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## Resilience and HIV: A review of the definition and study of resilience

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### Abstract

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People living with Human Immunodeficiency Virus (PLWH) face numerous adversities at the individual, interpersonal, and neighborhood levels, which have been linked to negative health behaviors and outcomes. Therefore, there is a growing interest in studying resilience among PLWH to inform future research and intervention efforts. We use a socioecological model of health to define resilience, review the definition and study of resilience among PLWH in the existing peer-reviewed literature, and discuss the strengths and limitations of how resilience is defined and studied in HIV research. We conducted a review of resilience research among for HIV-related behaviors/outcomes of antiretroviral therapy (ART) adherence, clinic attendance, CD4 cell count, viral load, viral suppression, and/or immune functioning among PLWH. We performed searches using PubMed, PsycINFO and Google Scholar databases. The initial search generated 14,296 articles across the three databases, but based on our screening of these articles and inclusion criteria,  $n = 54$  articles were included for review. The majority of HIV resilience research defines resilience only at the individual (i.e., psychological) level or studies individual and limited interpersonal resilience (e.g., social support). The exclusion of neighborhood resilience and more interpersonal factors contrasts with qualitative and quantitative evidence that describes these factors as resilience resources for PLWH. Furthermore, the preponderance of HIV resilience research uses general measures of psychological or interpersonal resilience; these measures have not been developed with or tailored to the needs of PLWH. Our review suggests that a socioecological model of health approach can more fully represent the construct of resilience. Furthermore, measures specific to PLWH that capture individual, interpersonal, and neighborhood resilience are needed. Future research should develop and test multilevel resilience measures for PLWH.

### Keywords

resilience; HIV; multilevel; socioecological model

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### Introduction

People living with Human Immunodeficiency Virus (HIV) (PLWH) continue to face numerous adversities at the individual (e.g., trauma), interpersonal (e.g., stigma), and neighborhood (e.g., socioeconomic deprivation and violence) levels (Dale et al., 2014a; Earnshaw, Bogart, Dovidio, & Williams, 2013; Fullilove, 2006; Latkin, German, Vlahov, & Galea, 2013; Nunn et al., 2014; Pellowski, Kalichman, Matthews, & Adler, 2013). These adversities have been linked to worse health behaviors (e.g. lower HIV medication adherence, poorer clinic attendance) and outcomes (e.g. less viral suppression) (Holtzman, Brady, & Yehia, 2015; Howe et al., 2014; Langebeek et al., 2014; Mugavero, Amico, Horn, & Thompson, 2013). Given the adversities faced by PLWH, resilience resources may facilitate good health behaviors and outcomes, potentially enabling PLWH to overcome the negative effects of adversities (De Santis, Florom-Smith, Vermeesch, Barroso, & DeLeon, 2013; Earnshaw et al., 2013).

While resilience refers to overcoming adversities, it has been defined in multiple ways and mostly as resources related to an individual's personality characteristics (Bonanno, 2004; Connor & Davidson, 2003; Leipold & Greve, 2009; Luthar, Cicchetti, & Becker, 2000;

Masten, 2001). However, the definition of resilience used in this paper incorporates recent insights from existing resilience literature (Fletcher & Sarkar, 2013) and a Socioecological Model of Health (SMH) (Baral, Logie, Grosso, Wirtz, & Beyrer, 2013). A SMH posits that health is influenced by factors at the individual, interpersonal, neighborhood, and societal/policy levels (Baral et al., 2013). Therefore, a SMH may be beneficial in framing resilience as a multi-component construct with direct relevance to the lives of PLWH.

Based on this SMH framework, we define resilience resources as positive psychological, behavioral, and/or social adaptation in the face of stressors and adversities (Fletcher & Sarkar, 2013) that draws upon “an individual’s capacity, combined with families’ and communities’ resources to overcome serious threats to development and health” (Earnshaw et al., 2013; Unger, 2008). Resilience resources may protect the health of PLWH via promotion of positive health behaviors (e.g., engagement in care, antiretroviral therapy (ART) adherence) and buffering of adversities (e.g., trauma) on mental health, health behaviors, and physiological functioning (Dale et al., 2014a; Emlet, Shiu, Kim, & Fredriksen-Goldsen, 2017; O’Leary, Jemmott, Stevens, Rutledge, & Icard, 2014; Saucedo, Wiebe, & Simoni, 2014; Spies & Seedat, 2014). Resilience resources are also viewed here as processes that buffer against and are potentially more malleable to intervention than some of the aforementioned adversities at the individual, interpersonal, and neighborhood levels (Dale, Grimes, Miller, Ursillo, & Drainoni, 2016; De Santis et al., 2013; Kent, Davis, Stark, & Stewart, 2011; M. Steinhardt & Dolbier, 2008).

The multilevel adversities faced by PLWH warrant a multi-component resilience definition and study (i.e. individual, interpersonal, and neighborhood components) to (1) fully understand resilience among PLWH and (2) intervene in a comprehensive manner to promote good health behaviors and outcomes for PLWH. Moreover, a synthesis of the evidence for how a multilevel resilience resource approach has been incorporated into HIV research is needed. Thus, the objectives of this paper are to (1) review the definition and study of resilience resources among PLWH as it relates to important health behaviors and outcomes (i.e. ART adherence, viral suppression, CD4 count, and clinic attendance); (2) identify gaps in the existing literature on resilience and HIV-related health behaviors and outcomes; and (3) provide recommendations for future research. Completing these objectives may inform the design and conduct of multilevel (including structural) interventions to enhance resilience and good behavioral/health outcomes among PLWH and thereby reduce HIV-related mortality and morbidity.

