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Adolescents' expectations for the future predict health behaviors in early adulthood

Thomas W. McDade, PhD^{1,2}, Laura Chyu, PhD¹, Greg J. Duncan, PhD³, Lindsay T. Hoyt, MA^{1,4}, Leah D. Doane, PhD⁵, and Emma K. Adam, PhD^{1,4}

¹Cells to Society (C2S): The Center on Social Disparities and Health Institute for Policy Research Northwestern University Evanston, IL 60208

²Department of Anthropology Northwestern University Evanston, IL 60208

³Department of Education University of California, Irvine Irvine, CA 92697

⁴Program on Human Development and Social Policy Northwestern University Evanston, IL 60208

⁵Department of Psychology Arizona State University Tempe, AZ 85287

Abstract

Health-related behaviors in adolescence establish trajectories of risk for obesity and chronic degenerative diseases, and they represent an important pathway through which socio-economic environments shape patterns of morbidity and mortality. Most behaviors that promote health involve making choices that may not pay off until the future, but the factors that predict an individual's investment in future health are not known. In this paper we consider whether expectations for the future in two domains relevant to adolescents in the U.S.—perceived chances of living to middle age and perceived chances of attending college—are associated with an individual's engagement in behaviors that protect health in the long run. We focus on adolescence as an important life stage during which habits formed may shape trajectories of disease risk later in life. We use data from a large, nationally representative sample of American youth (the US National Longitudinal Study of Adolescent Health) to predict levels of physical activity, fast food consumption, and cigarette smoking in young adulthood in relation to perceived life chances in adolescence, controlling for baseline health behaviors and a wide range of potentially confounding factors. We found that adolescents who rated their chances of attending college more highly exercised more frequently and smoked fewer cigarettes in young adulthood. Adolescents with higher expectations of living to age 35 smoked fewer cigarettes as young adults. Parental education was a significant predictor of perceived life chances, as well as health behaviors, but for each outcome the effects of perceived life chances were independent of, and often stronger than, parental education. Perceived life chances in adolescence may therefore play an important role in establishing individual trajectories of health, and in contributing to social gradients in population health.

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Corresponding author: Thomas McDade, Ph.D. Northwestern University Department of Anthropology 1810 Hinman Avenue Evanston, IL 60208 847-467-4304 (phone) 847-467-1778 (fax) t-mcdade@northwestern.edu.

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Keywords

USA; future certainty; time perspective; health inequalities; risk behavior; cardiovascular disease; human development; obesity; smoking; adolescents

Introduction

Health behaviors related to physical activity, diet, and smoking are key determinants of risk for obesity and chronic degenerative diseases in adulthood, and adolescence is an important developmental period during which trajectories of risk are established. Adolescence is often characterized as a period of perceived invulnerability, but adolescents greatly overestimate the chances they will die in the near future (Fischhoff et al., 2000; Fischhoff et al., 2010; Hurd & McGarry, 1995; Jamieson & Romer, 2008). At the same time, adolescents may underestimate the negative consequences associated with some problem behaviors (Reyna & Farley, 2006). Elevated rates of delinquency and risk taking in adolescence have led some scholars to speculate that low expectations for the future, or an orientation toward the present rather than the future, may contribute to high risk behavior during this developmental period. Several studies have demonstrated significant associations between these temporal constructs and the likelihood an adolescent will engage in substance use/abuse, unsafe sexual activity, violence, crime, and attempted suicide (Borowsky et al., 2009; Caldwell et al., 2006; Harris et al., 2002; Kruger et al., 2008).

While delinquency and other conspicuously dangerous activities have important implications for adolescents, their families, and their communities, this paper focuses on the role of expectations for the future in shaping common health behaviors that set the stage for chronic disease risk later in life. Cardiovascular disease (CVD) is the leading cause of death in the U.S., and a major cause of disability and lost productivity (U.S. Department of Health and Human Services, 2007). While diabetes and CVD have historically been considered diseases of aging, recent research has traced their origins to lifestyle factors much earlier in life related to recent increases in rates of overweight and obesity among children and adolescents (Freedman et al., 2001; McGill et al., 2002). Health behaviors are primary tools for the prevention and management of cardiovascular and metabolic diseases, and recent recommendations encourage people to quit smoking, maintain healthy body weight, engage in daily physical activity, and reduce intake of saturated and trans fats, cholesterol, sodium, and simple sugars (Grundy et al., 2005; Lichtenstein et al., 2006).

