

## **APPENDIX A**

### **Childhood Maltreatment Measures**

Maltreatment experiences were collected in Wave III and IV (Appendix Table 1) via a computer-assisted self-interviewing method. In Wave III, participants reported the number of times (1, 2–3, 4–5, >5 times) they experienced supervisory neglect, physical neglect, physical abuse, and sexual abuse prior to beginning sixth grade. At Wave IV, participants were questioned again about the number of times they experienced emotional neglect, physical abuse, and sexual abuse and the earliest age at which each given type of maltreatment had occurred; from this information, maltreatment that occurred prior to age 12 years was identified. Because false-positive reports are likely rare,<sup>1</sup> physical abuse and sexual abuse (reported in both waves) were defined as experiencing that maltreatment type in at least one wave.

All maltreatment types in the questionnaire were included in the analysis because they are each associated with psychosocial outcomes, such as substance abuse, perpetration of intimate partner violence, and violent delinquency.<sup>2–5</sup>

The discordance in maltreatment reported in Wave III versus Wave IV was typical for sensitive questions such as maltreatment:<sup>1</sup> 16.4% for physical abuse and 3.7% for sexual abuse, after excluding discordance due to missing values. Consistent with prior research,<sup>6,7</sup> participants were classified as experiencing each type of maltreatment if they reported one or more incidents of a given maltreatment type. Using these AddHealth childhood maltreatment metrics, Shin and Miller<sup>6</sup> reported prevalence of abuse in childhood (30%), which varies widely in other studies,

such as 10% confirmed maltreatment by age 12 years,<sup>8</sup> which omits unreported maltreatment, and 23% self-reported abuse and neglect.<sup>9</sup>

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## **APPENDIX B**

### **Latent Growth Curve Analysis: Overview and Rationale**

Growth modeling can be conducted in multiple ways, including multi-level models (e.g., SAS PROC Mixed), and latent growth curve (LGC) analysis within a Structural Equation Modeling (SEM) framework. Multi-level and LGC models are similar in that they both model a dependent variable over time, allow baseline values (intercept,  $i$ ) and change over time (slope,  $s$ ) to vary from person to person, and calculate uncertainty (error) in the intercepts and slopes. In both types of models, intercepts and slopes can be estimated and modeled as a function of independent variables. That is, growth models simultaneously estimate the trajectories and the estimated effects of independent variables on the trajectories. These models are discussed in detail in Bollen & Curran, *Latent Curve Models: A Structural Equation Perspective*; Wiley 2005.

This study used LGC because the SEM framework enabled not only the simultaneous estimation of two trajectories (BMI and depression), but also the estimated effects of depression trajectories on BMI trajectory. SEM is ideally suited for analysis of a trajectory as both an outcome and predictor in a series of pathways.

### **Multiple Groups Analysis**

Within SEM, the degree to which parameter estimates differ across subgroups (e.g., gender) is typically determined using multiple groups analysis. In multiple groups analysis, the model is simultaneously fit within each subgroup of interest. The multiple groups model is first fit, allowing parameter estimates to differ among groups; then fit a second time, constraining the parameter estimates to be equal among groups. The model fit (BIC) is compared between the models. If the unconstrained model has a better fit, we conclude that the parameter estimates