## Methods

### Search Strategy

We performed searches using PubMed, PsycINFO and Google Scholar databases. While we completed unrestricted searches in PubMed and PsycINFO, we limited our examination of Google Scholar records to the first 300; this approach is consistent with best practice guidelines for using Google Scholar to conduct searches of the peer-reviewed literature (Haddaway, Collins, Coughlin, & Kirk, 2015). The two first authors (AJD and SKD) identified key search terms based upon expertise in resilience and HIV (Dale et al., 2014a; Dale et al., 2014b; Dale et al., 2015). We also drew upon the work of Martin et al., (2015)

that constructed a multilevel resilience measure for low-income families and a multilevel resilience framework for HIV prevention proposed by Herrick and colleagues (2014). We conducted a Boolean search using the 31 search terms that are listed in Table 1.

### Inclusion and Exclusion Criteria

To be eligible for inclusion, the studies had to be published prior to January 1, 2018, in English in a peer-reviewed journal, and used the term “resilience” or included resilience-related key words. Additional inclusion criteria required that the specific HIV-related outcomes were ART adherence, clinic attendance, CD4 cell count, viral load, viral suppression, and/or immune functioning. We excluded studies that included children, did not focus solely on PLWH, focused on measure development, focused on mental health as an outcome, and were interventions and/or housing studies. While it can be argued that housing may represent a neighborhood resilience resource associated with favorable HIV outcomes, we excluded housing studies because a systematic review of housing status and HIV was published recently (see Aidala et al., 2016).

### Study Selection and Data Extraction

The two first authors and (seven) students/staff members performed initial database searches and selected articles for review. To depict the article selection process (see Figure 1), we used a modified PRISMA 2009 Flow Diagram (Moher, Liberati, Tetzlaff, Altman, & Group, 2009). The initial search generated 14,296 articles across the three databases. We then removed the article titles unrelated to HIV  $n = 13,948$  and duplicates  $n = 253$ . This resulted in 95 articles eligible for full-text review. Based on our inclusion criteria,  $n = 54$  articles were selected for inclusion and are summarized in Table 2.

In the included studies, resilience resources were examined as exposure variables only ( $n = 30$ ), both exposure and mediator or moderator variables ( $n = 15$ ), other variables (e.g., mediators, covariates) ( $n = 4$ ), or as an outcome only ( $n = 5$ ). Analysis of the included articles is guided by a SMH. For the resilience definition component, we indicate whether the definition is at the individual-, interpersonal-, or neighborhood/community-level only, or whether it is multilevel (i.e., two components or all three components of a SMH included in the definition). Please note that to be consistent with the methods and results from the included studies, we use neighborhood/community-level resilience resources to refer to geographic boundaries. We also used the abovementioned approach to summarize study results of the associations between resilience and the HIV-related outcomes described in the study inclusion criteria.

### Study Characteristics

The study design and characteristics are presented in Table 2; 31 studies were cross-sectional, 22 were longitudinal, and 1 was a retrospective case-control study. Thirty-two studies were conducted in the U.S. and/or a U.S. territory, 3 were multinational, 3 were from South Africa, 2 were from Kenya, 2 were from India, 2 were from Hong Kong, 1 study was published in Russia, Nepal, England, Mexico, Nigeria, Italy, Sweden, and Malawi, respectively and 2 studies did not report a location.

## Results

### Definition of Resilience Resources

**Use of the term “resilience.”**—The majority of articles (50 out of 54; 92.5%) did not mention the construct, “resilience,” or provide a definition. These studies used related terms and constructs such as psychosocial factors, psychological factors, personal resources, protective factors, optimism, hardiness, self-efficacy, spirituality/religiousness, coping, personality state and trait characteristics, and/or social support. Two articles did not include the construct, “resilience,” but the authors provided definitions that aligned with resilience. Three articles mentioned “resilience” and two defined the construct.

**Individual Level:** Even though Solano et al., (1993) did not mention resilience, they referred to personality characteristics (i.e., fighting spirit or positive mood) in the face of conflict or loss; this aligns with general definitions of trait resilience that have been presented by others (Connor & Davidson, 2003; Hu, Zhang, & Wang, 2015; Tugade, Fredrickson, & Barrett, 2004). O’Cleirigh et al., (2007) mentioned resilience as a mechanism for the protective effects of conscientiousness on health outcomes. In their view, conscientiousness may protect individuals from engaging in health damaging behaviors via active coping and greater resilience to distress; the example of resilience was “less catastrophic disease-related stressor appraisals and lower levels of depressive symptomatology.” Dale and colleagues (2014a), defined resilience as “a combination of personality characteristics and successful coping that allows an individual to function adaptively in the face of or following adversity.” Pecoraro and colleagues (2016) defined resilience as the “ability to resist negative psychological responses when confronted with stress or trauma.” Both Dale et al., and Pecoraro et al., (Dale et al., 2014a; Pecoraro et al., 2016) supplemented their definitions by providing examples of resilience resources at the individual level.

No article included definitions of resilience at interpersonal-, neighborhood/community-, or multi-levels.

### Associations between Resilience Resources and HIV-related Outcomes

**Individual Level:** Ten of the articles examined resilience resources at the individual level. Four of these studies examined ART adherence only. These studies found that higher self-efficacy (Colbert, Sereika, & Erlen, 2013; Mo & Mak, 2009; Reif et al., 2013; Wolf et al., 2007) and lower avoidant coping scores (Mo & Mak, 2009) were associated positively with ART adherence. Tomakowsky et al., (2001) examined CD4 cell count as the outcome; they found that explanatory style optimism was predictive of a decline in CD4 cell count.

