Published in final edited form as:

J Dev Behav Pediatr. 2006 October ; 27(5): 386–395.

Physical Health of Mothers with HIV/AIDS and the Mental Health of Their Children

DEBRA A. MURPHY, Ph.D., LISA GREENWELL, Ph.D., MICHELE MOUTTAPA, Ph.D., and MARY-LYNN BRECHT, Ph.D.

Health Risk Reduction Projects, Integrated Substance Abuse Programs, Department of Psychiatry, University of California at Los Angeles, Los Angeles, California

MARK A. SCHUSTER, M.D., Ph.D.

Department of Pediatrics and Health Services, University of California, Los Angeles, Los Angeles, California; and RAND, Santa Monica, California

Abstract

A longitudinal study was conducted on the psychological well-being of 81 young children (mean age = 8.8 years) living with mothers with AIDS or HIV-infected mothers with symptomatic disease. The relationship between mothers' physical health and children's psychological well-being was investigated. The children were assessed at seven time points over approximately 6 years. 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 (self-report). Results showed significant linear declines in children's depression, anxiety, and aggressiveness over time. Lower levels of physical functioning and more physical symptoms among mothers were associated with higher levels of children's depression, anxiety, and aggressiveness at baseline. Lower levels of physical functioning and more physical symptoms among mothers were associated with initially high but more rapidly decreasing levels of depression among children. However, mothers who began the study in better health appear to have changed in health more quickly than mothers who began the study in poorer health. Thus, stability in mothers' health appears to be associated with a more rapid improvement in children's mental health over time. Our findings suggest that the measures representing observable levels of, and changes in, mothers' health that are most likely to be directly experienced by themselves and their children are the measures that are most predictive of changes in children's mental health over time.

Index terms

HIV/AIDS; mother health/child psychological well-being

Important shifts in the epidemiology of the AIDS epidemic are evident in its third decade. Close to half of the 37.2 million adults living with HIV worldwide are women.¹ The percentage of women with HIV has been increasing, accounting for an estimated 26% of new AIDS diagnoses in 2002.² From 1999 through 2003, the annual number of estimated AIDS diagnoses increased 15% among women and 1% among men.³ African American and Hispanic women together represent about 25% of all U.S. women, but account for 83% of AIDS diagnoses reported in 2003.^{3,4} In 2004, HIV disease was one of the four to six leading causes of death

among women ages 25 to 44.⁵ Thus, women are at the forefront of the disease,⁶ and women are most often the primary caregivers in a family constellation.^{7,8}

However, HIV is now considered a chronic illness,^{9,10} and HIV-infected patients are living longer as a result of improved treatment. As a result of both increasing numbers of infected women and improved treatment, growing numbers of children are living for long periods of time with an infected mother. As of 1996, Schuster et al¹¹ reported that there are more than 120,000 children in the United States with a parent who has symptomatic HIV/AIDS, and this outcome has increased with the extensive use of antiretroviral therapy to reduce vertical HIV transmission. Anyone diagnosed with HIV/AIDS faces the physical challenges of a chronic and generally fatal disease, as well as the social impact of the stigma associated with this disease. However, mothers living with HIV must also meet the demands of childrearing and mediate the negative impact of their illness on their family.¹²

Somatic illness in a parent has long been considered a risk factor for psychological problems in children.¹³ Prior to studies focused on HIV, studies of children whose mother had breast cancer found that children may exhibit psychological distress. In one study, one third of the patients reported an increase in behavioral disorders in their younger children;¹⁴ and in another study, daughters who had less emotional resolution of feelings about their mother's breast cancer showed marked alterations in long-range plans, and higher depression scores were related to less satisfaction with relationships.¹⁵ In a review of 15 years of literature on children of somatically ill parents (including case studies, other reviews, and theoretical articles) Romer et al¹⁶ reported that the evidence indicated that children of seriously ill parents had higher scores than controls on symptom scales, with a tendency toward internalizing symptomatology. The degree of emotional distress or psychological maladjustment depended on a number of variables, including the sex of the ill parent and the subjective perception of parental impairment.

Some factors may mitigate the effect of parental illness on children. For example, the presence of daily family routines is associated with child adjustment.^{17,18} However, daily routines are often disturbed when a parent is suffering from distress.^{17,19} Similarly, mothers who are HIV positive may have difficulty maintaining routines in their household because they are challenged with physical and mental distress due to their disease.

Until recently, the psychological and behavioral impact of mothers' HIV infection on young, well children has been poorly studied.²⁰ Numerous factors can be related to child mental health outcomes of children affected by parental HIV (e.g., poverty, stigma) and have been laid out in an empirical model by Murphy et al,²¹ but the parent's health is a main factor. Regarding behavioral and psychological functioning of children affected by parental HIV, Biggar and Forehand²² found a significant relationship between presence versus absence of HIV and child depressive symptoms. In a longitudinal study of children affected by maternal HIV, Murphy et al²³ found that when HIV-infected mothers remained healthy, their children were less likely to exhibit depressive symptoms. In another study, children living with a seropositive mother showed greater disturbance in psychological functioning than other children attending public school in the same community.²⁴ Several studies have been conducted to expressly investigate acting out and internalizing behaviors among children affected by parental HIV: Forehand and colleagues²⁵ found an increase in children's externalizing and internalizing symptoms; similarly, Esposito et al²⁰ found more externalizing symptoms among children of HIV-seropositive mothers than among children with no family history of HIV infection, with children showing significantly more anxiety and depression than did controls, although caretakers reported fewer symptoms of anxiety and depression in the children than did the children themselves. Forsyth et al²⁶ found that 52% of case children had scores on the Child Behavioral Checklist in the clinically abnormal range, compared to 32% of the children in the

comparison group, and that the case children reported more depression. In addition, the Forsyth et al study found that children with symptomatic mothers were more anxious. Dorsey et al²⁷ 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.

