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Adolescent Precocious Development and Young Adult Health Outcomes

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Although previous research has documented the general healthiness of adolescents and young adults compared to older ages, an increasing number of studies indicate rising numbers of health problems and emerging patterns of health inequalities during these early years of the life course (Glendinning, Love, Hendry, & Shucksmith, 1992; Wickrama, Wickrama, & Lott, 2009). For example, a significant proportion of youth experience health problems such as diabetes (Roux, Jacobs, & Kiefe, 2002), hypertension (National High Blood Pressure Working Group, 2004), sexually transmitted diseases, obesity (CDC, 2010), physical inactivity (Adams, 2006), poor overall health (Wickrama, Lorenz, & Elder, 2003), and depressive disorders (Hankin, 2006; Kessler, Gills-Light, Magee, Kendler, & Eaves, 1997). It is important to understand increasing health problems and emerging health inequalities during the earlier years in order to obtain information that might help prevent the incidence and long term impact of health problems over the life course (House, Kessler, & Herzog, 1990).

Previous research suggests that precocious transition events of adolescents and young adults, such as early sexual activity, teenage pregnancy, early cohabitation and early marriage that may have health consequences (Booth, Rustenbach, & McHale, 2008; Musick & Bumpass, 2006; Wickrama, Merten, & Elder, 2005), have rarely been investigated. Particularly, we argue that precocious transition events place adolescents and young adults at various mental and physical health risks and would explain some of the emerging health inequalities among young adults. However, we know less about the implications of adolescent precocious transition events on young adult physical health. Moreover, previous studies suffer from methodological limitations, including the cross-sectional nature of samples, small sample sizes, systematic biases in participants' characteristics (e.g., primarily European Americans), and investigations of a single health outcome.

Thus, the goal of the present study was to extend this line of research, using a large nationally representative sample (*Add Health*) comprised of longitudinal data, by investigating the physical health implications of adolescent precocious transitions into

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adulthood after controlling for family socioeconomic characteristics, race/ethnicity, and lagged health status variables.

Adolescent Precocious Transition and Physical Health Consequences

Consistent with the life course perspective (Elder, George, & Shanahan, 1996), normative timing and sequence of life events (e.g. completing education, beginning a career, and entry into family responsibilities) give structure to the life-course. Particularly, research has shown that a deviation from normative timing of events, particularly earlier than normative age (*a rush to adulthood*), such as teenage pregnancies and early family responsibilities (early marriage or parenthood), will disrupt an orderly transition to adulthood (Caspi & Bem, 1990; Elder et al., 1996). A *rush to adulthood* creates a chronically stressful life situation involving numerous role changes that place excessive demands on emotionally, socially, and financially ill-equipped adolescents due to an increase in adult and family responsibilities (Hatch, 2005; Maynard, 1996; Wickrama et al., 2003). Although recent research shows that youths take diverse pathways to adulthood with varying sequences and patterns of transitional events (Schoen, Landale, & Daniels, 2007; Shanahan, 2000), we propose that, in general, adolescents' early entry into adult roles has persistent influences on mental and physical health that continue into young adulthood (Goldscheider & Goldscheider, 1998; Kessler, Gills-Light, Magee, Kendler, & Eaves, 1997; Maynard, 1996).

Stress research has documented the physical and mental health effects of stressful circumstances (Pearlin, Scheiman, Fazio, & Meersman, 2005); which directly generate depressive symptoms such as hopelessness, helplessness, and powerlessness (Pearlin et al.). Medical research has shown that chronic stressful conditions influence physical health directly by causing deleterious effects through an interconnected set of physiological mechanisms including cardiovascular, hormonal, neurological, and immunological functioning (Fremont & Bird, 2000; Herbert, Cohen, Marsland, Bachen, Rabin, Muldoon, & Manuck, 1994; Lovallo, 2005; Wickrama et al., 2001). Moreover, chronic unbroken stressors produce a cumulative "dose-response" effect (Singh-Manoux, Ferrie, Chandola, & Marmot, 2004) on the allostatic load and subsequent physical health of an individual (Pearlin et al., 2005).

In addition, financial difficulties created by early family responsibilities (e.g., early parenthood, early marriage, early cohabitation) may directly (structurally) limit basic health resources; this includes proper food, leisure, sports participation/exercises, health insurance, and health care. Thus, we hypothesize that early family responsibilities will have mental and physical health implications for young adults.

Furthermore, long hours of working (working full-time) while attending school may be stressful during adolescence. Working long hours may result in decreased healthy behaviors, such as participation in leisure and sports activities or regular exercise, and instead promote unhealthy behaviors such as eating 'fast food' and obtaining inadequate amounts of sleep. Moreover, adolescents' long hours of working may reduce parental supervision and monitoring and reduce quality time spent with family (e.g., family dinners). Recent research suggests that mere parental presence has a positive influence on adolescent eating behaviors (Merten, 2009). We expect that long working hours will foster an unhealthy lifestyle for adolescents, placing them at relatively high risk for poor health. Although previous research has documented that high intensity of working during adolescence may have consequences for young adults' educational and socioeconomic achievements (Mortimer & Staff, 2004), to our knowledge, no study has examined health consequences of adolescents' high intensity working. We also expect a parallel of negative health effects for adolescents who leave home early.

Not only are adolescents who drop out of high school more likely to end-up in low-paying, low-status occupations, they are also less likely to be provided with health insurance and are more likely to be unable to afford basic health resources. They are also more likely to live in hazardous environments with poor housing conditions compared to youth who have completed a high school education (Freudenberg & Ruglis, 2007). Moreover, research has been well documented in the association between educational level and health status. In sum, adolescents' dropping out of school places young adults at relatively high risks for poor health (Freudenberg & Ruglis, 2007).