Five U.S.-based studies examined multiple HIV-related outcomes. These studies found significant relationships between individual-level resilience resources (e.g., patient activation, optimism, conscientiousness) with ART adherence (Marshall et al., 2013; Milam, Richardson, Marks, Kemper, & McCutchan, 2004), CD4 cell count (Ironson et al., 2005; Marshall et al., 2013; Milam et al., 2004; O’Cleirigh et al., 2007); and viral suppression (Ironson et al., 2005; Marshall et al., 2013; O’Cleirigh et al., 2007). Higher Connor-

Davidson Resilience Scale scores were associated positively with higher levels of ART adherence and with increased odds of having an undetectable viral load in work by Dale et al., (2014a); these relationships were moderated by histories of abuse.

**Interpersonal Level:** Fourteen articles examined interpersonal level resilience resources. Six studies examined ART medication adherence as the outcome variable. All of these studies examined social support. General social support was associated positively with ART adherence in the Poudel et al., (2015), Afolabi et al., (2013), Huynh et al., (2013), Murphy et al., (2004), and Power et al., (2003) studies. However, Södergård et al., (2006) did not find significant associations of social support for medication taking with ART adherence. Additionally, Afolabi and colleagues (2013) found that those adherent to ART had normal family functioning while Murphy et al., (2004) found that social attachment and reassurance of worth were associated with ART adherence.

The remaining studies examined outcomes such as clinic attendance, viral load, and/or disease progression. In some of these studies, social support was associated with clinic attendance (Waldrop-Valverde, Guo, Ownby, Rodriguez, & Jones, 2014) and delayed time to care (McCoy et al., 2009). In other studies, there were no significant relationships of social support with ART adherence (Sagarduy, Lopez, Ramirez, & Davila, 2017), entry into care (Williams, Shahryarnejad, Andrews, & Alcabes, 1997), viral load or ART adherence (Attonito, Devieux, Lerner, Hospital, & Rosenberg, 2014; Safren et al., 2014). However, in the Friedman et al., (2017) study, social support was associated negatively with viral load and in the work of Leserman and colleagues (2002), less social support predicted HIV disease progression.

**Neighborhood/Community-Level:** One study examined these resilience resources. Zachariah et al., (2007) found that PLWH who received neighborhood/community-level resilience resources (e.g., community centers, a community health worker) were more likely to be alive and on ART than those residing in communities without these resources.

**Multi-level:** Twenty-seven articles examined resilience resources at multiple levels.

**Individual and Interpersonal Level:** Twenty-three studies examined resilience resources at the individual and interpersonal levels; of these, 12 articles examined ART adherence as the only outcome. Some study findings indicated that trait-level control beliefs (Cook, Schmiege, Bradley-Springer, Starr, & Carrington, 2017), social support (Catz, Kelly, Bogart, Benotsch, & McAuliffe, 2000; Peltzer, Friend-du Preez, Ramlagan, & Anderson, 2010), coping self-efficacy (Kamau, Olson, Zipp, & Clark, 2011), and treatment self-efficacy (Catz et al., 2000; Simoni, Frick, Lockhart, & Liebovitz, 2002) were associated positively with medication adherence or time adherence for medication taking. Simoni et al., (2002) also found that treatment self-efficacy mediated the relationship between need for social support and nonadherence to ART. However, Peltzer et al., (2010) found that spirituality exhibited an inverse relationship with ART. The Cha et al., (2008) article tested a model of ART adherence that was also used by Kekwaletswe and colleagues (2017). Both of the aforementioned studies found indirect associations of social support with ART adherence via

medication taking self-efficacy and that self-efficacy mediated the relationship of depression on ART adherence.

The remaining studies that examined ART adherence as the only outcome examined resilience resources such as mood, engagement with medical provider, and social problem solving. Harzke et al., (2004) did not find associations between resilience resources and ART adherence. In contrast, other study findings suggested that control beliefs and social support (Cook, Schmiede, Starr, Carrington, & Bradley-Springer, 2017) and social problem solving (Johnson, Elliott, Neilands, Morin, & Chesney, 2006) indirectly affected ART adherence via motivation (Cook, Schmiede, Starr, et al., 2017) and psychological health (e.g., social provisions and positive states) (Johnson et al., 2006). In the study conducted by Luszczyńska and colleagues (2007), finding benefits in being an HIV patient partially mediated the relationship of self-efficacy with ART adherence while self-efficacy mediated associations of social support with ART adherence. Molassiotis et al., (2002) found that some resilience resources were positively (e.g., internal locus of control) or negatively (e.g., family support for medication taking) associated with ART adherence

Three articles examined resilience resources associated with healthcare engagement among PLWH. These studies suggested that PLWH who were engaged-in-care had higher proactive coping (Pecoraro et al., 2016), greater HIV treatment adherence self-efficacy (Chen et al., 2013), social support (Colasanti, Stahl, Farber, del Rio, & Armstrong, 2017; Pecoraro et al., 2016), and more spirituality/religious beliefs (Pecoraro et al., 2016). However, Chen et al., (2013) also found that PLWH with better healthcare provider engagement had lower self-esteem.

Two studies, examined immune response (CD4 cell count) as the only outcome. While Trevino et al., (2010) did not find that resilience resources (e.g., positive religious coping, social support) were predictive of CD4, Pandey et al., (2017) found that social support partially mediated the association between hardiness and higher immune response.

