Probabilistic (or Risk) Trajectories of Family Structure and Adolescent Depression

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ABSTRACT

Studies recognize the importance of family structure on diverse outcomes of well-being, and, more recently, consequences of different longitudinal patterns of continuity and change in family structure have garnered much attention. Prevailing studies on the dynamics of family structure include research on family instability based on the count measures of transitions in family living arrangement and/or the measures of duration of extant family type, as well as research on risk of family disruption based on the probability measures of family break-up or other types family transitions. These researches present particular ways of conceptualizing the temporal dynamics of family structure and highlight unique consequences associated with each family structure dynamic. This paper introduces another way, a new way, of conceptualizing patterns of family structure dynamics based on the probabilistic trajectories of family structure over the life course. Unlike prior hazard model types we do not measure the risk patterns of family structure based on any a priori grouping of population but rather identify the population groups ex post based on how family structure present themselves as distinct probabilistic paths. To these risk paths of family structure, we associate the likelihood of sample respondents' membership and determine individual characteristics that precede (i.e., risk factor) and follow (i.e., consequences) each trajectory. To illustrate the approach, we assess the risk trajectories of family structure for Baltimore youths, their risk factors, and their consequences on youth depression. We utilize the data from Beginning School Studies (BSS) that followed the representative sample of Baltimore public school students (N=788) from their childhood to mature adulthood. For statistical model, we adopt modified version of general mixture modeling (GMM). Our analyses reveal that, over the span of child's 1st through 12th grade (1982 to 1993), children followed five distinct probabilistic trajectories of family structure, including the paths showing stable probabilities for either family type as well as transitioning paths involving both the changes towards and away from two-parent type. Race and socioeconomic status are identified as strong risk factors, and adolescent depression are shown to be influenced by different probabilistic paths of family structure.

INTRODUCTION

Today, one in two marriages in America eventually ends in divorce (Barmlett & Mosher 2002). Moreover, many of these failed marriages are followed by a second that fails, and at a higher rate than for first marriages (Barmlett & Mosher 2002). Family dissolution poses burdens for the children involved, who are obliged to adjust to parental figures' coming into *or* leaving their lives. And children born to non-married parent(s) face even greater lifetime risk of experiencing changes in family structure, either marital if the parent eventually marries or through a cohabitating relationship (Furstenberg 2009; Cherlin 2008). It is no wonder that the consequences of family disruption for children have become an important issue. The present analysis assesses consequences in the socio-emotional realm, specifically the risk of depressive symptoms during adolescence.

Against the general consensus that an unstable family life burdens children socio-emotionally (Fomby & Cherlin 2007; Osborne & McLanahan 2007; Cavanagh and Huston 2006; Wu & Martinson 1993), there is less agreement on what specific facets of family disruption are most harmful. Is it simply the fact of change, or does the underlying risk or potential for change matter? Not all family conflicts materialize into family disruption, yet it is unlikely that such risks carry no consequence. What about changes in family type? When the prospect of change is high, does it matter whether the change is, say, from two-parents as opposed to from the single parent? Cherlin argues forcefully, and persuasively, that partnership changes in themselves are challenging for children,[1] but it hardly follows that the situation of the never-married mother with no history of co-habitation is equivalent to that of a stable two-parent household. The "other things equal" stipulation might hold the key, but how often are other things truly equal? Never-married single mothers tend also to have low levels of schooling, low levels of income, and poor job prospects ( ), all well-established risk factors for children's adverse developmental outcomes. The current project examines consequences of continuity and change in family structure using risk exposure perspective. Specifically, we track adolescents' likelihood of experiencing depressive symptoms in relation to probability patterns in family structure. And since time and its passage are integral to both family structure change and the expression of depressive mood disorder, the two are evaluated dynamically, as trajectory analyses.

Family Structure and Family Disruption

Much attention has focused on the deficiencies of single-parent households as child-rearing environments. When compared to households with both biological parents present, children raised in single-parent households (as well as other types) generally fare poorly on measures of socioemotional well-being (e.g., Wu & Martinson 1993; Thomsen et al. 1992; Astone & McLanahan 1991). But a static perspective centered on the classification of family types offers a limited view of developmental dynamics in family life. More specifically, a cross-sectional profile will not capture stability or disruption in family unions.

Conventional studies on the temporal dynamics of family structure include examination of family instability (e.g., Wu & Martinson 1993) based on the count measures of transitions in family living arrangement (Cavanagh and colleagues 2006b) or the measures of duration of extant family type (Hao and Xie 2001), as well as examination on risk of family disruption based on the probability measures of family

[1] "Partnership" as used here subsumes marital and co-habiting relationships.

break-up or other types family transitions ( ). These researches present particular ways of conceptualizing the temporal dynamics of family structure and highlight unique consequences associated with each family structure dynamic. This paper introduces another way, a new way, of conceptualizing patterns of family structure dynamics based on the probabilistic trajectories of family structure over the life course. Unlike prior hazard model types ( ) we do not measure the risk patterns of family structure based on any *a priori* grouping of population but rather identify the population groups *ex post* based on how family structure patterns present themselves as distinct probabilistic paths. To these risk paths of family structure, we associate the likelihood of sample respondents' membership and determine individual characteristics that precede (i.e., risk factor) and follow (i.e., consequences) each trajectory.

Specifically, the present analysis investigates the inter-trajectory association between probabilities of experiencing two-parent vs. alternative family structure and risk of depression. In doing so, we pay a close attention to *timing* and *sequencing* of changing risk in family types—that is to say, the risk in family disruption—as conditioning factors for varying developmental trajectories of risk in depression. Finally, we evaluate the relationship between adolescent depressive risk and the likelihood of *adult* depression and how this relationship may be moderated by trajectories of risk in family structure.

Using data on a panel of urban youth that extend from 1st grade into young adulthood, we employ general mixture modeling (GMM) to identify distinctive probability trajectories of family structure from 1st through 12th grade *and* characteristic probability trajectories of adolescent depression from 6th through 12th grade. Once trajectories are identified, the model is used to assess interrelationships between the two sets of probability paths and then subsequent consequences for the depressive risk in young adulthood, adjusting possible confounds involving unobserved heterogeneity.

Though we believe our agenda and approach are distinctive, there are useful literatures on the parts, if not the whole, that help to inform our expectations.

Timing of Family Disruption

There are two schools of thought regarding the critical/sensitive period for family influence. One favors childhood; the other adolescence. The first perspective stresses early influence and continuity across stages of development. Scholars taking this perspective generally subscribe to a cumulative advantage/disadvantage perspective on development, under which advantages and disadvantages from early life accrue throughout one's lifetime (Dannefer 2003). Evidence that family influence in early childhood can affect children's development long term includes studies of achievement scores (and educational attainment) from the early period of schooling in relation to later outcomes (Alwin & Thorton 1984; Entwisle & Alexander 1989; Duncan & Brooks-Gunn 1997; Guo 1998).

A second school of thought emphasizes later influence, in particular during adolescence, when the transition to adulthood is imminent. This position holds that adolescents are more susceptible to external influence owing to their greater maturity (Mickelson 1989 1990). This line of reasoning accords with the developmental discontinuity perspective, which ascribes greater importance to events more proximal to the present and less significance to more distant childhood events (McLeod & Alamazen 2003).

Empirical studies on the timing and critical period issues have produced mixed results (e.g., Amato 1993). Clear purchase on the topic is complicated by the difficulties in distinguishing effects of age from those of family disruption, as well as other methodological complexities (Shanahan 2000). On the one hand, studies have pointed to *early* family disruption as being more deleterious than later (e.g., Furstenberg 1988; Aquilino 1994). For example, Aquilino's (1996) study of children born to unwed mothers finds that those who encounter family transitions *early* in childhood are delayed in gaining residential independence. On the other hand, studies by Chase-Lansdale and colleagues (1995) indicate that divorce during adolescence may be more harmful to children because of the adolescent's proximity to adulthood, as well as the psychophysical changes that adolescence brings. More recently, Cavanagh and Huston (2008) compared the impact of family transitions during early (e.g., from birth to kindergarten) and middle childhood (e.g., from 1st to 4th grade) and found negative effects of family transitions on child outcomes—externalizing behavior, peer popularity, and loneliness—only when encountered during early childhood. To the authors' knowledge, no studies have yet to examine timing for the onset of *risk* in family transition in this context.

Additionally, *timing* is not just a matter of when family disruption occurs but also when its consequences become manifest. The emotional distress surrounding disruptive family change could remain latent for a time, only to present itself years later when other vulnerabilities create the opening. In a study by Cavanagh and colleagues (2006), early family instability was associated with academic difficulties during the later years of high school but not the beginning. Aquilino's (1996) analysis of children raised by single-mothers (1996) likewise documents lagged effects in the academic realm, with consequences for completing postsecondary schooling but not high school. Similarly, Cherlin and colleagues (1998) showed that post-disruption effects of divorce on children's emotional problems do not manifest themselves immediately during childhood but become more apparent as children mature. This view is consistent with the study by Chase-Lansdale and colleagues (1995) who suggest that effects of divorce on children's emotional problems are more evident in young adulthood than in childhood. "Sleeper effects" likewise are evident in Cavanagh and Huston's (2008) conclusion that family transitions during early childhood affect children's behavioral outcomes at the end of elementary school not the beginning and that family transitions during middle childhood manifest no concurrent effect on child outcomes.

These studies suggest that the stresses and emotional turmoil surrounding family disruption take the form of vulnerabilities that become evident during other times of life course challenge. These include the challenges associated with life course transitions (e.g., the transition into high school or college, when academic demands escalate) and the challenges associated with the biological and social changes surrounding adolescence. This instructs us that a long time horizon is needed for monitoring developmental consequences across time, and certainly not to settle for a cross-sectional approximation, or even longitudinal examination based on short time intervals.

Based on this literature and with an outcome in the socioemotional domain, we anticipate the deleterious consequences for risks in family disruption will be more severe when experienced during childhood than when experienced during adolescence.