In addition, certain early life events may create 'damages' that may multiply and continue into the young adult years. For example, youths who engage in early sexual activities get a "head start" and are more likely to engage in other unhealthy behaviors such as substance use (Browning, Burrington, Leventhal, & Brooks-Gunn, 2008; Steinberg, 2005; Tubman, Windle, & Windle, 1996) and risky sexual behaviors which put them at risk for contracting sexually transmitted diseases (Adimora & Schoenbach, 2005). Also, physical inactivity during adolescence that is influenced by stressful precocious events (e.g., teenage pregnancy) may continue well into young adulthood. Such early behavioral orientations place youth at risk for negative mental and physical health outcomes.

Control Variables

Family Characteristics

We expect family socioeconomic characteristics to influence young adult health outcomes. Hence, the influence of adolescents' precocious events on young adults' health will be assessed while controlling for the influences of family socioeconomic characteristics.

Previous research has shown that family socioeconomic characteristics, such as family poverty, parental education, and single parenthood are associated with youth health outcomes due to several factors. First, family socioeconomic characteristics exert direct structural constraints on youth health via differential access to financial, social, and human capital (Duncan & Magnuson, 2003). Material deprivation may influence youths' health status because it constrains youth in the day-to-day choices available for education, household equipment, recreation, sports participation, food, clothing, and health insurance/care. The continuous constraints in choices and repeated experiences of denial will compromise youths' mental and physical health.

Second, family research has documented that family socioeconomic characteristics influence adolescents' health through parental practices (Wickrama, Conger, & Lorenz, 1997). Parents who experience constant economic pressure are likely to be distressed, making them more irritable, authoritarian, and hostile toward their children; distressed parents are more likely to be involved in less effective parental practices than are non-distressed parents (Conger & Donnellan, 2007; Conger, Ge, Elder, Lorenz, & Simons, 1994). Also, higher levels of educational attainment among parents offer greater access to social-psychological resources, skills, and information that help to protect children from adverse health risks. Educated parents may also have greater knowledge of health and health promoting behaviors, resulting in more effective parental practices (Wickrama, Conger, Lorenz, & Elder, 1998). Research also documents that single parents experience more stressful events (Lorenz, Elder, Bao, Wickrama, & Conger, 2000) and have less effective parental practices than do intact parents (Simons and Associates, 1994).

Most important, the influence of precocious life events on health outcomes may depend on family socioeconomic conditions. We will capture these potential differences by examining interaction effects between precocious events and family socioeconomic characteristics.

Racial and Ethnic Minority Status

It is important to ensure, empirically, that the effects of adolescents' precocious life events on young adults' health outcomes are estimated net of the influence of individual racial/ethnic minority status. Previous research shows that racial/ethnic minority status exhibit influences on health, beginning in childhood and continuing across the life course, regardless of family socioeconomic characteristics (Spencer, 2001; Wickrama, Merten, & Elder, 2005). We anticipate direct, main effects of race/ethnic minority status on young adult health. Hence, the influence of adolescents' precocious events on young adults' health will be assessed while controlling for the influences of race/ethnic minority status.

Notably, individuals of different race/ethnic minority groups may not fit with normative timing of youth life events because those are largely created by mainstream society. Thus, the influence of precocious life events based on 'mainstream normative timing' may be different for youths from various race/ethnic minority groups. We will capture these differences by examining interaction effects between precocious events and race/ethnicity.

Gender

Previous research has documented significant gender differences in prevalence of health problems in young adults. For example, female youth experience depressive disorders more often than males because they may be more exposed to stressful circumstances than males (Hankin & Abrahamson, 1999). Additionally, African American females are more likely than African American males to be obese (Wickrama, Wickrama, & Bryant, 2006). Research has also shown that women are more likely to be vulnerable to sexually transmitted disease (STD) infections than are men, due to biological reasons. For example, in adolescent girls and young women, the cervix is made up of unstable cells which make the cervix more vulnerable to sexually transmitted organisms (Mayo Clinic, 2009). For these reasons, the influence of adolescents' precocious sexual events on young adults' health will be assessed while controlling for gender.

It is important to note that the influence of precocious life events on health outcomes may be different for males and females. We will capture these potential differences by examining interaction effects between precocious events and gender.

Lagged Health Variables

We will control for lagged health variables when predicting health outcomes. By controlling for lagged health variables, we predict changes in health during the study period. More important, by controlling for lagged health variables, we control for possible selection of respondents to experience precocious events. The selection effect involves reversed causation. That is, healthier youths may be more (or less) likely to experience precocious events. For example, adolescents who are healthier may be more likely to engage in sexual activities or enter into cohabitation or marriage earlier than adolescent who are less healthy. On the other hand, less healthy adolescents may be more likely to drop out of school than healthy adolescents. By controlling for possible selection effects, we correct for potential biases on regression estimates. Furthermore, the influence of precocious events on health outcomes may be reduced by the influence of family socioeconomic characteristics and race/ethnicity. Thus, by controlling for family socioeconomic characteristics and race/ethnicity, we investigate the unique influences of precocious events on changes in youths' health.

Hypotheses

To investigate health implications of adolescent precocious transitions into adulthood, this study focuses on a set of direct effect hypotheses. Adolescents' precocious life events, such as early sexual engagement, an early exit from the home, teenage pregnancy, early full-time work, early marriage, early cohabitation, and dropping out of school, will be associated with young adults' physical health problems including diabetes, obesity, hypertension, sexually transmitted diseases, smoking, physical inactivity, and depression, after controlling for lagged health variables (e.g., family socioeconomic characteristics such as family poverty, parental education, single parenthood, and race/ethnicity).

