Developmental Trajectories of Irritability and Bidirectional Associations With Maternal Depression

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Objective: Irritability is a dimensional trait in typical development and a common presenting symptom in many psychiatric disorders, including depression. However, little is known about the developmental trajectory of irritability or how child irritability interacts with maternal depression. The present study identifies classes of irritability trajectories from toddlerhood to middle childhood; characterizes maternal depression and other family, social environment, and child variables within each irritability trajectory class; and, as a more exploratory analysis, examines bidirectional associations between maternal depression and child irritability. **Method:** A total of 4,898 families from the Fragile Families and Child Wellbeing Study reported on irritability symptoms at ages 3, 5, and 9 years, assessed with items from the Child Behavior Checklist. Parental major depressive episode was assessed using the Composite International Diagnostic Interview–Short Form at child ages 1, 3, 5, and 9 years. **Results:** A latent class growth analysis identified 5 irritability classes: low decreasing; moderate decreasing; high steady; initially very high, then decreasing; and high increasing. Children with more severe irritability trajectories are more likely to have mothers with recurrent depression, and, with the exception of the most severe (high increasing irritability) class, were more likely to have mothers who were exposed to violence. Moreover, paternal depression and alcohol abuse, as well as maternal drug and alcohol abuse, were also risk factors for membership in the more severe irritability classes. A latent auto-regressive cross-lag model showed that child irritability at ages 3 and 5 years is associated with increased mother depression at ages 5 and 9, respectively. Conversely, mother depression at child ages 1 and 3 years is associated with increased child irritability at 3 and 5. **Conclusion:** Irritability development across toddlerhood and middle childhood has 5 main trajectory types, which differ on maternal depression recurrence and exposure to violence. Maternal depression and child irritability influence each other bidirectionally, particularly early in development. Understanding irritability development and its bidirectional relationship with maternal depression and association with violence exposure may help identify intervention targets. *J. Am. Acad. Child Adolesc. Psychiatry*, 2014; 53(11):1191–1205. **Key Words:** irritability, depression, parent, childhood, violence

I rritability is a dimensional trait in typically developing youth[1] as well as a very common presenting symptom in young people with psychiatric disorders. Despite this, little is known about irritability's developmental trajectory or how it varies across individuals. Also, emerging data suggest that social environmental and family factors such as trauma (e.g., exposure to violence)[2] and particularly maternal depression[3,4]

may be associated with child irritability. Although clinicians have observed a vicious cycle between child irritability and maternal depression, little empirical work has been done to address the potential impact of child irritability on maternal depression.

Irritability is related to other concepts whose associations with maternal depression have been examined, including child temperament, personality, and psychopathology. For example, a review by Beardslee *et al.*[5] documented the detrimental effects of maternal depression on the development of child depression and internalizing

and externalizing disorders, which often include irritability components. In addition, Bongers et al.[6] traced developmental trajectories of aggression and opposition, which are related to irritability. However, because key differences exist between the conceptualization of irritability and these related constructs, for the purposes of this article, irritability is narrowly defined, with a focus on emotional, not "acting out" or behavioral aspects.[7]

Using a person-centered approach to categorize heterogeneity in intraindividual trajectories and to identify developmental pathways for irritability would inform the assessment and management of children presenting with this symptom. To our knowledge, only 1 study has identified irritability trajectory classes. Caprara et al[8] found that irritability development in adolescence through adulthood could follow 1 of 4 trajectories: low stable, medium declining, medium stable, or high stable. However, little is known about how irritability develops from toddlerhood to the middle childhood years or what social environmental, family, or child characteristics are associated with different trajectories of irritability.

Examination of the developmental trajectories of irritability should be informed by data indicating associations between child irritability and maternal depression, among other factors. For example, children of parents with a lifetime history of depression are at high risk for exhibiting irritability in early childhood.[4] In addition, mothers with more severe trajectories of depressive symptoms have children with worse internalizing and externalizing problems, both psychopathology dimensions related to irritability.[9] Moreover, children whose parents have a history of both recurrent depression and a recent depressive episode exhibit significantly more depressive symptoms than children whose parents' depression is farther in the past.[10] Thus, timing and recurrence may be aspects of maternal depression that are relevant to child irritability. In these studies, however, researchers have largely focused on the unidirectional influence of maternal depression on child outcomes. Nevertheless, the relationship between maternal depression and child irritability may be characterized by bidirectional influences that interact over time,[11] mirroring other parent–child interactions (e.g., parent hostility and child depression[12]). Little is known, however, about how child irritability interacts with maternal depression, and such knowledge could have important treatment implications.

To address these gaps in the literature, the present study pursued 3 objectives: (1) use of a person-centered approach to identify classes of individuals based on irritability development from toddlerhood to middle childhood; (2) characterization of these irritability trajectory classes in terms of maternal depression and other family, social environment, and child characteristics; and (3) as a more exploratory analysis, determination of the extent to which the relationship between maternal depression and child irritability is bidirectional.

METHOD

Participants

Data were from the Fragile Families and Child Wellbeing Study,[13] which follows a large, population-based cohort of predominantly low-income children born in 18 large cities in the United States between 1998 and 2000. The sample was recruited by approaching families after the child's birth at hospitals in major urban centers with populations of more than 200,000. Births of children to unmarried parents were oversampled. The overarching goal of the Fragile Families and Child Wellbeing Study is to examine the role of the social and family environment on child development. The present study used data from mother (primary caregiver) in-home and telephone interviews at child ages 1, 3, 5, and 9 years unless otherwise noted. Of the 4,898 families recruited at the child's birth, 4,712 (96.2%) completed the irritability or maternal major depressive episode measures for at least 1 time point.

Measures

Irritability. Irritability symptoms were assessed using the Child Behavior Checklist (CBCL). The CBCL/2-3 (Toddler) version[14] was collected at age 3 years, the CBCL/4-18[15] at age 5 (the current school-age version at the time), and the CBCL/6-18[16] (the most recent version) at age 9. Three items from the CBCL ("temper tantrums or hot temper," "stubborn, sullen or irritable," and "sudden changes in mood or feelings") were used to create the irritability variables for ages 5 and 9 (Cronbach's $\alpha = 0.70$ and 0.73, respectively). These items have previously been identified as comprising an irritability factor.[17] A fourth item ("easily frustrated") was also included for age 3 years; this item is strongly related to irritability conceptually but is available only in the CBCL/2-3 version administered at age 3. A 1-factor confirmatory factor analysis for the 4 items comprising irritability at age 3 showed excellent fit (root mean square error of approximation [RMSEA] = 0.037, comparative fit index [CFI] = 0.996, Tucker-Lewis index [TLI] = 0.989) and internal reliability

among the 4 items was acceptable (Cronbach's α = 0.72), supporting the inclusion of the "easily frustrated" item in the age 3 irritability variable with the previously identified items.[17]

Maternal Depression. The Composite International Diagnostic Interview–Short Form (CIDI-SF)[18] was administered over the phone and used to assess maternal as well as paternal major depressive episodes in the past year at child ages 1, 3, 5, and 9 years and generalized anxiety disorder (GAD) at child ages 1 and 3. Parental alcohol abuse (4 or more drinks in a day) and drug use (use of at least 1 of 9 common illicit drugs) in the past year at child ages 3, 5, and 9 were assessed with items from the CIDI-SF.