The remaining six articles examined multiple HIV outcomes (e.g., CD4, viral load). In the Weaver et al., article (2005), neither individual (i.e., approach-oriented coping) nor interpersonal (i.e., social support) level resilience were directly associated with medication adherence. Solano and colleagues (1993) found that fighting spirit was higher in unchanged subjects (i.e., not symptomatic) and that low hardiness predicted a CD4 cell count decrease. Ironson and colleagues (2006) found that spirituality predicted greater preservation of CD4 and better viral load control. Kremer and colleagues (2013) found that multiple dimensions of compassionate love (e.g., self) predicted undetectable viral load and CD4 cell count preservation. Turan and colleagues (2016) found that an experience sampling method measure of treatment self-efficacy predicted medication adherence, visit adherence, CD4 cell count, and viral load. Additionally, in the work by Thornton et al., (2000) men living with HIV who scored in the lowest tertile of acceptance coping had five-fold greater risk of AIDS-related complex and AIDS diagnosis at follow-up.

**Interpersonal- and Neighborhood/Community-Level:** Four studies examined interpersonal and neighborhood/community-level resilience resources on ART adherence (n

= 3) or CD4 and viral load (n = 1). Regarding ART adherence, neither Kioko and colleagues (2017) nor Bogart et al., (2015) found significant relationships between social support and ART adherence. However, there were associations of structural support interaction with stigma (Bogart et al., 2015) and not belonging to an HIV support group (Berg et al., 2004) with lower ART adherence. Wouters and colleagues (2009) found that multilevel social support was associated with higher CD4 cell count and viral suppression over time.

**Individual-, Interpersonal-, and Neighborhood/Community-Level:** Although two studies included resilience resources (e.g., self-efficacy, self-compassion, social support, social capital) at all three levels, only self-efficacy was associated with ART adherence in the studies by Nokes and colleagues (2012) and Corless et al., (2017).

## Discussion

Based on our review of the literature, we conclude that there are significant gaps in the field of HIV resilience research and opportunities to advance scholarship in this area. Specifically, only two studies defined resilience. The common theme across these definitions was the focus on individual-level resilience resources. There is growing criticism that defining resilience exclusively as an individual-level phenomenon ignores the social context and social systems in which resilience may occur (Earnshaw et al., 2013; Herrick et al., 2014; Shaw, McLean, Taylor, Swartout, & Querna, 2016; Unger, 2008).

In the commentary of Shaw et al., the authors underscore that the majority of resilience research uses an individual-level definition even though resilience is complex and multilevel. Herrick and colleagues (2014) propose a multilevel resilience framework for HIV prevention and argue that resilience resources may be important in conferring positive health outcomes to gay and bisexual men who face adversities. This work cites novel resilience resources (e.g., neighborhood affirmation) to support a multilevel definition of resilience. Also, the multilevel nature of resilience is supported by the grounded theoretical approach used by De Santis et al., (2013) to identify intrinsic (e.g., spirituality) and extrinsic (e.g., social support, advocacy) resilience resources among PLWH.

Recent scholarship across a variety of disciplines supports arguments to define resilience at multiple levels of a socioecological model of health. These research findings indicate that resilience resources exist at multiple levels and that each of these levels [(i.e., individual (Davidson et al., 2012; Earnshaw et al., 2013; Kent et al., 2011; M. A. Steinhardt, Mamerow, Brown, & Jolly, 2009); interpersonal (Earnshaw et al., 2013; M. A. Steinhardt et al., 2009); and neighborhood/community (Earnshaw et al., 2013; Herrick et al., 2014; Latkin et al., 2013)] is important. Given these findings, more studies should include definitions of resilience and should incorporate a socioecological perspective into the definition (Shaw et al., 2016).

Almost half of the articles reviewed focused on resilience resources at one level of a socioecological model of health. Of these articles, the majority examined interpersonal resilience resources with general social support being the resilience resource examined most often. While the evidence for associations between social support and viral load was mixed



(Attonito et al., 2014; Friedman et al., 2017), the majority of the aforementioned studies found positive relationships of social support with ART adherence, clinic attendance, and disease progression. In the only study that examined social support specific to chronic disease management, Södergård et al., (2006) found that social support for medication taking was not associated with ART adherence. The second most frequently examined resilience resource level was the individual level. The majority of these studies examined self-efficacy and found consistent support for this resilience resource on multiple outcomes (i.e., ART adherence, CD4 cell count, and viral suppression). Two studies (Dale et al., 2014a; Milam et al., 2004) examined other resilience resources, optimism and resilience (Connor-Davidson Resilience Scale), and found support for associations with CD4 cell count, ART adherence, and viral load. Lastly, only one study (Zachariah et al., 2007) examined neighborhood/community level resilience resources among PLWH in Africa; and found support for this resilience resource on ART adherence.

The remaining studies used a multilevel resilience resource perspective, with the overwhelming majority examining individual and interpersonal level resilience resources. These studies focused mostly on associations of resilience resources such as coping, self-efficacy, control beliefs, and social support with ART adherence. Although the findings regarding the aforementioned relationships were mixed [(e.g., (Harzke et al., 2004; Simoni et al., 2002)], the majority of the findings supported associations between social support and ART adherence [e.g., (Kekwaletswe et al., 2017; Peltzer et al., 2010)]. Some of the longitudinal findings indicated that control beliefs (Cook, Schmiede, Bradley-Springer, et al., 2017), social support (Cook, Schmiede, Bradley-Springer, et al., 2017) and self-efficacy for medication taking (Cha et al., 2008) predicted ART adherence. Some studies examining ART included other resilience resources such as medical provider communication, positive feelings, and managing mood; again there was mixed support for associations between these resilience resources and ART adherence [e.g., (Harzke et al., 2004; Molassiotis et al., 2002)]. The majority of the studies that looked at multiple HIV outcomes were longitudinal in nature. Findings from these studies indicated that resilience resources such as social support, hardiness, optimism, spirituality, compassionate love, and proactive coping, predicted CD4 cell count (Ironson et al., 2006; Kremer et al., 2013; Solano et al., 1993) and lower viral load (Ironson et al., 2006; Kremer et al., 2013). Another longitudinal study found that treatment self-efficacy also predicted medication adherence, visit adherence, CD4 cell count, and viral load (Turan et al., 2016). Three of the studies examined resilience resources that were associated with healthcare engagement and found that individual and interpersonal resources were critical to remaining engaged-in-care (Chen et al., 2013; Colasanti et al., 2017; Pecoraro et al., 2016).