Methods

Sample

Data for this study came from a nationally representative school-based sample of adolescents participating in the National Longitudinal Study of Adolescent Health (*Add Health*). In 1995, the baseline (W1) data were derived from a complex stratified cluster-sampling of middle and high school students from 134 schools, yielding 20,745 respondents of ages 12 to 19 years ($M = 15.2$ years, $SD = 1.28$ years). To ensure diversity, the sample was stratified by region, urbanicity, school type (public vs. private), racial composition, and size. Of the sample, approximately 22% were from households living in poverty, and in 40% of the participating families at least one parent worked as a manual laborer. Approximately 10% of parents did not respond to the parent questionnaire. The sample was represented by whites (52%), African Americans (20%), Hispanics (16%), Asians (8%), and Native Americans (3%). The median education of mothers and fathers was high school or GED completion. About 11 % of the households received food stamps.

Second wave (Wave 2) and third wave (Wave 3) data were collected in year 1996 and 2001 ($N_2 = 14,738$ and $N_3 = 15,100$), respectively. We also used Wave 4 (W4) data collected in 2008 ($N_4 = 15,000$) to assess several young adult health problems. We used a sample of 13,500 adolescents who participated in all four waves composed of 53% females and 47% males.

We imputed missing data only for independent and control variables. We assume that missingness is at random (MAR) (Amato, Landale, & Havasevich-Brooks, 2008) and, consequently, used the EM (Expectation Maximization) algorithm to impute data (Allison, 2002; Booth et al., 2008). We used Wave 4 sample weights (adjusted for Wave 1) in the analyses. More information about the *Add Health* sample is available at <http://www.cpc.unc.edu/projects/addhealth>. We performed several analyses to examine the influence of attrition and missing data in the sample. Our findings showed that adolescents who participated in all four waves were slightly younger and confirmed that there was little difference between adolescents with missing data in our study sample and those with complete data. Also, the differences between Wave 1 data and the complete data (with Wave 4) were not significant in terms of Wave 1 variables.

Measurements

Precocious Transitions—We used both Wave 3 (2001) and Wave 4 (2008) retrospective data to identify respondents who experienced precocious events. In this classification, we ensured that all respondents had aged enough to have experienced risks defined as precocious events. If all the respondents were aged enough by Wave 3 (2001), according to the definition of a precocious event, we used Wave 3 (rather than Wave 4) to identify respondents who have experienced that event to minimize reporting bias due to

forgetfulness. We operationalized most of the youth's precocious life events (e.g., early sexual activities, early marriage, early cohabitation, and early leaving home) based on US national norm ages, and the events that occurred before the normative ages were considered to be precocious (Wickrama, Merten et al., 2005).

Early Sexual Activities (Early Sex): In the United States, the average age of first sexual intercourse was 16 years old among American males and female (Centers for Disease Control and Prevention, 1996). The onset of early sex before 16 years of age was categorized as 'early sex.' Retrospective reports of respondents' (Wave 3, 2001) year of first sexual intercourse and their age were used for this classification.

Early Cohabitation: The Gallup Poll (2008) indicated that 50% of 24-year-olds today are either married or cohabiting. Thus, cohabitation before 24 years of age was classified as 'early cohabitation.' Retrospective reports (Wave 4, 2008) on cohabitation status (living/lived with someone), duration of living with someone, and the respondent's age were used to identify youths who cohabitated before 24 years of age. We also identified and added respondents who reported their cohabitation experience before 24 years of age in Wave 3, but did not report it in Wave 4.

Early Marriage: Marriage before 24 years of age was categorized as 'early marriage.' Retrospective reports (Wave 4, 2008) on marital status (married once or more), duration of marriage, and the respondents' age were used to identify young adults who married before 24 years of age. We also identified and added respondents who reported their marital experience before 24 years of age in Wave 3, but did not report it in Wave 4.

Early Leaving Home: Previous studies have documented that the average age of leaving home is 21 years for young adults (Kreiter, 2003). Reports (Wave 3, 2001) on the residential status (living in a separate house, apartment, trailer home, or group quarters) and the retrospective reports on the year of moving were used for this classification (these reports were not available in Wave 4). Full-time college/university students were not categorized as 'early leavers.' Since the youngest respondent was still 19 years old in 2001, our 'early leaving home' classification used 19 years of age as the cutoff for this classification. Thus, our measure corresponds to 'early leaving home' during adolescent (school attending) years.

Early Pregnancy: Teenage pregnancy (during adolescence) was considered as early pregnancy. Thus, early pregnancy ('got pregnant' for females and 'fathering' or 'made pregnant' for males) before 19 years of age was classified as 'early pregnancy.' Retrospective reports (Wave 3, 2001) on the year of first pregnancy or 'fathering' were used for this classification.

Retrospective reports (Wave 3, 2001) on the year of 'first full-time paid work' and respondent's age were used to identify youths who worked full-time during the high school attending years. Also, adolescents who did not complete high school or an equivalent level of education (early termination of education) were identified ('no high school') from Wave 3 data.

Young Adult Health Outcomes Wave 3 (2001) or Wave 4 (2008)

Smoking (Wave 4): Young adult *smoking* status was assessed by asking youths whether they were a daily smoker (1) or not a daily smoker (0). Approximately 22% of young adults reported that they were daily smokers. Smoking in Wave 1 was then used as a control variable when predicting *smoking* in Wave 4.

Physical Inactivity (Wave 4): Was determined by asking youths if they have had no bouts of physical activity (1) or some bouts of physical activity (0). Approximately 84% did not have bouts of physical activity, while 15% did have some bouts of physical activity. Regular exercise participation in Wave 1 was used as a control variable when predicting *physical inactivity* in Wave 4.

Depressed Mood (Wave 4): Depression (*depressed mood*) in 2001 was created by using 80th percentile as a cut-off point of the CES-D depressive symptom subscale (The prevalence rate of clinically significant mental health problems involving depressive symptoms is approximately 20% among youth, National Institute of Mental Health, 2006). A depressive symptom subscale was created by summing responses to eight items from the Center for Epidemiological Studies of Depression Scale (CES-D; Radloff, 1991). CES-D items assessed the frequency of adolescents' feelings of distress (e.g., "felt depressed and sad") during the past week on a scale ranging from 0 (never or rarely) to 3 (most of the time or all of the time). The internal consistency of depressive symptoms measures were .76 and .75 in 1995 and 2001, respectively. The Wave 1 depressive symptom subscale was used as a control variable when predicting *depression* in Wave 4.