What factors predict an individual's willingness to commit to these kinds of health-promoting behaviors? Do lower expectations for the future undermine the adoption of positive health behaviors in the present? Research on time perspective and future discounting suggests that these types of considerations may be relevant to individual decision-making, with implications for individual health as well as disparities in population health (Guthrie et al., 2009; Kruger et al., 2008). Time perspective evaluates the degree to which the past, present, or future serves as a temporal point of reference guiding an individual's attitudes and behaviors (Zimbardo & Boyd, 1999). For example, orientation toward the present has been associated with higher likelihood of drug and alcohol use (Keough et al., 1999), and higher levels of formal education have been significantly associated with stronger orientation toward the future (Guthrie et al., 2009).

A distinct, but related concept of time preference considers the extent to which individuals favor immediate utility over delayed utility, and the reasons why less value may be assigned to future events (Frederick et al., 2002). The long-term benefits of many health-promoting behaviors are discounted by individuals to varying degrees, with implications for behavior in

the present. For example, avoidance of cardiovascular disease may be seen as a long term benefit of a low fat diet, but fatty foods typically taste good. Their short term utility may tip the balance toward their consumption despite potential long-term costs to an individual's health. Higher rates of future discounting have been positively associated with alcohol consumption in adolescence (Bishai 2001), and recent increases in the marginal rate of time preference have been hypothesized as a mechanism contributing to the global epidemic of obesity (Komlos et al., 2004).

In this analysis we investigate the role that perceived life chances in adolescence may play in decisions regarding health behaviors. We focus on perceived life chances for two reasons. First, “nothing to lose” attitudes appear to contribute to high risk behavior in adolescence, but prior research has not considered the impact on common, everyday health behaviors that shape risk for chronic diseases that represent principal threats to public health in the US. Second, variation in perceived life chances may represent a cognitive mechanism through which socioeconomic contexts contribute to disparities in population health. Measures of income, education, and occupation are commonly used to locate individuals with respect to social position, based on the assumption that these measures serve as proxies for an individual's “life chances” (Lynch & Kaplan, 2000). Measures of perceived life chances provide an opportunity to assess this phenomenon more directly, as experienced by individuals themselves, and to evaluate whether subjective expectations for the future are motivational with regard to health behaviors. This line of reasoning builds on prior research into the factors that shape adolescents’ expectations for significant future life events (Fischhoff et al. 2000; Dominitz et al., 2001; Reynolds & Pemberton, 2001).

The transition from adolescence to young adulthood is an important developmental period for these issues since it is marked by increased autonomy and the assumption of greater responsibility for decisions regarding diet, exercise, and other health-related behaviors. This period is also characterized by cognitive shifts that have implications for orientation toward the future and perceptions of vulnerability (Stein et al, 1968). While adolescents tend to take health for granted, they have a growing ability to reflect on their own behavior, and to weigh the long term consequences of their actions (Millstein, 1993; Weithorn & Campbell, 1982). From a life course health development perspective, adolescence therefore represents a sensitive period during which habits may form that help shape trajectories of disease risk later in life (Halfon & Hochstein, 2002).

In this paper, we investigate the extent to which levels of cigarette smoking, fast food consumption, and physical activity in young adulthood can be explained by future expectations in adolescence. Analyses employ two measures of future expectations: perceived chances of living to the age of 35, and perceived chances of attending college. We hypothesize that individuals who rate themselves less likely to live to middle age or less likely to attend college will be more likely to smoke, smoke more frequently, consume more meals at fast food restaurants, and exercise less. We also hypothesize that future expectations will be associated with SES in adolescence, but that the impact of expectations on health behaviors will be independent of SES.

Perceived mortality risk and perceived chances of attending college likely represent different domains of future orientation, with each shaped by different experiences and cognitive processes. Our focus on mortality extends prior research on the consequences of perceived risk in adolescence, while attention to college attendance recognizes the importance of higher education for future life chances in our society. College graduates earn on average \$16,000 per year more than non-graduates (U.S. Department of Education, 2009), and live about 30% longer (Meara et al., 2008). For adolescents, the prospect of attending college may be a more immediate, and perhaps more salient, gauge of their expectations for the

future than perceived risk of premature death. By simultaneously evaluating both these domains we can estimate which aspects of perceived life chances are most important for predicting behavior. We test our hypotheses using prospective data from a large, nationally representative sample that allows us to examine change in health behaviors over time, and to control for a wide range of potentially confounding variables.

