Published in final edited form as:

J Adolesc Health. 2012 October ; 51(4): 313–318. doi:10.1016/j.jadohealth.2011.12.025.

Impact of Maternal HIV Health: A 12-year Study of the PACT Children

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Abstract

Purpose—The purpose of this 12-year longitudinal study was to assess the effects of maternal HIV/AIDS on child/adolescent well-being and behavioral outcomes, extending an earlier published account.

Methods—Interviews were conducted with 66 pairs of healthy children and their mothers living with HIV/AIDS (MLH), who are participants in the Parents And children Coping Together (PACT) project begun in 1997. All study participants were English or Spanish speaking. About half (48.5%) of the youth were female. Maternal health status (e.g., viral load biomedical marker, illness symptoms, physical functioning and depression) and child/adolescent outcomes (e.g., depression, anxiety/worry, aggression, and self-concept) were assessed over 16 time-points.

Results—Using growth curve modeling, results show a negative effect of maternal health status on child/adolescent outcomes, including child/adolescent depression, anxiety/worry, aggression, and self-concept. Interaction effects within the growth models suggest younger children are more impacted by poor maternal health than are older children/adolescents.

Conclusions—This is the first study to follow a cohort of children of MLH over such an extended age range, through late adolescence/early adulthood, to determine the impact of maternal health status throughout the entire developmental period.

Keywords

HIV; Longitudinal Studies; Child Behavior; Child Development; Adolescent Behavior; Adolescent Development

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There are no other conflicts of interest, either real or perceived.

Implications and Contribution

Effects of maternal HIV/AIDS on child/adolescent well-being were longitudinally assessed over 12-years ($N = 66$ child/mother pairs). Growth curve modeling revealed negative effects of mothers living with HIV/AIDS (MLH) health on child/adolescent well-being. This is the first study to assess MLH health status on children/adolescents throughout the entire developmental period.

Introduction

A number of factors may be related to mental health outcomes among children affected by parental HIV, and have been laid out in an empirical model [1]; however, parental health is a main factor in the model. Several studies have reported that parental HIV is associated with child depressive symptoms [2-5], and with acting out behavior [6]. Dorsey and colleagues [7] found a linear increase in children's report of externalizing and internalizing difficulties as their mothers progressed through stages of HIV infection and then AIDS. However, some studies have not found differences in child mental health outcomes due to maternal HIV [8].

Parental physical illness has long been considered a risk factor for psychological problems in children [9], especially younger children. Prior to studies focused on parental HIV, studies of children whose mother had breast cancer found that young children exhibit an increase in behavioral disorders [10]. In a review of 15 years of literature on children of ill parents, Romer and colleagues [11] reported that overall, children of seriously ill parents had higher scores than controls on symptom scales, with a tendency towards internalizing symptomatology. Specific to parental HIV, Reyland and colleagues [12] compared the psychosocial adjustment of 60 children 11 to 16 years of age living with a seropositive mother to children attending public school. After statistical models adjusted for child age and gender, the HIV-affected group showed poorer psychological functioning. The authors suggested that risk for psychosocial maladjustment in children living with an HIV-seropositive parent extends through late childhood into early to middle adolescence, and that research of children living with parents ill with cancer suggest that compared to younger children, older children and adolescents will present with higher levels of psychological disturbance.

The Parents and Adolescents Coping Together III study (PACT III) is a continuation of two longitudinal studies (PACT and PACT II) assessing mothers with HIV/AIDS and their well children. The original Parents And children Coping Together (PACT) study followed a sample of 135 families every six months beginning in 1997 when the children were age 5 – 11. Parents and Adolescents Coping Together (PACT II) continued to follow the families as the children transitioned to early and middle adolescence. PACT III is now following the families as the early/middle adolescents transition to late adolescence/early adulthood. In 2006, Murphy and colleagues [13] conducted a longitudinal study on the psychological well being of the PACT young children (at that time, M age = 8.8 years; study conducted over 6 years) and the association with mothers' physical health. Individual growth models were estimated for children's depression, anxiety, and aggressiveness in relation to: mothers' viral load (medical records) and physical functioning, number of HIV-related physical symptoms, and medical visits due to illness. Lower levels of physical functioning and more symptoms among mothers were associated with higher levels of children's depression, anxiety, and aggressiveness at baseline. Lower levels of physical functioning and more symptoms among mothers were associated with initially high but more rapidly decreasing levels of depression among children. Stability in mothers' health appeared to be associated with a more rapid improvement in children's mental health over time.

