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Benefits of family and social relationships for Thai parents living with HIV.

Permalink

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Journal

Prevention science : the official journal of the Society for Prevention Research, 11(3)

ISSN

1389-4986

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Publication Date

2010-09-01

DOI

10.1007/s11121-009-0165-6

Peer reviewed

Benefits of Family and Social Relationships for Thai Parents Living with HIV

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Published online: 18 December 2009
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Abstract Family and social relationships are important structural supports in Thailand that are likely to influence the health and mental health of persons living with HIV (PLH). Structural equation modeling examined these relationships among 409 PLH in two communities in Thailand. Latent variables were constructed for most outcomes and mediators, with adherence to antiretroviral (ARV) therapy, depression, and disclosure represented by single-item indicators. All models controlled for gender, age, and education. Disclosure was significantly and positively associated with ARV adherence, and to both family functioning and social support. Family functioning and social support were significantly related to the PLH's self-perceptions of health and mental health, as well as being significantly correlated with each other. Better family functioning was significantly associated with better quality of life, better perceived health, fewer symptoms of depression, and greater ARV adherence. Social support was significantly associated with better quality of life and fewer depressive symptoms. These results highlight the important role that an organized and structured family life and social support network can play in encouraging better health outcomes among PLH.

Keywords Family relationships · HIV-affected families · Social support · Thailand

Introduction

There are 1 million persons living with HIV (PLH) in Thailand (UNAIDS 2008). Globally, HIV affects not only the individual, but also radiates into family and social relationships (Rotheram-Borus et al. 1997, 2004, 2005; VanLandingham et al. 2000). The goal of this article is to examine how family and social relationships are associated with the adjustment of PLH in Thailand.

Similar to many places in the developing and developed world, parents and adult children routinely exchange support and services in Thailand (Knodel et al. 2000). About 2/3 of PLH either live with or next to a parent during their terminal stage (Knodel et al. 2001; Knodel and Im-em 2004; Knodel and VanLandingham 2002). Almost two-thirds of adults who die of HIV received at least some personal care from a parent in Thailand (Knodel and Saengtienchai 2002).

Because the caretaker's burden and community stigma may influence the family living with HIV, family members' lives are often dramatically affected by having a PLH (Brown and Sankar 1998; Mullan 1998). In particular, the elderly family members may be affected the most. Between 8% and 13% of older Thais (>50 years) will experience the death of an adult child due to HIV, and about one in four grandparents will have custody of an AIDS orphan (Wachter et al. 2002). The elderly lose support in their old age that the child would have provided (VanLandingham et al. 2000). More than 50% of Thai parents of a PLH experience significant fatigue, insomnia, and anxiety caring for their adult children with HIV (Knodel et al. 2002). Thus, family relationships are likely to be particularly

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important to the adjustment of PLH. Friends and social relationships may also play a major role in the adjustment of PLH.

As Thailand has become increasingly urbanized, growing numbers of young, heterosexual adults have moved away from their families and then have become HIV infected (Punpanich et al. 2004). Being willing to disclose HIV status to their friends and social networks may be more important in meeting their HIV-related health and mental health challenges. In secure relationships, reducing HIV transmission risk is likely to require disclosure of serostatus (Murphy et al. 2008). While disclosure of serostatus has been universally identified as a challenge, the country and local norms regarding disclosure shape the probability of disclosure (Lee et al. *in press*). Disclosure may depend on the “identity” of the PLH. For example, early in the Thai epidemic, injecting drug users (IDU) and commercial sex workers (CSW) used disclosure of serostatus as a strategy to cope with the health and mental health challenges of HIV (Brown et al. 1994; Nelson et al. 1993).

