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Socioeconomic Status and Health Behaviors in Adolescence: A Review of the Literature

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Abstract
Objective The goal of this review was to determine the direction of associations between SES and health behaviors during the period of adolescence.
Method We searched the PsychInfo and Pubmed databases for studies that measured the association between SES and cigarette smoking, alcohol consumption, marijuana use, diet, and physical activity in adolescents between 10- and 21-years old.
Results Associations between SES and health behaviors conformed to two patterns. First, low SES was associated with poorer diets, less physical activity, and greater cigarette smoking. Second, there was no clear pattern of associations between SES and alcohol consumption or marijuana use.
Conclusion Results from this review indicate that, although some associations between SES and health behaviors exist during adolescence, the associations are not as robust as those in adulthood. Efforts to curb poor diet, inactivity, and smoking behaviors should target low SES adolescents, whereas efforts to curb teen drinking and marijuana use may be useful across the SES spectrum.

Keywords Socioeconomic status · Adolescence · Health behaviors · Health outcomes

Introduction

Previous research has consistently documented social class gradients in child and adult health. In children, low socioeconomic status (SES) is associated with a range of negative health outcomes, including higher rates of chronic illnesses, vision and hearing problems, injury, and acute illnesses (Chen et al. 2002; Hasselberg and LaFlamme 2005; Koster et al. 2005; Starfield et al. 1995, 2002; Chen 2004). In adults, low SES also is associated with greater rates of morbidity and mortality, including cardiovascular disease, hypertention, osteo-arthritis, asthma, and cancer (Adler et al. 1994; Jaffe et al. 2005; Marmot et al. 1987). As well, low SES adults are more likely to engage in risky health behaviors (Wardle et al. 2003), increasing their susceptibility to poor health. Low SES may place individuals at risk for poorer health for a variety of reasons, such as having less access to health care, poorer living conditions, less knowledge about the negative consequences of health-compromising behaviors, and greater psychological stress (Adler et al. 1994; Chen et al. 2002; Chen 2004; Marmot et al. 1987).

However, the association between SES and health may not be equally apparent across the lifespan (Chen et al. 2002; Chen and Killeya-Jones 2006; House et al. 1988; West 1997). In particular, adolescence is a time of marked social and biological changes, and also a time when many health behaviors are becoming established. Thus, the primary aim of this review is to determine the nature of the relationship between SES and health behaviors during adolescence, and to assess whether associations adhere to a ''traditional'' (consistent with adult literatures), reversed, or null pattern.

Traditional Associations Low SES Related to Greater Negative Health Behaviors

First, it is possible that the association between SES and health behaviors during adolescence conforms to patterns

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found in adulthood that suggest that lower SES is associated with poorer health behaviors (Adler et al. 1994; Marmot et al. 1987; Williams 1990). In adults, this relationship has been proposed to be due to factors such as unsafe living environments, less access to fitness facilities, less knowledge about proper nutrition, less access to health care, and reduced availability of fresh fruits and vegetables (Cubbin et al. 2006; Kamphuis et al. 2006). If the same direction of associations is found in adolescents, similar mechanisms may be operating during this life stage as well.

Reversed Associations High SES Related to Greater Negative Health Behaviors

Alternatively, Luthar and colleagues argue that, for some health behaviors, high SES teens may be at greater risk than low SES adolescents (Luthar and D'Avanzo 1999a; Luthar and Becker 2002; Luthar and Latendresse 2005). This increased risk in high SES teens may stem from factors such as over-scheduling in extracurricular ''resume building'' activities (including sports teams, music lessons, and extra academic tutoring), academic achievement pressure to be accepted by prestigious universities, and/or isolation from parents due to demanding jobs or emotional detachment as youth are left home alone to develop ''self-sufficiency'' (Luthar and Latendresse 2005). According to this theory, high SES adolescents engage in negative health behaviors in order to combat the stress, anxiety, and depression they experience from achievement pressures.

Null/weak Associations Non-significant Relation between SES and Health Behaviors

Finally, the association between SES and negative health behaviors may be diminished or latent during adolescence. West and others, for example, have argued that as teens spend less time in the home during adolescence, the influence of peers and school environments outweighs the impact of family SES. Because social hierarchies within the school environment may be more important in determining health behaviors than the impact of family socioeconomic factors, this may result in a relative equality of health across the SES spectrum during adolescence (West and Sweeting 2004; West 1997; West et al. 1990). West's research findings have primarily focused on health outcomes; however, he hypothesized that youth culture would also impact health behaviors. According to this theory, then, no association would exist between SES and health behaviors during adolescence.

In this review, we chose to focus on the relationship between SES and health behaviors (as opposed to health outcomes) for three reasons. First, health behaviors are risk factors for many chronic illnesses later in life, such as cardiovascular disease, diabetes, and cancer (Escobedo et al. 1990; Marmot et al. 1987; Marmot et al. 1991; Winkleby et al. 1990), and thus are important to understand earlier in life as precursors to disease. Second, risky health behaviors, such as cigarette smoking and alcohol use, are often initiated during adolescence (Green and Palfrey 2000; NIDA Notes 2004) and continue into adulthood (Jefferis et al. 2003). Third, because other reviews have covered the association between SES and acute and chronic conditions in youth (Chen et al. 2002; DiLiberti 2000; Dutton 1985), we did not want to duplicate their findings, and instead chose to focus on an area that has received less attention in reviews, that of health behaviors (Mackino et al. 2003; Starfield et al. 2002; West 1997). In this review, we will examine SES and its relation to five health behaviors: cigarette smoking, alcohol use, marijuana use, physical activity, and diet/nutrition.

Methods

To compile papers on socioeconomic status and health behaviors in adolescence, we searched the PsychInfo and Pubmed databases for the years 1970–2007. For both databases, we used the following as search terms for SES: socioeconomic status, social class, education, occupation, income, and poverty. Our health behavior search terms included physical activity, exercise, cigarette, smoking, alcohol, marijuana, cannabis, diet, and nutrition. We also searched the reference lists of several review articles (Chen et al. 2002; Hawkins et al. 1992; Jenkins and Horner 2005) to identify any additional articles. We carefully reviewed each journal article that was identified by the search, even if an SES indicator was not explicitly mentioned in the abstract. Included in this review are articles in which associations between SES and a relevant health behavior are reported, including studies in which SES was used as a covariate, rather than as the primary focus of analyses. However, in the case where SES was included as a covariate but no statistics on SES were reported, we were not able to include the study in this review.

The period of adolescence is characterized by marked biological and psychological changes, and these processes are not necessarily occurring simultaneously (Irwin et al. 2002). Therefore, the boundaries between childhood and adolescence, as well as between adolescence and adulthood, are difficult to define (West 1997). National Center for Health Statistics defines adolescence as the age range of 12–19 (http://www.cdc.gov/nchs/), while the Center for Disease Control and Prevention defines adolescence as the period between approximately 10 years and 18 years of age (http://www.cdc.gov/nchs/data/hus/hus00cht.pdf). Based on the argument made by Irwin and colleagues

(Irwin et al. 2002), we will define early adolescence as the range between 10 years and 14 years, and late adolescence between 15 and 21 in this review. These categories may not capture each individual's pubertal stage. However, Irwin and colleagues argue that, despite this limitation, the categories correspond to distinct developmental stages. For this review, we restricted our search to encompass studies that measured the association between SES and health behaviors in adolescents between the ages of 10 and 21. Where possible, we assessed whether patterns of associations differed in early adolescence and late adolescence.

For the purposes of this review, we focused on adolescents who were healthy and from Western countries. Thus studies were excluded if sample participants had a chronic illness. Studies were also excluded if data were gathered from developing countries, in order to limit the confounding influences of culture on health behaviors. As well, studies were excluded if substance use was collapsed across multiple types of substances, so that we could clarify the relationship between SES and specific substance use behaviors.