Sequence of Family Disruption

Transitions in family structure matter in children's development, but does the particular pattern or sequence of change in risk of family disruption also matter? Prior studies have examined the sequence of changes in parental figures largely in terms of divorce and remarriage. Results vary on whether distinct patterns of family transition produce different child consequences. For instance, children's misbehavior does not differ comparing children from remarriages with those from stably divorced families (Hetherington & Clingempeel 1992; Macoby 1992; Zill 1988), but children who experienced a parental remarriage leave the household at earlier ages than those from stably divorced or non-divorced families (Goldscheider & Goldscheider; Aquiliano 1991). In work more closely related to the present analysis, Lagenkemp and Frisco (2008) report that children whose mothers remarry scored lower in acute depressive symptoms than children whose mothers divorce, suggesting that the loss of a biological father due to a martial breakup triggers greater emotional distress than the acquisition of a stepfather. The authors add that having gone through divorce fosters a protective sturdiness in children that can buffer the stresses associated with subsequent family disruption, including remarriage.

Studies have also examined single transition sequences and serial patterns involving multiple transitions. According to Hill, Yeung, & Duncan (1999), children who transition from a mother-only family to two-parents and then back to mother-only are prone to higher levels of academic and behavioral risk than are children exposed to other sequences. More recently, Cavanagh and Huston (2008) compared across four broad sequences of family transitions: (1) transitions during early childhood and no transitions during middle childhood, (2) no transitions during early childhood and transitions during middle childhood, (3) transitions during both early and middle childhood, and (4) no transitions during both early and middle childhood.[2] They report that sequences involving early childhood family transitions are particularly deleterious for several child outcomes, including popularity and loneliness.

Timing and sequencing dimensions of family instability are integral to Cavanagh and Huston's classification; they are integral as well to our trajectory construction. In this paper, however, we center on the underlying risk or potential for family disruption. These studies and others suggest that risk sequences going from a two-parent type to some alternative type (i.e., "exit transition") will have greater bearing on children's depressive risk than the sequence from an alternative type to a two-parent type (i.e., "entrance transition"). As to timing, since we subscribe to the cumulative disadvantage perspective, we anticipate that the adverse effect on children's depressive risk will be more pronounced for exit transitions experienced during childhood than for exit transitions experienced during adolescence.

Socio-emotional Well-Being and Adolescent Mood Disorder

One of the widely used markers of children's socio-emotional well-being is depressive affect or depressive mood. Depressive affect generally refers to either the direct expression of depressed mood (e.g., unhappiness, sadness, distressed mood) or its symptoms (e.g., sleep disturbance, tiredness, low appetite, etc) that lasts for an extended period time. Depressive mood is sometimes distinguished from depressive symptoms, but generally the two are subsumed under "depressive affect" because the risk factors are the same for both (Brooks-Gunn, Petersen, and Compass 1995). Depressive mood among

[2] Note in particular that the type of transition—whether a divorce or second marriage—is not at issue.

adolescents is fairly common, with about a third of adolescents evidencing depressive mood at any given time (Brooks-Gunn, Petersen, and Compass 1995). The prevalence rate for depressive symptoms (usually more stringently measured than depressive mood) is somewhat lower, with an adolescent prevalence rate of around one sixth (Petersen et al. 1993). Clinical depression is marked by more severe and lengthy duration of depressive mood and symptoms, and, as such, the prevalence rate of clinical depression for adolescents is much lower, at about 2~3% (e.g., see Angold & Costello 1995 for review).

Previous literature traces adolescent depression to various stressors that heighten the levels of daily stress, including puberty, school transitions, and peer relations (Goodyer 1991; Compas et al. 1989). In fact, studies show that the number of potential stressors peaks during adolescence (Brooks-Gunn 1991; Paikoff & Brooks-Gunn 1991). One result is that the risk of initial onset of depression among depressed adults is greatest during adolescence (Burke et al. 1990; Kessler et al. 1993; Lewinsohn et al. 1986). Essau and Dobson's review (1999), for example, reports a mean age of onset at around age fifteen. But in studies using clinical diagnosis, the age of onset is found as young as eleven ( ).

Some prominent risk factors for the onset and subsequent episodes of depression include parental depression (Lewinsohn et al. 2000; *Gilman), gender (Weissman & Klerman 1977; Angold & Worthman 1993; Kessler et al. 1993; *Gilman et al. 2003), parental SES (Gilman et al. 2002, 2003) and family disruption (Amato 1991; Cherlin et al. 1998; Gilman et al. 2003). Of most immediate relevance for our study is the dynamics of family structure over time as a risk factor, for it appears to influence both vulnerability or predisposition to depression and the level of stress needed to trigger depressive episodes in adolescence. Studies, for example, link early bereavement or the loss of a parent to depression in youths (Brown 1961; Bowlby 1980; Berney et al. 1991). Likewise, divorce, separation, and parental figure "exit" transitions trigger depression in vulnerable children (Goodyer 1995). There is also evidence that "entrance" transitions, such as remarriage, are associated with depressive disorder among adolescent boys, but not girls ( ). Furthermore, consequences of divorce and other forms of family instability for children's depression also appear to vary by life-stages. According to Wallerstein and Kelly (1980), for example, the response of children to parental divorce changes from "attention-seeking" behaviors during the preschool years to depressive symptoms during middle school, to short-term and severe forms of depression in mid-adolescence. Hence, the manifestation of depressive episodes varies by age and by one's experience of family structure over time.

Depression Trajectories

A cross-sectional typology of adult depression involves classifying or identifying "depressed" individuals using scores measured at one-time during adulthood, but growing evidence suggests that adult depression is closely linked to psychopathology earlier in life, including the onset and severity of the depressive episodes during *adolescence* ( ). In fact, some suggest that the life course may be marked by distinct trajectories of psychiatric disorder (e.g., Harrignton 1993,..). Girls and boys, for example, appear to follow distinctive longitudinal paths of depressive mood in which the prevalence of depressive symptoms are typically equivalent or slightly lower for girls (vs. boys) in the beginning of adolescence but significantly higher by the end of adolescence (e.g., Petersen et al.). But while the value of monitoring an individual's longitudinal

pattern of depressive symptoms over time is recognized (Coleman et al. 2007; McLeod & Fettes 2007; Stoolmiller, Kim, and Capaldi 2005), developmental studies of depression are few in numbers.

As Stoolmiller and colleagues (2005) observe, depression is still "viewed mainly as a *state* rather than as a *process* that unfolds over the prior life course" (p 331). As a result, studies of depressive disorder typically rely on single point in time adult interviews. The present study, in contrast, models the time line of depressive mood across stages of development from adolescence through young adulthood, asking whether different longitudinal patterns of depressive risk during adolescence are discernible. Specifically, we expect to find distinctive characteristic patterns or trajectories of adolescent depressive risk and that these will differ in both their antecedents and consequences.

The several studies that comprise the extant literature suggest the characteristic trajectories of adolescent depressive risk we might anticipate. Wickrama and colleagues (2008), for example, hypothesized an increase in depression with age in their sample of rural adolescents from Iowa but found no such time trend. Instead they found *significant variance* around the non-significant (i.e., flat) age trend, prompting conjecture about a possible *heterogeneity of depressive trajectories*. This hypothesis is consistent with the results reported in Stoolmiller and colleagues' (2005) study, which document four distinct depressive mood trajectories for Oregon youth aged 15 to 24: (1) chronically high depressed, (2) stably low depressed, (3) from highly depressed to moderately depressed, and (4) from moderately depressed to low depressed. And of special relevance to our study, Stoolmiller et al (2005) demonstrated that family disruption in childhood increased the risk of membership in the chronically high depressive trajectory compared to the stably low depressive trajectory. Finally, McLeod and Fettes (2007) examined the trajectories of internalizing problems of children over ages 6 to 18, finding four distinct developmental sequences: (1) stable low, (2) decreasing (i.e. decreasing from a high baseline level in childhood), (3) moderate decreasing (i.e., decreasing from a moderate baseline level in childhood), and (4) increasing (i.e., increasing from low baseline in childhood).

Based on these and the other studies discussed, we expect to identify several distinct trajectories for the two domains of development examined: adolescent depressive mood at the person level and the risk of family structure at the family level. These trajectories would represent, at each point in time, the *likelihood* of the elevated depressive mood or residing in alternative family type and their longitudinal patterns the changes in depressive risk or family structure. We anticipate observing *at least* four sequenced patterns in each domain. For adolescent depressive risk over grades 6 through 12: (1) chronic high risk, (2) stable low risk, (3) increasing risk, and (4) decreasing risk. For changing risks of family structure over grades 1 through 12: (1) consistently high probability of two-parent family type, (2) consistently low probability of two-parent family type, (3) increasing high probability of two-parent family type, and (4) decreasing probability of two-parent family type.

We also anticipate that the risk of one's following a particular trajectory will be conditioned by socio-demographic factors. For example, we expect: (1) *females* to have a greater likelihood than males of following the increasing risk trajectory of depression than the stable-low trajectory and the chronic-high depressive trajectory than the stable-

low trajectory; (2) *blacks* to be more likely than whites to follow family trajectories that involve higher likelihood of alternative family type than the stable two-parent trajectory; (3) youth of *lower socioeconomic* background to be more likely than those of higher status background to follow family trajectories that involve higher likelihood of alternative family type than the stable two-parent trajectory.

A key concern in this paper is how these two developmental trajectories intersect. We address three central research questions regarding the *inter-trajectory* relationships between the developmental sequence of risks in family disruption and adolescent depression: (1) does a stability and change in the likelihood for particular family structures discriminate among developmental patterns of adolescent depressive risk? (2) Do the timing and sequence of risk in family disruption affect the developmental path of adolescent depressive risk? Based on prior studies, we anticipate distinct developmental patterns of probability in family structure to condition how depressive risk unfolds over adolescence. As for timing and sequence, we expect early onset of risk in family disruption will be more harmful than later onset and that a risk sequence towards family disruption (i.e., "breakup") will be more harmful than a "reunion" or "re-cohabitation."