Methods

Participants and study design

Data come from the first three waves of the US National Longitudinal Study of Adolescent Health (Add Health), a large, nationally representative study of the social, behavioral, and biological linkages defining health trajectories from adolescence through adulthood (Harris et al. 2009). The Wave I in-home interview was conducted in 1995 following a school-based survey, and included a sample of 20,745 adolescents in grades 7 through 12. All adolescents in grades 7 through 11 in Wave I were targeted about one year later for the Wave II in-home interview. Wave II interviews were conducted successfully with about 72% of the original sample. A third wave of data collection took place in 2000-2001 and attempted to interview all respondents from the Wave I in-home sample. Wave III consists of 73% of the original Wave I sample, at which time respondents were between the ages of 18 and 26 (N=15,197).

Our general analytic strategy was to relate health behaviors in Wave III to adolescents' response to questions regarding expectations for the future asked in Waves I and II, controlling for a wide range of Wave I baseline measures, including health behaviors and health status. Our final analytic sample (N=10,142) included respondents who participated in all three in-home surveys and had valid sampling weights. Students who were in 12th grade at the time the sample was drawn were excluded from these analyses because Add Health did not attempt to interview them in Wave II. Procedures for data access and analysis were implemented as approved by the Institutional Review Board at Northwestern University, and in agreement with the sensitive data security plan approved by Add Health data managers.

Measures

Outcome Measures (Wave III)—Cigarette smoking was operationalized as: i) being a current smoker (i.e., reporting one or more cigarettes smoked in the past 30 days), and, for current smokers only, ii) the average daily number of cigarettes respondents smoked in the last month. Fast food consumption was measured as the number of days the respondent ate fast food in the past week, with responses ranging from 0-7 days. Level of physical was operationalized from seven questions asking about the frequency of various activities in the past week. Total amount of weekly physical activity was constructed by summing the number of times across all seven items and ranged from 0 to 49.

Expectations for the future (Waves I and II)—The main explanatory variables were two measures of future expectations: perceived chances of living to age 35, and perceived chances of attending college. These measures derive from research in economics and cognitive psychology that attempts to elicit from survey participants probabilistic expectations for the occurrence of significant personal events (Fischhoff et al. 2000; Manski 2004). Respondents were asked at Waves I and II to rate their chances of living to age 35 and attending college. Response choices were: almost no chance; some chance, but probably not; 50/50 chance; a good chance; and almost certain. Responses were coded to 0, 0.25, 0.5, 0.75, and 1, respectively, following previous work with the Add Health dataset (Harris et al., 2002). Prior survey-based research on adolescent perceptions of mortality risk has used a continuous rating of mortality risk, on a scale from 0 to 100 (Fischhoff et al., 2000). We are

limited by the response choices included in the Add Health survey instrument, and results from our ordinal variables may not be directly comparable to findings based on continuous measures, particularly with respect to evaluating average levels of perceived risk. However, ordinal and continuous measures of perceived risk are likely to be highly correlated, and should therefore provide comparable patterns of association with dependent variables. Future expectations at WI and WII were moderately correlated ($r=0.37$ for living to age 35; $r=0.56$ for attending college). Non-missing responses to the Wave I and II questions were averaged.

Parental education (Wave I)—Household socioeconomic status was assessed based on parental education, categorized as less than high school; high school graduate/GED; some college; college graduate; and post graduate. A combined parental education variable was created using the higher level of mother or father's education; if either mother or father's educational status was missing, the other parent's educational status was used.

Other sociodemographic variables (Wave I)—Models included gender (male; female); nativity status (US-born; foreign-born); age of respondent at Wave I; and race/ethnicity (non-Hispanic (NH) white; NH black; Hispanic; NH Asian; NH Native American; NH other). Hispanic ethnicity was assigned priority over racial groups, and respondents who identified with more than one racial group were assigned to the category that they thought best described their racial background.

Health Behaviors (Wave I)—Health behaviors at Wave I comparable to our outcome variables were included in all models as baseline controls. Average number of cigarettes smoked per day in Wave I was constructed in the same way as the outcome variable for smoking in Wave III. Measures of physical activity in Wave I differed slightly from Wave III. In Wave I, respondents were asked how many times in the past week they engaged in various physical activities. Response choices (not at all, 1 or 2 times, 3 or 4 times; 5 or more times), were assigned values of 0; 1.5; 3.5; and 5 respectively. Total amount of weekly physical activity at Wave I was constructed by summing all three items. Respondents' diet at Wave I was also controlled for by variables measuring frequency of eating fruit, fruit juice, and vegetables per day, and frequency of eating cookies, doughnuts, pie, and cake per day.