A preponderance of the literature indicates that children with an HIV-positive parent experience more psychological distress than do control group children. However, many of these studies had fairly small sample sizes (e.g., Forsyth et al's sample size was N = 26; Esposito et al's sample of HIV-affected children was N = 39). More importantly, these studies were cross-sectional investigations. In the current study, we conducted a prospective, longitudinal investigation of the psychological distress of young children affected by maternal HIV in relation to mother's health over time. The goal was to determine whether the children's depression and anxiety followed a pattern in relation to mother's health.

METHOD

Participants

One hundred thirty-five mothers living with HIV/AIDS were recruited from 14 sites in Los Angeles County (11 clinical primary care sites and three AIDS service organizations) from November 1997 to June 1999 into the Parents and Children Coping Together (PACT I) study. PACT I was designed to longitudinally assess mothers living with HIV and their young, well children 6 to 11 years old, to investigate child outcomes for children living with a chronically ill mother with a stigmatized disease. The majority of these mothers and children were followed in a subsequent longitudinal study, Parents and Adolescents Coping Together (PACT II), when the children were transitioning to early and middle adolescence.

Inclusion criteria were as follows: mother had AIDS or was HIV symptomatic at the PACT I baseline, she had a well child age 6 to 11 years at the PACT I baseline, and she was English or Spanish speaking. HIV symptomatic was defined using the Centers for Disease Control and Prevention (CDC) Guidelines for CD4⁺ T Lymphocyte Category 2 and Clinical Category B, which includes a CD4 count between 200 and 400 and the occurrence of a specified opportunistic disease or the occurrence of diseases for which treatment was complicated by HIV.²⁸ Medical chart abstraction was conducted to verify eligibility. Of a total of 214 mothers contacted for possible study participation, 24% were ineligible based on the above criteria, and 13% chose not to participate. For mothers who had more than one eligible child, random selection was used to identify which child would participate. Specifically, if a mother had more than one eligible child, the child with the most recent birthday was selected for participation. If that child did not assent to participate, the child with the next most recent birthday was asked to participate, and this process continued until there were no more children to select from. However, this procedure was rarely used, as almost all the children with the most recent birthday who were approached for study participation assented.

Data were collected over two study periods. PACT I consisted of a baseline assessment of the mother and child, followed by five subsequent mother and child assessments every 6 months. This study also includes the mother and child baseline assessment of PACT II. Of the 135 mothers who were recruited for PACT I, 81 remained in the study across all 30 months, reconsented to participate in PACT II, and provided data at the PACT II baseline. (The number of participants increased from 66 at follow-up 4 for PACT I to 71 at follow-up 5 because the usual interview protocol was changed in order to allow PACT I participants to be eligible for PACT II. Specifically, whereas PACT I follow-ups 1 through 4 were conducted no more than 6 months after the prior PACT I interview, follow-up 5 interviews were conducted even if more than 6 months had elapsed since the follow-up 4 interview).

Baseline Sample Description

Attrition analyses were conducted. Of the 135 mother-child pairs who were recruited into the study at PACT I baseline, 81 of them (60%) remained in the study and provided data for PACT II. Of the 54 who were lost to follow-up, 21 mothers had died, 19 could not be located, seven declined to continue participating in the study, six had lost custody of their child, and one was incarcerated. *t* Tests and analyses of variance (ANOVAs) were calculated for children separately and for mothers separately to determine whether (1) those who were lost to follow-up differed from those who remained in the study and (2) differences existed among the attrition groups (mother died, mother could not be located, etc.) on demographic characteristics and baseline variables of interest. Comparisons were made between children who remained in the study and children lost to follow-up on gender, age, living with biological father, and attending religious services as well as baseline anxiety, depression, aggression, delinquent behavior, and externalizing behavior. No differences were found between these two groups; furthermore, ANOVA results suggested that there were no differences among the attrition groups on all the variables. Next, comparisons were made between mothers who remained in the study and mothers lost to follow-up on ethnicity, family characteristics (cohesion, conflict, democratic family style, and sociability), number of illness symptoms, bodily pain, physical functioning, vitality, health-related anxiety, CD4 count, and viral load. Mothers who were lost to follow-up due to loss of child custody reported higher scores on family conflict compared to those who remained in the study. Furthermore, mothers who died had lower CD4 counts compared to mothers who remained in the study. No other differences were found, which suggests that results in this study were not strongly affected by attrition bias.

