

PERCEIVED SURVIVAL EXPECTATIONS AND YOUNG ADULT OUTCOMES

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ABSTRACT

QUYNH C. NGUYEN: Perceived Survival Expectations and Young Adult Outcomes
(Under the direction of Charles Poole)

Anticipation of an early death may be a marker of negative health trajectories. The primary aim of this study was to investigate the impact of perceived chances of living to age 35 (perceived survival expectations, PSE) on socioeconomic status and risk behaviors in young adulthood (age 24-32). The secondary aim was to examine predictors of PSE and change in PSE. These aims were met through analyses of the National Longitudinal Study of Adolescent Health (Add Health) initiated in 1994-95 among 20,745 adolescents in grades 7-12 with follow-up interviews in 1996 (Wave II), 2001-2002 (Wave III) and 2008 (Wave IV; ages 24-32).

At Wave I, one in seven adolescents reported that their chance of living to age 35 was 50-50 or worse. Older adolescents reported lower PSE than their younger-aged peers. Among the foreign-born, increasing time in the U.S. was related to higher PSE. Most respondents reported high or higher PSE at Wave III compared to Wave I. High neighborhood poverty rate, low parental education, black race and perceptions that the neighborhood was unsafe were related to low PSE at Waves I and III. Low Waves I and III PSE predicted lower education attainment and personal earnings at Wave IV controlling for confounding factors like previous family socioeconomic status, sociodemographic characteristics, and depressive symptoms. Low PSE also predicted an increased risk of suicidal ideation and suicide attempt in young adulthood controlling for depressive symptoms and history of suicide among family members and friends. Low PSE additionally predicted smoking at least a pack a day; consuming more than the recommended daily limits for moderate drinking; and using illicit substances other than marijuana at least weekly controlling for previous substance use and depressive symptoms.

PSE can be utilized to identify at-risk youth. Its assessment can be incorporated into discussions with youth about their expectations for their future and prospects for education and employment. Because beliefs about the future are informed by evaluations of present conditions, the promotion of positive future orientations necessitates investment in resources that promote youth development, security and health.

DEDICATION

To my sister and cheerleader, Thu Nguyen

To my life partner and companion, Yan Lau

To my mom who made it all possible, Hong Nguyen

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ABBREVIATIONS

Add Health	National Longitudinal Study of Adolescent Health
PSE	Perceived Survival Expectations
SES	Socioeconomic status

CHAPTER 1

INTRODUCTION & BACKGROUND

Our perceptions, beliefs and attitudes influence our behaviors and decisions. For example, patients' beliefs about the seriousness and cause of their health conditions, and self-efficacy in taking medications have been linked to their disease management (1, 2). Anticipation of an early death is a particular type of expectation that may be predictive of detrimental health behaviors in the short and long-term. Perceiving a shortened lifespan among American adolescents is an emerging field of inquiry. The goal of this dissertation was to examine the enduring effects of perceived chances of living to age 35 (perceived survival expectations, PSE) with a secondary goal of examining predictors of PSE and changes in PSE.

Review of the Literature

The next section describes the limited literature on the topic of perceived probabilities of survival—first among adults and then among youths. We then describe the theory we utilized (i.e., theory of hopelessness) to guide the development of hypotheses and selection of outcomes.

Perceived probabilities of survival among adults

Perceived probabilities of survival among adults are relatively accurate and have been assessed by asking adults the degree to which they are certain they will live beyond a specified age (3-7). Research on perceived probabilities of survivorship to late age (i.e., 75 and 85 years) among late middle-aged adults revealed relatively realistic perceived probabilities with the exception of men's overly optimistic estimation of their survivorship to age 85 (5). As expected, adult perceived probabilities were lower among smokers and those who reported fair/poor health. Perceived probabilities of survival increased with socioeconomic status (4). Moreover, adult perceived

probabilities of survival varied over time with new information such as the onset of disease or the premature death of a parent, and they were predictive of mortality (5). However, we cannot assume the same level of accuracy for adolescents' perceived probabilities.

Perceived probabilities of survival among adolescents

Very little is known about adolescents' perceived probabilities of survival. Baruch Fischhoff and colleagues conducted one of the few studies in this area. The 1997 National Longitudinal Survey of Youth (NLSY97) asked respondents aged 15 and 16 to report perceived probabilities of 18 different life events. In contrast to optimistic expectations for college graduation and accurate expectations for employment by age 30, perceived probabilities of survival were highly unrealistic (8). Reported mean probabilities of dying in the next year and dying by age 20 were 18.6% and 20.3%, respectively. Approximately 25% of respondents said they had 50% or greater probability of dying before age 20—with the majority of responses in this probability range being “50%” (9). Among teens, the actual probability of dying by age 20 is 0.4% (10). However, not all perceived risks of negative events were uniformly pessimistic. Mean reported perceived probabilities of being arrested (10.3%) or serving jail time (5.4%) were within 2.5% of the observed rates (8.2% and 2.8%, respectively) (11).

Assessing the accuracy of adolescents' perceived probabilities

Parker and Fischhoff examined the accuracy of perceived probabilities espoused in the 1997 NLSY97 with a second wave of data. They estimated correlations between perceived probabilities and actual occurrence of events one year later. Correlations were largest for school attendance one year later (0.58), pregnancy (0.48) and experiencing an arrest (0.41). Correlations were weak for employment outcomes—working for pay for 20 hours or more if in school (0.18) and if not in school (0.19). [These correlations are positive implying that, for instance, higher perceived probabilities of school attendance correlated positively with the actual school attendance one year later.] Four individuals died in the next year (0.1%), and hence there was not enough data to evaluate correlations. These four individuals reported low perceived probabilities of death (mean= 10% for death in the next year) (12). Thus, youths may be moderately accurate in their perceptions of some significant life events but pessimistic on average about their mortality risk. Perhaps because of the

tendency for adolescents to have an overly inflated sense of their mortality risk, the literature on adolescents' perceived probabilities of survival thus far has focused on the content of these beliefs rather than on quantifying the accuracy of these beliefs. Likewise, in this study, we concentrate on examining the potential effects of PSE. Accurate or not, PSE may influence decision-making.

Predictors of perceived survival expectations

The determinants of PSE appear multi-dimensional—stemming from diverse domains. For instance, utilizing Add Health data, Duke and colleagues examined 45 correlates of Wave I PSE \leq 50%. In their final model, 11 correlates of moderate magnitude remained after adjustment for sociodemographic characteristics and other independent correlates. These include: *health risk* (HIV diagnosis, binge drinking, violence involvement, home gun access); *connection* (lower other adult connection, lower peer connection); *individual/developmental factors* (emotional distress, lower grade point average, lower self-esteem); and *parent/family characteristics* (less access to medical care, parental unemployment) (13). Hence, PSE appear to reflect considerations of psychological, physical, economic and social factors relating to health and well-being.

Ties between PSE and risk behaviors among youths

In the seminal study identifying pessimistic survival expectations among youth, Fischhoff and colleagues also found correlations (albeit weak) between survival expectations and the following factors: self-reported health, smoking, drinking experience, attacking someone, seeing someone shot, and estimated proportion of friends in a gang. In their concluding remarks Fischhoff and colleagues stated the following hypothesis: “They [adolescents] take risks not just because of an exaggerated feeling that they are not going to die, but also because of an exaggerated feeling that they are not going to live (8).”

Cross-sectional studies

Studies examining anticipation of an early death among adolescents have focused on the consequences of these beliefs. Using data drawn from four years (2002-2005) of the National Annenberg Survey of Youth (NASY) among individuals aged 14-22, Jamieson and Romer defined low

survival expectations via responses to the following statement: “I do not expect to live much past the age of 30.” Respondents who reported they agreed or strongly agreed (versus disagreed or strongly disagreed) were categorized as “fatalists.” Individuals who believed they would not live to age 30 were more likely to be out-of-school, to have engaged in suicide planning within the past year, to be accepting of suicide, and to have greater impulsive sensation-seeking (14).

In another study, Valadez-Meltzer and colleagues found links between risk behaviors and a belief in death within the next two years. Data were obtained from a clinic sample of 2694 black urban youth aged 12-21 recruited from 1994 to 1997. Mortality expectations were assessed by asking respondents: “Which of the following applies to you: In the next two years (1) I am certain I will be alive, (2) It’s very possible I will die, (3) It’s unlikely I will die, or (4) I am certain I will be dead.” Adolescents who stated that their near-future death was certain or very possible were categorized as subscribing to a belief in a near-future death (15). Suicide ideation/act, drinking and driving, and selling drugs were associated with a belief in a near-future death.

Add Health Studies

Harris and colleagues conceived of survival expectations as being a component of a “nothing to lose” attitude. According to the theory of reasoned action, behavioral intentions reflect attitudes about the benefits and costs associated with a given behavior. Harris and colleagues hypothesized that adolescents with high expectations about the future will associate greater costs to risk behaviors and hence be more likely to avoid risk behaviors than adolescents with low expectations about the future. Using data from Wave I and II from Add Health, they found mixed evidence for connections between low expectations of survivorship to age 35 and the onset of the following risk behaviors: early sexual activity (among boys and girls ages 13-15 years), selling drugs (only among boys 13-16 years), weapon use (only among boys 13-16 years). After adjustment for school-level effects, individual and family characteristics, only the relationship between low PSE and selling drugs among boys remained (16).

Bi-directionality of ties between PSE and risk behaviors

In a recent Add Health study, Borowsky and colleagues found that PSE at Wave I predicted risk behaviors at Waves II and III. PSE at Wave I were related to suicide attempt, fight-related injury and unsafe sexual activity at Wave II as well as police arrest and HIV diagnosis at Wave III (17). Borowsky's Add Health study differed from Harris's Add Health in that Harris examined the onset of particular risk behaviors, whereas Borowsky examined the prevalence of risk behaviors. PSE may not influence early initiation of risk behaviors but rather higher risk-taking.

Furthermore, Borowsky and colleagues found that risk behaviors at Wave I predicted PSE at Waves II and III. Specifically, illicit drug use, suicide attempt, fight-related injury, police arrest, unsafe sexual activity at Wave I predicted low PSE at Wave II. Suicide attempt and police arrest at Wave I continued to predict low PSE at Wave III. This may suggest that anticipation of an early death may promote greater risk taking and also that people who engage in risk behaviors do perceive their activities as dangerous. Low survival expectations were defined as perceived chances of living to age $35 \leq 50\%$ (17).

While we acknowledge that the relationship between PSE and risk behaviors may be bi-directional, our study focused on PSE as a predictor of behavioral outcomes in young adulthood. We did so because of the implications for intervention programs; if survival expectations are linked to a broad array of behavioral outcomes (as suggested by previous research), intervening and altering these expectations may have wide-ranging and long-term impacts. The study implications of focusing on how risk behaviors influence PSE may include drawing the conclusion that adolescents who engage in risk behaviors realize the potential harm of their activities and such realizations do not serve as a sufficient deterrent.

Questioning the personal fable

We question the accuracy of characterizing adolescents as believing in their own immortality or invulnerability. Moreover, we argue that a heightened sense of mortal danger and insecurity about the future, as reflected by PSE, can be detrimental to behavioral outcomes. Adolescence marks the transition from childhood to maturity. Although the years spanning adolescence varies with definition, they generally encompass age 12 to 20 (18, 19). In lay and scientific literature, variants of the

“adolescent invulnerability hypothesis” are offered as potential explanations for adolescent risk taking, although there is little empirical evidence to support that feelings of invulnerability are unique to adolescents and inconsistent support for links between adolescent egocentrism and risk-taking (20-26). The early theoretical underpinnings of these arguments can be found in the work of authors like Elkind (1967, 1978) who assert that adolescents are cognitively egocentric. This egocentrism heightens feelings of uniqueness and leads them to believe in a “personal fable” (i.e., that they are exempt from natural/physical laws that govern others).

The accuracy of the personal fable has been contested by empirical data. A study by Millstein and Halpern-Felsher found that compared to young adults, adolescents consistently perceived higher probabilities of negative outcomes on a broad array of scenarios. These patterns persisted even after accounting for factors that covary with risk perception and age, such as numeracy and behavioral experience. As an example, respondents were asked about their probability of dying if they were in Florida when a strong hurricane hit. The majority of adolescents (85% of fifth graders, 79% of seventh graders, 60% of ninth graders) believed that their risks were 10% or higher compared to 22% of young adults. However, the actual risk was much lower. In 1992 when Hurricane Andrew hit southeast Florida, 61 people died—producing a risk of 0.00002% (26).

While feelings of invulnerability (e.g., perceptions of immortality, invincibility) may encourage risk behaviors, this dissertation explored whether feelings of *vulnerability* (as reflected by PSE) promoted risk behaviors. People engage in risk behaviors for a variety of reasons. For instance, they may do so because they believe nothing can harm them. Alternatively, they may also do so because they believe that there is no point in trying to make a better future. Low PSE may be an expression of hopelessness. In the next section, we present a discussion of the theory of hopelessness which guided the development of our hypotheses and selection of outcomes. Both hopelessness and PSE have been connected to detrimental behaviors in adolescence. This dissertation pursues PSE as a predictor of health-damaging behaviors in young adulthood.

Theory of hopelessness

PSE may reflect an overall tendency to view the future pessimistically, fatalistically and with resignation. Similarities in the potential effects of low PSE and hopelessness and their malleability by similar factors may indicate they are related constructs. Hopelessness has been linked with violence involvement, substance use and early sexual activity among adolescents (27). Analogous associations have been found for low PSE among adolescents (17). Hopelessness is modifiable by cognitive therapy (28) and receipt of social support (29). Likewise, transitioning out of low PSE is predicted by increased self-esteem and connection with adults (30).

Essential components of hopelessness include the expectation that desired events will not occur, negative events will occur, and nothing can be done to change the course of these events. Beck's original 20-item true/false hopelessness scale composed of items such as "My future seems dark to me," and "I might as well give up because I can't make things better for myself" (31). There are current movements to incorporate considerations of survival expectations more directly into hopelessness theory. For instance, Bolland added the following item to his hopelessness scale: "I don't expect to live a very long life" (27). Hopelessness has been conceived both as a symptom of depression and also as a subtype of depression. The hopelessness theory of depression postulates that hopelessness arises from cognitive vulnerabilities and the occurrence of negative events. Cognitive vulnerabilities entail "a style or tendency to infer negative characteristics about the self, negative consequences for the future, and stable [i.e., enduring], global [i.e., affecting many outcomes] causes for negative events" (29). Hopelessness may impair an individual's abilities to define problems and to formulate and implement their solutions (32). In a recent Add Health study, low PSE at Waves I or II predicted lower problem-solving abilities at Wave III (33). Bleak perceptions about the future may fuel the abandonment of traditional long-term goals in place of short-term rewards.

Behavioral Outcomes under Investigation

In this study, we investigated the possible effects of PSE on socioeconomic status, suicidal behavior, and substance use. Below we discuss each of the outcomes separately, outlining predictors of each outcome.

Education attainment

We hypothesize that reduced PSE will be tied to lower socioeconomic status in young adulthood. However, because socioeconomic attainment occurs through multiple routes, when examining associations between PSE and SES, it is important to consider factors that may co-occur.

Individual-level predictors of educational attainment

Rigorous high school academic curriculum, grades, educational aspirations and parental education are positively associated with educational attainment (34). Depression is also related to lower educational attainment. Using Add Health data, Fletcher found that CES-D depressive symptoms were associated with a decrease in number of years (0.2 to 0.5 years) of schooling. Conditional on high school graduation, depression was associated with a 3% to 7% decrease in college enrolment (35). Moreover, parental and peer support have both been linked to social and emotional adjustment as well as goal commitment among college students. In a study of 100 minority college students, Dennis and colleagues found that lack of peer support was related to lower grade point average (36). While examining ties between survival expectations and SES attainment, it is critical to consider racial disparities. According to the 2004 Current Population Survey (CPS), college completion rates differed greatly by race/ethnicity; 50% of Asians, 30% of non-Hispanic whites, 17% of blacks, and 11% of Hispanics 25 years and older have a bachelor's degree (37). [These are college completion rates do not control for parental socioeconomic status].

Economic hardship

In addition to investigating connections between PSE and educational attainment, we further assessed PSE as a predictor of evictions and material hardships in young adulthood. We do so because much can be missed by exclusively relying upon education attainment as an indicator of socioeconomic status. For instance, highly educated immigrant workers can be found in unskilled, low-paying jobs (38). *Predictors of eviction*

In addition to household poverty, eviction represents another prominent form of economic hardship. A number of studies on the demographic characteristics of people facing eviction

documented over-representation by women, the poor and minorities. For instance, Eldridge (2001) in a study of Philadelphia residents found that 83% of individuals facing eviction were nonwhite and 70% were nonwhite women. In addition, a Los Angeles study concluded that evictions in immigrant communities may be under-estimated due to the use of illegal means to force out tenants who may be less knowledgeable about their rights (39). Other risk factors for eviction include living alone, mental health problems, having less than a high school education, heavy drinking and using drugs other than marijuana (40, 41).

Suicidal behavior

Suicidal behavior among youths is strongly related to psychiatric disorders including major depressive disorder, antisocial behaviors (e.g., conduct disorder), and substance use disorder. Of these disorders, affective disorders are often found to most frequently and most strongly relate to suicidal behavior (42). Moreover, the strength of some of these relationships increases as adolescents age into young adulthood (43). Hopelessness is also tied to suicidal behavior (44, 45). Other key risk factors for suicide include family history of suicide and psychopathology, stressful life events such as child abuse, and access to firearms. Research from a Dutch registry study found that suicides were five times greater among youths with mothers who committed suicide and two times as common among youths with fathers who committed suicide, controlling for parental psychiatry history. Unemployment or dropping out of school increase the risk for suicide attempts (46). In addition, Flannery and colleagues utilizing a community sample of adolescents found that violence was associated with increased suicide potential (47). Suicide is also linked to social isolation among females (48). Protective factors include family cohesion (i.e., mutual involvement, shared interests, emotional support) and religiosity (46).