We anticipate that these important family and social relationships, as well as the decisions each PLH makes about disclosure will have important consequences for the PLH. Each PLH faces HIV-related challenges to maintaining his or her own health and mental health, as well as reducing transmission acts (Rotheram-Borus et al. 1998). Effectively managing one’s health care has been consistently linked to survival and a better quality of life (Rabkin and Ferrando 1997). Thailand has been providing access to anti-retroviral therapies (ARV; APEC Emerging Infections Network 2003), which in turn requires PLH to be responsible for adhering to health care visits on a quarterly basis and to monitor their CD4 and viral load (World Health Organization 2007). When the health of a PLH has been compromised to the point of needing ARV, medical adherence emerges as a major challenge. Failed adherence may result in a substantial increase in multidrug-resistant HIV mutations whose further spread could intensify Thailand’s HIV epidemic (Punpanich et al. 2004).

In addition to physical health, mental health symptoms are common among PLH (Benotsch and Kalichman 2001; Crepaz and Marks 2001). A range of negative emotions often occur in response to being HIV positive: fear of death, anger over victimization, or depression about lost opportunities (Rotheram-Borus et al. 1997, 2001). Keeping a positive outlook and maintaining a good quality of life is curtailed by having to cope with societal stigma (Punpanich et al. 2004).

For PLH in Thailand, coping with these HIV-related stressors may be influenced, in part, by decisions concerning the process of disclosing their diagnosis (e.g., whether to disclose or not, their reasons behind the decisions, who to disclose to, and how) (Greene et al.

2003; Holt et al. 1998; Murphy et al. 2008; Serovich 2000). For example, perceived social support is positively associated with HIV disclosure (Perry et al. 1994; Serovich et al. 2000), whereas potential negative emotional reactions (e.g., depression), as well as negative consequences of HIV disclosure (e.g. rejection and isolation by loved ones) are inversely associated with HIV disclosure (Bennetts et al. 1999; Song and Ingram 2002; Winstead et al. 2002).

To our knowledge, there are only limited cohort studies of PLH in Thailand. In this study, we recruited a highly diverse sample of HIV positive adults in two regions in Thailand: the North where the epidemic initially emerged 20 years ago and the Northeast, a region with an emerging epidemic. This article examines how family and social relationships, as well as disclosure within these ongoing relationships, impact the ability of PLH to cope with these health and mental health challenges.

Methods

Participants and Setting

This study uses the baseline data from a randomized controlled family intervention trial in the Northern and Northeastern regions of Thailand. These data were collected at baseline before randomization and prior to the delivery of the intervention among the participants. PLH were recruited at four district hospitals in the two regions (two district hospitals per region) using the existing cases in the district hospitals. Initial screenings of PLH were performed by healthcare workers and research staff specifically hired for the study. The eligibility criteria for enrollment were: PLH having disclosed their serostatus to at least one family member in their household, and PLH having at least one child in their household aged 6 to 17. In the northern hospitals, almost no PLH was ineligible due to non-disclosure. In the two northeast hospitals, 30% of PLH were ineligible. We have no information on the gender, age, or the number of children of ineligible PLH. Once the PLH had been screened and had agreed to participate in the study, written informed consent was obtained.

Following informed consent, a trained interviewer, a member of the assessment team hired by the project staff, administered a baseline assessment to the PLH using Computer Assisted Personal Interview (CAPI) on laptop computers ($N=410$). During the baseline assessment, PLH were asked about their family network, whether they have a partner, who their extended family members are, the ages and gender of their children, and whether they have disclosed their HIV + status to anyone in the family network and outside of their immediate family network. In addition, PLH were asked detailed questions about their

family functions, social support, depression, quality of life, ARV adherence, and physical health. PLH received \$10 for participating in the baseline interview. The participation rate of the baseline interview was 95%. The study was approved by the Human Subjects Protection Committee of the University of California at Los Angeles, and the Thailand Ministry of Public Health Ethical Review Committee for Research in Human Subjects. One PLH was excluded due to an incomplete baseline interview for a final sample size of 409.