Finally, we assessed whether patterns of results varied by study quality. For these purposes we performed secondary analyses for each health behavior on only those studies that included a sample that, (a) had an *N* of greater than 500, (b) was nationally representative according to the authors of the study, and (c) had an SES range consistent with national demographics. We will refer to this subset of studies as ''high quality studies'' for the remainder of the paper. High quality studies are identified by an asterisk (*) throughout the tables.

Unfortunately, there were too few high quality studies that reported on differences by gender, age, race/ethnic group, or measure of SES to adequately assess moderating factors within this subset of studies.

Results

First, we will review associations between SES and substance use behaviors during adolescence, including cigarette smoking, alcohol consumption, and marijuana use. Second, we will review the findings from the literature on the SES associations with daily living/lifestyle behaviors, including diet and physical activity. Because we recognize the possibility that different health behaviors may have different associations with SES, we review associations for each behavior separately.

Cigarette Smoking

Overall Effects

In our review of the literature, 44 studies examined the association between SES and cigarette smoking during adolescence (see Table 1). The majority found some support that low SES was associated with greater smoking. Eighteen studies reported negative associations indicating that low SES teens smoked more than high SES teens. Another 12 studies found negative associations in at least one subgroup of the sample. In contrast, only five studies found positive associations, indicating that high SES adolescents smoked more cigarettes than low SES teens, and two studies found positive associations in one subgroup. Finally, nine studies found no significant association between SES and cigarette smoking, with another six reporting no association in a subgroup of the sample.

High Quality Studies

Twenty-one high quality studies were identified that examined the association between SES and cigarette smoking (see Table 1). Nine studies found a negative association, with another six reporting a negative association within at least a sub-sample. One study reported a positive association, and another two found a positive association within a sub-sample. Finally, six studies reported no significant association between SES and cigarette smoking, with another three reporting no significant association within a sub-sample. Overall, 15 of 21 studies, or 71%, found some support of a negative association between SES and cigarette smoking, indicating that, parallel to results from the entire set of studies, low SES adolescents are more likely to smoke than high SES adolescents.

Moderator Effects

Of the studies reporting different patterns in different subgroups, we investigated whether patterns consistently emerged for one gender, age, ethnic group, or measure of SES. With respect to gender, two studies found negative associations for females only (Mittlemark et al. 1987; Scragg et al. 2002). No studies reported associations for males only, and no other studies broke down associations by gender.

With respect to age, we divided studies into those that reported patterns for early adolescence only (ages 10–14, approximately middle-school aged), late adolescence only (ages 15–21, or approximately high-school aged), or those that reported on a wide age range but separated effects by age. Eight studies focused on early adolescence, eleven studies focused on late adolescents, and four studies reported effects separately by age group (including both early and late adolescent groups). Of the 12 early adolescence studies, ten found negative associations of SES with smoking (Ary and Biglan 1988; Blum et al. 2000; Chassin et al. 1992; Elder et al. 1988; Griesler and Kandel 1998;

Table 1 Summary of studies that investigated the association between SES and cigarette smoking

Study	Age range (years)	SES measure	Outcome	HQ	*N*	Study design
Wardle et al. (2003)	11–12	Neighborhood economic deprivation	–	*	4,320	Cross-sectional; Nationally rep
Elder et al. (1988)	6th–7th grade	Parental occupation	–		433	Cross-sectional; Regionally rep.
Waldron and Lye (1990)	17–18	Parent education	–	*	12,014	Cross-sectional; Nationally rep.
Sweeting and West (2001)	15	Parent occupation	–	*	2,196	Longitudinal; Nationally rep.
Green et al. (1991)	15	Father's occupation	–	*	1,009	Cross-sectional; Nationally rep.
Terre et al. (1992a, b)	15–19	Parent education, income	–		139	Cross-sectional; Regionally rep.
Kokkevi and Stefanis (1991)	14–18	Father's occupation	–	*	11,058	Cross-sectional; Nationally rep.
Boyle and Offord (1986)	12–16	Parent wducation	–	*	5,401	Cross-sectional; Nationally rep.
Huure et al. (2003)	16	Father's occupation	–	*	2,194	Longitudinal; Nationally rep.
Bergstrom et al. (1996)	14; 17	Parent education	–		879	Cross-sectional; Regionally rep.
O'Connell et al. (1981)	10–12	Parent occupation	–		669	Cross-sectional; Regionally rep.
Stanton et al. (1994)	15; 18	Parent occupation	–		969	Cross-sectional; Regionally rep.
Terre et al. (1992a, b)	11–13	Parent education/occupation	–		589	Cross-sectional; Regionally rep.
Ennett and Bauman (1993)	9th grade	Mother's education	–		165/ 292	Longitudinal; Nationally rep
Townsend et al. (1994)	16–19	Family income	–	*	N/A	Longitudinal; Nationally rep.
White et al. (2004)	10–19	Hollingshead: Parent education, occupation	–		500	Longitudinal; Regionally rep.
Lowry et al. (1996)	12–17	Family income	–	*	6,321	Cross-sectional; Nationally rep.
Murray et al. (1987)	12–13	Parent occupation	–		669	Cross-sectional; Regionally rep.
Hanson and Chen (2007)	16–19	Parent education, occupation, family income	+		113	Cross-sectional; Non-probability
Johnson et al. (1997)	15	Spending money/allowance	+		4,808	Cross-sectional; Regionally rep.
Johnson et al. (2004)	9th grade	Spending money/allowance	+		4,763	Cross-sectional; Regionally rep.
Gordon-Larsen et al. (2000)	12–22	Family income	+	*	12,759	Cross-sectional; Nationally rep.
Graham (1996)	Grades 6–10	Free school lunch	+		1,247	Longitudinal; Regionally rep.
Bergman and Scott (2001)	11–15	Family income, Employment	0	*	773	Cross-sectional; Nationally rep.
Borland and Rudolph (1975)	14–18	Parent education	0		1,814	Cross-sectional; Regionally rep.
Friedstad et al. (2003)	18–19	Parent education	0	*	924; 2,025	Cross-sectional; Nationally rep

Table 1 continued

Study	Age range (years)	SES measure	Outcome	HQ	*N*	Study design
Maurer et al. (2003)	13–18	Family income	0		200	Cross-sectional; Regionally rep.
Donato et al. (1994)	14–15	Father's occupation	0	*	9,375	Cross-sectional; Nationally rep.
West et al. (1999)	15–16	Parent's occupation	0	*	1,009	Cross-sectional; Nationally rep.
Dornbusch et al (2001)	11–18	Community economic deprivation	0	*	13,568	Longitudinal; Nationally rep.
Pederson and Skrondal (1999)	14–17	Parent education	0	*	10,812	Cross-sectional; Nationally rep.
Ennett et al. (1997)	5th–6th graders	Neighborhood SES: median family income; % below poverty line; % unemployment	0		36	Cross-sectional; schools Regionally rep.
Mittlemark et al. (1987)	12–16	Parent education	–(girls)		2,284	Cross-sectional; Regionally rep.
Chassin et al. (1992)	13.9	Parent education	–(middle-schoolers)		6,234	Cross-sectional; Regionally rep.
Ary and Biglan (1988)	14–16	Parent education, housing conditions	– (high-schoolers)		1,171	Cross-sectional; Non-probability
Blum et al. (2000)	7th–12th graders	Household income	–(7–8th gr)/+(9–12th gr)	*	10,802	Longitudinal; Nationally rep.
Scarinci et al. (2002)	7th grade	Family income, ed., Free school lunch	–(Non-White)/0 (Caucasians)		3,813	Cross-sectional; Regionally rep.
Lewis et al. (2001)	10–15	Parent education	–(White)/0 (Non-White)		1,207	Cross-sectional; Regionally rep.
Scragg et al. (2002)	14–15	School SES deciles	–(girls only)	*	14,793	Cross-sectional; Nationally rep.
Goodman and Huang (2002)	7th to 12th grade	Family income, education	–(White)/0 (Non-White)	*	15,112	Cross-sectional; Nationally rep.
Pedersen and Lavik (1991)	12–18	Parent education	–(Exp.)/0 (Regular)		1,230	Longitudinal; Regionally rep.
Wallace et al. (1999)	8th; 10th; 12th grade	Parent's education	–(8th, 10th gr)/0 (12th gr)	*	25,000	Cross-sectional; Nationally rep.
Griesler and Kandel (1998)	10–12	Family income, ed.	–(Whites)/0 (Non-Whites)	*	1795	Cross-sectional; Nationally rep.
Georgiades et al. (2006)	12–18	Family income, ed.	–(Canadians)/+(Immigrants)	*	5,401	Cross-sectional; Nationally rep.