Of the multilevel resilience resource studies, four included both interpersonal- and neighborhood/community-level resilience resources; the findings from these studies were mixed with regard to ART adherence or viral load and CD4 [e.g., (Kioko & Pertet, 2017; Wouters et al., 2009)]. Only two studies (Corless et al., 2017; Nokes et al., 2012) examined individual, interpersonal, and neighborhood/community-level resilience resources. In these two studies, only adherence self-efficacy was associated with ART adherence. However, in the work of Nokes and colleagues (2012), it appears that social support and social capital were combined in analyses which may limit the interpretability of their findings.

Although this review included a large number of research studies, there remain opportunities for future HIV resilience research. These include examining resilience from a multilevel perspective, developing multilevel resilience measures tailored to PLWH, and examining adversities other than HIV. Although many studies examine multilevel resilience resources, 23 of the 27 studies focus on individual and interpersonal resilience resources. Few studies examine both interpersonal and neighborhood/community resilience resources or resilience resources at all three levels. Also, the majority of the studies included in the review overwhelmingly include general measures of interpersonal resilience resources that are not specific to living with HIV or focus on individual-level resilience resources while excluding potential neighborhood/community resilience resources. The studies that do include resilience resources specific to living with HIV mostly examine HIV-specific self-efficacy measures [(e.g., (Nokes et al., 2012; Wolf et al., 2007)]; very few studies include measures of social support specifically for PLWH or include neighborhood/community-level resilience resources specific to PLWH. While there are some published studies that have developed measures specific to PLWH, these studies mostly include measures developed at the individual level (e.g., HIV Self-Efficacy, health-related resilience, treatment optimism) (Brennan et al., 2009; Erlen, Cha, Kim, Caruthers, & Sereika, 2010; Renwick, Halpen, Rudman, & Friedland, 1999) while a few measure social support for PLWH (Cortes, Hunt, & McHale, 2014).

Qualitative studies of resilience among PLWH highlight the limitations of existing quantitative studies and extant measures (Bartone, Ursano, Wright, & Ingraham, 1989; Connor & Davidson, 2003; Wagnild & Young, 1993). Qualitative findings indicate that among PLWH, mastery for management of HIV is important but absent from most resilience measures (Emlet, Tozay, & Raveis, 2011; Hussen et al., 2014; Kaplan et al., 2014; Teti, French, Bonney, & Lightfoot, 2015). Other studies suggest that interpersonal resilience components (e.g., HIV support groups and relationships with healthcare professionals) are important but are excluded from most measures (Emlet et al., 2011; Hussen et al., 2014; Kaplan et al., 2014; Teti et al., 2015), or need further development as evidenced by the limited inclusion of social support specific for PLWH in the reviewed studies (Molassiotis et al., 2002; Sodergard et al., 2006). Neighborhood social capital (e.g., availability of clinics that distribute equipment and financial vouchers, and availability of supportive organizations for PLWH) may also be critical to fostering positive adaptation to adversities (Emlet et al., 2011; Hussen et al., 2014; Kaplan et al., 2014; Tariq et al., 2016; Teti et al., 2015), yet these components have been excluded from the most used resilience measures. The qualitative findings indicate the need for resilience measures that are better tailored to HIV-related resilience resources. Additionally, most studies included in this review focused only on living with HIV as the adversity. PLWH encounter multiple adversities and future studies should consider the relationships and interactions between these different types of adversities and resilience resources with HIV-related health behaviors and outcomes. Taken together, these research gaps suggest that definitions of resilience as multilevel resources, multilevel resilience measures specific to PLWH, and examination of additional adversities are warranted.

## Limitations

Our review sheds light on gaps within the literature regarding how resilience has been defined and studied among PLWH in relation to HIV health behaviors and outcomes; nonetheless, there are a few limitations. First, our review excluded studies of children and adolescents and given that their lives and experiences are often examined within the context of their families and neighborhood/community systems (e.g. schools), perhaps a broader review would have yielded additional insights about resilience at the interpersonal and neighborhood/community levels [e.g., see (Betancourt, Meyers-Ohki, Charrow, & Hansen, 2013)]. Second, we did not include “medical care” in our search term and may have missed some multilevel resilience studies; however, many of the studies identified using the search criteria referred to engagement in care (i.e., medical care). Also, we did not include other outcomes such as mental health or quality of life; these studies may have included multilevel approaches to resilience. Despite these limitations, our review provides implications for next steps in advancing the study, definition, and measurement of resilience among PLWH.

## Conclusions

PLWH face multiple adversities and resilience resources at the individual, interpersonal, and neighborhood/community levels may be important in helping them to thrive with good health behaviors and outcomes despite these adversities. However, the overwhelming focus on individual-level resilience resources in studies among PLWH misses the opportunities to understand fully the range of resilience resources at the interpersonal and neighborhood/community levels that may be pivotal in empowering PLWH to adapt positively and strive in the face of adversity. Using a SMH to guide the study of resilience is likely to advance the understanding of resilience resources among PLWH and inform interventions to enhance their resilience.