Analytic Plan

Latent Class Growth Analysis (Objective 1). Our first objective was to use a person-centered approach to identify classes of individuals based on irritability development from toddlerhood to middle childhood. To accomplish this, we used latent class growth analysis, implemented in Mplus 7.11 statistical software (Muthén and Muthén, Los Angeles, CA). Latent class growth analysis allowed identification of unobserved but distinct groups of individuals who have similar developmental trajectories.[19] Following established procedures,[20] we estimated models with 2 to 6 classes and chose the best-fitting model based on a comprehensive consideration of multiple fit indicators (Lo-Mendell-Rubin Adjusted Likelihood Ratio Test [LMR-LRT], Vuong-Lo-Mendell-Rubin Likelihood Ratio Test [VLMR], Bootstrapped Likelihood Ratio Test [BLRT], Akaike Information Criterion [AIC], Bayesian Information Criterion [BIC], sample size-adjusted BIC [SSABIC], entropy, minimum class size of 1%) and interpretability. Because class was intended to capture the variance in the data, intercepts and slopes were constrained to be invariant within each class. This approach also helped to avoid convergence issues and was consistent with the fact that our primary focus was not within-group variance. Also, to prevent convergence issues, irritability was calculated as an index score, that is, the average of items at each time point, with scores ranging from 0 (no symptoms) to 2 (worst symptoms). To avoid local maxima, models were run with at least 800 random starts. In addition, a latent growth curve model with random intercepts and slopes was run to compare to the latent class growth models.[21,22]

Characterization of Classes on Maternal Depression Recurrence and Other Characteristics (Objective 2). To accomplish our second objective, that is, to characterize the irritability trajectory classes in terms of maternal depression and other family, social environment, and child variables, we used multinomial logistic regression (for categorical outcomes) and general linear models (for continuous outcomes). The most likely class

assignments for each individual were exported for use in SPSS version 21.

For the multinomial logistic regression equation used to characterize irritability classes on maternal depression, we examined whether children in each of the irritability classes identified in objective 1 differed on the likelihood of having a mother not depressed at any of the time points (year 1, 3, 5, or 9); depressed at 1 time point; or with recurrent depression (i.e., depressed during at least 2 time points). Although it is not the primary focus of this article, we also included other maternal and paternal psychopathology in the model. This allowed us to examine the relationship of other parent psychopathology on irritability, as well as to examine the contribution of maternal depression to childhood irritability, above and beyond other parental psychopathology. Paternal depression (coded as 0, 1, or at least 2 times across child ages 1–9 years); maternal and paternal GAD (coded as 0, 1, or 2 times between child ages 1–3), alcohol abuse (measured as more than 4 drinks in a day, coded as 0, 1, or 2 times between child ages 5 and 9), or drug use (any drug use reported between child ages 3 and 9) were included in the model. Of note, parental psychopathology was not collected every year, so this method of coding (0, 1, or 2 times) allowed us to use the data collected at different time points in a consistent manner.

Additional multinomial logistic and general linear models were run to characterize the classes on other social environment, family, and child characteristics. Because the frequencies of witnessing and being a victim of violence were highly skewed, rank analysis of covariance (ANCOVA) was used for those 2 models.[23] All models controlled for maternal education, age, race/ethnicity, relationship status, and child gender. Bonferroni-corrected pairwise comparisons followed significant omnibus tests. Social environment and family predictors were restricted to those measured from birth to age 3, the time period at or before the first time point covered by our irritability trajectory models (ages 3–9) to reduce causality interpretation issues.

Latent Auto-Regressive Cross-Lag Model (Objective 3). Our third objective was to determine the extent to which the relationship between child irritability and maternal depression is bidirectional in an exploratory analysis. To accomplish this, we used a latent auto-regressive cross-lag model implemented in Mplus 7.11 with irritability at ages 3, 5, and 9 years as latent variables and maternal depression status at child ages 1, 3, 5, and 9. In this model, each variable was regressed on all the variables that preceded it in time. The auto-regressions examined continuity (stability) of irritability and maternal depression. The cross-lags examined interrelationships between maternal depression and child irritability at each time point, controlling for the previous time point (e.g., child irritability at age 3 influencing maternal depression at child age 5, controlling for prior maternal depression at child age 3). In

addition, the influence of maternal depression at child age 1 year on child irritability at ages 5 and 9 was estimated to examine whether the earliest experiences of maternal depression had a direct impact on later child irritability, and whether maternal depression at ages 3 and 5 had an impact on child irritability at ages 5 and 9, above and beyond the effects of maternal depression in the year after birth.

This model was run using maximum likelihood with robust errors (MLR) and Monte Carlo integration to obtain odds ratio (OR) and B estimates, and using weighted least-squares mean- and variance–adjusted (WLSMV) to obtain absolute model fit indices.

Examination of Missingness and Control Variables

Mplus has the advantage of using the expectation maximization algorithm to obtain maximum likelihood estimates with robust standard errors. This is the preferred method for data that are missing at random.[24]

Of the 4,898 original families recruited at the child's birth, subsequent irritability data were collected on 68%, 76%, and 68% of children at ages 3, 5, and 9 years; depressive episode was assessed for 89%, 86%, 84%, and 72% of mothers at child ages 1, 3, 5, and 9. Parents were contacted by telephone at each time point to schedule the in-home interview; during this telephone call, the CIDI was administered to assess whether a depressive episode had occurred in the past year. If the family decided to schedule an in-home visit, during the subsequent in-home visit, irritability data on the child were collected. Thus, all children who had irritability data also had maternal depression data. Maternal education, age, and race/ethnicity were related to number of time points missing for irritability ($F_{3,4888} = 9.54$, $p < .001$; $F_{3,4890} = 4.91$, $p = .002$; $F_{3,4882} = 22.34$, $p < .001$, respectively) and maternal depression ($F_{3,4888} = 13.34$, $p < .001$; $F_{3,4889} = 3.20$, $p = .012$; $F_{3,4882} = 17.71$, $p < .001$), but child gender and relationship status were not related to missingness (for all, $F \leq 1$).

We addressed attrition by controlling for the characteristics related to missingness, in addition to other demographic variables, in the multinomial logistic regression and latent auto-regressive cross-lag analyses. The best-fitting latent class growth model (5-class solution) was repeated with the control variables. Control variables were as follows: maternal age at birth of child, race/ethnicity (dummy-coded as "black/ African American," "white/European American," "Hispanic/Latino(a)," or "other race"), education ("less than high school," "high school," "some college," "college or graduate degree"), relationship status ("single," "married," "cohabiting"), and child gender.

Addressing of Mother as Informant

We took 2 major steps to address and decrease the possibility that our results would be confounded by a potential tendency for mothers with depression to view their children as irritable. First, in the latent auto-regressive cross-lag model (objective 3), we controlled for stability of child irritability and of maternal depression, as well as maternal depression at year 1. Thus, the model predicts changes in child irritability based on previous changes in maternal depression and vice versa; therefore, it is unlikely that our findings are primarily driven by an overall correlation between maternal depression and child irritability. Second, although it is not possible to formally test for informant effects without nonmother informant data at all time points, father report of irritability at age 5 and teacher report (using similar irritability items from the Conner's Teacher Rating Scale[25] [Supplement 1, available online]) at age 9 are available to compare with irritability trajectory class patterns estimated with mother-reported irritability (Table 1).