Mean age of the mothers was 35.0 years (SD = 5.96; range 23–52) at the PACT I baseline. The racial/ethnic composition of the sample of mothers was 54% Latina, 33% non-Latina African American, 6% non-Latina white, and 7% other non-Latina ethnic groups. Marital status was 36% never married, 19% married, 23% widowed, 14% separated, and 9% divorced. About half of the sample (51%) had not completed high school, about one fourth (26%) had completed high school, and the rest had completed some college or technical school or had received an undergraduate degree. The majority (81%) of the women were unemployed, and nearly three fourths (73%) lived in households in which no adult was employed. Among those households with at least one employed adult, the average monthly income was \$1316, with a median income of \$1090 (based on all employed persons in the household). The majority of women (75%) reported living in their own house or apartment; 14% were living with parents, other relatives, or friends; and 11% were in some type of shelter.

Medical chart abstraction indicated that the median viral load was about 500 cells/ml at baseline. Slightly more than 45% of the mothers had viral loads above this value at the last assessment. Mean CD4 count increased from 400 at baseline (median = 355; SD = 286; range = 13–1664 copies/mL) to 446 at follow-up (median = 407; SD = 292; range = 20–1324 copies/mL). Table 1 suggests that some measures of mothers' health fluctuate over time, but end up roughly where they began (e.g., physical functioning and viral load). The number of physical symptoms that mothers reported, in contrast, appears to decrease steadily over time, but the percentage of mothers who visited a health care provider in the past 6 months increases over time.

Mean age of the children in the analysis sample was 8.32 years at baseline (SD = 1.87; range 5–12 years); 53% were male. All children were living with their mothers at the time of the interviews.

Procedures

At recruitment sites, agency staff (i.e., doctors, nurse practitioners, research staff, and case managers) reviewed patient files, identified eligible families, and obtained verbal consent for UCLA interviewers to contact potential participants. In addition, flyers and brochures for the project were available at the recruitment sites, and patients/clients could contact study staff. UCLA interviewers verified eligibility of volunteers and obtained the mother's informed consent and the child's assent. A team of two bilingual interviewers conducted interviews at the family's home, the recruitment site, or the research offices, depending on the preference of the family. Almost all interviews were conducted in respondents' homes. Parent and child interviews were conducted simultaneously, with few exceptions. Interviews were administered using a computer-assisted interviewing program (CAPI) on laptop computers. (There were no differences in attrition by site at which respondents received their primary care).

Parents were paid \$25 and children selected a toy worth \$10 from a toy chest (or \$10 in cash if requested) immediately after each assessment was completed.

Predictor Variables: Mother Assessment

Viral Load—Mothers' health status was assessed using viral load obtained from medical records abstraction. Records with data closest to the interview date were selected. Since viral load varied considerably in this sample, its relationships with other variables might not be consistent across the entire range. Hence, viral load scores above 50,000 were set equal to 50,000 for descriptive purposes, and a dichotomized variable was created for the analysis to differentiate mothers at or above the approximate median viral load (500 cells/mL) from those below the median in this sample.

Physical Functioning—The Medical Outcome Short Form 36²⁹ was administered to mothers. This instrument includes subscales that measure physical functioning, bodily pain, energy and fatigue, and general health perceptions. The scale is responsive to clinical change over time (for a review, see Ware et al³⁰). The 10-item physical functioning subscale was chosen for analyses in this study because it is based on a mother's report of her activity limitations rather than how she felt; activity limitations presumably are more easily observable by the child. This subscale measures the extent to which one's current health limits typical daily activities such as walking, climbing stairs carrying groceries, bending, kneeling, and stooping. Higher scores indicate better functioning. A coefficient alpha of .91 at baseline for the physical functioning scale was found in this sample. Total physical functioning scores were calculated and then centered for the main analyses by subtracting the sample grand mean over all cases and time points from individual values (see Singer and Willett³¹).

Physical Symptoms—Mothers were administered questions regarding 16 HIV/AIDS-related symptoms in the past 3 months (e.g., unexpected weight loss, skin sores or rashes, shortness of breath). The number of symptoms that each mother reported was counted and then centered by subtracting the sample mean from individual values for the main analyses.

Hospitalization and Other Medical Care Visits—Mothers were also asked whether in the past 6 months (1) they had been hospitalized for any medical reason and (2) they visited a health care provider for a medical problem or illness. Responses on these items were coded as 1 = yes and 0 = no.

Children's Age—For the time variable used to assess the growth trajectory of children's mental health (see Analysis section), we used age in years. However, for simplicity, we present descriptive statistics and graphs by wave of the study rather than by child's age.

Predictor Variables: Child Assessment

Children's Depression—The Children's Depression Inventory (CDI)^{32,33} was administered to children. The CDI is the most widely used self-report measure of childhood depression.³⁴ Test-retest reliability has been demonstrated in studies of 8 to 16 year olds. The CDI is patterned after the Beck Depression Inventory and includes 27 items that refer to affective, cognitive, and behavioral symptoms of depression. A coefficient alpha of .85 was found for this scale.

Children's Anxiety—The physiological anxiety and worry and oversensitivity subscales of the Revised Children's Manifest Anxiety Scale (RCMAS)^{35,36} were administered to children. Construct, concurrent, content, and predictive validity has been previously demonstrated in a national sample of 6 to 19 year olds for this widely used scale. The 11-item worry and oversensitivity subscale was chosen for analysis in this study since higher internal consistency reliability was found among these items (coefficient alpha = .76) than among the items in the physiological anxiety subscale.

Children's Aggression—The Aggressive Behavior Sub-scale of the Child Behavior Checklist (CBCL)^{37,38} was administered; the mother was the informant for the CBCL. It has standardized competence items that discriminate significantly between children who are adapting successfully versus children needing help for behavioral or emotional problems. A coefficient alpha of .88 was found for this scale.