Our analysis uses data on the parents and children from the Baltimore-based Beginning School Study (BSS), a population that is predominantly black and socio-economically disadvantaged. To our knowledge, no studies of adolescent depression and family structure have been conducted on community samples of our kind using an inter-trajectory approach. The statistical approach we adopt in this paper is General Mixture Modeling (GMM).

To summarize, then, this paper contributes to the literature on family structure and child outcomes in the following ways:

1. Trajectory analysis allows the paper to specify the major types of probabilistic patterns in family structure over time.
2. Trajectory analysis allows examination of timing and sequencing of risk patterns in family structure better than any other paper to date.
3. Trajectory analysis allows us to assess life course relationship between two developmental domains (i.e., family structure and depression) through inter-trajectory associations.
4. Trajectory analysis allows us to take into account unobserved heterogeneity in family structure and depressive symptoms (e.g. high depressive symptoms may indicate recent onset or a chronic condition, and the predictors and consequences of these two different trajectories may be very different.)
5. This paper uses recent methodological advances to examine the temporal dynamics of family structure in a way not before possible.
6. The Beginning School Study (BSS) is one of few data sets in the world that allows analysis of trajectories of family structure and depressive symptoms because of its multiple measurements over key periods of childhood and its large sample size.

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10. Trajectory analysis allows us to take into account unobserved heterogeneity in family structure and depressive symptoms (e.g. high depressive symptoms may indicate recent onset or a chronic condition, and the predictors and consequences of these two different trajectories may be very different.)
11. This paper uses recent methodological advances to examine the temporal dynamics of family structure in a way not before possible.

DATA

The Beginning School Study (BSS) is a longitudinal study (N=790) of youth development in Baltimore, from early childhood through mature adulthood. Data collection first began in 1982 when the sample respondents were in their 1st grade of elementary school and ended in 2004 when the sample respondents reached 28-29 years of age. Data were collected annually from 1982 to 1994 except for the two years (1984 and 1986), and were collected again in 1998 in young adulthood (BSSYA) and in 2004 in mature adulthood (BSSMA). Retention rates for the 17-year and 24-year follow-ups were both 80%.

Twenty schools in the sample were randomly selected from a pool of Baltimore city public schools that were stratified by race (African-American and whites) and socioeconomic status. In the initial year of the survey, the sample was 55% African-Americans and 45% whites, representing an oversampling of whites, who made up 23% of the city school system enrollment at the time. The average parental educational level for the sample was 11.9 years, with African-American parents at 12.1 years and white parents at 11.7 years (14.7% of white parents and 11.7% of African-American parents completed four or more years of college). Seventy-seven percent of African-American families (vs. 53% white families) were eligible for the free or reduced lunch meal at school. Forty-four percent of African-American sample respondents (vs. 70% of white respondents) lived in two-parent households as first graders. Not all sample respondents remained in the original twenty schools after 1st grade, but by the middle school years everyone, including those who left to other school systems, were tracked for interview in subsequent years.

Analytic Sample

With many data sources used across many years, missing data is an issue. Although survey coverage most years was quite credible, the cumulative effect would yield an analytic sample in the vicinity of half the original (See Table *). However, panel attrition, across the entire sweep of years from 1st grade to the age 28/29 mature adult survey, was essentially random with respect to measures of family background and depressive mood.

Accordingly, we performed multiple imputations using "ice" in STATA in order to impute the missing values, under the assumption that our data was missing at random (MAR).[3] The trajectory constructions (to be discussed later) for family structure and youths' depression were all performed using the imputed dataset.[4]

Table * Raw Variables: Percentage Missing (%)

Variable	Pct. Missing (%)
sex	0.0
race	0.0
socioeconomic status	6.1
Adolescent Dep 6th grade	39.4
Adolescent Dep 8th grade	29.4
Adolescent Dep 9th grade	20.3
Adolescent Dep 10th grade	22.3
Adolescent Dep 11th grade	22.6
Adolescent Dep 12th grade	25.5
Adult Dep (age 28-9)	22.3
Family Structure 1st grade	10.0
Family Structure 2nd grade	21.4
Family Structure 5th grade	43.8
Family Structure 6th grade	35.1
Family Structure 8th grade	29.0
Family Structure 9th grade	21.5
Family Structure 10th grade	20.0
Family Structure 11th grade	21.8
Family Structure 12th grade	29.8
Parent Dep 6th grade	49.4
Parent Dep 8th grade	44.6
Parent Dep 9th grade	45.1
Parent Dep 10th grade	22.7
Parent Dep 11th grade	28.0

Measures

Family Structure. Our measure of family structure is based on a question distinguishing among four family types; (1) two-parent, (2) single-mother, (3) mother-with-other-adult, and (4) mother-absent. For analytic purposes, these four types are reduced to two: "two-parent" versus "others," which we refer by the catch-all *alternative* family type. The alternative family type consists predominantly of single-mother

[3] This method uses Monte Carlo Markov Chain (MCMC) to generate values for missing cases at step *t* by using the regression-imputed values from the previous step *t-1* and "residuals" associated with Bayesian posterior distribution for the multivariate distribution of all variables included in the MI procedure. The process repeats several times (cycles) to yield a simulated version of complete data.

[4] We imputed five sets of "complete" data using ten cycles for each set in STATA. There were no missing values for race and sex, but these were all included in the "ice" model along with all other analytic variables (including mother's employment status). The missing values for child depression, family structure, and parental depression were all dichotomous variables and were regressed using logit model within "ice." Socioeconomic status ("ses") was continuous variable and was regressed using OLS within "ice."

households (with or without non-marital cohabiting male partners), accounting for about 80% of the entire category on average. The percentage alternative ranges from 44.4% in 1st grade to 52.0% in 12th, averaging 47.8% across the nine years for which data are available.

Depressive Mood. The Kandel Depression Scale (KDS) is one of the most extensively used diagnostic instruments for measuring childhood and adolescent depressive mood (Compas, Ey, and Grant 1993; NIMH 1999:139). However, it is generally not used to screen for *adult* depression ( ). Test-retest and internal consistency checks carried out in various settings with diverse sample subjects establish satisfactory levels of reliability, content validity, concurrent validity, and construct validity for the KDS (Kandel & Davis 1982; Compas et al 1994). The KDS instrument consists of six questions: During the past few months, how much have you been bothered or troubled by: 1. "feeling too tired to do things" 2. "having trouble going to sleep or staying asleep" 3. "feeling unhappy, sad, or depressed" 4. "feeling hopeless about the future" 5. "feeling nervous or tense" 6. "worrying too much about things." Scores range from 1 to 3, with 1 representing "not at all," 2 "a little," and 3 "a lot." Their average is the overall ranking of depressive mood. The BSS administered the KDS in 1987, 1989, 1990, 1991, 1992, and 1993, spanning 6th through 12th grade. This span of years is appropriate for bracketing adolescence. Sixth grade, the first year of middle school, with most 12~13 years of age at the time, is the anchor, while high school seniors, who are mostly 18~19 year of age, are in the process of aging out of adolescence. Age benchmarks are but rough approximations of developmental milestones, but the span of years covered by these data is well suited to our purpose.

Dichotomized Measures for Depressive Symptoms. In the analyses reported below we use a dichotomized version of the KDS. How well the KDS discriminates those who are clinically diagnosed with depression from others is one way to gauge its clinical significance (Compas, Ey, and Grant 1993). In Kandel and Davis's (1982) research with New York public-school adolescents, the cut-off values of 23, 21.8, and 19.5 identified 15%, 18%, and 28%, respectively, of the sample youth as at high risk of depression. For this study, we adopt Kandel and Davis's most inclusive cut-off value, 19.5, which on every occasion identified roughly a third of the BSS sample as being at elevated risk for depression.

We also include a measure of depression when BSS sample respondents are adults at age 28-9. For these measures, we used more conventional CES-D instrument, consisting of twenty questions. The sum score of 16 in CES-D scale is, then, used as a cut-off (Radloff 1977), with those who are at or above the value being considered at high risk of depression. This cut-off value is used in our analysis to transform a respondent's adult depression measure into a dichotomous variable: 0 = no risk (scoring below 16) and 1 = at risk (scoring at or above 16).

Control Variables. Our analysis includes several demographic risk factors (sex, race, parental socioeconomic status, and parental depressive mood) as control variables. Race and sex are dummy variable with black (vs. white) and female (vs. male) as the reference categories respectively. The panel is balanced by sex and majority African-American (55% black and 45% white). Parental SES is a continuous standardized variable that combines parental education level, parental occupation status, and family income—using school record data on participation in the meal subsidy program for

income and parent interview for the other four. Socioeconomic status is assumed time-constant in our analysis.

In addition, we include KDS measures of parental depressive mood (again dichotomized), as a time-varying variable measured through parent interviews in 6th, 8th, 9th, 10th, and 11th grade.

DESCRIPTIVES

Depressive Mood & Family Structure

We begin our analysis by reviewing the distribution of depressive mood and family structure across years. BSS panel data on depressive mood span the adolescent years from 6th to 12th grade, while data on family structure encompass childhood and adolescence, from 1st to 12th grade. Table 1 reports the percentage distribution of each along the observational timeline. The first row indicates the sample percentage scoring above the KDS cut-off for elevated depressive mood; the second row the sample percentage residing in alternative family types—i.e., an adult configuration other than two-parent. In 6th grade (equivalently, age 12-13), for example, a third of the panel scored above the KDS cut-off indicating severe depressive mood; that same year, 43.4% of the panel was in family arrangements other than two-parent.