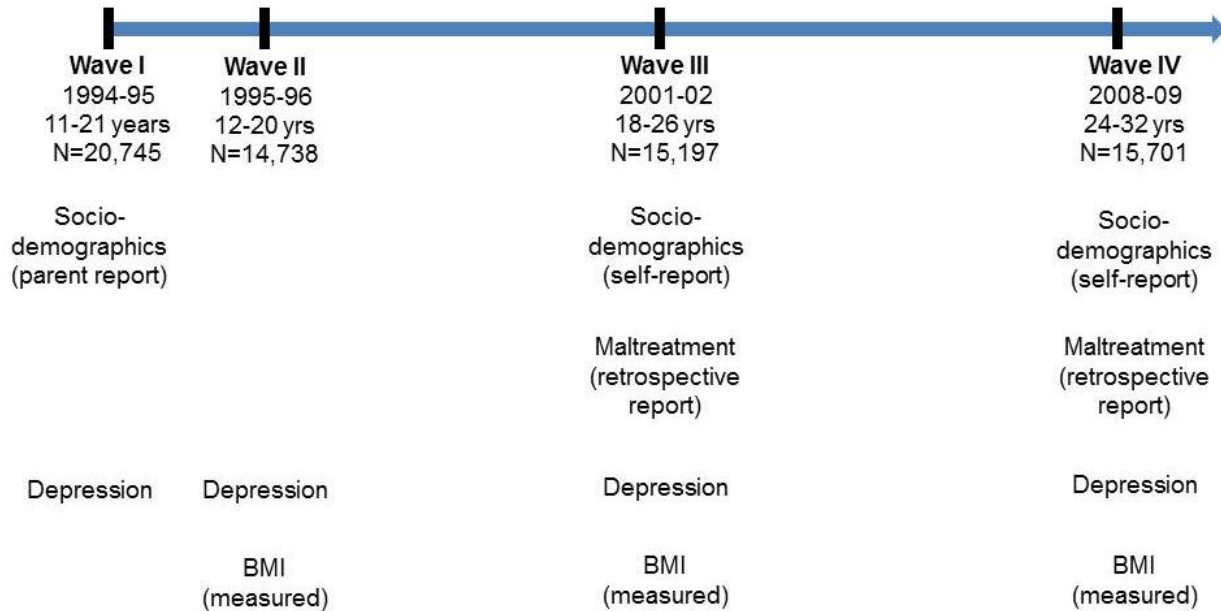
differ between groups. In preliminary analysis, associations between maltreatment and depression trajectory differed substantially between males and females ( $BIC_{\text{unconstrained}} = 277578$ ,  $BIC_{\text{constrained}}=279244$ ); because this pathway was central to the research question regarding mediation by depression, the remainder of the analyses were stratified by gender, allowing for the calculation of indirect and direct effects within gender.

### **Accelerated Cohort Design**

Participants were aged 12–19 years old at Wave I. Rather than examining latent trajectories across study wave, each containing a broad age range, the analysis used an accelerated cohort design. Age group was treated as its own cohort over time, enabling the examination of BMI and depression by age rather than by wave. To illustrate, for younger participants, depression trajectories across waves would reflect trajectory from age 12 through 25 years; and for older participants, from age 18 through 31 years. Because adolescence is a critical period of depression and BMI change, trajectories from “baselines” of early versus late adolescence can mask important age-related differences within the periods of adolescence and young adulthood. In the accelerated cohort design, eight age cohorts (12-year-old cohort, 13-year-old cohort, etc.) were examined. The analytic dataset was structured to indicate age-specific measures; this resulted in a large degree of planned missingness (each participant had  $\leq 4$  data points out of 20) accommodated by setting the acceptable minimum covariance coverage to zero. Linear trajectories, rather than higher order trajectories, were estimated because  $\leq 3$  BMI time points were available for each participant.

**APPENDIX C**

**Appendix Figure 1.** Study flow chart and key study variables collected at each study wave, National Longitudinal Study for Adolescent and Adult Health.



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**Appendix Table 1.** Maltreatment Questionnaire Items<sup>a</sup>

Type of maltreatment/ Study wave	Question
<b>Supervisory neglect</b>	
III	“By the time you started 6th grade, how often had your parents or other adult care-givers left you home alone when an adult should have been with you?”
<b>Physical neglect</b>	
III	“[By the time you started 6th grade,] how often had your parents or other adult care-givers not taken care of your basic needs, such as keeping you clean or providing food or clothing?”
<b>Physical abuse</b>	
III	“[By the time you started 6th grade,] how often had your parents or other adult care-givers slapped, hit, or kicked you?”
IV	“Before your 18th birthday, how often did a parent or adult caregiver hit you with a fist, kick you, or throw you down on the floor, into a wall, or down stairs?”
<b>Sexual abuse</b>	
III	“[By the time you started 6th grade,] how often had one of your parents or other adult care-givers touched you in a sexual way, forced you to touch him or her in a sexual way, or forced you to have sexual relations?”
IV	“[Before your 18th birthday,] how often did a parent or other adult caregiver touch you in a sexual way, force you to touch him or her in a sexual way, or force you to have sexual relations?”
<b>Emotional neglect</b>	
IV	“Before your 18th birthday, how often did a parent or other adult caregiver say things that really hurt your feelings or made you feel like you were not wanted or loved?”