RESULTS

Objective 1: Identification of Classes Based on Irritability Trajectories

A comprehensive review of the model fit indices was used to identify the optimal number of classes (Table S1, available online). A latent growth curve model with random slopes and intercepts (a single class; RMSEA = 0.118) performs more poorly on relative fit indices than any of the latent class growth models (Table S1, available online), indicating that more than 1 class is present and necessitating the use of latent class growth analysis. For all of the latent class growth models, entropy values are consistent and high (0.69–0.76), indicating high classification accuracy across all models, and no class has less than the 1% minimum size. VLMR and LMR-LRT indicate that the 3- and 5-class models are preferable to 2- and 4-class models. To distinguish between the 3- and 5-class models, AIC, BIC, SSABIC, and BLRT were used. AIC, BIC, and SSABIC values are smaller for 5 classes than for 3 classes, favoring 5 classes, and BLRT is significant for up to 5 classes. Thus, the 5-class model is accepted as best fitting.

Description of the Irritability Classes

Figure 1 contains a graphical representation of the estimated trajectories for each of the classes. Table S2 (available online) contains the estimates and confidence intervals for the intercepts and slopes of each class. Slopes and intercepts for all classes differ significantly from each other except for the intercepts for C3 and C5.

The first class, C1, represents the normative trajectory of irritability over ages 3 to 9 years, encompassing 60.8% of the sample. This class is

TABLE 1 Child, Family, and Social Environment Characteristics of Each Irritability Trajectory Class

Characteristic	C1 Low—Decreasing Irritability (norm; ref) n = 2,675	C2 Medium—Decreasing Irritability n = 923	C3 High—Steady Irritability n = 236	C4 Initially Very High— Decreasing Irritability n = 468	C5 High—Increasing Irritability n = 95	χ^2	df	p
Race/Ethnicity, % (OR)						43.79	12	<.001
White/European American (Ref)	57	23	13	4.1	3.5			
African American	61	21 (0.76)*	10 (0.55)*	6.3 (0.99)	1.9 (0.38)*			
Hispanic/Latino(a)	64	21 (0.76)*	9.6 (0.52)*	4.5 (0.66)	1.6 (0.35)*			
Other	63	18 (0.73)	10 (0.70)	6.3 (1.38)	2.5 (0.66)			
Education, % (OR)						30.14	12	.003
College or graduate school (Ref)	66	20	9.2	1.9	2.4			
Some college or tech school	64	22 (1.03)	8.9 (0.81)	3.7 (1.79)	1.8 (0.72)			
High school or equivalent	59	22 (1.09)	11 (0.97)	5.9 (2.87)*	2.7 (1.13)			
Less than high school	59	20 (0.95)	12 (1.12)	7.2 (3.59)*	1.9 (0.84)			
Relationship Status, % (OR)						27.36	8	.001
Married (Ref)	67	20	7.2	3.7	1.8			
Cohabiting	60	22 (1.14)[a]	11 (1.72)[b],*	5.3 (1.03)[a]	2.2 (1.66)[a,b]			
Single	58	21 (1.13)[a]	13 (2.22)[b],*	6.5 (1.23)[a]	2.4 (1.98)[a,b]			
Family Instability (Birth—Y3), % (OR)						51.10	24	.001
Married, same partner (Ref)	66	21	6.8	3.8	1.8			
Cohabiting, same partner	61	20 (0.96)	11 (1.92)*	5.1 (0.95)	2.0 (1.52)			
Married or Cohabiting								
1 or 2 Partner transitions	60	24 (1.14)	8.0 (1.37)	5.2 (0.90)	2.4 (1.76)			
3+ Partner transitions	62	20 (0.93)	11 (1.87)*	4.6 (0.76)	2.1 (1.54)			
Single Mother								
No partner transitions	60	20 (0.95)	12 (2.07)*	5.1 (0.87)	3.0 (2.39)*			
1 or 2 Partner transitions	54	23 (1.23)	12 (2.42)*	8.3 (1.50)	2.0 (1.78)			
3+ partner transitions	61	17 (0.84)	14 (2.47)*	5.0 (0.76)	1.8 (1.86)			
Child Sex, % (OR)						15.01	4	.005
Female (Ref)	63	21	9.0	4.8	2.0			
Male	59	21 (1.02)	12 (1.42)*	5.9 (1.29)	2.3 (1.25)			

TABLE 1 Continued

Characteristic	C1 Low—Decreasing Irritability (norm; ref) n = 2,675		C2 Medium—Decreasing Irritability n = 923		C3 High—Steady Irritability n = 236		C4 Initially Very High—Decreasing Irritability n = 468		C5 High—Increasing Irritability n = 95		F (Rank)	df	p
Neighborhood (Y3)													
Witnessed Violence (freq.)	1.55	(4.5)	1.95	(4.7)	2.56	(5.7)	3.21	(6.5)	1.70	(3.6)	40.76	4, 3295	<.001
Victim of Violence (freq.)	0.20	(1.9)	0.36	(2.6)	0.41	(2.6)	0.70	(3.3)	0.12	(0.45)	18.74	4, 3295	.001
Loitering	0.23	(0.28)[a]	0.28	(0.30)[b]	0.35	(0.31)[c]	0.40	(0.33)[c]	0.32	(0.32)[b,c]	21.64	4, 3241	<.001
Social Support	0.65	(0.23)[a]	0.65	(0.23)[a]	0.59	(0.24)[b]	0.55	(0.24)[b]	0.58	(0.24)[b]	9.51	4, 3273	<.001
Age at Child's Birth	25.6	(6.0)[a]	25.9	(5.8)[b]	24.4	(5.5)[a,b]	23.8	(5.5)[a,b]	24.6	(6.2)[a,b]	3.45	4, 4368	.008
Material Hardship	1.01	(1.5)[a]	1.20	(1.6)[b]	1.45	(1.8)[b]	1.51	(1.8)[b]	1.63	(1.9)[b]	10.49	4, 4035	<.001
Aggravation in Parenting	1.11	(0.66)[a]	1.22	(0.65)[b]	1.35	(0.71)[b,c]	1.51	(0.72)[c]	1.26	(0.67)[a,b,c]	22.24	4, 3554	<.001
Parent-Child Conflict Tactics (Y3)													
Nonviolent Discipline	0.51	(0.28)[a]	0.60	(0.28)[b]	0.62	(0.29)[b]	0.63	(0.29)[b]	0.63	(0.23)[a,b]	21.08	4, 3291	<.001
Harsh Parenting	0.13	(0.13)[a]	0.18	(0.15)[b]	0.20	(0.14)[b]	0.23	(0.17)[c]	0.21	(0.15)[b,c]	40.11	4, 3291	<.001
Child Internalizing symptoms											45.14	8, 4626	<.001
Y3	0.30	(0.22)[a]	0.35	(0.25)[b]	0.45	(0.26)[c]	0.59	(0.29)[d]	0.44	(0.27)[c,e]			
Y5	0.17	(0.16)[f]	0.26	(0.21)[g]	0.36	(0.29)[h]	0.35	(0.23)[h,i]	0.34	(0.26)[h,i]			
Y9	0.11	(0.12)[i]	0.22	(0.18)[k]	0.34	(0.23)[h]	0.17	(0.15)[k]	0.61	(0.48)[l]			
Child Externalizing symptoms											41.12	8, 4626	<.001
Y3	0.49	(0.29)[a]	0.65	(0.31)[b]	0.85	(0.35)[c]	1.04	(0.32)[d]	0.91	(0.48)[c,d]			
Y5	0.38	(0.31)[e]	0.50	(0.30)[f]	0.67	(0.36)[g]	0.63	(0.36)[f,g,h]	0.71	(0.38)[h]			
Y9	0.08	(0.09)[i]	0.22	(0.13)[i]	0.37	(0.19)[k]	0.14	(0.10)[l]	0.69	(0.37)[h]			
Other Reports of Irritability													
Father Report Y3	0.37	(0.43)[a]	0.54	(0.45)[b]	0.63	(0.48)[b,c]	0.75	(0.48)[c,d]	0.87	(0.54)[d]	33.56	4, 1755	<.001
Teacher Report Y9	0.23	(0.41)[a]	0.36	(0.53)[b]	0.50	(0.59)[c]	0.29	(0.46)[a,b]	0.75	(0.62)[d]	32.75	4, 2232	<.001

Note: n refers to the number of children in each irritability trajectory class. Race/ethnicity was determined by maternal self-reported race/ethnicity. Education refers to maternal educational level. Freq. = frequency, that is, the number of times in the past year the mother reported witnessing or being a victim of violence; ref = reference for odds ratio; Y1 = child age 1, etc.