Measures

Social Support was constructed as a latent variable based on the four subscales in the Medical Outcomes Study Social Support Scale (Sherbourne and Stewart 1991). Responses are based on the stem: “People sometimes look to others for companionship, assistance, or other types of support. How often is each of the following kinds of support available to you if you need it?” Responses to individual items ranged from 1 (none of the time) to 5 (all of the time) and means for four subscales were calculated: emotional and informational support (eight items, $\alpha=.86$), tangible support (four items, $\alpha=.83$), affectionate support (three items, $\alpha=.63$), and positive social interaction (four items, $\alpha=.83$).

Family Functioning was a latent variable comprised of four indicators representing the responses to two different scales: 1) The Thai Family Functioning Scale (TFFS), adapted from the McMaster Model of Family Functioning (Epstein et al. 1983), has three subscales reflecting interactions over the last 3 months: cohesion ($\alpha=.87$), expressiveness of conflictual feelings ($\alpha=.69$), and problem solving ($\alpha=.82$). It is scored on a 0 (never) to 3 scale (always). 2) A family’s daily routines (Weisner 1984) have been linked to healthy adjustment in the United States and Western Africa. From an initial 45 min qualitative interview probing multiple domains of families’ lives, we created a 53 item self-report inventory that queried the consistency and tone of a broad range of Thai family activities based on key informant interviews of four groups. It resulted in a mean score based on 53 daily routine items assessing their opinion about experiences in their families in the past 3 months ranging from 0 (never) to 4 (always) detailing activities within their family. Typical items center around family activities such as mealtime (e.g., we will eat similar food, we enjoy the meal together as a family), finances (e.g., we all know who is in charge of the expenses), etc. Coefficient alpha was very high among these items and the mean score was used ($\alpha=.93$).

Disclosure was a single summative composite item based on the extent to which PLH disclosed their HIV serostatus (0 = to no one, 1 = some, or 2 = all) to members of their

social network (including sexual partners, co-workers, family members outside of their household, health care workers, village leaders, village health volunteers, or other people in the community) in addition to the one family member that qualified them for this study. A summative composite disclosure score was derived by summing across PLH’s level of disclosure (0 = to no one, 1 = some, or 2 = all) to each of the potential recipients (score range = 0 to 14; $\alpha=.84$). A score of 14 indicates full disclosure to all the members in their social network.

Depression was assessed with a 15-item screening test that was developed and used previously in Thailand (Thai Department of Mental Health 2006). These questions asked about problems that had bothered participants in the past week (e.g., feeling depressed most of the time; feelings of hopelessness or worthlessness; loss of self-confidence; fear of death), with response categories from 0 (not at all) to 3 (usually [5–7 days a week]). A summative composite scale was developed, with a range of 0 to 45 and an excellent internal consistency ($\alpha=0.91$).

ARV Adherence was assessed by asking the question, “Have you ever forgotten to take ARV medicines?” A dichotomous measure was constructed with a score of 1 if a patient reported never missing ARV medication, and a score of 0 if the participant reported ever forgetting to take ARV medication. The participants who never forgot to take ARV medication were considered as adherent. Among the PLH who reported ever failing to adhere to ARV therapy, they were asked to report their reason for failing to adhere to ARV therapy in the past month.

Quality of Life was measured using the Thai version of the Short Form (26 items) of the World Health Organization (WHO) Quality of Life Questionnaire (Thai Department of Mental Health 1998; WHO 2004) and was constructed as a latent variable with five indicators based on a 26-item measure. Items were scaled from 1–5 ranging from “not at all” to “an extreme amount.” Typical items included: “How much do you enjoy life?”, “To what extent do you feel your life to be meaningful?” and “Have you enough money to meet your needs?” Coefficient α across all items was .84 and parcels were constructed at random to provide the five indicators. Parceling is an acceptable technique when coefficient α is high and there is only one large eigenvalue in the set of items (Yuan et al. 1997). One item very specific to their health was dropped to avoid an overlap with the perceived health measure (how much they need any medical treatment to function in their daily life).

