APPENDIX MATERIALS FOR
Kahng, S., Oyserman, D., Bybee, D. & Mowbray, C. (2007). Mothers with serious mental illness: When symptoms decline does parenting improve? *Journal of Family Psychology*.

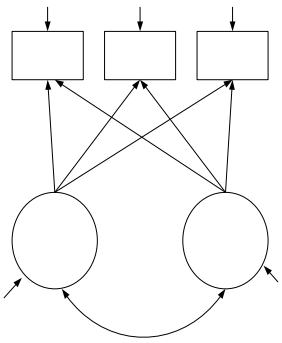
Analysis plan

Data were analyzed using latent growth curve modeling (LGCM) in AMOS 5 (Arbuckle & Wothke, 1999), a current generation technique that allows us to examine each of the three proposed longitudinal models, including individual differences in trajectories over time and predictors of these individual differences (Cheong, MacKinnon, & Khoo, 2003; Curran & Muthen, 1999; Duncan, Duncan, Strycker, Li, & Alpert, 1999). LGCM is an improvement over prior approaches as it allows for simultaneous modeling of bidirectional longitudinal relationships (Curran & Muthen, 1999).

Unconditional Model

To examine within-person change in parenting nurturance, parenting stress, and psychiatric symptoms, we developed and tested unconditional (i.e., descriptive, without covariates) models of growth curves for symptoms, nurturance, and stress separately. Figure 1 describes the details of unconditional models.

Figure 1. Unconditional model



Notes:

Y_1, Y_2, & Y_3: Repeatedly measured observed indicators (psychiatric symptoms, parenting stress, parenting nurturance) at W1, W2, and W3

α_i: Intercept indicating the initial level of psychiatric symptoms, parenting stress, or nurturance for an individual *i*

μ_α: The mean of the intercept across individuals

β_i: Slope indicating the rate of change in psychiatric symptoms, parenting stress, or nurturance for an individual *i*

μ_β: The mean of the slope across individuals

$\zeta_{\alpha i}$: Random effects (individual uniqueness) in intercept for individual *i*

$\zeta_{\beta i}$: Random effects (individual uniqueness) in slope for individual *i*