In this study, we extend the time-span to 12 years using data from PACT I, PACT II, and PACT III to determine if the previous findings [1] hold for older adolescents. Also in the current paper we evaluate additional maternal covariates (mother's report of their physical health, and health-related anxiety) and child/adolescent outcomes (anxiety, aggression, and self-concept). The M age of the children in this sample was 8.2 years ($SD = 1.8$) at PACT I baseline, and 19.3 years ($SD = 1.8$) at the PACT III 12-month follow-up interview. This study adds to the literature, in that it is the first study investigating child/adolescent outcomes among children affected by maternal HIV/AIDS over such an extended age range.

Methods

Participants

The Parents And children Coping Together (PACT) study followed a sample of 135 mothers living with HIV/AIDS (MLH) and their well children every six months (assessments spanned 3 years) beginning in 1997 when the children were age 5 – 11. Mothers were recruited from primary care sites and AIDS service organizations in Los Angeles County. Medical chart abstraction was conducted to verify eligibility, confirm diagnosis, and obtain CD4 count and viral load. Data were collected in compliance with the Health Insurance Portability and Accountability Act of 1996 (HIPAA). In 2002, PACT II continued to follow 81 of the original families and 37 new families ($N = 118$) every six months. (Attrition analyses reported in Murphy and colleagues [13] indicate that PACT families who participated in PACT II did not differ on primary demographic, behavioral or health variables from those who did not.) The final study, PACT III, is following 96 families (95 youth and 88 MLH) from PACT II. To date, three PACT III interviews have been conducted at six-month intervals beginning in 2008.

The current analysis includes families ($N = 66$) who participated in PACT, PACT II and PACT III. Youth outcomes and maternal health data were collected at 16 time points over 12 years. All study participants were English or Spanish speaking. About half (48.5%) of the youth were female. The majority of families (94%) reported receiving public assistance (e.g., Medi-Cal [California's Medicaid program], food stamps, AFDC). The mothers' mean age at PACT baseline was 34.9 ($SD = 5.9$); 53% were Latina, 33% African American, 8% White and 6% other/multiracial.

Procedures

The Institutional Review Board at the University of California, Los Angeles, approved the study. Trained bilingual interviewers provided eligible participants with a complete description of the study; MLH and youth age 18 who agreed to participate then provided signed informed consent and youth age <18 provided signed assent. Face-to-face interviews of mothers and adolescents were conducted separately in the family's home using a computer-assisted interviewing program on laptop computers. The mother interviews lasted 45 - 60 minutes and they received \$25 - \$35; the youth interviews lasted 45 - 90 minutes and they received toys/gift cards in PACT, and \$25 - \$35 in PACT II and PACT III.

Measures

Predictor variables: Mother assessment—Maternal health was assessed using several measures. First, maternal self-report viral load was used. Due to its skewed distribution, it was dichotomized based on a median split of 500 copies/mL, as described in Murphy and colleagues [13] A higher viral load (infection) indicates poorer health (see Table 1 for observed variable means and standard deviations for all maternal predictors at select time-points, and for select child/adolescent outcomes).

The Medical Outcome Short Form 36 [14] was administered to the mothers. Two subscales were used for this analysis: physical functioning, which assesses the extent to which one's current health limits activities such as walking, or climbing stairs carrying groceries; and bodily pain, which assesses one's level of pain and the extent to which pain interferes with daily activities. These scales were chosen because they provide the mother's report of how she feels physically, and activity limitations (which may be more easily observable by the child). Higher scores indicate better functioning. Coefficient alphas across the PACT assessment waves averaged .87 and .80, respectively.

An HIV symptom illness checklist was used to assess 16 HIV-related symptoms in the past three months (e.g., unexpected weight loss, shortness of breath and coughing). A scale was calculated by summing positive responses.

Health-related anxiety was assessed using a four-item scale in which the mothers were asked about troubles with sleeping, eating, socializing and work/school activities as a result of thinking about her health and HIV/AIDS [15]. Mothers rated how often they had difficulty in each area (1 = not at all to 5 = always). The scale has been previously utilized with an HIV-infected population with good internal consistency reliability [16]. Cronbach's alpha averaged .89 across assessment waves.