Better Perceived Health was indicated by three items from the MOS-HIV Health Survey Manual (Wu 1999) each rated

on a 1–5 scale: 1) physical health (ranging from poor, fair, good, very good, to excellent); 2) a rating of their personal health relative to peers, “I am as healthy as anybody I know” (from definitely false to definitely true) ; and confidence in excellent personal health (definitely false to definitely true).

Demographics included age in years, gender, and years of education. Gender was coded 1 for males and 2 for females.

Data Analysis

The analyses were performed using the EQS structural equations program (Bentler 2009). The goodness-of-fit of the models was assessed with the maximum-likelihood χ^2 statistic, the Comparative Fit Index (CFI), and the root mean squared error of approximation (RMSEA) (Bentler 2009). The CFI ranges from 0 to 1 and reflects the improvement in fit of a hypothesized model over a model of independence among the measured variables. CFI values at .95 or greater are desirable, indicating that the hypothesized model reproduces 95% or more of the covariation in the data. The RMSEA is a measure of lack of fit per degrees of freedom, controlling for sample size, and values less than .06 indicate a relatively good fit between the hypothesized model and the observed data. Model improvement was guided by suggestions from the Lagrange Multiplier test (LM test: Chou and Bentler 1990). The LM test suggests additional relationships to add to models for fit improvement.

An initial confirmatory factor analysis (CFA) assessed the adequacy of the hypothesized measurement model and the associations among the latent and measured variables serving as key indicators in the model. Then a path model comprised of both latent and single-item variables positioned the demographics of gender, age, and education as predictors of the intermediate variables of Social Support, Family Function and Disclosure, which in turn predicted the outcomes of Depression, ARV adherence, Quality of Life and Better Perceived Health. We allowed direct prediction of the outcome variables by the demographics as well if suggested by the LM test. Indirect effects of the demographics on the outcomes were also examined.

Results

Demographic information is reported in Table 1. The mean age of the PLH was 38 years (SD = 6.6 years). Most of the sample was female (72.6%), who also were somewhat younger (average age of females = 37 years; average age of males = 39 years) and who tended to be less educated than males. Women typically reported having less than a junior high school education (85%). About half of PLH were married or cohabitating with an average of 1.4 children.

Almost 30% were widowed, and 17% were divorced or separated. Almost all PLH (93.7%) reported getting HIV infection via heterosexual intercourse with only 1% from IDU, perinatal or homosexual contact. HIV disclosure varied significantly, depending on the type of relationship. PLH were least likely to disclose to community acquaintances (37%) and most likely to disclose to family members outside of their household (69%). Disclosure rates are reported in Table 1.

Confirmatory Factor Analysis

Table 2 reports ranges, means, and standard deviations of all variables, as well as the factor loadings of the hypothesized latent variables. Because there are often gender differences in disclosure (Murphy et al. 2008), summary statistics are also reported separately for females and males for reader interest. Gender was included as a covariate in the latent variable analyses. All factor loadings were significant ($p \leq .001$). Fit indexes for the CFA model were excellent: ML χ^2 (168, $N=409$) = 326.07; CFI = .95, RMSEA = .048, 90% confidence interval for RMSEA (CI) = .040 to .058. Two supplementary correlated error residuals were added to this model based on suggestions from the LM test. One addition was a negatively correlated error residual between one of the QOL indicators and depression, and the other was between two of the health indicators.

Table 3 reports the correlations among the variables in the model. There were several noteworthy correlations among the constituents of the model, even before the path analysis was performed. Social Support and Family Functioning were highly correlated (.68). Both Family Functioning and higher Social Support were significantly associated with better Quality of Life and with less Depression. ARV Adherence and Disclosure were significantly but modestly associated with each other (.13) and depression was negatively associated with ARV Adherence, Quality of Life, and Better Perceived Health. As would be anticipated, Better Perceived Health and Quality of Life were also highly correlated (.61).

