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The Influence of Social Adjustment on Normative and Risky Health Behaviors in Emerging Adults With Spina Bifida

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Objective: To understand the rates of normative and risky health behaviors and the influence of prior and current social adjustment on health risk behaviors in emerging adults with spina bifida (SB). ***Method:*** These data are part of a larger longitudinal study of youth with SB; at ages 18–19, 50 emerging adults with SB and 60 typically developing (TD) youth participated. Social adjustment was measured at ages 12/13, 14/15, 16/17, and 18/19. Substance use and sexual activity were self-reported by emerging adults. ***Results:*** The SB group reported similar frequencies (i.e., number of days in the previous month) of cigarette and marijuana use. Fewer individuals with SB reported initiation of both alcohol use (i.e., ever used) and sexual activity (i.e., ever had sex) compared to TD peers. The SB group also reported less frequent alcohol use and fewer sexual partners. Better social adjustment during early adolescence (ages 12/13) predicted more frequent alcohol use and a greater number of sexual partners for all youth. Social adjustment also mediated the effect of group status on health risk behaviors. ***Conclusions:*** Emerging adults with SB lag behind TD peers in terms of normative initiation of alcohol use and sexual activity. However, this population participates in some risky health behaviors at similar rates compared to their TD peers (e.g., smoking). Youths' health risk behaviors may be influenced by their level of social adjustment. A challenge for future interventions for this population will be finding methods of improving social functioning without increasing the rate of health risk behavior.

Keywords: spina bifida, substance use, sexual activity, social adjustment, emerging adulthood

Emerging adulthood (ages 18–25) is a distinct developmental period characterized by dramatic change and exploration, as young people examine life choices and make important decisions regarding self-identity and independence (Arnett, 2000). Although initiation of alcohol use and sexual intercourse are normative behaviors achieved during this developmental period, emerging adulthood is marked by increases in risk behaviors, including frequent substance use and risky sexual behavior (Arnett, 2000). According to recent longitudinal research, health risk behaviors begin in adolescence, peak in the early 20s, and subsequently level off following marriage and parenthood (Mahalik et al., 2013).

Health risk behaviors may be defined as any activity undertaken with a frequency or intensity that increases risk of disease or injury (Steptoe & Wardle, 2004). However, the line between what is normative behavior and what is risky behavior may be blurred, particularly during late adolescence and early adulthood. Experimentation with smoking, drinking, sexual activity, and illicit drug use can be part of normative psychosocial development, and instrumental in achieving certain goals. Such goals include gaining peer acceptance, establishing autonomy, and affirming the transition from adolescence into emerging adulthood (Jessor, 1991). Youth who engage in some drug experimentation may even be better adjusted than those who do not (Shedler & Block, 1990). Nevertheless, physical and social consequences of engaging in risky behaviors have been clearly documented.

Several theoretical models have been posited to explain the emergence of health risk behaviors in typically developing (TD) youth. Jessor (1991) provided a well-known psychosocial framework for understanding risk and protective factors for the emer-

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gence of risk behaviors, including biological factors (e.g., higher intelligence, family history of substance abuse), the social environment (e.g., low socioeconomic status), the perceived environment (e.g., peer models of deviant or nondeviant behaviors), adolescents' personality (e.g., low self-esteem), and other behaviors (e.g., involvement in school activities and clubs).

With a focus on the connection between perceived environment and risk behavior, researchers have noted that youths' health risk behaviors are greatly influenced by the behaviors of their close friends, as well as their perceptions of the attitudes and behaviors of the larger peer group (La Greca, Bearman, & Moore, 2002). Although popularity and social acceptance have generally been accepted as positive outcomes for youth, recent theoretical and empirical work suggests that stronger socialization and associated popularity status lead to positive *and* negative behaviors that are valued by the larger peer group (Allen, Porter, McFarland, Marsh, & McElhaney, 2005). This popularity-socialization hypothesis also aligns with the Prototype-Willingness Theory (Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008), which suggests that children and adolescents reference social norms in order to understand how peers reward certain behaviors. These norms, as well as friends' behaviors, influence their willingness to engage in risk behaviors. This theory favors a social reactionary path to health behaviors, rather than a reasoned decision-making path, in which adolescents' willingness (vs. intentions) to engage in a behavior is predictive of their actual engagement (Gerrard et al., 2008). A recent evaluation of these models by Prinstein, Choukas-Bradley, Helms, Brechwalk, and Rancourt (2011) found that higher levels of peer-rated popularity predicted cigarette use, marijuana use, and sexual risk behavior among TD adolescents in the 10th and 11th grade.

The majority of research on substance use and sexual activity in emerging adulthood has focused on TD youth. Comparatively little is known about normative and risky health behaviors in youth with disabilities or chronic illnesses, such as spina bifida (SB). SB is a relatively common congenital birth defect (18 out of every 100,000 live births in 2005; Centers for Disease Control and Prevention [CDC], 2008) that is caused by the failed closure of one or more vertebrae during the early weeks of gestation. SB is associated with a number of complications, including paralyzed lower extremities, urinary and bowel incontinence, and hydrocephalus. Along with striving to achieve normative developmental milestones during emerging adulthood, young adults with SB must also manage a number of illness-related challenges, including self-care demands, impaired cognitive abilities, social difficulties, and medical problems (Zukerman, Devine, & Holmbeck, 2011).

Research that compares the prevalence of health risk behaviors in youth with chronic illnesses to TD peers has yielded mixed findings. Some studies have found that youth with chronic illnesses participate in health risk behaviors at higher rates than their peers, while others have found the opposite trend. One study that included a mixed sample 760 adolescents with chronic health conditions reported that youth were more likely to smoke cigarettes and to be current marijuana users compared to a sample of 6,493 adolescents without a health condition (Surís, Michaud, Akre, & Sawyer, 2008). Similarly, Blum, Kelly, and Ireland (2001) found that adolescents with disabilities were more likely to have sexual intercourse before the age of 12 and regularly smoke cigarettes compared to their peers. In youth with asthma, studies have revealed that adolescents with this condition are more likely to smoke cigarettes than TD peers (Precht, Keiding, & Madsen, 2003; Zbikowski, Klesges, Robinson, & Alfano, 2002). Such investigators have posited that the stress of managing a chronic health condition, as well as the normative challenges of adolescence and young adulthood, may contribute to higher levels of emotional distress and increased health risk behavior (Erickson, Patterson, Wall, & Neumark-Sztainer, 2005).

