

Understanding the interface of HIV, trauma, post-traumatic stress disorder, and substance use and its implications for health outcomes

D. J. BRIEF^{1,2}, A. R. BOLLINGER^{1,2}, M. J. VIELHAUER^{1,2,3},
J. A. BERGER-GREENSTEIN^{1,3}, E. E. MORGAN³, S. M. BRADY¹,
L. M. BUONDONNO³, & T. M. KEANE^{1,2} FOR THE HIV/AIDS
TREATMENT ADHERENCE, HEALTH OUTCOMES AND COST
STUDY GROUP

¹*Boston University School of Medicine*, ²*VA Boston Healthcare System*, and ³*Boston Medical Center, Boston, MA, USA*

Abstract

Many individuals living with HIV have been exposed to some type of traumatic event during their lives and may be living with symptoms of post-traumatic stress disorder (PTSD). A substantial number of these individuals are also likely to show evidence of a co-morbid substance use disorder (SUD). There is reason to believe that the co-occurrence of HIV and PTSD or co-morbid PTSD and SUD (PTSD/SUD) may predict poorer health outcomes. There are several pathways through which PTSD or PTSD/SUD might adversely impact the health of individuals living with HIV, including participation in negative health behaviours, low levels of adherence to antiretroviral medications, and/or a direct, deleterious effect on immune function. Psychological interventions are needed to treat PTSD and PTSD/SUD in HIV-positive individuals, and reduce the negative impact of these conditions on health outcomes. This article will explore data on the prevalence of trauma exposure, PTSD, and PTSD/SUD among individuals living with HIV, the pathways through which these conditions might affect health, possible interventions for PTSD and PTSD/SUD for individuals living with HIV, and methods for integrating care for individuals with these disorders. Future directions for research related to HIV, PTSD, and PTSD/SUD will also be discussed.

Introduction

There is growing awareness that many individuals living with HIV have been exposed to some type of traumatic event during their lives and may develop symptoms of post-traumatic stress disorder (PTSD) in response to this experience (Kimerling et al., 1999a). PTSD is a debilitating disorder that has the potential to adversely affect health outcomes in people living with HIV (Kimerling et al., 1999a,b). Further, when PTSD co-occurs with a substance use disorder (SUD), this may present an even greater challenge for health care

Correspondence: Deborah J. Brief, VA Boston Healthcare System, Psychology 116B, 150 S. Huntington Ave, Boston, MA 02130, USA. Tel: +1 (617) 232-9500 ext. 4689; Fax: +1 (617) 278-4408; E-mail: deborah.brief@med.va.gov

providers (Zweben, 1998). Thus, to effectively manage the health care of individuals with HIV and PTSD or PTSD and an SUD, it is essential for providers to understand the interface between these disorders.

The goal of this paper is to describe: (1) the prevalence of trauma exposure, PTSD, and PTSD and SUD co-morbidity (PTSD/SUD) among individuals living with HIV; (2) the pathways through which trauma exposure, PTSD, and PTSD/SUD might influence health outcomes in individuals who are HIV-positive; (3) potentially effective psychological treatments for HIV-positive individuals with PTSD or PTSD/SUD; and (4) possible methods for integrating services for HIV and PTSD or PTSD/SUD. In reviewing these topics, we draw heavily on what is known about trauma exposure, PTSD, and PTSD/SUD in HIV-negative trauma survivors, largely because similar research on individuals living with HIV is still in its early stages or unavailable. While the generalizability of these findings to individuals who are HIV-positive is unknown, we believe that the vast amount of research with HIV-negative trauma survivors can be useful in guiding research and the development of clinical interventions for individuals with HIV and PTSD or PTSD/SUD.

Prevalence

Trauma exposure. Empirical studies clearly document high rates of trauma exposure among both women and men living with HIV. For example, Kimerling et al. (1999a) interviewed 67 African American women, recruited primarily from a public health clinic in New Orleans, and found that the majority (62.1%) had been exposed to at least one traumatic event during their lives. This finding suggests that HIV-positive women may be more likely to experience a traumatic event than women in the general population (e.g. 51.2% of women in the National Comorbidity Survey (NCS) reported exposure to at least one lifetime trauma (Kessler et al., 1995)).

HIV-positive women also report exposure to a wide range of potentially traumatic events (Martinez et al., 2002), including physical and sexual assault and other types of criminal victimization (e.g. robberies/muggings (Kimerling et al., 1999b)). Kimerling et al. (1999a) found that 33.3% of the women interviewed in their study had a history of physical assault and 30.3% had a history of sexual assault. Based on a chart review, Bedimo et al. (1997) found that 32% of 238 women between the ages of 14 and 35, who were enrolled in an HIV outpatient clinic in New Orleans, had a history of sexual assault. Kalichman et al. (2002) reported even higher rates of lifetime sexual assault (68%) in 110 HIV-positive women recruited from a variety of settings, including AIDS service organizations, health care providers, social service agencies, residential settings, and infectious diseases clinics. Collectively, these data indicate that the lifetime prevalence of physical and sexual assault may be higher among women living with HIV than among women in the general population (e.g. in the NCS, 6.9% of women reported lifetime physical assault and 9.2% reported lifetime sexual assault (Kessler et al., 1995)).

In studies focused exclusively on childhood trauma among HIV-positive women, investigators also find high rates of both childhood physical abuse (CPA) and childhood sexual abuse (CSA). Simoni & Ng (2000) interviewed 230 HIV-positive women living in New York City, who were primarily African American or Hispanic, and found that a substantial number had a history of CPA (43%) and CSA (38%). Martinez et al. (2002) interviewed an ethnically diverse sample of 47 women seeking HIV outpatient care through a county medical system in California and found slightly lower, but still substantial rates of exposure for CPA (32%) and CSA (31%). In the aforementioned study conducted by

Kalichman et al. (2002), 34% of female participants reported a history of CPA, 19% reported CSA prior to age 6, and 32% reported CSA between ages 7 and 15. Across these studies, HIV-positive women consistently reported higher rates of CPA compared to women in a large community sample from Canada (i.e. 21% reported exposure to CPA (MacMillan et al., 1997)), and higher rates of CSA compared to women in a national probability sample in the USA (i.e. 27% reported CSA (Finkelhor et al., 1990)).