– = Low SES significantly associated with greater smoking; 0 = No significant association between SES and smoking; + = High SES significantly associated with greater smoking

*Included in ''high quality'' analyses. N/A = Sample size not presented in article.

O'Connell et al. 1981; Scarinci et al. 2002; Terre et al. 1992a; Wallace et al. 1999; Wardle et al. 2003; Murray et al. 1987). Two studies found no association (Griesler and Kandel 1998; Scarinci et al. 2002).

Fifteen studies included a late adolescent age group. Within those studies, eight found a negative association of SES with smoking, three found a positive association, and four found no association (Friedstad et al. 2003; Green et al. 1991; Hanson and Chen 2007; Huure et al. 2003; Johnson et al. 1997; Stanton et al. 1994; Sweeting and West 2001; Terre et al. 1992b; Townsend et al. 1994; Waldron and Lye 1990; West et al. 1999).

As well, five studies reported findings separately by racial/ethnic group (Georgiades et al. 2006; Goodman and Huang 2002; Griesler and Kandel 1998; Irwin et al. 2002; Lewis et al. 2001; Scarinci et al. 2002). Three of these studies (Goodman and Huang 2002; Griesler and Kandel 1998; Lewis et al. 2001) reported negative associations

among white adolescents, but not among adolescents from any other racial/ethnic group. In contrast, Scarinci and colleagues (2002) reported no significant associations for white adolescents, but negative associations among African American adolescents. Finally, Georgiades and colleagues (2006) separated groups by immigration status, and reported negative associations for teens born in Canada, but positive associations for teens who immigrated to Canada.

Finally, we assessed whether any of the SES patterns were primarily due to one type of SES measure. We found that four of the five positive SES-smoking studies utilized at least one resource-based measure of SES (e.g., income, qualification for federal school lunch program). This suggests that one reason why a handful of studies found more smoking in high SES groups could have to do with these teens' access to financial resources to purchase cigarettes.

In summary, the majority of the findings (i.e., 30 of 44 studies, or 68%) suggest that adolescent smoking has a negative relationship with SES, such that lower SES adolescents smoke more than higher SES adolescents. We did not see a strong effect of gender or race on the SES-cigarette smoking association. In terms of the effects of marker of SES, those with greater financial resources may be more likely to smoke cigarettes. However, the relation between SES and smoking appears more consistently in adolescents ages 10–14 than in older teens, aged 15–21.

Alcohol

Overall Effects

Of the 28 studies reviewed that examined the association between SES and alcohol consumption in adolescents, five reported positive associations, indicating that high SES was related to greater alcohol use (see Table 2). Another two studies found positive associations within one subgroup of the sample. Five studies reported negative findings, such that low SES was related to greater use, and another three studies found negative associations in one subgroup. Finally, 16 studies found no significant association between SES and alcohol consumption in teens.

High Quality Studies

We identified 13 high quality studies that examined the association between SES and alcohol consumption during adolescence (see Table 2). Of those 13, two reported a negative association in a sub-sample, three reported positive findings, with an additional sample reporting a positive association within a sub-sample, and finally, eight studies reported no significant association between SES and alcohol consumption, with another study reporting no significant association within a sub-sample. Overall, nine of 13 studies, or 69%, found no significant association between SES and alcohol consumption. These results are consistent with those from the entire set of studies, again suggesting that alcohol consumption during adolescence is not significantly patterned by SES.

Moderator Effects

We assessed whether patterns varied by gender, age, racial/ethnic group, or measure of SES. While all but one of the studies included gender in their analyses (Ennett et al. 1997), no studies examined the effect of gender in the association of SES and alcohol use. As well, no studies reported that patterns differed by race/ethnic group.

We considered whether patterns differed in early versus late adolescent age groups. Four studies sampled early adolescents only (Droomers et al. 2003; Ennett and Bauman 1993; Epstein and Karweit 1983; Terre et al. 1992a; Villalbi et al. 1991), seven sampled late adolescents only (Adalbjarnardottir 2002; Breslin and Adalf 2005; Ellickson et al. 1996; Green et al. 1991; Huure et al. 2003; Terre et al. 1992b; Zucker and Harford 1983), and one study sampled both early and late adolescents (Wallace et al. 1999). In studies that included an early adolescent sample, one found a negative relation between SES and alcohol consumption (Terre et al. 1992a), while four found no significant relation (Ennett et al. 1997; Epstein et al. 1995; Villalbi et al. 1991; Wallace et al. 1999).

Within the late adolescent samples, one study reported a positive association (Green et al. 1991), four report non-significant associations (Adalbjarnardottir 2002; Huure et al. 2003; Terre et al. 1992b; Wallace et al. 1999), and three reported that patterns were mixed according to SES measure (Breslin and Adalf 2005; Ellickson et al. 1996) and amount of alcohol consumed (Zucker et al. 1983).

Sixteen studies included more than one measure of SES. Among those that documented negative associations of SES with alcohol use, four out of five utilized family social status measures (e.g., parental education and occupational status). Among those that documented positive associations, three of five studies used both social status and resources measures. Overall, this suggests that one explanation for the handful of studies that found negative associations may have been because higher family social status or prestige buffers high SES adolescents from using alcohol.

In addition, two studies reported that the associations between SES and alcohol consumption varied by type of SES measure. Breslin and Adalf (2005) reported that teens with greater household incomes drank less alcohol, but found no significant association between neighborhood-level SES and alcohol consumption (Breslin and Adalf 2005). In contrast, Ellickson and colleagues (Ellickson et al. 1996) found that teens from families with greater

Table 2 Summary of studies that investigated the association between SES and alcohol use