Predictive Path Model

The final structural equation model is presented in Fig. 1 after gradual model trimming. Fit indexes for the final path model were very good: ML χ^2 (194, $N=409$) = 345.99; CFI = .95, RMSEA = .044, CI = .036 to .051. Family Functioning assumed a central role in the associations with health and mental health indices. Better Family Functioning was associated with less Depression, better ARV Adherence, better Quality of Life, and Better Perceived Health. Social Support was associated with better Quality of Life and less Depression, and Disclosure predicted better ARV

Table 1 Baseline characteristics of people living with HIV in Thailand ($N=409$)

| | Frequency or Mean | % or SD |
|---|-------------------|---------|
| Mean age in years (range = 23–64 years) | 37.7 | 6.6 |
| Gender | | |
| Male | 112 | 27.4% |
| Female | 297 | 72.6% |
| Education | | |
| Junior high or less | 331 | 80.9% |
| Some high school or high school | 56 | 13.7% |
| Some college or college graduate | 22 | 5.4% |
| Number of children in household (range = 1–4) | 1.38 | 0.65 |
| Marital status | | |
| Currently married or living together | 207 | 50.6% |
| Divorced | 42 | 5.4% |
| Separated | 28 | 11.7% |
| Widowed | 123 | 30.1% |
| Never married | 6 | 1.5% |
| Decline to state | 3 | 0.7% |
| Method of infection | | |
| Heterosexual intercourse | 384 | 93.7% |
| Homosexual intercourse | 4 | 1.0% |
| Drug injection/needle sharing | 5 | 1.2% |
| Blood transfusion | 4 | 1.0% |
| Mother-to-child transmission | 0 | 0 |
| Other | 12 | 3.1% |
| HIV disclosure (mean score range = 0–14) | 9.41 | 0.57 |
| Sexual partners | 269 | 65.6% |
| Co-workers | 182 | 45.1% |
| Family members outside household | 281 | 69.0% |
| Health center workers | 164 | 40.4% |
| Village leaders | 200 | 49.1% |
| Other people in your community | 147 | 36.6% |

Adherence. Similar to their bivariate associations, female gender directly was associated with more Depression. More education predicted better Social Support and better Family Functioning.

Figure 1 also reports correlations among the demographic characteristics and reports correlations among the error residuals of the dependent variables. Family Functioning and Social Support had a high correlation between their error residuals (.67) and the error residual of better Family Functioning was correlated with Disclosure, which was an independent variable as it was not predicted by any of the demographic variables. Other correlations among residuals can be seen on the right side of the figure. In examining indirect effects, there were three significant effects of education mediated through Social Support and Family Functioning. More education had significant indirect effects on (less) Depression, Better Perceived Health, and better Quality of Life ($p \leq .05$).

Discussion

Social and familial relationships emerge as key influences on the health and well-being of PLH. Previous research has demonstrated that families form the backbone of Thai social networks, even after marriage (Knodel et al. 2001). The results of this study support the concept of the family's centrality in Thai culture and the importance of family support to PLH. These findings and the strong cultural norms prevailing in Thailand towards families suggest that care be reorganized towards providing more family-based services. Filial obligations are universally expected, so that elderly parents and adult children live in close proximity: About half of adult children live in the same community as their parents and half of these co-reside in the same household (Knodel and Im-em 2004).

Our measure of family functioning included multiple indices: an analysis of the consistency and tone of the

Table 2 Means, standard deviations, ranges, and factor loadings of measured variables in the Confirmatory Factor Analysis