Analysis

We used SAS PROC MIXED (SAS Institute, 2004) to estimate individual growth models. These models allow us to investigate the influence of various factors (such as mother's physical health) on individuals' changes over time (trajectories) of a particular phenomenon—in this case, children's mental health. The models assume that individuals' trajectories are adequately described by a starting point (the intercept) and a level of increase or decrease over time (the slope or "growth rate"). Because this intercept and slope are assumed to be distributed normally, they imply something like an "average" trajectory that represents individuals.

To describe the models in technical terms, we borrow notation and interpretation from Singer,³⁹ and Singer and Willett.³¹ Most generally, individual growth models are multilevel models, made up of a level-1 (individual-level or within-person) submodel and a level-2 (trajectory-level or between-person) submodel. The level-1 submodel (Equations 1a and 3a) predicts the individual's outcome. The level-2 submodel (Equations 1b and 3b) predicts the intercept and slope estimated by the level-1 submodel. The intercept and slope are allowed to vary randomly among individuals, as shown by the residuals (also called random effects or variance components) in Equations 1b and 3b. The covariate AGE_C represents child's age, and MHEALTH in Equations 3a, 3b, and 4 represents the mother's health, which can vary over time. Both of these variables were "recentered" by subtracting the mean from each person's value. Some covariates also are binary variables, which were not recentered.

In the equations, π represents the estimated effects of covariates in the level-1 submodel, and γ represents the estimated effects of covariates in the level-2 submodel, which correspond with the estimated effects in the composite model (see Equations 2 and 4). The ϵ_{ij} represents the within-person residual (random variation in the dependent variable that is unaccounted for by the model), the ζ represents the random effects of the intercept and slope in the level-2 submodel, i indicates a person, and j indicates a time point.

Equations 1a, 1b, and 2 represent the unconditional growth model (i.e., one that includes no covariates except time). When algebraically combined, the level-1 (Equation 1a) and level-2 (Equation 1b) submodels yield the composite model (Equation 2).

$$Y_{ij} = \pi_{0i} + \pi_{1i} \text{AGEC}_{ij} + \varepsilon_{ij}. \quad (1a)$$

$$\begin{aligned} \pi_{0i} &= \gamma_{00} + \zeta_{0i} \\ \pi_{1i} &= \gamma_{10} + \zeta_{1i} \end{aligned} \quad (1b)$$

$$Y_{ij} = \gamma_{00} + \gamma_{10} \text{AGEC}_{ij} + \zeta_{0i} + \zeta_{1i} \text{AGEC}_{ij} + \varepsilon_{ij}. \quad (2)$$

Equations 3a (level-1 submodel); 3b (level-2 submodel), and 4 (composite model) represent the growth model conditional on covariates that are hypothesized to affect both children's mental health and growth rate.

$$\begin{aligned} Y_{ij} &= \pi_{0i} + \pi_{1i} \text{AGEC}_{ij} + \pi_{2i} \text{MHEALTH}_{ij} \\ &+ \pi_{3i} \text{MHEALTH}_{ij} * \text{AGEC}_{ij} + \varepsilon_{ij} \end{aligned} \quad (3a)$$

$$\begin{aligned} \pi_{0i} &= \gamma_{00} + \zeta_{0i} \\ \pi_{1i} &= \gamma_{10} + \zeta_{1i} \\ \pi_{2i} &= \gamma_{20} \\ \pi_{3i} &= \gamma_{30} \end{aligned} \quad (3b)$$

$$\begin{aligned} Y_{ij} &= \gamma_{00} + \gamma_{10} \text{AGEC}_{ij} + \gamma_{20} \text{MHEALTH}_{ij} \\ &+ \gamma_{30} \text{MHEALTH}_{ij} * \text{AGEC}_{ij} + \zeta_{0i} \\ &+ \zeta_{1i} \text{AGEC}_{ij} + \zeta_{2i} \text{MHEALTH}_{ij} + \zeta_{3i} \text{MHEALTH}_{ij} * \text{AGEC}_{ij} + \varepsilon_{ij} \end{aligned} \quad (4)$$

Both models estimate: (a) the average initial status (baseline measure) of children's mental health, that is, the *intercept* (γ_{00}); and (b) how children's mental health changes over time (the slope, or growth rate), indicated by the main effect of age (γ_{10}). Models that include time-varying covariates (Equations 3a, 3b, and 4) also estimate (c) the average difference, over time, in children's mental health that is associated with a unit change in mother's health (represented by the main effect of mothers' health, γ_{20}); and (d) how the growth rate of the children's mental health is related to a unit change in mothers' health (represented by the interaction effect of age and mothers' health, γ_{30}). Because mothers' health is a time-varying covariate, it appears in the level-1 model.

We use an alpha level of .05 to determine statistical significance. We do not present estimated variance components because in this article, we are interested only in the fixed effects.

RESULTS

For each of the three measures of child's mental health, we estimated (a) an unconditional growth model and (b) four additional models, each including a single measure of mother's health. No other control variables were added to these models due to small cell sizes.