Respondents also reported whether they had physician-diagnosed physical health problems, including diabetes, hypertension, and sexually transmitted diseases in 2008 (Wave 4).

Diabetes (Wave 4): Response categories included 'do not have diabetes' (0) or 'have diabetes' (1). Approximately 94% of young adults did not have diabetes while 6% reported having diabetes. A similar indicator of diabetes in Wave 1 was used as a control variable when predicting *diabetes* in Wave 4.

Hypertension (Wave 4): Response categories included 'no hypertension' (0) or 'have hypertension' (1). Approximately 87% of young adults did not have hypertension while 13% did have hypertension. *General health* (Wave 1) was used as a control variable when predicting *hypertension* in Wave 4.

Obesity (Wave 4): Body mass index (BMI) for each adolescent was computed by dividing weight (kg) by height² (m). Individuals with a BMI greater than or equal to 30 were characterized as obese. A similar indicator of obesity in Wave 1 was used as a control variable when predicting *obesity* in Wave 4.

Sexually Transmitted Disease/STD (Wave 3, 2001): Response categories included 'no diagnosed STDs' (0) or 'have a diagnosed STD' in Wave 3. A similar report for sexually transmitted diseases in Wave 1 was used as a control when predicting this outcome.

Family/Parental Socioeconomic Characteristics (Wave 1, 1995 and Wave 4, 1998)

Parental Education (Wave 1): Parental education was measured by years of parents' schooling. Years of schooling was computed by replacing original response categories for formal education by average years of schooling reported for each category: 0 years= never went to school, 6 years= eighth grade or less, 10 years = more than eighth grade but did not graduate from high school, 12 years = from a high school equivalent to less than a college degree, 16 years = graduated from a college or university, and 18 years= professional training beyond a four-year college or university. The average of maternal and paternal education (years of schooling) served as an index of *parental education* in each family. Maternal education was used as the parental education index in the 1,100 (8%) families that were headed by a single female without data for the corresponding father.

Family Poverty (Wave 1): Parents responded to five dichotomously scored (0 = no, 1 = yes) hardship items assessing whether any member of the household received social service benefits, including social security, supplemental security income, aid to families with dependent children, food stamps, or housing subsidies. Summing responses to these five items yielded an internally consistent ($\text{Alpha} = 0.85$) index of *family poverty*. Standardized scores on this index ranged from -0.48 to 4.52 with higher scores reflecting greater economic hardship.

Parents' Marital Status (Wave 1): We computed a binary variable that separated parents who had been in one marriage (or marriage-like relationship) for 15 or more years by 1995 (1) from other parents (0). This measure captures the stability of the parents' marriage during youths' childhood/early adolescence.

Gender (Wave 1): Gender was recorded as being male (1) or female (2). About 47% of respondents were males and 53% of respondents were females.

Race/Ethnicity: A dichotomous variable (e.g., African American = 1, otherwise = 0) was used to assess race/ethnicity. Adolescents were asked to report their race. If adolescents reported more than one race, they were then asked to choose the one racial category that best describes their racial/ethnic background.

Analysis

Logistic regression was used to examine the relative risk or odds ratios of health outcomes (e.g., smoking, physical inactivity, diabetes, hypertension, depressive symptoms, sexually transmitted diseases, and obesity) in young adulthood (Wave 3, 2001 and Wave 4, 2008, depending on the availability of data), based on youths' precocious transitions measured using retrospective data in Wave 3 (2001) and Wave 4 (2008), after controlling for social stratification variables, gender, and baseline values of the same health outcomes.

Results

Descriptive Analysis

Precocious Events—The percentages of youths who experienced early sex, early pregnancy, early marriage, early cohabitation, early leaving home, early full-time work, or dropping out of high school were approximately 23.8%, 9.3%, 28%, 36%, 27%, 11%, and 13.2%, respectively. In 2008, the percentage of youth who had experienced none of the seven precocious events was approximately 30.2%, whereas the number of youth experiencing at least one precocious event was 27.4%. Roughly 42% of youth had experienced more than one precocious event. The percentages of youths who experienced 2, 3, 4, 5, 6, or 7 precocious events were approximately 18.8%, 13.3%, 6.8%, 2.7%, 0.7%, and 0.1%, respectively.

The descriptive analysis showed that some precocious events co-occurred with each other. For example, nearly 47% of youths who reported early cohabitation also reported early leaving home. Nearly 78% of youths who reported dropping out of high school also reported early full-time work. Nearly 38% of youths who reported early marriage also reported early leaving home. Nearly 85% of youths who reported early full-time work also reported dropping out of high school. Nearly 19% of youths who reported early sexual activities also reported early pregnancy, 26% reported early marriage, and 53% reported early cohabitation.

Young Adult Health Problems—The percentages of young adults who reported smoking, physical inactivity, diabetes, hypertension, depression, sexually transmitted disease, and obesity were approximately 21%, 15%, 6%, 13%, 18%, 8%, and 35%, respectively. Although some of the health problems may co-occur, the associations appear to be weak. For example, although most of the correlations among health problems were significant, coefficients ranged from .02 to .17. Nearly 32% of distressed youths were also daily smokers. Nearly 18% of distressed youths were also physically inactive. Nearly 37% of distressed youths were also obese. Nearly 26% of youths who were diagnosed with an STD were also distressed. Nearly 8% of youths who were diagnosed with hypertension were also diagnosed with diabetes.