However, the frequency and type of health risk behavior may vary according to whether the illness is sudden and/or life threatening, or a lifelong congenital disorder. Studies utilizing mixed samples of youth with chronic illnesses (e.g., Surís et al., 2008 cited above) may not accurately capture the unique variability in health risk engagement that exists between pediatric illnesses. Findings that suggest that chronic illness is associated with *increased* health risk behavior may be attributed to the inclusion of youth with recent, life-threatening diagnoses (e.g., pediatric cancer) and/or conditions characterized by oscillating periods of illness and health (e.g., pediatric asthma). Contrary to the notion of the cumulative negative impact of a chronic illness, certain congenital pediatric illness groups may actually show *resiliency* to emotional distress. In fact, literature on family functioning in youth with SB supports a resiliency-disruption model (Costigan, Floyd, Harter, & McClintock, 1997; Holmbeck, Coakley, Hommeyer, Shapera, & Westhoven, 2002), such that children with SB demonstrate areas of resiliency as well as vulnerability. In support of this model, one study found that rates of experimentation (56%) and current smoking (22%) did not differ between adolescents and young adults with and without Type 1 diabetes. Additionally, a survey of 116 adolescents with cystic fibrosis and 205 adolescents with sickle cell disease indicated that, although sexual intercourse and substance use occurred in both disease groups, chronically ill teens reported significantly less lifetime and current use of substances (i.e., alcohol, tobacco, and marijuana) and less sexual intercourse compared to matched groups of TD youth (Britto et al., 1998). Thus, for several reasons, there may be some advantage to conducting studies of single illness groups. Further, although the majority of research indicates that youth with long-term or lifelong pediatric illnesses report lower or similar rates of substance use compared to peers, even low to moderate levels of substance use may have a negative impact on the course of youths' illness, particularly for certain illness groups. For example, one study found that approximately 50% of adolescents with diabetes mellitus had tried alcohol and 25% were ongoing users, even though alcohol is associated with glucose regulation problems among these youth (Vanelli et al., 1997).

Few investigations have examined normative or risky health behaviors in youth with SB; most studies have focused only on the initiation of sexual activity, which is typically expected by emerging adulthood. Although neural tube defects can result in disturbances of sexual and reproductive function, most individuals still have an interest in sex. One study reported that 22% of young adults with SB (ages 16 to 25 years, M age = 20.8) have had sexual intercourse (Verhoef et al., 2005), compared to 47% of TD high school youth (CDC, 2012). The age of onset of normative and risky health behaviors is frequently older for chronically ill youth (Britto et al., 1998), and recent research has indicated that emerging adults with SB lag behind their peers in terms of achieving certain milestones, such as leaving home, attending college, em-

ployment, and romantic relationship experience (Zukerman et al., 2011). As a logical extension of this research, emerging adults with SB may also lag behind in terms of developmentally normative experimentation with alcohol and sexual intercourse. Beyond experimentation, there is a paucity of studies that have investigated salient health risk behaviors in adolescents and young adults with SB, including frequent drug and alcohol use.

Finally, because peer relationships and popularity influence health risk behaviors of TD children, adolescents, and young adults, it is important to study social acceptance and health risk behaviors in youth with chronic illnesses. Adolescents may be influenced by perceived pressures from the larger peer group to "fit in," and this pressure may be particularly difficult to manage for youth with SB, who already feel different by virtue of their illness (La Greca et al., 2002). In this way, children and adolescents with SB may be particularly susceptible to peer pressure. On the other hand, these youth are often socially isolated (Blum, Resnick, Nelson, & St. Germaine, 1991), providing less opportunity for peer group conformity and peer pressure. Further, youth with SB are at risk for experiencing social difficulties; an accumulating body of research has indicated that this population may have higher rates of social immaturity (Holmbeck et al., 2003) and smaller social networks compared to TD youth (Ellerton, Stewart, Ritchie, & Hirth, 1996). Youth with SB generally have fewer close peer relationships, and may experience lower levels of companionship and security in their friendships (Devine, Holmbeck, Gayes, & Purnell, 2012). Thus, although the physical and social sequelae of SB may have a number of disadvantages, they may also protect youth against engagement in health risk behaviors by limiting social-behavioral opportunities (Verrill, Schafer, Vannatta, & Noll, 2000). However, to our knowledge, there is currently no data on the potential protective impact of social adjustment difficulties on health risk behaviors in this population.

The current study had three main objectives. The first aim was to provide descriptive information on normative and risky substance use and sexual activity in emerging adults with SB compared to a matched group of TD youth. Normative behaviors were defined as the initiation of alcohol use and sexual intercourse by age 18/19. Health risk behaviors were defined as the frequency of alcohol, cigarette, and marijuana use in the past 30 days, and number of lifetime sexual partners. Youth with SB were expected to engage less in normative and risky substance use, and have fewer lifetime sexual partners compared to their TD peers.

The second aim of this study was to examine the impact of social adjustment in early adolescence (i.e., middle school ages), middle-to-late adolescence (i.e., high school ages), and emerging adulthood on subsequent and concurrent health risk behaviors. Group status (i.e., emerging adults with SB vs. TD peers) was examined as a potential moderator of the association between social adjustment and risk behaviors. It was expected that higher levels of social adjustment would predict more frequent alcohol, cigarette, and marijuana use (in the past 30 days), and a higher number of lifetime sexual partners for all youth, but particularly in youth with SB. Peer relations may be more salient in youth with SB because the social domain is especially challenging for these individuals. The predictive utility of social adjustment at different transitional time periods (e.g., middle school vs. high school) was analyzed to examine whether social adjustment during these two periods would be more or less predictive of later risk in emerging adulthood.

Previous research has suggested that having a disability or chronic illness may limit the number of peer contacts and opportunities for peer pressure. Thus, the final aim of the current study was to conduct exploratory analyses regarding the mediational impact of social adjustment on the association between group status (i.e., emerging adults with SB vs. TD peers) and health risk behaviors. It was expected that social adjustment difficulties would help explain why youth with SB might engage in less health risk behaviors. It was expected that social adjustment difficulties would partially explain why youth with SB might engage less in health risk behaviors.