Unconditional Change in Children's Average Mental Health Scores over Time

The unconditional growth models are the first models displayed across Table 2. The estimated Parents and Children Coping Together (PACT) baseline means (intercepts) of all three measures were significantly different from zero. The estimated negative growth rates (slopes) indicated statistically significant declines in children's depression, anxiety, and aggression over the study period.

Mothers' Physical Health in Relation to Children's Mental Health

There were significant relationships in the predicted direction of mother's health with all three measures of children's mental health. Specifically, children's depression, anxiety, and aggression levels were higher when mothers had poorer physical functioning or physical illness symptoms. Contrary to our expectations, the mental health scores of children whose mothers had relatively high viral loads or who had visited a provider for a medical problem in the past 6 months were not significantly different from those of other children.

Relationship of Mothers' Physical Health to Change in Children's Mental Health over Time

Among our measures of children's mental health, only depression had a rate of change that was significantly related to mothers' physical health, and the findings are mixed across specific mother's health measures. As expected, compared with mothers who did not visit a provider for a medical problem in the past 6 months, mothers who visited a provider had children whose depression scores declined more slowly over the course of the study ($p < .10$). That is, because the growth rate of depression is negative (i.e., children's depression decreases over time), the positive estimated relationship of 0.76 between mothers' medical visits and the rate of change in depression indicates that children's depression levels declined at a rate 0.76 more slowly (i.e., decreased by 1.60 rather than 2.36 units per time period) when their mothers visited a provider than when they did not.

Other relationships of mother's health to change in children's depression scores, however, were contrary to our expectations. Mothers with higher physical functioning had children whose depression levels declined more slowly than did those of other children. Mothers who reported a greater number of physical symptoms had children whose declines in depression levels occurred more rapidly over the course of the study than did those of children whose mothers had fewer symptoms. Additionally, there were no significant relationships between mothers' health and change in children's anxiety levels or aggressiveness levels over time.

As noted in the literature review, findings suggest that children's satisfaction with relationships is negatively related to their level of depression. Although our focus was on mothers' health, we examined bivariate correlations of children's depression and measures of relationship quality from both parents' and children's perspectives (18 from the children's perspective and seven from the mother's perspective) at the PACT I baseline. Only two of these relationships were significant: the mother's report of family cohesion is negatively related to child depression ($-0.26, p = .04$) and the mother's report of how poorly she and the child had recently gotten along is positively related to child aggression ($0.44, p < .001$). We also examined disclosure.²³ Although also not related to child depression at the PACT I baseline, in a linear growth model, disclosure was significantly related to lower depression scores. Moreover, disclosure was related to both mothers' and children's assessments of closeness to each other in the PACT I baseline.

Also, as noted in the literature review, HIV/AIDS disproportionately affects the lives of women of color. This raises the issue of potential cultural variations in the findings. Eighty-eight percent of the mothers in our sample are African American or Latina. Of the 44 Latinas, 32 had interviews conducted in Spanish. In bivariate correlations, we found that children had lower depression scores among the interviews conducted in Spanish compared with those conducted in English ($r = -.32, p < .001$).

Selected findings are illustrated with two graphs of depression scores (Figs. 1 and 2). In these simplified graphs, raw data are used (as opposed to values predicted by the estimated models), and observation period is used (rather than child's age). In contrast, the growth models produce estimates of linear relationships over time, and the findings, which are based on individual

patterns of change, are not directly related to mean values. Nevertheless, these illustrate in a concise way the findings of the growth models.

Figure 1 shows the relationship between children's mean depression at each time point and mother's physical functioning at baseline: when mothers start with better health, children's depression is lower and declines more slowly than do the scores of children whose mothers begin with poorer health. Later observation points show convergence of depression scores in the two groups. This may be partly due to regression toward the mean (i.e., those with lower depression scores at baseline are likely to have a lesser decline in scores over time than those with higher depression scores, simply because extreme values in a distribution are less likely to occur at any given time than are more typical values), but it is noteworthy that for both groups of children, depression levels end up lower than initial values.

Figure 2 shows how children's depression scores change over time according to mothers' medical visits over the previous 6 months. There is a difference in rates of change, but not in intercepts, between the two groups. The decline in depression appears steeper for children whose mothers had no medical visits than for children whose mothers had medical visits.

DISCUSSION

Initial findings were as might be expected. Children's self-reported levels of depression and anxiety were higher if their mothers had more problems with physical functioning or more health-related symptoms. For children of mothers who had higher levels of physical symptoms or more health-related symptoms, the mothers reported higher levels of aggression for their child on the Child Behavior Checklist (CBCL) Aggressiveness subscale. These findings are consistent with previous research on children of ill parents. For example, Rait and Lederberg⁴⁰ found increased incidences of psychological symptoms, acting out behaviors, and low self-esteem among children whose parents had cancer, and adolescents informed of parental HIV status have reported higher levels of depression compared to uninformed adolescents. Other findings were somewhat divergent. Children whose mothers had higher viral loads had mental health scores that did not differ from those of children whose mothers had lower viral loads. In addition, child mental health scores were not related to whether mothers had visited a provider for medical problems.