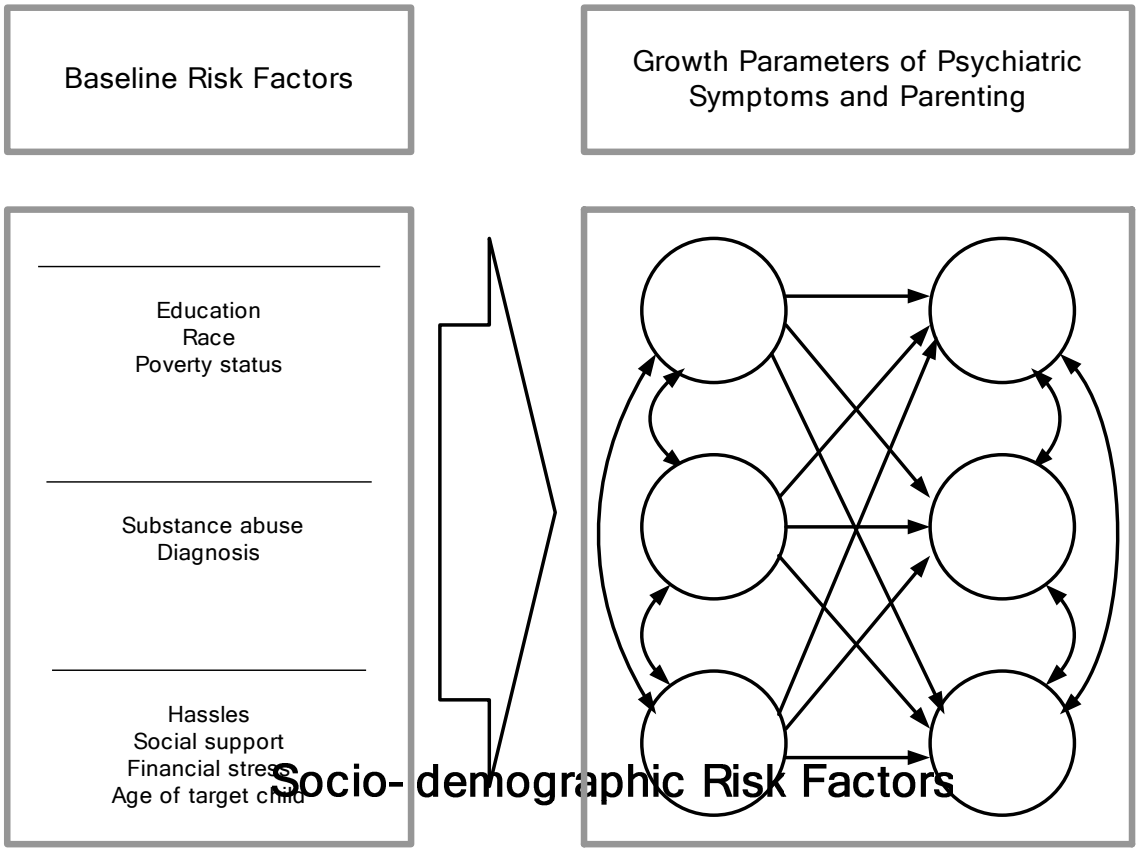
Conditional Model

In order to test hypotheses 1 and 2, we first examined the relationship between psychiatric symptom trajectory and parenting trajectories before adding contextual risk factors. That is, we first modeled the associations among growth parameters of psychiatric symptoms, nurturance, and parenting stress, as described in the right side of Figure 2 – 'Growth Parameters of Psychiatric Symptoms and Parenting.'

To examine whether these trajectories vary by socio-demographic, mental health history, and social contextual risk factors, we estimated a full conditional model by adding contextual risk factors. Figure 2 describes the details of the conditional model. With regard to the model development process, after estimating both unconditional models for each parameter and

associations among the growth parameters, we estimated an untrimmed full-path conditional model by adding directional links between variables, reflecting the hypothesized conceptual model. To facilitate interpretation, a final structural equation model (SEM) was assessed in which paths that were not significant (i.e., *p*-value of path coefficient <.05) were fixed at zero.

Figure 2. Conditional Model



The fit of all models was examined using the three fit indices and associated thresholds recommended by Hu and Bentler (1998; 1999). These are chi-square Root Mean Squared Error of Approximation (RMSEA) not much higher than .06, Standardized Root Mean Residual (SRMR) values of .08 or smaller and incremental fit index (IFI) not much lower than .95. To allow calculation of fit indices and appropriate testing of indirect effects, expectation maximization (EM) was used to estimate the 4.2% of the longitudinal data matrix that were missing, apparently at random; Little's MCAR χ^2(df = 77) = 80.49, p = .37 (Little & Rubin, 1990). Models were also estimated on the original, unimputed data matrix using AMOS' (Arbuckle & Wothke, 1999) full information maximum likelihood (FIML) to handle missing observations; the two methods were comparable in model fit and produced virtually identical estimated parameters and standard errors.

Results

Table 1 summarizes descriptive statistics of three time-varying variables (i.e., psychiatric symptoms, parenting nurturance, and parenting stress) across three waves, plus descriptive statistics of baseline contextual risk factors.

Table 1. Descriptive Statistics

	Wave 1			Wave 2			Wave 3			
	M *N*	*SD* *%*	*Mdn*	*M*	*SD*	*Mdn*	*M*	*SD*	*Mdn*	*Cronbach's Alpha*
Psychiatric Symptoms	2.81	0.83	2.79	2.59	0.74	2.50	2.51	0.75	2.45	0.90
Parenting Nurturance	3.69	0.34	3.80	3.68	0.30	3.80	3.64	0.35	3.70	0.80
Parenting Stress	2.51	0.79	2.42	2.35	0.79	2.21	2.43	0.80	2.38	0.86
Baseline Risk Factors										
Years of Education	11.98	2.19	12.00							
Race										
African American		182	61.9							
White		91	31.0							
Hispanic		21	7.1							
Poverty Status										
Being at or over poverty line		95	32.3							
Under poverty line		199	67.7							
Substance Use (DAST)										
Has substance use history (Scored $\geq$ 5)		123	41.8							
No substance use history (Scored<5)		171	58.2							
Diagnosis										
Schizophrenia		62	21.1							
Major depression w/o psychotic features		115	39.1							
Major depression w/ psychotic features		36	12.2							
Bipolar disorder w/o psychotic features		38	12.9							
Bipolar disorder w/ psychotic features		43	14.6							
Daily Hassles (without child related items)	9.01	3.64	9.00							
Available social support	7.07	3.48	6.00							
Financial stress	4.01	2.49	5.00							
Age of target child	9.11	9.00	3.99							

Unconditional models

Initial unconditional latent growth models showed reasonable fit to the data with both significant individual differences in initial levels and trajectories over time, as well as, in general, an overall decline over time for symptoms, parenting stress and nurturance. The results of the unconditional models are summarized in Table 2.