Study	Age range (years)	SES measure	Outcome	HQ	*N*	Study design
Droomers et al. (2003)	11–21	Father's occupation	–		1,000	Longitudinal;Regionally rep.
Sussman and Dent (2000)	13–18	Parent occupation, education	–		875	Cross-sectional;Non-probability
Terre et al. (1992a, b)	11–13	Parent education/occupation	–		589	Cross-sectional; Regionally rep.
Lowry et al. (1996)	12–17	Family income, education	–		9,375	Cross-sectional; Regionally rep.
Measham et al. (1994)	14–15	Parent's occupation	–		776	Cross-sectional; Regionally rep.
Hanson and Chen (2007)	16–19	Parent education/occupation, Family finances	+		113	Cross-sectional; Non-probability
Green et al. (1991)	15	Father's occupation	+		139	Cross-sectional; Regionally rep.
Goodman and Huang (2002)	7th–12th graders	Family income, education	+	*	15,112	Cross-sectional; Nationally rep.
Boyle and Offord (1986)	12–16	Parent education	+	*	5401	Cross-sectional; Nationally rep.
Blum et al. (2000)	11–18	Family income	+	*	10,803	Cross-sectional; Nationally rep.
Donovan and Jessor (1978)	11–18	Parent's education	0	*	16,181	Longitudinal; Nationally rep.
Stewart and Power (2002)	13–18	Parent education/occupation	0	*	1,009	Longitudinal; Nationally rep.
Terre et al. (1992a, b)	15–19	Parent education, family income	0		139	Cross-sectional;Non-probability
Barnes et al. (1999)	13–19	Mother's education	0		1,324	Cross-sectional; Regionally rep.
Villalbi et al. (1991)	5th; 8th graders	Average neighborhood income	0		2,215	Cross-sectional; Regionally rep.
Kokkevi and Stefanis (1991)	14–18	Father's occupation, education	0	*	11,058	Cross-sectional; Nationally rep
Gibbons et al. (1986)	11–18	Family education, Income	0		650	Cross-sectional; Regionally rep.
Hurre et al. (2003)	16	Father's occupation	0	*	2,194	Cross-sectional; Nationally rep.
Epstein et al. (1995)	7th graders	Subsidized school lunch	0	*	4,847	Cross-sectional;Nationally rep.
Wallace et al. (1999)	8th,10th,12th gr.	Parent's education	0	*	10,812	Cross-sectional; Nationally rep.
Pederson and Skrondal (1999)	14–17	Parent education, occupation	0	*	11,058	Cross-sectional; Nationally rep.
Ennett et al. (1997)	5th; 6th graders	Neighborhood SES: median family income; % below poverty line; % adults w/out high school education	0		36	Cross-sectional; schools Regionally rep.
Donato et al. (1994)	14–15	Parent's education, father's work	0	*	9,375	Cross-sectional; Nationally rep.
Miller et al. (2003)	13–16	Family income, parents' education	0		699	Cross-sectional; Regionally rep.
Adalbjarnardottir (2002)	15; 17	Hollingshead: Parent education, occupation	0		1,198	Cross-sectional; Regionally rep.

Table 2 continued

Study	Age range (years)	SES measure	Outcome	HQ	*N*	Study design
Zucker and Harford (1983)	16–18	Parent education, occupation	+ (exper.)/– (drunk)	*	1,028	Longitudinal; Nationally rep.
Ellickson et al. (1996)	High School Seniors	Family income, parent education, parent occupation	+(income)/ – (ed, occup)		9,222	Cross-sectional; Regionally rep.
Breslin and Adalf (2005)	15–19	Family income, community SES	–(income)/0 (community SES)	*	3,458	Cross-sectional;Nationally rep.

0 = No significant association between SES and alcohol use; + = High SES associated with greater alcohol use; – = Low SES associated with greater alcohol use

*Included in ''high quality'' analyses

incomes reported *more* alcohol use than teens from poorer families, while teens whose parents had higher educational degrees and more prestigious occupations used *less* alcohol than teens whose parents completed fewer years of education and whose jobs held less status.

Overall, the majority of studies find no relationship between SES and alcohol use during adolescence (i.e., 16 of 28 studies, or 57%). Of the studies that find a pattern, they are split between those documenting negative versus positive effects. No differences emerged by age, gender or race. However, patterns may vary by SES marker; for example, when family social status is used as an indicator of SES, the association between SES and alcohol use is more likely to be negative.

Marijuana

Overall Effects

A total of 25 studies analyzed the association between SES and marijuana use during adolescence (see Table 3). Of those studies, six reported positive associations; high SES teens used more marijuana than low SES teens. Four studies found negative associations; low SES teens reported more marijuana use than high SES teens. Fourteen of the 25 studies reported null findings, and another reported null findings within one subgroup (Goodman and Huang 2002); no significant association existed between SES and marijuana use. Finally, one study found a non-linear association between SES and marijuana use within one subgroup; both low *and* high SES teens reported greater marijuana use than middle SES teens in non-white adolescents (Goodman and Huang 2002).

High Quality Studies

Twelve studies were included as high quality studies that assessed the relation between SES and marijuana use (see Table 3). Of those 12, two reported negative findings, two reported positive findings, seven reported no significant association, and one reported a U-shaped association between SES and marijuana use. Overall, seven of 12, or 58%, found no significant association between SES and marijuana use, suggesting that, similar to results from all identified studies, marijuana use does not appear to be significantly patterned by SES during adolescence.

Moderator Effects

We assessed whether patterns varied by gender, age, racial/ethnic group, or measure of SES. Patterns of associations did not differ between boys and girls in any of the 10 studies that reported effects separately by gender, with the exception of Ennett et al. (1997), which considered whether SES of the school was associated with prevalence of marijuana use throughout the student body. Therefore, the effect of gender could not be considered.

With respect to race, only Goodman and colleagues (2001) considered whether race/ethnicity moderated the SES-marijuana use association. They found that, while the association was U-shaped for non-White teens, there was a non-significant relation between SES and marijuana use for non-Hispanic teens.

With respect to age effects on the association between SES and marijuana use, five studies included early adolescent samples, while seven studies sampled late adolescents. Of the studies that included early adolescents, one reported a negative association (Kaplan et al. 1982), one reported positive findings (Murray et al. 1997), and three found no significant association (Butters 2002; Ennett et al. 1997; Olsson et al. 2006). Findings within late adolescents point to predominantly null findings; one study found a positive association between SES and marijuana use (Youniss et al. 1999) while six found no relationship between SES and marijuana use (Bachman et al. 1981; Butters 2002; Fergusson et al. 2003; Lynskey et al. 1998; Miller

Table 3 Summary of studies that investigated the association between SES and marijuana/cannabis

Study	Age range (years)	SES measure	Outcome	HQ	*N*	Study design
Wichstrom and Pederson (2001)	12–16	Parent occupation, employment	–	*	2,436	Longitudinal;Nationally rep.
Kaplan et al. (1982)	11	Parent education, occupation	–		1,229	Longitudinal; Regionally rep.
Duncan et al. (1997)	11–15	Parent education, family income	–		638	Cross-sectional; Regionally rep.
Miller and Miller (1997)	11–17	Hollingshead: Education, occupation	–	*	1,725	Longitudinal; Nationally rep.
Chen and Killeya-Jones (2006)	12–18	Family income	+		1,936	Cross-sectional; Regionally rep.
Murray et al. (1987)	11–13	Parent occupation	+		4,599	Cross-sectional; Regionally rep.
Maddahian et al. (1986)	13–18	Spending money/allowance	+		847	Longitudinal; Regionally rep.
Dornbusch et al. (2001)	11–18	Parent education, income, Unemployment	+	*	13,568	Longitudinal Nationally rep.
Youniss et al. (1999)	16–18	Parent education	+	*	13,000	Cross-sectional; Nationally rep.
Graham (1996)	11–16	Free school lunch	+		1,247	Longitudinal; Regionally rep.
Langille et al. (2003)	14–20	Mother and father education	0		2,198	Cross-sectional; Regionally rep.
Fergusson et al. (2003)	16; 18	Mother education, occupation	0		1,265	Longitudinal; Regionally rep.
Wallace et al. (1999)	12–18	Parent education	0	*	25,000	Cross-sectional; Nationally rep.
Lynskey et al. (1998)	16	Parent occupation	0		1,265	Longitudinal; Regionally rep.
Pederson and Skrondal (1999)	14–17	Parent education, occupation	0	*	10,812	Cross-sectional; Nationally rep.
Ennett et al. (1997)	10–12	Neighborhood: median family income; % below poverty line; % of adults w/out high school ed.	0		36	Cross-sectional; schools Regionally rep.
Boyle et al. (1993)	12–16	Family income	0	*	5,401	Cross-sectional; Nationally rep.
Olsson et al. (2006)	12–13; 14–16	Parent employment	0		5,211	Cross-sectional; Regionally rep.
Butters (2002)	Grades 7; 9; 11; 13	Perceived financial status	0		3,990	Cross-sectional; Regionally rep.
Miller (1996)	15–16	Parent education	0	*	7,722	Cross-sectional; Nationally rep.
Smith and Nutbeam (1992)	15–16	Father's education	0	*	2,239	Cross-sectional; Nationally rep.
Coombs et al. (1986)	9–17	Parent subjective rating of status	0		400	Longitudinal; Non-probability
Bachman et al. (1981)	16–18	Parent education	0	*	61,000	Longitudinal; Nationally rep.
Duncan et al. (2002)	11–17	Family income	0	*	1,044	Cross-sectional; Nationally rep.