Method

Participants

Individuals participating in this study were part of a larger longitudinal study of family relationships and psychosocial outcomes for children and adolescents with and without SB (Holmbeck et al., 2002; Holmbeck et al., 2003). Families of children with SB, ages 8 or 9 years old, were recruited from three Chicago-area hospitals and from a statewide SB association. A matched comparison group of TD children were recruited from schools where participating SB children were enrolled (see Holmbeck et al., 2003 for details of the matching process). Children with SB who declined participation ($n = 64$) did not differ from those who did participate ($n = 70$) with respect to lesion level ($\chi^2 = 0.62$, $p > .05$), or type of SB (myelomeningocele vs. lipomeningocele; $\chi^2 = 1.63$, $p > .05$).

The final sample that participated at Time 1 included 68 families of children with SB (two participants were dropped due to matching procedures; 37 males, 31 females, M age = 8.34) and 68 families of TD children (37 males, 31 females, M age = 8.49). Data obtained from medical charts indicated that the majority of children with SB had myelomeningocele (83%), and 71% of participants had a shunt. Reported lesion levels included: 59% lumbosacral or lumbar, 29% sacral, and 12% thoracic. Maternal report of ambulation indicated that 21% ambulated without assistance, 62% ambulated using braces, and 17% ambulated using a wheelchair. Participants in the SB and TD groups were matched on 10 demographic variables, including age, gender, ethnicity, child birth order, parental marital status, maternal and paternal age, maternal and paternal income, and SES. The two groups did not differ on any of the demographic variables ($ps < .05$; Holmbeck et al., 2003). Data were collected from families every 2 years. The present study included data collected at Time 1 (ages 8/9), Time 3 (ages 12/13; i.e., middle school), Time 4 (ages 14/15; i.e., early high school), Time 5 (ages 16 to 17; i.e., late high school), and Time 6 (ages 18/19; i.e., emerging adulthood) to predict risk behaviors at Time 6. Data from Time 2 (ages 10–11) were not included in this study. The cohorts at Time 6 included 50 families of children with SB (76%, M age = 18.64) and 60 comparison families (88%, M age = 18.60). Examination of families in the SB and TD groups who participated at Time 6 versus those who dropped out of the study revealed no differences with respect to gender, race, or SES.

Table 1 provides sociodemographic characteristics at Time 1 for the Time 6 sample. Although the groups were matched on SES at Time 1, there was a significant difference in SES at Time 6, such that the SB group reported lower SES ($M = 42.63$, $SD = 10.49$) compared to the TD group ($M = 46.91$, $SD = 10.85$). Therefore, SES was included as a covariate in analyses for Aims 2 and 3. Because attrition analyses demonstrated no significant differences in SES between those who participated versus those who did not for either group, it appears that the SB group's nonsignificant decrease in SES and the TD group's nonsignificant increase in SES due to attrition led to the group difference in SES at Time 6. In addition, a measure of verbal intelligence at Time 1 (the Peabody Picture Vocabulary Test–Revised Edition; PPVT-R; Dunn & Dunn, 1981) was included as a covariate. A statistically significant difference in PPVT-R scores between the SB and TD groups was expected due to cognitive difficulties associated with SB, and was found at baseline for the Time 6 sample, $t(108) = -5.25$, $p < .001$.

Verbal IQ was included as a covariate in analyses for Aims 2 and 3 for two reasons. First, studies to date have noted the negative association between verbal IQ and social communication impairments in large samples of TD children (Skruse et al., 2009). Second, studies conducted with this study sample have indicated that families of SB youth that have lower verbal IQ scores may experience reduced or poor family communication compared to youth that have higher verbal IQ scores (Holmbeck et al., 2002). Therefore, it is likely that youth with lower verbal IQ scores experience similar decrements in communication with their peers.

Procedure

This study was approved by university and hospital Institutional Review Boards. At Times 1 through 5, trained graduate and undergraduate research assistants collected data during home visits that lasted approximately 3 hours. During each visit, informed consent from parents and assent from children were obtained, in addition to release forms that allowed researchers to acquire data from medical records. Families completed questionnaires that were counterbalanced to protect against order effects. Families were also asked to participate in semistructured interaction tasks that were audiotaped and videotaped. Observational data obtained from audiotaped and videotaped tasks were not used in the present study. At Time 6, parents and youth completed questionnaires by mail. Youth ages 18/19 provided independent consent to participate at Time 6. Youth and their parents received monetary compensation at every time point: $50 for Time 1 and $75 for Times 2 through 6.

Measures

Demographics. The Parent Demographic Questionnaire (PDQ) assessed their child's age, gender, ethnicity, race, as well as medical variables. Parents also reported their own education level and occupation.

SES. The Hollingshead Four Factor Index of socioeconomic status was used to assess SES (Hollingshead, 1975). SES was derived by assigning a score to the mothers' and/or fathers' current occupations and level of education. If both caregivers were employed, education and occupation scores were averaged across parents to calculate SES. For two-parent households in which only one caregiver was employed, or for single-parent households, that individual's information was used to calculate SES. Higher scores indicate higher SES.

Verbal IQ. Receptive language ability was measured using the Peabody Picture Vocabulary Test—Revised Edition (PPVT-R, Dunn & Dunn, 1981) at baseline, and was utilized as a proxy measure of verbal IQ. The PPVT-R has high levels of validity and reliability, and correlates moderately with other measures of verbal intelligence (Sattler, 2002).

Social adjustment. Social adjustment was examined using mother and father report of *social acceptance* and *social competence*.

Mother and father report of social acceptance by peers was measured at Times 3 through 6 using the Social Acceptance scale from Harter's Self Perception Profile (SPP, Parent Version; Harter, 1985, 1988). A total score was computed by averaging all items. Higher scores indicated greater social acceptance. Alphas were

Table 1
Descriptive Data of Analytic Sample at Time 1

Characteristic	SB ($n = 50$) M (SD) or %	TD ($n = 60$) M (SD) or %	SB vs. TD
Youth age at Time 1	8.34 (0.48)	8.48 (0.50)	$t(106.14) = -1.53$
Maternal age at Time 1	37.98 (5.46)	37.68 (4.97)	$t(108) = 0.30$
Paternal age at Time 1[a]	41.08 (5.38)	40.39 (6.25)	$t(83) = 0.54$
Gender			
Male	54.0%	50.0%	$\chi^2(1) = 0.18$
Female	46.0%	50.0%	
Child racial background			
Caucasian	84.0%	90.0%	$\chi^2(1) = 0.88$
Other	16.0%	10.0%	
Verbal IQ at Time 1	93.14 (17.39)	109.53 (15.33)	$t(108) = -5.25^*$
Hollingshead SES at Time 1[b]	42.99 (10.46)	46.91 (10.85)	$t(105) = -1.88$