Distinguishing between ideators and attempters

While there is much overlap between suicide attempt and ideation (for instance, suicide ideation is predictive of suicide attempt), distinctions exist. Some argue that a distinguishing feature of suicide attempters from non-attempters is a heavier burden of depressive illness among suicide

attempters. Claassen and colleagues found among those with major depressive disorder (MDD), suicide attempters had earlier onset of MDD and more depressive episodes than non-attempters. Suicide attempters also had more suicide ideation, general medical problems, current alcohol/substance use, and missed work hours than non-attempters with MDD. As such, they suggested earlier, continuous and more aggressive interventions for those with a history of suicidal behavior (49). Furthermore, research suggests that substance use and dependence are more strongly linked to suicide attempt than suicide ideation (50). In addition, while suicide ideation and attempts are more common among girls, completed suicides are much more common among boys in the United States (46).

Substance use

Substance use disorders have relatively early onset. Data from the National Comorbidity Survey Replication (NCS-R), a nationally representative face-to-face survey of English-speaking household residents in the United States, estimates the median age of drug abuse at 19 years, of drug dependence at 21 years, of alcohol abuse at 21 years, and of alcohol dependence at 23 years (51). Identified risk factors for substance use are extensive and include regulations and norms favorable to drug use, availability of drugs, severe economic deprivation, psychiatric disorders, family history of substance use, family conflict, low family attachment, low school commitment, early peer rejection, social pressure, alienation and rebelliousness (52). Gender differences in alcohol and marijuana use appear small in adolescence but increase with age. For instance, men consume higher quantities of alcohol and have greater prevalence of alcohol use disorders (53). Personality traits hypothesized to be associated with substance use include hopelessness, impulsivity, anxiety sensitivity, and sensation-seeking (32).

In summary, previous literature suggests that adolescent perceived survival expectations (unlike those of older adults) are pessimistic. PSE among adolescents are informed by psychological and material aspects of the adolescent's life. Moreover, low PSE has been linked to an array of detrimental adolescent outcomes. PSE may reflect hopelessness which may motivate greater risk-taking behaviors and discourage long-term goals.

CHAPTER 2

STUDY AIMS & RATIONALE

Study aims and proposed mechanism

The primary aim of this study was to examine the potential effects of PSE on future socioeconomic status (SES) and risk behaviors in young adulthood. The secondary aim was to examine change in PSE and predictors of PSE. These aims were met through analyses of the National Longitudinal Study of Adolescent Health (Add Health), a nationally representative field study initiated in 1994-95 among 20,745 adolescents in grades 7 through 12. Beliefs individuals have about their futures may influence their decision-making—whether to invest in education and training, to plan for the future, to sacrifice some of today's transient pleasures for long-term rewards. People who perceive a severely bleak or limited future may respond to challenges with fatalism and less persistence. They may set fewer goals, seek less guidance, and develop or attempt fewer solutions to their problems (54). People who do not believe they can make things better for themselves may act more recklessly with themselves and with others, and this is demonstrated by studies linking anticipation of an early death with violence and health risk behaviors in adolescence (14, 15, 17, 33). Nonetheless, alternative explanations are possible. Low PSE correlates with greater depressive symptoms and lower family socioeconomic status. These factors impede successful youth development. In our analyses, we controlled for these factors which may be linked both to lower PSE and worse young adult outcomes.

Superiority of Add Health

The only longitudinal studies establishing associations between PSE and future outcomes have come from Add Health studies (17, 33). These studies suggest that PSE is related to an array of detrimental behaviors in adolescence. The other two studies in this program area relied upon cross-

sectional surveys (14, 15) which place great limitations on conclusions about causality. While cross-sectional studies permit identification of associations, they do not allow for the determination of causal ordering. For instance, from the study conducted by Valadez-Meltzer and colleagues, we are unable to conclude whether risky behaviors led to the belief in an early death or whether a belief in an early death promoted risky behaviors (15). Add Health data allows researchers to examine whether PSE is predictive of future outcomes and whether such associations endure past adolescence. In addition, Valadez-Meltzer and colleagues found that for some risk behaviors, passive (having friends or relatives who engage in risk behaviors) but not active participation (personal engagement in risk behaviors) was associated with anticipation of an early death (15). However, adolescents may be less forthcoming about their own behaviors than the behaviors of their friends and relatives. Under-reporting of personal engagement in risk behaviors may be an issue. Add Health utilized CASI (computer-assisted self-interviewing) on sensitive questions which has been shown to increase reporting of substance use and violence compared to a more traditional self-administered questionnaire (55). Furthermore, Add Health contains rich data on a variety of individual, family and community characteristics that allow adjustment for important potential confounders. Moreover, Add Health is nationally representative, which may enable greater generalizability of results compared to that found in small convenience samples. Thus, currently, Add Health is arguably the best data source for an investigation of the determinants and potential effects of PSE in the general American population.

Extending knowledge of ties between PSE and future SES attainment

Low PSE may not only predict worse adolescent outcomes, but worse trajectories in health with ties to negative outcomes that persist into young adulthood. This study extends investigation of PSE as a marker of future detrimental outcomes by 1) examining these associations outside of adolescence, and 2) by delving more deeply into these associations. For instance, we assess SES as an outcome in young adulthood via multiple indicators including education attainment, personal earnings and economic hardships. Duke and colleagues found that low PSE at Waves I or II was associated with lower odds of at least a high school education at Wave III (33). While these results indicate that PSE may be related to lower schooling, educational attainment is in flux throughout early

adulthood. Indeed education attainment is typically assessed among adults 25 years and older (25). We examine PSE as a predictor of lower education attainment among adults 24-32 years.

Extending knowledge of ties between PES and future risk behaviors

We extend the investigation of ties between PSE and harmful health behaviors—specifically suicidal behavior and substance use. A previous Add Health study related low PSE at Wave I to suicide attempt at Wave II (56). We assess the endurance of associations between PSE and suicidal behavior. Finding that PSE measured in adolescence or early adulthood is predictive of suicidal behavior many years later would highlight its longevity as a risk factor for suicide. PSE may reflect hopelessness, which is a stronger predictor of suicide than depression (57). Individuals with low PSE may be more apt to believe that their problems are insoluble and to view suicide as the only recourse. Additionally, previous studies have only initially examined associations between PSE and substance use. These studies found that PSE was either unrelated to future substance use (defined as any vs. none) or may modestly predict lower substance use (17, 33). They did not distinguish marijuana use from other illicit substance use. The health effects of marijuana are also generally more benign than those of other illicit drugs (23). In addition, they did not examine varying levels of use. We further the investigation of PSE as a marker of future substance use by examining legal and illicit substances and varying levels of substance use. PSE may predict only a subset of substance use behaviors. For instance, PSE may not predict recreational use, but rather heavy use. Individuals who engage in substance use may do so for a variety of reasons and these reasons may have differential impact on the pattern of substance use. Drinking for enhancement reasons (e.g. to get high, experience excitement) has been tied to binge drinking and use of illicit substances (10, 58). Alternatively, drinking to cope with problems (e.g. avoid or escape from problems) often involves drinking alone and is most related to the manifestation of drinking problems and alcohol misuse (10, 58, 59). Low PSE may encourage substance use as a means to cope. Individuals with low PSE may also be more likely to engage in health-detrimental behaviors like substance use because they are not bound by concerns about future consequences given the perception that they may not have a future. Greater recklessness may be a self-fulfilling prophecy. A previous Add Health study found low PSE predicted future risk behaviors, and also that engagement in risk behaviors predicted lower future PSE (17).

Because previous substance use may depress PSE and elevate future substance use, in assessing PSE as a predictor of future substance use, we control for previous substance use.

Wave I and III PSE as predictors of Wave IV outcomes

This study focuses on PSE as a predictor of negative young adult outcomes including lower SES, increased suicidal behavior, and greater substance use. We estimate associations for PSE measured at Waves I and III. We expect low PSE at both waves to relate to worse young adult outcomes. However, the strength of associations may vary depending upon the outcome under investigation. For instance, adolescence is a critical period for experimentation with substance use (20). Alternatively, the years of early adulthood are characterized by the pursuit of higher education. Indeed in 2009, 70% of high school graduates were enrolled in college (60). Low PSE held during different time periods may have differential influence on disparate outcomes. As the next two sections detail, socioeconomic status and risk behaviors are worthy young adult outcomes given their strong ties to health.

Importance of socioeconomic status

The importance of socioeconomic status is highlighted by pervasive health inequities (61-63) and dramatic differences in life expectancy ranging from 4-10 years among income and education groups (64). In addition to examining education outcomes, we include economic and material hardships because they enable a richer understanding of economic status in young adulthood. Housing instability, food insecurity, lack of health care access, and having heat or utilities disconnected are prominent problems facing the poor (65, 66). For instance, in 2001, a survey of 19 states found that 4.3 million Americans were at risk for having their utilities disconnected because they couldn't afford to pay (39). In a study of former and current women on welfare, one in five had been evicted during a six year period (41). Evictions represent a main pathway to homelessness (39). They may also trigger a chain of negative events from not being able to find another job in a new location to difficulty finding new housing due to bad credit resulting from an eviction (39).

Importance of suicidal behavior & substance use

In addition to socioeconomic status attainment, we investigate PSE as a predictor of suicidal behavior and substance use in adulthood. Suicide is the second leading cause of death among 25-34 year olds. In 2003, the rate of suicide for people aged 25-34 was 12.7 per 100,000 (67). One-third of suicide attempts result in injuries that require medical attention (48). Additionally, the health costs associated with substance use are substantial. Alcohol accounts for approximately 3% of global deaths and 4% of disability-adjusted life years (DALYs, years lost due to premature mortality and health life lost due to disability) (68). Injury is a large component of the health burden of alcohol use—accounting for approximately half of alcohol-attributable deaths. Moreover, increased risk of injury begins at relatively low levels of alcohol consumption as well as relatively infrequent bouts of high consumption. Cherpitel and colleagues found that for both males and females, an average daily volume of 1 drink was correlated with elevated risk of injury (69). Alcohol volume exerts a detrimental effect on major chronic diseases including mouth and oropharyngeal cancer, breast cancer, unipolar major depression, epilepsy, alcohol use disorders, hypertensive disease, hemorrhagic stroke, and cirrhosis of the liver. Beneficial effects of alcohol on coronary heart disease (CHD), stroke, and diabetes mellitus depend on the pattern of drinking. Light to moderate drinking is linked to reduced risk, whereas heavy drinking even among persons who usually drink moderately, is related to increased CHD risk (70).

Examining changes in PSE

In addition to examining the potential effects of PSE on SES and risk behaviors in young adulthood, we examine age-related changes in PSE. Multiple surveys have highlighted pessimistic mortality expectations among youth (8, 17) in comparison to relatively accurate mortality expectations among adults 50 years and older regarding their perceptions of living to age 75 and 85 (4). Tracking changes in mortality expectations among youth will inform us about the evolution of these expectations. For instance, among youth, do mortality expectations steadily increase with age? An Add Health study documented that a fraction of respondents who initially reported Wave I PSE \leq 50% continue to report PSE \leq 50% at Wave II (44%) and PSE \leq 50% at Wave III (17%) (17). We map PSE by age of respondents at Waves I and III. We also assess changes in PSE between Waves I and III.

During these assessments, we leave PSE as a five level categorical variable rather than a dichotomous variable to allow the detection of changes in different levels of PSE.

Examining predictors of PSE

Duke and colleagues reported that low Wave I PSE is predicted by an extensive range of correlates including self-destructive behaviors, physical and psychological distress, lower peer and adult connection, and worse family economic conditions (13). We supplement that analysis by examining community poverty and crime as potential predictors of low Waves I and III PSE.

Neighborhood disadvantage is connected with low birth weight, child injury and abuse and criminality (71). More research is needed into how these youths interpret their social and physical environments, and the consequences of those interpretations. We also explore increasing length of time in the U.S. (among the foreign born) as a predictor of higher PSE. Greater time in the U.S. may allow for gains in family socioeconomic status, adaptation and acculturation, which may lessen uncertainty about the future (72).

Study contributions

Overall, little is known about perceived survival expectations among youths or their effects. Indeed, only a handful of studies exist on this topic. We describe changes in PSE and extend a discussion of predictors of PSE. Ties between PSE and future outcomes have only been examined in adolescence and early adulthood (13, 16, 17). We investigate whether PSE continues to predict detrimental health behaviors among individuals 24-32 years old. Finding enduring connections between PSE and young adult outcomes would lend support for a closer investigation of how youths characterize their future and what is arguably taken for granted—young people's perceptions of their mortality risk. Low PSE may be a marker for hopelessness and other cognitive vulnerabilities. These perceptions may have long-term consequences on decision-making and behaviors. If indeed ties between low PSE and later-life outcomes are not specific but rather wide-ranging, influencing PSE along with other psychological factors may represent a means by which we can hinder the development of a host of highly damaging adult outcomes.

CHAPTER 3

STUDY HYPOTHESES

Manuscript #1: Perceived Survival Expectations: Predictors and Potential Effects on Socioeconomic Status in Young Adulthood

The first manuscript characterized patterns of change in PSE and predictors of PSE. However, its primary aim was to investigate the relationship between PSE and future socioeconomic status in young adulthood. The specific aims and hypotheses of this study are listed below.

1. *Describe patterns of change in PSE*
 - *We hypothesize that most individuals will report high or higher PSE with entry into adulthood (i.e., higher PSE at Wave III compared to those seen at Wave I).*

2. *Examine predictors of PSE*
 - *We hypothesize that higher community-level poverty and crime rates and less time spent in the U.S. (among the foreign born) will be related to lower PSE at Waves I and III.*

3. *Estimate associations between PSE and socioeconomic status in young adulthood (i.e., Wave IV)*
 - *We hypothesize that low PSE at Waves I and III are predictive of lower education attainment, lower personal earnings and greater material hardships at Wave IV.*

MANUSCRIPT #2: Perceptions of an Early Death Predicts Future Risk Behaviors

The second manuscript assessed the potential long-term associations between PSE on risk behaviors—specifically suicidal behavior and substance use.

1. *Estimate associations between PSE and suicidal behavior in young adulthood (i.e., Wave IV).*
 - *We hypothesize that low PSE at Waves I and III will be related to greater suicide attempts and suicidal ideation at Wave IV.*

2. *Estimate associations between PSE and substance use in young adulthood (i.e., Wave IV).*
 - *We hypothesize that low PSE at Waves I and III will be related to more alcohol use, cigarette smoking, marijuana use and other illicit substance use at Wave IV.*

CHAPTER 4

RESEARCH DESIGN AND METHODS

This section describes the Add Health dataset and is followed by a discussion of data quality, issues relating to the measurement of PSE and variable definitions/coding, and Wave IV outcomes.

Table 1. Data source, Add Health

Data on PSE available from Waves I-III			Data on outcomes
Wave I (1994/95)	Wave II (1996)	Wave III (2001/02)	Wave IV (2008)
Youths in grades 7-12 Mean age: 16, Range: 11-21 N = 18,924 with valid sampling weights	Youths in grades 8-12 Mean age: 16, Range: 11-21 88% of eligible cohort at Wave I N= 13,570 with valid sampling weights	Mean age: 22, Range: 18-26 77% of eligible cohort at Wave I N=14,322 with valid sampling weights	Mean age: 28, Range: 24-32 80% of eligible cohort at Wave I N= 14,800 with valid Wave IV cross- sectional weights N= 9,421 with valid longitudinal weights (for analyses that use data from Waves I-IV)

The data

Study sample

This study used data from the National Longitudinal Study of Adolescent Health (Add Health), a national probability sample of adolescents in grades 7 through 12 in 1994-1995. Data were collected through a two-stage clustered sampling design. The sample was composed of 80 high schools and 52 'feeder schools.' High schools were selected with sampling probabilities proportional to size. For each high school, a middle school was selected that 'fed' the greatest number of students to that high school. At Wave I, all students in selected schools were asked to participate in the in-school interview.

In addition, Wave I also included an in-home interview. Approximately 200 students from each school were asked to participate in the Wave I in-home interview. The sampling frame for the Wave I in-home interview included students who had completed an in-school questionnaire or who were listed on their school enrollment roster. From April to December of 1995 20,745 Wave I in-home interviews were completed (79% response rate). At Wave I, a parent, usually the resident mother, also completed a questionnaire. The adolescent's mother was the preferred respondent for the parent interview given that previous research has indicated that mothers are more knowledgeable about their children's schooling, health behaviors and health status than fathers (73).

Response rates

The Wave I in-home sample of adolescents is the basis for all longitudinal follow-up. In 1996, approximately one year after Wave I, the Wave II in-home interviews (88% response rate) were completed, consisting primarily of Wave I respondents in grades 7 through 11, for a total Wave II sample size of 14,738. High school seniors at Wave I were not followed at Wave II by design. However, these individuals were included at Wave III and IV. In 2001-02, Wave III in-home interviews were collected from 15,197 respondents aged 18 to 26 (77% response rate). Wave IV has 15,701 respondents. The original Wave I respondents are now between 24 and 32 years of age. Written

parental/guardian consent and adolescent assent were obtained prior to the Wave I and II interviews. At Wave III and IV, written consent was obtained from each respondent.

Interviewing mode

During the previous waves of data collection, in-home interviews took one to two hours and were conducted using two modes of interviewing. To protect the confidentiality of respondents, no paper questionnaires were used. A laptop computer recorded all answers. For less sensitive questions, an interviewer read the questions out loud and recorded the respondent's answers (Computer Assisted Personal Interviewing or CAPI). For more sensitive questions on topics such as substance use and suicidal behavior, respondents input their answers into the computer themselves without the interviewers' knowledge or assistance (Computer Assisted Self-Interviewing or CASI).

Data quality

Bias from excluding drop-outs

Like all school-based samples, potential bias from the absence of dropouts is an initial concern. However, unlike most other school-based studies, the magnitude of this bias in the Add Health sample has been estimated. Udry and Chantala found that the bias in estimates of drug use and violence, emotional distress, and physical activity due to the omission of those not enrolled in school was small; rates generally differed by less than 1% (74). It is also important to note that some school dropouts were included in the Wave I and Wave II samples. This is because there was a lag of several months between the selection of the Wave I survey sample (from school enrollment rosters) and the actual Wave I data collection plus an additional lag of approximately 12 months between the Wave I and Wave II interviews. Moreover, previously enrolled students who dropped out during either of these lag periods were still eligible for Wave I and II interviews.