Table 3 continued

Study	Age range (years)	SES measure	Outcome	HQ	*N*	Study design
Goodman and Huang (2002)	12–18	Parent education; family income	U (non-white)/0 (non-Hispanic)	*	15,041	Longitudinal; Nationally rep.

– = Low SES related to greater marijuana use; + = High SES related to greater marijuana use; 0 = No significant association between SES and marijuana use; U = U-shaped association (i.e., low and high SES related to greater marijuana use, middle SES related to less use)

*Included in ''high quality'' analyses.

1996; Smith and Nutbeam 1992). These results suggest that the findings that support a lack of association between SES and marijuana use may be strongest during older adolescence; however, because very few studies included samples of early adolescents, the effect of age in the SES-marijuana use association is not definitive.

Seven studies measured multiple markers of SES; however no studies found that patterns of associations varied across SES measures within a study. Within the studies reporting negative associations between SES and marijuana use, the majority (three out of four) measured SES via family social status. In contrast, within studies reporting positive findings, the majority (four of six) measured SES via family financial resources. Taken together, these patterns suggest that the relationship between social status and marijuana use is more likely to be negative, whereas the relationship between financial resources and marijuana use is more likely to be positive. This may help to explain the variability in SES-marijuana use associations across studies.

Overall, the majority of studies find no significant relationship between SES and marijuana use during adolescence (i.e., 15 of 25 studies, or 60%). Of the studies that find a pattern, they are split between those documenting negative versus positive effects. No differences emerged by gender or race. With respect to age, there is preliminary support to suggest that the non-significant association between SES and marijuana use may be stronger during late adolescence. As well, patterns *may* vary by SES marker; when family social status is used as an indicator of SES, the association between SES and alcohol use is more likely to be negative, whereas when family financial resources are measured, the association is more likely to be positive.

Diet/nutrition

Overall Effects

Associations between SES and diet are consistent, despite the fact that nutritional habits were measured very differently across studies (see Table 4). Of the 31 studies included in this review, 25 reported negative associations, such that teens from low SES backgrounds were more likely to report inadequate consumption of fruits and vegetables, greater fat and refined sugar intake, and were less likely to take a daily vitamin supplement. Another three studies found negative associations within at least one subsample (Lytle et al. 2003; Roos et al. 2004; Wardle et al. 2003). Three studies found no significant association between SES and diet, and another two studies found no significant association in at least one sub-sample of the study (Lytle et al. 2003; Roos et al. 2004). However, within the studies reporting no significant relation between SES and diet, one study attributed their null results to high attrition rates (Lien et al. 2002a), and another measured only breakfast eating (Shaw 1998), which may have been limited given that teens often attributed skipping breakfast to time constraints rather than social or economic factors.

High Quality Studies

Sixteen studies were identified as high quality studies that assessed the relation between SES and diet/nutrition (see Table 4). Of those 16, 13 reported a negative association and another found a negative association within females only. Two studies reported no significant association between SES and diet. Overall, 14 of 16, or 88%, reported a negative association in at least a sub-sample, indicating that, parallel to the results of the entire set of studies, low SES adolescents have a poorer diet than high SES adolescents.

Moderator Effects

Of the studies reporting different patterns in different subgroups, we investigated whether patterns consistently emerged for one gender, age group, race, ethnicity, or marker of SES. While all studies (excluding Fleisher and Read's study (1982), which sampled boys only) considered the effect of gender on the SES-diet association, only one study reported that association between SES and diet differed by gender; the relation was negative in females but not in males (Wardle et al. 2003).

With respect to age, 19 studies could be analyzed to determine whether patterns varied in early versus late adolescence. Thirteen studies considered samples within

Table 4 Summary of studies that investigated the association between SES and diet/nutrition

Study	Age range (years)	SES measure	Outcome	HQ	*N*	Study design
Lowry et al. (1996)	12–17	Parent education, family income	–	*	6,321	Cross-sectional; Nationally rep.
Bergstrom et al. (1996)	14–17	Parent education	–		879	Cross-sectional; Regionally rep.
Xie et al. (2003)	11–20	Parent education, family income	–		3,201	Longitudinal; Regionally rep
Koivusilta et al. (1999)	16	Predicted education of teen	–	*	2,467	Cross-sectional; Nationally rep.
Freedman et al. (1997)	14–15	Parent employment status	–	*	11,564	Longitudinal; Regionally rep.
Cullen et al. (2002)	13–18	Inner city versus Church-affiliated	–		183	Cross-sectional; Non-probability
Lien et al. (2002a)	13; 15	Parent education/occupation, Eligibility for free lunch	–		1,406	Cross-sectional; Regionally rep
Lee and Cubbin (2002)	12–21	Parent education/employment, Eligibility for free lunch	–	*	8,165	Cross-sectional; Nationally rep.
Bowering and Clancy (1986)	13	Parent education	–	*	20,322	Longitudinal; Nationally rep.
Sweeting and West (2001)	11	Family income	–	*	2,146	Cross-sectional Nationally rep.
MacNicol et al. (2003)	11–15	Regional SES	–		451	Cross-sectional Nationally rep.
Keski-Rahkonen et al. (2003)	16	Parent education	–	*	5,448	Longitudinal;Nationally rep.
Karvonen and Rimpela (1996)	16–18	Socio-regional context (occup. and employ status)	–	*	9,121	Cross-sectional; Nationally rep.
Terre et al. (1992a, b)	11–13	Parent education/occupation	–		589	Cross-sectional; Regionally rep.
Fleischer and Read (1982)	13–18 (boys only)	Parent occupation	–		568	Cross-sectional; Non-probability
Neumark-Sztainer et al. (1996)	11–18	Parent education, Employment status	–	*	36,284	Cross-sectional; Nationally rep.
Sweeting et al. (1994)	11	Neighborhood deprivation, maternal employment status	–		1,682	Longitudinal; Regionally rep.
Terre et al. (1992a, b)	15–19	Hollingshead: Parent education, Occupation	–		139	Cross-sectional; Regionally rep.
Leino et al. (1996)	9; 12; 15	Parental occupation	–	*	1211	Cross-sectional; Nationally rep.
Salamoun et al. (2005)	10–16	Pocket money	–		385	Cross-sectional; Regionally rep.
Cartwright et al. (2003)	15–16	Neighborhood economic Deprivation	–	*	4,320	Cross-sectional;Nationally rep.
Laitinen et al. (1995)	9–15	Father's ed., occup., family income	–	*	1,300	Cross-sectional; Nationally rep.
Hackett et al. (1986)	11–14	Parent social status	–		375	Longitudinal; Regionally rep.
Forshee et al. (2004)	12–16	Income-to-poverty ratio	–	*	2,748	Cross-sectional; Nationally rep.
Overby et al. (2004)	12–13	Parent education	0	*	1,005	Cross-sectional; Nationally rep.
Lien et al. (2002b)	11–12	Parent education/occupation, Eligibility for free lunch	0		1,406	Cross-sectional;Regionally rep.

Table 4 continued

Study	Age range (years)	SES measure	Outcome	HQ	*N*	Study design
Shaw (1998)	13	Family income	0	*	699	Cross-sectional; Nationally rep.
Wardle et al. (2003)	11–12	Neighborhood economic deprivation	– (females)	*	4,320	Cross-sectional;Nationally rep.
Roos et al. (2004)	15	Father's education	– (recomm. foods)/0 (fats, sweets)	*	2388	Cross-sectional Regionally rep.
Lytle et al. (2003)	11–12	Parent education, employment Eligibility for free lunch	–(education)/0 (employ., lunch)		3,878	Cross-sectional; Regionally rep.