Child outcome measures

Anxiety symptoms—Youth age <18 reported on anxiety symptoms using the Revised Measure of Children's Manifest Anxiety (RCMAS) [17]. The overall scale, and the physiological anxiety (e.g., "Often I feel sick in my stomach") and worry/oversensitivity (e.g., "My feelings get hurt easily") subscales were used in this analysis (across the PACT assessment waves, average Cronbach's alpha was .86 for the overall scale, .71 for physiological anxiety, and .83 for the worry/oversensitivity). Youth 18 years of age or older were administered the Adult Manifest Anxiety Scale (AMAS-A) [18]. The overall scale, and physiological anxiety (e.g., "My muscles feel tense") and worry/oversensitivity (e.g., "I worry about what other people think of me") subscales were examined (for PACT III assessment waves, average Cronbach's alpha was .92, .87, and .86, respectively). Because of the measure change as the child/adolescent turned 18 years of age, we converted raw scores to z-scores to create a standardized continuum measure of the anxiety subscales and total score, moving from RCMAS into AMAS. We also created a dummy variable indicating whether child/adolescent scores were solely based on the RCMAS measures (if they remained < 18), or a continuum of RCMAS into AMAS scores (used in subsequent analyses to adjust for any bias in the anxiety measures due to measure change).

Depression symptoms—Participants age < 18 reported on depression symptoms using the Children's Depression Inventory (CDI) [19]. Adolescents chose the phrase that best responded to their experience in the last two weeks (e.g., "I do not feel alone; I feel alone many times"; "I feel alone all the time"). The average alpha across the PACT assessment waves was .82. Participants who were 18 years of age or older were administered the Beck Depression Inventory (BDI) [20]. The average alpha across the PACT III assessment waves was .88. (e.g., "I feel like crying every day; I feel like crying many days; I feel like crying once in a while"). As with the anxiety measures, we converted the raw scores to z-scores to create a standardized continuum measure of depression, moving from the CDI into the BDI. We also created a dummy variable to indicate whether child/adolescent scores were solely based on CDI (if they remained <18), or a continuum of CDI to BDI scores.

Self concept—The Piers-Harris Children's Self-Concept Scale [21], [22] was administered to the youth. The three subscales planned for analysis were the intellectual and school status scale, which assessed self-perceived intellectual abilities and academic performance (e.g., "when I grow up I will be an important person"); the popularity scale, which assessed social functioning and perceived popularity; and the happiness and satisfaction scale (e.g., "I am a cheerful person"). Average Cronbach's alphas across the PACT assessment waves were .67 for Intellectual/school status, .67 for Popularity, and .57 for Happiness. Due to its low average alpha, the Happiness subscale was dropped from the analysis.

Aggression—Mothers of youth age < 18 were administered the aggressive behavior scale from the Child Behavior Checklist (CBCL) [23], [24]. Mothers with youth ≥ 18 were administered the aggressive behavior scale from the Adult Behavior Checklist (ABCL). The ABCL is an upward extension of the CBCL for ages 18 - 30, and has been validated in numerous studies worldwide [25]. Average Cronbach's alpha for the PACT assessment waves was .88 for the CBCL, and .90 for the ABCL. We converted scores to z-scores and created a standardized continuum measure of aggression. We also created a dummy variable indicating whether child/adolescent scores were solely based on CBCL or a continuum of CBCL to ABCL scores.

Analysis—Growth curve modeling (through SAS V 9.1 Mixed procedure) was utilized to assess the effects of the proposed covariates on the child/adolescent outcomes. A first order autoregressive covariance structure AR(1) was applied to account for covariance decay across child/adolescent age on the outcome variables, and restricted maximum likelihood (REML) estimation was employed. All covariates were time-varying and mean centered. Based on recommendations [26] to make results more interpretable, age was given a starting point of zero (subtracting age from 5, the lowest age in the sample). Separate models were produced for each maternal health predictor. Models addressing the outcomes of depression, anxiety/worry, and aggression included a second covariate indicative of measure changes due to the youth aging out of one measure into the adult measure (see *Measures*). Fixed effects from the models were evaluated, including age, maternal health, dummy variables reflecting measure change, and interaction effects between age and maternal health measures. Significant interactions were investigated through trajectory plots based on the fixed-effect coefficients.

We present first unconditional growth models using age as the fixed-effect covariate (and where appropriate, the dummy variable reflecting measure change), with random intercepts and slopes. Conditional growth models follow, with maternal health covariates, the measure-change dummy variable, and interaction effects between age and maternal health covariates as fixed effects. Variance components are not provided since we are interested only in fixed model effects.