Baseline control variables (Wave I)—Controls for respondents' health status and health-care access at baseline included self reported general health status and physical fitness, reports of physical limitations, use of ambulatory device, heart problem, reports of 14 disease symptoms experienced over the preceding twelve months, birth weight < 2500 g (reported by parent), physical exam in past year, availability of health insurance, and body mass index (BMI; kg/m^2). Baseline measures of mental health and cognitive ability included scales for depression, self-efficacy, and scores on a standardized picture vocabulary test. Measures of the school environment included urbanicity (urban, suburban, or rural), questions asking respondents to rate how much they felt friends and teachers cared about them, and school-level averages of future expectation scores for living to age 35 and attending college. Measures the family environment included parental marital status, role of religion in the respondent's life, ratings of how much they felt their parents cared about them, and reports of parental involvement and educational expectations (reported by parent). Measures of neighborhood quality included median age, race/ethnic composition, proportion of families below the poverty level, proportion of individuals aged 25 years and older with a college degree, proportion of single family households with children under 18 years, and gender- and race-specific mortality rate. Neighborhood safety was measured using total crime rate as well as parental and child assessments of their neighborhood.

Data analysis

Weighted univariate distributions for outcome variables, future expectations, health behaviors, health status, and sociodemographic variables were examined. Differences in mean future expectations and health behavior outcome variables by sociodemographic groups were assessed using bivariate regressions, *t*-tests, and *F*-tests. Frequency of physical activity and fast food consumption at Wave III were analyzed using ordinary least squares regression. Average number of cigarettes smoked per day was analyzed using tobit regression with left censoring at 0 cigarettes to account for the large number of respondents who were not smokers. Marginal effects on the conditional expected values of average number of cigarettes per day were estimated for current smokers at Wave III.

For each outcome variable, a series of multivariate models were fit to control for different sets of variables from Wave I. In Model 1, the association between parental education and health behavior at Wave III was tested, adjusting for the corresponding health behavior at Wave I. Model 2 examined the association between respondent's future expectations and subsequent health behavior, adjusting for corresponding behavior at Wave I. Model 3 evaluated the independent effects of parental education and respondent's future expectations on health behaviors at Wave I. Models 4-8 added a series of Wave I control variables, representing distinct sets of factors that may confound associations between future expectations and health behaviors (mental health and cognitive ability; school environment; family environment; neighborhood environment). Model 9 was a full model that included all independent variables from models 1-8. Predicted values were calculated based on the full models for exercise frequency and smoking, with continuous variables set at the mean and categorical variables assigned to the modal category. Coefficients for the main independent variables in models 1-9 are presented in Tables 3-5. Coefficients for all covariates, including control variables, are presented as Electronic Supplementary Material in appendices A-C.

This conceptually motivated modeling approach takes advantage of the depth and breadth of the Add Health dataset to reduce bias by including health behaviors at baseline, in effect allowing us to look at change in health behaviors as a function of future expectations at baseline. Our analyses thus represent a conservative test of the hypothesis that future expectations shape health behaviors, since expectations prior to Wave 1 may have already determined health behaviors at baseline. The inclusion of a wide range of baseline control variables further reduces the likelihood of omitted variable bias. That said, unmeasured determinants of both future expectations and health behaviors could still bias our estimates.

Missing values on all variables were assigned using multiple imputation methods, using all independent and outcome variables, strata, and sampling weights (Alison, 2002; StataCorp, 2009). All analyses were weighted using appropriate Add Health longitudinal sampling weights, which adjust for complex sample design, selection, and non-response.

Results

The average expectation of attending college was 0.76, which corresponds closely to a response of “good chance” on the survey instrument. The average expectation of living to age 35 was 0.85, which lies between ratings of “good chance” and “almost certain” (Table 1). Lower levels of parental education were associated with lower expectations for both outcomes. Females had higher expectations for the future than males. In comparison to non-Hispanic whites, all other racial/ethnic groups except for the “other” group reported lower expectations of living to age 35. Black, Hispanic, and Native American respondents also had lower expectations for attending college than whites, however Asians and respondents of “other” race/ethnicity had higher expectations. Perceived probabilities of living to age 35 and attending college generally decreased with age. US-born individuals had higher

expectations for living to age 35, however expectation for college attendance did not vary by nativity status. There were no significant differences in future expectations between individuals who lived in their parents' home at Wave III and those who did not.