– = Low SES associated with poor diet/nutrition; 0 = No significant association between SES and diet/nutrition

*Included in ''high quality'' analyses

early adolescence, and eight out of 13 studies reported a negative association between SES and diet (Bowering and Clancy 1986; Hackett et al. 1986; Karvonen and Rimpela (1996); Lee and Cubbin 2002; Leino et al. 1996; Lien et al. 2002b; Sweeting and West 2001, 1994; Terre et al. 1992a). Of those eight, one found a negative association in females only (Wardle et al. 2003), and one found a negative association only when the SES marker of parental education was considered (Lytle et al. 2003). Three out of 13 studies within early adolescent samples reported non-significant associations (Lien et al. 2002b; Overby et al. 2004; Shaw 1998). Within late adolescent samples, all eight studies found negative associations between SES and diet (Cartwright et al. 2003; Karvonen et al. 1999; Keski-Rahkonen et al. 2003; Koivusilta et al. 1999; Leino et al. 1996; Lien et al. 2002a; Roos et al. 2004; Terre et al. 1992b).

With respect to race/ethnicity, no studies considered whether the relation between SES and diet was moderated by ethnic group.

When type of SES measure was considered as a moderator of the relation between SES and diet, we found that, within studies reporting a negative association between SES and diet, 12 of the 25 studies measured SES via family prestige, four measured SES via financial resources, six used both prestige and resource-based SES measures, and the remaining three measured SES by region (Cullen et al. 2002; MacNicol et al. 2003; Xie et al. 2003). Of the three studies reporting null associations, one measured SES via family financial resources (Shaw 1998) one via family prestige (Overby et al. 2004) and one measured SES using both prestige and finance measures (Lien et al. 2002b). Only one study found that associations differed by SES marker; Lytle and colleagues (Lytle et al. 2003) reported that the relation between SES and diet was negative for parent education, however the relation was not significant when parental employment or eligibility for free school lunch were considered as proxies for family SES.

Overall, the majority of results from previous studies reveal that low SES adolescents have poorer diets as compared to high SES teens (i.e., 27 of 30 studies, or 90%). Age did not affect the relation between SES and diet; during both early and late adolescence, low SES teens report poorer diets as compared to high SES teens. As well, the pattern of results remained consistent across genders, measures of SES, and race/ethnicity.

Physical Activity

Overall Effects

A review of past research indicates that, in the 34 identified studies, the association between socioeconomic status and physical activity in adolescents is consistently positive (see Table 5). Twenty studies found that adolescents of higher social class report greater amounts of physical activity than teens from lower SES brackets. An additional eight studies reported positive association within at least one subgroup. One study reported negative findings; low SES teens were more likely to report daily exercise than high SES teens (Nelson et al. 2005). In addition, two studies reported a negative association within a subgroup of the sample (Friestad et al. 2003; McMurray et al. 2000). Five of the studies reviewed reported non-significant results.

High Quality Studies

For exercise, 20 studies were identified as high quality (see Table 5). Within the high quality studies, one reported a negative association, with another two studies reporting a negative association within a sub-sample. 14 studies reported a positive association, with another three reported a positive association within a sub-sample. Finally, two studies found no significant association between SES and exercise. Overall, an analysis of the high quality studies

Table 5 Summary of studies that investigated the association between SES and physical activity/exercise

Study	Age range (years)	SES measure	Outcome	HQ	*N*	Study design
Nelson et al. (2006)	11–18	Family income compared to poverty level	–	*	20,745	Cross-sectional; Nationally rep.
Gordon-Larsen et al. (2000)	11–18	Family income, neighborhood crime	+	*	12,759	Cross-sectional; Nationally rep.
Sallis et al. (1996)	11–18	School district SES	+		1,871	Cross-sectional; Regionally rep.
Duncan et al. (2002)	10–14	Household income, single versus 2-parent families	+	*	1,044	Cross-sectional; Nationally rep.
Tunistra et al. (1998)	*M* = 16.2	Parents education, occupation	+		1,984	Cross-sectional; Regionally rep.
Karvonen et al. (1999)	16–18	Education, labor market position	+	*	8,355	Longitudinal; Nationally rep.
Lowry et al. (1996)	12–17	Parent education, family income	+	*	6,321	Cross-sectional; Nationally rep.
Molnar et al. (2004)	11–16	Parent education	+		1,378	Cross-sectional; Regionally rep.
Kimm et al. (2002)	18–19 (girls only)	Parent education	+	*	2,374	Longitudinal; Nationally rep.
Huure et al. (2003)	16	Father's education	+	*	2,194	Longitudinal; Nationally rep.
Mo et al. (2005)	12–20	Family income	+	*	18,441	Cross-sectional; Nationally rep.
Terre et al. (1992a, b)	11–13	Parent education/occupation	+		589	Cross-sectional; Regionally rep.
Kristensen et al. (2006)	8–10; 14–16	Maternal occupation	+	*	771	Longitudinal; Nationally rep.
Lee and Cubbin (2002)	12–21	Neighborhood clusters based on average economic status	+	*	8,165	Longitudinal; Nationally rep.
Kristjansdottir and Vilhjalmsson (2001)	11–16	Parent education	+	*	3,270	Cross-sectional; Nationally rep.
Raudsepp (2006)	12–15	Parent occupation	+		566	Cross-sectional; Regionally rep.
Janssen et al. (2006)	11–16	Neighborhood SES: Unemployment rate; average household income	+	*	6,684	Cross-sectional; Nationally rep.
Koivusilta et al. (1999)	16	Father's education	+	*	2,467	Cross-sectional; Nationally rep.
Gottlieb and Chen (1985)	12–15	Father's occupation	+		2,695	Cross-sectional; Regionally rep.
Gordon-Larsen et al. (2000)	11–18	Parent education; family income compared to poverty level	+	*	20,745	Cross-sectional; Nationally rep.
La Torre et al. (2006)	11–17	Parent education	+		2,411	Cross-sectional; Nationally rep.
Patrick et al. (2004)	11–15	Highest education level of a parent	0		878	Cross-sectional; Regionally rep.
Abernathy et al. (2002)	12–19	Household income	0	*	4,759	Cross-sectional; Nationally rep.
Carvajal et al. (2002)	10–13	Parent's education	0		1,119	Cross-sectional; Regionally rep.
Sallis et al. (1996)	10–18	Parental education, income	0	*	1,504	Cross-sectional; Nationally rep.
Zakarian et al. (1994)	14; 17	School district SES	0		1,634	Cross-sectional Non-probability

Table 5 continued

Study	Age range (years)	SES measure	Outcome	HQ	*N*	Study design
Utter et al. (2003)	11–17	Highest education of either parent	+ (girls only)		4,480	Cross-sectional; Regionally rep.
McMurray et al. (2000)	10–16	Parent's education	+ (low SES more TV viewing) – (low SES more exercise)	*	2,563	Cross-sectional; Nationally rep.
Bratteby et al. (2005)	15; 21	Parent education; housing conditions	+ (age 21 only)		160	Longitudinal; Regionally rep.
Friestad et al. (2003)	18–19	Family income	–			(Norway) + (US)
*	924	Longitudinal; Nationally rep.				
Fahlman et al. (2006)	12–18	Free school lunch	+ (girls only)		1,314	Cross-sectional; Regionally rep.
Wardle et al. (2003)	11–12	Neighborhood economic deprivation	+ (girls only)	*	4,320	Cross-sectional; Nationally rep.
Bergstrom et al. (1996)	14; 17	Parent's education	+ (girls only)		879	Cross-sectional; Regionally rep.
Drewnowski et al. (1994)	17	Father's education	+ (girls only)		3,978	Cross-sectional;Non-probability

– = Low SES related to more exercise; + = High SES related to more exercise; 0 = Null association between SES and exercise. * = Included in ''high quality'' analyses

* = Included in ''high quality'' analyses

indicated that 17 of 20, or 85%, reported that high SES teens engage in more physical activity than low SES teens. These findings mirror those from the entire set of studies.