Table 1. Time line of Depressive Mood and Family Structure Variables. Sample Percentage Distribution (N=790)

`	Childhood					Adolescence						
Age. Yrs	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19
School Grade	1st Grade	2nd Grade	3rd Grade	4th Grade	5th Grade	6th Gr	7th Gr	8th Gr	9th Gr	10th Gr	11th Gr	12th Gr
Severe Depressive Mood						33.4%		32.7%	34.4%	34.6%	33.4%	35.8%
"Alternative" Family Structure	44.4%	47.6%		45.9%		43.4%		46.1%	46.7%	50.1%	53.7%	52.0%

Levels for both are comparable to estimates from other studies. For depressive mood, about a third of BSS children exhibit high levels of depressive mood every year between 6th and 12th grade, ranging from a low of 32.7% in 8th grade to 35.8% in 12th grade (Table 1), about the level of prevalence rates for adolescent depressive mood in the literature (Brooks-Gunn, Petersen, and Compass 1995). Two points deserve mention. First, BSS socioeconomic levels are skewed low and there is a high presence of alternative family types in the panel (see below). In light of this socio-demographic profile, we might have expected higher levels of depressive mood than the findings in epidemiological studies, not similar rates. Also, the literature finds that rates of depressive mood increase with age during adolescence (Essau & Dobson 1999). In the BSS they hold steady, varying only a point or two across years. That said, data in Table 1 are aggregated across the entire sample. Disaggregated pathways of depressive mood, which the trajectory analysis will later reveal, could well evidence distinctive time trends.

For family structure, the sample proportion of alternative family type ranges between 44.4% in 1st grade to 52.0% in 12th grade (Table 1); the comparable figures nationally range between 25.0% and 29.5%.[5] Levels of alternative family structure ought to be higher in the BSS, given its composition: two parent households are less common

[5] The national figures represent the U.S. census figures from 1982 (25.0%) and 1993 (29.5%) for children under 18 years of age who were living in a non two-parent family arrangement (i.e., mother-only, father-only, other relatives, or other non relatives). *Source: U.S. Census Bureau, Housing and Household Economic Statistics Division, Fertility & Family Statistics Branch. Table Ch-2. <http://www.census.gov/population/www/socdemo/hh-fam.html>*

among African-Americans and families of lower socioeconomic status than among majority white and more advantaged households.( ).

We note also that the 17.1% increase over time in alternative family living arrangement between 1st grade and 12th grade. This corresponds to the years from 1982 to 1994, and the panel increases parallels almost exactly national data over the same time period.[6] By the end of adolescence, more than half of the BSS panel are in non-two parent households, but just as with depressive affect, this is the aggregate picture. At the disaggregated level we expect considerable variability in the timing of risk exposure to two parent and alternative family structures.

ANALYTIC STRATEGY

Some assumptions

Conventional growth modeling assumes a single population distribution of trajectories, from which varying trajectories of subpopulations are identified by estimating systematic variations/deviations around a true population intercept and a slope. These approaches are useful but are not always theoretically justified. In case when there exist subpopulations with distinct longitudinal patterns of outcomes that correspond to distinct sets of risk factors and consequences, the conventional assumption of a single homogeneous trajectory distribution of outcomes may be inappropriate. In criminology, for example, life-time persistent criminals are sometimes assumed as a distinct subpopulation, following their own unique set of criminal life-trajectories, rather than seen as deviating from a "true" population criminal trajectory (Moffitt 1993; Sampson and Laub 2003). Likewise, other scientific fields have widely adopted the assumption of population heterogeneity.

For our study, relaxing the assumption that there exists a single population trajectory of depressive risk and likelihood of family disruption has the added benefit of allowing us to assess the interrelationship between trajectories. We use the GMM model (Muthen 2004) to identify patterns of continuity and change in probability of family structure and depressive mood and to assess the associations *between* these two developmental risk patterns. The general mixture model (GMM) allows for multiple trajectory distributions, each governed by its own set of parameters. EM Algorithm (Muthen and Shedden 1999) is employed.

Our estimation imposes two restrictions based on both theoretical and practical considerations. First, we assume that the shapes of risk trajectories of family structure and depressive mood are independent of each other; that is to say, the *latent growth factors* of changes in probabilities of family structure are estimated independent of those for depressive mood (and vice versa). However, the association between these two sets of trajectories, as well with other control variables, are not constrained, nor are the latent class proportions and membership probabilities. Effectively, the coefficients for the "explanatory" part of the structural equation model are freely estimated, with the measurement parameters for the trajectories fixed through separate analyses.

The second restriction allows for no variance for the residuals of the growth factors. This is a practical solution to get around the computational difficulties involving random growth factors. By imposing no residual variance for the growth factors, we

[6] Nationally, 17.8% represents the rate of growth in non-two parent living arrangements between 1982 and 1993. *Source: U.S. Census Bureau, Housing and Household Economic Statistics Division, Fertility & Family Statistics Branch. Table Ch-2. <http://www.census.gov/population/www/socdemo/hh-fam.html>*

assume all the variations in intercept and slopes are fully accounted for by the latent classes. That is to say, within each latent class, the trajectories are homogeneous and everyone shares the same developmental patterns. With this particular assumption, the model becomes analogous to the semi-parametric group-based analysis (Nagin 1999).

Model Specification

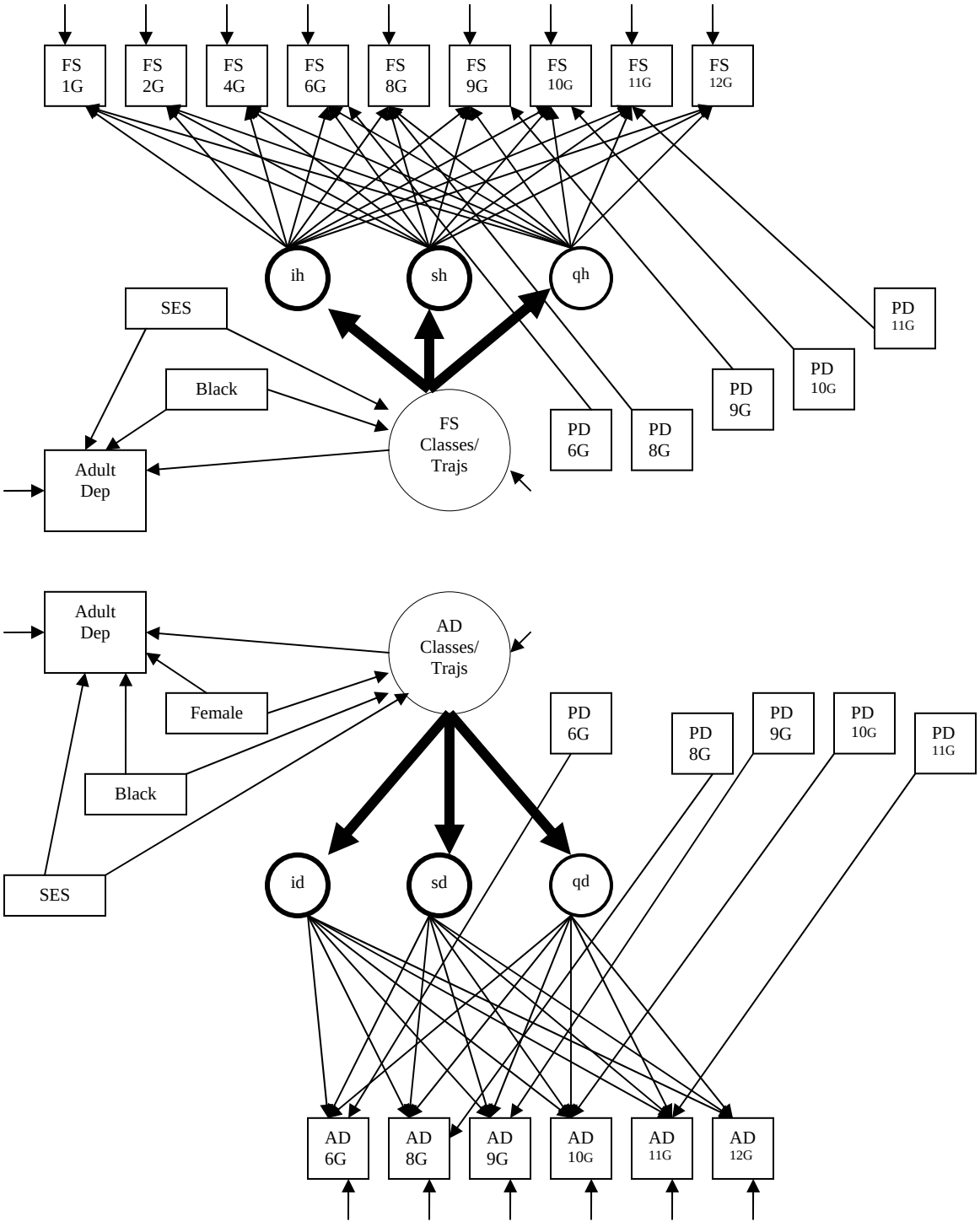
Our modeling includes two major components. The first component is the measurement model, used to determine the developmental patterns of risk in family disruption and depressive mood over time. Latent growth factors are estimated from within-person repeated measures of family type and depressive mood. These latent growth factors, in turn, are specified as indicators of the *latent classes* of family structure and adolescent depressive mood. The latent growth factors are individual growth parameters, such as an intercept or a slope coefficient, while a latent class is the *set* of growth factors that determine a particular trajectory (e.g., an intercept *and* a slope). Since a "trajectory" is defined not by a single growth factor (e.g., a slope alone) but by a set of growth factors (e.g., an intercept *and* a slope), a latent class is what we refer to as a latent *trajectory*. In our measurement model, specific sets or groups of latent growth factors are specified to identify or define latent classes (or, equivalently, latent trajectories). This group-based approach is what allows estimation of inter-class or inter-trajectory relations. Whereas the more conventional growth modeling only allows estimation of the covariance between growth factors—for example, covariance between a slope and an intercept—, the GMM model allows estimation of the relationships between *sets* of growth factors. That capability allows us to evaluate whether probability trajectories of family structure constitute risk factors for probability trajectories of adolescent depressive mood. The *control* variables used in the measurement model include sex, race, and socioeconomic status as time-invariant risk factors and parental depressive mood as a time-varying risk factor. The measurement models are displayed in Figure 1.

The second component of our model is the structural model. It consists of the three key structural paths; first, the path that evaluates influences of family trajectories on depressive trajectories, second, the paths that link the social risk factors—sex, race, socioeconomic status, and parental depressive mood—to family and depressive trajectories, and, third, the path from family and depressive trajectories in adolescence to depression risk in adulthood. We go over each of these briefly next.