The relationship of mother's physical health to child mental health over time was more difficult to understand. As anticipated, children's depression scores declined more slowly over time among those whose mothers who visited a health care provider during the previous 6 months than among children whose mothers did not need to visit a provider. Children are very aware of mother's health related activities. For example, children of HIV-infected mothers are often aware that their mothers are taking medication; 92% of mothers in one sample reported their children were aware of their medication taking, and of those, 39% reported their children were worried or anxious about this.⁴¹ It may be that children aware of their mother needing to see a health care provider are depressed because of concern and sadness over their mother's health problems. However, other findings were more difficult to interpret. Mothers with higher levels of physical functioning had children whose depression levels declined more slowly than did those of children with mothers having lower physical functioning. In addition, children whose mothers' reported having more physical symptoms experienced a more rapid rate of decline than those with mothers who had fewer symptoms. However, it may be that the stability level itself was somewhat of a protective factor for children whose mothers are less healthy; that is, while the children observe that their mothers have a low level of functioning, she is not deteriorating, and they have adjusted to how much energy she can put into family routines, etc. In fact, a comparison of means of mothers' physical functioning and number of symptoms over time, estimated by analysis of variance with mother's physical functioning at baseline (low vs

high) as a classification variable (not shown), suggest that both of these measures of mother's health worsened slightly or remained stable over time (while remaining at a relatively high level) among the initially healthier mothers, whereas there was a slight but smaller improvement among the initially less healthy mothers. This is consistent with some of the qualitative work we have done with HIV-infected mothers and their children, where mothers report that as long as their child sees them get up every morning and function, they become less emotional and less worried about her imminent death.⁴² As one mother said: "It doesn't really affect him because... they see me get up every morning.... I make myself get up and do things.... They don't have to go through the day wondering and worrying".

It is noteworthy, although not surprising, that we found no significant effects of viral load on patterns of change in children's mental health. Instead, the measures representing more observable characteristics of mother's health, such as functioning/impairment, experiencing illness symptoms, and going to see a health care provider are the variables that appear to influence both level and rate of change in children's mental health. These are characteristics that are likely to be salient to both the mother and child in ways that affect their everyday activities. Even if mothers (and possibly children) know such things as viral load number, this knowledge does not appear to influence children's psychological distress or acting out behaviors in the same way as experienced sensations and actions. While it is conceivable that this could be because children of mothers with high viral loads were receiving more support from other adults, we did not see evidence of this in the data. Thus, this is consistent with previous findings reporting that the mental health of children who had seriously ill parents was dependent on the children's perception of the parents' impairment¹⁶ and that the degree of externalizing and internalizing difficulties experienced by children is related to the parents' progression through stages of HIV and AIDS.²⁷ Moreover, the current findings suggest that not only the level, but also the relative stability of a mother's health over time has an influence on children's psychological distress.

There are limitations to the present study. This was a fairly small sample, and further study is needed on national, larger, and more culturally diverse samples. In addition, having had any medical visits in the past 6 months is an ambiguous measure; while it could indicate a greater need for medical care, it also could indicate factors unrelated to a woman's medical condition, such as a propensity to visit medical providers, the availability of transportation, or a change in treatment protocols. Only one covariate was used in each model, but the significance of some of the random effects estimated by the models suggest that more variance may be accounted for in more complex models, such as those including more predictors or imposing different structures on the variance covariance matrix within persons, if a sample size were sufficient.

These findings are preliminary and should be taken as such; however, mainly cross-sectional studies have been done in this area thus far. This study was an attempt to investigate this complex issue longitudinally. These findings indicate a need for further study in this area to confirm findings of the association of longitudinal stability of mothers' health and improved child mental health. Our research suggests that ethnicity, Spanish-speaking preference, family cohesion, and quality of family relations may inform this association in important ways. In addition, broader measures of maternal functioning and of child mental health could be used in future studies. This would assist in determining whether measures that represent observable levels and changes in maternal health, which are most likely to be directly experienced and salient to the mothers themselves and their children, are the measures that are most likely to be predictive of changes in children's mental health over time. That was a preliminary finding of this study that needs further exploration.

Acknowledgements

This research was supported by grant R01 MH 57207 from the National Institute of Mental Health to the first author and grant U48/DP000056 from the Centers for Disease Control and Prevention to the last author.