Moreover, many HIV-positive women report a pattern of repeated traumatization. For example, in a racially/ethnically diverse sample of 490 women, Wyatt et al. (2002) found that HIV seropositivity was associated with a 'severe trauma history' involving exposure to multiple events (e.g. CSA, adult sexual assault, and/or physical violence or conflict). Kalichman et al. (2002) provide further evidence for repeated exposure, finding that HIV-positive women with a sexual assault history had a lifetime average of 7.5 sexual assault experiences. In the latter study, many HIV-positive women with a history of sexual assault were also likely to have experienced non-sexual relationship violence, indicating not only a history of repeated traumatization but also exposure to more than one type of traumatic event. Further, Simoni & Ng (2000) found a significant correlation between childhood abuse and assault in adulthood among HIV-positive women, suggesting that many HIV-positive women live in a context of interpersonal violence throughout their life span.

Investigators have also documented high rates of sexual trauma among HIV-positive men. In a sample of 242 HIV-positive men, who were predominantly African American and gay or bisexual, Kalichman et al. (2002) found that 35% had a history of sexual assault. By comparison, less than 1% of men in the NCS reported a lifetime history of rape and 2.8% reported a history of molestation (Kessler et al., 1995). These data indicate that HIV-positive men may be at increased risk for exposure to certain types of interpersonal violence during their lives relative to men in the general population. In addition, similar to HIV-positive women, Kalichman et al. (2002) provided evidence of repeated traumatization among HIV-positive men. In this study, HIV-positive men with a history of sexual trauma reported experiencing an average of 10.1 sexual assaults during their lives.

Many HIV-positive men are also likely to have experienced childhood abuse. Holmes (1997) found that 20% of a sample of 95 primarily gay or bisexual HIV-positive men seen in hospital-based primary care clinics had a history of CSA. Allers & Benjack (1991) surveyed 52 HIV-positive adults registered at an AIDS social service agency in Atlanta and found that 65% of this predominantly male sample experienced some type of abuse during childhood. Among those reporting a history of abuse, 35% had a history of CPA and 65% had a history of both CPA and CSA. In a sample of HIV-positive men recruited from various settings, Kalichman et al. (2002) found that 27% had experienced CPA, 17% reported CSA before age 6, and 47% reported CSA between the ages of 7 and 15. Across these studies, the rates of CPA are similar to or slightly exceed those reported by men in a large community sample (i.e. 31% reported CPA (MacMillan et al., 1997)), and the rates of CSA are consistently higher than those reported in a national probability sample (i.e. 16% reported CSA (Finkelhor et al., 1990)).

There may be a number of reasons why the rates of trauma exposure are elevated among HIV-positive women and men. Childhood abuse has been linked to subsequent participation in sexual (Allers et al., 1993) and drug use behaviours (Holmes, 1997; Johnsen & Harlow, 1996) that increase the risk for HIV. Further, certain factors associated with HIV infection may increase the risk of exposure to potentially traumatic situations. For example, Martinez et al. (2002) found that many HIV-positive women in their sample were living at

the poverty level, and poverty may increase the risk of exposure to traumatic stressors, such as crime, domestic violence, and other types of assault (Zierler et al., 1996).

PTSD

PTSD describes a set of symptoms that may occur after exposure to a traumatic event such as rape, physical assault, mugging/robbery, and/or a life-threatening accident or serious or sudden medical illness (American Psychiatric Association, 2000). This disorder is characterized by symptoms of re-experiencing (e.g. intrusive memories or thoughts), avoidance and/or emotional numbing, and hyperarousal, and is often accompanied by feelings of anxiety and depression, social alienation, and mistrust of family, friends, and systems (Keane & Barlow, 2002).

While few studies have assessed PTSD in individuals living with HIV, the available data suggest that the rate of PTSD may be high in this population. In their study of HIV-positive women, Kimerling et al. (1999a) found that 35% of participants with a trauma history met criteria for a current diagnosis of PTSD. Further, a significant number of women who did not meet full criteria for PTSD met criteria for at least one symptom cluster associated with this disorder (i.e. 88% re-experiencing, 74% avoidance/numbing, and 70% hyperarousal). Martinez et al. (2002) also found that many of the women in their study probably met full criteria for current PTSD (42%) or partial PTSD (22%). The rates of PTSD reported in both studies are considerably higher than those reported for women in the general population (e.g. 10.4% of women in the NCS had a lifetime PTSD diagnosis (Kessler et al., 1995) and 4.6% of women in a nationally representative sample of crime victims had current PTSD (Resnick et al., 1993)). Similarly, in a sample of gay or bisexual men, Kelly et al. (1998) found that approximately 36% of participants met criteria for PTSD, a rate exceeding that reported for men in the general population (e.g. 5% of men in the NCS had a lifetime PTSD diagnosis (Kessler et al., 1995)). Thus, the evidence strongly suggests that an exceptionally high number of HIV-positive women and men may be living with PTSD or some symptoms of this disorder.

Few studies have documented the specific etiology of PTSD in individuals diagnosed with HIV. Kelly et al. (1998) found that approximately 31% of participants in a sample of HIV-positive men met criteria for PTSD related to being diagnosed with HIV (HIV/PTSD). This rate is higher than rates documented for some other life-threatening medical diagnoses that are associated with a diagnosis of PTSD (e.g. 5% following a breast cancer diagnosis (Andrykowski et al., 1998)). Thus, there may be an unusually high risk for developing PTSD in response to being diagnosed with HIV. Further research will need to identify the full range of traumatic events that lead to PTSD in this population.

There may be a number of factors contributing to the high rates of PTSD observed among HIV-positive individuals. First, the type of traumatic event to which an individual is exposed contributes to the probability of being diagnosed with PTSD (Keane & Barlow, 2002), and many HIV-positive individuals have histories of exposure to the types of events associated with a diagnosis of PTSD in the general population (i.e. CPA and CSA, physical and sexual assault, and crime-related violence (Kessler et al., 1995; Resnick et al., 1993)). Secondly, pre-morbid factors such as age of onset of trauma and prior trauma history play an important role in the development of PTSD (King et al., 1996). Exposure to trauma at an early age increases the risk for PTSD (Kessler et al., 1995), and the rates of childhood abuse are exceptionally high among HIV-positive women and men (Allers & Benjack, 1991; Simoni & Ng, 2000). The high prevalence of repeated traumatization (Kalichman et al., 2002) may further increase the probability that HIV-positive individuals will develop

PTSD, similar to what has been demonstrated in studies with HIV-negative trauma survivors with PTSD (Astin et al., 1995; King et al., 1996). Finally, the post-trauma environment also influences rates of PTSD (Keane & Barlow, 2002), and many HIV-positive individuals live in environments characterized by poverty, violence, and a lack of social support (Perez et al., 1995) that place them at risk for this disorder.