| Variables (range) | Mean (SD) | Females Mean (SD) | Males Mean (SD) | Factor Loading ^a |
|----------------------------------|--------------|-------------------|-----------------|-----------------------------|
| Gender female (1–2) | 1.73 (0.45) | – | – | NA ^b |
| Age (23–64 years) | 37.70 (6.56) | 37.07 (6.32) | 39.38 (6.92) | NA |
| Education (0–5) 0000 | 1.28 (1.22) | 1.18 (1.09) | 1.54 (1.47) | NA |
| Social Support (1–5) | | | | |
| Emotional support | 3.36 (0.85) | 3.37 (0.85) | 3.32 (0.85) | .63 |
| Tangible support | 4.38 (0.84) | 4.38 (0.83) | 4.38 (0.88) | .56 |
| Affectionate support | 4.18 (0.82) | 4.18 (0.84) | 4.18 (0.76) | .80 |
| Positive social interaction | 3.87 (0.91) | 3.83 (0.92) | 3.95 (0.88) | .73 |
| Family Functioning (0–3) | | | | |
| Cohesion | 2.04 (0.46) | 2.31 (0.55) | 2.44 (0.47) | .86 |
| Communication/feeling expression | 1.92 (0.53) | 1.91 (0.55) | 1.92 (0.52) | .87 |
| Problem solving | 1.78 (0.56) | 1.75 (0.56) | 1.86 (0.57) | .84 |
| Family daily routines | 2.96 (0.57) | 2.92 (0.58) | 3.05 (0.56) | .59 |
| Disclosure (0–14) | 9.41 (3.54) | 9.50 (3.52) | 9.20 (3.59) | NA |
| Depression (0–3) | 0.86 (0.56) | 0.91 (0.56) | 0.75 (0.54) | NA |
| ARV Adherence (0–1) | 0.75 (0.43) | 0.76 (0.42) | 0.73 (0.44) | NA |
| Quality of Life (1–5) | | | | |
| QOL1 | 3.81 (0.55) | 3.79 (0.54) | 3.85 (0.59) | .69 |
| QOL2 | 3.44 (0.60) | 3.43 (0.63) | 3.44 (0.52) | .65 |
| QOL3 | 3.54 (0.50) | 3.54 (0.51) | 3.55 (0.46) | .75 |
| QOL4 | 3.59 (0.54) | 3.58 (0.53) | 3.61 (0.56) | .75 |
| QOL5 | 3.41 (0.54) | 3.39 (0.55) | 3.46 (0.51) | .77 |
| Better Perceived Health (1–5) | | | | |
| Health rating | 2.80 (0.90) | 2.79 (0.88) | 2.84 (0.95) | .53 |
| As healthy as others | 3.54 (1.00) | 3.50 (1.03) | 3.64 (0.93) | .76 |
| My health is excellent | 3.37 (1.01) | 3.33 (1.03) | 3.47 (0.96) | .81 |

^a All factor loadings significant, $p \leq .001$. Factor loadings are standardized.

^b NA = Not applicable.

family’s daily routines; and indices of cohesiveness, problem solving, and conflict within the family. In the United States, families that have an organized and structured family life report a better quality of life (Weisner

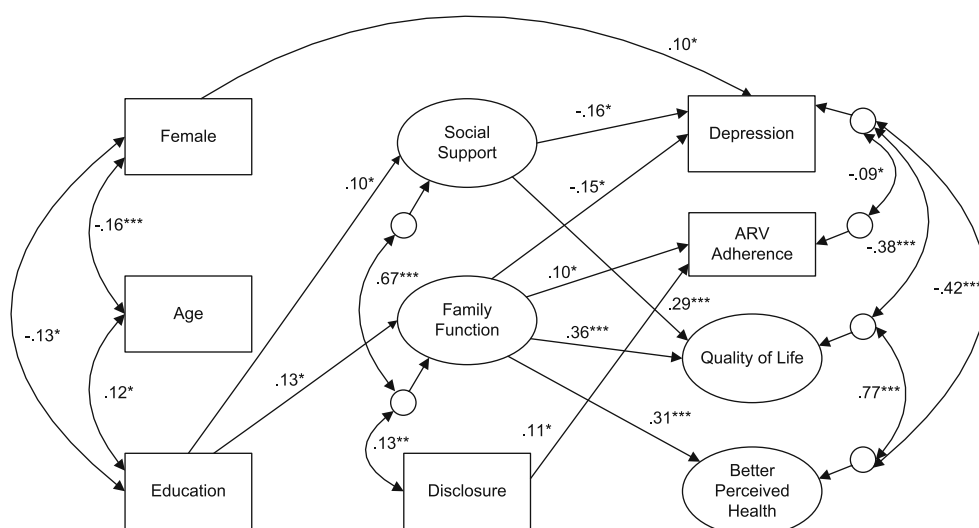
2008; Weisner et al. 2002; Weisner and Lowe 2004). Indices of both physical and mental health benefit from consistent daily routines that are positive in tone, high cohesiveness, problem solving, and low-conflict family