Results

For the unconditional growth models, age is used as the sole fixed-effect predictor. For depression, anxiety/worry, and aggression, a dummy variable indicating scale change was also included. Table 2 contains the model parameter estimates and standard errors (see *Unconditional Growth Models* section). Significant positive slopes for age were noted for the self-concept subscales: as age increases, so did popularity and self-perceived intellectual ability and academic performance. A significant negative slope for age was noted for physiological anxiety, indicating that as children/adolescents age, there is a decline in physiological anxiety.

Conditional growth models were next employed to evaluate the child/adolescent outcomes, including depression, worry/anxiety, aggressive behaviors, and self-concept (see Table 2 under *Conditional Growth Models*). The covariates include maternal viral load, the MOS subscales (physical functioning, bodily pain), illness symptoms, and health related anxiety as fixed-effects. Covariates were evaluated separately due to sample size concerns.

For depression, separate models for each fixed-effect covariate revealed significant findings for maternal viral load and health related anxiety. Greater child/adolescent depression is noted for higher maternal viral load, and more health-related anxiety. Age was not a significant predictor in the models. Significant interaction effects were noted for child/

adolescent age by viral load, illness symptoms, and health-related anxiety. Interaction trajectory plots using low/high values on these covariates show a greater negative effect of poor maternal health on the child/adolescent at a younger age than an older age. In other words, younger children are more affected by poorer maternal health.

For anxiety/worry, similar covariate findings for the maternal health measures are noted. Viral load was not associated with any of the measures. The MOS measures show significant negative associations with the three measures; as maternal physical illness increases, so does child/adolescent physiological anxiety, worry, and total anxiety. Increases in illness symptoms were also associated with increases in anxiety/worry. In most of the models, anxiety/worry was not found to be significantly associated with age. However, significant interactions between age and a number of the maternal health covariates were noted, including maternal viral load, physical functioning, and health-related anxiety. Interaction trajectory plots using low/high covariate values show findings similar to those reported for depression, noting a greater effect of poor maternal health on the child/adolescent's anxiety/worry at a younger age (see Figure 1 for projected trajectories of physiological anxiety affected by maternal physical functioning for younger children).

For child/adolescent aggression, poorer maternal physical functioning, and greater health-related anxiety, were associated with more aggression. Age was not found to be significant. However, an interaction was noted between age and health related anxiety, indicating a greater negative effect of poor maternal health on the child/adolescent's aggression at a younger age than at an older age.

For child/adolescent self-concept, greater popularity and intellectual and school status were associated with lower levels of maternal viral load. Increases in physical functioning were associated with increases in popularity. Age was found to have a positive association with the self concept measures (as the child/adolescents age, they show increases in these measures). A significant interaction between age and viral load was also noted; poorer maternal health had a greater negative effect on child/adolescent popularity at a younger age.

Discussion

Findings from this follow-up study of the PACT children, who are now late adolescents/early adults, are very consistent with our earlier findings. Physical health of mothers living with HIV is strongly associated with child outcomes. Across the various measures, the findings were constant. Poorer maternal health and increased maternal health-related anxiety were associated with child depression; an increase in maternal illness was associated with child anxiety; better maternal health is associated with better child self-concept—specifically popularity; and maternal self-report of poorer health and of health-related anxiety were associated with more child aggression.

It should be noted that the MLH in this sample had lower levels of physical functioning and experienced more bodily pain than females in the general population (based on samples reported by Ware and colleagues [27]): the values are within ranges reported for clinical populations. Comparison of child scores to normative samples varied by measure. The children affected by maternal HIV in our sample exceeded normative sample values for aggression, but are somewhat below values for clinical samples [25]; for the RCMAS worry subscale, our sample exceeds normative samples; and for the Piers-Harris the mean value on the popularity subscale of our sample was low compared to normative samples. However, for depression, our sample was comparable to normative samples.

What is new to the literature in this brief report is the extension of these findings over such an extended age range of children/adolescents of mothers living with HIV/AIDS (final M age = 19.3). While several studies have found psychological distress higher in younger children affected by maternal HIV/AIDS, including our own previous research, no other study has followed a cohort of children of MLH to late adolescence/early adulthood to determine if the impact of maternal health sustains throughout the entire developmental period. This study also partially confirms previous research [12] which found that children 11 to 16 years of age living with a seropositive mother showed greater disturbance in psychological functioning than a control group of children, and concluded that risk for psychosocial maladjustment in children living with an HIV-seropositive parent extends through late childhood into early to middle adolescence. This study extends the finding to late adolescence. However, it also partially contradicts Reyland and colleagues [12]. They suggested that older children and adolescents living with ill parents present with higher levels of psychological disturbance. In the current study, clearly consistent findings show strong evidence that younger children are more impacted by poor maternal health than are older children/adolescents. Young children are highly reliant on their mothers for a sense of support and security/stability. Among older children, psychological buffering systems come under their own control, and they seek protective relationships outside their family when needed. However, younger children are highly dependent on caregivers, and thus more vulnerable to declines in parenting quality.