PTSD/SUD

In HIV-negative individuals, PTSD and SUD are highly co-morbid across settings, populations, and types of trauma (Keane & Kaloupek, 1997; Keane & Wolfe, 1990). Although not yet well documented, converging evidence suggests that PTSD/SUD rates are also likely to be high among individuals living with HIV. First, CSA (Johnsen & Harlow, 1996; Lodico & DiClemente, 1994) and early-onset PTSD (Stiffman et al., 1992) are both associated with drug use behaviours (Holmes, 1997; Johnsen & Harlow, 1996; Lodico & DiClemente, 1994) that increase the risk for HIV infection. Thus, a link between trauma exposure, PTSD, and drug use may be established early in life for many individuals who become HIV-positive.

Secondly, there is evidence among HIV-negative trauma survivors that being diagnosed with PTSD increases the risk for developing an alcohol and/or drug use disorder (Breslau et al., 1997; Chilcoat & Breslau, 1998), especially when PTSD symptoms become chronic (Breslau & Davis, 1992). One explanation for this association is that individuals with PTSD use alcohol and/or drugs to self-medicate or cope with unpleasant thoughts or feelings related to the trauma (Brown & Wolfe, 1994; Stewart, 1996) or with symptoms of disorders (e.g. depression and other anxiety disorders) that are highly co-morbid with PTSD (Keane & Kaloupek, 1997). A similar causal mechanism may explain the development of an SUD among HIV-positive individuals with PTSD.

Thirdly, substance use may increase the risk of exposure to traumatic events that are likely to lead to PTSD. In one epidemiological study, researchers found that physical assault was the most common type of traumatic event associated with cocaine/opiate use in the general population (Cottler et al., 1992). Others find that women who use cocaine/crack are at an especially high risk for sexual assault (Najavits et al., 1998a). Further, alcohol use often precedes incidents of interpersonal violence, including rape, robbery, and domestic violence (Boles & Miotto, 2003; Brismar & Bergman, 1998; Roizen, 1993), not only for the perpetrator, but also for the victim (Collins & Schlenger, 1988; Roth, 1994). Alcohol use is also considered a significant risk factor for violence-related injuries (Cherpitel, 1997). Because the base rates for alcohol and drug use are considerably higher among HIV-positive individuals than the general population (Bing et al., 2001; Lefevre et al., 1995; Petry, 1999), this may increase the risk of exposure to traumatic events that are likely to lead to PTSD in this population.

Trauma, PTSD, SUD, and health outcomes

A growing body of research suggests that trauma exposure may influence one's perceptions about physical health. HIV-negative individuals exposed to a range of traumatic events, including sexual assault (Kimerling & Calhoun, 1994; Zoellner et al., 2000) and criminal victimization (Kilpatrick & Resnick, 1993), report higher levels of somatic symptomatology and have poorer perceptions of their general health status than non-traumatized individuals. These associations remain even when physical injuries from the event are controlled for in

the analyses (Kimerling & Calhoun, 1994), and persist over time for victims of childhood abuse and other types of trauma (Kimerling & Calhoun, 1994; Schnurr et al., 1998).

An association between trauma exposure and physical health complaints has also been observed in individuals living with HIV. In a study conducted by Kalichman et al. (2002), HIV-positive men and women with a history of sexual assault reported a greater number of HIV-related symptoms (e.g. respiratory problems, skin rashes, recurring fever, and fatigue) than HIV-positive men and women without a history of sexual assault, despite the fact that there were no differences between groups on objective measures of HIV-related illness (i.e. AIDS diagnoses, CD4 counts, and viral load). Thus, trauma exposure may increase somatization in individuals living with HIV, regardless of HIV-related health status.

There is also accumulating evidence from studies with HIV-negative individuals that the relationship between trauma and health perceptions is mediated by specific psychological responses to trauma. For example, several investigators found that PTSD was partially responsible for mediating the relationship between trauma exposure and negative health perceptions in HIV-negative trauma survivors (e.g., Kimerling et al., 2000; Wolfe et al., 1994). Further, the chronicity of PTSD (Breslau & Davis, 1992) and the severity of PTSD symptoms (Zoellner et al., 2000) may predict the severity of physical complaints. For some individuals, depression may also play a role in predicting physical complaints (Zoellner et al., 1992), or mediating the relationship between PTSD and health perceptions (Miranda et al., 2000). Thus, it is necessary to consider the full range of psychological responses to trauma to understand its impact on health perceptions in individuals who are HIV-positive.

The importance of PTSD in predicting health perceptions in individuals living with HIV is demonstrated by the results of a study examining the effect of PTSD on perceptions of pain (Smith et al., 2002). Among HIV-positive individuals reporting 'persistent pain', Smith et al. (2002) found that participants with PTSD had higher ratings of 'worst pain intensity', 'worse perceptions of physical health', and higher levels of 'pain-related interference in daily activities' than those without PTSD, regardless of health status or other risk factors. The researchers concluded that the amplification of pain perceptions in these individuals was attributable, at least in part, to psychological processes.

A link between trauma exposure, PTSD, and physical illness has also been documented in studies with HIV-negative trauma survivors. In a study focused on members of a health maintenance organization, exposure to 'adverse events' in childhood was associated with an increased number of self-reported disease conditions in adulthood (e.g. heart disease, stroke, cancer, emphysema, and hepatitis (Felitti et al., 1998). Female victims of sexual assault have also reported higher rates of chronic diseases, including diabetes, arthritis (Golding, 1994), and irritable bowel syndrome (Leserman et al., 1996), than women without this history. Further, Schnurr et al. (2000) found that a diagnosis of combat-related PTSD was associated with several physician-diagnosed medical conditions (e.g. arterial, lower gastrointestinal, dermatological, and musculoskeletal disorders). Thus, individuals who are exposed to trauma and develop PTSD may be at risk for some physical illnesses.

There is also some evidence of an association between trauma exposure and physical illness in HIV-positive individuals. Kimerling et al. (1999b) found that HIV-positive women with a history of three victimization experiences (mugging/robbery, physical assault, and sexual assault) had a higher number of AIDS-defining medical conditions (based on chart review) than women with two or fewer victimization experiences. These data suggest that cumulative trauma exposure may contribute to subsequent physical illness in HIV-positive individuals.