Non-response bias

Similarly, Kalsbeek, Morris, and Vaughn (2001) reported that bias due to non-response in Wave I and Wave II prevalence estimates of cigarette and alcohol use, depression, violent behavior,

and other major health risks rarely exceeded 1% (75). The overall response rate for Wave I was 78.9%, 88.2% for Wave II, 77.4% for Wave III, and 80.3% for Wave IV.

Assessment of PSE

Reliability and validity of probability assessments

The use of PSE is supported by literature indicating good reliability and validity across probability assessments. Subjective uncertainty pertaining to a specific statement or an event is assessed in a number of ways including numeric probabilities, other numerical indicators such as odds, and verbal responses. In their study of college students at a West Coast university, Ofir and Reddy utilized the following three modes of assessment: 1) numerical probabilities, 2) a 7-level “likelihood” rating scale (labels: very unlikely to very likely), and 3) a 7-level “probable” rating scale (labels: highly improbable to highly probable). These participants were asked to report the certainty/uncertainty of 8 independent events such as the chance that Bush will be defeated in 1992. None of these events were personal events (i.e., respondents not asked about their chances of finding employment, etc.) (76). Ofir and Reddy found that numerical probabilities had higher error variance (i.e., values were less reliable) compared to the other two mode of assessment. Correlations between the three different modes of assessment for the same event were high—ranging from 0.81 to 0.96. They also assessed discriminant validity (i.e., if distinct concepts result in distinct values on a scale). Most correlations among (latent) events were low and none exceeded 0.31. This is not surprising given that respondents were asked to report beliefs about independent events. They replicated these findings in another independent sample of college students at a Southeastern university (76).

Limitations of numerical scales to assess perceived probabilities

Some argue that requiring use of the full probability scale from 0 to 100 is to require “overly fine discrimination” and contend that the use of a simpler and coarser scale is sufficient (76). Research has indicated that when asked to give a probability of an event between 0% and 100%, individuals may respond with “50” to indicate uncertainty rather than the actual numerical meaning of

50%. Children, those with less numerical familiarity and people with less education utilize the “50” more often than others (77). Failure to take into account the non-literal meaning of “50” may inflate the numbers of small probabilities reported in studies that utilize numerical probabilities to assess perceived risks. Providing explicit scales rather than using open-ended questions that require respondents to fill in the blank reduce the use of “50-50.”

In addition, the greater ease associated with using categorical scales to assess perceived probabilities may benefit response rates to questions on PSE—that some young respondents may find intrusive and difficult to answer in quantitative terms. For instance, in Wave I of Add Health, PSE assessed via categorical responses was missing for only 151 individuals out of over 20,000 respondents. On the other hand, in the 1997 National Longitudinal Survey of Youth (NLSY), mortality expectations assessed via continuous probabilities were missing for over 100 out of approximately 3500 respondents (8).

Limitations of categorical scales to assess perceived probabilities

However, a disadvantage of asking respondents to choose between verbal expressions of uncertainty is that these expressions cannot be precisely mapped onto numerical values and thus are subject to individual interpretations. For instance, “almost no chance” may mean <1% to some individuals and 5% to others. A study conducted in Malawi compared expectations reported on a numerical scale (range: 0 to 10) to a four-category likelihood-based verbal scale (range: No likelihood to high likelihood) regarding perceived chances of currently being infected with HIV. Of the people who said they had no likelihood of HIV infection, 88% also reported a value of “0” for their expectations on the numerical scale. About 6% reported a value of “1” and 3% reported a value of “2” for their expectations on the numerical scale (78). Hence, verbal expressions of perceived probabilities cannot be mapped onto fine probability scales. Because of the scarcity of research in the area of PSE, we find that it is satisfactory to first examine whether broad and meaningful categories of PSE are predictive of young adult outcomes. Fine-grained numerical scales may be more critical when assessing accuracy of perceived probabilities. Such analyses would necessitate, for instance, comparisons between perceived probabilities and actual occurrence of events.

Variable definitions/coding schemes for PSE

At Waves I-III, PSE was assessed in Add Health by asking respondents about their chances of living to age 35. This was done utilizing CAPI (as described above). Possible responses (almost no chance; some chance, but probably not; a 50-50 chance; a good chance; almost certain) cover the spectrum of perceived chance of death. Analyses on the data from Waves I-III suggest sufficient variability in response values and low rates of missingness (Table 2). If adolescents derived their expectations of death from life tables, the most appropriate response to a question about their chances of living to age 35 is “almost certain.”

Table 2. PSE across Waves, Add Health

Response	Wave I		Wave II		Wave III	
	(1994/95)		(1996)		(2001/02)	
	n	% ^a	n	% ^a	n	% ^a
Almost no chance	301	1.46	188	1.28	32	0.21
Some chance, but probably not	498	2.42	355	2.42	67	0.44
A 50-50 chance	2,311	11.22	1834	12.50	1075	7.11
A good chance	6,348	30.82	4733	32.30	3007	19.90
Almost certain	11,137	54.08	7564	51.60	10929	72.30
Refused, don't know, missing, not applicable	151	--	64	--	87	--
Total NONMISSING RESPONSES	20,595	100	14,674	100	15,110	100

^a Unweighted

CHAPTER 5

ANALYTIC APPROACH

Data management activities were conducted using SAS version 9 (Research Triangle Park, NC). Analyses were conducted using Stata/SE version 10 (College Station, TX) with sample design variables to account for clustering and sampling weights to produce nationally representative estimates.

MANUSCRIPT #1

Analyses relating to Aim 1: Describe patterns of change in PSE

To assess change in PSE (Study Aim 1), we examined differences between Wave I and Wave III PSE via bivariate analyses (cross tabulations). To examine variation in PSE by age, we plotted predicted probabilities of PSE (at Waves I and III) by age estimated via multinomial logistic regression. In analyses restricted to foreign-born individuals, multinomial logistic regression was used to estimate predicted probabilities of Wave I PSE by time spent in the U.S. adjusted for factors that may vary with immigrant cohort (79)—specifically age, gender, race/ethnicity, parental education, parental public assistance receipt and block group poverty rate.

Analyses relating to Aim 2: Examine predictors of PSE

We assessed predictors of Wave I PSE \leq 50% and Wave III PSE \leq 50% (Study Aim 2) using logistic regression. Predictors included block group poverty rate, county adult violent crime rates, perceived neighborhood safety, foreign-birth, gender, race/ethnicity, parental education, violence involvement, self-rated health, and depressive symptoms.

Analyses relating to Aim 3: Estimate associations between PSE and future socioeconomic status in young adulthood

We investigated PSE as a predictor of Wave IV SES, separately for Wave I PSE and Wave III PSE (Study Aim 3). We examined multiple indicators of SES as outcome variables at Wave IV. For polytomous indicators of SES (education, personal earning quartile), we assessed the proportional odds assumption using the Brant test (80). We found the assumption violated and hence, for polytomous outcomes, we used multinomial logistic regression. For dichotomous SES outcomes (eviction, material hardships), we utilized logistic regression. Models controlled for the following factors associated with (or hypothesized to be associated with) Wave I PSE and SES attainment: age, sex, race/ethnicity, foreign-birth, family structure, parental education, parental public assistance receipt, perceived neighborhood safety and Wave I values for block group poverty rate, parental support/attachment, self-rated health, depressive symptoms, cigarette smoking, binge drinking, illicit drug use, and violence involvement (13, 17, 40, 81). When we examined the relationship between PSE and personal earnings, we additionally controlled for current student status at Wave IV, recognizing that PSE may be related to schooling and that current students may have lower earnings. We investigated the relationship between Wave III PSE and Wave IV SES controlling for the full set of aforementioned covariates with Wave III values where available (block group poverty rate, parental support/attachment, self-rated health, depressive symptoms, substance use and violence involvement).

MANUSCRIPT #2

Analyses relating to Aims 4: Estimate associations between PSE and future suicidal behavior in young adulthood

We investigated PSE as a predictor of Wave IV suicidal ideation and attempt (Study Aim 1), again separately for Wave I and III PSE. We utilized log-binomial logistic regression models to

calculate relative risks. Models controlled for the following factors associated with or hypothesized to be associated with PSE and suicidal behavior: age, sex, race/ethnicity, foreign-birth, parental education, family structure, childhood physical maltreatment, childhood sexual abuse and Wave I/III values for block group poverty, family history of suicide, history of suicide among friends, depressive symptoms, religiosity, parental attachment/support, cigarette smoking, binge drinking, illicit drug use and self-rated health (13, 50). We investigated the relationship between Wave III PSE and Wave IV suicidal behavior controlling for the full set of aforementioned covariates with Wave III values where available (i.e., block group poverty, family history of suicide, history of suicide among friends, depressive symptoms, religiosity, parental support, substance use and self-rated health).

Analyses relating to Aims 5: Estimate associations between PSE and future substance use

We investigated Wave I and Wave III PSE as predictors of Wave IV substance use (Study Aim 3) using log-binomial regression models to estimate relative risks when the outcome variable was dichotomous (i.e., drinking more than the recommended daily limits for moderate drinking). For polytomous outcome variables (i.e., frequency of daily smoking, binge drinking, illicit substance use other than marijuana, and marijuana use), we utilized multinomial logistic regression due to violations in the proportional odds assumption. Models controlled for covariates identified in the literature as being associated both with PSE and substance use. These included age, sex, race/ethnicity, foreign-birth, parental education, family structure, childhood physical abuse, childhood sexual abuse and Wave I/III values for cigarette smoking, binge drinking, illicit drug use, block group poverty, depressive symptoms, religiosity, parental attachment/support and self-rated health (52).

CHAPTER 6

MANUSCRIPT 1

Adolescent Expectations of Early Death Predicts Young Adult Socioeconomic Status

ABSTRACT

Among adolescents, expectations of early death have been linked to future risk behaviors. These expectations may also reduce personal investment in education and training, thereby lowering adult socioeconomic status attainment. The importance of socioeconomic status is highlighted by pervasive health inequities and dramatic differences in life expectancy among education and income groups. The objectives of this study were to investigate patterns of change in perceived chances of living to age 35 (Perceived Survival Expectations; PSE), predictors of PSE, and associations between PSE and future socioeconomic status attainment. We utilized the National Longitudinal Study of Adolescent Health (Add Health) initiated in 1994-95 among 20,745 adolescents in grades 7-12 with follow-up interviews in 1996 (Wave II), 2001-02 (Wave III) and 2008 (Wave IV; ages 24-32). At Wave I, 14% reported $\leq 50\%$ chance of living to age 35. Most respondents reported stable or increasing PSE from adolescence to early adulthood. Higher block group poverty rate, perceptions that the neighborhood is unsafe, and less time in the U.S. (among the foreign-born) were related to low PSE at Waves I and III. Low PSE at Waves I and III predicted lower education attainment and personal earnings at Wave IV in multinomial logistic regression models controlling for confounding factors such as previous family socioeconomic status, individual demographic characteristics, and depressive symptoms. Anticipation of an early death is remarkably prevalent among adolescents and predictive of lower future socioeconomic status. Low PSE reported early in life may be a marker for worse health trajectories.

While relatively accurate mortality expectations have been observed among older adults (4), substantial uncertainty regarding personal mortality has been found among adolescents. Among 15 and 16 year olds in the National Longitudinal Survey of Youth, mean perceived probabilities of dying in the next year and by age 20 were 18.6% and 20.3%, respectively (8). A handful of studies have tied anticipation of an early death during adolescence to an array of risk behaviors. Adolescents who believed they would not live to age 30 were more likely to be out-of-school, to have engaged in suicide planning within the past year, and to have greater impulsive sensation-seeking (14). Studies using data from the National Longitudinal Study of Adolescent Health (Add Health) have related expectation of death before age 35 (Perceived Survival Expectations, PSE) to future risk behaviors like selling drugs, suicide attempt, fight-related injury, unsafe sexual activity, police arrest, and HIV diagnosis (16, 17).

Hopelessness

PSE may reflect an overall tendency to view the future pessimistically and with resignation. Anticipation of an early death may indicate hopelessness. Indeed, there are current movements to incorporate considerations of survival expectations into hopelessness theory. For instance, Bolland added the following item to his hopelessness scale: "I don't expect to live a very long life" (27). Essential components of hopelessness include the expectation that desired events will not occur, negative events will occur, and nothing can be done to change the course of these events (31). The literature on hopelessness has documented that a belief in the inevitability of negative events is a risk factor for future negative events. Among inner-city youth in Alabama, Bolland and colleagues connected hopelessness with violent behavior, teen pregnancy, substance abuse, and unintentional injury (27). As mentioned above, similar associations have been found between anticipation of an early death and risk behaviors (82).

Correlates of PSE

Identified predictors of low adolescent PSE include health risk behaviors, parental unemployment, low adult and peer connection, and low self-esteem (13). Low adolescent PSE are

also more prevalent among males, who have higher rates of violence and substance use than females (52), and racial/ethnic minorities, who experience worse rates of mortality and morbidity (17). Hence, PSE appear to reflect considerations of physical, psychological, economic and social factors related to health and well-being.

In this study, we utilized Add Health data to track change in PSE from adolescence to early adulthood, an endeavor which may increase understanding of the evolution of risk perceptions and perceived vulnerability. We also examined PSE by time spent in the U.S. In the U.S., immigrants experience food insecurity, less timely health care services, limited economic options/unpredictable day labor, fear of discovery (among undocumented immigrants) along with other stressors specific to adaptation as an immigrant (83). Lower PSE among the foreign born and particularly among new immigrants may reflect uncertainty about the future. Poor neighborhoods are associated with worse youth outcomes including higher rates of criminality, child abuse and injury (71). Impoverished environments characterized by low institutional resources, low social controls, and the presence of illegitimate opportunity structures may encourage perceptions of a bleak future. We investigated community disadvantage as an additional predictor of low PSE.

PSE as a predictor of future socioeconomic status

Most previous studies have not examined the potential for anticipation of an early death to have broader consequences outside of risk behaviors—such as socioeconomic status (SES) attainment. Hopelessness has also been related to lower grade point average, less specified academic goals, and less academic counseling (54). Hopelessness may encourage fatalism and passivism as a response to failures and challenges, thereby lowering the likelihood of academic and career success. We expect that low PSE will lower commitment to education and training, and correspondingly be related to lower SES in young adulthood.

Recently, using Add Health data, Duke and colleagues found that adolescents who reported low PSE (i.e., a 50-50 chance or less of living to age 35) at Waves I or II compared to those with high PSE at both waves were less likely to be in school, employed or in the military (single outcome) and less likely to have at least a high school diploma/GED at Wave III (respondents 18-26 years) (33).

The importance of income and education is highlighted by pervasive health inequities by SES and dramatic differences in life expectancy ranging from 4-10 years among income and education groups (64). Nonetheless, education attainment is in flux particularly through early adulthood. Approximately 25% of students who entered a 4-year public college during the 1995-1996 academic year dropped out five years later (34). Additionally, close to 20% delay post-secondary education for 5 or more years (21). This is the first study to investigate PSE as a predictor of SES among adults 24-32 years when SES has become more stabilized. This study also examined multiple indicators of SES including education attainment, personal earnings and material hardships.

Furthermore, we examined PSE measured at Wave I (among adolescents) and Wave III (respondents 18 years and older) as predictors of Wave IV SES. Previous Add Health studies have not investigated links between Wave III PSE and future outcomes. However, PSE at Wave III may be informative of adult outcomes for a variety of reasons. First, it is temporally closer to Wave IV outcomes than Wave I PSE—which may increase its relevancy to Wave IV outcomes. Second, adults have more developed risk perceptions compared to adolescents who overestimate the probability of negative health-related events (26). Hence, low PSE at Wave III may be less subject to crude risk perceptions and may signal severe levels of hopelessness.

Study aims and hypotheses

The objectives of this study were to investigate patterns of change in PSE, predictors of PSE, and associations between PSE and future socioeconomic status attainment. This study used data from Add Health to test three hypotheses.

1. With entry into adulthood, most people will report high or higher PSE at Wave III (than at Wave I).
2. Higher community-level poverty and crime rates, foreign-birth, and less time in the U.S. will be associated with lower PSE at Waves I and III.
3. Low PSE at Waves I and III will be predictive of lower education, lower personal earnings, and experience of material hardships and evictions in young adulthood (Wave IV).

METHODS

Study population

Add Health is a nationally representative field study of 20,745 U.S. adolescents in grades 7 through 12 during the 1994-1995 school year. The Wave I response rate was 79% (84). Three in-home follow-up interviews of the cohort have been completed: Wave II in 1996 (88% of the eligible cohort at Wave I), Wave III in 2001-2002 (77%), and Wave IV in 2008 (80%). By design, high school seniors at Wave I were not re-interviewed at Wave II, but were included in Waves III and IV. At Wave IV 15,701 respondents aged 24 to 32 years were interviewed.

The analytic sample was restricted to respondents with non-missing survey weights (N= 14,800 with Wave IV cross-sectional weights and N= 9,421 with valid longitudinal weights for analyses that use data from Waves I-IV).

Variable definition/coding

Variable definitions can be found in Table 3. We provide additional descriptions for certain variables below. The main variable of interest was *Perceived Survival Expectations (PSE)*. Respondents were asked at Waves I, II and III, "What are your chances of living to age 35?" Possible responses were: "almost no chance;" "some chance, but probably not;" "a 50-50 chance;" "a good chance" and "almost certain." At Wave IV, four outcomes were examined: education, personal earnings, experience of material hardships, and experience of evictions (Table 3). Consistent with previous literature which found detrimental effects associated with $PSE \leq 50\%$, we collapsed PSE equals "50-50 chance" with lower categories (17, 33). Furthermore, we assessed whether more moderate departures from certainty of living to age 35 (i.e., reporting "a good chance") were also related to detrimental outcomes.