The Association between Precocious Events and Health Problems—The descriptive analysis showed strong bivariate associations between precocious events and young adult health problems in 2008. For example, young adults who reported early sexual activities, the prevalence rates of young adult health problems were approximately 36% (smoking), 17% (physical inactivity), 5% (diabetes), 25% (hypertension), 22% (depression), 13% (STDs), and 35% (obesity). For young adults who reported early pregnancy, the following prevalence rates for the same health problems were approximately 33% (smoking), 17% (physical inactivity), 5% (diabetes), 20% (hypertension), 25% (depression), 14% (STDs), and 40% (obesity). Young adults who reported early cohabitation, the prevalence rates were approximately 34% (smoking), 15% (physical inactivity), 5% (diabetes), 24% (hypertension), 22% (depression), 11% (STDs), and 35% (obesity). For young adults who reported early marriage, the prevalence rates were approximately 20% (smoking), 14% (physical inactivity), 4% (diabetes), 22% (hypertension), 16% (depression), 5% (STDs), and 36% (obesity). For young adults who reported early full-time work, the prevalence rates were approximately 29% (smoking), 13% (physical inactivity), 4% (diabetes), 25% (hypertension), 21% (depression), 7% (STDs), and 35% (obesity). Young adults who reported leaving home early had prevalence rates of 29% (smoking), 15% (physical inactivity), 5% (diabetes), 25% (hypertension), 19% (depression), 9% (STDs), and 35% (obesity). For young adults who reported dropping out of high school, the prevalence rates were approximately 46% (smoking), 19% (physical inactivity), 6% (diabetes), 20% (hypertension), 31% (depression), 11% (STDs), and 39% (obesity).

Socioeconomic Characteristics and Young Adult Health Outcomes

The descriptive analysis also provided evidence for the social stratification of youth health problems. For example, youths with more highly educated parents (average parental education > 16 years) had health problem prevalence rates of 20% (smoking), 11% (physical inactivity), 3.5% (diabetes), 22% (hypertension), 15% (depression), 6% (STDs), and 29% (obesity). On the other hand, youths who had less educated parents (average parental education < 12 years) had health problem prevalence rates of approximately 26% (smoking), 19% (physical inactivity), 8% (diabetes), 28% (hypertension), 26% (depression), 10% (STDs), and 43% (obesity). Youths from stable families (length of parents' marriage > 15 years) had health problem prevalence rates of approximately 22% (smoking), 13% (physical inactivity), 4.1% (diabetes), 24.6% (hypertension), 15.8% (depression), 6.6% (STDs), and 33% (obesity). Conversely, for youths from unstable families (length of parents' marriage < 15 years) prevalence rates of the same health problems were 26% (smoking), 15% (physical inactivity), 5% (diabetes), 24% (hypertension), 21% (depression), 9.7% (STDs), and 36% (obesity). The percentages of youths from non-poor families (family poverty <2) were 23% (smoking), 14% (physical inactivity), 4% (diabetes), 23% (hypertension), 17.4% (depression), 8% (STDs), and 33.59% (obesity), whereas for youths from poor families (family poverty >1), the prevalence rates of the same health problems were 29%, 15%, 6.7%, 15%, 2%, 8.8%, and 39%, respectively.

Finally, descriptive analysis provided evidence for gender differences in health problems. For example, for females, the prevalence rates of health problems were 21% (smoking), 16% (physical inactivity), 5% (diabetes), 16% (hypertension), 22% (depression), 13% (STDs), and 35% (obesity), whereas for males the prevalence rates of the same health problems were 26.6% (smoking), 12.5% (physical inactivity), 4.3% (diabetes), 32% (hypertension), 15.6% (depression), 3.6% (STDs), and 35% (obesity).

Predicting Young Adult Health Problems

Table 1 provides the results of logistic regression in terms of odds ratios of seven different young adult health outcomes in relation to adolescents' seven precocious transition events, female gender, age, and family socioeconomic characteristics variables. More important, when predicting for a specific health risk, the appropriate lagged health status in 1995 (Wave 1) was used as a control variable (as indicated in Table 1). For example, when predicting the risk of a young adult smoking outcome, smoking in Wave 1 was used as a control variable.

Each of the precocious transitions is shown to increase the risk of adverse health outcomes after controlling for lagged measures, socioeconomic variables, and adolescent age and gender. However, far more precocious transitions have an impact on the risk of smoking over time. *Early full-time work, early sexual experience, early pregnancy, early leaving home, early cohabitation, and dropping out of high school* significantly influenced the risk of adolescents' smoking behaviors in 2008 (Wave 4), after controlling for smoking in 1995 (Wave 1). That is, early full-time work, early sexual experience, being pregnant as an adolescent, early cohabitation, early leaving home, and dropping out of high school increased the risk of smoking by 24% (OR=1.24), 70% (OR=1.70), 30% (OR=1.30), 82% (OR=1.82), 20% (OR=1.20), and 106% (OR=2.06), respectively.

Early full-time work, early sexual experience, and dropping out of high school—Significantly predict the risk of physical inactivity in 2008 (Wave 4), after controlling for exercise behavior in 1995 (Wave 1). That is, early sexual activity and dropping out of school increased the risk of physical inactivity by 25% (OR = 1.25) and 35% (OR = 1.35), respectively. However, early full-time work decreased the risk of physical inactivity by 18% (OR=.82).

Leaving home early—Significantly increased the risk of hypertension in 2008 (Wave 4) by 25% (OR = 1.25) after controlling for general health in 1995. After controlling for diabetes in 1995 (Wave 1), *leaving home early* increased the risk of diabetes by 30% (OR = 1.30).

Early sexual experience, early cohabitation, early marriage, and no high school completion—Significantly influenced the risk of being diagnosed with sexually transmitted diseases (STDs) in 2008 (Wave 4), after controlling for STDs in 1995 (Wave 1). Early sexual experience, early cohabitation, and dropping out of school increased the risk of STDs by 80% (OR = 1.82), 145% (OR = 2.45), and 36% (OR = 1.36), respectively, while early marriage decreased the risk by 31% (OR = .69).