[a]Different superscript letters indicate significant pairwise comparisons.

*Odds ratio significantly different from 0 (p < .05). Aggravation in parenting, parent–child conflict tactics, neighborhood characteristics, family instability, internalizing and externalizing, and father- and teacher-report irritability measures are detailed in Supplement 1, available online. Externalizing excludes overlapping items used in irritability scale. Measures taken at year 1 unless otherwise indicated. Significance tests and odds ratios calculated while controlling for key child/family characteristics (maternal education, age, relationship status, race/ethnicity, child gender).

FIGURE 1 Trajectory classes of irritability. Note: Irritability was identified through latent class growth analysis. Lines indicate estimated trajectory for each class. C1 = Class 1, etc. Percentages indicate percentages of sample assigned to each class.
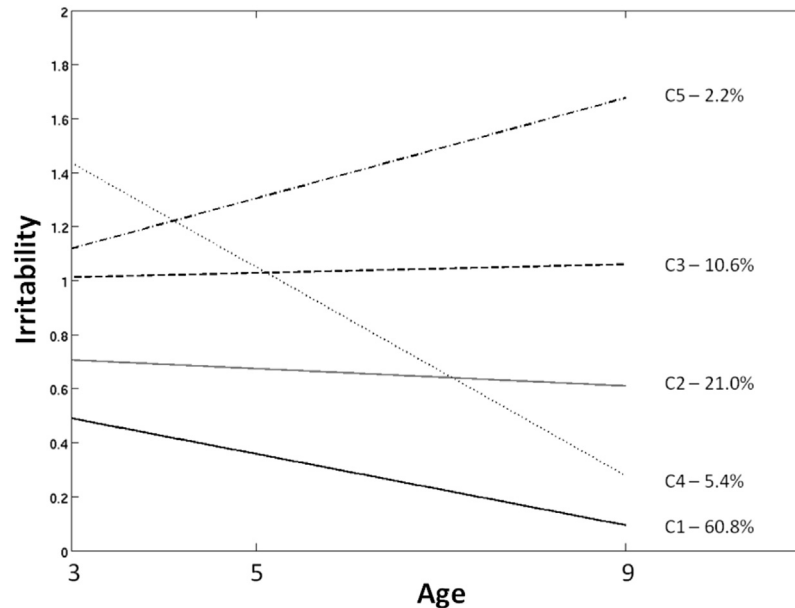
characterized by low, decreasing levels of irritability. The next-largest class (C2, 21.0%) has moderate levels of irritability that decrease, albeit less sharply than the normative class (C1, Table S2, available online). C3 (10.6%) has high levels of irritability that stay steady over time. C4 (5.4%) has the highest initial irritability of all the classes, but irritability in this class declines quickly, reaching low levels by age 9. Like C3, C5 (2.2%) has high levels of irritability at age 3 (Table S2, available online); however, in contrast to C3, irritability severity in C5 increases over time.

Control Variables. The estimation for the 5-class model with the control variables (maternal age, education, race/ethnicity, relationship status, and child gender) does not differ in class structure (slopes and intercepts) from the model without these variables (Table S2, available online). Moreover, the number of individuals assigned to each class does not differ between the models with and without control variables ($\chi^2 = 1.39$, df = 4, $p = .846$).

Potential Gender Differences. The 5-class model was rerun with child gender as a known class (multi-group analysis) to test for potential gender differences. Boys and girls have almost identical class structure, such that the intercepts and slopes estimated for each of the classes do not differ significantly between boys and girls (Table S2,

available online). The only significant gender difference is in C2, where boys and girls both start out with moderate irritability, which then decreases in boys but remains steady in girls.

Although overall class structure is similar across genders, the proportion of girls and boys in every group is not equal (likelihood ratio $\chi^2 = 15.29$, df = 4, $p = .004$). Specifically, boys are 1.42 times more likely than girls to be in C3, the class characterized by high, steady irritability (Wald statistic = 11.90, $p = .001$). Other classes do not differ in their proportions of boys and girls.

Objective 2: Characterization of Classes on Maternal Depression and Other Characteristics
The children in the irritability trajectory classes differ on maternal depression. Specifically, compared to the normative class (C1), children in each of the more severe irritability trajectory classes (C2–C5) are more likely to have mothers that have been depressed. This analysis controlled for paternal depression; maternal and paternal anxiety, drug and alcohol abuse; maternal age, race/ethnicity, education, relationship status; and child gender (likelihood ratio $\chi^2 = 73.31$, df = 8, $p < .001$) (Figure 2).

This effect was particularly driven by children whose mothers had recurrent depression (i.e., at least twice during the child's life) (Table 2). In

FIGURE 2 Proportion of children within each irritability trajectory class with mothers depressed at 0, 1, or 2 or more time points. Note: Children in more severe irritability classes (C2–C5) are more likely to have mothers who have been depressed, particularly 2 or more times (likelihood ratio $\chi^2 = 73.31$, df $= 8$, $p < .001$, controlling for paternal depression; maternal and paternal anxiety, drug use, and alcohol abuse; maternal age; race/ethnicity; education; relationship status; child gender). A graphical depiction of the irritability classes is in Figure 1.
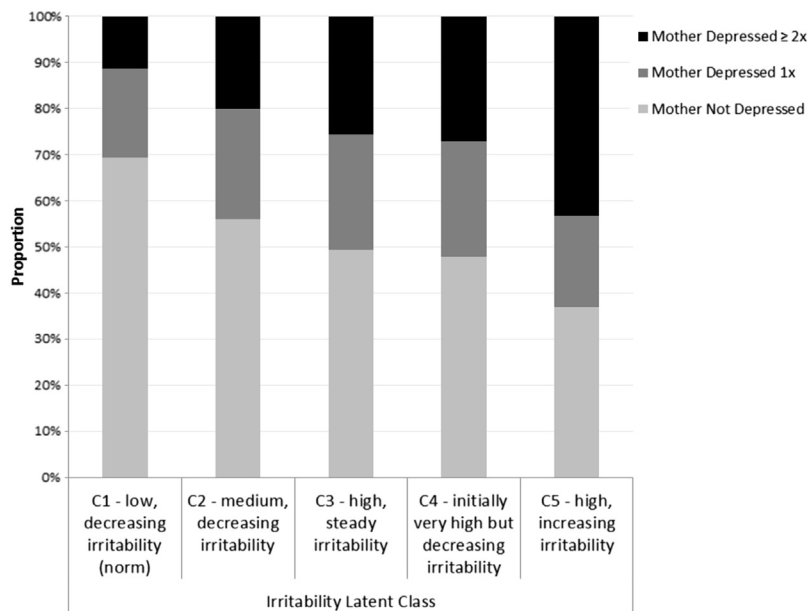
particular, children in the class characterized by initially high, increasing irritability (C5) are 4.88 times more likely than children in the normative irritability class (C1) to have mothers with recurrent depression. Furthermore, the odds of having a mother with recurrent depression is significantly higher for C5 versus C1 than for any of the other more severe classes (C2–C4 versus C1).

