit and vegetable consumption among adults (Van Duyn et al., 2001).

Family models, both for physical activity and low-fat diet, were lower among those with lower income in the current study. No other studies have reported similar analysis of family models with low-income groups.

Lower income was associated with lower social support, lower self-esteem, and sense of mastery, which was buffered by physical activity among Canadian adolescents (Heights, Abernathy, Webster, and Vermeulen, 2002). Xie, Gilliland, Li, and Rockett (2003) found dietary fat increased with decreased family income. Aaron et al. (2002) found low socioeconomic status resulted in lower levels of activity as boys transitioned into high school.

The association of higher family models and lower fat diet, despite lower income, in a ZIP code where there was a denser population, could be indicative of available supports as well as the ability to maintain traditional diets. As Hampl and Sass (2001) pointed out, the traditional diet of Hispanics can be healthy and parents with low income do not wish to use money in short supply when their children are “picky” eaters wasting unfamiliar foods. A traditional diet that is available in the neighborhood may be especially helpful when compared to adopting a “fast food” diet, as immigrants working in two and three jobs have limited time to prepare traditional meals (Moreno, Alvarado, Balcazar, & Lane, 1997).

No differences based on ZIP code were found for physical activity in the current study of low-income African American and Hispanic seventh-grade students. In a sample that was 73% Caucasian, Gilmer, Harrell, Miles, and Hepworth (2003) found that in North Carolina costal regions as compared with other parts of the state, peer influences were important for physical activity during mid puberty and that fathers’ activity was a significant predictor. Further study with larger samples over time is needed to examine the effect of local environment on antecedents of physical activity and diet in various ethnic groups.

A potential limitation of this study was that in order to reduce instrumentation fatigue, no measure of acculturation was included. Polednak (1997) found that age and gender (but not education or acculturation) were statistically significant predictors of fat intake among Hispanic adults. Romero-Gwynn et al. (1993) found that second generation Mexican Americans decreased their intake of traditional Mexican foods, adopting a diet “typical” of mainstream Americans. Block, Norris, Mandel, and DiSogra (1995) found that African American, Caucasian, and Hispanic sources of energy and

nutrients were similar. Kristal, Shattuck, and Patterson (1999) found that a single intervention program can work well with culturally diverse groups.

These study findings are based on self-report measures. Children's 24-hr dietary intake has shown no differences with adult-observed assessment (Van Horn, Gernhofer, & Moag-Stahlberg, 1990). Similar questionnaire methods have been found to be less subject to bias than person-to- person interviews and to questionnaires dealing with behaviors that have associated social and legal sanctions, e.g., sexual behavior, and drug use (Turner et al., 1998). Study findings are limited because data were collected in only one school and two predominant ZIP codes.

Despite the limitations of this study, the new insights gained include: (a) the lower family role models for both physical activity and dietary fat intake among those students with lowest income; (b) lower support for physical activity among Hispanics; and (c) the protective effects of a neighborhood with greater availability of culturally appropriate food sources and higher Hispanic population density on middle-school student dietary fat intake and their family role models for lower dietary fat. Further investigation of the interrelationships of HP/TM model variables with geographic/neighborhood characteristics is needed in a multischool sample including analysis of neighborhood of student residence.

Implications for nursing practice.

Although total support was important for physical activity among females and was lower among Hispanics, it is difficult to recommend parent support as a component for school-based programs based on these findings. Parent participation in school-based studies tends to be low (Baranowski et al., 1990; Nader et al., 1996). Parent support has not been found to be effective in increasing child physical activity (Luepker et al., 1996; Nader et al., 1996).

It may be that family interventions should be instituted with younger children, since those 4–7 years of age were nearly 6 times more active than peers where neither parent was active (Moore et al., 1991). Nurses in primary care or parish nurse settings also may have better opportunities to interact with both parents and children to implement family interventions than nurses in school settings.

Peer teasing about body size and shape was found to have effects on self concept among 5–7-year-old girls (Davidson & Birch, 2002), so peer support programs could incorporate positive support skill building. Because friend models were a significant predictor of dietary fat, along with stage of change in the current study, peer model improvement components seem reasonable for school-based interventions. Given that those in preparation, action, and maintenance stages of change had the recommended levels of dietary fat, these students may best serve as peer models for their classmates. The current study findings direct interventions among low income, African American and Hispanic youth to reduce health disparities among these groups.

Conclusions

Given the high prevalence of health problems related to diet and exercise behaviors, public health nurses may wish to use a school-based approach. School settings may be useful in building peer support for physical activity and lower dietary fat, though parish nurse or clinic settings may be most appropriate for building family role models and support. Living in a neighborhood with traditional

Hispanic culture and foods appears to have ameliorated the harmful effects of lower income among students in the present study, so community development that supports availability of healthy, culturally congruent foodstuffs may be recommended. The interaction of environment with HP/TM variables requires further study with larger samples followed over time to examine relationships between geographic/neighborhood characteristics, race/cultural population density, and support for healthy diet and physical activity in youth.

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