Note. The statistically significant difference in Verbal IQ, measured using the Peabody Picture Vocabulary Test–Revised Edition (PPVT-R), was expected due to cognitive difficulties associated with SB.
[a] SB ($n = 39$), TD ($n = 46$). [b] SB ($n = 48$), TD ($n = 59$).
* $p < .001$.

acceptable for both mother and father report of social acceptance for all time points in the total sample, ranging from 0.89 to 0.92 (M = 0.91) for mother report and 0.70 to 0.88 (M = 0.81) for father report. Alpha coefficients were unacceptable for child report (range = 0.25 to 0.49, M = 0.40), thus, child report of social acceptance was not included in study analyses.

Mother and father report of social competence was measured at Times 3 through 5 using the social competence subscale of the Child Behavior Checklist (CBCL; Achenbach, 1991). This subscale consists of questions regarding 1) participation in organizations, clubs, teams, or groups, 2) number of close friends, 3) amount of time spent with friends outside of regular school hours, and 4) behavior with others (i.e., how well the child gets along with their brothers and sisters, other kids, and their parents) and behavior when alone (i.e., how well the child does things by her/himself). Mother and father report of social competence on the CBCL was not collected at Time 6 because this measure is only normed for ages 6–18, and not age 19. However, parents did provide information regarding the youth's total number of friends at Time 6, thus, mother and father response to this item was combined (r = .61, $p < .05$) to provide a proxy measure for social competence at this time point.

Because mother and father measures of social acceptance were significantly correlated at all four time points (rs = 0.51–0.72, ps < .05) and mother and father report of social competence were significantly correlated at all four time points (rs = 0.57–0.61, ps < .05), composite scores were created to reduce the number of potential analyses. Finally, composite scores of social competence and social adjustment were highly correlated (rs = 0.58–0.69; ps < .05), thus, z-scores for both social variables were computed and then averaged together to create a total social adjustment score for each time point (Times 3 through 6). Finally, social adjustment scores at Time 4 and Time 5 were combined to allow the study authors to examine the predictive utility of social adjustment during middle school (Time 3, ages 12–13) versus high school (Times 4 and 5, ages 14–17).

Substance use. Substance use was assessed using the Problem Behavior Scale (PBS; Farrell, Danish, & Howard, 1992). Emerging adults reported if they had ever used drugs or alcohol in excess such as getting drunk or high, or passing out from drinking (yes/no). Participants also reported whether they had ever 1) smoked cigarettes, 2) drank beer (more than a sip or taste), 3) drank wine or wine coolers (more than a sip or taste), 4) drank liquor, like whiskey or gin, (more than a sip or taste), and/or 5) used marijuana (i.e., pot, hash, reefer). Study subjects then reported how often they had engaged in these behaviors in the past 30 days using a 6-point scale (1 = *Never*, 2 = *1–2 times*, 3 = *3–5 times*, 4 = *6–9 times*, 5 = *10–19 times*, and 6 = *20 or more times*). Three outcome variables for substance use were created and utilized in regression analyses: the total number of days in the past 30 days that youth 1) drank alcohol (i.e., beer, wine, or other alcohol), 2) smoked cigarettes and 3) used marijuana. For the purpose of descriptive analyses, percentages of emerging adults that abstained (0 days) from, were less frequent users (1–9 days) of, or were frequent users (10 + days) of beer, wine or alcohol in the past 30 days were determined. Conversion of 30-day substance frequency variables into categorical variables allowed authors to distinguish between abstainers, infrequent users, and frequent users and provide a clearer descriptive picture of substance use risk in emerging adults. In addition, calculating the percentage of abstainers in the past 30 days allowed authors to compare the TD group to national epidemiological statistics of substance use by young adults graduating from high school in the United States in 2011 (Monitoring the Future Study; Johnston, O'Malley, Bachman, & Schulenberg, 2011). Thus, study authors were able to examine whether the TD group was representative of the larger population of emerging adults in the U.S.

Sexual activity. Sexual activity was assessed using one item regarding number of sexual partners: "How many people have you ever had sexual intercourse with?" Both normative and risky sexual activity was assessed with this item. Lifetime number of sexual partners was thought to be an important measure of sexual risk, and was classified as: none (0), few (1–2), and several (3+) sexual partners for the purposes of descriptive analyses. Similar to the above analyses regarding substance use, converting the lifetime original sexual activity variable from a total number into a categorical variable allowed authors to provide a better descriptive picture of sexual risk. In addition, initiation of sexual activity, measured by the percentage of youth who had ever had sex (i.e., endorsed more than 0 sexual partners), was utilized as a marker of normative sexual behavior.

Data Analyses

All data analyses were conducted using Statistical Package for the Social Sciences (SPSS). To address Aim 1, group differences in normative and risky health behaviors were examined using Pearson chi-square analyses or Fisher's exact test (if cell counts were < 5) for categorical outcomes, and t tests for continuous outcomes. Whenever possible, we also compared our TD sample to national epidemiological statistics of substance use by young adults graduating from high school in the United States in 2011 (Monitoring the Future Study; Johnston et al., 2011). Because chi-square and Fisher's exact tests do not allow for inclusion of covariates, SES and verbal IQ were only controlled for in the regression and mediation analyses (i.e., for Aims 2 and 3).

For Aim 2, the effect of social adjustment on health risk behaviors in emerging adulthood was examined using linear regression techniques. Separate hierarchical regressions were conducted for each of the following emerging adulthood health risk behaviors: 1) frequency of alcohol use (in the past 30 days); 2) frequency of cigarette use (past 30 days); 3) frequency of marijuana use (past 30 days); and 4) lifetime number of sexual partners. SES and verbal IQ were entered in Step 1, group and social adjustment at Time 3, Time 4/5, or Time 6 were entered in Step 2, and one interaction term was entered in the last step to examine group as a moderator of the relation between social adjustment at each time point and for all four risk behaviors (i.e., group × T3 social adjustment). Thus, analyses included a total of 12 regression models; each model had one of three social adjustment variables (adjustment at Time 3, Time 4/5, or Time 6), and one of four health risk behaviors as the dependent variable (e.g., frequency of alcohol use in the past 30 days). Social adjustment variables were centered prior to conducting analyses to facilitate the interpretation of interaction effects (Holmbeck, 1997, 2002).