After controlling for the baseline level of obesity in 1995 (Wave 1), *early pregnancy* and *early marriage* significantly increased the risk of obesity by 18% (OR = 1.18) and 29% (OR=1.29). For mental health outcomes, *early full-time work, early cohabitation, and dropping out of high school* significantly increased the risk of depression by 66% (1.66), 21% (OR=1.21), and 71% (OR = 1.71) in young adulthood (Wave 4, 2008), respectively.

The Influences of Control Variables

Family socioeconomic characteristics showed direct influences on young adults' health outcomes. *Higher levels of parental education* are shown to slightly reduce the risk of many youths' health problems in young adulthood. Higher parental educational attainment decreased the risk of smoking by 4% (OR = .96), decreased the risk of diabetes by 5% (OR = .95), decreased the risk of hypertension by 2% (OR = .98), decreased the risk of being physically inactive by 1% (OR = .99), and decreased the risk of obesity by 5% (OR = .95). Parents' *marital status also reduced youths' risks of developing many health problems*. For example, youths with consistently married parents had decreased risks of physical inactivity by 4% (OR = .96), depression by 14% (OR=.86), and STDs by 16% (OR = .84). However, youths whose parents had a longer marital status increased the risk of hypertension by 14% (OR = 1.14).

Adolescent *age* and *gender* also illustrated significant associations with health risks over time. An older age increases the risk of youths' diabetes by 15% (OR = 1.15), physical inactivity by 6% (OR=1.06), and hypertension by 7% (OR=1.07), but decreases the risk of youths' smoking by 10% (OR = .90) and depression by 5% (OR=.95). Female gender showed a lower risk for youths' smoking by 28% (OR = .72) and hypertension by 66% (OR = .34), but an increase risk of youths' physical inactivity by 28% (OR=1.28), diabetes by 20% (OR = 1.20), depression by 39% (OR = 1.39), and STDs by 253% (OR = 3.53).

African American racial status decreased the risk of smoking by 50% (OR=.50), increases the risk of physical inactivity by 68% (OR=1.68), increased the risk of diabetes by 391% (OR=4.91), increased the risk of depression 58% (OR=1.58), and increased the risk of STDs by 306% (OR=4.06) when compared to Caucasian racial status.

Hispanic American racial status decreased the risk of smoking by 69% (OR=.31), increased the risk of diabetes by 27% (OR=1.27), and decreased the risk of hypertension by 14% (OR=.86) when compared to Caucasian racial status.

Asian American racial status decreases the risk of smoking by 29% (OR=.71), and decreased the risk of physical inactivity by 30% (OR = .70) when compared to Caucasian racial status. Native American racial status increased the risk of diabetes by 81% (OR=1.81) when compared to Caucasian racial status.

Testing Interactions

In order to examine differential influences of precocious events on health problems depending on family socioeconomic status, race/ethnicity, and gender, we examined interactions between family characteristics, race/ethnicity, and gender, and each precocious event by adding all the interaction terms in to the regression model. Only the significant interaction terms (out of a total of 60) are presented in Table 1. In regard to family characteristics, none of the interaction effects were significant (not shown in Table 1), but several interactions involving race/ethnicity were significant. For instance, the interaction between Hispanic American racial status and early sex on smoking was significant (OR=2.60). This interaction indicates that the detrimental influence of early sex on smoking is stronger among Hispanic youth compared to Caucasian youth. The interaction between Asian racial status and early pregnancy on hypertension was significant (OR=2.50). This interaction indicates that the detrimental influence of early pregnancy on hypertension is stronger among Asian youth when compared to Caucasian youth. The interaction between African American racial status and early cohabitation on STDs was significant (OR=.52). This interaction indicates that the detrimental influence of early cohabitation on STDs is weaker among African Americans when compared to Caucasian youths. The interaction between Native American racial status and dropping out of high school on smoking was

significant (OR=1.96). This interaction indicates that the detrimental influence of dropping out of high school on smoking is stronger among Native American youths when compared to Caucasian youths.

Several interaction effects involving gender were also significant. Gender interactions with early sex on diabetes (OR=2.06), early marriage on hypertension (OR=1.35), and dropping out of school on smoking (OR=1.47) were significant. The interactions indicate that the detrimental influences of early sex, early marriage, and dropping out of school on health outcomes are stronger for female youth than for male youth.

In addition, several interactions involving race/ethnicity and gender were significant. Gender interactions with African American racial status on hypertension were significant (OR=1.95). This indicates that the detrimental influence of African American race/ethnicity status on hypertension is stronger for African American females than for Caucasian females. Gender interactions with Hispanic race/ethnicity status on obesity was significant (OR=1.38). This indicates that the detrimental influence of Hispanic race/ethnicity status on obesity is stronger for Hispanic females than for Caucasian females. Gender interactions with Asian racial status on obesity was significant (OR=.61). This indicates that the detrimental influence of Asian race/ethnicity status on obesity is weaker for Asian females.

Discussion

The objective of this study was to investigate the health implications of adolescent precocious transitions into adulthood while addressing several limitations of previous studies. The results demonstrated that adolescents' precocious life events are associated with health problems in young adulthood. That is, emerging health inequalities in young adulthood may be partly due to a range of precocious life events experienced by adolescents.