SES in young adulthood was examined via the following Wave IV outcomes: 1) *education attainment* (< high school; high school/GED; some college/AA degree; four-year college or greater), 2) *annual personal earnings* (quartiles), 3) *eviction* in the past 12 months for not paying rent (yes/no); and 4) *experience of material hardships* (single dichotomous variable for having experienced any of

the following in past 12 months: a time without phone service; didn't pay full amount of rent/mortgage because didn't have enough money; gas/oil/electricity turned off because payments were not made; worried about whether food would run out before had time to buy more).

We constructed indices for lack of parental attachment/support, depressive symptoms and violence involvement. For each index, scores were calculated by averaging across items composing the index. We required valid responses for two-thirds of questions composing the indices. Internal consistency of items composing the indices was satisfactory with Cronbach's alphas all above 0.75. In our construction of *parental support/attachment (Waves I/III)*, values for father's support/attachment were missing at a high rate (approximately 30%) and missing values were more prevalent for minorities and lower-income individuals. Hence, we used mother's support/attachment unless it was missing, in which case we used father's support/attachment (4% at Waves I and III). *Depressive symptoms (Waves I/III)* were measured using items from the Center for Epidemiologic Studies Depression Scale (CES-D), commonly used to assess mental health although not intended as a diagnostic tool for clinical depression (85). Wave I had 19 out of the 20 questions that compose the CES-D. Possible responses to each item ranged from 0 (never or rarely) to 3 (most of the time or all of the time). We excluded the following CES-D items because they may overlap in content with perceived survival expectations: "You felt life was not worth living" and "You felt hopeful about the future" (reverse coded). Each unit increase in feeling like life was not worth living was associated with a doubling of the odds of Wave I PSE \leq 50%. Similarly, each unit increase in not being hopeful about the future was associated with a 50% increase in odds of Wave I PSE \leq 50%. Hence, at Wave I, 17 items composed our depression scale. At Wave III, 9 CES-D items were available.

Statistical analyses

To assess change in PSE (Study Aim 1), we examined differences between Wave I and Wave III PSE via bivariate analyses (cross tabulations). To examine variation in PSE by age, we plotted predicted probabilities of PSE (at Waves I and III) by age estimated via multinomial logistic regression. In analyses restricted to foreign-born individuals, multinomial logistic regression was used to estimate predicted probabilities of Wave I PSE by time spent in the U.S. adjusted for factors that

may vary with immigrant cohort—specifically age, gender, race/ethnicity, parental education, parental public assistance receipt and block group poverty rate. Moreover, we assessed predictors of Wave I PSE $\leq 50\%$ and Wave III PSE $\leq 50\%$ (Study Aim 2) using logistic regression. Predictors were block group poverty rate, county adult violent crime rates, perceived neighborhood safety, foreign-birth, gender, race/ethnicity, parental education, depressive symptoms, violence involvement and self-rated health.

Finally, we investigated the potential impact of PSE on Wave IV SES, separately for Wave I PSE and Wave III PSE (Study Aim 3). We examined multiple indicators of SES as outcome variables at Wave IV. For polytomous indicators of SES (education, personal earning quartile), we utilized multinomial logistic regression after finding violations in the proportional odds assumption. For dichotomous SES outcomes (eviction, material hardships), we utilized logistic regression. Models controlled for the following factors associated with (or hypothesized to be associated with) Wave I PSE and SES attainment: age, sex, race/ethnicity, foreign-birth, family structure, parental education, parental public assistance receipt, perceived neighborhood safety and Wave I values for block group poverty rate, parental support/attachment, self-rated health, depressive symptoms, substance use and violence involvement (13, 17, 34, 40). When we examined the relationship between PSE and personal earnings, we additionally controlled for current student status at Wave IV, recognizing that PSE may be related to schooling and that current students may have lower earnings. We investigated the relationship between Wave III PSE and Wave IV SES controlling for the full set of aforementioned covariates with Wave III values where available (block group poverty rate, parental support/attachment, self-rated health, depressive symptoms, substance use and violence involvement). All summary statistics were produced using STATA®/SE 10 (StataCorp LP, College Station, TX) and weighted to be representative of adolescents in grades 7-12 in the U.S. during the 1994-95 school year. This analysis was exempt from further review by the Public Health-Nursing IRB at the University of North Carolina at Chapel Hill.

RESULTS

Descriptive statistics

Table 3 displays descriptions of variable coding and Table 4 displays summary statistics for all variables used in the study. Among people with valid survey weights, missing data for PSE (<1%) and all Wave IV outcomes (<3%) were low. Missing data for covariates were also low (generally < 2%). Wave III parental support/attachment had the highest rate of missingness (5%). At Wave I, 14% (95% CI: 13, 16) of adolescents in grades 7-12 reported they had \leq 50% chance of living to age 35 (Table 4). One year later at Wave II, a similar proportion (15%; 95% CI: 14, 17) reported PSE \leq 50%. However at Wave III, when all respondents are 18 years and older, the proportion reporting PSE \leq 50% was much lower (7%; 95% CI: 7, 8). At Wave I, the study population was balanced between the sexes. Two-thirds of respondents were white (65%) with large subpopulations of non-Hispanic blacks (15%) and Hispanics / Latinos (11%). About 6% (95% CI: 5, 9) were foreign-born and 13% (95% CI: 10, 15) had parents with a less than a high school education. At Wave IV, the distributions of the sexes and racial/ethnic groups were similar to those at Wave I. However, lower proportions of foreign-born respondents were present at Wave IV than at Wave I. At Wave IV, 30% of respondents had a college education or greater and mean annual household income was approximately \$34,000 (standard deviation=\$43,000). About one in five (21%) reported material hardships and few experienced an eviction (1.1%) in the past 12 months (Table 4).

Change in PSE

Overall, more than half of individuals (56%; 95 CI: 54, 58) reported the same PSE at Wave I and Wave III. About a third (31%; 95% CI: 29, 32) reported a higher PSE at Wave III while 13% (95% CI: 12, 14) reported lower PSE. Table 5 displays cross tabulations for Wave I and Wave III PSE. Of the five categories of PSE, “almost certain” had the greatest stability in terms of repeat reports at Wave III (i.e., 82% of people who reported “almost certain” at Wave I also reported “almost certain” at Waves III). Alternatively, among people who reported PSE \leq 50% at Wave I, only approximately 20% reported PSE \leq 50% at Wave III with the remainder reporting higher PSE. Few people (<1%) reported very low PSE (“almost no chance” or “some chance but probably not”) at more than one of the three waves.

At Wave I, older adolescents were less likely to report that they were “almost certain” of living to age 35 and more likely to report lower categories of PSE compared to younger adolescents. At Wave III, age was less predictive of PSE (Figure 1). Results from proportional odds logistic regression indicate that Wave III age was unrelated to Wave III PSE (OR= 1.02; 95% CI: 0.97, 1.06). Controlling for experiences that vary with age such as substance use, violence involvement, and depressive symptoms (26) left the relationship between PSE and age largely unchanged, and sensitivity analyses in which age was coded more flexibly using indicator variables confirmed the shape of relationships shown in Figure 1. Among the foreign-born, longer duration in the U.S. was associated with increasing predicted probabilities of being “almost certain” or reporting “a good chance” of living to age 35 at Wave I and correspondingly lower predicted probabilities of PSE \leq 50% (Figure 2).

Predictors of low PSE

People who lived in block groups with high poverty rates (i.e., above the 75th percentile) had twice the proportion reporting PSE \leq 50% (21%; 95% CI: 19, 24) compared to those in block groups with lower poverty rates (11%; 95% CI: 10, 13)—although the adjusted odds ratio (AOR: 1.28) was much attenuated (Table 6). Perceiving one’s neighborhood as unsafe was linked to low PSE. Low parental education predicted low PSE. Moreover, at Wave I, foreign-born adolescents were more likely to report low PSE compared to the U.S. born (23% vs. 13%; AOR: 1.57). Black race, “other” race and Hispanic ethnicity were predictive of low Wave I PSE. Among black males, over a quarter (28%; 95% CI: 25, 31) at Wave I reported PSE \leq 50% (not shown) compared to an overall rate of 14% (95% CI: 13, 16) for the Add Health population. At Wave III, similar relationships were detected (Table 6).

Potential effects of PSE on young adult outcomes (Wave IV)

Education attainment

Lower Wave I and Wave III PSE predicted lower educational attainment at Wave IV (Table 7). For instance, reporting that one had a \leq 50-50 chance (versus being “almost certain”) of living to

age 35 at Wave I (AOR: 1.73; 95% CI: 1.23, 2.44) or at Wave III (AOR: 2.76; 95% CI: 1.68, 4.52) was related to having less than a high school education versus college education or greater at Wave IV. Controlling for perceived importance of college to the respondent and respondent's parents and the respondent's expectations for college attainment moderately reduced those adjusted odds ratio for Wave I PSE (AOR: 1.47) and Wave III PSE (AOR: 2.42) (not shown). The exclusion of individuals with very low (i.e., two standard deviations below the mean) Wave I Peabody Picture Vocabulary Test scores, a proxy measure of verbal intelligence (86), resulted in very similar results (not shown).

Personal earnings, material hardships, eviction

Wave I and III PSE \leq 50% were related to 36% and 63%, respectively, increase in adjusted odds of having personal earnings in the lowest versus highest income quartile at Wave IV (Table 8). Controlling for current student status had a negligible impact on effect estimates for personal earnings. Although the proportions of respondents (at Waves I and III) reporting material hardships and evictions increased as PSE decreased, adjustments for potential confounders attenuated relationships such that only Wave III PSE \leq 50% was statistically significantly related to greater experience of material hardships at Wave IV (Table 9). When material hardship was defined as an ordinal variable (range 0 to 4) and ordinal logistic regression was used, very similar adjusted odds ratios were obtained for Wave I PSE and Wave III PSE (not shown).

Analyses stratified by sex revealed a moderately stronger association between Wave I PSE \leq 50% and adjusted odds of less than a high school education versus college or greater among females than males (2.02 vs. 1.56) (not shown). Results remained robust after controlling for teen pregnancy (yes/no), a potential mediator of the relationship between PSE and lower education attainment (females: 2.11 vs. males: 1.63). Controlling for teen pregnancy, among females, Wave III PSE \leq 50% quadrupled (AOR: 4.36; 95% CI: 2.01, 9.48) the adjusted odds of less than a high school education versus a college degree or greater and tripled (AOR: 2.95, 95% CI: 1.51, 5.77) the adjusted odds of having personal earnings in the lowest quartile versus the highest quartile.

When the relationship between Wave III PSE and all Wave IV outcomes were examined adjusting for baseline (Wave I) PSE, effect measures were attenuated by $\leq 10\%$ (not shown). The strongest predictor of low education attainment was low parental education. Depressive symptoms, neighborhood poverty, male sex, family structure other than two biological parents, lower self-rated health, and violence involvement were also related to lower education attainment (Supplemental materials). Similar associations were detected for personal earnings with the exception of male sex, which was associated with higher personal earnings. Blacks were more likely to have personal earnings in the lowest quartile (AORs controlling for Waves I/III covariates: 1.48/1.71), to report material hardships (Waves I/III: 1.56/1.36), and to have experienced an eviction (Waves I/III: 2.12/3.29) compared to white, non-Hispanics.

DISCUSSION

The utility of examining perceptions and beliefs is underscored by their centrality in theories of health behavior (e.g., Theory of Reasoned Action, Theory of Planned Behavior) and in interventions designed to improve decision-making (87). At Wave I, one in seven adolescents reported $\leq 50\%$ chance of living to age 35. Older adolescents reported lower PSE than younger adolescents—which may signal greater perceived vulnerability among older aged adolescents as a response to increasing exposure to adult experiences and risk taking. Indeed heightened risk taking is a hallmark of adolescence (87). However, at Waves III (respondents 18+ years), PSE were similar across the various ages. Most respondents reported higher PSE at Wave III than at Wave I.

Low PSE was predicted by block group poverty, perceptions that the neighborhood is unsafe, and low family socioeconomic status. Impoverished environments with low quality schools, few employment opportunities, and high violence exposure may comprise the physical realities that shape perceptions about the future and one's abilities to obtain desired outcomes. The National Center for Children in Poverty estimates that 38% of children live in low-income families (88). Because beliefs about the future are informed by evaluations of present conditions, the promotion of positive future orientations necessitates investment in resources that promote youth development, security and health. Such efforts may include investment in public education and lowering the percentages of

families living in poverty. The emerging literature on expectations of an early death places needed focus on the creation of circumstances that promote healthy youth development.

This study found that foreign-born adolescents had lower PSE compared to U.S. born adolescents and that greater time in the U.S. was associated with higher PSE. While some health outcomes for foreign-born Americans are better than those for native-born Americans, foreign-born Americans have lower socioeconomic status and worse access to health care (89). Greater time in the U.S. may allow for greater familiarity with American culture, norms and systems and for upward mobility (72), thereby lowering uncertainty and anxiety about the future.

There is a growing literature connecting anticipation of an early death among youths to an array of detrimental outcomes including suicidal behavior, participation in illegal activities, fight-related injury, and unsafe sexual activity (14, 15, 17). However, to the authors' knowledge, this study is the first study to document the long-term impacts of PSE on future socioeconomic status among adults 24-32 years controlling for background individual and family characteristics. Wave III PSE may be a moderately better predictor of Wave IV SES given its temporal proximity to years characterized by the pursuit of higher education and training. PSE appeared a better predictor of SES for females than males, which aligns with previous literature showing depression as a stronger predictor of educational attainment for females than males (90). Nonetheless, Waves I and III PSE predicted Wave IV SES independent of corresponding depressive symptoms at Waves I and III. Hence, low PSE is predictive of worse SES above and beyond its association with depressive symptoms.

Duke and colleagues found that increased self-esteem and perceived caring by adult figures correlated with transitioning from low Wave I PSE to high Wave II PSE (30). Interventions may counteract hopelessness and promote positive future orientations by targeting depressogenic inferential styles, problem-solving abilities, and connecting youths with positive adult role models.

Study strengths and limitations

Using nationally representative, longitudinal data on a contemporary cohort of young adults, this study supplements scant existing research on 1) patterns of change in PSE, 2) predictors of PSE,

and 3) the long-term implications of PSE for outcomes besides risk behaviors. However, this study is subject to several limitations. Examining change in PSE was constrained by the availability of only three waves of data. By design, high school seniors at Wave I were not re-interviewed one year later at Wave II, but were interviewed again at Waves III and IV. Nonetheless, Add Health remains the only survey to have collected data on PSE at multiple time points. We were unable to assess the impact of numeracy on the reporting of PSE (91). Respondents self-reported on aspects of their SES which may be subject to reporting bias. However, while it is not uncommon for income data in surveys to be missing at 20% or higher (92), 98% of Add Health Wave IV respondents reported on annual personal earnings. Finally, loss to follow-up may have biased observed relationships although the distribution of demographic characteristics was similar at Wave I and Wave IV, and survey weights adjust for attrition across waves.

Conclusions

Low survival expectations are remarkably prevalent among adolescents, and are predictive of wide-ranging detrimental outcomes in adolescence and beyond. Low PSE reported early in life may be a marker for worse health trajectories.

Table 3. Variable definitions for Manuscript 1

Variable	Question/Source	Responses/Coding	Waves
Perceived Survival Expectations (PSE)	What are your chances of living to age 35?	Almost no chance; Some chance, but probably not; A 50-50 chance; A good chance; Almost certain	I, II, III
Covariates			
Poverty rate	<u>Wave I:</u> Census of Population and Housing 1990; <u>Wave III:</u> Census of Population and Housing 2000	Block group level; % 75 th percentile (high) at Waves I/III: 17%/16%	I, III
Adult violent crime arrests rates	<u>Wave I:</u> Uniform Crime Report 1993; <u>Wave III:</u> Uniform Crime Report 2001	County level; per 100,000 75 th percentile (high) at Waves I/III: 303/240	I, III
Age		Years	I
Sex		Male/female	I
Race/ethnicity	What is your Hispanic or Latino background? What is your race?	White, non-Hispanic; Black, non-Hispanic; Asian, non-Hispanic; Other single race, non-Hispanic; Multiracial	I
Foreign-birth	Were you born a U.S. citizen?	Yes/no	I
Parents received public assistance	<u>Parent interview:</u> Are you receiving public assistance, such as welfare? Is spouse/partner receiving public assistance, such as welfare? <u>Respondent interview:</u> Does residential father/mother receive public assistance, such as welfare?	Yes/no; If parental interview missing (15%), use respondent's report	I, III
Parent's education	<u>Parent interview:</u> How far did you go in school? How far did your current (spouse/partner) go in school? <u>Respondent interview:</u> How far in school did [residential mother/father] go?	Highest education achieved by mother or father; If parent interview missing (13%), use respondent's report. Less than high school, high school, some college, college or greater	I

Lack of parental attachment/support	<u>Wave I</u> : Closeness to mother/father, think mother/father is warm and loving, think mother/father care about respondent, satisfaction with communication, and overall satisfaction with relationship; <u>Wave III</u> : enjoy doing these with mother/father, closeness to mother/father, and think mother/father is warm and loving	Mean of non-missing responses (range 1 to 5); higher values indicate greater lack of parental attachment	I, III
Family structure		Two biological parents; two parents; single parent/other	I
Violence involvement	1) Someone pulled a gun or knife on you, 2) Someone shot you, 3) Someone cut/stabbed you, 4) Injured in a physical fight and had to be treated by a doctor or nurse, 5) Hurt someone badly enough to need bandages or care from doctor/nurse, 6) Used/threatened to use a weapon, 7) Participated in group fight, 8) Pulled a gun or knife on someone, 9) Shot or stabbed someone, 10) Saw someone shoot or stab another person (Bruce, 2004) ^a	Events coded dichotomously; Index is mean of non-missing responses	I, III
Think neighborhood is unsafe	Do you usually feel safe in your neighborhood?	Yes/no (Only assessed at Wave I)	I
Self-rated health	In general, how is your health?	Fair/poor; Good; Very good; Excellent	I, III
Depressive symptoms	Frequency of depressive symptoms in the past week was measured with a modified version of the Center for Epidemiologic Studies Depression Scale.	Mean of non-missing responses. See methods	I, III
30-day cigarette use	During the past 30 days, on how many days did you smoke cigarettes?	0 to 30 days	I, III

Illicit drug use	<u>Wave I:</u> How old were you when you tried 1) Marijuana 2) Cocaine, 3) Any other type of illegal drug? <u>Wave III:</u> In the past year, have you used 1) Marijuana, 2) Cocaine, 3) Crystal meth, 4) Any other types of illegal drugs?	<u>Wave I:</u> Any lifetime illicit drug use vs. none <u>Wave III:</u> Any previous 12-month illicit drug use vs. none	I, III
Binge drinking	Over the past 12 months, on how many days did you drink five or more drinks in a row?	Range 0 (never) to 6 (every day or almost every day)	I, III
Current student	Are you currently attending a college, university, or vocational/technical school where you take courses for academic credit?	Yes/no	IV
Wave IV Outcomes			
Education	What is the highest level of education that you have achieved to date?	Less than high school, High school/GED, Some college or post high school vocational training, College or greater	IV
Annual household income	What was the total household income before taxes and deductions in (2006/2007/2008) [previous year]? Include all sources of income, including non-legal sources.	Quartiles; 1st quartile: \$15,000 2nd quartile: \$30,000 3rd quartile: \$45,000 4th quartile: > \$45,000	IV
Evicted for not paying rent or mortgage	In the past 12 months, was there a time when you (your household) were evicted from your house or apartment for not paying the rent or mortgage?	Yes/no	IV
Any material hardships	In past 12 months, was there a time when you: 1) Were without phone service, 2) Didn't pay full amount of rent/mortgage because didn't have enough money; 3) Gas/oil/electricity turned off because payments were not made, 4) Worried about whether	Yes to any of the four items vs. no to all items	IV

food would run out before
had time to buy more

^aBruce, M. A. (2004). Contextual Complexity and Violent Delinquency among Black and White Males. *Journal of Black Studies*, 35(1), 65-98.