For Aim 3, it was hypothesized that social adjustment at Time 3 and Time 4/5 would mediate the associations between group status (SB Group = 0; TD Group = 1) and all four emerging adulthood health risk behaviors. Recent research has indicated that

the indirect effect is of primary importance when attempting to establish mediation; in other words, a direct effect does not necessarily need to be significant to test for the presence of mediation (Zhao, Lynch, & Chen, 2010). Thus, all possible mediation pathways (8 in total) were run regardless of whether there was a direct effect of group status on the emerging adulthood health behavior. Zhao and colleagues (2010) have termed mediation in which there is a mediated effect, but not a direct effect, an *indirect-only mediation.* Preacher and Hayes' (2008) bootstrapping macro was employed to test for the significance of indirect effects while controlling for SES and verbal IQ. Bootstrapping has been validated in the literature and is preferred over other methods. By using this procedure, parameter estimates decrease and power remains high, which reduces the possibility of Type II errors (Preacher & Hayes, 2008). This procedure generates: 1) an approximation of the product of the estimated coefficients' sampling distribution in the direct path, 2) percentile-based bootstrap confidence intervals (CI), and 3) bootstrap measures of standard errors using 5,000 resamples, with replacement, from the dataset (Preacher & Hayes, 2008). When zero is not included within the upper and lower bounds of the CI, it can be claimed that the indirect effect is not zero with 95% confidence; the absence of zero indicates a significant indirect effect.

Results

Preliminary Analyses

Power analyses were conducted to determine whether our sample size was adequate to detect medium effect sizes for the proposed regression analyses. Assuming a power of .80 and an alpha of .05, analyses with five predictors and a single dependent variable requires a sample of 42 to detect large effect sizes ($R^2 = .35$) and a sample size of 91 to detect medium effect sizes ($R^2 = .15$; Cohen, 1992). Thus, our Time 6 sample size of 110 was sufficient to detect medium to large effect sizes. Before running the analyses, the outcome variables were examined for skewness (Tabachnick & Fidell, 2007). Results indicated that frequency of alcohol use, cigarette use, and number of sexual partners were not highly skewed in this sample (skew values = 0.99, 1.25, and 1.22, respectively). However, frequency of marijuana use was highly positively skewed (value = 2.22). Thus, a log transformation was performed on this variable prior to analyses. The log transformation was successful in reducing the skew of this variable (value = 1.20).

Aim 1: Group Differences in Normative and Risky Health Behaviors

Normative alcohol and sexual behavior. Two-way chi-square analyses indicated that emerging adults with SB were less likely to have ever drank alcohol than their TD counterparts, $\chi^2(1) = 12.54$, $p < .01$ (see Table 2). In addition, emerging adults with SB were less likely to have ever been drunk compared to their TD peers, $\chi^2(1) = 15.46$, $p < .01$. Normative alcohol behavior in the TD group appeared slightly higher than expectations based on statistics of lifetime prevalence rates of ever having drank alcohol (28.3% vs. 24.3%) and ever being drunk (73.3% vs. 61.7%) in young adults ages 19–20 in the general population (Johnston et al., 2011). Significant group differences emerged upon classification of emerging adults as having several (3+) fewer (1–2) and no

Table 2
Group Differences in Substance Use and Sexual Activity

Health behavior	SB Group n (%)	TD Group n (%)	Group difference
Substance use			
Have you ever . . .?			
Drank beer, wine, or liquor	26 (52%)	50 (83.3%)	$\chi^2(1) = 12.54$, $p < .01$
Been drunk	18 (36%)	44 (73.3%)	$\chi^2(1) = 15.46$, $p < .01$
Passed out from drinking	7 (14%)	26 (43.3%)	$\chi^2(1) = 10.79$, $p < .01$
Smoked cigarettes	20 (40%)	38 (63.3%)	$\chi^2(1) = 5.95$, $p < .05$
Smoked marijuana	11 (22%)	32 (53.3%)	$\chi^2(1) = 11.25$, $p < .01$
Have you in past 30 days?			
Drank beer, wine, or liquor	----------	----------	Fisher's Test, $p < .05$
Frequent (10+ days)	2 (4%)	9 (15%)	
Less Frequent (1–9 days)	18 (36%)	28 (46.7%)	
Abstained	30 (60%)	23 (38.3%)	
Smoked cigarettes	----------	----------	Fisher's Test, (NS)
Frequent (10+ days)	11 (22%)	12 (20%)	
Less Frequent (1–9 days)	3 (6%)	9 (15%)	
Abstained	35 (72%)	39 (65%)	
Smoked marijuana	----------	----------	Fisher's Test, (NS)
Frequent (10+ days)	2 (4%)	7 (11.7%)	
Less Frequent (1–9 days)	6 (12%)	11 (18.3%)	
Abstained	42 (84%)	42 (70%)	
Sexual activity			
Lifetime sexual partners?	0–5[a]	0–6 plus[a]	$t(108) = -4.78$, $p < .05$
Several (3+)	4 (8%)	22 (36.7%)	Fisher's Test, $p < .05$
Few (1–2)	6 (4%)	15 (25%)	
None[b]	39 (78%)	23 (28.3%)	

Note. SB sample $n = 48$ to 50; TD sample $n = 59$ to 60.
[a] These numbers represent the range of sexual partners, from 0 to 6 plus. [b] None = never have had sexual intercourse.

sexual partners in their lifetime (Fisher's exact test $p < .05$; Table 2). With regard to normative sexual behavior, 78.0% of emerging adults with SB endorsed having no sexual partners (i.e., never having had sexual intercourse) compared to 28.3% of the TD group.

Risky substance use. Two-way chi-square analyses indicated that emerging adults with SB were less likely to have ever smoked cigarettes and to have ever used marijuana compared to the TD group, $\chi^2(1) = 5.95$ and $\chi^2(1) = 11.25$, $ps < .01$, respectively. In addition, emerging adults with SB were less likely to have passed out from drinking compared to their TD peers, $\chi^2(1) = 10.79$, $p < .01$ (see Table 2).