<sup>a</sup>National Longitudinal Study for Adolescent and Adult Health, Waves III and IV

**Appendix Table 2.** Feelings Questionnaire Items<sup>a</sup>

“You were bothered by things that don’t usually bother you.”
“You felt that you could not shake off the blues even with help from your family and your friends.”
“You felt that you were just as good as other people.” <sup>b</sup>
“You had trouble keeping your mind on what you were doing.”
“You felt depressed”
“You felt that you were too tired to do things” <sup>c</sup>
“You enjoyed life” <sup>b</sup>
“You felt sad”
“You felt that people disliked you”

<sup>a</sup>National Longitudinal Study for Adolescent and Adult Health, Waves III and IV

<sup>b</sup>Reverse coded

<sup>c</sup>Not a CES-D item

CES-D, Center for Epidemiological Studies Depression Inventory



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**Appendix Table 3.** Study Sample Characteristics<sup>a</sup>

Characteristic	Females (n=6,993)	Males (n=6,369)
Age (years) at Wave I, mean (SE)	15.2 (0.1)	15.4 (0.1)
Household income at Wave I, mean (in \$1,000) (SE)	45.5 (1.7)	45.6 (1.7)
Highest parental educational attainment, %		
<High school	13.8	13.2
High school graduate/GED	30.2	28.8
Some college/Technical school	26.4	28.2
College graduate	30.0	29.9
Participant income at Wave III, %		
\$0–\$9,999	40.8	33.0
\$10,000–\$19,999	24.6	24.8
\$20,000–\$39,999	14.5	23.7
≥\$40,000	20.1	18.5
Participant income at Wave IV, %		
\$0–\$9,999	6.3	4.6
\$10,000–\$19,999	7.9	6.4
\$20,000–\$39,999	22.2	20.9
≥\$40,000	63.6	68.1
Race, n (%)		
White	71.6	72.8
Black	17.0	15.0
Hispanic	11.5	12.1
Participant education at Wave IV, %		
<High school	7.7	11.1
High school graduate/GED	13.8	20.5
Some college/Technical school	44.6	41.9
College graduate	34.0	26.4
Current smoker, %		
Wave II	35.5	34.6
Wave III	34.1	37.9
Wave IV	35.2	43.9
Maltreatment experience before age 12 years, %		
Supervisory neglect	38.0	43.0
Physical neglect	8.6	14.3
Physical abuse	27.4	29.1
Sexual abuse	8.0	5.1
Emotional neglect	23.7	20.1
Any maltreatment	54.9	54.7
Depression score, <sup>b</sup> mean (SE)		
Wave I	6.4 (0.1)	5.0 (0.1)
Wave II	6.3 (0.1)	4.9 (0.1)
Wave III	4.9 (0.1)	4.0 (0.1)
Wave IV	5.7 (0.1)	4.7 (0.1)
BMI, mean (SE)		
Wave II	23.0 (0.1)	23.0 (0.1)

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Wave III	26.4 (0.2)	26.2 (0.1)
Wave IV	29.1 (0.2)	28.8 (0.1)

*Note:* Boldface indicates statistical significance ( $p < 0.05$ ) for males versus females, per oneway ANOVA or chi-square test for continuous or categorical variables, respectively.

<sup>a</sup>National Longitudinal Study for Adolescent and Adult Health: 13,362 participants with  $\geq 2$  BMI measures; non-Hispanic white, non-Hispanic black, or Hispanic race/ethnicity; 12 years of age or older at Wave I; and with childhood maltreatment data at Wave III or IV.