References

1. UNAIDS/WHO. Number of women living with HIV increases in each region of the world. [Accessed July 28, 2005]. Available at: <http://usinfo.state.gov/gi/Archive/2004/Nov/23-989775.html>
2. Dean, HD.; Lee, LM.; Thompson, M.; Dannemiller, T. Impact of HIV on women in the United States [conference summary]. Emerging Infectious Diseases [Internet serial]. [Accessed October 3, 2005]. Available at: http://www.cdc.gov/ncidod/EID/vol10no11/04-0623_08.htm
3. Centers for Disease Control and Prevention. HIV/AIDS Surveillance Report. 14. Atlanta: Centers for Disease Control and Prevention; 2003. Cases of HIV Infection and AIDS in the United States, 2002.
4. Spraggins, RE. Current population reports. Census brief: women in the United States: a profile. [Accessed August 9, 2005]. Available at: <http://www.census.gov/prod/2000pubs/cenbr001.pdf>
5. National Women's Health Information Center. AIDS Worldwide. [Accessed October 3, 2005]. Available at: <http://www.4woman.gov/hiv/world.cfm>
6. Centers for Disease Control and Prevention. Trends in STDs in the United States. Atlanta: Centers for Disease Control and Prevention; 2000. Tracking the Hidden Epidemics.
7. Bor R, du Plessis P. The impact of HIV/AIDS on families: an overview of recent research. Fam Syst Health 1997;15:413–427.
8. Wiener LS, Battles HB, Heilman NE. Factors associated with parents' decision to disclose their HIV diagnosis to their children. Child Welfare 1998;77:115. [PubMed: 9513994]
9. Carpenter CC, Fischl MA, Hammer SM, et al. Antiretroviral therapy for HIV infection in 1998: updated recommendations of the International AIDS Society-USA panel. JAMA 1998;280:78–86. [PubMed: 9660368]
10. Valdiserri RO, Holtgrave DR, West GR. Promoting early HIV diagnosis and entry into care. AIDS 1999;13:2317–2330. [PubMed: 10597773]
11. Schuster MA, Kanouse DE, Morton SC, et al. HIV-infected parents and their children in the United States. Am J Public Health 2000;90:1074–1081. [PubMed: 10897185]
12. Black, LW. AIDS and secrets. In: Imber-Black, E., editor. Secrets in Families and Family Therapy. New York: Norton; 1993. p. 355–369.
13. Rutter, M. Children of Sick Parents; An Environmental and Psychiatric Study. London, New York: Oxford University Press; 1966.
14. Buckley, IE. Listen to the Children: Impact on the Mental Health of Children of a Parent's Catastrophic Illness. New York: Cancer Care, Inc; 1977.
15. Wellisch DK, Gritz ER, Schain W, Wang HJ, et al. Psychological functioning of daughters of breast cancer patients: II. Characterizing the distressed daughter of the breast cancer patient. Psychosomatics 1992;33:171–179. [PubMed: 1557482]
16. Romer G, Barkmann C, Schulte-Markwort M, Thomalla G, Riedesser P. Children of somatically ill parents: a methodological review. Clin Child Psychol Psychiatry 2002;7:17–38.
17. Haugland BSM. Paternal alcohol abuse: Relationship between child adjustment, parental characteristics, and family functioning. Child Psychiatry Hum Dev 2003;34:127. [PubMed: 14617946]
18. Markson S, Fiese BH. Family rituals as a protective factor for children with asthma. J Pediatr Psychol 2000;25:471. [PubMed: 11007804]
19. Leiferman JA, Ollendick TH, Kunkel D, Christie IC. Mothers' mental distress and parenting practices with infants and toddlers. Archives of Women's Mental Health 2005;8:243. [PubMed: 16133784]
20. 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;20:411–417. [PubMed: 10608370]

21. 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*. Thousand Oaks, CA: Sage; 2005. p. 178-194.
22. Biggar H, Forehand R. The relationship between maternal HIV status and child depressive symptoms: do maternal depressive symptoms play a role? *Behav Ther* 1998;29:409–422.
23. 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.
24. 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;11:313–329.
25. Forehand R, Steele R, Armistead L, Morse E, Simon P, Clark L. The family health project: psychosocial adjustment of children whose mothers are HIV infected. *J Consult Clin Psychol* 1998;66:513–520. [PubMed: 9642890]
26. Forsyth BW, Damour L, Nagler S, Adnopoz J. The psychological effects of parental human immunodeficiency virus infection on uninfected children. *Arch Pediatr Adolesc Med* 1996;150:1015–1020. [PubMed: 8859131]
27. Dorsey S, Forehand R, Armistead LP, Morse E, Morse P, Stock M. Mother knows best? Mother and child report of behavioral difficulties of children of HIV-infected mothers. *J Psychopathol Behav Assess* 1999;21:191–206.
28. Centers for Disease Control and Prevention. 1993 revised classification system for HIV infection and expanded surveillance case definition for AIDS among adolescents and adults. *MMWR Morb Mortal Wkly Rep* 1992;41:961–962.
29. Ware JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36): I. Conceptual framework and item selection. *Med Care* 1992;30:473–483. [PubMed: 1593914]
30. Ware JE, Gandek B, Group IP. The SF-36 health survey: development and use in mental health research and the IQOLA Project. *Int J Ment Health* 1994;23:49–73.
31. Singer, J.; Willett, J. *Applied Longitudinal Data Analysis*. New York: Oxford University Press; 2003.
32. Kovacs M. The interview schedule for children (ISC). *Psychopharmacol Bull* 1985;21:991–994. [PubMed: 4089115]
33. Kovacs, M.; Beck, AT. An empirical clinical approach toward a definition of childhood depression. In: Schulerbrandt, JG.; Raskin, A., editors. *Depression in Childhood: Diagnosis, Treatment, and Conceptual Models*. New York: Raven Press; 1977.
34. Curry, JF.; Craighead, WE. Depression. In: Ollendick, TH.; Hersen, M., editors. *Handbook of Child and Adolescent Assessment*. Boston: Allyn and Bacon; 1993. p. 251-268.
35. Reynolds CR, Richmond BO. What I think and feel: a revised measure of children's manifest anxiety. *J Abnorm Child Psychol* 1978;6:271–280. [PubMed: 670592]
36. Reynolds, CR.; Richmond, BO. *Revised Children's Manifest Anxiety Scale (RCMAS)*. Los Angeles: Western Psychological Services; 1985.
37. Achenbach TM. The child behavior profile: I. Boys aged 6–11. *J Consult Clin Psychol* 1978;46:478–488. [PubMed: 670491]
38. 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;47:223–233. [PubMed: 469068]
39. Singer JD. Using SAS PROC MIXED to fit multilevel models, hierarchical models, and individual growth models. *J Educ Behav Stat* 1998;23:323–355.
40. Rait, D.; Lederberg, M. The family of the cancer patient. In: Holland, J.; Rowland, J., editors. *Handbook of Psychooncology: Psychological Care of the Patient with Cancer*. New York: Oxford University Press; 1989. p. 585-597.
41. Murphy DA, Steers WN, Dello Stritto ME. Maternal disclosure of mothers' HIV serostatus to their young children. *J Fam Psychol* 2001;15:441–450. [PubMed: 11584794]
42. Murphy DA, Roberts KJ, Hoffman D. Young children's reactions to mothers' disclosure of maternal HIV+ serostatus. *J Child Fam Stud* 2006;15:39–56.