With regard to 30-day prevalence rates, there was a significant group difference in the frequencies that youth had used alcohol frequently (10+ days), less frequently (1–9 days), or abstained in the past 30 days, Fisher's exact test $p < .05$. However, there were no group differences in the number of emerging adults that smoked frequently (10+ days), less frequently (1–9 days) and not at all in the past 30 days (Fisher's exact test $p > .05$). Although epidemiological data were not available regarding "ever" usage, the 30-day prevalence rate of the TD group in our study (35%) was in line with 30-day prevalence rates for young adults ages 19–20 in the general population (30.2%; Johnston et al., 2011). Similarly, there were no group differences in the number of emerging adults that used marijuana frequently, less frequently, and that had abstained in the past 30 days (Fisher's exact test $p > .05$). Although prevalence rates of 30-day marijuana use (i.e., frequent or infrequent) in our SB group (16.0%) appeared to be in line with expectations based on normative data on emerging adults ages 19–20 (20.4%), the TD group reported slightly higher rates of marijuana use in the past 30 days compared to the general population (30.0% vs. 20.4%; Johnston et al., 2011; Table 2).

Risky sexual activity. The SB group ($M = 0.49$, $SD = 1.16$) reported fewer lifetime sexual partners compared to their TD peers ($M = 2.20$, $SD = 2.28$, $t(108) = -4.78$, $p < .05$). Significant group differences emerged upon further classification of emerging adults as having several (3+), fewer (1–2), and no sexual partners in their lifetime (Fisher's exact test $p < .05$; Table 2). In terms of risky sexual behavior, only 8.0% of emerging adults with SB reported having had several (3+) sexual partners compared to 36.7% of their TD peers.

Aim 2: The Influence of Prior and Current Social Adjustment on Health Risk Behaviors

Prior social adjustment. After adjusting for covariates (i.e., SES and verbal IQ), longitudinal analyses demonstrated that there were significant main effects of social adjustment at Time 3 (ages 12/13) on alcohol use ($\beta = 0.35$ $p < .01$) and number of sexual partners ($\beta = 0.20$, $p < .05$). Results indicated that higher levels of social adjustment in middle school (i.e., early adolescence) predicted increased alcohol use and number of sexual partners in emerging adults with and without SB. Analyses also indicated that social adjustment at Time 4/5 (ages 14–17) predicted total number of sexual partners ($\beta = .26$ $p < .01$). Thus, higher levels of social adjustment in high school youth (i.e., middle to late adolescence) predicted a greater number of lifetime sexual partners across groups. Analyses of interaction effects (T3 Social adjustment × Group; T4/T5 Social Adjustment × Group) were not significant ($ps > .05$; see Table 3). Social adjustment at Time 3 accounted for 11.0% of the variance in alcohol use. Finally, social adjustment at Time 3 and Time 4/5 accounted for 3.0% and 6.0%, respectively, of the variance in total number of sexual partners.

Current social adjustment. After adjusting for covariates, analyses using social adjustment at Time 6 indicated an overall main effect of social adjustment on frequency of alcohol use in the past 30 days, $\beta = 0.24$, $p < .01$ (see Table 3). Specifically, higher levels of social adjustment were associated with increased alcohol use across groups. There were no significant main effects of social adjustment at Time 6 on marijuana use, cigarette use, or number of sexual partners

Table 3
The Influence of Social Adjustment on Health Risk Behaviors

Independent variables		T6 Health risk behaviors															
		Alcohol use (past 30 days)				Cigarette use (past 30 days)				Marijuana use (past 30 days)				Total number of sexual partners (lifetime)			
Step	Variable	*B*	*SE b*	β	ΔR^2	*B*	*SE b*	β	ΔR^2	*B*	*SE b*	β	ΔR^2	*B*	*SE b*	β	ΔR^2
1	SES	−.00	.01	−.01	.00	−.05	.02	−.26**	.07	−.01	.01	−.08	.01	−.07	.02	−.35**	.08
	Verbal IQ	.02	.01	.22*	.05	.01	.01	.12	.01	.02	.01	.27**	.07	.02	.01	.20*	.04
2	Group	.34	.33	.11	.01	−.09	.45	−.02	.00	.35	.29	.13	.01	1.93	.38	.47**	.18
	T3 Social adjustment	.52	.17	.35**	.11	.08	.22	.04	.01	.02	.15	.02	.00	.41	.19	.20*	.03
3	Group × T3 social	−.10	.32	−.04	.00	.32	.43	.11	.01	−.14	.29	−.07	.00	−.29	.38	−.10	.00
1	SES	−.00	.01	−.01	.00	−.05	.02	−.26**	.07	−.01	.01	−.08	.01	−.07	.02	−.35**	.08
	Verbal IQ	.02	.01	.22*	.05	.01	.01	.12	.01	.02	.01	.27**	.07	.02	.01	.20*	.04
2	Group	.34	.33	.11	.01	−.09	.45	−.02	.00	.35	.29	.13	.01	1.93	.38	.47**	.18
	T4/5 Social adjustment	.31	.17	.20	.04	−.05	.22	−.02	.00	−.11	.15	−.08	.00	.61	.20	.26**	.06
3	Group × T4/5 social	−.05	.34	−.02	.00	.12	.44	.04	.00	−.28	.29	−.13	.01	−.60	.39	−.18	.02
1	SES	−.00	.01	−.01	.00	−.05	.02	−.26**	.07	−.01	.01	−.08	.01	−.07	.02	−.35**	.08
	Verbal IQ	.02	.01	.22*	.05	.01	.01	.12	.01	.02	.01	.27**	.07	.02	.01	.20*	.04
2	Group	.34	.33	.11	.01	−.09	.45	−.02	.00	.35	.29	.13	.01	1.93	.38	.47**	.18
	T6 Social adjustment	.35	.16	.24**	.05	−.12	.20	−.05	.00	−.04	.14	−.03	.00	.26	.18	.13	.01
3	Group × T6 social	.24	.31	.10	.01	.14	.41	.04	.00	.32	.28	.14	.01	−.25	.37	−.07	.00

Note. T3 = Time 3; T4/5 = Time 4/5 (combined); T6 = Time 6.
* $p < .05$. ** $p < .01$.