With regard to symptoms, it was necessary to free a factor coefficient (i.e., to estimate the value of the coefficient linking the slope construct to the third measurement point -- y_3) in order for the model to achieve adequate fit to the data. This suggested that the rate of change in psychiatric symptoms over time was not uniformly linear, although the average trajectory was downward and monotonic. Specifically, the value estimated for wave 3 psychiatric symptoms – 1.21, indicated that, on average, mothers' psychiatric symptoms declined more slowly between wave 2 and wave 3 than between wave 1 and wave 2; trajectories varied significantly. This model

showed no significant departure from the data ($\chi^2(2)=2.15$ (ns), IFI=1.00, RMSEA=.02, SRMR=.01) .

Table 2. Unconditional models for psychiatric symptoms, parenting stress and parenting nurturance

	Psychiatric Symptoms		**Parenting Nurturance**		**Parenting Stress**	
Parameter	α Intercept	β Slope	α Intercept	β Slope	α Intercept	β Slope
μ (Mean)	2.81 ***	-.23 ***	3.69 ***	-.02 *	2.48 ***	-.04 *
σ^2 (Variance)	.48 ***	.09 *	.07 ***	.01 **	.47 ***	.03 *
cov(α, β)		-.10 **		-.01 *		-.03
Measurement Paramenters						
y_1	1	0	1	0	1	0
y_2	1	1	1	1	1	1
y_3	1	1.21 ***~	1	2	1	2
Fit Indices						
Model χ^2 (df)	2.15 (2)		7.51 (3)		18.12 (3) ***	
RMSEA	.02		.07		.13	
SRMR	.01		.01		.01	
IFI	1.00		.98		.97	

Notes: ~' indicates a measurement parameter that is freed (i.e., estimated from the data)
* $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$

The model for parenting nurturance showed no significant departure from the data ($\chi^2(3)=7.51$ (ns), IFI=.98, RMSEA=.07, SRMR=.01). On average, maternal nurturance declined across the three time points (mean slope =-.02, $p<.05$), and the rate of change varied significantly between mothers.