In addition to maternal depression, other parent characteristics were found to be risk factors for membership in more severe irritability classes (C2–C5), including paternal depression, maternal drug use, and maternal and paternal alcohol abuse. Specifically, similar to the pattern with maternal depression, recurrent paternal depression also significantly predicts membership in more severe classes (C2–C5), although less strongly than maternal depression. Also, a single instance of maternal drug use is significantly associated with greater likelihood of membership in the more severe irritability classes (C2–C5) compared to the normative class (C1). Moreover, whereas a single episode of paternal alcohol abuse is associated with membership in intermediate classes C3 and C4, a single episode of maternal alcohol abuse predicts membership in the most severe class, C5. Of note, maternal and paternal anxiety do not significantly predict

irritability class membership, controlling for other parent characteristics (Table 2).

Other Characteristics. Child, family, and social environment characteristics for each class are shown in Table 1, along with irritability data from father and teacher informants. Classes differ on demographics as well as other child, family, and social environment characteristics (see Supplement 1, available online, for details of the measures). To summarize, more severe irritability classes are generally more likely to have single mothers who are white/European American with lower levels of educational attainment and greater material hardship. Moreover, children in more severe irritability classes are likely to live in worse neighborhoods, where their mothers are more likely to report witnessing or being a victim of violence (for C2–C4, but, interestingly, not C5) while concurrently receiving less social support from neighbors. Children in more severe irritability classes also experience more and harsher parental discipline.

The internalizing and externalizing symptoms that children exhibit largely mirror the trajectory patterns of the irritability classes (e.g., internalizing and externalizing are low and decreasing for the normative class, which also has concurrently low and decreasing irritability.). Moreover,

TABLE 2 Odds Ratios From Multinomial Logistic Regression Predicting Child Irritability Latent Class From Maternal and Paternal Characteristics

Latent Irritability Growth Class[a]	Parental Issue	Parent Target / Informant	Recurrence (Times Met Criteria)	Odds Ratio	Lower Bound[b]	Upper Bound[b]	p
C2—Medium, decreasing irritability	Depression[c]	Mother	1x	**1.49**	1.21	1.85	<.001
			≥2×	**2.02**	1.55	2.62	<.001
		Father	1×	1.15	0.91	1.45	.251
			2×	**1.87**	1.38	2.53	<.001
	Anxiety[c]	Mother	1×	0.73	0.47	1.12	.149
			2×	0.57	0.22	1.49	.251
		Father	≥1x	0.94	0.62	1.43	.764
	Drug Use[c]	Mother	1×	**1.65**	1.25	2.18	<.001
			≥2x	**1.63**	1.03	2.59	.039
		Father	1×	**0.77**	0.59	1.00	.046
			≥2x	0.86	0.60	1.22	.394
	Alcohol Abuse[c]	Mother	1×	1.19	0.94	1.51	.149
			≥2×	1.35	0.97	1.86	.074
		Father	1×	1.18	0.95	1.46	.136
			≥2×	1.14	0.90	1.44	.270
C3—High, steady irritability	Depression	Mother	1×	**1.58**	1.18	2.11	.002
			≥2x	**2.42**	1.75	3.36	<.001
		Father	1×	1.31	0.97	1.76	.080
			2×	1.31	0.87	2.00	.199
	Anxiety	Mother	1×	1.11	0.68	1.80	.687
			2×	1.09	0.41	2.93	.866
		Father	≥ 1x	0.84	0.48	1.47	.539
	Drug Use	Mother	1×	**2.28**	1.64	3.17	<.001
			≥2×	1.38	0.75	2.52	.297
		Father	1×	1.11	0.80	1.54	.520
			≥2×	1.22	0.79	1.88	.375
	Alcohol Abuse	Mother	1×	1.07	0.77	1.47	.697
			≥ 2×	1.40	0.93	2.11	.110
		Father	1×	**1.38**	1.04	1.83	.024
			≥2×	0.96	0.69	1.34	.814
C4—Initially very high but decreasing irritability	Depression	Mother	1×	**1.54**	1.03	2.29	.034
			≥ 2×	**2.44**	1.58	3.75	<.001
		Father	1×	1.43	0.96	2.14	.078
			2×	**2.16**	1.30	3.60	.003
	Anxiety	Mother	1×	1.72	0.96	3.06	.068
			2×	0.38	0.05	3.02	.363
		Father	≥1x	0.67	0.31	1.42	.293
	Drug Use	Mother	1	**1.67**	1.05	2.66	.029
			≥2×	1.20	0.53	2.71	.664
		Father	1×	0.82	0.53	1.29	.398
			≥2×	0.94	0.52	1.70	.835
	Alcohol Abuse	Mother	1×	1.13	0.72	1.75	.597
			≥2×	1.71	0.97	3.00	.063
		Father	1×	**2.54**	1.78	3.62	<.001
			≥2×	1.10	0.68	1.79	.691
C5—High, increasing irritability	Depression	Mother	1×	1.79	0.96	3.34	.069
			≥2×	**4.88**	2.71	8.79	<.001
		Father	1×	1.46	0.81	2.60	.206
			2×	**2.25**	1.11	4.57	.025
	Anxiety	Mother	1×	1.21	0.56	2.63	.634
			2×	1.23	0.26	5.86	.791
		Father	≥1×	1.12	0.46	2.73	.810

TABLE 2 Continued

Latent Irritability Growth Class[a]	Parental Issue	Parent Target / Informant	Recurrence (Times Met Criteria)	Odds Ratio	Lower Bound[b]	Upper Bound[b]	p
	Drug Use	Mother	1×	**2.40**	1.34	4.30	.003
			≥2×	1.30	0.46	3.67	.624
		Father	1×	0.85	0.44	1.62	.617
			≥2×	0.86	0.37	1.99	.723
	Alcohol Abuse	Mother	1×	**2.89**	1.71	4.88	<.001
			≥2×	1.91	0.88	4.14	.102
		Father	1×	1.31	0.74	2.32	.358
			≥2×	1.24	0.68	2.29	.482

Note: Analysis controlled for maternal age, education, race/ethnicity, relationship status, and child gender, as well as all parental psychopathology variables. Maternal depression odds ratios correspond to the graphical depiction of the proportions of children in each class with mothers depressed 0, 1, or 2 or more times in Figure 2. Significant (p < .05) odds ratios are marked in boldface. A graphical depiction of the irritability classes (C1–C5) is in Figure 1.
[a]Latent irritability growth class versus C1: low, decreasing irritability (norm).
[b]95% CI.
[c]Versus no depression, anxiety, drug, or alcohol abuse.

father and teacher reports of irritability generally follow the trajectory patterns of the classes identified using mother report.

Objective 3: Determination of Bidirectional Nature of Relationship Between Child Irritability and Maternal Depression

The latent autoregressive cross-lag model showed acceptable fit on several indices (RMSEA = 0.028, CFI = 0.933, TLI = 0.888). Figure 3 shows the path coefficients in the model. We highlight the main results.

Child irritability at ages 3 and 5 years is associated with increased mother depression at ages 5 and 9, respectively (ORs = 1.47 and 1.28). Conversely, mother depression at child years 1 and 3 is associated with increased child irritability at ages 3 and 5, respectively (B = 0.44 and 0.33), but mother depression at age 5 does not significantly predict child irritability at age 9 (B = 0.11, p = .129). Of note, irritability regression on the previous time points of irritability (auto-regressions) indicate that, overall, irritability is stable over the toddlerhood to middle childhood period (age 3–5, B = 0.831; age 5–9, B = 0.526).