Thus, there is growing evidence of a link between trauma exposure, PTSD, and health variables in HIV-positive individuals, similar to what is seen in individuals who are HIV-seronegative. Research with HIV-negative trauma survivors suggests that there may be a number of potential pathways through which trauma exposure and PTSD might influence health perceptions and physical illness. First, individuals with PTSD may experience neurobiological alterations across a range of systems and come to interpret some of these disturbances (e.g. abnormalities in cardiovascular reactivity) as a change in health status even in the absence of illness (Friedman & Schnurr, 1995). Secondly, it is possible that negative affect contributes to biased attributions about health (Kimerling et al., 2000). Thirdly, trauma exposure may lead to higher levels of participation in behaviours that compromise health (e.g. smoking (Acierno et al., 1996)). Finally, trauma may lead to neurochemical and physiological changes that affect immunocompetence (Friedman & Schnurr, 1995). If trauma exposure and PTSD have a similar, adverse effect on health behaviours, immune function, and possibly adherence in individuals living with HIV, this could have devastating consequences for health outcomes. Evidence for involvement of these pathways is discussed below.

Health behaviours

Trauma exposure and the subsequent development of PTSD may be associated with participation in behaviours that are likely to compromise health status. For example, researchers found that HIV-negative individuals exposed to 'adverse events' in childhood were more likely to participate in a range of negative health behaviours in adulthood that increased the risk for morbidity and mortality (e.g. smoking, poor nutrition, and physical inactivity) than individuals without this exposure (Felitti et al., 1998).

Further, there is an extensive body of research describing an association between trauma exposure, in particular CSA, and participation in HIV risk behaviours (e.g. see Miller (1999) for a review of this literature as it relates to women). Researchers find that women and men with a history of CSA are more likely to engage in high-risk sexual (e.g. unprotected sex, anonymous sex, sex with multiple partners, and sex work (Allers et al., 1993; Bartholow et al., 1994; Caraballo-Dieguez & Dolezal, 1995; Johnsen & Harlow, 1996; Zierler et al., 1991)) and drug use (e.g. use of drugs that are likely to be injected and frequent needle sharing (Johnsen & Harlow, 1996; Lodico & DiClemente, 1994)) behaviours than individuals without a trauma history. Thus, it appears that a pattern of poor self-care, established early in life for many individuals who experience CSA, may increase the risk for physical illnesses such as HIV. Moreover, in addition to CSA, investigators find that CPA and the experience of more than one type of abuse (i.e. a combination of physical and sexual abuse) in adolescence increases subsequent participation in HIV risk behaviours in young adulthood (Cunningham et al., 1994). Data also indicate that some adult women engage in high-risk sexual behaviours out of fear that refusal will lead to physical harm, especially if they are in a violent relationship (Amaro, 1995).

A number of studies also provide evidence that many HIV-infected individuals continue to engage in sexual and drug use behaviours that have the potential to compromise health, even after receiving an HIV diagnosis (Halkitis & Wilton, 1999; Rotheram-Borus et al., 1997). For example, in a national telephone probability sample of urban men who have sex with men (MSM), Paul et al. (2001) found that HIV-infected MSM were more likely to report recent participation in high-risk behaviours than those untested or HIV-seronegative. This observation raises serious concerns for both primary and secondary prevention efforts.

For the HIV-positive individual, continued participation in these types of behaviours can contribute to additional health problems, including the acquisition of sexually transmitted diseases and common co-infections such as hepatitis (Rotheram-Borus et al., 1996), as well as possible reinfection with a more virulent or drug-resistant strain of HIV (Halkitis, 1998). The latter may limit treatment options and contribute to more rapid disease progression and poorer health outcomes (Halkitis & Wilton, 1999).

Among individuals diagnosed with HIV, there are additional data indicating that those with a trauma history may be more likely than those without a history of trauma to engage in high-risk behaviours. In one study, Kalichman et al. (2002) found that HIV-positive individuals with a history of sexual assault were more likely to engage in some high-risk sexual behaviours (e.g. unprotected anal intercourse) in the three months prior to the study when compared to HIV-positive individuals without a history of sexual assault. Thus, it may be difficult to interrupt a pattern of poor self-care, even after an HIV diagnosis, in individuals with a history of sexual assault.

For HIV-positive individuals with PTSD/SUD, there is also a documented risk for physical illness associated with an SUD. Regardless of HIV status, alcohol and drug abuse can lead to a range of health problems (e.g. diseases of the liver, central nervous system, and gastrointestinal, cardiovascular, and pulmonary systems (Moak & Anton, 1999; Stine & Kosten, 1999; Weaver & Schnoll, 1999)). In individuals who are HIV-positive, alcohol may also increase susceptibility to other infectious diseases (e.g. pneumonia and tuberculosis (National Institute on Alcohol Abuse and Alcoholism (NIAAA, 2001))), worsen common co-infections such as hepatitis C virus-related disease (Schiff, 1999), and contribute to the severity of opportunistic infections (Bagasra et al., 1993).

Adherence

Poor adherence to HIV care, especially highly active antiretroviral therapy (HAART), has the potential to compromise health outcomes. While consistently high levels of adherence to HAART are associated with increased longevity (e.g. Lemp et al., 1990) and improvements in the quality of life (Bright, 1999), poor adherence is associated with drug resistance, cross-resistance, and/or viral replication (Cinatl et al., 1994; Vanhove et al., 1996). Despite the potential benefits of HAART, numerous obstacles to adherence have been identified in the literature, including the complexity of the regimen, side-effects, knowledge and beliefs about medications, practical concerns such as housing or finances (see Friedland & Williams (1999) and Rabkin & Chesney (1999) for reviews), and potential neuropsychological complications of HIV (Castellon et al., 2000; Hinkin et al., 2002).

HIV-positive individuals with a trauma history and PTSD may also face a number of unique challenges to adherence. First, high levels of distress have been shown to disrupt adherence to HAART (Holzemer et al., 1999; Singh et al., 1996), and HIV-positive individuals with a trauma history report higher levels of emotional distress than HIV-positive individuals without a history of trauma (Kimerling et al., 1999b). Secondly, depression has been linked to poor adherence to HAART (Avants et al., 2001; Gordillo et al., 1999), and HIV-positive men and women with trauma histories report higher levels of depressive symptomatology than HIV-positive individuals without this history (Kalichman et al., 2002). Given the high rates of co-morbidity between PTSD and depression (Keane & Kaloupek, 1997), the risk for poor adherence may be especially high among HIV-positive trauma survivors who develop PTSD. Thirdly, PTSD is often associated with problems establishing trusting relationships and accessing social support (Foa et al., 2000; Keane et al., 1985). Because the provider-patient relationship (Mostashari et al., 1998; Stone

et al., 1998) and ability to access support (Singh et al., 1996; Stone et al., 1998) are both important determinants of adherence to HAART, these trauma-related problems may interfere with adherence. Unless these challenges are addressed, HIV-positive trauma survivors, especially those with PTSD, may be at an especially high risk for poor health outcomes.