Moderator Effects

Of the studies reporting different patterns in different subgroups, we investigated whether patterns consistently emerged according to gender, age, race/ethnicity, or SES measure.

In terms of gender, all studies reported gender differences in physical activity. Six studies found that the association between high SES and physical activity was significant in females only (Bergstrom et al. 1996; Drewnowski et al. 1994; Fahlman et al. 2006; Kimm et al. 2002; Utter et al. 2003; Wardle et al. 2003). The remaining 28 studies found no significant differences in the association between SES and physical activity between boys and girls.

With respect to the effect of age on the relation between SES and physical activity, of the 34 studies reviewed, 15 studies included samples of teens that could be separated into early and late adolescent age groups. Within early adolescence, three out of seven studies reported positive associations between SES and physical activity (Duncan et al. 2002; Kristensen et al. 2006; Terre et al. 1992a), two of these studies found positive associations within females early adolescents only (Bergstrom et al. 1996; Wardle et al. 2003). Two reported non-significant associations (Carvajal et al. 2002; Zakarian et al. 1994). Of studies that included samples of late adolescents, nine out of 10 found positive associations between SES and physical activity (Huure et al. 2003; Karvonen et al. 1999; Kimm et al. 2002; Koivusilta et al. 1999; Kristensen et al. 2006; Tunistra et al. 1998), and one reported no significant association (Bratteby et al. 2005; Zakarian et al. 1994). Therefore, the association between SES and physical activity may be more likely to be positive in older adolescents.

With respect to race/ethnicity, no studies considered whether the relation between SES and physical activity was moderated by ethnic group.

When marker of SES was considered as a moderator of the relation between SES and physical activity, we found that the one study reporting a negative association used a financial marker of SES (Nelson et al. 2006). Of the 20 studies reporting a positive association, three used a financial marker of SES, 12 used a measure of family prestige, and five measured SES by both prestige and financial status. Finally, within the five studies reporting null associations between SES and physical activity, two studies used prestige-based measured SES, one study measured SES via financial resources, and the remaining two studies used both prestige and financial makers of SES. Overall, these findings suggest that higher family social status or prestige may be a stronger influence of

physical activity than financial resources in high SES adolescents.

Overall, high SES was associated with greater physical activity (i.e., in 28 of 34 studies, or 82%). The relation between SES and physical activity may be stronger when family prestige-based markers of SES are considered versus markers of family financial status. The relation may also be stronger in older adolescents. As well, the relation between SES and exercise may be stronger in females than in males.

Discussion

Traditional Associations Diet, Physical Activity, and Cigarette Smoking

In our review of the literature, we found that in the majority of studies, the daily living/lifestyle behaviors of diet and physical activity were significantly associated with SES, such that low SES adolescents reported poorer nutritional habits and less exercise than high SES teens. As well, low SES adolescents were at greater risk for one of the substance use behaviors, cigarette smoking. All of these patterns remained the same when only studies identified as high quality were assessed.

In terms of physical activity, low SES teens, compared to high SES teens, may spend more time indoors as a result of unsafe neighborhoods or lack of green spaces in which to exercise (Estabrooks et al. 2003; Weir et al. 2006). Additionally, low SES teens may spend their after-school time at work in order to earn spending money or contribute to the family's income (Van Matre et al. 2000). Thus these teens may not have the time to participate in extracurricular activities, such as sports teams, or to incorporate exercise into their daily routines, and as a result, may become more sedentary than high SES teens.

In terms of diet and nutrition, low SES adolescents may report poorer nutritional habits than high SES adolescents for several reasons. Low SES families may not be able to afford nutritious foods. As well, fresh fruits and vegetables may be less available in low SES, as compared to high SES, neighborhoods (Sooman et al. 1993). In addition, it is possible that low SES families have a less detailed understanding of the nutritional content of different foods and the daily recommendations about different food groups (Inglis et al. 2005). Finally, low SES families may consume more fast foods, given the higher prevalence of fast food restaurants in low SES neighborhoods (Burdette and Whitaker 2004).

In terms of smoking, several factors may lead low SES teens to experiment and use cigarettes more than high SES teens. First, low SES parents may be more likely to model smoking behaviors for their teenagers (given the higher prevalence rate in low SES adults) (Kalesan et al. 2006; Pederson and Lavik 1991). As well, previous researchers have suggested that psychological factors, such as depressive symptoms, may mediate the association between low SES and cigarette use (Elpidoforos et al. 2003). In addition, Wills and colleagues (Wills et al. 2002) reported that negative life events are a risk factor for increased cigarette smoking during adolescence. Thus the greater experience of negative life events among low SES adolescents may make them more likely to smoke cigarettes. Taken together, parent modeling and attitudes, as well as the experience of stress and negative life events, may lead low SES teens to be more likely to try cigarettes than high SES teens. Given the addictiveness of nicotine (Henningfield et al. 2006), if low SES teens experiment, they may also be more likely to smoke at greater frequencies and become addicted than high SES teens.

Null Associations Alcohol and Marijuana Use

Unlike the patterns reported in adult populations, we found some support to suggest that alcohol consumption and marijuana use are not distributed by SES during adolescence. The majority of studies with each of these behaviors documented no significant association between SES and adolescents' engagement in these forms of substance use, indicating that family economic and social factors may not exert the same effects between the ages of 10 and 21 as they do in adulthood. Findings were the same when only patterns within high quality studies were assessed. It is possible that, during adolescence, alcohol and marijuana use are more strongly influenced by peer social status (i.e., the social standing of an adolescent within his/her school), as opposed to family social status. An adolescent's family social status is an assigned status and its impact may be too distal, as teens gain independence, to impact their health behavior choices, resulting in a null association between family SES and these health behaviors (West et al. 2004). Status with their peers, however, is an earned status, and may better capture the experience of placement within a social hierarchy during adolescence (Goodman et al. 2001). It is possible that, if peer status, as opposed to family social status, was measured in these studies, results would indicate a patterning of health behaviors by peer social status.

One question that arises is why patterns would differ for smoking versus alcohol and marijuana use, given that they are all substance use behaviors. It may be the case the parents are more likely to model smoking in front of their children than to model drug use. If this is true, and low SES parents are more likely to smoke, this may contribute to the smoking gradient in adolescence. Previous research on smoking has found that the combined influence of both

parent behavior (e.g., modeling of cigarette smoking) and parental attitudes is greater than peer influence in predicting teen smoking (Wen et al. 2005). Thus, while status amongst peers remains an important predictor of teen smoking behaviors, family social status may continue to play an important role with this specific behavior.

Reversed Associations

In our review, no detrimental health behaviors were consistently associated with high SES. That is, although there were some specific studies that documented associations of high SES with negative health behaviors, this pattern did not consistently emerge across studies for any adolescent health behavior. This result is in contrast to Luthar and colleagues' (Luthar and D'Avanzo, 1999b; Luthar and Becker 2002; Luthar and Latendresse 2005) theory suggesting that high SES adolescents are at greater risk for engaging in negative health behaviors due to the combination of increased access to spending money, high achievement pressures, and less adult supervision. From our review of the literature, high socioeconomic status remains a protective factor in adolescent substance use behaviors.