DISCUSSION

The present study identified 5 distinct trajectories for the developmental time course of irritability between toddlerhood and middle childhood. On average, across participants, irritability levels drop with age ($F_{1,2335}$ = 586.44,

p < .001) (Table 3). However, this average masks considerable heterogeneity in intra-individual trajectories, and the heterogeneity can be categorized into 5 classes. Specifically, in addition to normative class C1 (low, decreasing irritability), we found 4 other classes with more severe trajectories of irritability that are likely to contain individuals who present for mental health care. Classes differed on a number of social–environmental, family, and child characteristics; in particular, we documented that the more severe classes (C2–C4), but not the most severe class (C5), had mothers who were more likely to be exposed to violence. Moreover, paternal depression and alcohol abuse, as well as maternal drug and alcohol abuse, predicted membership in irritability classes. We also found that the severe classes (C2–C5) were more likely than C1 to include mothers with recurrent depression, a finding that also has considerable clinical relevance. It is possible that recurrent maternal depression is a risk factor because recurrence may be a marker of severity. Alternatively, in light of our finding that child irritability also influences maternal depression, it is possible that depression recurrence in the mother may be driven by irritability in the child.

Of note, whereas the 3 most severe classes, namely, C3, C4, and C5, all have high levels of irritability in toddlerhood, their paths differ considerably from toddlerhood to middle childhood. In both C3 and C5, irritability fails to remit by middle childhood; however, in C5, irritability

FIGURE 3 Results for the latent autoregressive cross-lag model for child irritability and mother major depression. Note: Significant paths (*p* < .05) shown with black lines; non-significant paths shown with gray dotted lines. Paths specified from every control variable to every mother depression and child latent irritability variable. CI = 95% confidence intervals; MDE = major depressive episode; OR = odds ratio; Y1 = child age 1, Y3 = age 3, etc.
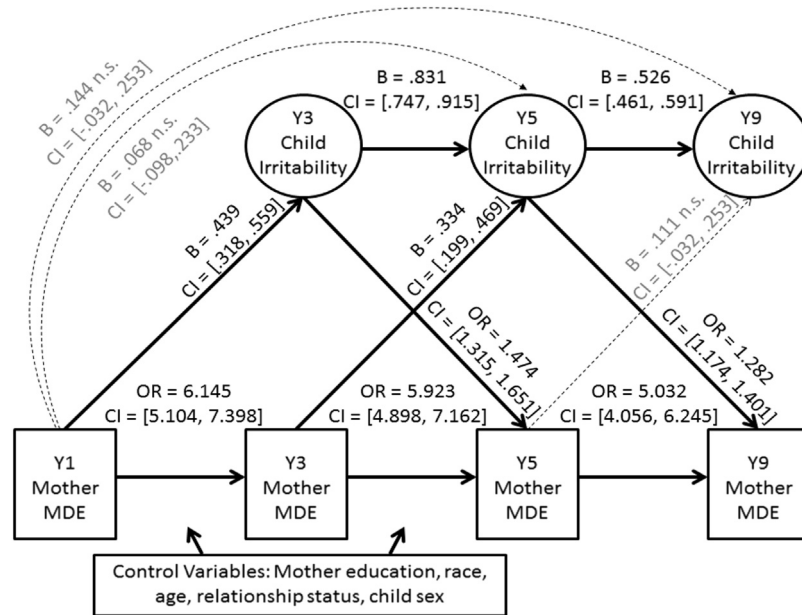
becomes increasingly worse with time, whereas in C3 high levels of irritability remain steady. Of all the classes, C5 (2.2% of the sample) may represent individuals at the highest risk for later psychopathology. Longitudinal studies are ongoing and will be informative, especially comparing outcomes of C3 and C5.

In contrast to C3 and C5, which exhibit severe irritability throughout toddlerhood to middle childhood, children in C4 start out with the highest levels of irritability at age 3 years but are close to normative levels by age 9. Moreover, individuals in C4 are as likely as those in C3 to have mothers with a history of depression, but irritability levels stay high in C3, whereas they normalize in C4. Thus, C4 may consist of resilient individuals. Preliminary characterization of the classes (Table 1) indicates that children in C4 were more likely to be African American with a mother with less than high school education, residing in a violent neighborhood; however, these are not known to be resiliency factors. Of note, we observed a "dose response" increase in the effects of violence exposure (i.e., the frequency of mothers being witnesses to, or victims of, violence in the year before the child age 3 time point) on irritability across C1 to C4, with C4 having the highest likelihood of

maternal violence exposure, but a drop in likelihood of maternal violence exposure for C5 (Table 1). It is possible that irritability symptoms in children in C4 are attributable to environmental influences (such as trauma); irritability in C4 may decline after toddlerhood because the trauma abates or because children develop the executive function needed to cope with the trauma. In contrast, the high, increasing irritability in C5 may be due to genetic/neurobiological vulnerabilities that unfold over development and result in irritability, regardless of environment. However, this preliminary finding must be interpreted cautiously, as C5 is relatively small (n = 95). Additional research is needed to understand how, for children in C4, irritability symptoms remit despite high, sustained levels of maternal depression and exposure to the environmental pathogen of violence.

C3, C5, and, in toddlerhood, C4 represent levels of irritability that may be clinically significant; C2, on the other hand, represents a large portion of the population (21%) who have elevated levels of irritability that decrease less rapidly than those of the normative class (C1) and yet do not rise to the levels of the most severe classes (C3, C5). Thus, C2 may consist of

TABLE 3 Overall Sample Characteristics

Characteristics	
N	4,712
Child Gender (%)	
Male	52.5
Female	47.5
Race/Ethnicity (%)	
Black/African American	47.7
Hispanic/Latino(a)	27.3
White/European American	21.1
Other	3.9
Education (%)	
Less than high school	34.4
High school or equivalent	30.4
Some college or tech school	24.5
College or graduate school	10.7
Relationship Status (%)	
Single	39.2
Cohabitating	36.4
Married	24.4
Irritability, Mean (SD)	
Age 3	0.67 (0.50)
Age 5	0.62 (0.50)
Age 9	0.39 (0.42)
Mothers depressed (%)	
Age 1	15.5
Age 3	20.6
Age 5	17.0
Age 9	17.5

Note: n refers to the number of participants with data from at least 1 time point of irritability or maternal depression. Race/ethnicity was determined by maternal self-reported race/ethnicity. Education refers to maternal education level. Irritability was assessed by the Child Behavior Checklist. Mothers depressed = percentage with major depressive disorder, as assessed by Composite International Diagnostic Interview—Short Form.

medium stable, and high stable) identified in the previous work.[8] In addition, our analyses included close to 5,000 individuals from a population-based study (versus 500 participants in the Italian cohort[8]) and thus may be more sensitive to detect subpopulations.

We also performed some of the first work characterizing irritability trajectory classes on a variety of social environment, family, and child variables. Consistent with the literature on other child outcomes,[26] several social environment and family variables (e.g., lower maternal educational attainment, violent neighborhood, harsh parenting) are implicated in worse irritability trajectories. Moreover, our preliminary characterization of the irritability classes on other concurrent internalizing and externalizing symptoms suggests that children exhibit irritability in conjunction with these related symptom domains; this finding is in line with previous observations that psychiatric symptoms are highly co-occurring,[27] particularly in children.[28] Our preliminary characterization of the irritability classes lays the foundation for future work examining how these environmental and family predictors and child symptoms interact with and relate to irritability over time.