For HIV-positive individuals living with PTSD/SUD, there may be additional challenges to adherence associated with the SUD. Alcohol (Eldred et al., 1998; Samet et al., 1992) and drug use (Galvan et al., 2002; Malow et al., 1998) have been shown to contribute to poor adherence to HAART for a number of reasons. For example, intravenous drug users (IVDUs) reportedly have fears about combining medications and street drugs once relapse occurs, and have difficulties making appointments due to their daily routine of drug use (Freeman et al., 1996). Further, the negative impact of socio-economic factors on adherence may be particularly relevant for alcohol and drug users, many of whom are poor, homeless, and lacking adequate support (Cabaj, 1998).

Immune function

Trauma exposure and psychological responses to trauma have the potential to negatively affect immune functioning, which may lead to poorer health outcomes. Kimerling et al. (1999a) found that HIV-positive women with a trauma history showed a more rapid decline in CD4+/CD8+ cell ratios than women without a history of trauma exposure. Moreover, among those exposed to trauma, those with current PTSD showed a greater decline in CD4+/CD8+ cell ratios than those without PTSD. In another study, Leserman et al. (1997) found that exposure to a 'stressful life event' and depressive symptoms, both independently and in combination, led to a decline in cell populations associated with immune functioning. These changes were also associated with an increase in physical complaints, indicating a possible decline in health. These data suggest that trauma exposure and psychological responses to these experiences may accelerate HIV disease progression through their impact on immune function.

For HIV-positive individuals with PTSD/SUD, there is an additional risk that substance use will adversely affect immune function and health status. To date, this evidence is primarily linked to alcohol consumption. Regardless of HIV status, chronic alcohol consumption is known to suppress normal immune responses, including infection-fighting white blood cells (Liu, 1980) and antibody production (Gluckman et al., 1997). While evidence from a large cohort of homosexual men in the Multicenter AIDS Cohort Study found no association between alcohol use and markers of HIV disease progression (Kaslow et al., 1989), Crum et al. (1996) found that heavy drinking in seropositive IVDUs was associated with a decline in CD4 percentage starting from two years post-seroconversion and a significant increase in CD8 percentage between two and five years post-seroconversion. The latter data indicate that alcohol may have a delayed, detrimental effect on immune function.

Since the advent of HAART, research findings have been similarly mixed. Fabris et al. (2000) failed to find a relationship between alcohol consumption and CD4 counts in individuals on HAART. However, Samet et al. (2003) found a negative relationship between current drinking levels and CD4 cell counts in HIV-positive individuals with a history of alcohol problems who were treated with HAART. No comparable association was found for HIV-positive individuals who were not receiving HAART. This study provided further evidence that alcohol use may increase the rate of HIV disease progression, although the mechanism for this effect was unclear (e.g. a direct effect of alcohol on immune

functioning, adherence, or alcohol-exacerbated liver toxicity) and warrants further investigation.

Treatment implications and interventions

The high estimates of trauma exposure and PTSD symptoms in HIV-infected individuals have important implications for treatment of this population. In the aftermath of trauma exposure, many HIV-positive individuals may be coping with significant PTSD symptomatology (Kelly et al., 1998; Kimerling et al., 1999a), an SUD, and/or other mental health problems (e.g. depression (Kalichman et al., 2002; Kimerling et al., 1999b)) beyond those associated with living with HIV. These trauma-related sequelae have the potential to disrupt psychosocial functioning and decrease the quality of life for individuals living with HIV. Trauma exposure, PTSD, and PTSD/SUD also have the potential to negatively impact immune function and disease progression, and are associated with behaviours (e.g. continued participation in high-risk behaviours, and poor adherence) that may interfere with the benefits of medical treatments for HIV. Thus, it is imperative that providers of HIV care take these experiences and symptoms into account when designing and implementing treatment programmes for this population (Allers et al., 1993; Fullilove et al., 1993).

Treatments for HIV and PTSD. Several treatments for PTSD have been empirically validated in HIV-negative trauma survivors (see Keane, 1998; Keane & Barlow (2002) and Rothbaum et al. (2000) for reviews) and may prove beneficial for individuals living with HIV and PTSD. There is relatively widespread acceptance of exposure therapy, including both imaginal and in vivo exposure (Foa et al., 1991, 1999; Keane & Kaloupek, 1982; Keane et al., 1989), as a highly effective treatment for PTSD. Further, anxiety management training (e.g. relaxation training and breathing retraining (Peniston, 1986)), cognitive therapy and/or cognitive restructuring (Resick & Schnicke, 1992; Resick et al., 2002), and anger management training (Chemtob et al., 1997) are now recognized as important components of PTSD treatment. When exposure therapy, anxiety management training, and cognitive therapy are combined in a treatment package (e.g. cognitive processing therapy (Resick & Schnicke, 1993)), investigators also report significant improvements in PTSD outcomes (Resick & Schnicke, 1992; Resick et al., 2002).

In HIV-negative trauma survivors, PTSD treatment has been shown to decrease trauma-related symptomatology (Foa et al., 1991) and depression (Resick et al., 2000), and lead to improvements in social and occupational functioning (Foa et al., 1999; Richards et al., 1994). Whether it is possible to achieve similar treatment outcomes in individuals living with a chronic, life-threatening disease such as HIV remains to be determined. However, the fact that these treatments have demonstrated efficacy for PTSD stemming from a wide range of traumatic experiences among HIV-negative individuals (Marks et al., 1998; Tarrier et al., 1999), including the types of events (e.g. sexual assault (Foa et al., 1991)) often reported by individuals living with HIV, suggests they hold promise for this population.

Making PTSD treatment available to individuals living with HIV also represents an important step toward improving health outcomes for this population, if this type of treatment can help to reduce negative health behaviours, improve adherence, and reduce the negative impact of traumatic stress on immune functioning. The need to reduce participation in negative health behaviours among individuals living with HIV is clearly illustrated by the documented link between these behaviours, especially HIV risk behaviours, and an increased risk for illness (Halkitis, 1998). However, while effective

motivational (Carey et al., 1997) and skills-based interventions for risk reduction have been developed (Belcher et al., 1998), psychological and behavioural correlates of trauma may prevent individuals from benefiting from these interventions (Allers & Benjack, 1992). Further, investigators have argued that skills-based interventions do not always consider the social context in which high-risk behaviours occur (e.g. drugs, crime, poverty, and discrimination), especially for women who are victimized (Kimerling et al., 1999b). Thus, a more comprehensive intervention that addresses PTSD symptoms may be needed to decrease high-risk behaviours in HIV-positive trauma survivors.