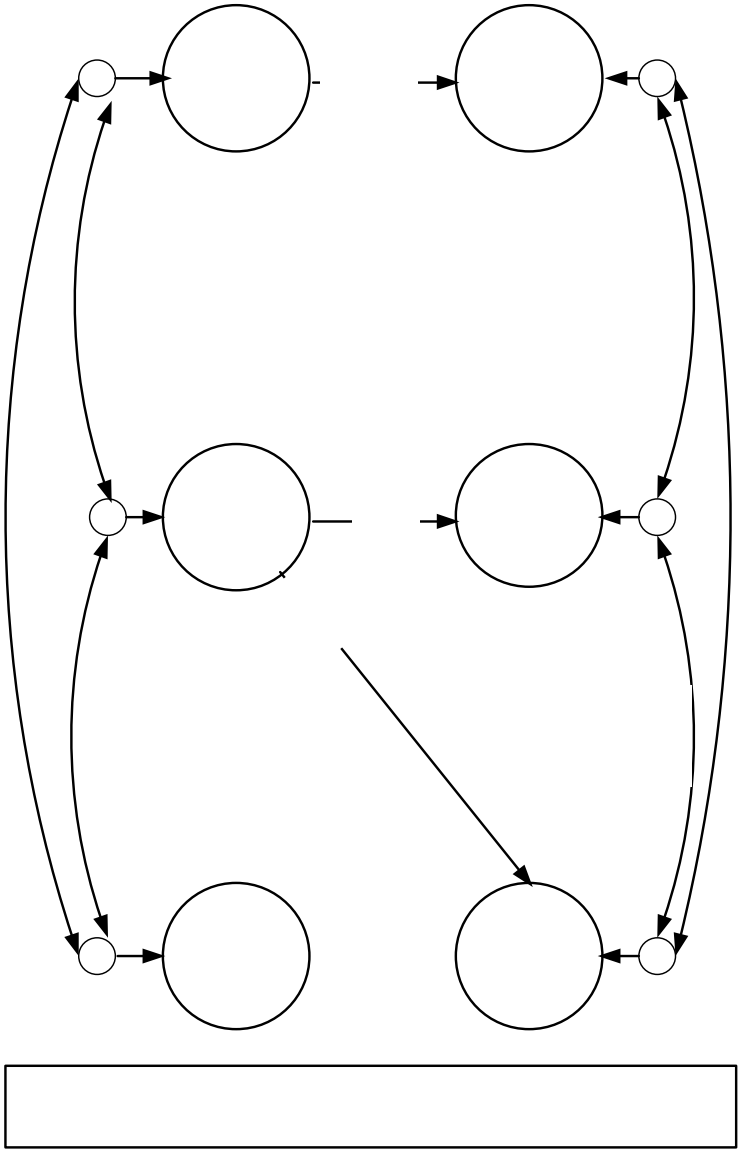
Although the model for parenting stress showed significant departure from the data matrix, two of the three fit indices suggested adequate fit ($\chi^2(3)=22.34$, $p< 0.001$, IFI=.97; RMSEA=.13; SRMR=.01). RMSEA did not meet standard criteria; however, further inspection showed that model residuals were small and uniform, and that unique variances were small, suggesting good fit. This combination of contradictory fit indicators has been identified by Browne, MacCallum,

Kim, Anderson, and Glaser (2002) as a limitation of RMSEA in judging models with small unique variances; following their recommendation, we judged the model for stress to be adequate. On average, maternal parenting stress declined across the three time points (mean slope = -.04, $p<.05$) and rate of change varied significantly between mothers.

Results of Hypothesis Tests

Hypothesized paths 1 and 2: The results of analyses relevant to hypotheses 1 and 2 are summarized in Figure 3.

Figure 3. The relationships among the trajectory parameters for psychiatric symptoms, parenting nurturance, and parenting stress



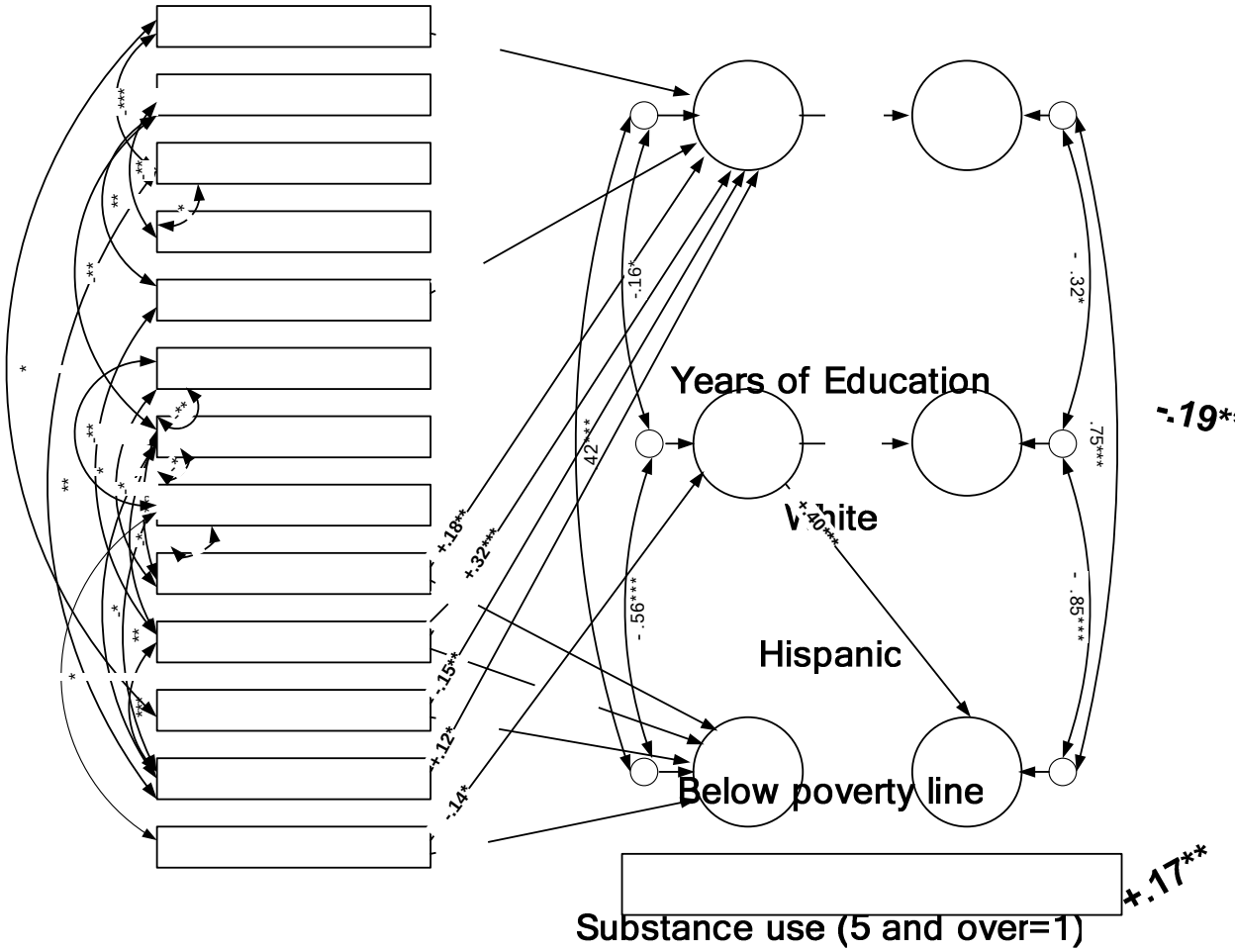
Hypothesized path 3: The results of analyses relevant to hypothesis 3 are summarized in Table 3 and Figure 4.