Respondents engaged in 5.97 bouts of physical activity per week and ate fast food 2.48 days per week (Table 2). Approximately 35% percent of the participants in our sample were current smokers at Wave III, smoking on average 11.25 cigarettes per day (Table 2). As expected, we found significant SES gradients in these health behaviors (Model 1 in tables 3-5). Individuals with more highly educated parents exercised more frequently as young adults, ate less often at fast food restaurants and were less likely to smoke. Furthermore, among current smokers, individuals with more highly educated parents smoked fewer cigarettes per day.

When considered separately from parental education, perceived life chances were significantly associated with each of our health behavior outcomes, controlling for baseline health behavior (Model 2). Adolescents who rated their chances of attending college as "almost certain" as opposed to "no chance" exercised more (1.83 more episodes/week; 29.47% of standard deviation), consumed fast food less frequently (0.51 fewer days/week; 24.40% of standard deviation) and smoked fewer cigarettes (1.40 fewer cigarettes/day for current smokers). All of these differences were statistically significant. Similarly, adolescents who rated their chances of living to age 35 higher ate fast food less frequently (0.50 fewer days/week) and smoked fewer cigarettes (1.27 cigarettes/day), however perceived chances of living to age 35 were not associated with exercise frequency. Perceived life chances were not associated with the likelihood of being a regular smoker (results not shown), only with cigarette consumption among current smokers. When parental education was considered alongside perceived life chances (Model 3), associations with health behaviors were attenuated, but remained statistically significant.

Subsequent models (Models 4 through 8) considered additional sets of baseline control variables that might confound associations between perceived life chances in adolescence and health behaviors in young adulthood. Associations between perceived chances of attending college and exercise frequency and cigarettes smoked were robust to the inclusion of these controls. However, the association between college expectations and fast food consumption was substantially attenuated, and was only marginally or not significant in the presence of controls for other health behaviors, mental health and cognitive ability, and school and neighborhood environments (Table 4, Models 4-8). The association between perceived chances of living to age 35 and cigarette consumption remained significant in the presence of all controls, while the association with fast food consumption was attenuated and not statistically significant.

In our final set of models including all control variables (Model 9), perceived life chances in adolescence were not significant predictors of fast food consumption in young adulthood, although associations remained in the expected direction. Adolescents who rated their chances of attending college more highly exercised more frequently in young adulthood, and among smokers, those with better perceived chances of living to age 35 and attending college smoked fewer cigarettes in young adulthood. These effects were substantial in magnitude: moving from the lowest to highest levels of perceived chances of college attendance resulted in 1.07 more bouts of exercise per week and 0.80 fewer cigarettes smoked per day in young adulthood, above and beyond baseline levels of exercise and smoking in adolescence. Similarly, adolescents rating their chances of living to age 35 as high smoked 1.37 fewer cigarettes as young adults, compared to adolescents with low expectations for living to 35.

While perceived life chances in adolescence remained as significant, independent predictors of exercise frequency and cigarette consumption in young adulthood, parental education did not. The association between parental education and exercise frequency was substantially attenuated when perceived life chances were added to the model (Model 3), and was not statistically significant in the final model including perceived life chance and control variables. A similar pattern emerged for cigarette consumption in the final model, with no association between parental education and smoking, with the exception of significantly lower levels of cigarette consumption among individuals with the least educated parents (less than high school). In contrast, the highest level of parental education (more than college) was significantly associated with less frequent fast food consumption, whereas perceived life chance variables were not significant predictors of this outcome independent of parental education and baseline control variables.

Discussion

We present evidence from a large, nationally representative cohort that expectations for the future predict the extent to which individuals engage in health-promoting behaviors. Adolescents who perceive better life chances—higher probabilities of attending college, lower probabilities of dying before age 35—engage in higher levels of regular physical activity and consume fewer cigarettes in young adulthood. These associations are robust to the inclusion of a comprehensive set of baseline control variables, and they account for substantial portions of the associations between health behaviors and parental education. As such, expectations for the future in adolescence may play an important role in establishing individual trajectories of health, and may represent a pathway through which socioeconomic contexts shape individual health behaviors and patterns of population health in the US.

Our results are consistent with prior studies using the Add Health dataset showing that lower expectations for future survival are associated with potentially damaging behaviors, including delinquency, high risk sexual activity, and substance abuse (Borowsky et al., 2009; Caldwell et al., 2006; Harris et al., 2002). The life course consequences of these behaviors may be dramatic for a subset of adolescents, but for most individuals adolescence represents a time-limited period during which certain forms of deviance and boundary testing are normative (Schulenberg & Zarrett, 2006). Our findings are complementary in that they investigate expectations for the future as predictors of more mundane behaviors that define trajectories of health across the entire life course. Obesity, cardiovascular disease, and diabetes are the major causes of morbidity and mortality in our society, and lack of physical activity, poor quality diets, and cigarette smoking are the most important factors shaping individual risk for these diseases. The costs to society, as well as to individual quality of life, are high and it is therefore important to understand sources of variation in behaviors that contribute to, or help prevent, these diseases. From a practical standpoint, our findings suggest that practitioners may benefit from asking adolescents about their perceived life chances in order to identify individuals least likely to engage in health-promoting behaviors.