Given the devastating effects of poor adherence to HAART on health outcomes (Vanhove et al., 1996), it is essential that HIV-positive trauma survivors are able to maintain high levels of adherence to these medications to ensure positive health outcomes. Research indicates that many HIV-positive individuals are able to learn single strategies to address obstacles to adherence (e.g. medication timers to 'combat forgetting' (Malow et al., 1998; Samet et al., 1992)). However, the 'self-defeating and self-destructive behaviour patterns' (Cohen et al., 2001, p. 294) associated with PTSD may interfere with the ability of some trauma survivors to adhere to medications. Thus, to improve adherence in HIV-positive trauma survivors it may be necessary to address symptoms of traumatic stress.

There is some evidence that treatment utilizing a range of anxiety management techniques is helpful in improving adherence in HIV-positive individuals who faced a potentially traumatic stressor (i.e. being diagnosed with HIV (Antoni et al., 1991)). Antoni et al. (1991) enrolled 47 healthy gay men in a cognitive behavioural stress management (CBSM) intervention that included relaxation, cognitive restructuring, and assertiveness training, and examined the effect of this intervention on psychological and immunological status following HIV serostatus notification. HIV-positive men who were enrolled in this CBSM intervention for five weeks prior to serostatus notification were more likely to maintain their social support and engage in adaptive coping strategies post-notification than HIV-positive men in an assessment control condition. These data are promising because HIV-positive individuals who rely on active coping skills are more likely to reach adherence goals than those who have difficulties with trust and rely on passive strategies (Singh et al., 1999). Future research is needed to determine whether similar strategies can help to improve adherence in individuals coping with other types of traumatic events and in the presence of PTSD. Further, it will be important to determine whether these strategies are efficacious when administered following exposure to a traumatic event, as many HIV-positive trauma survivors are likely to be seen in treatment long after their initial exposure to some type of trauma.

A second intervention that may help to improve adherence in HIV-positive trauma survivors is coping effectiveness training (CET). Developed by Chesney et al. (1996), CET incorporates 'elements of stress management interventions and provides a framework for choosing among coping strategies to promote adaptive coping and reduce distress' (Chesney et al., 1996, p. 76) associated with living with HIV. Preliminary evidence from a randomized clinical trial of CET, in which 149 HIV-positive gay men were assigned to CET, an HIV information condition, or a waiting list control group, indicated that participation in CET was associated with a greater increase in coping self-efficacy and a greater reduction in perceived stress than participation in an HIV information group (Chesney et al., 1996). Further, improvements in coping self-efficacy from pre- to post-intervention for participants in the CET intervention were associated with lower levels of distress, and lower levels of distress were associated with better adherence to medications and higher levels of participation in health-promoting behaviours. Further research is

needed to determine whether this type of intervention is also effective in reducing distress associated with specific traumas, and in improving adherence among HIV-positive trauma survivors with PTSD.

Reducing the impact of traumatic stressors and PTSD on immune functioning may also be necessary to improve health outcomes in HIV-positive trauma survivors, given the potential impact of traumatic stress and PTSD on disease progression (Kimerling et al., 1999a). Antoni et al. (1991) offer promising findings in this regard. In this study, Antoni et al. (1991) found that HIV-positive gay men enrolled in a CBSM intervention for five weeks prior to notification of a positive HIV diagnosis showed a significant increase in CD4 counts between pre- and post-notification, while HIV-positive men randomized to an assessment-only control condition showed no change. Moreover, post-notification immunological values in the CBSM group were positively associated with the frequency of self-reported daily home practice of stress management procedures prior to notification. These data suggest that the use of anxiety management techniques may help to buffer the immune system of HIV-positive individuals from the adverse impact of a traumatic stressor. Additional research is needed to determine whether similar strategies are as effective in reducing the adverse effects of trauma exposure on immune functioning in HIV-positive individuals with a history of exposure to other types of potentially traumatic events, or in the presence of PTSD. Further, it will be important to determine if anxiety management techniques reduce the impact of trauma exposure on immune function in the HIV population when administered following the event rather than prior to the traumatic event.

Treatments for HIV and PTSD/SUD. The documented high rates of co-morbidity between PTSD and SUD (Keane & Kaloupek, 1997), and the negative impact of this co-morbidity on treatment outcomes for both SUD and PTSD (Ouimette et al., 1999), have led investigators to emphasize the importance of addressing both disorders in treatment (Ouimette et al., 2000; Triffleman, 1998). In particular, offering treatment for an SUD either before or in conjunction with trauma-focused therapy is thought to be essential, in part because substance abuse can mask symptoms of PTSD, and interfere with the potential benefits of PTSD treatment (Brown et al., 2003; Hyer et al., 1993).

Various types of 'integrated therapy', in which both symptoms of PTSD and an SUD are addressed, are currently under investigation in HIV-negative trauma survivors (e.g. see Triffleman (1998) for a review). The effectiveness of these therapies for PTSD/SUD has not yet been evaluated in individuals living with HIV. However, two integrated therapies that have shown promise with HIV-negative trauma survivors, seeking safety (Najavits, 2002) and concurrent treatment of PTSD and cocaine dependence (CTPCD) (Brady et al., 2001), may be helpful for this population.

Seeking safety employs a combination of coping skills training techniques (i.e. cognitive, behavioural, and interpersonal) throughout treatment to simultaneously address PTSD and the SUD (Najavits, 2002). Preliminary findings, based on an uncontrolled trial with 17 women, all of whom received seeking safety, indicated that participants who completed treatment improved across multiple domains (e.g. PTSD symptoms, substance use, and social and occupational functioning (Najavits et al., 1998b)). Seeking safety appears especially promising because the data suggest it is effective for women with diverse trauma histories (including childhood abuse and other types of interpersonal violence) and histories of repeated traumatization (Najavits et al., 1998b), similar to those of many HIV-positive women (Zierler et al., 1996). Recent data also suggest that seeking safety may be effective

with hard-to-reach populations, such as women in prison (Zlotnick et al., 2003), and low-income, urban women (Hien et al., 2004).