Table 4. Descriptive Statistics for Manuscript 1

	Wave I (1994-95)		Wave II (1996)		Wave III (2001-02)		Wave IV (2008)	
	n	% (95% CI) or Mean (SD) ^a	n	% (95% CI) or Mean (SD) ^a	n	% (95% CI) or Mean (SD) ^a	n	% (95% CI) or Mean (SD) ^a
PSE								
Almost certain	10250	57 (55, 59)	7016	54 (52, 56)	10309	74 (72, 75)		
A good chance	5775	29 (28, 30)	4336	31 (29, 32)	2817	19 (18, 20)		
A 50-50 chance	2065	11 (10, 12)	1670	12 (11, 13)	1020	6.8 (6.1, 7.6)		
Some chance but probably not	439	2 (2, 3)	325	2 (2, 3)	63	0.4 (0.3, 0.5)		
Almost no chance	257	1 (1, 2)	169	1 (1, 2)	30	0.2 (0.1, 0.3)		
Covariates								
Age (years)	18919	16 (2)					14800	28 (2)
Male	9288	51 (50, 52)					6930	51 (49, 52)
Race								
White, non-Hispanic	9608	65 (59, 70)					7849	66 (60, 71)
Black, non-Hispanic	3790	15 (11, 19)					2975	15 (12, 20)
Hispanic	2993	11 (8, 15)					2168	11 (8, 15)
Asian, non-Hispanic	1247	3 (2, 5)					836	3 (2, 5)
Other, non-Hispanic	270	1 (1, 2)					182	1 (1, 2)
Multiracial	936	4 (3, 5)					729	4 (3, 5)
Foreign-born	1746	6 (5, 9)					928	4 (3, 6)
Parents received public assistance	1870	10 (9, 12)						
Parent's education								
Less than high school	2527	13 (10, 15)						
High school	4704	28 (25, 30)						
Some college	5333	30 (28, 31)						
College or greater	6011	30 (27, 34)						
Family structure								
Two biological parents	9686	53 (51, 56)						
Two parents	3444	17 (16, 18)						
Single parent/other	5794	29 (27, 32)						
Think neighborhood is unsafe	2150	10 (9, 12)						
Block group poverty rate	18627	12 (13)			14027	11 (12)		
County adult violent crime per100,000	18191	222 (155)			13637	165 (117)		
Parental support, Range [1,5]	18526	1.6 (0.6)			13661	1.5 (0.7)		

Violence involvement, Range [0, 1]	18781	0.10 (0.16)	14248	0.04 (0.10)		
<i>Self-rated health</i>						
Fair/poor	1339	7 (6, 8)	650	5 (4, 5)		
Good	4832	26 (25, 27)	3149	22 (21, 23)		
Very good	7431	39 (38, 40)	5805	41 (40, 42)		
Excellent	5300	28 (27, 29)	4716	32 (31, 34)		
Depressive symptoms, Range [0, 3]	18880	0.6 (0.4)	14314	0.5 (0.5)		
30-day cigarette use	18796	5 (10)	14275	9 (13)		
Illicit drug use	5593	30 (27, 32)	4580	34 (32, 36)		
Binge drinking, Range [0, 6]	18875	0.7 (1.3)	14262	1.3 (1.6)		
Current student					2481	16 (15, 17)
Wave IV Outcomes						
<i>Education</i>						
Less than high school					1142	9 (8, 11)
High school					2396	18 (16, 20)
Some college					6521	43 (41, 45)
College or greater					4737	30 (27, 33)
Annual personal earnings					14462	34015 (43079)
<i>Evicted in past 12 months</i>						
Yes					151	1.1 (0.9, 1.3)
No					14635	98.9 (98.7, 99.1)
<i>Material hardship in past 12 months</i>						
Yes					3028	21 (20, 23)
No					11746	79 (77, 80)

PSE= Perceived Survival Expectations. Assessed via: "What are your chances of living to age 35?"

^a Unweighted sample size; Means (Standard Deviations) and Percentages (95% Confidence Intervals) are weighted

Table 5. Cross tabulations of Perceived Survival Expectations (PSE)

	Wave III PSE					Totals
	Almost certain	A good chance	A 50-50 chance	Some chance but probably not	Almost no chance	
Wave I PSE	n (%) ^a	n (%) ^a	n (%) ^a	n (%) ^a	n (%) ^a	n (%) ^a
Almost certain	6374 (47)	1124 (8)	345 (2)	23 (0.1)	14 (0.1)	7880 (57)
A good chance	2825 (19)	1129 (7)	336 (2)	20 (0.2)	4 (0.0)	4314 (29)
A 50-50 chance	811(6)	410 (3)	249 (2)	10 (0.1)	5 (0.0)	1485 (10)
Some chance	151 (1)	91 (1)	48 (0)	4 (0.0)	6 (0.1)	300 (2)
Almost no chance	107 (1)	46 (0)	26 (0)	4 (0.0)	0 (0.0)	183 (1)
Totals	10268 (74)	2800 (19)	1004 (7)	61 (0.4)	29 (0.2)	14162 (100)

PSE assessed via perceived chances of living to age 35

Bolded numbers represent individuals who reported the **same** PSE at Wave I and III; Shaded cells represent participants who reported lower PSE at Wave III than at Wave I

^a Unweighted sample size; weighted percentages (95% confidence intervals)

Table 6. Predictors of low Perceived Survival Expectations (PSE)

	Wave I PSE ≤ 50-50 chance n=17408		Wave III PSE ≤ 50-50 chance n=13188	
	n (%) ^a	AOR (95% CI) ^b	n (%) ^a	AOR (95% CI) ^b
Characteristics				
<i>Block group poverty</i>				
≥ 75th percentile (High)	920 (21)	1.28 (1.09, 1.50)	331 (10)	1.25 (1.04, 1.49)
< 75th percentile	1611 (11)	1.00	682 (6)	1.00
<i>County violent crime</i>				
≥ 75th percentile (High)	867 (19)	1.08 (0.91, 1.28)	329 (9)	1.12 (0.90, 1.39)
< 75th percentile	1664 (13)	1.00	684 (7)	1.00
<i>Perceived neighborhood as safe</i>				
No	523 (27)	1.45 (1.19, 1.76)	164 (12)	1.25 (0.96, 1.63)
Yes	2008 (12)	1.00	849 (7)	1.00
Age (years)	---	1.03 (0.99, 1.07)	---	1.05 (1.00, 1.10)
<i>Sex</i>				
Male	1331 (15)	1.34 (1.20, 1.50)	575 (9)	1.87 (1.56, 2.25)
Female	1200 (13)	1.00	438 (5)	1.00
<i>Immigrant Status</i>				
Foreign-born	326 (23)	1.57 (1.24, 1.99)	72 (9)	1.28 (0.84, 1.97)
US born	2205 (13)	1.00	941 (7)	1.00
<i>Race/ethnicity</i>				
White, non-Hispanic	820 (10)	1.00	398 (5)	1.00
Black, non-Hispanic	781 (25)	2.02 (1.71, 2.38)	316 (14)	1.91 (1.50, 2.42)
Hispanic	566 (21)	1.29 (1.02, 1.62)	161 (10)	1.20 (0.80, 1.79)
Asian, non-Hispanic	165 (15)	1.17 (0.80, 1.71)	61 (5)	0.67 (0.41, 1.10)
Other single race, non-Hispanic	56 (21)	1.89 (1.26, 2.85)	21 (11)	1.46 (0.68, 3.15)
Multiracial	143 (15)	1.17 (0.82, 1.65)	56 (7)	0.99 (0.65, 1.52)
<i>Parent's Education</i>				
< High School	604 (27)	2.15 (1.77, 2.62)	197 (13)	1.89 (1.34, 2.67)
High school	702 (16)	1.49 (1.24, 1.79)	288 (8)	1.44 (1.12, 1.87)
Some college	686 (13)	1.38 (1.17, 1.64)	292 (7)	1.33 (1.06, 1.69)
College graduate	539 (8)	1.00	236 (5)	1.00
<i>Violence involvement</i>				
≥ 75th percentile (High)	970 (23)	1.42 (1.29, 1.57)	299 (12)	1.25 (1.14, 1.39)
< 75th percentile	1561 (11)	1.00	714 (6)	1.00
<i>Depressive symptoms</i>				
≥ 75th percentile (High)	995 (26)	2.19 (1.90, 2.52)	406 (15)	2.11 (1.77, 2.53)
< 75th percentile	1536 (11)	1.00	607 (5)	1.00
<i>Self-rated health</i>				
Fair/poor	328 (25)	1.68 (1.29, 2.20)	116 (19)	2.78 (2.05, 3.78)
Good	839 (18)	1.46 (1.25, 1.70)	291 (9)	1.45 (1.09, 1.92)
Very good	820 (12)	1.11 (0.94, 1.30)	354 (6)	1.14 (0.90, 1.44)
Excellent	544 (10)	1.00	252 (5)	1.00

PSE assessed via perceived chances of living to age 35

^a Unweighted sample size; Percentages, Adjusted Odds Ratios (95% Confidence Intervals) are weighted^b PSE ≤ 50-50 chance versus PSE > 50-50 chance; Logistic regression controlled for all listed covariates

Table 7. PSE as a predictor of lower Wave IV educational attainment

	Less than High School vs. \geq College		High School vs. \geq College		Some college vs. \geq College	
	n (%) ^a	AOR (95% CI)	n (%) ^a	AOR (95% CI)	n (%) ^a	AOR (95% CI)
Wave I PSE^b						
\leq A 50-50 chance	270 (17)	1.73 (1.23, 2.44)	425 (24)	1.62 (1.20, 2.17)	876 (42)	1.19 (0.93, 1.54)
A good chance	296 (8)	1.07 (0.83, 1.39)	733 (19)	1.28 (1.07, 1.54)	1917 (43)	1.04 (0.92, 1.19)
Almost certain	450 (7)	1.00	1030 (15)	1.00	3341 (43)	1.00
Wave III PSE^c						
\leq A 50-50 chance	111 (19)	2.76 (1.68, 4.52)	140 (23)	1.94 (1.24, 3.04)	285 (43)	1.68 (1.18, 2.40)
A good chance	116 (8)	0.89 (0.63, 1.27)	292 (21)	1.27 (0.99, 1.63)	710 (42)	1.00 (0.83, 1.20)
Almost certain	370 (8)	1.00	852 (15)	1.00	2661 (42)	1.00

PSE assessed via perceived chances of living to age 35

^a Unweighted sample size; Percentages and Adjusted Odds Ratios (95% Confidence Intervals) are weighted

^b n=13903; Multinomial logistic regression model controlled for age, sex, race/ethnicity, foreign-birth, family structure, parental education, parental public assistance receipt, perceived neighborhood safety and Wave I values for block group poverty rate, parental support/attachment, self-rated health, depressive symptoms, substance use and violence involvement

^c n=8556; Multinomial logistic regression model controlled for the above-listed Wave III equivalent covariates

Table 8. PSE as a predictor of lower Wave IV annual personal earnings

	1st quartile (lowest) vs. 4th quartile		2nd quartile vs. 4th quartile		3rd quartile vs. 4th quartile	
	n (%) ^a	AOR (95% CI)	n (%) ^a	AOR (95% CI)	n (%) ^a	AOR (95% CI)
Wave I PSE^b						
≤ 50-50 chance	642 (36)	1.36 (1.03, 1.79)	486 (27)	1.20 (0.97, 1.49)	397 (21)	1.24 (0.98, 1.58)
A good chance	1073 (27)	0.95 (0.76, 1.18)	1113 (28)	1.04 (0.89, 1.20)	920 (21)	0.90 (0.76, 1.07)
Almost certain	1878 (26)	1.00	1923 (26)	1.00	1869 (24)	1.00
Wave III PSE^c						
≤ 50-50 chance	239 (40)	1.63 (1.09, 2.44)	171 (29)	1.25 (0.84, 1.84)	114 (15)	0.83 (0.56, 1.22)
A good chance	473 (31)	1.23 (0.96, 1.57)	428 (28)	1.09 (0.86, 1.39)	372 (22)	0.98 (0.78, 1.22)
Almost certain	1501 (25)	1.00	1597 (27)	1.00	1556 (24)	1.00

PSE assessed via perceived chances of living to age 35

^a Unweighted sample size; Percentages and Adjusted Odds Ratios (95% Confidence Intervals) are weighted

^b 13602; Multinomial logistic regression model controlled for current student status, age, sex, race/ethnicity, foreign-birth, family structure, parental education, parental public assistance receipt, perceived neighborhood safety and Wave I values for block group poverty rate, parental support/attachment, self-rated health, depressive symptoms, substance use and violence involvement

^c n=8388; Multinomial logistic regression model controlled for the above-listed Wave III equivalent covariates

Table 9. PSE as a predictor of Wave IV material hardships and eviction

	Material hardships		Eviction	
	n (%) ^a	AOR (95% CI)	n (%) ^a	AOR (95% CI)
Wave I PSE^b	N=13883		N=13894	
≤ A 50-50 chance	499 (26)	0.82 (0.67, 1.00)	34 (2.2)	1.59 (0.75, 3.33)
A good chance	854 (21)	0.90 (0.77, 1.04)	37 (0.8)	0.76 (0.44, 1.29)
Almost certain	1435 (19)	1.00	67 (0.9)	1.00
Wave III PSE^c	N=8548		N=8553	
≤ A 50-50 chance	192 (31)	1.42 (1.09, 1.84)	13 (3.0)	2.12 (0.79, 5.69)
A good chance	331 (20)	0.97 (0.80, 1.18)	15 (0.8)	0.78 (0.42, 1.42)
Almost certain	1056 (18)	1.00	41 (0.8)	1.00

PSE assessed via perceived chances of living to age 35

^a Unweighted sample size; Percentages and Adjusted Odds Ratios (95% Confidence Intervals) are weighted

^b Logistic regression model controlled for age, sex, race/ethnicity, foreign-birth, family structure, parental education, parental public assistance receipt, perceived neighborhood safety and Wave I values for block group poverty rate, parental support/attachment, self-rated health, depressive symptoms, substance use and violence involvement

^c Logistic regression model controlled for the above-listed Wave III equivalent covariates