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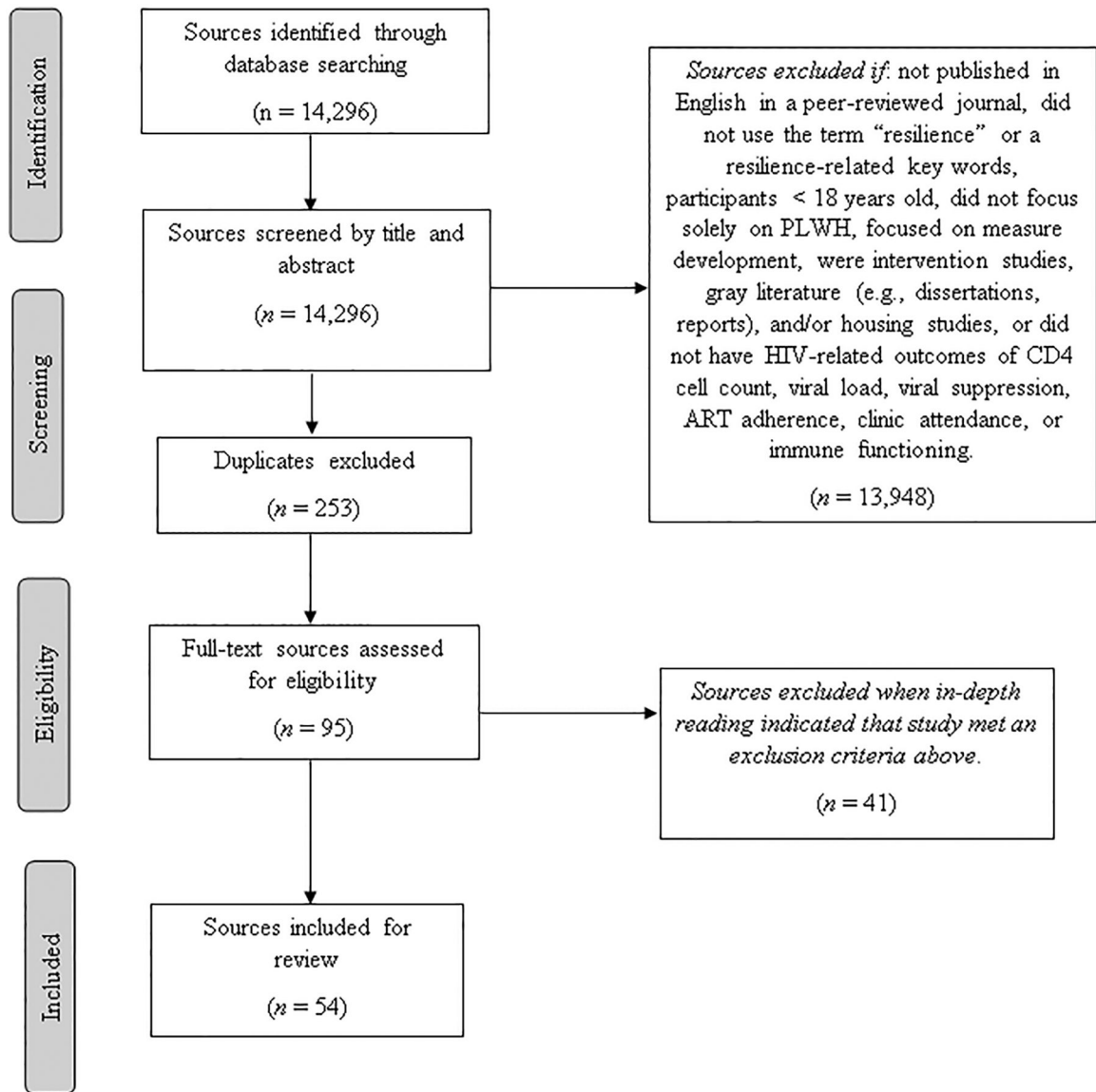
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**Figure 1.**  
PRISMA flow diagram of article review and inclusion

**Table 1.**

Search Terms Used in PubMed, PsycINFO and Google Scholar

Search Term
Resilience resources AND HIV
Measure AND resilience AND HIV
Scale AND resilience AND HIV
Resilient resources AND HIV
Measure AND resilient AND HIV
Scale AND resilient AND HIV
Measure AND strength AND HIV
Scale AND strength AND HIV
Measure AND hardiness AND HIV
Scale AND hardiness AND HIV
Measure AND optimism AND HIV
Scale AND optimism AND HIV
Measure AND self-efficacy AND HIV
Scale AND self-efficacy AND HIV
Measure AND protective factors AND HIV
Scale AND protective factors AND HIV
Scale AND adaptation AND HIV
Measure AND adaptation AND HIV
Scale AND adversity AND HIV
Measure AND adversity AND HIV
Measure AND coping AND HIV
Scale AND coping AND HIV
CD-RISC AND HIV
Measure AND social support AND HIV
Scale AND social support AND HIV
Neighborhood resources AND HIV AND measure
Neighborhood resources AND HIV AND scale
Community resources AND HIV AND measure
Community resources AND HIV AND scale
Neighborhood environment AND HIV AND scale
Neighborhood environment AND HIV AND measure

**Table 2.** Literature review findings of multilevel resilience resources among Persons Living With HIV (PLWH) on HIV-related health behaviors and outcomes