CTPCD (Brady et al., 2001) may also be an effective treatment for PTSD/SUD in individuals living with HIV. CTPCD relies on a two-phase, sequential model of treatment. During the first phase of treatment, CTPCD focuses exclusively on problems related to substance use, utilizing a combination of coping skills training, cognitive restructuring, and relapse prevention techniques. During the second phase of treatment, CTPCD focuses primarily on PTSD, utilizing exposure therapy to address symptoms of this disorder. Findings from an initial trial, in which all participants (32 women, 7 men) received CTPCD, indicated that those who completed treatment improved on multiple domains (i.e. substance use, PTSD, and other psychosocial outcomes (Brady et al., 2001)). The fact that PTSD diagnoses in this sample stemmed primarily from interpersonal violence (i.e. rape, aggravated assault, and other types of physical assault) suggests that this approach may be helpful for HIV-positive individuals, many of whom are exposed to similar traumas.

For HIV-positive trauma survivors, there may also be an improvement in health outcomes associated with the treatment of PTSD/SUD. There is evidence that high-risk sexual behaviours for HIV often take place in the context of alcohol or drug use (Dilorio et al., 2002; Rotheram-Borus & Miller, 1998); thus, decreasing substance use may also help to minimize the risk of health problems associated with continued participation in these behaviours. Further, research suggests that alcohol and/or drug use can interfere with adherence to antiretroviral medications, while decreasing substance use may increase adherence to these medications (Broers et al., 1994; Freeman et al., 1996). Future research is needed to determine whether PTSD/SUD treatment also has benefits for immune functioning in individuals living with HIV beyond those achieved by a reduction in PTSD symptoms alone, but the deleterious effect of alcohol on immune functioning in this population (NIAAA, 2001) suggests this is possible.

Integrating services for HIV and PTSD or PTSD/SUD

Integrated models of care, described as those that promote a strong 'professional and geographical alliance between health and mental health providers' (Schnurr & Green, 2004, p. 262), have been recommended for HIV-negative trauma survivors. Schnurr & Green (2004) offer several reasons why integrated care is appropriate for this population, including the observation of a strong link between trauma, PTSD, and physical health, and the fact that this approach is consistent with patients' preferences, and is thus likely to lead to better adherence and health outcomes. Integrated models of care have also been recommended for HIV-negative dually diagnosed individuals with mental health problems other than PTSD and an SUD (Barreira et al., 2000; Minkoff, 2001), in part because this approach has been associated with higher levels of engagement in treatment, lower levels of substance use (Drake et al., 1998), better psychosocial functioning, and lower health care costs (Jerrell, 1996).

Not surprisingly, the importance of 'integrated care' for individuals living with HIV and either a mental health disorder or an SUD, or both, has also been recognized (Conviser & Pounds, 2002; Mellins et al., 2002; Zweben, 1998). Numerous models of service integration have been proposed for the HIV population, including: (1) the formation of formal linkages between substance abuse, mental health, and primary HIV medical care; (2) the inclusion of services for primary care, mental health, HIV, and substance abuse

treatment at the same site; and (3) the use of case managers to co-ordinate care (Berger & Levin, 1993).

Researchers have provided preliminary data on the effectiveness of integrated models of care for individuals living with HIV. For example, Andersen et al. (2003) found that participation in the Personalized Nursing LIGHT programme, an intervention that focuses on the linkage of HIV medical and substance abuse treatment programmes (e.g. by having nurses accompany patients to medical appointments and co-ordinating care between programmes), led to a reduction in drug use in 78% of patients at a six-month follow-up. A high level of engagement and adherence with primary care services was also reported for HIV-positive drug users when these services were offered in the context of methadone maintenance (Sorensen et al., 1989). With the integration of psychiatric evaluation and treatment in an HIV primary medical care clinic, Lyketsos et al. (1997) found that 50% of patients referred for an evaluation showed improvements on a global outcome measure. Finally, data from the Action Point programme, a facility in San Francisco that provides 'highly integrated care' (including on-site urgent medical and nursing care, case management, referrals for mental health or substance abuse treatment, and medication storage and supply), suggest that linking all components of treatment can lead to improvements in health outcomes over time (Bamberger et al., 2000).

These findings suggest that integrated treatment for HIV and PTSD or PTSD/SUD may be appropriate for HIV-positive trauma survivors. There are several ways in which the health care system might improve integration of care for these disorders. First, routine screening for trauma exposure, PTSD, or PTSD/SUD within the context of primary HIV medical care may help to identify trauma survivors in need of specialized treatment (Kimerling et al., 1999b). Secondly, if providers increase their familiarity with existing treatments for PTSD and PTSD/SUD this should better enable them to assist patients in making decisions about treatment options. Thirdly, the development of collaborative networks between medical providers and trauma specialists may help to improve access to care and referrals to specialized treatment programmes (Allers & Benjack, 1992). Fourthly, brief motivational interventions in the context of HIV care may help to facilitate follow through with referrals for specialized treatment. Finally, offering PTSD or PTSD/SUD treatment at the site of HIV primary care may help to engage patients in PTSD or PTSD/SUD treatment when this is appropriate.

Conclusions and directions for future research

Researchers have documented a high prevalence of trauma exposure and PTSD among individuals living with HIV, with data indicating particularly high rates of exposure to interpersonal violence. Additional research is needed to determine the etiology of PTSD diagnoses, and the factors that contribute to the development of this disorder (e.g. repeated trauma and the environment in which the trauma occurs) in HIV-positive individuals. Finally, while it is clear that there is a high prevalence of SUD in the HIV population, information on the prevalence of PTSD/SUD is not currently available.

With regard to health variables, the available, albeit limited, data suggest that trauma exposure has a negative impact on health perceptions and is associated with an increased number of physical complaints and physical diagnoses among HIV-positive individuals. In addition, PTSD has been shown to increase perceptions of pain intensity. More work is needed to determine whether PTSD affects health perceptions other than those related to pain, contributes to increased rates of physical diagnoses, and plays a significant role in mediating the relationship between trauma exposure and health variables in this population.

The pathways through which trauma exposure and/or PTSD might impact health outcomes in individuals living with HIV are not well understood but may involve health risk behaviours, poor adherence, and compromised immune function. Evidence suggests that trauma exposure is associated with increased participation in HIV risk behaviours both prior to and following an HIV diagnosis. The extent to which HIV-positive trauma survivors participate in other types of behaviours that compromise health (e.g. smoking and poor nutrition) is unclear, although there seems to be a general pattern of poor self-care in this population that relates to a trauma history. At present, very little is known about the impact of trauma exposure and PTSD on adherence in individuals living with HIV, although many of the factors known to disrupt adherence to antiretroviral therapy (e.g. psychological distress, depression, and mistrust) are often observed in trauma survivors. In future studies it will be important to define the unique challenges to adherence faced by HIV-positive trauma survivors. Existing data also suggest that trauma exposure and PTSD can compromise immune functioning in HIV-positive individuals. However, longitudinal research is needed to establish whether there is a link between immune system changes and disease progression, and/or the development of specific illnesses in HIV-positive trauma survivors.