Our findings clearly point to the detrimental health risks associated with the early occurrence of precocious life events. Consistent with the life course perspective, the results emphasized the importance of a normative timing of life events (Elder et al., 1996). For example, each of the precocious transitions in our study (e.g., early sex, early full-time work, early pregnancy, early leaving home, early cohabitation, early marriage, and not completing high school) led to significant physical or mental health risks (e.g., smoking, physical inactivity, diabetes, hypertension, depression, STDs, and/or obesity) in young adulthood. But numerous studies (Schoen, Landale, & Daniels, 2007) have shown a considerable heterogeneity in the timing and sequence of youth transition events. That is, youths take a variety of divergent pathways from adolescence to young adulthood. However, prior research illustrates that regardless of the divergent paths taken by youths, in general, early onset of transitional events during adolescence have a greater chance of eliciting negative health consequences in young adulthood (Booth et al., 2008; Wickrama, Conger, & Lorenz, 2008).

These negative health outcomes may be attributed to the fact that, during the turbulent period of adolescence, youths are not prepared for the excessive emotional, social, and financial demands of the adult and family responsibilities associated with precocious life events (Maynard, 1996; Kessler et al., 1997; Teti & Lamb, 1989). Such stressful experiences have been shown to have long-term health consequences over the life course. As discussed earlier, these health influences may also be attributed to early 'damages' (e.g., behavioral orientations) and structural constraints (e.g., lack of access to health resources) imposed by early transitional events.

Results from the current study showed several patterns of associations between precocious events and young adult health problems. First, early termination of education (dropping out

of school) was associated with the greatest number of health problems, indicating that dropping out of school during adolescence places young adults at a high risk for negative health outcomes. This may be largely attributed to the structural constraints imposed by their relatively poor socioeconomic achievement. As argued earlier, adolescents who drop out of high school are more likely to end-up in low-paying, low-status occupations. These occupations are less likely to provide them with proper health insurance or provide them with adequate income to access basic health resources (e.g. proper nutrition, medicine, and housing). Second, these results demonstrated that early sexual experience was associated with greater health risks in early adulthood. These results supported the notion that youths who engage in early sexual activities get a “head start” and are more likely to engage in risky sexual behaviors exposing them to STD risks (Browning et al., 2008). Third, the results showed that leaving home early was associated with greater health risks in early adulthood. As previously argued, adolescents' leaving home early may also reduce parental supervision and monitoring, health care utilization (e.g. regular check-ups), adequate sleep, and family bonding experiences (e.g., eating meals together). Instead, engaging in precocious events may promote unhealthy behaviors such as eating ‘fast food.’

The present study also showed that early cohabitation was associated with several health problems (e.g., smoking, depression, STDs), whereas early marriage was only associated with obesity. Moreover, early marriage has been shown to be a protective factor for preventing STDs, suggesting that although the marriage is early, it provides some health benefits for youths. Given the results of this study, it appears marriage may deter youths' risky sexual behaviors and decrease their risks of acquiring STDs. In fact, the association between health and marriage is well documented. Research shows that married men and women are healthier and happier than their unmarried counterparts. This may be attributed to the fact that marriage institutionalizes individuals, clearly defines individuals' social roles, and fosters social support from family and friends (Kaball et al., 2010; Music & Bumpass, 2006; Waite & Gallagher, 2000). However, cohabitation does not clearly define partners' social roles and also lacks legitimacy and stability compared to marriage, consequently, individuals who cohabit may receive less social support than their married counterparts. Furthermore, our results suggested that early timing of cohabitation may worsen this situation. Research has also shown health disadvantages (or less beneficial effect) of cohabitation (Duncan, Wilkerson, & England, 2006; Musick & Bumpass, 2006).

Additionally, results from the current study provided evidence to suggest that smoking was associated with all but one precocious event. This may be attributed to the fact that (a) smoking co-exists with other precocious events as a syndrome of disrupted behaviors, and/or (b) smoking may be used as a coping mechanism for stressful precocious events. These associations of precocious life events during adolescence with young adult health problems suggested that different etiological processes were associated with different precocious events.

In addition, the present study addressed methodological limitations found in most previous studies. For instance, the current study used a longitudinal design with prospective and retrospective data from a large, non-clinical sample of adolescents. The longitudinal design provided support for hypothesized causal direction. Because the study sample represented all racial/ethnic and socioeconomic groups in the United States, the study did not suffer from systematic biases due to dominant race/ethnicity (e.g., primarily European Americans). Also, unlike previous studies which have focused on single health outcomes, the present study investigated an array of health outcomes revealing differing associations between precocious transition events and various health outcomes. Also the analyses predicted young adults' health problems after controlling for appropriate lagged measures. That is, mitigating the possibility of reverse hypotheses and controlling for selection effect, the study predicted

change in health problems from adolescence to young adulthood in relation to experiences with each of the precocious events in adolescence.

Although findings from the present study were generally consistent with the study hypotheses, several factors potentially limited the scope and generalizability of the results. First, the present study used mostly self-reported measures. Replication using clinical health measures would alleviate concerns regarding potential self-report biases related to the measures used in this study. Particularly, previous research suggests that men's reports of childbearing are less reliable than those of women (Amato, Landale, & Havasevich-Brooks, 2008; Randall et al., 1999). Second, direct lagged measures were not available in previous waves for some health problems. In such cases, a general health measure was used as the lagged control variable. Third, variables not considered in the present study may influence both adolescent life events and young adult health, such as adolescent individual characteristics (e.g., self-control, mastery, and self-esteem). Such variables may cause a spurious association between adolescent life events and young adults' health. Finally, we did not examine potential buffering effects of certain types of life transitions which can protect young adults from the negative influence of precocious life events. These transitions may include establishing an effective close relationship, exposing them to a positive role model, joining the military, or participating in a vocational training program (Wheaton & Gotlib, 1997).

Despite these limitations, the findings from this study have several theoretical and practical implications. This study demonstrated that vulnerable groups of adolescents who experience precocious life events can be identified early, thus resulting in applying appropriate intervention efforts. Such interventions should promote and develop resiliency factors, aid in redirecting youths' adverse health outcomes, and moderate the relationship between adolescent precocious development and young adult health problems.