Why do adolescents who perceive better life chances exercise more and smoke less? It is not possible to distill the mechanisms from this large, observational study, but prior research suggests three possibilities worthy of further investigation. First, experimental work has shown that individuals differ in the extent to which they value immediate versus delayed rewards, as well as on the amount that future rewards must be discounted before choosing immediate rewards over larger, longer term payoffs (Hariri et al., 2006; McClure et al., 2004; Olson et al., 2007; Seeman & Schwarz, 1974). The perception of better life chances may place higher value on later-life health, thereby providing motivation to engage in healthier behaviors in the present. Conversely, the perception of poor life chances heavily discounts any potential rewards in the future, thereby placing a premium on more immediate

rewards. Prior research has shown that higher future discount rates are associated with smoking, propensity to eat a poor diet, and obesity (Huston & Finke, 2003; Komlos et al., 2004; Zhang & Rashad, 2007).

Second, the health belief model focuses on subjective attitudes and beliefs in the following domains as individual-level determinants of action related to health: perceived vulnerability to disease, severity of disease, the effectiveness and benefits of prevention efforts, and perceived barriers to these efforts (Becker, 1974; Strecher & Rosenstock, 1997). The health belief model has been used to explain uptake of recommendations for diet, exercise, smoking, contraceptive use, vaccinations, health care utilization, and compliance with medical regimes (Ali, 2002; Laraque et al., 1997; Rosenstock, 1990). In our study, it is conceivable that adolescents who foresee a longer life are more likely to perceive themselves as vulnerable to diseases of aging, or to believe that efforts to ward off these diseases in the present will protect their health in the future.

Third, time perspective may be a cognitive mechanism for calibrating behavior and developmental processes in response to cues from the local environment (Kruger et al., 2008). Theories of human behavior scaffolded by an evolutionary, life history framework suggest that humans strive to optimize allocations of effort across the life course based on the constraints and opportunities of the local ecology, and to do so in ways that balance current as well as long term goals related to survival and reproduction (Chisholm et al., 1993; Stearns, 1992). Mortality risk in adulthood helps set the pace of life history trajectories, and individuals growing up in high mortality settings can be expected to prioritize short term gains at the expense of future utility. Indeed, prior research has shown that high mortality environments are associated with earlier onset of sexual activity, higher degrees of risk taking, orientation toward the present rather than the future, and expectations for a shorter lifespan (Chisholm et al., 2005; Wilson & Daly, 1997).

Findings from this study suggest that attention to subjective life chances may represent a productive direction for future health disparities research, the vast majority of which focuses on income, education, and occupation as primary indicators of socioeconomic position. Although rarely stated explicitly, these measures are grounded in early work by Weber, in which he noted that hierarchies of class and status structure the unequal distribution of knowledge, skills, assets, and opportunities in society (Lynch & Kaplan, 2000; Weber, 1946). In short, measures of SES proxy an individual's "life chances"—a term used by Weber himself to describe how class and status shape an individual's fate. In this study we find that a measure of social position—parental education—predicts an individual's own subjective perception of life chances, consistent with this Weberian perspective. This approach provides an opportunity to evaluate the health impact of life chances as perceived directly by individuals, and our results suggest that these perceptions may represent an important mechanism accounting for—at least in part—the impact of socioeconomic contexts on health in the US.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Research Highlights

- Health-related behaviors establish trajectories of risk for obesity and chronic degenerative diseases, and expectations for the future may be an important determinant of positive health behaviors in the present.
- Adolescents who perceive their chances of attending college as high exercise more and smoke less as young adults, in comparison with adolescents who rate their chances of college attendance as low.
- Adolescents who rate their chances of living to age 35 as high are less likely to smoke as young adults than adolescents with a higher perceived risk of early death.
- Perceived life chances in adolescence may play an important role in establishing individual trajectories of health, and in contributing to socioeconomic gradients in population health.

Table 1

Descriptive statistics for sociodemographic and life expectation variables, Add Health (N=10,142).