First, the linkage between family trajectories and adolescent depressive trajectories is estimated by the multinomial logistic regression of adolescent depressive trajectories on family trajectories, with the effects of family trajectories interpreted as the likelihood or odds of belonging to *each* of the several adolescent depressive trajectories—i.e., it is a probabilistic measure, not a determent one. Likewise, the associations between social risk factors and family and depressive trajectories are estimated by multinomial logistic regression, with sex, race, and SES included as predictors explaining the respondents' likelihood of belonging to each of the available trajectories in both family structure and depressive mood. At the same time, time-varying parental depressive mood is specified as affecting family type and depressive mood score at each time period for which parental depressive mood data are available (6^{th}, 8^{th}, 9^{th}, 10^{th}, and 11^{th} grade). This estimation uses logistic regression. Finally, the logistic regression is used to predict risk of adult depression from the *combined trajectories* of

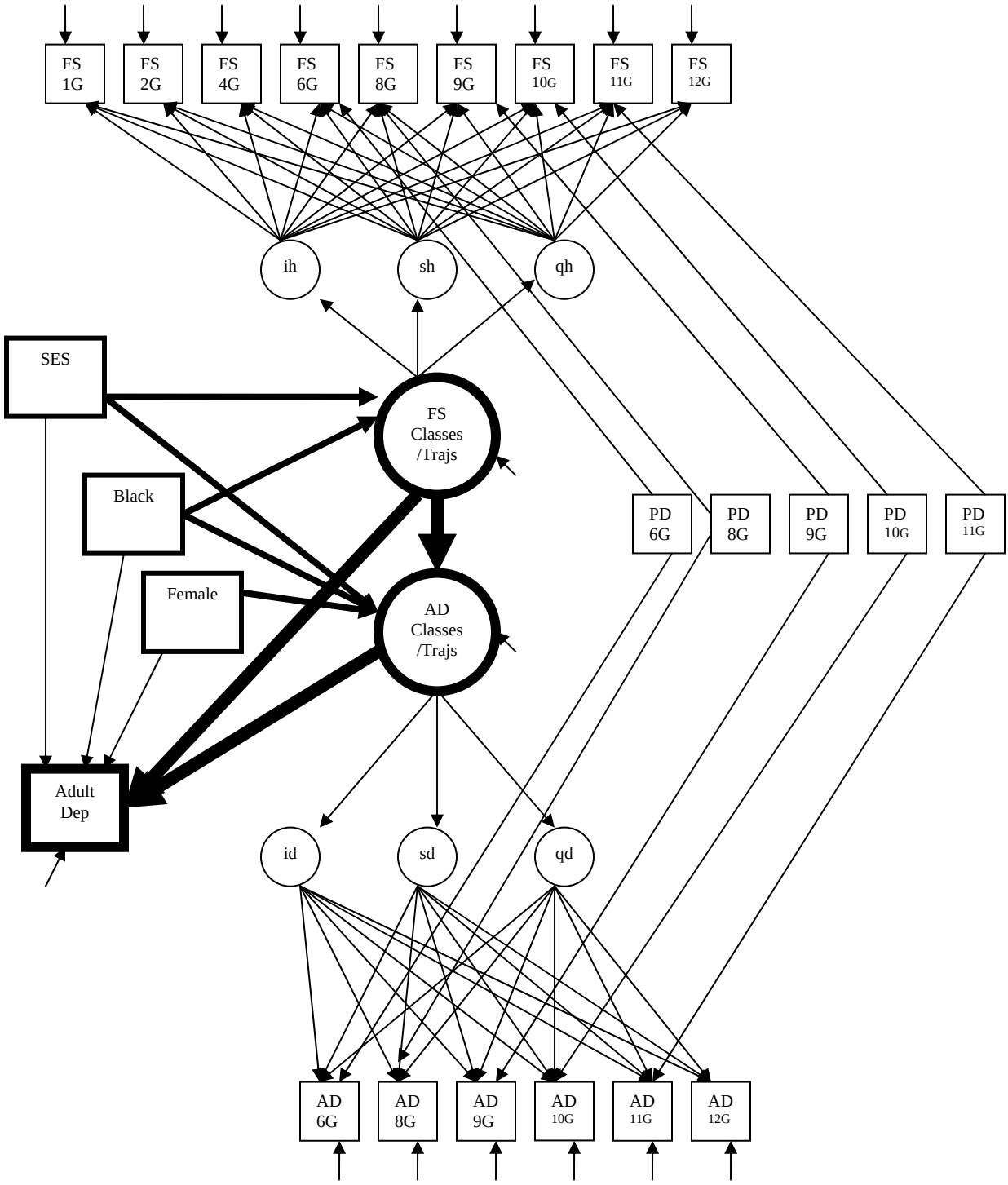
family and adolescent depression, while controlling for sex, race, and socioeconomic status. That is to say, the entire set of family trajectories (total of five—to be shown later) and adolescent depressive trajectories (four) are combined to make *twenty distinct latent classes*, and this new set of trajectories, defined by the intersection of patterns of family type and depressive mood, is used to explain the likelihood of depression in adulthood. Figure 2 displays the structural component of our model.

Figure 1. Measurement Models for Probability Traj of Family Structure and Depression



(FS = Family Structure, AD = Adolescent Depressive Mood, ih = latent intercept for family structure, sh = latent linear slope for family structure, qh = latent quadratic slope for family structure, id = latent linear intercept for adol. depressive mood, sd = latent linear slope for adol. depressive mood, qd = latent quadratic slope for adol. depressive mood, PD = parental depressive mood)

Figure 2. Structural Model for Probability Traj of Family Structure and Depression



(FS = Family Structure, AD = Adolescent Depressive Mood, ih = latent intercept for family structure, sh = latent linear slope for family structure, qh = latent quadratic slope for family structure, id = latent linear intercept for adol. depressive mood, sd = latent linear slope for adol. depressive mood, qd = latent quadratic slope for adol. depressive mood, PD = parental depressive mood)

Multiple Imputations

In conducting the analysis, multiple imputation methods are used to help ensure the robustness of our results. First, for the purpose of determining the latent growth factors of family structure and adolescent depressive mood trajectories, we run five separate measurement models (i.e., five for each—family structure and depressive mood) using five different imputed datasets. Afterwards, we average the resultant values from all five datasets to determine the average growth factors of family structure and adolescent depressive mood. Second, in the structural model, we use the average growth factors obtained from the first procedure as fixed values, and then freely estimate the rest of the parameters by running the model five separate times based on five imputed datasets. Our results consist of the average coefficient values from these five imputed datasets, with the standard error values that correspond to the sums of the within and the between-analysis errors (Rubin__).

RESULTS

Family Structure Trajectories (1^{st} ~ 12^{th} grade)

We begin by reviewing the measurement model estimations for patterns of continuity and change in family structure risk over grades 1 through 12 and of adolescent depressive risk over grades 6 through 12, as specified in Figure 1. For both, we proceeded through a series of exploratory model-fitting exercises, starting with an intercept only specification, then a linear specification, and finally a quadratic specification, allowing from one to seven trajectories at each step. Additionally, the entire exercise was repeated five times, once for each of five imputed data sets (imputed for missing data).

The best fitting model for describing probability trajectories of family structure is a quadratic growth function with five latent classes. Table 3 displays the *average* values across the five imputed data sets of the parameters for this specification. These coefficients determine the shape of the trajectories and will be fixed when estimating the structural relationships specified in Figure 2. For example, in Table 3 Class 3 has an average intercept value of 2.328, slope of 0.127, and quadratic slope of -0.007. The trajectory plot based on these parameters is a nearly straight line from first grade through 12^{th} grade, hovering at probability roughly 0.9 (See Figure 4).[7]

Table 3. Latent Growth Factors for the BSS Panel's Probability Trajectories of Family Structure & Sample Percentages for Each Trajectory **(in bold)**

		Intercept	Slope	Quadratic	**Sample %**
Class 1	"Disruption towards alternative at 9th Gr"	-0.834	-1.847	0.210	**4.8%**
Class 2	"Disruption towards alternative at 2nd Gr"	-3.538	0.983	-0.049	**13.1%**
Class 3	"Stable Alternative"	2.328	0.127	-0.007	**36.1%**
Class 4	"Disruption towards two-parents at 2nd Gr"	2.659	-0.599	0.005	**10.6%**
Class 5	"Stable Two-Parents"	-3.071	-0.209	0.019	**35.4%**

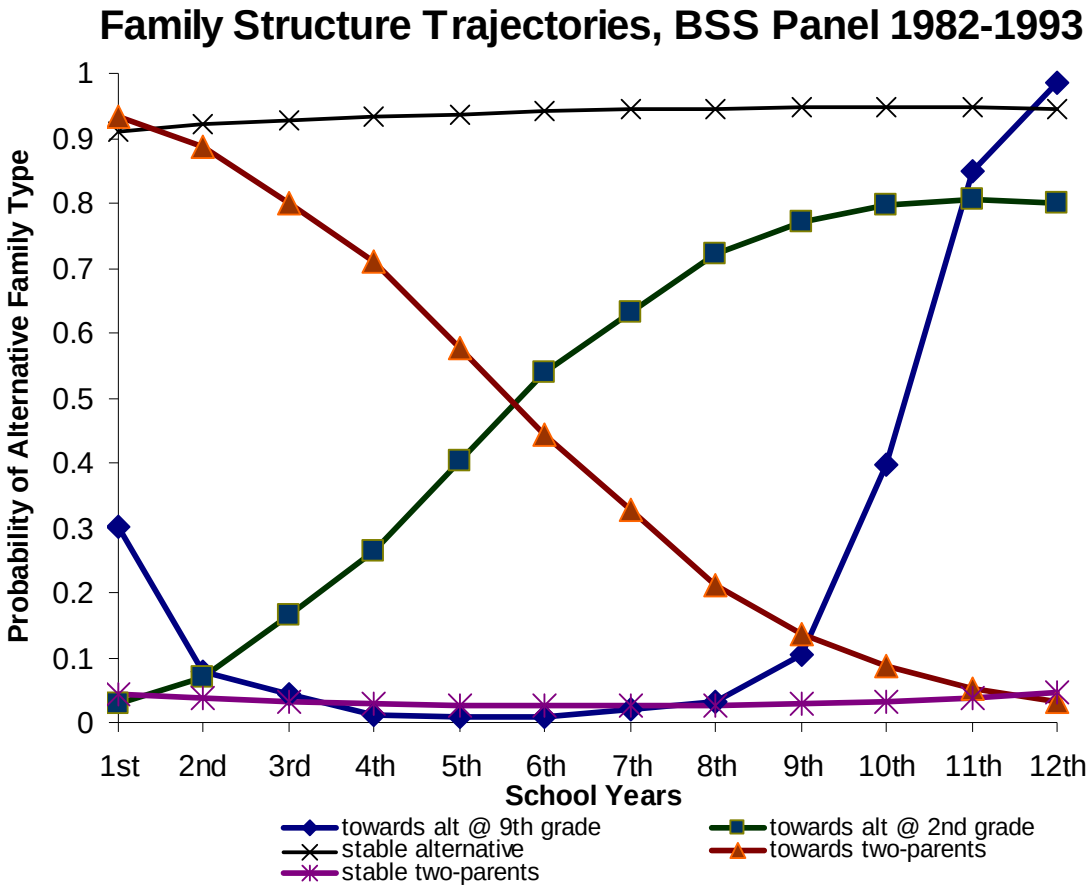
The display in Figure 3 plots all five trajectories. Even though the estimated probability of membership in each is non-zero, the display uses convenient shorthand that