Our characterization of the classes with respect to parental psychopathology corroborates and extends the finding by Dougherty *et al.*[4] that lifetime parental depression and anxiety predict irritability in early childhood. The association that Dougherty *et al.* found between parental anxiety and child irritability may be due to the high comorbidity of anxiety and depression. Indeed, our results show that, when controlling for anxiety and other parental psychopathology (and also when differentiating between maternal versus paternal and single-episode versus recurrent psychopathology), recurrent maternal depression is highly predictive of membership in more severe irritability trajectory classes (C2–C5), whereas parental anxiety is not. This suggests that recurrent maternal depression has an effect on child irritability above and beyond parental anxiety and other psychopathology.

Moreover, in contrast to Dougherty *et al.*'s[4] finding that lifetime parental substance use does not predict irritability in early childhood, we found that maternal drug use and maternal and paternal alcohol abuse does predict irritability trajectory class. Our analysis may be more sensitive to detect subtle patterns of parental substance use effects because we differentiate between maternal

individuals with subclinical symptoms who might be less likely to present for care yet may still exhibit irritability. This "in-between" class of individuals is consistent with previous research that has identified irritability as a dimensional trait present across both typical and clinical populations.[1]

Our identification of irritability trajectory classes from ages 3 to 9 in a United States population–based cohort complements the only other study, to our knowledge, to identify irritability trajectory classes, in an older, Italian cohort (ages 12–20 years).[8] Because of the age gap (ages 9–12) between studies, it is not possible to pinpoint how the 5 classes that we identified in toddlerhood and middle childhood may transition into the 4 classes (low stable, medium declining,

versus paternal use, drug versus alcohol abuse, and single episodes versus recurrent use. Indeed, we found that a single episode of maternal drug use predicts membership in the non-normative irritability classes (C2–C5). Also, a single episode of paternal alcohol abuse predicted membership in the intermediate classes (C3–C4), whereas a single episode of maternal alcohol abuse predicted membership in the most severe class (C5). Maternal characteristics may be associated with greater irritability severity, compared to paternal characteristics, because mothers are often the child's primary caregiver; maternal substance use may thus have a more direct impact on childcare than paternal substance use. (Consistent with this idea, compared to maternal depression, paternal depression has similar but weaker effects on child irritability; see Table 2.) Of note, counterintuitively, single episodes of substance use have a greater effect in almost every case than recurrent substance use (Table 2). It may be that single episodes of substance use represent acute stressors, which could have a greater impact on child irritability than recurrent use, which may represent genetic vulnerabilities distinct from irritability risk. Alternatively, it is possible that recurrent substance use is not significant for other reasons, such as relatively low base rates. Future research in a cohort oversampled for parental substance use will be necessary to directly address these possibilities.

The present study also documented evidence for a bidirectional relationship between maternal depression and child irritability. With a much larger sample and longitudinally sensitive design, our study confirms previous findings that maternal depression relates to irritability.[4] Furthermore, our finding extends previous work by demonstrating that not only does maternal depression influence child irritability, but child irritability also influences maternal depression. Our results are consistent with both theoretical expectations[11] and prior research on other mother–child interactions and psychopathology.[12] Our findings suggest that if the goal is to decrease the child's irritability and to prevent it from worsening, it is important also to assess (and, where appropriate, treat) the mother's depression. On the other hand, if the goal is to treat the mother's depression, our findings suggest it is important also to assess and treat the child's irritability.

The mechanism by which maternal depression transmits risk for child irritability and vice versa may involve direct parent–child interactions. It is possible that mothers who are depressed have harsher parenting interactions with their children, which then increase child irritability and in turn provoke harsher parenting.[11] Indeed, maternal hostility and warmth mediate the link between maternal depression and other child psychopathology[29]. Moreover, preliminary characterization of the classes indicates that the more severe irritability classes (C2–C5) received harsher parenting (Table 1). To examine this potential mechanism by which maternal depression and child irritability might influence each other, further research on parenting will be necessary.

Despite a number of strengths of the current study, including a very large, population-based sample, longitudinal assessments, and both a person- and variable-centered approach, 2 main limitations exist. First, because we used mother report for both the child's irritability measures and maternal depression, it is possible that relationships among the variables are inflated due to shared method variance. Because we do not have data at all time points from non-mother informants, we could not repeat these analyses with non-mother informants. Nonetheless, father- and teacher-reported irritability at the available time points generally mirror the class growth patterns identified with mother report (Table 1). Moreover, because our latent auto-regressive cross-lag model (objective 3) controlled for stability of maternal depression and child irritability as well as mother depression at year 1, the model predicts changes in child irritability based on prior changes in maternal depression and vice versa. Thus, an overall correlation between depression and irritability due to mother report is unlikely to be primarily driving our findings. Indeed, despite the risk of shared method variance, mother reports of child irritability symptoms may be based on greater time observing the child, because mothers usually spend the most time with the child during toddlerhood through middle childhood.

Second, in our sample, younger Hispanic or other race/ethnicity mothers with less than a high school education were more likely to have missing data, and each time point had 11% to 32% missing data. Although patterns of attrition may affect our results, this very large sample is population based and, because of sampling, has disproportionately large numbers of hard-to-reach individuals, such as historically underserved and

under-researched minority groups and low socio-economic status groups. Thus, even with missing data, it is likely that our analyses reflect the range of subgroups across the United States, unlike community samples, which may have no representation of many key demographic groups. Moreover, to address missing data, we included variables affecting attrition in our analyses as control variables and used the expectation maximization algorithm, which is robust to great portions (>50%) of missing data,[24] larger than in our study.

In summary, the present study classified trajectories of irritability development and characterized the bidirectional association of maternal depression and child irritability, information that will be important to predict course and potentially to choose treatment based on history and parent–child characteristics. Follow-up data on individuals in the Fragile Families and Child Wellbeing Study will be collected at age 15 years. Future research examining how the irritability classes identified in the present study navigate the transition to adolescence, a time when many types of psychopathology manifest, will be important to identify individuals most in need of intervention. &

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SUPPLEMENT 1

Method

Preliminary Characterization Measures (Table 1)

Family instability was based on information on family structure and family structure transitions obtained at each wave (birth and years 1 and 3) and used to determine the number of partner transitions (either exiting or entering into a new residential or nonresidential partner relationship) during the first 3 years of the child's life. In addition to the number of partner transitions, families were classified as married, cohabitating (but unmarried), or other (i.e., single mother) based on questions about where the child would live after leaving the hospital and the marital status at birth. This measure has been used previously to represent family structure instability.[1-3]

Neighborhood characteristics were evaluated by mother report at child age 3 years, with 4 subscales: Loitering, Social Support, Witnessed Violence, and Victim of Violence. The Loitering subscale consists of 8 items (e.g., "How often do drug dealers or users hang around in the neighborhood?"; Cronbach's $\alpha = 0.93$) and the Social Support Subscale of 10 items (e.g., "People around here are willing to help their neighbors"; Cronbach's $\alpha = 0.86$) answered on a scale of 1 to 5 (reverse-coded for Social Support) and standardized from 0 to 1. Values closer to 1 indicate greater loitering and social support. Mothers also responded to 4 questions regarding the frequency with which they witnessed violent events (e.g., "In the past year, how many times did you see someone get attacked with a weapon?"), as well as 3 questions assessing the frequency with which they were the victim of violence (e.g., "In the past year, how many times were you attacked with a weapon?"). Frequencies of Witnessed Violence and of being a Victim of Violence were assessed by taking the midpoint of the response categories (0 times = 0 times, 1 time = 1 time, 2 or 3 times = 2.5 times, 4–10 times = 7.5 times, and >10 times = 14 times [assumed midpoint]) and summing the items.[4] Thus, values for these scales represent the number of times the mother witnessed violence or was a victim of violence in the year before the child's age 3 time point.