FIGURE 1. Children's depression by mother's physical functioning. Mean scores, PACT I (Parents and Children Coping Together) and PACT II.

FIGURE 2. Children's depression by any mother medical visit in past 6 months. Mean scores, PACT I (Parents and Children Coping Together) and PACT II.

Table 1
Child Mental Health and Maternal Physical Health Indicators by Assessment Period

	PACT I												PACT II	
	Baseline (n = 81)		FU1 (n = 79)		FU2 (n = 77)		FU3 (n = 74)		FU4 (n = 66)		FU5 (n = 71)		Baseline (n = 81)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Child mental health and age														
Depression	51.27	11.56	49.00	10.34	44.48	7.74	44.77	9.09	43.49	7.13	44.24	8.69	43.39	6.76
Anxiety	4.82	2.85	4.58	3.13	4.32	3.09	4.18	3.25	3.46	3.02	3.77	3.33	3.04	2.98
Aggression	11.48	7.43	11.88	7.69	10.78	7.10	11.30	7.73	10.71	6.76	10.42	7.14	10.43	7.53
Age	8.81	1.85	9.31	1.92	9.82	1.86	10.38	1.88	10.79	1.88	11.54	1.97	13.96	1.90
Maternal physical health														
% Viral load	45.94		53.73		54.72		35.42		62.16		56.41		45.31	
>500 cells/mL	71.91	25.98	74.08	27.97	75.89	24.96	75.21	25.76	73.23	27.35	74.01	24.83	71.30	26.53
Physical functioning														
Physical symptoms	3.23	2.56	3.09	2.93	3.05	2.73	2.74	2.50	2.40	2.30	2.18	2.16	2.83	2.47
% Medical care visits	40.74		46.05		50.68		41.43		49.23		46.97			

PACT, Parents and Children Coping Together; FU, follow-up.

Table 2
Individual Growth Models of Children's Outcomes by Mothers' Physical Health

Fixed Effects	Depression			Anxiety			Aggressiveness		
	Estimate	SE	df	p	Estimate	SE	df	p	Estimate
Unconditional model									
Initial status: π_{0i}	48.18	0.97	80	<.001	4.64	0.22	80	<.001	11.39
Intercept: γ_{00}									
Rate of change: π_{1i}	-1.15	0.19	403	<.001	-0.31	0.06	435	<.001	-0.28
Intercept: γ_{10}									
Viral load									
Initial status: π_{0i}	49.87	1.21	79	<.001	4.59	0.30	79	<.001	11.76
Intercept: γ_{00}									
Viral load > 500 cells/mL: γ_{20}	-1.88	1.08	266	.084	0.29	0.36	292	.430	0.07
Rate of change: π_{1i}	-1.20	0.27	266	<.001	-0.29	0.09	292	.001	-0.25
Intercept: γ_{10}									
Viral load > 500 cells/mL: γ_{30}	0.00	0.34	266	.995	-0.09	0.12	292	.443	-0.28
Physical functioning									
Initial status: π_{0i}	48.22	0.96	80	<.001	4.65	0.21	80	<.001	11.41
Intercept: γ_{00}									
Physical functioning: γ_{20}	-0.05	0.02	385	.014	-0.02	0.01	416	.012	-0.03
Rate of change: π_{1i}	-1.10	0.18	385	<.001	-0.32	0.06	416	<.001	-0.28
Intercept: γ_{10}									
Physical functioning: γ_{30}	0.01	0.01	385	.034	0.00	0.00	416	.902	0.01
No. of symptoms									
Initial status: π_{0i}	48.12	0.97	80	<.001	4.60	0.20	80	<.001	11.35
Intercept: γ_{00}									
No. of symptoms: γ_{20}	0.55	0.19	385	.004	0.16	0.06	416	.005	0.31
Rate of change: π_{1i}	-1.08	0.18	385	<.001	-0.30	0.06	416	<.001	-0.26
Intercept: γ_{10}									
No. of symptoms: γ_{30}	-0.13	0.06	385	.03	-0.02	0.02	416	.388	-0.01
Medical visits									
Initial status: π_{0i}	49.58	1.14	79	<.001	4.44	0.25	80	<.001	11.79
Intercept: γ_{00}									
Any medical visits: γ_{20}	-1.22	0.86	306	.157	0.35	0.29	336	.239	-0.63
Rate of change: π_{1i}	-2.36	0.41	306	<.001	-0.25	0.11	336	.289	-0.67
Intercept: γ_{10}									
Any medical visits: γ_{30}	0.76	0.36	306	.035	-0.08	0.12	336	.543	0.19