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Table 1
Logistic regression predicting young adult health outcomes using precocious events, Odds Ratios, CI in parentheses

Precocious Transition	Smoke	Physical Inact	Diabetes	Hypertension	Depression	STD	Obesity
Early Fulltime Work	1.24 [*] (.9,1.5)	.82 ^{**} (.7,1)	.99(.8,1.3)	1.00(.89,1.1)	1.66 [*] (1.1,3)	.87(.7,1.1)	1.00(.9,1.1)
Early Sex	1.70 ^{***} (1.2)	1.25 ^{***} (1.1,3)	.89(.7,1.1)	1.05(.94,1.16)	1.05(.9,1.2)	1.80 ^{***} (1.5,2)	.97(.8,1.1)
Early Pregnancy	1.30 ^{**} (1.1,5)	1.00(.8,1.1)	.84(.6,1.1)	.92(.73,1.15)	1.01(.87,1.2)	.65(.37,1.1)	1.18 [*] (.9,1.3)
Early Leave Home	1.20 [*] (.8,1.5)	1.02(.7,1.3)	1.30 ^{**} (1.1,5)	1.25 [*] (.90,1.6)	1.00(.9,1.6)	1.32(.86,2.0)	.98(.8,1.2)
Early Marriage	.82(.9,2.1)	1.10(.8,1.4)	.82(.5,1.3)	.83(.5,.90)	.84(.7,1.1)	.69 ^{**} (.39,.96)	1.29 ^{**} (1.1,1.6)
No High School	2.06 [*] (1.7,2.3)	1.35 ^{**} (1, 1.6)	1.10(1.1,5)	.90(.76,1.07)	1.71 ^{***} (1.5,1.9)	1.36 [*] (.95,1.5)	.99(.9,1.1)
Early Cohabitation	1.82 ^{***} (1.5,2)	.93(.8,1.0)	.99(.8,1.2)	1.06(.96,1.17)	1.21 [*] (.99,1.24)	2.45 ^{***} (2,3)	1.04(.95,1.15)
Control Variables:							
Family Poverty	1.15(1.1,2)	.96(.9,1.0)	1.11 [*] (1.1,2)	1.07 ^{**} (1.1,1)	1.05 [*] (1.0,1.1)	.96(.9,1.0)	1.04+ (.99,1.0)
Parent Education	.96 [*] (.95,.97)	.99 [*] (.9,1)	.95 ^{***} (.9,.98)	.98 ^{***} (.9,.99)	1.00 ^{**} (.9,1.1)	1.01(.9,1.0)	.95 ^{***} (.94,.96)
Parent Marital Status	.95(.8,.1)	.96 [*] (.8,1.0)	1.06(.9,1.3)	1.14 ^{**} (1.1,2)	.86 ^{**} (.8,.96)	.84 [*] (.7,.9)	.93+ (.85,1.0)
Age	.90 ^{***} (.8,.9)	1.06 ^{**} (1.1,1)	1.15 ^{**} (1.1,2)	1.07 ^{***} (1.1,1)	.95 ^{**} (.92,.99)	1.01(.9,1.1)	1.00(.97,1.0)
Gender (Female)	.72 ^{***} (.6,.8)	1.28 ^{**} (1.1,4)	1.20 [*] (1.1,5)	.34 ^{***} (.3,.39)	1.39 ^{***} (1.1,5)	3.53 ^{***} (2.9,4)	.96(.86,1.1)
Smoking –W1	4.09 ^{***} (3,5)						
Exercise – W1	.61 [*] (.54,.70)						
General Health –W1				1.18 ^{***} (1.1,2)			
Diabetes- W1			41.6 ^{**} (21,80)				
Depression- W1					1.12 ^{***} (1,1.1)		
STD-W1						1.04(.83,1.31)	
Obesity-W1							35.6 ^{***} (26,48)
African American	.50 [*] (.4,.6)	1.68 ^{***} (1.4,2)	4.91 ^{***} (4,6)	.92(.77,1.1)	1.58 ^{***} (1.4,1.8)	4.06 ^{***} (3.2,5)	.99(.82,1.2)
Hispanic American	.31 [*] (.2,.37)	1.1(.9,1.3)	1.27 [*] (.9,1.7)	.86 [*] (.74,.9)	1.13+ (.97,1.31)	1.17(.93,1.49)	.96(.8,1.5)
Asian American	.71 [*] (.55,.9)	.70 [*] (.5,.81)	.66(.34,1.25)	.92(.73,1.2)	.97(.75,1.26)	.98(.65,1.47)	.83(.6,1.2)
Native American	.93(.6,1.3)	1.29+ (.9,1.7)	1.81 ^{**} (1.2,7)	1.13(.88,1.4)	1.29 [*] (.99,1.7)	.94(.63,1.41)	1.19(.9,1.52)
Interactions:							

Precocious Transition	Smoke	Physical Inact	Diabetes	Hypertension	Depression	STD	Obesity
Early Sex × Hispanic	2.60** (1.3,5)		2.06* (1.3,9)				
Early Sex × Gender							
Early Preg × Asian				2.50** (1.5,3)			
Early Preg × Gender				.79+ (.58,1.0)		1.85* (1.0,3.3)	
Early Mrge × Gender				1.35** (1.1,7)			
Early Mrge × Fm Pov				1.00 (.89,1.13)			
Af. Am. × Gender				1.95** (1.5,2)			1.90*** (1.5,2.5)
Hispanic × Gender							1.38** (1.0,1.8)
Asian × Gender							.61* (.38,.98)
No Hgh Sl × Gender				1.47** (1.1,9)			
No Hgh Sl × Native	1.96* (1.3,7)						
Cohab × Af. Am.						.52*** (.38,.7)	
Constant	.50	-2.41	-5.14	-2.97	-1.64	-4.32	-.45
R-sq (Nagelkerke)	.21	.04	.12	.07	.10	.15	.18

*
p < .05,
**
p < .01,

p < .001