First Author, Year	How Was Resilience Defined?	What was the adversity?	Research Design (Longitudinal, Cross-Sectional)	Location	Sample	Resilience is independent or other variable	Resilience Measure	Level of Resilience Resource	HIV Health Behavior or Health Outcome	Key findings between resilience & outcome measure
Solano, et al. (1993)	Resilience not specifically mentioned, however, the article refers to personality features (i.e., fighting spirit or positive mood) in relation to chronic disease survival	Living with HIV	Longitudinal	Italy	100 PLWH; 74 males and 26 females;	IV	Social support: Social Support Scale; Hardiness: Hardiness Scale; Psychological Attitudes - Fighting Spirit using three stories	ML (I, Int)	Clinical Evolution (i.e., unchanged/symptomatic); CD4 obtained from blood samples	At 12 months, fighting spirit was higher in unchanged participants. There was an interaction between immunological factors and hardiness control subscale scores such that low hardiness was higher in symptomatics who had low CD4 at baseline.
Friedman, et al. (2016)	Resilience mentioned but not defined	Living with HIV, psychosocial syndemics (e.g., depression, condomless sex)	Longitudinal	USA, Illinois, Pennsylvania, California, Maryland	712 PLWH; 100% male; 14.9% Hispanic, 59.3% White, 24.7% Black	IV, moderator	Social support- Functional Social Support	Int	Viral load: Obtained from blood draws	Compared to men with low levels of social support, men with medium and high levels of social support had lower viral loads and were more likely to have viral load suppression. Social support moderated the effects of syndemic indicators on higher viral load; among this subgroup, those reporting higher social support had more viral suppression over time.
Simoni MJ, et al. (2002)	NR	Living with HIV	Cross-sectional	USA, New York	50 PLWH; 31 women and 19 men; 52% African American (52%) and 30% or Puerto Rican	IV and mediator	Social Support: Modified UCLA Social Support Inventory; Self-efficacy: Self-efficacy to adhere to prescribed medications.	ML (I, Int)	ART adherence: AACTG medication adherence and a self-report measure of acknowledged nonadherence	Receipt of social support was not associated with adherence, thus examination of self-efficacy as a mediator of this relationship was not conducted. Self-efficacy was positively associated with time adherence and inversely correlated with acknowledged nonadherence. Self-efficacy mediated the relationship between need for social support and acknowledged nonadherence.
Catz, et al. (2000)	NR	Living with HIV	Longitudinal	USA, Wisconsin	72 PLWH; 87% men and 13% women; Race/ethnicity 36% African Americans, 56% Caucasians and 8% other	IV	Social support: Social Attachment subscale of the Social Provisions Scale; Self-efficacy: Treatment adherence self-efficacy; Uncategorized: Adherence self-promotion strategies	ML (I, Int)	ART adherence: self-reported ART Adherence	Low social support and low treatment adherence self-efficacy were associated with increased odds of missing medication doses. There were no significant differences in adherence self-promotion strategies between adherers and non-adherers to ART.
Trevino, et al. (2007)	NR	Living with HIV	Cross-sectional and longitudinal	USA, Washington DC, Pennsylvania and Ohio	429 PLWH; 85.5% male; Race/ethnicity: 52.7% African American and 47.3% Caucasian	IV	HIV Mastery: HIV/AIDS-Targeted Quality of Life scale; Social Support: Brief Interpersonal Support Evaluation: Spirituality/Religion: Functional Assessment of Chronic Illness Therapy-Spiritual	ML (I, Int)	CD4: Obtained from medical records	None of the resilience resources were predictive of CD4.

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Colbert, et al. (2013)	NR	Living with HIV, health literacy	Cross-sectional	USA, Pennsylvania and Ohio	302 PLWH; 70.5% male and 29.5% female; Race/ethnicity: 41.4% White and 58.6% African American	IV, mediator	Well-Being Scale Expanded, Duke Religion Index, and Brief RCOPE; Self-esteem: Rosenberg Global Self-Esteem Scale  Self-Efficacy: HIV Self-Efficacy Scale for Medication Taking, beliefs subscale	I	Adherence: ART medication adherence measured using electronic event monitoring and a self-report daily diary	There was a significant positive association between medication-taking self-efficacy and medication adherence.
Ironson, et al. (2006)	NR	Living with HIV	Longitudinal	USA, NR	100 PLWH; 64% male and 36% female; Race/ethnicity: 27.3% Hispanic White, 29.3 White, non-Hispanic; 38.4% African American, 5.1% other	IV	Religiosity/Spirituality: Increase in religiosity/spirituality after finding out about HIV+ status measure and at various times in one's life measure; Social Support: ENRICH Social Support Instrument; Coping- COPE; Optimism - Life Orientation Test; Proactive behavior: E.g., fighting spirit, self-initiated action-oriented behavior	ML, (I, Int)	Disease progression: CD4 and viral load obtained by blood draws	Increase in religiosity/spirituality and church attendance predicted greater preservation of CD4 over time. Increase in religiosity/spirituality predicted lower increase in viral load over time.
Ironson, et al. (2005)	NR	Living with HIV	Longitudinal	USA, NR	177 PLWH; 30% female and 70% male; 31% White, 36% African American, 28% Hispanic, 5% Other	IV and mediator	Optimism - Life Orientation Test (LOT) and the LOT-R; Coping - COPE scale; Proactive behavior: Self-reports of proactive behavior (e.g., fighting spirit, self-initiated action-oriented behavior)	I	Disease progression: CD4 and viral load obtained from blood draws	Optimism at baseline predicted increases in CD4 over 2 years and lower viral load increase. Proactive coping, depression, and avoidant coping mediated the relationship between optimism and CD4 change. Depression and avoidant coping also mediated the relationship between optimism and viral load.
Cha E, et al., (2008)	NR	Living with HIV and depression	Cross-sectional	USA, NR	215 PLWH; 64.7% male; Race/ethnicity: 62.3% White	IV, mediator, and outcome variable	Social support: Interpersonal Support Evaluation List; Self-efficacy: HIV Medication-Taking Self-Efficacy Scale	ML, (I, Int)	ART adherence: Morisky Self-Report Medication Taking Scale	When each study hypothesis was examined separately: (1) low medication taking self-efficacy partially mediated the relationship between greater depressive symptoms and low medication adherence; (2) There was only an indirect effect of perceived social support on medication adherence via medication taking self-efficacy; and (3) depressive symptoms partially mediated the association between social support and medication taking self-efficacy
Hartzke, et al. (2004)	NR	Living with HIV among drug users	Cross-sectional	USA, NR	137 PLWH; 100 men and 37 women; Race/ethnicity: 100% African American	IV	Social Support: Perceived Social Support scales; Impact of ART on feelings about HIV/AIDS: positive emotions scale; Relationship	ML, (I, Int)	Adherence: Self-reported adherence to ART	None of the resilience measures were associated significantly with ART adherence.