Table 3 Correlations among model constructs

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-----------------------|---------|------|------|---------|---------|-------|---------|------|--------|----|
| 1. Female | – | | | | | | | | | |
| 2. Age | –.16*** | – | | | | | | | | |
| 3. Education | –.13* | .12* | – | | | | | | | |
| 4. Social Support | –.01 | –.07 | .10* | – | | | | | | |
| 5. Family Functioning | –.08 | .00 | .12* | .68*** | – | | | | | |
| 6. Disclosure | .03 | .03 | –.05 | .04 | .15** | – | | | | |
| 7. Depression | .13** | –.06 | –.08 | –.24*** | –.23*** | –.04 | – | | | |
| 8. ARV Adherence | .03 | –.03 | –.08 | .05 | .11* | .13** | –.12* | – | | |
| 9. Quality of Life | –.04 | –.03 | .12* | .54*** | .56*** | .07 | –.51*** | .12* | – | |
| 10. Perceived Health | –.08 | .03 | .08 | .14* | .19*** | .04 | –.45*** | .09 | .61*** | – |

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

Fig. 1 Significant regression paths among latent and measured variables in the structural equation model assessing outcomes among 409 HIV + Thai parents. Regression coefficients (represented as one-way arrows) and correlations (represented by double-headed arrows) are standardized (* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$.)



relationships. It is likely that strong, consistent routines also help families maintain order and balance in the face of devastating illness. Coping with chronic conditions, especially those that may end in death, often require substantial accommodation, especially during periods of acute illness (Crane and Marshall 2005; Rolland 1987). HIV requires such adaptation and is likely to tax the entire family's capacity to cope with the illness.

Disclosure plays a role in health adherence, but the primary influence of disclosure appears to operate through its relationship on the family and social relationships of the PLH. Disclosure is particularly related to Family Functioning. Typically, only with disclosure can we mobilize the family and social relationships to provide support for the PLH. In contrast, in the United States and in some African countries, disclosure is independently associated with perceived quality of life and mental health (Murphy et al. 2008). Disclosing to others has a benefit that is independent of the relationships it improves.

While family and social relationships predicted better health and mental health, more disclosure was associated only with better ARV adherence. It is likely that it is difficult to seek care at HIV-identified sites if one is hiding one's serostatus. In particular, in rural sites most community members are aware of the behavioral patterns of almost all community members. It is difficult to control information about clinic attendance if one seeks care at HIV-identified sites. Furthermore, even though confidentiality is a key norm of all support groups, attending group services for PLH may result in inadvertent disclosure to neighbors and friends of HIV serostatus. Being comfortable about disclosing one's serostatus is likely to be strongly related to attending health services and availing oneself of necessary treatment. Non-disclosure may also be a barrier to medication adherence.

The observed relations among gender, age, and education generally reflect the culture of Thai society. As in many other countries, women are generally less educated and report more depression than men. Better educated people reported better social support and family functioning. To be effective, treatment regimens need to be understandable to a relatively under-educated population, and interventions to improve family functioning also need to be tailored to the education level of the participants. In families in which the PLH is more educated, the quality of the family and social relationships is higher and the associated benefits for physical and mental health are greater, according to our findings. It is unclear, however, whether the higher family functioning helped the PLH to receive a better education or whether the smarter PLH, who receives more education, is better able to sustain positive family relationships. It is likely that both relationships are operating.

Limitations

This study shares with others some of the general limitations related to data based on patients' self-reports, which may be affected by social desirability and recall bias. In addition, because we used the cross-sectional data for this study, our findings cannot be interpreted as causal relationships.