Figure 1. PSE by age

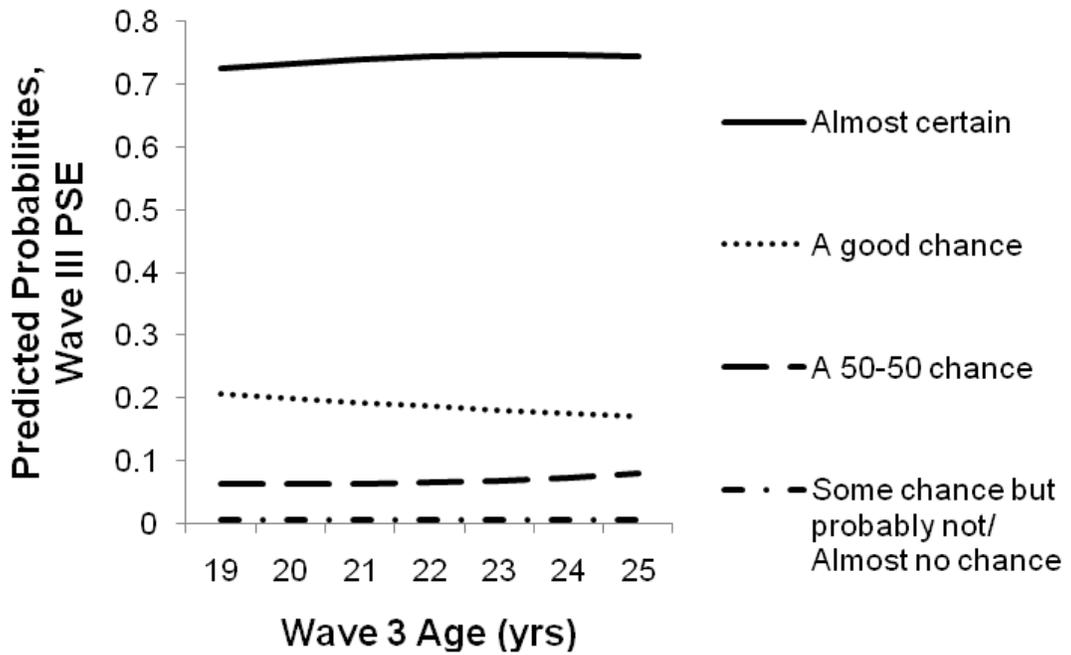
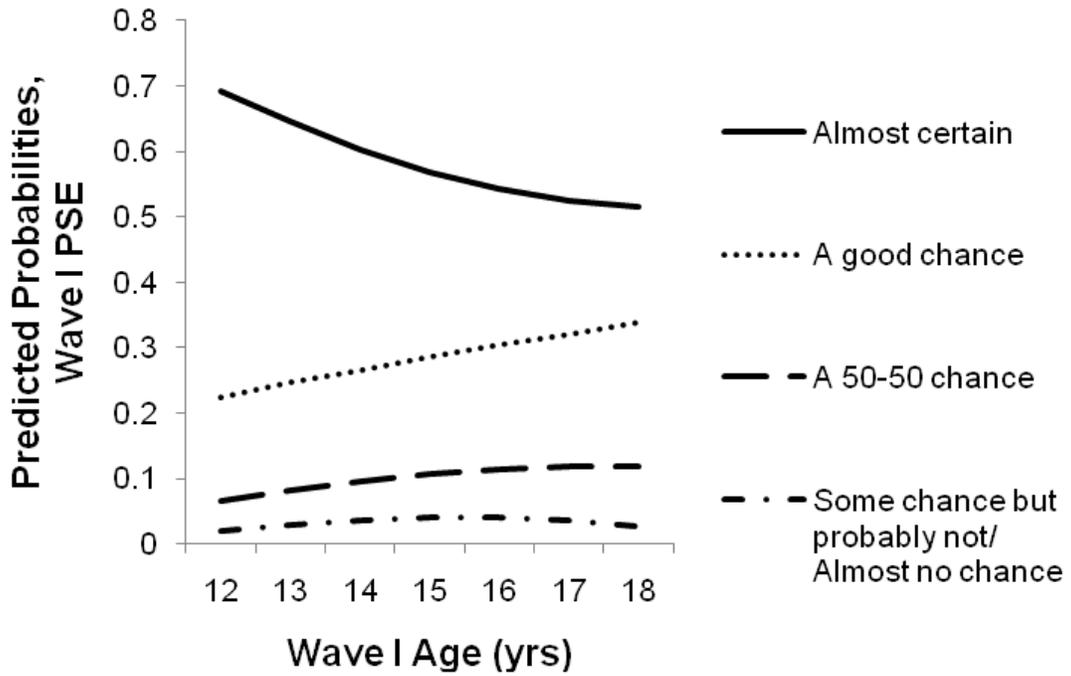
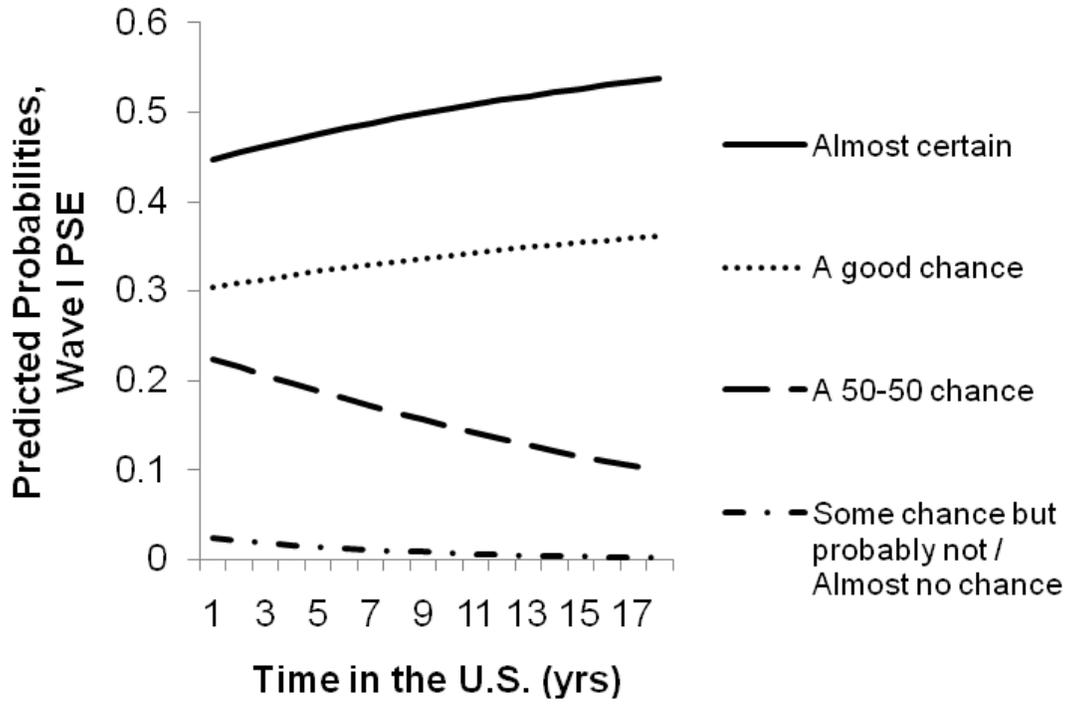


Figure 2. PSE by time in the US



CHAPTER 7

MANUSCRIPT 2

Adolescent Expectations of Early Death Predict Young Adult Risk Behaviors

ABSTRACT

Previous literature connects expectations of early death to risk behaviors in adolescence. We investigated its long-term association with suicidal behavior and substance use in young adulthood. Utilizing the National Longitudinal Study of Adolescent Health, we examined perceived chances of living to age 35 assessed at Wave I (1994-95; mean age 16) and Wave III (2001-02; mean age 22) as predictors of Wave IV (2008; mean age 28) risk behaviors. Controlling for depressive symptoms and other confounders, adolescent expectations of early death predicted increased suicide attempt and ideation. Low perceived chances of living to age 35 were moderately linked to lower episodic binge drinking and marijuana use—behaviors which may be more motivated by social/recreational reasons. However, low perceived chances of living to age 35 predicted smoking \geq a pack/day, exceeding daily limits for moderate drinking, and using illicit substances other than marijuana at least weekly. One in seven adolescents reported expectations of early death. Their high prevalence and long-term ties to wide-ranging detrimental outcomes suggest they may contribute to identifying at-risk youth.

Perceptions of immortality and invincibility have been offered as explanations for heightened risk-taking among youth (25). However, fatalism and perceived vulnerability may also encourage greater recklessness. Cross-sectional studies linked adolescent expectations of early death to risk behaviors like suicide ideation/act, impulsive sensation-seeking, drinking and driving, and selling drugs (14, 15). Studies utilizing data from the National Longitudinal Study of Adolescent Health (Add Health) identified low perceived chances of living to age 35 (which we term Perceived Survival Expectations, PSE) as a predictor of future suicide attempt, fight-related injury, unsafe sexual activity, police arrest and human immunodeficiency virus (HIV) diagnosis (17).

The importance of low PSE is underscored by their prevalence among youth. One in seven adolescents at Wave I of Add Health reported perceiving a 50-50 chance or less of living to age 35 (17). Low PSE may reflect an overall tendency to view the future pessimistically, fatalistically and with resignation. Hopelessness has been linked with violence involvement, substance use and early sexual activity among adolescents (27). As described above, analogous associations have been found for low PSE (17). Hopelessness may impair an individual's abilities to define problems and to formulate and implement their solutions (32). Recently, low PSE were linked to avoidance of problems and acting without considering consequences (93). Essential components of hopelessness include the expectation that desired events will not occur, negative events will occur, and nothing can be done to change the course of these events. Beck's original 20-item true/false hopelessness scale composed of items such as "My future seems dark to me," and "I might as well give up because I can't make things better for myself" (31). There are current movements to incorporate considerations of survival expectations more directly into hopelessness theory. For instance, Bolland added the following item to his hopelessness scale: "I don't expect to live a very long life" (27). Hopelessness has been conceived both as a symptom of depression and also as a subtype of depression.

Suicide and substance use among young adults

Among those 25-34 years old, suicide represents the second leading cause of death (12.3 suicide deaths per 100,000) (94). One-third of suicide attempts result in injuries that require medical attention (48). Additionally, substance use has substantial health costs. Cigarette smoking is the

largest individual cause of preventable deaths and morbidity across the world (95). Alcohol accounts for approximately 3% of global deaths and 4% of disability-adjusted life years (DALYs) (68). Illicit substance use is connected with excess mortality, fatal and non-fatal injuries, motor-vehicle accidents, violence and psychiatric disorders (32).

Extending research on PSE as a predictor of future risk behaviors

Low PSE may not only predict worse adolescent outcomes, but worse trajectories in health with ties to negative outcomes that endure in young adulthood. Utilizing outcome data from Wave IV of Add Health, we assessed the endurance of associations between PSE and suicidal behavior among respondents ages 24-32 years. Low PSE may reflect hopelessness, which is a stronger predictor of suicide than depression (57). Individuals with low PSE may be more apt to believe that their problems are insoluble and to view suicide as the only recourse. Finding that adolescent PSE is predictive of suicidal behavior many years later in young adulthood would highlight its longevity as a risk factor for suicide. It is also important to assess whether such associations persist even after accounting for depressive symptoms and other potentially confounding factors.

Furthermore, low PSE may encourage substance use as a means to cope. Perceptions of a bleak future may also encourage substance use by promoting a disregard of future consequences. Using Add Health data, Duke and colleagues found that adolescents who reported low PSE at Waves I and II were more likely to report past-year illicit substance use compared to those who had high PSE at both waves, although effect measures bordered statistical significance (93). Another Add Health study found Wave I PSE was unrelated to past-year illicit substance at Waves II and III (17). Nonetheless, these studies did not examine the use of legal substances or distinguish marijuana, the most common illicit substance, from other illicit drugs. Approximately three-quarters of illicit drug users report marijuana use (96). The health effects of marijuana are also generally more benign than those of other illicit drugs (23). In addition, these studies did not examine varying levels of use. PSE may predict only a subset of substance use behaviors. For instance, PSE may not predict recreational use, but rather heavy use. Individuals who engage in substance use may do so for a variety of reasons and these reasons may have differential impact on the pattern of substance use.

Drinking for enhancement reasons (e.g. to get high, experience excitement) has been tied to binge drinking and use of illicit substances (10, 58). Alternatively, drinking to cope with problems (e.g., avoid or escape from problems) often involves drinking alone and is most related to the manifestation of drinking problems and alcohol misuse (10, 58, 59).

In assessing PSE as a marker of negative health outcomes, we examined both the predictive capacities of PSE measured at Wave I when respondents were in grades 7-12th and PSE measured at Wave III when respondents were 18-26 years old. Low PSE in adolescence may increase the risk for suicide later in life through the development of cognitive schemas in which negative events are seen as inevitable and desired events are seen as unattainable. Additionally, adolescence is a critical period of vulnerability for experimenting with substances (20). Low PSE held during adolescence may predispose individuals towards risk behaviors and this relationship may continue into adulthood. Nonetheless, adults have more developed risk perceptions compared to adolescents who overestimate the probability of negative events (26). Hence, low PSE at Wave III may be less subject to crude risk perceptions and may signal severe levels of hopelessness.

Study aims and hypotheses

The aim of this study was to examine associations between PSE and future health risk behaviors in young adulthood. This study used data from Add Health to test two hypotheses:

4. Low PSE at Waves I and III will be associated with increased suicidal ideation and suicide attempt at Wave IV.
5. Low PSE at Waves I and III will be associated with increased cigarette smoking, alcohol use, marijuana use and other illicit substance use at Wave IV.

METHODS

Study population

This study utilized data from Add Health, a nationally representative field study of 20,745 U.S. adolescents in grades 7 through 12 during the 1994-1995 school year. The Wave I response rate was 79% (mean age 16) (84). Three in-home follow-up interviews of the cohort have been completed:

Wave II in 1996 (88% of the eligible cohort at Wave I; mean age 16), Wave III in 2001-2002 (77%; mean age 22), and Wave IV in 2008 (80%; mean age 28). By design, high school seniors at Wave I were not re-interviewed at Wave II, but were included in Waves III and IV. At Wave IV, 15,701 respondents aged 24 to 32 years were interviewed. The analytic sample was restricted to respondents with non-missing survey weights (N= 14,800 with Wave IV cross-sectional weights and N= 9,421 with valid longitudinal weights for analyses that use data from Waves I-IV).

Variable coding/definitions

Variable definitions can be found in Table 10. We provide more detailed information for certain variables below. The main predictor of interest is *Perceived Survival Expectations (PSE)*. Respondents were asked at Waves I, II and III, “What are your chances of living to age 35?” Possible responses were: “almost no chance;” “some chance, but probably not;” “a 50-50 chance;” “a good chance” and “almost certain.” Consistent with previous literature, we collapsed PSE equals “50-50 chance” with lower categories (17). We also assessed whether more moderate departures from certainty of living to age 35 (i.e., reporting “a good chance”) were also related to detrimental outcomes.

Outcomes under examination included suicidal behavior and substance use at Wave IV. Both *suicidal ideation* (assessed via the question, “During the past 12 months, have you ever seriously thought about committing suicide?”) and *suicide attempt* (assessed via the question, “During the past 12 months, how many times have you actually attempted suicide?”) were coded dichotomously due to low prevalences of both behaviors (Table 10). All respondents were asked about the number of suicide attempts regardless of their response to the question on suicidal ideation. To investigate whether PSE is differentially related to divergent levels of substance use, we coded substance use with a series of polytomous variables—with the exception of *exceeding recommended daily limits for moderate drinking* which was defined as two or more drinks per day for women and three or more drinks per day for men (97). *Cigarette smoking* had the following levels: A) none, B) less than daily smoking, C) daily smoking but less than a pack a day, and D) at least a pack a day (98). *Binge drinking* was defined as 5/4 [men/women] or more drinks in a row (99). We also investigated

marijuana use and use of illicit substances other than marijuana. Frequency of the latter three outcomes was examined with the following levels: none, monthly or less, 2-3 days/month, at least weekly (Table 10).

Indices were constructed for the following covariates: depressive symptoms, parental attachment/support and religiosity. For each index, scores were calculated by averaging across items composing the index. We required valid responses for two-thirds of questions composing the indices. Internal consistency of items composing the indices was satisfactory with Cronbach's alphas approximately 0.70 or greater. For all variables, higher values indicate greater risk. *Depressive symptoms (Waves I/III)* were measured using items from the Center for Epidemiologic Studies Depression Scale (CES-D), commonly used to assess mental health although not intended as a diagnostic tool for clinical depression (85). At Wave I, 19 items compose the Add Health CES-D instrument. Possible responses to each item ranged from 0 (never or rarely) to 3 (most of the time or all of the time). We excluded the following CES-D items because they may overlap in content with PSE: "You felt life was not worth living" and "You felt hopeful about the future" (reverse coded). Each unit increase in feeling like life was not worth living was associated with a doubling of the odds of Wave I PSE $\leq 50\%$. Likewise, each unit increase in not being hopeful about the future was associated with a 50% increase in odds of Wave I PSE $\leq 50\%$. Hence, at Wave I, 17 items composed our depression scale. At Wave III, 9 CES-D items were available. Father's support/attachment was missing at a high rate (approximately 30%) and missing values were more prevalent for minorities and lower-income individuals. Thus, we used mother's support/attachment to define *parental support/attachment* unless it was missing in which case we used father's support/attachment (4% at Waves I and III) (Table 10).

Statistical analyses

We first calculated prevalence estimates and 95% confidence intervals for PSE, all covariates, and Wave IV outcomes. We then evaluated associations between PSE and Wave IV outcomes, separately for Wave I PSE and Wave III PSE. We investigated the potential effects of Wave I PSE on Wave IV suicidal ideation and attempt (Study Aim 1) using log-binomial regression

models to calculate relative risks. Models controlled for factors, identified through our literature review, associated with or hypothesized to be associated with PSE and suicidal behavior. These factors included: age, sex, race/ethnicity, foreign-birth, family structure, parental education, childhood physical maltreatment, childhood sexual maltreatment as well as Wave I values for family history of suicide, history of suicide among friends, block group poverty, depressive symptoms, religiosity, parental attachment/support, cigarette smoking, binge drinking, illicit drug use and self-rated health (13, 50). We investigated the relationship between Wave III PSE and Wave IV suicidal behavior controlling for the full set of aforementioned covariates with Wave III values where available (i.e., family history of suicide, history of suicide among friends, block group poverty, depressive symptoms, religiosity, parental attachment/support, substance use and self-rated health).

Secondly, we investigated the potential impact of Wave I and Wave III PSE on Wave IV substance use (Study Aim 2). For the dichotomous outcome variable (i.e., exceeding daily limits for moderate drinking), we utilized log-binomial regression models to estimate relative risks. For polytomous outcome variables (i.e., frequency of cigarette smoking; illicit substance use other than marijuana; marijuana use; and binge drinking), we utilized multinomial logistic regression because the Brant test showed violations of the proportional odds assumption (80). In order to investigate whether PSE has an enduring effect on substance use in young adulthood beyond its effects on adolescent substance use (17), we controlled for previous substance use in addition to other risk factors identified through our literature review. Models controlled for covariates related to PSE and substance use and included age, sex, race/ethnicity, foreign-birth, family structure, parental education, childhood physical maltreatment, childhood sexual maltreatment and Wave I/III values for cigarette smoking, binge drinking, illicit substance use, block group poverty, depressive symptoms, religiosity, parental attachment/support and self-rated health (52). All summary statistics were produced using STATA®/SE 10 (StataCorp LP, College Station, TX) and weighted to be representative of U.S. adolescents in grades 7-12 in the 1994-95 school year. This analysis was reviewed by the IRB at the University of North Carolina at Chapel Hill.