The Material Hardship Index[5] measures economic burden (i.e., whether parents had problems making ends meet) in the first year of the child's life. A summary count variable was created that includes 10 hardships from 4 domains: food, utilities, housing, and medical care. In year 1, mothers were asked items such as, "In the past 12 months, were you ever hungry but didn't eat because you couldn't afford enough food?" or "Was there anyone in your household who needed to see a doctor or go to the hospital but couldn't because of the cost?" Greater scores on this scale indicate more material hardship.

Aggravation in Parenting items are from the Child Development Supplement of the Panel Study of Income Dynamics and the JOBS (Job Opportunities and Basic Skills Training Program) Child Outcomes Study.[6] This scale measures the amount of parenting stress and consists of 4 of the 8 original items (e.g., "I find that taking care of my child(ren) is much more work than pleasure," "I feel trapped by my responsibilities as a parent") rated on a Likert scale from 1 ("strongly agree") to 4 ("strongly disagree"). Higher scores indicate greater aggravation in parenting (Cronbach's $\alpha = 0.61$).

The Parent–Child Conflict Tactics Scales measure child maltreatment and parenting, rated by the mother at child age 3 years. The Non-Violent Discipline subscale consists of 4 items (e.g., "Explained why something was wrong"; "Took away privileges or grounded [child]"; Cronbach's $\alpha = 0.75$). Harsh parenting consists of the mean of the Psychological Aggression and Physical Assault subscales (10 items total, Cronbach's $\alpha = 0.74$). For harsh parenting, mothers were asked how often, in the past year, they performed parenting behaviors related to psychological aggression (e.g., "Shouted, yelled, or screamed at [child]"; "Called [child] dumb or lazy or some other name like that") and physical assault (e.g., "Spanked [child] on the bottom with your bare hand"; "Hit [child] on the bottom with something like a belt, hairbrush, a stick, or some other hard object"). All subscales were scored for annual chronicity with severity weights in accordance with the frequencies indicated by the response categories. The subscales were standardized to a scale of 0 to 1, indicating the proportion of possible total score.[4,7]

Internalizing and externalizing symptoms were assessed using the Child Behavior Checklist (CBCL). Parents indicated whether the statement of the behavior (e.g., "unhappy, sad or depressed" for internalizing or "argues a lot" for externalizing) is "never true," "sometimes or somewhat true," or "very true or often true." For internalizing, there were 16 and 23 items at ages 3 and 5 years, respectively; for externalizing, there were 22 and 30 items. The CBCL/2-3[8] was collected at age 3 years,

and CBCL/4-18[9] at age 5. Although different versions of the CBCL are given across ages, the constructs that they measure are similar. Moreover, the CBCL/2-3 version contains modifications of the questions for very young children to measure symptom domains in a developmentally appropriate manner. Mean item scores were calculated to represent each subscale, and thus all subscales ranged from 0 to 2. Both internalizing (Cronbach's $\alpha = 0.75$ and 0.76 for ages 3 and 5 years, respectively) and externalizing had acceptable internal reliability (Cronbach's $\alpha = 0.88$, and 0.87).

Father-report irritability items are identical to mother-report items used in the main analyses from the CBCL; data are included from fathers who have at least 50% custody of child. Father reports of irritability were obtained at child age 3 years only. Teacher-report irritability items are from the Conners Teacher Rating Scale–Revised Short Form[10]: "child has temper tantrums," "gets angry easily," and "has temper outburst, is explosive, or has unpredictable behavior." Both range from 0 (no symptoms) to 2 (worst symptoms). Teacher reports of irritability were obtained at age 9 years only.

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TABLE S1 Model Fit Indices for Latent Class Growth Analyses With Irritability

LC	AIC	BIC	SSABIC	Entropy	VLMR (p)	LMR-LRT (p)	BLRT (p)	Smallest Class Size, %
1[a]	12663.760	12714.870	12689.449	NA	NA	NA	NA	100
2	12372.911	12424.021	12398.600	0.734	<.0001	<.0001	<.0001	21.8
3	12014.040	12084.315	12049.362	0.693	.0001	.0002	<.0001	12.2
4	11615.173	11704.614	11660.128	0.720	.0547	.0594	<.0001	5.4
5	**11302.607**	**11411.215**	**11357.196**	**0.761**	**<.0001**	**<.0001**	**<.0001**	**2.2**
6	11156.615	11284.389	11220.837	0.744	.1399	.1475	Did not converge	2.2

Note: Best-fitting model (5 classes), based on considering all model fit indices as a whole as well as interpretability, shown in boldface. AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; BLRT = Bootstrapped Likelihood Ratio Test; LC = number of latent classes; LMR-LRT = Lo-Mendell-Rubin Adjusted Likelihood Ratio Test; NA = not applicable; SSABIC = sample size-adjusted BIC; VLMR = Vuong-Lo-Mendell-Rubin Likelihood Ratio Test.

[a]One class (e.g., growth curve model) with random slopes and intercepts.

TABLE S2 Intercept and Slope Estimates for Each Class

	Intercept	Confidence Interval Lower Bound	Confidence Interval Upper Bound	Slope	Confidence Interval Lower Bound	Confidence Interval Upper Bound
All Participants						
C1	0.49	0.47	0.51	−0.066	−0.070	−0.062
C2	0.71	0.62	0.79	−0.016	−0.031	−0.001
C3	1.01	0.92	1.10	0.008 (NS)	−0.012	0.027
C4	1.44	1.34	1.53	−0.193	−0.210	−0.176
C5	1.12	0.99	1.25	0.093	0.071	0.114
Boys						
C1	0.48	0.44	0.51	−0.063	−0.069	−0.058
C2	0.75	0.64	0.85	−0.024	−0.041	−0.007
C3	0.98	0.87	1.09	0.013 (NS)	−0.012	0.038
C4	1.41	1.27	1.54	−0.196	−0.216	−0.176
C5	1.23	1.02	1.45	0.076	0.004	0.108
Girls						
C1	0.50	0.47	0.53	−0.067	−0.072	−0.062
C2	0.68	0.60	0.75	0.009 (NS)	−0.022	0.004
C3	1.05	0.95	1.15	0.004 (NS)	−0.016	0.023
C4	1.45	1.32	1.57	−0.187	−0.208	−0.165
C5	1.02	0.85	1.19	0.107	0.075	0.139
All Participants With Controls						
C1	0.54	0.43	0.65	−0.072	−0.089	−0.054
C2	0.75	0.59	0.92	−0.023 (NS)	−0.049	0.003
C3	1.05	0.93	1.16	0.003 (NS)	−0.018	0.025
C4	1.50	1.36	1.65	−0.204	−0.231	−0.177
C5	1.15	0.98	1.31	0.090	0.062	0.117

Note: Intercept and slope estimates with 95% confidence intervals for each irritability trajectory class for all participants (boys, girls), and all participants including the control variables maternal age, education, race/ethnicity, relationship status, and child gender. All estimates significant at p < .05 unless marked as nonsignificant (NS). A graphical depiction of the irritability classes (C1–C5) is presented in Figure 1.