These results are consistent with our 2006 study of the PACT children, with a few variations. In our earlier study in 2006, there was no significant effect of viral load (based on medical abstraction) on patterns of change in children's mental health, but measures representing more observable characteristics of maternal health for young children—such as physical functioning, experiencing illness symptoms, and going to a health care provider—did influence level and rate of change in children's mental health. In the current study, with the children being older, maternal viral load was significantly associated with greater child/adolescent depression. It may be that the older children are more likely to talk with their mother about her health status, and are certainly at a developmental stage where they can understand the fluctuations in viral load and what they mean in terms of her health and response to medication therapies. It could also be plausible that older children may act as navigators of the health care system for parents (especially in households where the MLH speaks Spanish primarily), and thus are more aware of their MLH health status.

There are limitations to the study. We had a relatively small sample size representing primarily African American and Latino ethnic groups from one geographic region of the country. However, we also had a longitudinal design that spanned 16 assessment timepoints, providing over 12 years of data on a range of maternal physical health and youth mental health measures. Future work should further explore the impact of MLH physical health on youth outcomes, examining other racial/ethnic groups, and from different geographic regions. Another limitation is that the growth models evaluated also evidenced significant random effects, suggesting more complex models (i.e., multiple or additional covariates) may be viable. Third, experiment-wise Type I error may be inflated due to the number of models evaluated, although many of the significant effects were at the .01 or .001 level; findings at the .05 level should be interpreted as suggestive. Finally, the youth outcome measures utilized are correlated with each other, as are the maternal health covariates -- some of the reported significant model results may reflect this overlapping variance and therefore should not be interpreted as fully independent. A larger sample size would have allowed for models with multiple covariates to be evaluated, or more appropriate, latent growth curve modeling could be implemented to evaluate the relationship between maternal health and youth outcomes as latent constructs [28]. A larger sample would also allow assessment of the impact of maternal HIV and differences by child gender.

Acknowledgments

The first draft was written by Debra Murphy. This research was supported by Grant # 5R01MH057207 from the National Institute of Mental Health (NIMH) to the first author. The NIMH had no role in the study design; the collection, analysis, or interpretation of data; the writing of the report; or the decision to submit the manuscript for publication. All authors received research funding from the NIMH to conduct this study.