Table 3. Summary of effects for the conditional model

	Psychiatric Syptoms				**Parenting Nurturance**				**Parenting Stress**			
Latent Parameters	**Intercept (α)**	**Slope (β)**			**Intercept (α)**	**Slope (β)**			**Intercept (α)**	**Slope (β)**		
Total Variance Explained	**.29**	**.24**			**.02**	**.13**			**.13**	**.16**		
	Total (direct)	**Total**	**Indirect**	**Direct**	**Total (direct)**	**Total**	**Indirect**	**Direct**	**Total (direct)**	**Total**	**Indirect**	**Direct**
Baseline Independent Variables												
Years of education	-.19**	.09	.09	.00	.00	.00	.00	.00	.00	.00	.00	.00
White (1, Black=0)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Hispanic (1, Black=0)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Poverty status (below poverty line=1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Substance use (5 and over=1)	.17**	-.08	-.08	.00	.00	.00	.00	.00	.00	.00	.00	.00
Schizophrenia	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Depression with psychotic features	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Bipolar w/o psychotic features	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
Bipolar with psychotic features	.18**	-.09	-.09	.00	.00	.00	.00	.00	.12*	.00	.00	.00
Daily Hassles	.32***	-.15	-.15	.00	.00	.00	.00	.00	.30***	.00	.00	.00
Available social support	-.15**	.07	.07	.00	.00	.00	.00	.00	-.11*	.00	.00	.00
Financial Stress	.12*	-.06	-.06	.00	.00	.00	.00	.00	.00	.00	.00	.00
Age of target child	.00	.00	.00	.00	-.14*	.05	.05	.00	.11*	-.06	-.06	.00
Intercept of psychiatric symptoms		-.49***	.00	-.49***		.00	.00	.00		.00	.00	.00
Intercept of parenting stress		.00	.00	.00		.00	.00	.00		.00	.00	.00
Intercept of parenting nurturance		.00	.00	.00		-.36**	.00	-.36**		.40***	.00	.40***

Note: Fit Indices - $\chi^2(189) = 304.01$; IFI=.934, RMSEA=0.046 (.036<CI<.055), SRMR=.058
* p < 0.05; ** p < 0.01; *** p < 0.001

Figure 4. Latent trajectory model relating socio-demographic, mental health, and contextual variables stress to psychiatric symptoms and parenting



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