[7] The equation for estimating the trajectories of family structure is:

$$\Pr(FamilyStr = Altnerative) = \frac{e^{threshold + \text{int} + slope*grade + quadratic*grade^2}}{1 + e^{threshold + \text{int} + slope*grade + quadratic*grade^2}}$$

associates individuals with their highest probability trajectory. We can do this because the trajectories are highly discriminating, with entropy values in each instance .9 or above for the highest probability trajectory (table not shown). In addition to the parameter estimates from the GMM measurement model, Table 3 includes the associated label for each trajectory and the percentage distribution of the panel across trajectories. The two most highly populated trajectories are characterized by stable likelihoods: stable two-parent (accounting for 35.4% of the panel) and stable alternative (36.1%).

Figure 3. Trajectories of Risk in Family Instability for the BSS sample respondents from 1st through 12th grade.



The other three trajectories involve significant risk of transitioning between family types, including, for roughly 10% of the panel an alternative family type to a two-parent household. Since our classification does not distinguish biological from step-parents, it is likely that these mostly are newly formed stepparent families. Family advocates probably would take that as a positive change in children's family live, but stepparents we know do not stand in well for biological parents ( ) and even welcome change can be unsettling. It remains to be seen what consequences follow.

The remaining trajectories involve breakup of two-parent households, but differ in their timing. In the larger of the two (13.1% of the panel), the likelihood of experiencing

disruption starts tracking upward in childhood ("disruption toward alternative in 2nd grade"); for the other (4.8%), the trigger is in adolescence, with the likelihood tracking steeply upward beginning in ninth or tenth grade. The timing thus separates key developmental life stages: is early onset or later onset of increased risk of family disruption more consequential for children's socio-emotional well-being? That is to say, is there a critical period? We suggested in the introduction that the impact of family disruption experienced in childhood was likely more severe and lasting than similar family shocks during adolescence, and contrasting the risk of depressive disorder across these two trajectories promises to inform the question. That is one of the issues addressed in the evaluation of Figure 2, but there is a prior need to first examine how adolescent depressive risk itself tracks using a similar trajectory approach.

Adolescent Depressive Mood Trajectories (6^{th} ~ 12^{th} grade)

The same procedure used to identify the respondents' probability trajectories of family structure was used to model trajectories of depressive risk over adolescence. To select the best-fitting model, we estimated a series of growth models with varying polynomial degrees, each time with a different number of latent classes. The lowest BIC criterion was used.

The best fitting model chosen for risk trajectories of depression was a quadratic growth model with four latent classes. Table 4 shows the average values of the growth parameters derived from five imputed datasets; Figure 4 displays the plot using these values. [8]

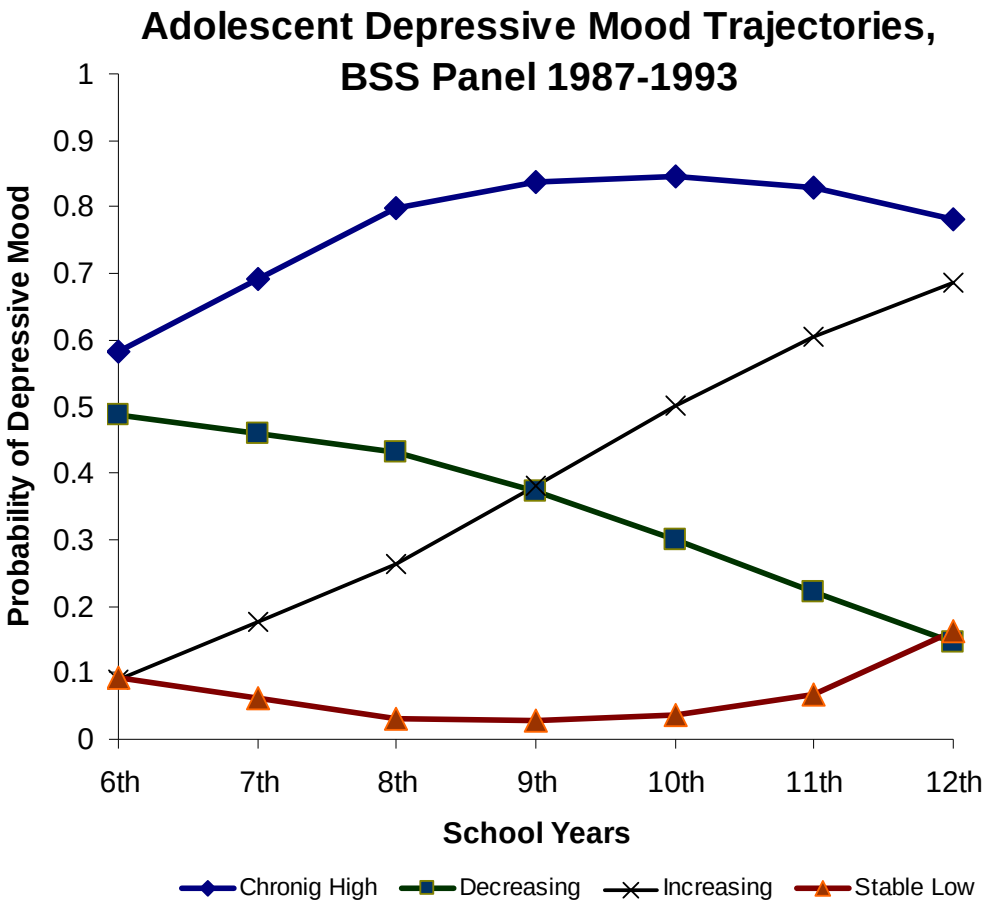
Table 4. Latent Growth Factors for the BSS Panel's Probability Trajectories of Adolescent Depression & Sample Percentages for Each Trajectory **(in bold)**

		Intercept	Slope	Quadratic	**Sample %**
Class 1	"Chronic High"	0.336	0.707	-0.092	**19.0%**
Class 2	"Decreasing"	-0.053	-0.027	-0.043	**30.6%**
Class 3	"Increasing"	-2.318	0.705	-0.031	**11.0%**
Class 4	"Stable Low"	-2.277	-0.950	0.176	**39.3%**

[8] The equation for the quadratic growth form used is as follows:

$$\Pr(DepressiveMood = Yes) = \frac{e^{threshold + \text{int} + slope*grade + quadratic*grade^2}}{1 + e^{threshold + \text{int} + slope*grade + quadratic*grade^2}}$$

Figure 4. Trajectories of Adolescent Depressive Mood for the BSS sample respondents from 1st through 12th grade.



Both stability and change are evident in the four plots. Two of the four trajectories evidence relatively stable probability patterns for depression over time, one with a low risk of depression throughout adolescence and one with chronic high risk. We refer to these as "stable low" and "chronic high" respectively. Youth with the highest chance of following the stable low trajectory are said to "belong" to the stable low latent class or group; likewise for the high risk group. Again this is a convenient shorthand, as all youth have some risk of following each of the four trajectories. Still, the shorthand is not too great a stretch, as the estimated entropies for the stable low and the chronic high tracks are .85 and .79 respectively. Table 4 shows that 39.3% of the panel belongs to the stable low group; 19.0% to the chronic high group.

The stable low class constitutes the largest of the four groups. These youth are expected to enjoy an adolescence that is relatively risk-free of depression. In contrast, the chronic high group experienced persistently high risk of depression throughout adolescence. The structural estimations reported in the next section examines whether the groups are also distinguished in terms of risk factors, including risk of family disruption, and in terms of chance of depression in adulthood.

The two trajectories characterized by changing probabilities of adolescent depression over time also differ sharply. For one, the risk of depression reverses from low risk to high (labeled "increasing" in Table 4); for the other, the change is from high risk to low risk (labeled "decreasing"). The risk trajectory with the decreasing pattern is the second largest of the four, accounting for 30.6% of the panel. These youth experienced a relatively high probability of depression in 6th grade (over 0.5), but with gradual improvement over time, ending in 12th grade with a relatively low probability below 0.2 (a drop in risk of 60 %). In stark contrast, members of the class with the increasing risk pattern had a 6th grade probability of depression below 0.1 but tracked upward over the ensuing years, ending in 12th grade with a high level of over 0.7 (a rise of 86%). The same questions are posed of youth who embody rising and falling risk of adolescent depression: Are the risk factors we examine differentially predictive of adult depressive risk? Girls, for example, generally evidence lower levels of depression than do boys at the onset of adolescence, but higher levels in late adolescence ( ). For the BSS panel, then, we might see a greater likelihood for girls than for boys of membership in the trajectory of increasing risk. Less clear, however, is how membership in these two trajectories might relate to depression risk in adulthood. Is earlier onset more consequential than later?