RESULTS

Descriptive statistics

Table 10 displays descriptions of variable coding and Table 11 displays summary statistics for all variables used in the study. Among respondents with valid survey weights, missing data for PSE and all Wave IV outcomes was <1%. Missing data for covariates were also low (generally < 2%). Wave III parental attachment/support had the highest rate of missingness (5%). At Wave I, 14% (95% CI: 13, 16) of adolescents in grades 7-12 reported they had \leq 50% chance of living to age 35. However at Wave III, when all respondents were 18 years and older, the proportion reporting PSE \leq 50% notably reduced to 7% (95% CI: 7, 8). At Wave I, the Add Health population was approximately balanced between males and females. Most respondents were white (65%) with large populations of blacks (15%) and Hispanics (11%). At Wave IV, distribution of the sexes and racial/ethnic groups was similar to that at Wave I. However, lower proportions of foreign-born respondents were present at Wave IV (4%) than at Wave I (6%). At Wave IV, 7.2% of respondents had engaged in suicide ideation in the past 12 months and 1.6% had attempted suicide. Approximately 1 in 4 were current daily smokers, of whom about one-third (or 8% of the Add Health Wave IV population) smoked a pack or more a day. While 12% reported binge drinking at least weekly, fewer (2.3%) reported exceeding recommended daily limits for moderate drinking (i.e., up to one drink per day for women and up to two drinks per day for men) (97). Self-reported past-year marijuana use was relatively common (23%) and higher than past-year use of other illicit substances (11%).

PSE as a predictor of Wave IV suicidal behavior

Low PSE at Waves I and III predicted greater risk of suicidal behavior at Wave IV. Reporting that one had a 50-50 chance or less of living to age 35 at Wave I or Wave III versus reporting that one was “almost certain” of living to age 35 was associated with a 30% and 60%, respectively, increase in risk of suicidal ideation at Wave IV (Table 12). Wave I PSE \leq 50% was additionally related to a 74% increase in risk of suicide attempt at Wave IV. Crude rates suggest a relationship between Wave III PSE \leq 50% and suicide attempt at Wave IV (2.9% vs. 1.0%), and although the adjusted relative risk was close to 2.0, it did not reach statistical significance (RR: 1.93; 95% CI: 0.79, 4.69).

Analyses stratified by sex revealed similar magnitudes among males and females for the estimated effects of Wave I PSE on suicidal behavior (not shown). Before adjustment for covariates, Wave III PSE \leq 50% was related to suicidal ideation (RR: 3.60 and 2.00) and suicide attempt (RR: 4.07 and 2.05) among males and females, respectively—albeit with stronger effect measures observed among males. However, after adjustment for concurrent Wave III depressive symptoms and other potential confounders, Wave III PSE was a statistically significant predictor of suicidal ideation and suicide attempt only among males. In multivariate analyses, Waves I/III depressive symptoms, illicit drug use, history of suicide among family or friends and experience of physical or sexual child maltreatment were associated with increased risk of suicide ideation at Wave IV. Waves I/III illicit drug use and history of suicide among family or friends predicted suicide attempt at Wave IV. Additionally, Asians (vs. non-Hispanic whites) were less likely to attempt suicide at Wave IV.

PSE as a predictor of Wave IV substance use

Low PSE was associated with cigarette smoking and illicit substance use other than marijuana, but only at relatively high levels of use. To conserve space, we only show a subset of relationships in Tables 13 and 14. The uncondensed tables are available from the authors upon request. Associations between PSE and substance use were attenuated after controlling for previous substance use. The adjusted odds ratios (AORs) for a) Wave I PSE \leq 50% and b) Wave III PSE \leq 50%, respectively, not controlling for previous substance use (versus controlling for previous substance use) were a) 1.95 (vs. 1.74) and b) 1.47 (vs. 1.40) for *exceeding recommended daily limits for moderate drinking*; a) 1.79 (vs. 1.62) and b) 1.59 (vs. 1.30) for *smoking at least a pack a day*; and a) 1.68 (vs. 1.46) and b) 2.43 (vs. 2.21) for *using illicit substances other than marijuana at least weekly*. However, low Wave I PSE were related to lower binge drinking (AOR: 0.68) and marijuana use (AOR: 0.74) at a rate of monthly or less (Table 14). Wave I PSE also predicted binge drinking 2-3 times a month vs. none (AOR: 0.64). AORs neared the null value for associations between Wave I PSE and marijuana use at a rate of monthly or more (not shown).

When the relationships between Wave III PSE and all Wave IV outcomes were examined adjusting for baseline (Wave I) PSE, effect measures were attenuated but conclusions remained the

same. Analyses stratified by sex revealed no consistent pattern of stronger effect measures for males or females for any substance use outcome examined. In multivariate models, younger age, male sex, previous substance use and lack of religiosity were related to higher substance use at Wave IV. Blacks were less likely to report binge drinking and illicit drug use (other than marijuana) than white, non-Hispanics. The patterning of relationships between Waves I/III depressive symptoms and substance use at Wave IV was similar to that seen for low PSE. For instance, higher depressive symptoms suggested greater adjusted odds of smoking at least a pack a day and using illicit substances other than marijuana at least monthly. Wave I depressive symptoms appear related to lower binge drinking at a rate of less than weekly.

DISCUSSION

To the authors' knowledge, this is the first study to demonstrate that expectations of early death can have long-lasting associations with risk behaviors beyond adolescence and early twenties and independent of depressive symptoms. Detrimental effects were largely confined to low PSE (i.e., $PSE \leq 50\%$) rather than moderately low PSE (i.e., reporting "a good chance" versus being almost certain of living to age 35). $PSE \leq 50\%$ was linked to increased suicidal ideation and suicide attempt during the years of 24-32. Low PSE also predicted smoking at least a pack a day; consuming more than the recommended daily limits for moderate drinking; and using illicit substances other than marijuana at least weekly at Wave IV. Previous Add Health studies may have had difficulty detecting a relationship between low PSE and illicit substance use because marijuana, the most common illicit substance, was not differentiated from other substances. In addition, level of substance use had only been examined as any past-year use. We found that low PSE predicted heavy/regular rather than low levels of use of illicit substances other than marijuana.

An alternative explanation for ties between low PSE and risk behaviors is that individuals who engage in risk behaviors realize the dangers of those behaviors, and hence report lower PSE. Indeed, a previous Add Health study found that risk behaviors were connected with lower PSE (17). In this study, we utilized PSE measured 6-13 years before data on young adult risk behaviors were

collected, and hence these young adult risks behaviors (which had not yet happened) could not be informing reports of low PSE.

Although Wave III PSE was closer in time to Wave IV outcomes than Wave I PSE, low Wave I PSE was a better predictor of Wave IV cigarette smoking and exceeding daily limits for moderate drinking—highlighting the importance of examining adolescent developmental factors on adult outcomes (20). Nonetheless, low Wave III PSE was a better predictor of using illicit substances other than marijuana. Earlier life factors may be important to the prediction of adult smoking and alcohol use given high rates of experimentation and opportunity for the development of substance use disorders in adolescence. Most adult smokers in the U.S. begin smoking before age 18. In addition, 40% of adult alcoholics experience symptoms of alcoholism between 15 and 19 (20).

Unexpectedly, in this study we found that low PSE at Wave I were related to lower frequency of binge drinking and marijuana use. The complexity of motivational factors underlying substance use may help explain the patterning of associations. Episodic binge drinking among young adults may occur with the expectation of positive affective consequences of drinking. Indeed social drinking motives (e.g., drinking to have fun with friends) are the most commonly endorsed drinking motives (58). These drinking motives may be less prevalent among individuals with low PSE, leading to lower rates of binge drinking. In a recent study, Duke and colleagues found that low PSE at Waves I and II predicted lower odds at Wave III of prosocial activities (i.e., hanging out with friends, shopping, creative activities) and civic engagement (i.e., volunteer/community service, political activities, voting) (93). People with low PSE may be more socially isolated. The relatively high prevalence of recreational marijuana use may partly account for why marijuana did not selectively concentrate among those with low PSE (100). Nonetheless, substance use motives were not assessed in Add Health.

Study strengths and limitations

Using nationally representative, longitudinal data, this study found that anticipation of an early death was predictive of select health risk behaviors 6-13 years later among young adults aged 24-32

years. Nonetheless, this study is subject to several limitations. We were unable to assess the influence of numeracy on the reporting of PSE (91). Our ability to examine the relationship between PSE and suicidal behavior was constrained by the exclusion of people who completed suicide. Respondents self-reported their substance use, which may be subject to under-reporting. If under-reporting is related to actual substance use (e.g., if heavier users under-report), this may attenuate observed relationships between PSE and substance. However, Add Health used Computer Assisted Self-Interviewing (CASI) on sensitive questions pertaining to suicide and substance use, which has been shown to increase reporting of drug use and violence compared to a more standard self-administered questionnaire (55). Moreover, our study focused on the examination of prevalent substance use behaviors (which are themselves associated with high health costs) rather than the onset of substance use disorders at Wave IV. It is possible that loss to follow-up may have biased observed relationships although the distribution of demographic characteristics was similar at Wave I and Wave IV, and survey weights adjust for attrition across waves. Finally, while the longitudinal nature of Add Health is superior to cross-sectional surveys which assessed concurrent risk behaviors and survival expectations, and as such do not allow for determination of causal ordering of relationships (14, 15)—the Add Health population differs from the current U.S. population aged 24-32 which has a higher proportion of foreign-born (19% vs. 4% in Add Health) and Hispanics (20% vs. 11% in Add Health) (101). However, it is unclear whether associations between PSE and risk behaviors vary with sociodemographic characteristics.

Study Implications

Anticipation of an early death is not a typical health survey question. However, its demonstrated prevalence among adolescents and its long-term ties to wide-ranging detrimental outcomes suggest it may contribute to identifying at-risk youth beyond measures of depressive symptoms. Recently, Nguyen and colleagues identified low adolescent PSE as a predictor of lower future socioeconomic status in young adulthood even after controlling for background family characteristics (102). PSE may be incorporated into questions pertaining to future orientation, and expectations about work and school. Positive adult connections and increases in self-esteem have

been linked with transitioning out of having expectations of an early death (30). Interventions may decrease hopelessness cognitions and promote positive future orientations by challenging interpretations of events viewed through a depressogenic inferential style and aiding in the development of problem-solving and coping abilities (29). Efforts to delay the onset of alcohol and drug use during adolescence; reduce the quantity consumed; and otherwise alter its pattern of use so as to attenuate its riskiness would lower the burden of substance use and related outcomes (103). The emerging literature on PSE highlights the importance of earlier life factors on adult health and behaviors.

Table 10. Variable Definitions for Manuscript 2

Variable	Question	Responses/Coding	Waves
Perceived Survival Expectations (PSE)	What are your chances of living to age 35?	Almost no chance; Some chance, but probably not; A 50-50 chance; A good chance; Almost certain	I, II, III
Covariates			
Poverty rate	<u>Wave I:</u> Census of Population and Housing 1990; <u>Wave III:</u> Census of Population and Housing 2000	Block group level; %	I, III
Age		Years	I, III, IV
Sex		Male/female	I
Race/ethnicity	1) What is your Hispanic or Latino background? 2) What is your race?	White, non-Hispanic; Black, non-Hispanic; Asian, non-Hispanic; Other, non-Hispanic; Multiracial	I
Foreign-birth	Were you born a U.S. citizen?	Yes/no	I
Parent's education	<u>Parent interview:</u> How far did you go in school? How far did your current (spouse/partner) go in school? <u>Respondent interview:</u> How far in school did [residential mother/father] go?	Highest education achieved by mother or father; If parent interview missing (13%), use respondent's report. Less than high school; High school/GED, Some college/AA degree, ≥ College	I
Family structure		Two biological parents; Two parents; Single parent/other	I
(Lack of) Parental attachment/support	<u>Wave I:</u> 1) Closeness to mother/father, 2) think mother/father is warm and loving, 3) think mother/father care about respondent, 4) satisfaction with communication, and 5) overall satisfaction with relationship; <u>Wave III:</u> 1) enjoy doing things with mother/father, 2) closeness to mother/father, and 3) think mother/father is warm and loving	Cronbach's alpha for Wave I: 0.84; Cronbach's alpha for Wave III: 0.83	I, III
Childhood physical maltreatment	Before your 18th birthday, how often did a parent or adult caregiver hit you with a fist, kick you, or throw you down on the floor, into a wall, or down stairs	0 = None; 1= One time; 2 = 2 times; 3 = 3 to 5 times; 4 = 6 to 10 times; 5= >10 times	IV

Childhood sexual maltreatment	Before your 18th birthday, how often did a parent or other adult caregiver touch you in a sexual way, force you to touch him or her in a sexual way, or force you to have sexual relations?	0 = None; 1= One time; 2 = 2 times; 3 = 3 to 5 times; 4 = 6 to 10 times; 5= >10 times	IV
Family history of suicide	1) Have any of your family members tried to kill themselves during the past 12 months? 2) Have any of them died as a result?	1=Suicide attempt resulted in death; 2= Suicide attempt but no death (referent = No suicide attempt)	I, III
History of suicide among friends	1) Have any of your friends tried to kill themselves during the past 12 months? 2) Have any of them died as a result?	1=Suicide attempt resulted in death; 2= Suicide attempt but no death (referent = No suicide attempt)	I, III
Depressive symptoms	<u>Wave I:</u> 17 Center for Epidemiologic Studies Depression Scale items (CES-D); <u>Wave III:</u> 9 CES-D items	Cronbach's alpha for Wave I: 0.86; Cronbach's alpha for Wave III: 0.80	I, III
(Lack of) Religiosity	1) attendance of religious services, 2) attendance of activities offered by places of worship (i.e., choir, Bible classes), 3) importance of religion	Cronbach's alpha for Wave I: 0.70; Cronbach's alpha for Wave III: 0.75	I, III
Self-rated health	In general, how is your health?	Fair/poor; Good; Very good; Excellent	I, III
30-day Cigarette use	During the past 30 days, on how many days did you smoke cigarettes?	0 to 30 days	I, III
Illicit drug use	<u>Wave I:</u> How old were you when you tried 1) marijuana 2) cocaine, 3) any other type of illegal drug? <u>Wave III:</u> In the past year, have you used 1) marijuana, 2) cocaine, 3) crystal meth, 4) any other type of illegal drugs?	<u>Wave I:</u> Any lifetime illicit drug use vs. None; <u>Wave III:</u> Any 12-month illicit drug use vs. None	I, III
12-month Binge drinking	Over the past 12 months, on how many days did you drink five or more drinks in a row?	Range 0 (never) to 6 (every day or almost every day)	I, III
Wave IV Outcomes			
Suicide ideation	During the past 12 months, have you ever seriously thought about committing suicide?	Yes/no	IV
Suicide attempt	During the past 12 months, how many times have you actually attempted suicide?	Any vs. None	IV
Cigarette smoking	1) During the past 30 days, on how many days did you smoke	None; Less than daily smoking; Daily smoking	IV

	cigarettes? 2) During the past 30 days, on the days you smoked, how many cigarettes did you smoke each day?	(1 to 19 cigarettes a day; Smoking at least a pack a day (≥ 20 cigarettes)	
12-month illicit substance use (other than marijuana)	During the past 12 months, on how many days did you use favorite drug? (excludes marijuana)	None; \leq Monthly; 2-3 Days a month; \geq Weekly	IV
Exceeds daily limits for moderate drinking ^a	1) During the past 12 months, on how many days did you drink alcohol? 2) How many drinks did you usually have each time?	Yes/No; <u>Women</u> : 2 or more drinks daily; <u>Men</u> : 3 or more drinks daily	IV
12-month Binge drinking	During the past 12 months, on how many days did you 5/4 [men/women] or more drinks in a row?	None; \leq Monthly; 2-3 Days a month; \geq Weekly	IV
12-month Marijuana use	During the past 12 months, on how many days did you use marijuana?	None; \leq Monthly; 2-3 Days a month; \geq Weekly	IV

^aDepartment of Health and Human Services and the Department of Agriculture. (2005). Dietary Guidelines for Americans 2005

Table 11. Descriptive Statistics for Manuscript 2

	Wave I (1994-95)		Wave II (1996)		Wave III (2001-02)		Wave IV (2008)	
	n	% (95% CI) or Mean (SD) ^a	n	% (95% CI) or Mean (SD) ^a	n	% (95% CI) or Mean (SD) ^a	n	% (95% CI) or Mean (SD) ^a
PSE								
Almost certain	10250	57 (55, 59)	7016	54 (52, 56)	10309	74 (72, 75)		
A good chance	5775	29 (28, 30)	4336	31 (29, 32)	2817	19 (18, 20)		
A 50-50 chance	2065	11 (10, 12)	1670	12 (11, 13)	1020	7 (6, 8)		
Some chance but probably not	439	2 (2, 3)	325	2 (2, 3)	63	0.4 (0.3, 0.5)		
Almost no chance	257	1 (1, 2)	169	1 (1, 2)	30	0.2 (0.1, 0.3)		
Covariates								
Age (years)	18919	16 (2)					14800	28 (2)
Male	9288	51 (50, 52)					6930	51 (49, 52)
<i>Race</i>								
White, non-Hispanic	9608	65 (59, 70)					7849	66 (60, 71)
Black, non-Hispanic	3790	15 (11, 19)					2975	15 (12, 20)
Hispanic	2993	11 (8, 15)					2168	11 (8, 15)
Asian, non-Hispanic	1247	3 (2, 5)					836	3 (2, 5)
Other, non-Hispanic	270	1 (1, 2)					182	1 (1,2)
Multiracial	936	4 (3, 5)					729	4 (3, 5)
Foreign-born	1746	6 (5, 9)					928	4 (3, 6)
<i>Parent's education</i>								
Less than high school	2527	13 (10, 15)						
High school/GED	4704	28 (25, 30)						
Some college/AA degree	5333	30 (28, 31)						
College or greater	6011	30 (27, 34)						
<i>Family structure</i>								
Two biological parents	9686	53 (51, 56)						
Two parents	3444	17 (16, 18)						
Single parent/other	5794	29 (27, 32)						
Block group poverty rate	18627	12 (13)					14027	11 (12)
Parental support, Range [1,5]	18526	1.6 (0.6)					13661	1.5 (0.7)
<i>12-mos family history</i>								