References

1. Murphy, DA.; Marelich, WD.; Hoffman, DA.; Schuster, MA. Parental HIV/AIDS: An empirical model of the impact on children in the United States. In: Crane, DR.; Marshall, ES., editors. *Handbook of families and health: Interdisciplinary perspectives*. Sage; Thousand Oaks, CA: 2006. p. 178-194.
2. Biggar H, Forehand R. The relationship between maternal HIV status and child depressive symptoms: Do maternal depressive symptoms play a role? *Behavior Therapy*. 1998; 29(3):409-422.
3. Esposito S, Musetti L, Musetti MC, et al. Behavioral and psychological disorders in uninfected children aged 6 to 11 years born to human immunodeficiency virus-seropositive mothers. *J Dev Behav Pediatr*. 1999; 20(6):411-417. [PubMed: 10608370]
4. Forsyth BW, Damour L, Nagler S, et al. The psychological effects of parental human immunodeficiency virus infection on uninfected children. *Arch Pediatr Adolesc Med*. 1996; 150(10):1015-1020. [PubMed: 8859131]
5. Murphy DA, Marelich WD, Hoffman D. A longitudinal study of the impact on young children of maternal HIV serostatus disclosure. *Clin Child Psychol Psychiatry*. 2002; 7:55-70.
6. Forehand R, Steele R, Armistead L, et al. The Family Health Project: Psychosocial adjustment of children whose mothers are HIV infected. *J Consult Clin Psychol*. 1998; 66(3):513-520. [PubMed: 9642890]
7. Dorsey S, Forehand R, Armistead LP, et al. Mother knows best? Mother and child report of behavioral difficulties of children of HIV-infected mothers. *J Psychopathol Behav Assess*. 1999; 21:191-206.
8. Mellins CA, Brackis-Cott E, Dolezal C, et al. Mental health of early adolescents from high-risk neighborhoods: The role of maternal HIV and other contextual, self-regulation, and family factors. *J Pediatr Psychol*. 2008; 33(10):1065-1075. [PubMed: 18250092]
9. Rutter, M. *Children of sick parents: An environmental and psychiatric study*. Oxford University Press; London: 1966.
10. Buckley, IE. Listen to the children: Impact on the mental health of children of a parent's catastrophic illness. *Cancer Care, Inc.*; New York: 1977.
11. Romer G, Barkmann C, Schulte-Markwort M, et al. Children of Somatically Ill Parents: A Methodological Review. *Clin Child Psychol Psychiatry*. 2002; 7(1):17-38.
12. Reyland SA, McMahon TJ, Higgins-Delessandro A, Luthar SS. Inner-City Children Living with an HIV-Seropositive Mother: Parent-Child Relationships, Perception of Social Support, and Psychological Disturbance. *J Child Fam Stud*. 2002; 11(3):313-329.
13. Murphy DA, Greenwell L, Mouttapa M, et al. Physical health of mothers with HIV/AIDS and the mental health of their children. *J Dev Behav Pediatr*. 2006; 27(5):386-395. [PubMed: 17041275]
14. Ware JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care*. 1992; 30(6):473-83. [PubMed: 1593914]
15. Murphy DA, Durako SJ, Moscicki AB, et al. No change in health risk behaviors over time among HIV infected adolescents in care: Role of psychological distress. *J Adolesc Health*. 2001; 29(3 Suppl):57-63. [PubMed: 11530304]
16. Murphy DA, Steers WN, Dello Stritto ME. Maternal disclosure of mothers' HIV serostatus to their young children. *J Fam Psychol*. 2001; 15(3):441-450. [PubMed: 11584794]
17. Reynolds CR, Richmond BO. What I think and feel: A revised measure of children's manifest anxiety. *J Abnorm Child Psychol*. 1978; 6(2):271-280. [PubMed: 670592]
18. Reynolds, CR.; Richmond, BO.; Lowe, PA. *The Adult Manifest Anxiety Scale--Adult Version*. Western Psychological Services; Los Angeles, CA: 2003.

19. Kovacs M. The Interview Schedule for Children (ISC). *Psychopharmacol Bull.* 1985; 21(4):991–994. [PubMed: 4089115]
20. Beck, AT.; Steer, RA. Beck depression inventory manual. The Psychological Corporation, Harcourt Brace Jovanovich, Inc.; New York: 1987.
21. Hughes HM. Measures of self-concept and self-esteem for children ages 3-12 years: A review and recommendations. *Clin Psychol Rev.* 1984; 4(6):657–692.
22. Piers, EV. Piers-Harris Children's Self-Concept Scale: Revised Manual 1984. Western Psychological Services; Los Angeles, CA: 1993.
23. Achenbach TM. The Child Behavior Profile: I. Boys aged 6-11. *J Consult Clin Psychol.* 1978; 46(3):478–488. [PubMed: 670491]
24. Achenbach TM, Edelbrock CS. The Child Behavior Profile: II. Boys aged 12-16 and girls aged 6-11 and 12-16. *J Consult Clin Psychol.* 1979; 47(2):223–233. [PubMed: 469068]
25. Achenbach, TM. Manual for the Young Adult Self-Report and Young Adult Behavior Checklist. University of Vermont, Department of Psychiatry; Burlington, VT: 2006.
26. Singer, J.; Willett, J. *Applied Longitudinal Data Analysis*. Oxford University Press; New York, NY: 2003.
27. Ware, JE.; Snow, KK.; Kosinski, M.; Gandek, B. SF-36 Health Survey Manual and Interpretation Guide. The Health Institute; Boston, MA, New England Medical Center: 1993.
28. Bollen, KA.; Curran, PJ. *Latent curve models: A structural equation perspective*. Wiley-Interscience; Hoboken, NJ: 2006.

Figure 1.

Projected RCMAS Physiological Anxiety (standardized) trajectories for children age 5 to 11 with mothers reporting low and high MOS Physical Functioning by age

Note: Growth curve model estimate values taken from Table 2. Low and high MOS physical functioning values of -15 and 4.5 were used (negative low value due to covariate being centered), and a value of -0.124053 was used for the scale change covariate (based on the original centered dichotomous variable).