(βs = −0.05, −0.03 and 0.13, respectively, *p*s > .05). Social adjustment at Time 6 accounted for 5.0% of the variance in alcohol use in emerging adulthood. Analyses of interaction effects (Group × T6 Social adjustment) did not yield significant results (*p*s > .05). Verbal IQ at Time 1 significantly predicted all but one risk behavior outcome, such that higher verbal IQ predicted higher levels of alcohol use, marijuana use, as well as number of sexual partners in emerging adulthood across groups (βs = 0.22, 0.27 and 0.20, respectively, *p*s < .05). Verbal IQ at Time 1 did not predict higher levels of cigarette use. Higher SES at Time 1 predicted lower levels of cigarette use as well as fewer sexual partners across groups (βs = −0.26, −0.35, respectively, *p*s < .01; see Table 3).

Aim 3: Exploratory Mediation Analyses

It was hypothesized that membership in the SB group would be associated with lower levels of social adjustment at Time 3 and Time 4/5 (i.e., middle and high school ages, respectively), which, in turn, would impact engagement in health risk behaviors. Analyses using the bootstrap strategy indicated that the association between membership in the SB group and less alcohol use in the past 30 days was explained by lower levels of social adjustment in early (i.e., T3; 95% CI Lower to Upper = .09 to .79; See Figure 1a) and late adolescence (i.e., T4/5; 95% CI Lower to Upper = .01 to .59; See Figure 1b). The type of mediation represented by these two pathways may be termed *indirect-only mediation*, as there was not a significant direct effect of group status on alcohol use (see Zhao et al., 2010).

In addition, analyses indicated that the association between membership in the SB group and fewer sexual partners was explained by lower levels of social adjustment in early adolescence (i.e., T3 social adjustment; 95% CI Lower to Upper = .03 to .69; See Figure 1c). Results for the indirect effect of social adjustment at Time 3 on the association between group status and marijuana use (95% CI Lower to Upper = −.03 to .05) and cigarette use (CI Lower to Upper = −.24 to .44) were not significant. The indirect effects of social adjustment at Time 4/5 on the association between group status and marijuana use (95% CI Lower to Upper = −.05 to .03), cigarette use (CI Lower to Upper = −.39 to .32) and number of sexual partners (95% CI Lower to Upper = −.09 to .49) were also not significant.

Discussion

The findings of this study advance the literature by providing a more complete understanding of the extent to which emerging

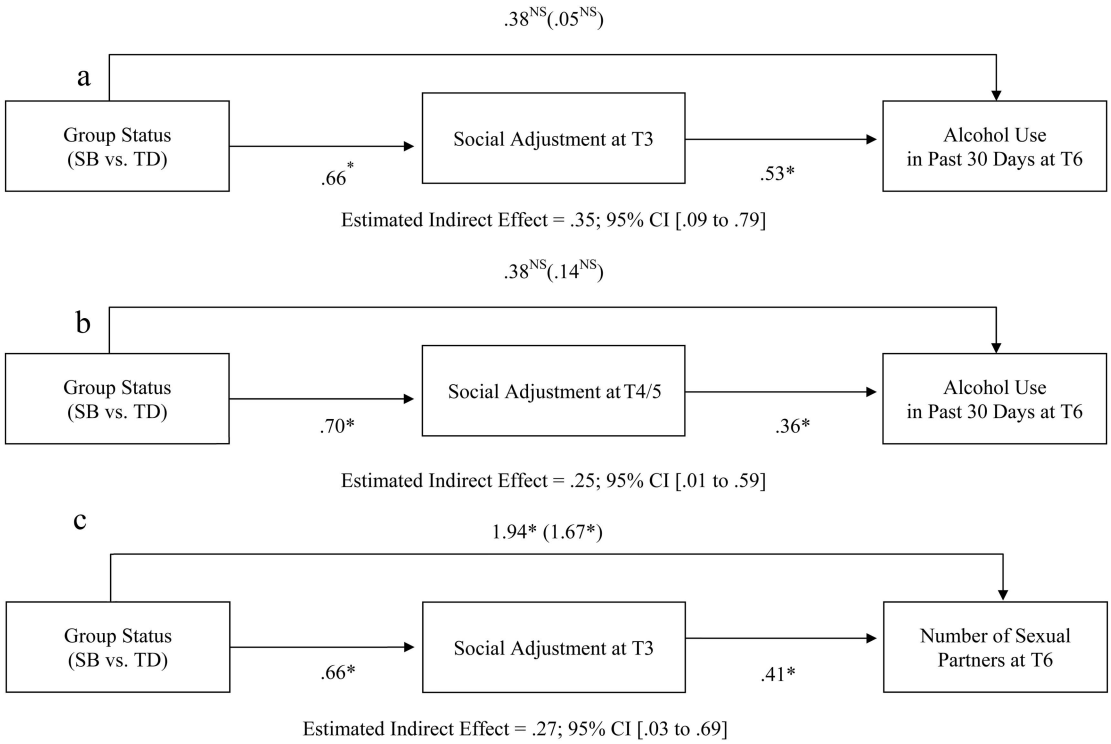

Figure 1. (a) The association between membership in the SB group and less alcohol use in the past 30 days in emerging adulthood (T6) is mediated by social adjustment in early adolescence (T3). (b) The association between membership in the SB group and less alcohol use in the past 30 days in emerging adulthood (T6) is mediated by social adjustment in middle to late adolescence (T4/5). (c) The association between membership in the SB group and fewer sexual partners in emerging adulthood (T6) is mediated by social adjustment in early adolescence (T3). *Note:* Path coefficients outside parentheses are estimates of the total effect of group status on the outcome, and direct effects between group status to the mediator (social adjustment) and the mediator and the outcome. Coefficients inside parentheses are results that include the mediator variable with a direct effect on the criterion. Estimated indirect effects and confidence intervals are results from bootstrap analyses. Mediation analyses controlled for SES and verbal IQ. * $p < .05$.

adults with SB engage in normative and risky health behaviors. Emerging adults with SB reported less lifetime substance use and lower rates of sexual activity than emerging adults in the comparison sample. These data suggest that emerging adults with SB may lag behind their peers in terms of experimental substance use and sexual activity, which are common during this period of development. However, emerging adults with SB had similar 30-day frequencies of smoking cigarettes and marijuana compared to their TD peers. This latter finding is important because the consequences of smoking may be more serious for those with SB, given their preexisting medical difficulties, regardless of the relatively small proportion of such youth that report smoking behavior.