<i>of suicide</i>							
No suicide attempt	17862	95 (95, 96)			13517		97 (97, 98)
Suicide attempt	658	4 (3, 4)			290		2 (2, 2)
Suicide attempt resulted in death	170	1 (1, 1)			100		1 (1, 1)
12-mos history of suicide among friends							
No suicide attempt	15429	82 (81, 83)			12963		93 (92, 93)
Suicide attempt	2690	15 (14, 16)			601		4 (4, 5)
Suicide attempt resulted in death	542	3 (2, 4)			334		3 (2, 3)
Depressive symptoms, Range [0, 3]	18880	0.6 (0.4)	14314	0.5 (0.5)			
(Lack of) Religiosity, Range [1, 4]	18862	2.5 (1.0)			14114		3.0 (0.7)
Self-rated health							
Fair/poor	1339	7 (6, 8)	650	5 (4, 5)			
Good	4832	26 (25, 27)	3149	22 (21, 23)			
Very good	7431	39 (38, 40)	5805	41 (40, 42)			
Excellent	5300	28 (27, 29)	4716	32 (31, 34)			
30-day Cigarette use, Range [0, 30]	18796	5 (10)	14275	9 (13)			
Illicit drug use	5593	30 (27, 32)	4580	34 (32, 36)			
12-mos Binge drinking, Range [0, 6]	18875	0.7 (1.3)	14262	1.3 (1.6)			
Childhood physical maltreatment, Range [0, 6]					14627		0.5 (1.3)
Childhood sexual abuse, Range [0, 6]					14651		0.1 (0.7)
Wave IV Outcomes							
12-mos							7.2 (6.5,

Suicide ideation	972	7.9
12-mos Suicide attempt	203	1.6 (1.2, 2.0)
<i>Cigarette smoking</i>		
None	9468	61 (59, 63)
Less than daily	2063	14 (13, 15)
1-19 cigarettes/day	2164	16 (15, 18)
A pack or more a day	972	8 (7, 9)
<i>12-mos ≥ Illicit drug use</i>		
None	13339	89 (88, 90)
Monthly or less	784	6 (5, 7)
2-3 days/month	248	2 (2, 2)
Weekly or more	420	3 (3, 4)
Exceeds daily limits for moderate drinking	333	2.3 (2.0, 2.6)
<i>12-mos ≥ Binge drinking</i>		
None	7855	50 (48, 53)
Monthly or less	4009	28 (27, 30)
2-3 days/month	1243	9 (8, 10)
Weekly or more	1637	12 (11, 13)
<i>12-mos ≥ Marijuana use</i>		
None	11548	77 (75, 79)
Monthly or less	1368	9 (8, 10)
2-3 days/month	341	3 (2, 3)
Weekly or more	1522	11 (10, 12)

PSE= Perceived Survival Expectations. Assessed via: "What are your chances of living to age 35?"

^a Unweighted sample size. Means (Standard Deviations), Percentages (95% Confidence Intervals) are weighted

Table 12. PSE as a predictor of Wave IV suicidal behavior

	Suicidal ideation		Suicide attempt	
	n (%) ^a	RR (95% CI)	n (%) ^a	RR (95% CI)
Wave I PSE^b		<i>N = 13581</i>		<i>N = 13585</i>
≤ A 50-50 chance	159 (9.8)	1.29 (1.03, 1.62)	40 (2.4)	1.74 (1.00, 3.02)
A good chance	286 (8.1)	1.28 (1.05, 1.55)	58 (1.7)	1.48 (0.93, 2.35)
Almost certain	437 (5.8)	1.00	77 (1.0)	1.00
Wave III PSE^c		<i>N = 8177</i>		<i>N = 8177</i>
≤ A 50-50 chance	65 (14.0)	1.61 (1.14, 2.28)	14 (2.9)	1.93 (0.79, 4.69)
A good chance	110 (7.9)	1.19 (0.92, 1.54)	24 (1.6)	1.50 (0.85, 2.66)
Almost certain	351 (6.0)	1.00	64 (1.0)	1.00

PSE= Perceived Survival Expectations. Assessed via: "What are your chances of living to age 35?"

^a Unweighted sample size; Percentages, Relative Risks (95% Confidence Intervals) are weighted

^b Log-binomial regression model controlled for age, sex, race/ethnicity, foreign-birth, parental education, family structure, childhood physical maltreatment, childhood sexual abuse and Wave I values for block group poverty, family history of suicide, history of suicide among friends, depressive symptoms, religiosity, parental attachment/support, cigarette smoking, binge drinking, illicit drug use and self-rated health

^c Log-binomial regression model controlled for the above-listed Wave III equivalent covariates

Table 13. PSE as a predictor of Wave IV substance use

	Log binomial regression (Dichotomous outcome) Exceeds recommended daily limits for moderate drinking ^a		Multinomial logistic regression (Polytomous outcome, only one comparison shown) Smoking at least a pack a day (≥ 20 cigarettes) vs. None			
	n (%) ^b	RR (95% CI)	n (%) ^a	AOR (95% CI)	n (%) ^a	AOR (95% CI)
Wave I PSE^b	N= 13726		N=13683		N= 13737	
≤ A 50-50 chance	61 (4.0)	1.74 (1.12, 2.68)	168 (13)	1.62 (1.19, 2.19)	79 (4.7)	1.46 (1.01, 2.10)
A good chance	79 (1.9)	0.88 (0.61, 1.26)	254 (8)	1.02 (0.78, 1.35)	115 (3.5)	1.30 (0.98, 1.73)
Almost certain	168 (2.1)	1.00	464 (7)	1.00	192 (2.5)	1.00
Wave III PSE^c	N=8432		N=8404		N= 8439	
≤ A 50-50 chance	23 (3.2)	1.40 (0.78, 2.49)	58 (14)	1.30 (0.79, 2.14)	35 (7.8)	2.21 (1.31, 3.72)
A good chance	41 (2.8)	1.17 (0.79, 1.74)	97 (8)	1.07 (0.76, 1.52)	44 (3.2)	1.09 (0.63, 1.88)
Almost certain	120 (2.0)	1.00	366 (7)	1.00	157 (2.6)	1.00

PSE= Perceived Survival Expectations. Assessed via: "What are your chances of living to age 35?"

^a Unweighted sample size; Percentages, Adjusted Odds Ratio (95% Confidence Intervals) are weighted

^b Model controlled for age, sex, race/ethnicity, foreign-birth, parental education, family structure, childhood physical abuse, childhood sexual abuse and Wave I values for cigarette smoking, binge drinking, illicit drug use, block group poverty, depressive symptoms, religiosity, parental attachment/support and self-rated health

^c Model controlled for the above-listed Wave III covariates

Table 14. PSE as a predictor of Wave IV binge drinking and marijuana use

Multinomial logistic regression (Polytomous outcome, only one comparison shown)				
Binge drinking (≤ Monthly vs. None)			Marijuana use (≤ Monthly vs. None)	
	n (%) ^a	AOR (95% CI)	n (%) ^a	AOR (95% CI)
Wave I PSE^b			N= 13729	
≤ A 50-50 chance	390 (20)	0.68 (0.56, 0.83)	137 (7)	0.74 (0.56, 0.99)
A good chance	1140 (30)	1.05 (0.93, 1.18)	380 (9)	0.94 (0.78, 1.14)
Almost certain	2278 (31)	1.00	760 (10)	1.00
Wave III PSE^c			N= 8437	
≤ A 50-50 chance	147 (24)	0.79 (0.57, 1.09)	57 (12)	1.16 (0.79, 1.69)
A good chance	435 (28)	0.91 (0.75, 1.10)	133 (9)	0.82 (0.62, 1.08)
Almost certain	1860 (31)	1.00	621 (10)	1.00

PSE= Perceived Survival Expectations. Assessed via: "What are your chances of living to age 35?"

^a Unweighted sample size; Percentages, Adjusted Odds Ratio (95% Confidence Intervals) are weighted

^b Model controlled for age, sex, race/ethnicity, foreign-birth, parental education, family structure, childhood physical abuse, childhood sexual abuse and Wave I values for cigarette smoking, binge drinking, illicit drug use, block group poverty, depressive symptoms, religiosity, parental attachment/support and self-rated health

^c Model controlled for the above-listed Wave III covariates

CHAPTER 8

OVERALL CONCLUSIONS & INTERPRETATION OF FINDINGS

The literature on expectations of an early death among youth is sparse, but growing. Previous literature has found that PSE is predicted by factors such as home gun access, engagement in violence, HIV diagnosis, depressive symptoms as well as parental unemployment (13)—suggesting that PSE may reflect perceived endangerment, vulnerability and mental health. PSE has also been identified as a marker for detrimental outcomes in adolescence and early adulthood (14-17, 33). Modes of intervention are suggested by results finding that transitioning out of low PSE is related to increased self-esteem and connection and caring by adult figures (30). Utilizing nationally representative, longitudinal data this study supplements existing research on: 1) PSE as a marker of future adult outcomes, 2) changes in PSE, and 3) predictors of PSE.

Summary of findings

We found that low PSE in adolescence and early adulthood predicted lower education attainment and personal earnings among respondents aged 24-32—even after controlling for previous family SES and corresponding depressive symptoms in adolescence and early adulthood that may be correlated with PSE and with young adult outcomes. Furthermore, we found that low PSE predicted suicidal behavior and heavy/regular use of certain substances in young adulthood—specifically smoking at least a pack a day, exceeding daily limits for moderate drinking, and using illicit substances other than marijuana at least weekly. However, low PSE was correlated with lower episodic marijuana use and binge drinking. The motives for substance use are diverse. Although we hypothesized low PSE would motivate substance use as a means to cope, social/recreational motives

for substance use are prevalent (58) and these motives may be less common among people with low PSE.

Additionally, while Wave III PSE (respondents 18+ years) was a better predictor of future SES than Wave I PSE (respondents 7-12 graders), Wave I PSE was a better predictor of cigarette smoking and heavy daily drinking at Wave IV. This may signal different critical periods and pathways for different behavioral outcomes. The years between 18 and 22 are critical years of higher education and training. Conversely, adolescence is a critical period for experimentation and risk taking. PSE has been shown to increase health detrimental behaviors during adolescence. The establishment of a predisposition towards risk taking may increase the likelihood of later-life risk taking in adulthood. We also found that PSE was a stronger predictor of SES among females than males—which may suggest greater influence of psychological factors on achievement among females. For instance, depression is more strongly linked to educational achievement among females than males (35).

In addition, this study identified age-related changes in PSE. At Wave I, older aged adolescents had lower PSE compared to their younger peers. This may reflect greater perceived vulnerability associated with greater exposure to adult experiences including violence exposure and substance use. However, at Wave III when respondents were 18 years and older, PSE was similar across the various ages. Also, at Wave III, most people reported high PSE or higher PSE compared to their reports at Wave I. Among the foreign-born, PSE increased with time spent in the U.S. Greater length of stay in the U.S. may allow for increases in family socioeconomic status as well as adaptation and familiarity with American culture and systems (83, 104) which may, in turn, decrease uncertainty and anxiety about the future. Respondents living in neighborhoods with high poverty had twice the rate of low PSE at Waves I (21% vs. 11%) and III (10% vs. 6%) compared to those living in neighborhoods with lower poverty rates.

Conclusions

This research addresses three key issues: first, anticipation of an early death is not an uncommon phenomenon among American adolescents, suggesting that characterizations of

adolescence as a time of perceived invulnerability may be inaccurate. Increased awareness of pessimistic mortality expectations of adolescents may renew interest in exploring novel predictors of health damaging behaviors. Perceptions of immortality and invincibility have been offered as explanations for heightened risk-taking (8). However, perceived endangerment, fatalism, and vulnerability may also encourage greater recklessness. Increased awareness of adolescents' pessimistic interpretations of the future may renew interest in exploring novel predictors of health damaging behaviors.

Second, the origins of PSE may be multi-faceted involving structural (e.g. neighborhood poverty), family (e.g. parental education), and individual factors (e.g. violence involvement, depressive symptoms). Negative events, poorly resourced and dangerous environments, and personal cognitive vulnerabilities may put adolescents at risk for believing that their futures are limited.

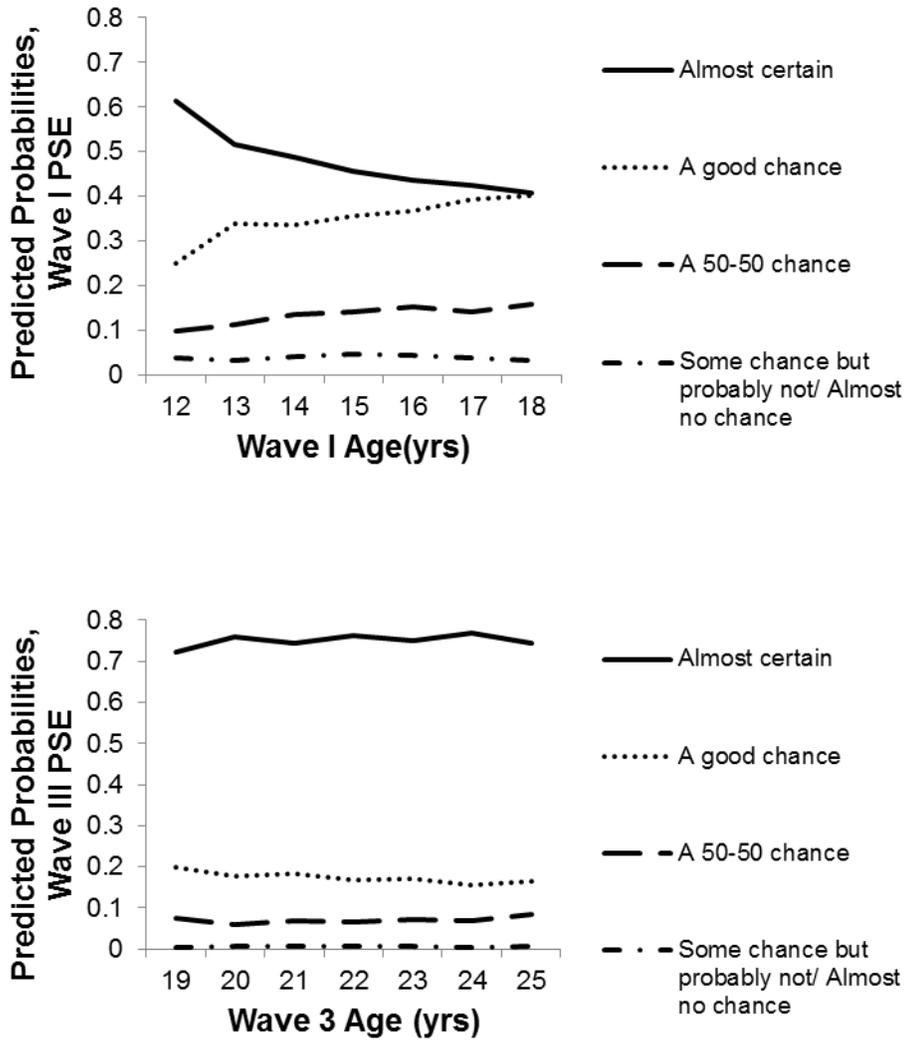
Third, low PSE is predictive of future detrimental health outcomes and behaviors years after its report. PSE may be a marker of downward trajectories; a proxy for hopelessness related to negative outcomes through passivism and fatalism as a response to adversity.

Implications of research

Screening for PSE along with other psychosocial factors may assist in the identification of at-risk youth. Continued efforts are needed to equip youths with the necessary skills and resources (e.g., through problem-solving and coping skills training) to meet the demands of their daily lives and enable a belief in a better future. In addition, making environments conducive to healthy youth development is warranted. Such efforts may include investment in public education (24), through greater numbers of teachers, reduced class sizes, after-school programs, and improvements in school infrastructure. Furthermore, lowering the numbers of families living in poverty is a long-standing and critical issue (88). The emerging literature on expectations of an early death emphasizes the need for circumstances that promote healthy youth development.

APPENDIX A: PSE by Age

Figure 1. A) Predicted probabilities for Wave I Perceived Survival Expectations (PSE) by Wave I age and age-squared (n=18326), B) Predicted probabilities for Wave III PSE by Wave 3 age and age-squared (n= 14016).



APPENDIX B: PSE as a Predictor of Wave IV Hopelessness

Table 1. PSE as a predictor of Wave IV hopelessness, Add Health

	4th quartile (highest)		3rd quartile	2nd quartile	1st quartile (lowest)
	n	% (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
Wave I PSE^a					
≤ A 50-50 chance	2073	40 (37, 43)	2.70 (2.19, 3.32)	1.66 (1.35, 2.04)	1.22 (0.95, 1.56)
A good chance	4475	31 (29, 33)	1.75 (1.52, 2.01)	1.43 (1.23, 1.66)	1.31 (1.13, 1.51)
Almost certain	8114	24 (23, 26)	1.00	1.00	1.00
Wave III PSE^b					
≤ A 50-50 chance	726	44 (39, 49)	2.62 (1.94, 3.55)	1.48 (1.06, 2.06)	1.21 (0.88, 1.67)
A good chance	1847	35 (32, 38)	1.81 (1.48, 2.22)	1.29 (1.03, 1.61)	1.26 (0.99, 1.61)
Almost certain	6765	25 (23, 26)	1.00	1.00	1.00

^aN=14662; Multinomial logistic regression model

^bN=9303; Multinomial logistic regression model controlled for Wave I PSE

Hopelessness (Wave IV). An index was constructed from five questions which incorporated negative feelings about oneself and the future. These questions are similar to the questions in Beck's hopelessness scale. Items included: 1) always optimistic about my future; 2) hardly ever expect things to go my way; 3) expect more good things to happen to me than bad; 4) rarely count on good things happening to me; 5) there is little I can do to change the important things in my life. Responses ranged from 1 (strongly agree) to 5 (strong disagree) and were summed to create the index. Positive items were reverse coded so that higher scores indicate greater hopelessness (Cronbach's alpha = 0.68).

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