How do these Findings Relate to Past Theories

Results from this review are consistent with two theories regarding the relationship between SES and health behaviors during adolescence. According to Starfield et al. (2002), Power et al. (2003), and Emerson et al. (2006), associations between SES and health behaviors during adolescence are the same as those found in adulthood. Consistent with this theory, in our review of the literature, we found that the associations between SES, cigarette smoking, diet, and physical activity are similar during adolescence as the patterns found in adulthood.

Conversely, West and colleagues (West 1997; West et al. 1990; West and Sweeting 2004) argue that adolescence is a time of relative health equality across the SES spectrum, due to a decreasing impact of family SES and the increasing influence of youth culture as adolescents spend more time with peers, which would result in no significant association between SES and health. Our review of the association between SES and alcohol and marijuana use during adolescence supports West's theory, and suggests that peer and school influences may make alcohol and marijuana use appear similar across SES groups during adolescence.

Moderator Results

For each health behavior, we also assessed whether gender, age, race/ethnicity, or type of SES measure moderated the relation between SES and the particular behavior. Unfortunately, the subset of high quality studies was too small to replicate our moderator analyses. Therefore, we will present tentative findings and suggest that future studies consider whether gender, age, race/ethnicity, and SES measure moderate the SES-health behavior association.

Gender

In terms of gender, we found that the relation between SES and exercise may be stronger in females than in males. Females may be more likely to exercise if they are enrolled in a formal activity, such as dance class, soccer practice, or swimming lessons (Vilhjalmsson and Kristjansdottir 2003). Low SES females may be limited in their access to these activities, and thus engage in lower levels of physical activity as compared to high SES females (Ball et al. 2006). In contrast, males may engage in daily activity more naturally as part of their interaction with peers, which may make differences by SES less likely to appear (Canada's Report Card on Physical Activity for Children and Youth, 2007).

Age

With respect to age, we found some support suggesting that the relation between SES and cigarette smoking may be stronger in early adolescence than in late adolescence. In addition, the non-significant association between SES and marijuana use may be more consistent in older adolescents. Taken together, there is some support for West's 'equalization in youth' hypothesis, and suggests that some substance use behaviors continue to be influenced by family social status between the ages of 10 and 14, as the majority of younger teens' time is likely to be spent with family members (Spencer 2006). In contrast, in late adolescence, the influence of friends and peers may overpower the effect of family SES, which could help to explain the non-significant findings for certain substance use behaviors during late adolescence. However, the association between SES and physical activity may be more likely to be positive in older adolescents, suggesting that, for some lifestyle behaviors, older youth may continue to be influenced by family socioeconomic factors.

Race

We did not find support for the notion that race moderates the association between SES any of the health behaviors considered in this review. However, because very few studies assessed whether the relation between SES and health behaviors varied by race, we cannot draw firm conclusions as to the role of race in SES-health behavior associations.

SES Marker

Finally, we found that the type of SES marker (e.g., family financial resources versus family social status) may be important to consider when assessing the relation between SES and alcohol, marijuana use, and physical activity. In particular, it appeared that lower SES may be more likely to be related to negative health behaviors if SES was measured using social status indicators such as parent education. In contrast, there was some support to suggest that, when indicators of family financial resources are used, higher SES adolescents are at greater risk for marijuana use.

These results suggest that while overall, there is no significant effect of SES on alcohol and marijuana use during adolescence, certain types of family SES characteristics may confer some slight vulnerability. In particular, teens whose parents work in manual-class jobs that require long hours or shift work may spend more time without adult supervision, giving them the opportunity to experiment with alcohol and marijuana, as compared to teens whose parents hold higher status jobs (Fothergill and Ensminger 2006). In addition, teens whose parents hold less prestigious jobs may have greater job instability and psychological stress, indirectly resulting in greater stress in their children (Masten et al. 1988). Because psychological stress has been found to be related to greater substance use in adult samples (Croghan et al. 2006), these negative psychological states may also result in greater alcohol and marijuana use in low SES teens. In contrast, teens from families with ample financial resources may also experience some vulnerability to substance use. For example, teens with greater access to financial resources may be more easily able to purchase substances (Hanson and Chen 2007; McMahon and Luthar 2006), leading to a slightly increased risk of marijuana use only when family financial resources are assessed.

Finally, teens whose parents are more educated may be more likely to exercise because parents are imparting information about the health benefits of exercise to their children. In addition, parents who understand these health benefits may be modeling exercise behaviors for their children, or they may be exercising *with* their children (Davison et al. 2003; Ritchie et al. 2005; Trost et al. 2003).

Limitations

The goal of this review was to determine the relation between SES and those health behaviors that directly effect physical health. However, many health behaviors were not included in this review that could impact physical health, such as sexual risk behavior and violence. This limits our ability to apply our conclusions across health behaviors.

As well, it should be noted that there may be shortcomings to the use of parental SES markers as measures of social status during adolescence (Emerson et al. 2006; Judge and Benzeval 1993). Traditionally, adolescent studies assess the socioeconomic position of the parents (e.g., parent education, occupation, family income) as an indicator of SES. As adolescents spend less time in the home and transition into the independence of adulthood, parental SES markers may not be accurate indicators of adolescents' social status. The mixed findings across studies within a given health behavior may in part have been due to SES measures differentially capturing families' social status across the different study samples. Future studies should employ alternative measures of SES, such as an adolescent's perception of social status relative to others in their peer group, due to recent findings that suggest such measures may be a better predictor of adolescent health than the traditional objective measures (Goodman et al. 2001). By employing alternative measures of social status, future studies will be able to further clarify the SES patterns for adolescent health behaviors.

Our recommendation is also that future studies should include samples of both early and late adolescent age groups and test for moderating effects of age in order to assess the developmental changes in the relationship between SES and health behaviors. This parallels recommendations made by other researchers in this field (Irwin et al. 2002).

Conclusions and Implications

In our review, we found two distinct patterns of association between SES and health behaviors. Patterns appeared to differ by SES for daily lifestyle health behaviors (i.e., diet and exercise), such that low SES was associated with poorer diets and less physical activity than high SES. In contrast, substance use behaviors such as alcohol and marijuana use did not significantly vary by SES during adolescence. The substance use behavior of cigarette smoking, however, was associated with SES in the same direction as diet and exercise behaviors; low SES teens reported greater cigarette smoking than high SES teens. These findings suggest that socioeconomic factors impact daily health behaviors (diet, exercise) and cigarette smoking in a similar fashion across the lifespan. Diet and exercise, as well as smoking behaviors, may be modeled by caregivers during childhood in a way that places children on trajectories that remain stable through adolescence and into adulthood. This finding emphasizes the need for early education and intervention in order for low SES children to

establish healthy eating habits, adequate levels of physical activity, and avoidance of cigarette smoking initiation. Interventions may include providing information to new parents, creating educational programs in elementary schools on proper nutrition and exercise, as well as establishing affordable food options and green spaces in low SES neighborhoods. Parents should also be made aware of how smoking behaviors in the family and around the neighborhood serve as models for their children's future smoking choices.

In contrast, when considering substance use behaviors, we found that low SES teens do not appear to be at heightened risk for alcohol consumption or marijuana use as compared to high SES teens. It may be the case that for these types of substances, other factors such as peer influence trump the effects of family socioeconomic conditions. Future anti-drug and alcohol interventions may wish to consider implementing peer-directed programs so that teens not only receive the information of the harmful effects of these health behaviors, but also receive the message that drug use is not an accepted behavior among their peers.

Results from this review indicate that traditional associations between SES and health behaviors exist during adolescence, such that lower SES is associated with greater cigarette smoking, poorer diets, and less physical activity. However, the associations are not as uniform as those in adulthood, given that both alcohol and marijuana use were not significantly related to SES. Future research should pursue a better understanding of the factors that increase vulnerability to unhealthy behaviors in certain subgroups such as low SES adolescents, to aid researchers and practitioners in moving individuals onto trajectories for healthier lifestyles across the lifespan.

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