Table 1

Observed means, standard deviations, and time-point N for maternal covariates and select child/adolescent outcomes at PACT I, II, and III baseline, and 12-month follow-up PACT III

	Mean (SD, N)			
	PACT I Baseline	PACT II Baseline	PACT III Baseline	PACT III 12-Month
<i>Maternal Covariates</i>				
Viral Load (dichotomized)	0.59 (0.50, 44)	0.33 (0.47, 55)	0.11 (0.32, 45)	0.07 (0.26, 42)
MOS Physical Functioning	24.47 (5.07, 66)	24.54 (4.90, 65)	25.24 (4.86, 58)	25.62 (4.94, 53)
MOS Bodily Pain	7.64 (3.06, 66)	8.43 (2.77, 65)	8.67 (2.38, 58)	8.60 (2.72, 53)
Illness Symptoms	3.32 (2.65, 66)	2.91 (2.47, 65)	2.33 (2.13, 58)	1.89 (1.91, 53)
Health-Related Anxiety	7.32 (4.31, 66)	6.40 (3.20, 65)	6.26 (3.49, 58)	5.04 (2.14, 53)
<i>Select Child/Adolescent Outcomes</i>				
Piers-Harris Popularity	6.89 (2.87, 65)	9.37 (1.86, 65)	9.00 (1.53, 65)	9.10 (1.43, 59)
Piers-Harris Intellectual and School Status	12.84 (2.85, 63)	13.57 (2.51, 65)	14.35 (2.27, 65)	14.59 (1.98, 59)

Note: Sixteen time-points were utilized in the study; we present here baseline means (SD, N) and the last time-point assessed only (PACT III 12-month).

Other child/adolescent outcome means and standard deviations are not included here due to change in measures when youth turned 18 (see Method).

Change in measures required data to be standardized and aggregated, and thus the resulting observed means were 0 (SD = 1) for each time-point.

Table 2

Parameter Estimates, Standard Errors, and Significance Tests for Unconditional Growth Models, and Conditional Growth Models with Interactions on Child/Adolescent Outcomes (Fixed Effects only)

Maternal Health Predictors (Intercept and Slope Fixed Effects Only)	Child/Adolescent Well-Being and Behavioral Outcomes - Estimate (SE)						
	Depression	RCMAS Physiological Anxiety	RCMAS Worry	RCMAS Total Anxiety	Aggression	Piers-Harris Popularity	Piers-Harris Intellectual and School Status
Unconditional Growth Models							
Intercept	0.074 (0.080)	0.23 ** (0.071)	0.082 (0.069)	0.15 * (0.067)	0.14 * (0.067)	7.71 *** (0.15)	13.21 *** (0.18)
Scale change covariate	0.054 (0.10)	0.28 ** (0.093)	0.13 (0.089)	0.21 * (0.088)	0.17 (0.093)	--	--
Age	-0.0083 (0.011)	-0.025 * (0.011)	-0.0084 (0.011)	-0.016 (0.011)	-0.013 (0.012)	0.14 *** (0.021)	0.069 * (0.027)
Conditional Growth Models							
Viral Load							
Intercept	-0.033 (0.098)	0.25 *** (0.086)	-0.0052 (0.084)	0.098 (0.083)	0.16 * (0.080)	7.76 *** (0.18)	13.29 *** (0.22)
Scale change covariate	-0.10 (0.12)	0.29 ** (0.11)	0.13 (0.11)	0.22 * (0.11)	0.19 (0.11)	--	--
Age	-0.0021 (0.013)	-0.035 *** (0.013)	-0.0017 (0.013)	-0.016 (0.013)	-0.0072 (0.014)	0.14 *** (0.025)	0.070 * (0.031)
Viral Load	0.71 *** (0.17)	0.20 (0.15)	0.063 (0.15)	0.14 (0.14)	0.058 (0.14)	-1.87 *** (0.35)	-1.0039 * (0.44)
Interaction (Age by Viral Load)	-0.080 *** (0.021)	-0.044 * (0.019)	-0.0074 (0.019)	-0.023 (0.018)	-0.0053 (0.018)	0.19 *** (0.044)	0.073 (0.054)
Physical Functioning							
Intercept	0.082 (0.082)	0.22 ** (0.072)	0.068 (0.069)	0.14 * (0.068)	0.15 * (0.067)	7.66 *** (0.15)	13.18 *** (0.18)
Scale change covariate	0.062 (0.11)	0.31 ** (0.097)	0.16 (0.093)	0.24 ** (0.092)	0.18 * (0.092)	--	--
Age	-0.0096 (0.012)	-0.023 * (0.012)	-0.0051 (0.011)	-0.013 (0.011)	-0.014 (0.012)	0.15 *** (0.022)	0.074 * (0.029)
Physical Functioning	-0.019 (0.013)	-0.044 *** (0.012)	-0.045 *** (0.011)	-0.048 *** (0.011)	-0.025 * (0.011)	0.056 * (0.030)	0.025 (0.035)
Interaction (Age by Physical Functioning)	0.0032 * (0.0016)	0.0047 ** (0.0015)	0.0042 ** (0.0014)	0.0047 *** (0.0014)	0.0021 (0.0014)	-0.0051 (0.0036)	-0.00079 (0.0043)
Bodily Pain							
Intercept	0.049 (0.085)	0.16 * (0.075)	0.0022 (0.072)	0.063 (0.071)	0.13 (0.070)	7.70 *** (0.16)	13.14 *** (0.19)
Scale change covariate	0.041 (0.11)	0.28 ** (0.098)	0.12 (0.094)	0.20 * (0.093)	0.17 (0.093)	--	--
Age	-0.0070 (0.012)	-0.017 (0.012)	0.0024 (0.012)	-0.0050 (0.012)	-0.012 (0.012)	0.14 *** (0.022)	0.077 * (0.029)
Bodily Pain	-0.045 (0.026)	-0.054 * (0.023)	-0.054 * (0.022)	-0.062 ** (0.022)	-0.0026 (0.022)	0.054 (0.057)	-0.082 (0.069)