	Total percentage distribution	Mean expectation of living to age 35 Waves I and II (standard deviation)	Mean expectation of attending college Waves I and II (standard deviation)
Total	100.00	0.85 (0.17)	0.76 (0.26)
Parental education		***	***
Less than high school	14.29	0.77	0.62
High school graduate	30.61	0.83	0.69
Some college	20.72	0.86	0.77
College graduate	23.23	0.87	0.84
More than college	11.16	0.89	0.91
Gender		***	***
Male	50.31	0.84	0.72
Female	49.69	0.85	0.79
Race/ethnicity		***	***
NH White	67.71	0.87	0.77
NH Black	15.13	0.77	0.74
Hispanic	11.92	0.80	0.67
NH Asian	3.67	0.84	0.83
NH Native American	0.77	0.80	0.72
NH Other	0.80	0.87	0.82
Age of respondent WI		***	***
≤12 years	3.56	0.91	0.82
13 years	18.09	0.88	0.79
14 years	20.11	0.85	0.78
15 years	20.35	0.84	0.76
16 years	19.68	0.83	0.73
17 years	14.43	0.83	0.74
18 years	3.33	0.77	0.61
≥19 years	0.45	0.71	0.41
Nativity status		***	
US-born	94.11	0.85	0.76
Foreign-born	5.89	0.80	0.73

† p ≤ .1; * p ≤ .05; ** p ≤ .01

Significance determined by F-test.

p ≤ .001.

Table 2

Descriptive statistics for health outcome variables, Add Health (N=10,142).

	Mean # times engage in physical activity in past week Wave III (standard deviation)	Mean # days ate fast food in past week Wave III (standard deviation)	% current smokers at Wave III	Mean # cigarettes per day among current smokers only at Wave III (standard deviation)
Total	5.97 (6.21)	2.48 (2.09)	35.19	11.25 (9.59)
Parental education	***	***	**	***
Less than high school	5.36	2.86	31.28	11.43
High school graduate	5.54	2.60	38.25	12.92
Some college	5.97	2.58	36.48	11.90
College graduate	6.51	2.26	34.39	9.16
More than college	6.79	1.94	31.09	8.79
Gender	***	***	**	***
Male	7.08	2.72	37.39	12.39
Female	4.84	2.24	32.97	9.95
Race/ethnicity		***	***	***
NH White	5.98	2.38	40.70	12.11
NH Black	5.72	2.97	20.76	7.79
Hispanic	6.16	2.57	25.68	8.32
NH Asian	6.39	2.18	26.18	6.70
NH Native American	4.55	2.52	26.56	15.10
NH Other	6.39	1.95	33.87	10.66
Age of respondent WI	†	†		
≤12 years	6.50	2.33	35.61	9.92
13 years	6.32	2.53	35.64	10.44
14 years	6.00	2.53	36.24	11.05
15 years	6.18	2.47	36.70	12.07
16 years	5.70	2.43	33.70	11.30
17 years	5.55	2.38	33.16	11.43
18 years	5.43	2.89	34.52	11.95
≥19 years	6.03	2.79	34.47	13.04
Nativity status			***	*
Foreign-born	5.98	2.49	18.51	11.32
US-born	5.76	2.34	36.24	9.10
N	10,142	10,142	10,142	3,227

Significance determined by F-test.

† p ≤ .1

* p ≤ .05

** p ≤ .01

 $p \leq .001$.

Table 3

Coefficients from OLS regression models for frequency of exercise activities in past week at Wave III, Add Health (N=10,142).

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Life chances									
Live to age 35	--	0.00	-0.07	-0.54	-0.26	-0.20	-0.30	-0.13	-0.64
Attend college	--	1.83***	1.49***	1.07**	1.29**	1.40***	1.37***	1.38***	1.07**
Parental education (HS grad)									
Less than high school	-0.15	--	-0.06	-0.07	-0.13	-0.03	-0.57	-0.03	-0.05
Some college	0.42	--	0.31	0.20	0.34	0.31	0.33	0.32	0.27
College graduate	0.69**	--	0.48 [†]	0.40 [†]	0.54*	0.46 [†]	0.53*	0.47 [†]	0.43 [†]
More than college	1.06***	--	0.75*	0.55 [†]	0.82**	0.73*	0.81**	0.74*	0.62 [†]
Demographic factors	X	X	X	X	X	X	X	X	X
Exercise at W1	X	X	X	X	X	X	X	X	X
Controls for W1 health	--	--	--	X	--	--	--	--	X
Controls for W1 mental health/cognitive ability	--	--	--	--	X	--	--	--	X
Controls for W1 family environment	--	--	--	--	--	X	--	--	X
Controls for W1 school environment	--	--	--	--	--	--	X	--	X
Controls for W1 neighborhood environment	--	--	--	--	--	--	--	X	X
Constant	2.37***	1.39**	1.44**	1.48**	3.46***	1.54**	1.57	1.36	2.25

Note: Each model controls for additional variables as indicated by 'X'. Complete results for each model are reported in Appendix A.