Consistent with previous research (Blum et al., 1991) and study hypotheses, emerging adults with SB reported fewer lifetime sexual partners compared to their TD peers. Higher levels of social adjustment, particularly during early and middle adolescence, predicted a greater number of sexual partners for all youth. Results of mediation analyses supported our hypothesis that difficulties with social adjustment in late adolescence would predict fewer sexual partners in youth with SB. Social isolation and difficulties acquiring social skills commonly associated with SB may provide fewer opportunities to find sexual partners. It is interesting to note that social adjustment in late adolescence, but not early adolescence, was found to be a significant mediator. Social adjustment in late adolescence may be particularly important because youth commonly have an increased interest in dating and long-term relationships during this stage. Yet, finding a romantic partner may be difficult if older adolescents with this condition continue to experience difficulties with social adjustment. Other condition-related concerns associated with SB, such as urinary/fecal incontinence, motor impairments, and partial paralysis may also impact sexual relationships by exacerbating body image issues and poor self-esteem.

Further, higher levels of early adolescent and concurrent social adjustment predicted increased alcohol use, but not cigarette or marijuana use in the total sample of emerging adults. Research indicates that adolescents who affiliate with deviant peer crowds (i.e., "burnouts" or "alternative") typically smoke cigarettes and use marijuana more frequently (Verkooijen, de Vries, & Nielsen, 2007; La Greca, Prinstein, & Fetter, 2001; see Simons-Morton & Farhat, 2010 for a recent review). Alternatively, "popular" crowds have been found to have higher rates of alcohol use (La Greca et al., 2001), but may be average in other areas of health risk. Because socially well-adjusted adolescents may be more likely to affiliate with the popular crowd than deviant peer groups, it is not surprising that SB and TD youth in our sample who also had better social adjustment were more likely to have health risk profiles characterized by alcohol use, but not cigarette or marijuana use.

Moreover, these findings suggest that the use of cigarettes and marijuana depend less on an individual's level of social skills and competency, but rather the crowds with which youth affiliate (La Greca et al., 2001). In accordance with this theory, the current study found that social adjustment in early and late adolescence mediated the relationship between group status and alcohol use in the past 30 days. Thus, youth with SB may be less likely to affiliate with the "popular group" due to social adjustment difficulties, leading to less peer pressure and opportunities to engage in health risk behavior (Allen et al., 2005; Kosterman, Hawkins, Guo, Catalano, & Abbott, 2000; Prinstein et al., 2011). Future research should determine the types of peer groups (i.e., popular, alternative, burnouts; La Greca et al., 2002) with which youth with SB are more likely to affiliate, and determine whether different peer groups impact the likelihood of engagement in certain health risk behaviors.

Further, social adjustment in early adolescence, but not in emerging adulthood, predicted the frequency of alcohol use in the past 30 days and the number of lifetime sexual partners for all youth. These findings highlight the salience of social adjustment in early adolescence. Indeed, studies have shown that conformity to peers and susceptibility to peer pressure is highest during early and middle adolescence, peaking at age 14 (Steinberg, 2005). During this time, adolescents are learning to become autonomous from their parents, and may rely more on their peers for guidance (Steinberg, 2005). Social adjustment in early adolescence may also serve as a proxy for the overall length of time youth have had to develop social skills and competencies; youth who are socially well-adjusted from an early age may have spent more time with peers, and thus have also had more opportunities to experience peer pressure and engage in health risk behaviors.

Finally, in years past, some research has suggested that higher IQ was a protective factor for engagement in risk behaviors (Jessor, 1991), including cigarette smoking (Young & Rogers, 1986). However, our results are consistent with more recent research that suggests that higher IQ is actually predictive of engagement in health risk behaviors, such as alcohol, tobacco, and illegal drug use (Johnson, Hicks, McGue, & Iacono, 2009; Kanazawa & Hellberg, 2010). Indeed, results from the present study revealed that, across groups, higher verbal IQ predicted higher levels of substance use (excluding cigarettes) and number of sexual partners in emerging adulthood. Youth with higher verbal IQ scores may have increased social communication skills and involvement with peers and social groups; thus, higher IQ may predict youths' engagement in some health risk behaviors by increasing social opportunities.

This study had several strengths, including the use of a matched TD comparison sample, as well as the use of longitudinal data across multiple time points. In addition, given that the TD group engaged in risk behaviors at similar rates compared to the general population, our results have external validity. Yet, this study also had several limitations. First, the majority of participants were Caucasian; future studies should strive to include a more diverse sample of youth from other ethnic/racial groups. Second, this study may not have had a large enough sample size to detect significant interaction effects. Third, the substance use questionnaire assessed whether emerging adults had ever used particular substances, but did not inquire about the age at which they were first used. Therefore, although we found group differences in initiation of substance use at age 18/19, we cannot say whether youth with SB experimented on a different timeline. Fourth, the measurement of sexual activity was limited in that it did not include other sexual risk behaviors, such as frequency of sex or condom use, which are strong indicators of sexual risk behavior.

Finally, the reasons for and consequences of substance use in this population will be important areas of future research. It is important to note that early and concurrent social adjustment accounted for only a small amount of variance in health behavior engagement. Thus, it will be essential for researchers to

investigate other psychosocial and behavioral factors that may better explain engagement in risk behaviors in youth with SB. Some of these factors may include parenting behaviors, such as parental involvement or protectiveness, as well as psychological and physical health factors (e.g., coping, pain, sleep patterns, anxiety, and depression; Bellin et al., 2010; Bellin et al., 2013). It would also be beneficial for future studies to include peer reports of social acceptance and/or behavioral observations of peer interactions to lend additional support to the findings based on parent report.

Emerging adults with SB generally lag behind their peers in substance use experimentation and sexual activity, providing further evidence that individuals with SB are less likely to engage in normative developmental behaviors during the transition to adulthood. Although frequencies were generally low, this population nevertheless participated in some risky health behaviors at similar rates compared to their TD peers. Thus, a challenge for future interventions will be finding methods of improving social functioning without increasing the rate of risky health behavior in this population. Initiating discussions about peer pressure with regard to substance use will likely become a necessary component of such interventions. Research is needed to investigate the potentially deleterious physiological and psychological consequences of alcohol and tobacco use in individuals with this complex medical illness. Given the important and unique medical and psychological consequences of health risk behaviors, clinicians should regularly monitor individuals with SB throughout development with respect to their individual health risk trajectories.

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