Risk Factors: Family Structure Trajectories across Race & SES.

Our results indicate patterned differences by race in the risk of experiencing different family structure trajectories.[9] As shown in Table 5, black children relative to white are more likely to follow probability trajectories of family structure that involve *alternative family* type over the stable two-parent type. Two points merit particular note. First, black children are *six times* more likely than their counterpart whites to follow the stable alternative family trajectory versus the stable two-parent family trajectory (OR=6.098, p<0.001). This result is not surprising, as African-American children are more likely than Whites to reside in father-absent households ( ). Second, black children are more likely than Whites to experience changing risks over time. This disproportion is evident in all three trajectories against the stable two-parent trajectory (see Table 5)—i.e., (1) the towards-alternative-@-9th grade trajectory (OR=3.034, p<0.01), (2) the towards-alternative-@-2nd-grade trajectory (OR=1.990, p<0.01), and (3) the towards-two-parents trajectory" (OR=2.026, p<0.01). Thus, black children in the BSS face a higher risk of residing in alternative family types than in two-parent households, *and* a higher risk of experiencing family disruption than to reside continuously in a two-parent household.

[9] The variable for parental depressive mood is used as a time-varying control while estimating the risk factor association with family trajectories. As shown in the structural coefficient paths in Figure 2, parental depressive mood is specified to explain the dichotomous depressive mood score at *each time* point for which the two variables are concurrent (i.e., 6th, 8th, 9th, 10th, and 11th).

Table 5. Multinomial Regression of Probability Trajectories of Family Structure (Reference: Stable Two-parents) on Race and Socioeconomic Status (Standard Errors in Parentheses and **Odds Ratio in Bold**)

	Towards alternative @ 9th Gr. vs. Stable two-parents	Towards alternative @ 2nd Gr. vs. Stable two-parents	Stable alternative vs. Stable two-parents	Towards two-parents vs. Stable two-parents
Black (vs. Whites)	1.110 **	0.688 **	1.808 ***	0.706 **
	(0.470)	(0.318)	(0.218)	(0.284)
OR	**3.034**	**1.990**	**6.098**	**2.026**
Socioeconomic Status	-0.155	-0.317 **	-1.160 ***	-0.600 ***
	(0.340)	(0.161)	(0.183)	(0.206)
OR	**0.856**	**0.728**	**0.313**	**0.549**

* p<0.05, ** p<0.01, *** p<0.001

With regards to socioeconomic status, we find support for the conventional view that parental levels of education and income are inversely associated with the likelihood of an alternative family structure. Holding race constant, Table 5 shows that children of *low* SES background are *more* likely than those of high SES to follow a stable alternative family structure trajectory than a stable two-parent trajectory. These findings are largely consistent with the view that "class," above and beyond race, has bearing on family structure. Some scholars have debated whether class is all that matters—obviating the influence of race, but we find that race and class both discriminate among family type trajectories. Socioeconomic status, too, appears to affect not only type of family structure but also its stability, as BSS children from less educated and low income households are more likely than others to face disruption in family unions than a stable two-parent family.

In light of these findings, it may be asked whether race and socioeconomic status may relate to developmental patterns of adolescent depression *indirectly* through their influences on risk patterns in family structure. That will be taken up shortly, after we assess whether race and socioeconomic status, as well as sex, have direct influence on depression trajectories.

Risk Factors: Depression Trajectories across Sex, Race, and SES. Table 6 shows the path coefficients linking adolescent depressive trajectories to these several risk factors[10].

As expected, strong relationships are evident between sex and patterns of risk for adolescent depression. For example, the *girls* are nearly *three times* more likely than boys to experience consistently high risk of depression than stable low risk (OR=2.829, p<0.001). This result is not unexpected. Girls also are over *eight times* more likely than boys to experience increasingly higher risk of depression than stable low risk (OR=8.390, p<0.001). And, between those who face increasingly higher risk of depression and those

[10] Again, as was the case with family structure trajectories, the variable for parental depressive mood is specified to explain the dichotomous depressive mood score at *each time* point for which the two variables are concurrent (i.e., 6th, 8th, 9th, 10th, 11th, and 12th grade). We treat parental depression mainly as a control variable in our analysis. Furthermore, the associations for risk factors in this section are obtained while controlling for family trajectories' influence on depressive trajectories. That is to say, the categorical latent variable of adolescent depressive trajectories (i.e., latent classes) is specified as being explained by sex, race, SES, and family trajectories (see Figure 2).

who face decreasingly lower risk, the girls are over seven times more likely than the boys to experience increasing risk (OR=7.752, p<0.001). These results align with studies that posit distinct developmental trajectories of depression for boys and girls, with girls' profile one of increasing risk of depression over the course if adolescence ( ).

Table 6. Multinomial Regression of Probability Trajectories of Adolescent Depression on Sex, Race, and Socioeconomic Status (Standard Errors in Parentheses and **Odds Ratio in Bold**)

	Reference: Stable low			Reference: Chronic High		Reference: Decreasing
	Chronic High vs. Stable low	Decreasing vs. Stable low	Increasing vs. Stable low	Decreasing vs. Chronic High	Increasing vs. Chronic High	Increasing vs. Decreasing
Females (vs. Males)	1.040 ***	0.079	2.127 ***	-0.961 ***	1.087	2.048 **
	(0.299)	(0.290)	(0.914)	(0.352)	(0.970)	(0.942)
OR	**2.829**	**1.082**	**8.390**	**0.383**	**2.965**	**7.752**
Blacks (vs. Whites)	-0.268	-0.106	-1.070	0.162	-0.802	-0.964
	(0.283)	(0.485)	(0.709)	(0.458)	(0.731)	(0.711)
OR	**0.765**	**0.899**	**0.343**	**1.176**	**0.448**	**0.381**
Socioeconomic Status	-0.170	-0.721 **	0.472 +	-0.551 +	0.643 +	1.194 **
	(0.227)	(0.282)	(0.286)	(0.292)	(0.366)	(0.384)
OR	**0.844**	**0.486**	**1.603**	**0.576**	**1.902**	**3.300**

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Finally, Table 6 shows that, among those who face high risk of depression at the onset of adolescence (i.e., between those who face chronic high risk of depression and the decreasing risk), girls are more than 60% *less* likely than boys to experience decline/improvement in depression risk over time, (OR=0.383, p<0.001). Girls, it appears, are *disadvantaged* relative to boys in virtually all respects.

Table 6 reports no significant differences in adolescent depressive trajectories by race. This finding is consistent with existing literature which reports no definitive relations between youth's depressive symptoms and race. Our result does imply, however, that if race were to influence trajectories of risk in adolescent depression, it would likely do so indirectly through its impact on risk patterns in family structure.

Finally, socioeconomic status is related to adolescent depressive trajectories, with the impact of SES appearing to dissipate over the course of adolescence. Studies have not been extensive or conclusive about the time-varying nature of SES's impact on depression, though some researchers have postulated that socioeconomic status' influence on depression might fluctuate, being strong during childhood, weak during adolescence, and strong again during both adulthood and old age ( ). Our finding accords with that view. The results in Table 6 indicate a strong negative impact on children's depression at the beginning of adolescence (i.e., 6th grade) but diminishing effects in subsequent periods, effectively disappearing by the end of adolescence. This is implied by the finding that higher SES youth are at low risk of depression early—that is, less likely to follow the "decreasing" trajectories than the "stable low" (OR=0.486, p<0.01)—but are at heightened risk in later adolescence—that is, they are more likely to follow the "increasing" vs. "chronic high" (OR=1.902, p<0.1), "increasing" vs. "decreasing" (OR=3.300, p<0.01), and "increasing" vs. "stable low" paths (OR=1.603, p<0.1). Floor

and ceiling effects play could contribute to this "convergence"; but, more than likely, the dissipation of SES's influence on youth's depressive symptoms is substantial and the convergence of SES differentials in depressive symptoms real. Hence, at least for the type of youth tracked by the BSS, socioeconomic background plays a lesser role in adolescent depression risk than other factors. One candidate is family structure and, in particular, its patterning of stability and change over time. We examine next the inter-trajectory relationships between patterns of risk for family structure and disruption and patterns of risk for adolescent depression.

Inter-trajectory Relation between Family Structure & Depression.

Three research questions frame our interest in the inter-trajectory relations between risks in family structure and adolescent depression: (1) does one's likelihood for a particular family structure matter for developmental patterns in risk of adolescent depression? (2) Does risk of family disruption play a role in how the odds of depression track over adolescence? (3) Do the *timing* (e.g., early vs. late family disruption) and *sequencing* (e.g., divorce vs. remarriage) of risk in family disruption affect the progression of depressive risks? We address each of these questions in turn.

Family Structure. First, we find that likelihood of residing in a particular family structure matters in how risk of depression develops over adolescence. We infer this by comparing variations in depression trajectories across two *stable* family trajectories: the stable-two-parent and the stable-alternative trajectories. By comparing only the stable family trajectories, and not the three "changing" trajectories, we reduce potential confoundment of family-structure effects by effects issuing from disruption in the family union. Children associated with the stable two-parent trajectory (35% of sample) and the stable alternative trajectory (36% of sample) face *continuously high* probabilities of these respective family types (see Figure 4); therefore, the contrast between them excludes influences stemming from family disruption.[11]

Table 7 shows the 10X6 matrix that arrays the ten contrasts of family trajectories (the row entries) against the six contrasts of depressive trajectories (the column entries). Included among the ten contrasts of family trajectories is the contrast between the stable two-parent and the stable alternative trajectories. How they intersect addresses our first question.