A critical focus for future research will be the evaluation of psychological treatments for individuals living with HIV and PTSD or PTSD/SUD. It remains an empirical question whether existing treatments, whose efficacy has been established with HIV-negative trauma survivors, will lead to positive outcomes (e.g. decreased PTSD and depression, improvements in psychosocial functioning, and decrease in substance use) in individuals living with HIV, or whether existing interventions must be modified to achieve similar outcomes. In particular, researchers have suggested that it may be important to consider the influence of social context in designing treatments for individuals living with HIV (Kimerling et al., 1999b). Having effective treatments for PTSD or PTSD/SUD available for HIV-infected individuals is likely to become increasingly important, given the rising rate of new infections among low-income, minority women (Centers for Disease Control and Prevention, 2002), many of whom are at risk for trauma exposure and PTSD.

It is also essential to determine whether PTSD treatments can ultimately improve health outcomes in the HIV-positive population. Interventions that utilize anxiety management training and cognitive restructuring, and focus heavily on coping, have been shown to improve adherence and provide a buffer against the negative impact of trauma on immune functioning. Future studies will need to determine whether these or other types of PTSD treatment also have the ability to enhance the effectiveness of risk reduction strategies to reduce negative health behaviours.

Finally, researchers will need to evaluate alternative models for integrating specialized services for PTSD or PTSD/SUD with HIV medical care. Some of the critical unanswered questions include whether integrated models of care can: (1) increase the number of HIV-positive trauma survivors who receive care for PTSD or PTSD/SUD; (2) lead to a reduction in symptoms of PTSD and/or an SUD; and (3) help to decrease participation in negative health behaviours, and improve adherence, immune function, and health outcomes. It is only through additional research focused on these specific problems that we will be able to develop the most effective and comprehensive treatments for this population.

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HIV/AIDS Treatment Adherence, Health Outcomes and Cost Study Group

Steering Committee

Seth Kalichman (Steering Committee chair), University of Connecticut, Storrs, CT; Mary C. Knipmeyer (CMHS programme director), CMHS, SAMHSA, Rockville, MD; Phil Meyer (consumer liaison), Los Angeles, CA; James Bell (co-ordinating centre principal investigator), James Bell Associates, Arlington, VA; Marcia Andersen (principal investigator), Well-Being Institute, Detroit, MI; Robert Calsyn (principal investigator), University of Missouri, St Louis, MO; Terence Keane (principal investigator), Boston University School of Medicine, Boston, MA; Stanley Sacks (principal investigator), National Development & Research Institutes, Inc., New York; Tomas Soto (principal investigator), Cook County Bureau of Health Services/CORE Center, Chicago, IL; Karina Uldall (principal investigator), University of Washington, Seattle, WA; Mark Winiarski (principal investigator), Montefiore Medical Center, Bronx, NY; Kathryn Whetten (principal investigator), Duke University, Durham, NC.

Federal collaborators

Mary C. Knipmeyer, CMHS (lead agency), SAMHSA, Rockville, MD; David Thompson, Ali Manwar, CSAT, SAMHSA, Rockville, MD; Philomena Green-Morsell, Melinda Tinsley, HIV/AIDS Bureau, HRSA, Rockville, MD; David M. Stoff, NIMH, NIH, Bethesda, MD; Jerry Flanzer, NIDA, NIH, Bethesda, MD; Kendall Bryant, Michael Hilton, NIAAA, NIH, Bethesda, MD.

Collaborating scientists: co-principal investigators and co-investigators

Peter Arno, Montefiore Medical Center, Bronx, NY; Karen Bonuck, Montefiore Medical Center, Bronx, NY; Deborah Brief, Boston University School of Medicine, Boston, MA; Christopher J. Conover, Duke University, Durham, NC; Patrick Flynn, National Development & Research Institutes, Inc., Raleigh, NC; Victoria Harris, University of Washington, Seattle, WA; Thomas W. Helminiak, University of Missouri, St Louis, MO; Ann Hendricks, Boston University School of Medicine, Boston, MA; W. Dean Klinkenberg, Missouri Institute of Mental Health, St Louis, MO; Alec Miller, Montefiore Medical Center, Bronx, NY; Darlene Mood, Well-Being Institute, Detroit, MI; Gary A. Morse, Community Alternatives, St Louis, MO; Susan Pfoutz, Well-Being Institute, Detroit, MI; Jim Porto, National Development & Research Institutes, Inc., Chapel Hill, NC; Rebecca Roberts, Cook County Hospital, Chicago, IL; Renslow Sherer, Cook County Bureau of Health Services/CORE Center, Chicago, IL; Laura Sadowski, Cook County Hospital, Chicago, IL; Geoffrey Smereck, Well-Being Institute, Detroit, MI; Marvin Swartz, Duke University Medical Center, Durham, NC; Glenn Trezza, Boston VA Medical Center, Boston, MA; Marcia Weaver, University of Washington, Seattle, WA; Robert Weinstein, Cook County Hospital, Chicago, IL.

Project co-ordinators/directors

Andreas Bollinger, Boston University School of Medicine, Boston, MA; Raymond Cruthis, Community Alternatives, St Louis, MO; Lori Greene, Nancy Palmer, Maite Villanueva, Montefiore Medical Center, Bronx, NY; Carolyn Mildner, Cook County Bureau of Health Services/CORE Center, Chicago, IL; JoAnn Sacks, National Development & Research Institutes, Inc., New York; Rose Schulte, University of Washington, Seattle, WA; Rachel Stevens, Duke University, Durham, NC; Jannie Tinsley, Well-Being Institute, Detroit, MI; John Yagelka, National Development & Research Institutes, Inc., New York.

Co-ordinating centre

James Bell, Cheryl McDonnell, Michelle Pillen, Jill Hensley (consultant), Carolyn Lichtenstein (consultant), James Bell Associates, Arlington, VA; Susan Ettner, University of California at Los Angeles, School of Medicine, Los Angeles, CA; Jennifer Havens, Columbia-Presbyterian Medical Center, New York; Claude Mellins, New York State Psychiatric Institute, New York.

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