Maternal Health Predictors (Intercept and Slope Fixed Effects Only)	Child/Adolescent Well-Being and Behavioral Outcomes - Estimate (SE)						
	Depression	RCMAS Physiological Anxiety	RCMAS Worry	RCMAS Total Anxiety	Aggression	Piers-Harris Popularity	Piers-Harris Intellectual and School Status
Interaction (Age by Bodily Pain)	0.0051 (0.0030)	0.0046 (0.0027)	0.0034 (0.0026)	0.0042 (0.0026)	-0.00086 (0.0026)	-0.0051 (0.0067)	0.0085 (0.0082)
<i>Illness Symptoms</i>							
Intercept	0.068 (0.082)	0.19** (0.073)	0.026 (0.069)	0.096 (0.068)	0.14* (0.068)	7.67*** (0.15)	13.22*** (0.19)
Scale change covariate	0.038 (0.11)	0.29** (0.098)	0.15 (0.093)	0.22* (0.092)	0.17 (0.093)	--	--
Age	-0.0087 (0.012)	-0.020 (0.012)	-0.00021 (0.012)	-0.0085 (0.012)	-0.013 (0.012)	0.15*** (0.022)	0.070* (0.029)
Illness Symptoms	0.048 (0.026)	0.051* (0.023)	0.079*** (0.022)	0.074*** (0.021)	0.038 (0.022)	-0.064 (0.056)	-0.039 (0.069)
Interaction (Age by Illness Symptoms)	-0.0066* (0.033)	-0.0045 (0.0030)	-0.0046 (0.0029)	-0.0047 (0.0028)	-0.0043 (0.0028)	0.0092 (0.0073)	-0.00078 (0.0090)
<i>Health-Related Anxiety</i>							
Intercept	0.085 (0.082)	0.21** (0.073)	0.060 (0.070)	0.12 (0.069)	0.12 (0.067)	7.65*** (0.15)	13.22*** (0.18)
Scale change covariate	0.062 (0.11)	0.31** (0.097)	0.15 (0.093)	0.23* (0.092)	0.17* (0.092)	--	--
Age	-0.011 (0.012)	-0.022 (0.012)	-0.0038 (0.012)	-0.012 (0.012)	-0.012 (0.012)	0.15*** (0.22)	0.070* (0.029)
HRA	0.042* (0.017)	0.038* (0.016)	0.018 (0.015)	0.029* (0.015)	0.057*** (0.015)	-0.0095 (0.039)	-0.054 (0.047)
Interaction (Age by HRA)	-0.0068** (0.0022)	-0.0047* (0.002)	-0.0022 (0.0019)	-0.0036 (0.0019)	-0.0044* (0.0019)	0.0025 (0.0049)	0.0025 (0.0060)

* $p < .05$.

** $p < .01$.

*** $p < .001$.