Question 1: Does Family Structure Matter? Row 3 of Table 7 reveals risk patterns for depression comparing children with a stable likelihood for two-parent type and children with a stable likelihood for alternative family type are different in some but not all aspects. For example, they do not differ significantly in the chance of experiencing a stable low risk of depression versus any of the other remaining risk patterns (Table 7: Columns A, B, and C). However, their chance of experiencing either *chronic high* risk of depression or gradually declining risk does vary. Specifically, children who experience a stable likelihood for alternative family type are 2.68 times[12] more likely to experience chronic high risk of depression (OR=0.372, $p<0.05$, Table 7: Row 3 and column D). This result suggests that for those at high risk of depression at the onset of adolescence (e.g., 6th grade), stability in likelihood of family structure plays a role in whether they remain at

[11] We remind readers that all of our estimations are done simultaneously in FIML setting and, as such, the inter-trajectory associations shown in Table 6 are estimated while holding constant the demographic risk factors—sex, race, SES, and parental depressive mood, whose own estimates are presented in Table 4 and 5.

[12] This is inverse of the odds ratio of 0.37 = 2.68.

high risk throughout adolescence (more likely for those in stable alternative family trajectory) or whether they experience gradual improvement in risk of depression (more likely for those in stable two-parent trajectory). Table 7 also indicates that the children in stable alternative family trajectory, in comparison to an those in stable two-parent family trajectory, are 4.67 times more likely to experience an increasing risk of depression than to experience decreasing risk (OR=4.679, $p<0.05$, Table 7: Row 3 and Column F). In these instances, then, family structure appears to be the operative agent, with two parents a protective factor vis-a-vis the risk of experiencing either chronic high or increasing risk of adolescent depression.

Question 2: Does Family Disruption Matter? The consequences of risk in family disruption are informed by the contrasts between the stable and changing family trajectories (e.g., stable-two-parent trajectory vs. the towards-alternative-@-2nd-grade).

The evidence for distinctive consequences for family trajectories that are transitioning is less compelling than that just reviewed for trajectories that are stable; nevertheless, some contrasts are suggestive. First, the towards-alternative-@-2nd -grade family trajectory, in comparison to the stable-two-parent trajectory, is associated with a four-fold increase in the likelihood of facing an increasing risk of depression during adolescence as opposed to stable low risk (OR=3.99, $p<0.1$, Table 7: Row 2 & Column C). This is a large elevation of risk, but we characterize it as suggestive because it cannot be said whether the effect traces to *transitioning* risk itself or whether the particular *direction* of transitioning—namely, from high likelihood for two-parent to high likelihood for alternative family type—is the factor driving the pattern. To isolate "transitioning" as the causative agent, transitioning in the opposite direction—from high likelihood for alternative to high likelihood for two-parent family type—would be expected to produce a similar result. Table 7, however, does not indicate that. Rather, the contrast between the stable alternative family trajectory and the towards-two-parent trajectory yields no statistically significant differences across risk patterns of depression (Table 7: Row 7 across Columns A ~ F). Thus, our analysis hints at an adverse impact for risk of family transitions on patterns of adolescent depressive risks, but potentially confounded with the matter of sequencing.

Another suggestive finding regarding risk of family disruption involves youths who face a high risk of experiencing alternative family type towards the end of adolescence (e.g., 12th grade). Those with a stable likelihood for alternative family type compared to those who face an increasing likelihood are more likely to evidence a low risk of depression throughout adolescence than to experience gradually decreasing risk (OR=7.877, $p<0.05$, Table 7: Row 5 and Column B). This finding suggests that a stable alternative family type is less stressful than unstable two-parent family trajectory. However, this finding alone, too, does not isolate the risk of family disruption in itself as determinant, as again there is a confound with the direction of family transition—namely, from two-parent to alternative. For greater clarity, we would need evidence that a high likelihood of transitioning in the opposite direction yields a like result, but that is not indicated in Table 7. Rather, the contrast between the stable-two-parent and the towards-two-parent trajectory does not map onto differentiated risk patterns of depression (Table 7: Row 4 across Columns A ~F). In sum, we find some indications that risk of family disruption is associated with unfavorable risk patterns of depression during adolescence,

but also that such effects might be conditioned on the particular type of family disruption at issue.

Question 3: Does Timing of Family Disruption Matter? For the issue of "timing," we compare the transitioning family trajectories that differ in timing—the towards-alternative-@-2nd-grade and the towards-alternative-@-9th-grade trajectories.

Several findings in Table 7 implicate timing of family transition risk in patterns of depressive risk. First, children who experience a high likelihood for family transition beginning in 2nd grade, compared to those who experience a stable likelihood for alternative family type, are nearly four times more likely to face an increasing risk of depression during adolescence than to face stable low risk (OR=3.99, p<0.1, Table 7: Row 2 and Column C). However, late onset family transitions (beginning in *9th grade* instead of 2nd grade) evidence no such elevated risk. Together, these results suggest that risk for transitions in family structure have a greater impact when experienced in *early childhood* than when experienced during adolescence. But this interpretation too requires qualification because the transition risk towards a two-parent family type detected in this analysis is sequence-specific. That is, the timing effect emerges (or is evident) only when transitioning from two-parent family type to an alternative type. Thus, timing may play a role, but its influence may be sequence-specific. Taking the other vantage point, the same pattern suggests the relevance of sequencing but here inseparable from timing.

Question 4: Does Sequencing of Family Disruption Matter? To examine the impact of sequencing, we compare the risks of family transitions that are different in sequence but are similar in most other aspects.

In Table 7, a sequencing effect is suggested contrasting the trajectories of family structure that involve increasing risk towards "breakup" against increasing risk towards "rematch/reunion" (Table 7: contrasts of Row 2 vs. contrasts of Row 4).[13] Of children who experience the onset of risk for family transition in 2nd grade, those who follow the towards-alternative family trajectory are nearly four times more likely than those who follow the stable two-parent family trajectory to experience increasing risk of depression than to experience steady low risk during adolescence (Table 7: Row 2 and Column C). In contrast, those who follow the *towards*-two-parent family trajectory are indistinguishable from those who follow the *stable*-two-parent family trajectory in risk of depression (OR=3.31, p=n.s., Row 4 across Column A~F). This suggests a "breakup" sequence is more stressful than transitions that bring two parents together. However, the sequencing effect is timing-specific, the other side of the timing specific transition discussed above. To disentangle timing from sequencing, we would need to observe similar contrasts for later family transitions, but our data identified only one type of consequential "rematch/reunion" trajectory—the one that begins around 2nd grade; hence, there are no comparable trajectories to estimate a sequencing effect in later time periods.

[13] That is, the contrast between the "towards alternative @ 2nd grade" and the "towards two-parent." Although the "towards two-parent" trajectory does not have the term "@ 2nd grade" added to its label, the timing of the transition towards two-parent family structure for this group is around 2nd grade, which is comparable to the "towards alternative @ 2nd grade" trajectory (see Figure 3).

Table 7. Multinomial Regression of Trajectories of Adolescent Depressive Risk Trajectories on Family Disruption Risk Trajectories, Controlling for Sex, Race, Socioeconomic Status, and Parental Depressive Mood (Standard Errors in Parentheses and **Odds Ratio in Bold**)

			Reference: Stable low			Reference: Chronic High		Reference: Decreasing
			Chronic High vs. Stable low	Decreasing vs. Stable low	Increasing vs. Stable low	Decreasing vs. Chronic High	Increasing vs. Chronic High	Increasing vs. Decreasing
			A	B	C	D	E	F
Reference: Stable two-parents	1	Towards alt. @9th G.	0.499	1.403	-7.315	0.904	-7.952	-8.718
			(1.504)	(0.912)	(18.953)	(1.795)	(18.647)	(19.252)
		OR	**1.647**	**4.067**	**0.001**	**2.469**	**0.000**	**0.000**
	2	Towards alt. @2nd G.	0.809	0.255	1.386 +	-0.554	0.577	1.131
			(0.648)	(0.754)	(0.818)	(0.639)	(0.922)	(0.926)
		OR	**2.246**	**1.290**	**3.999**	**0.575**	**1.781**	**3.099**
	3	Stable Alt.	0.330	-0.660	0.883	-0.990 *	0.553	1.543 *
			(0.384)	(0.500)	(0.624)	(0.486)	(0.721)	(0.676)
		OR	**1.391**	**0.517**	**2.418**	**0.372**	**1.738**	**4.679**
	4	Towards two-par.	0.271	-0.662	1.197	-0.933	0.926	1.859
			(0.610)	(0.791)	(0.915)	(0.961)	(1.220)	(1.170)
		OR	**1.311**	**0.516**	**3.310**	**0.393**	**2.524**	**6.417**
Reference: Stable alternative	5	Towards alt. @9th G.	0.169	2.064 *	-8.197	1.895	-8.366	-10.400
			(1.517)	(0.865)	(18.993)	(1.803)	(18.553)	(19.285)
		OR	**1.184**	**7.877**	**0.000**	**6.653**	**0.000**	**0.000**
	6	Towards alt. @2nd G.	0.479	0.916	0.503	0.436	0.024	-0.431
			(0.565)	(0.618)	(0.810)	(0.600)	(0.933)	(0.949)
		OR	**1.614**	**2.499**	**1.654**	**1.547**	**1.024**	**0.650**
	7	Towards two-par.	-0.059	-0.001	0.315	0.058	0.374	0.316
			(0.529)	(0.751)	(0.800)	(0.820)	(0.960)	(1.078)
		OR	**0.943**	**0.999**	**1.370**	**1.060**	**1.454**	**1.372**
Reference: Towards alt @9th	8	Towards alt. @2nd G.	0.301	-1.172	8.972	-1.458	8.601	9.791
			(0.565)	(0.954)	(18.813)	(1.817)	(18.623)	(19.002)
		OR	**1.351**	**0.310**	**-**	**0.233**	**-**	**-**
	9	Towards two-par.	-0.234	-2.085 +	8.775	-1.837	8.951	10.519
			(1.616)	(1.142)	(18.766)	(2.114)	(18.768)	(19.098)
		OR	**0.791**	**0.124**	**-**	**0.159**	**-**	**-**
Reference: Towards alt @2nd	10	Towards two-par.	-0.538	-0.917	-0.188	-0.379	0.350	0.728
			(0.798)	(0.890)	(0.979)	(0.909)	(1.286)	(1.368)
		OR	**0.584**	**0.400**	**0.829**	**0.685**	**1.419**	**2.071**

+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

CONCLUSION & DISCUSSION

To be written…

Bibliography

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