[†] p < .1;

* p < .05;

** p < .01;

*** p < .001.

Table 4

Coefficients from OLS regression models for number of days consumed fast food in past week at Wave III, Add Health (N=10,142).

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Life chances									
Live to age 35	--	-0.50 ^{***}	-0.45 [*]	-0.45 [*]	-0.37 [*]	-0.45 [*]	-0.26	-0.42 [*]	-0.18
Attend college	--	-0.51 ^{***}	-0.30 [†]	-0.27 [†]	-0.24	-0.42 ^{**}	-0.26 [†]	-0.26 [†]	-0.27 [†]
Parental education (HS grad)									
Less than high school	0.26 ^{**}	--	0.22 [*]	0.22 [*]	0.19 [†]	0.21 [*]	0.15	0.16	0.10
Some college	0.06	--	0.08	0.09	0.11	0.08	0.08	0.10	0.10
College graduate	-0.28 ^{***}	--	-0.23 ^{**}	-0.24 ^{**}	-0.20 [*]	-0.22 ^{**}	-0.22 ^{**}	-0.15 [†]	-0.15 [†]
More than college	-0.52 ^{***}	--	-0.44 ^{***}	-0.45 ^{***}	-0.39 ^{***}	-0.43 ^{***}	-0.42 ^{***}	-0.30 ^{**}	-0.27 ^{**}
Demographic factors									
Controls for WI health	X	X	X	X	X	X	X	X	X
Controls for WI mental health/cognitive ability	--	--	X	X	--	--	--	--	X
Controls for WI family environment	--	--	--	--	X	--	--	--	X
Controls for WI school environment	--	--	--	--	--	X	--	--	X
Controls for WI neighborhood environment	--	--	--	--	--	--	--	X	X
Constant	2.25 ^{***}	2.98 ^{***}	2.84 ^{***}	3.02 ^{***}	3.37 ^{***}	2.92 ^{***}	5.86 ^{***}	3.21 ^{***}	6.62 ^{***}

Note: Each model controls for additional variables as indicated by 'X'. Complete results for each model are reported in Appendix B.

† p ≤ .1;

* p ≤ .05;

** p ≤ .01;

*** p ≤ .001.

Table 5

Marginal effects on conditional expected values from tobit regression models for average number of cigarettes smoked per day among current smokers at Wave III, Add Health (N=10,142).

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Life chances									
Live to age 35	--	-1.27***	-1.33***	-1.07**	-1.26**	-1.49***	-1.39***	-1.34***	-1.37***
Attend college	--	-1.40***	-1.08**	-0.98**	-1.08**	-0.88*	-0.93**	-1.00**	-0.80*
Parental education (HS grad)									
Less than high school	-0.47 [†]	--	-0.59*	-0.59*	-0.56*	-0.65*	-0.55*	-0.56*	-0.56*
Some college	-0.35	--	-0.24	-0.24	-0.27	-0.20	-0.23	-0.17	-0.18
College graduate	-0.94***	--	-0.72**	-0.67**	-0.76**	-0.60*	-0.66**	-0.55*	-0.42 [†]
More than college	-1.34***	--	-1.02***	-0.95***	-1.11***	-0.83**	-0.91**	-0.68*	-0.53 [†]
Demographic factors									
Smoking at W1	X	X	X	X	X	X	X	X	X
Controls for W1 health	--	--	--	X	--	--	--	--	X
Controls for W1 mental health/cognitive ability	--	--	--	--	X	--	--	--	X
Controls for W1 family environment	--	--	--	--	--	X	--	--	X
Controls for W1 school environment	--	--	--	--	--	--	X	--	X
Controls for W1 neighborhood environment	--	--	--	--	--	--	--	X	X
Constant	-9.61***	-3.43*	-9.48***	-6.03**	-7.03*	-2.52	-1.45	0.70	-5.84

Note: Each model controls for additional variables as indicated by 'X'. Complete results for each model are reported in Appendix C.

[†] p ≤ .1;

* p ≤ .05;

** p ≤ .01;

*** p ≤ .001.