One major caveat around disclosure is the eligibility criterion for this study. There had to be at least one other family member who knew about the HIV status of the PLH in order to be eligible for recruitment. In Northern Thailand, almost all PLH had disclosed to at least one family member. Patient registry data from the study sites in the Northeast indicated that 30% of their PLH were ineligible for recruitment. We have documented this

regional difference in HIV disclosure (Lee et al. [in press](#)). However, we have no evidence that family relations vary between Northern Thailand and Northeast Thailand. In addition, the challenges families face around HIV disclosure are universal. Given our eligibility criteria, the challenges documented in our study around HIV disclosure may be underestimating the impact of the challenge around HIV disclosure. In fact, PLH not included in our study may indeed have more challenges around HIV disclosure. This may have resulted in a sample that may not be representative of all PLH living in these regions, particularly in terms of HIV disclosure.

In addition, our measure of ARV adherence was relatively weak as it is only one item and it is based on self-report. Because the participants were newly enrolled in the study, more objective measures of adherence such as pill counts and physiological information were not available to the researchers. Also, the disclosure variable referred to individuals outside the immediate family. This was due to the design of the study which required that someone in the family know about the serostatus of the PWH.

Some unavoidable degree of conceptual overlap may be possible among some of the variables in the model. For instance, the relatively high correlation between the Social Support and Family Function latent variables indicates that they may have some features in common. Nonetheless, they were not used to predict each other but rather were used simultaneously to predict the outcomes and had differing impacts on the outcome variables. In the same fashion, depression and perceived health may have some overlap in that depressed individuals may perceive that their health is worse or bad health may lead to depression. As these were both used as outcomes and not as predictors of one or the other, this helps mitigate the overlap problem to some extent.

Implications for Public Health and Prevention

Despite these limitations, our findings support the growing body of evidence suggesting that psychosocial factors including depression, family functioning, social support, and HIV disclosure play an important role in ARV adherence (Ammassari et al. [2004](#); Bouhnik et al. [2005](#); Hartzell et al. [2007](#); Ncama et al. [2008](#); Tucker et al. [2003](#)). Due to their physical debilitation and the psychological impact of their infection, PLH remain a highly vulnerable group to social isolation (Singh et al. [1999](#)), and social support may play a significant role in ARV adherence (Ncama et al. [2008](#)). In addition, our findings suggest that the various factor associated with ARV adherence are also interconnected. For example, PLH's depression could be a direct result of adverse physical side effects due to ART, as well as estranged family relations, and/or lack of social support (Catz et al. [2000](#)). At the same time, reducing

depressive symptoms may result in increased ARV adherence (Yun et al. [2005](#)).

Future programs and intervention that address the challenges that PLH and their families face are urgently needed. Longitudinal examination of the impact of the cumulative burden of HIV on psychological well-being, family relationships and quality of life of families living with HIV may contribute to a better understanding of service providers' capacities to respond to the needs of families living with HIV in Thailand. The programs should address the mental health needs of PLH and their family members. Understanding the complex relationship between ARV adherence, HIV disclosure, social support, family functioning, mental health, and quality of life may help to identify effective approaches to intervention to promote the well-being of families living with HIV in Thailand. Building on the existing programs in Thailand, we are currently mounting a longitudinal trial and providing the family-based intervention for PLH and their caregivers in Northern and Northeastern Thailand, focusing on family well-being, in a non-stigmatizing setting.

Acknowledgements This paper was completed with the support of the National Institute of Nursing Research (Grant NINR R01-NR009922) and the National Institute on Drug Abuse (Grant DA-01070-35). We thank our research coordinators, hospital directors, and health officers in Chiang Rai province (Mae Chan and Chiang Saen district hospitals) and Nakhon Ratchasima province (Pak Chong and Khonburi district hospitals). We thank our collaborators at the Thai Ministry of Public Health, Bureau of Epidemiology for their contributions to the study.

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