<sup>b</sup>Modified Center for Epidemiologic Studies Depression Scale. Possible scores range from 0 to 27.

GED, General Educational Development test

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**Appendix Table 4.** Model Fit for Alternate Latent Childhood Maltreatment Classes<sup>a</sup>

<b>Model specification</b>	<b>BIC</b>	<b>Entropy</b>
<b>Class determination<sup>b</sup></b>		
3 class	54,235.008	0.700
4 class <sup>c</sup>	54,087.422	0.690
5 class	54,128.239	0.736
<b>Constraint determination</b>		
4 class, fully constrained <sup>b</sup>	54,087.422	0.690
4 class, free item thresholds	72,482.003	0.784
4 class, free item thresholds/free class probabilities	72,502.318	0.832

<sup>a</sup>National Longitudinal Study for Adolescent and Adult Health (n=13,362). Latent class analysis of five dichotomous maltreatment types.

<sup>b</sup>Fully constrained models

<sup>c</sup>The four class, fully constrained LCA model was selected as the final model (Table 2).

BIC, Bayesian Information Criterion; LCA, latent class analysis

**Appendix Table 5.** Crude Associations Among Maltreatment Class,<sup>a</sup> Depression Trajectory, and BMI Trajectory<sup>b</sup>

Independent variable	Females	Males
<b>Model 1</b>		
<b>Dependent variable: Depression intercept</b>		
No/Low maltreatment	ref	ref
Supervisory neglect dominant	<b>0.7 (0.3, 1.0)</b>	<b>0.5 (0.2, 0.8)</b>
Physical abuse dominant	<b>1.4 (1.0, 1.9)</b>	<b>1.2 (0.7, 1.6)</b>
High abuse and neglect	<b>2.6 (1.8, 3.5)</b>	<b>1.6 (1.0, 2.1)</b>
<b>Dependent variable: Depression slope</b>		
No/Low maltreatment	ref	ref
Supervisory neglect dominant	-0.1 (-0.4, 0.2)	-0.0 (-0.3, 0.2)
Physical abuse dominant	0.2 (-0.3, 0.6)	0.1 (-0.3, 0.5)
High abuse and neglect	-0.2 (-1.0, 0.5)	0.1 (-0.4, 0.6)
<b>Model 2</b>		
<b>Dependent variable: BMI intercept</b>		
Depression intercept	<b>0.1 (0.0, 0.2)</b>	0 (-0.1, 0.1)
<b>Dependent variable: BMI slope</b>		
Depression intercept	<b>0.1 (0.1, 0.2)</b>	-0.1 (-0.2, -0.0)
Depression slope	<b>0.3 (0.1, 0.5)</b>	-0.2 (-0.4, -0.1)
<b>Model 3</b>		
<b>Dependent variable: BMI intercept</b>		
No/Low maltreatment	ref	ref
Supervisory neglect dominant	0.2 (-0.2, 0.7)	0.1 (-0.3, 0.6)
Physical abuse dominant	0.1 (-0.4, 0.7)	-0.4 (-1.1, 0.3)
High abuse and neglect	0.7 (-0.1, 1.5)	0.7 (-0.1, 1.6)
<b>Dependent variable: BMI slope</b>		
No/Low maltreatment	ref	ref
Supervisory neglect dominant	0.3 (-0.0, 0.7)	-0.1 (-0.5, 0.2)
Physical abuse dominant	<b>0.6 (0.0, 1.1)</b>	0.2 (-0.2, 0.6)
High abuse and neglect	0.1 (-0.7, 0.9)	0.1 (-0.7, 0.8)

*Note:* Boldface indicates statistical significance ( $p < 0.05$ ).

<sup>a</sup>Maltreatment classes derived using Latent Class Analysis (Table 1).

<sup>b</sup>National Longitudinal Study for Adolescent and Adult Health (n=13,362). Associations estimated from gender-stratified, individual latent growth curve models: Model 1 models maltreatment class predicting depression trajectory, Model 2 models depression trajectory predicting BMI trajectory, Model 3 models maltreatment class predicting BMI trajectory.