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Leserman, et al. (2002)	NR	Living with HIV	Longitudinal	USA, North Carolina	96 PLWH, 100 male Race/ethnicity: 78% white; 22% non-white	IV	Social support - Sarason Brief Social Support Questionnaire with care provider; Perceived quality of relationship with primary care provider	Int	HIV disease progression; Blood draws to obtain lymphocyte subsets (e.g., CD4) to determine CDC defined AIDS, clinical AIDS, and mortality	Lower cumulative average social support was predictive of higher risk of HIV disease progression as measured via the CDC classification and clinical condition.
Reif et al. (2013)	NR	HIV, substance use, and mood disorder	Cross-sectional	USA, North Carolina	154 PLWH; 64% Male, 36% Female, 1% Transgender; race/ethnicity: 82% African American, 13% Caucasian, 5% Multiracial, 2% Hispanic	IV and moderator	Self-efficacy - HIV Self-efficacy Questionnaire	I	Adherence: Center for Adherence Support Evaluation (CASE) Adherence Index for medication adherence	Combined HIV self-efficacy was associated positively with ART adherence. Among participants with a mood disorder, higher combined HIV self-efficacy was associated with greater adherence to HIV medication. Among those without a mood disorder, there was no significant relationship between combined HIV self-efficacy and ART adherence.
McCoy, et al. (2009)	NR	Living with HIV and alcoholism	Cross-sectional	USA, North Carolina	216 PLWH; 40.3% women and 59.7% male; 70.4% Black, 21.3% White, 8.3% other	IV	Social support: modified Medical Outcomes Study Social Support Scale	Int	Time from HIV diagnosis until entry into care; obtained from state and medical records	The relationship between low positive social interaction and delayed time to care was moderated by history of alcoholism.
Berg, et al. (2004)	NR	Living with HIV among substance users	Longitudinal	USA, New York	113 PLWH; 43% female and 57% male; Race/ethnicity: 66% Hispanic, 22% African American and 12% White	IV	Social support: Social network measure adapted to include HIV-specific factors	ML (Int, C)	ART adherence; Medication event monitoring systems caps record	Not belonging to any HIV support groups was associated with worse adherence for both men and women.
Marshall, et al. (2013)	NR	Living with HIV	Cross-sectional	USA, Maryland, Michigan, New York, and Oregon	433 PLWH; 66% male; Race/ethnicity: 58.7% African American, 24.3% White, 14.3% Latino, 2.8% other	IV	Patient activation: Patient Activation Measure (e.g., self-efficacy, locus of control)	I	Adherence: Self-reported ART; CD4 reported ART; CD4 and viral load; Obtained from medical records	Higher patient activation score was associated significantly with CD4 count > 200 cells/mL and viral suppression. ART adherence partially mediated the association between patient activation and viral suppression.
Murphy, et al. (2004)	NR	Living with HIV	Cross-sectional	USA, Los Angeles County, California	115 PLWH; Men and women (breakdown NR); Race/ethnicity: 50% African American/Black; 24% White/Caucasian; 20% Latino/Hispanic; 2% Asian/Pacific Islander; 2% Native American; Alaska	IV	Social support - Social Provisions Scale; Provider-patient relationship	Int	Adherence - modified AACTG ART adherence measure and dose and schedule adherence	Associations of social provisions subscales on ART adherence were mixed. The social attachment subscale was inversely associated with three-day adherence, overall social support was inversely associated with past week adherence whereas reliable adherence with others subscale was positively associated with past week adherence. Finally, reassurance of worth was

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Wolf, et al. (2007)	NR	Literacy	Cross-sectional	USA, Illinois and Louisiana	Native; 2% mixed race/ethnicity 204 PLWH; 79.9% Male; Race/Ethnicity: 45.1% African American	Mediator	Self-efficacy: Patient Medication Adherence Questionnaire to properly take and manage HIV medication	I	Adherence: Patient Medication Adherence Questionnaire	Low medication self-efficacy mediated the relationship between low literacy and medication nonadherence.
Colasanti J. et al. (2017)	NR	Living with HIV	Retrospective case-control study	USA, Georgia	59 PLWH; 32% female; Race/ethnicity: 88% African American	DV	Self-efficacy: General Self-Efficacy Scale; Social support: Multidimensional Scale of Perceived Social Support; Resilience: Connor-Davidson Resilience Scale	ML (I, Int)	Retention in HIV Care	Resilience and self-efficacy scores did not significantly differ between continuously retained and unretained groups. Higher social support was observed among the continuously retained group compared to the unretained group.
Weaver, et al. (2005)	NR	Negative Mood	Longitudinal	USA, Florida	322 PLWH: 188 men and 134 women; Race/ethnicity: 59.9% African American, 22.8% non-Hispanic White, and 12.5% Latino/Hispanic.	Exogenous and endogenous variable	Social Support: Interpersonal Support Evaluation List; Coping: COPE Inventory	ML (I, Int)	Adherence: ACTG measure of ART adherence and MEMS cap data; Viral load: Obtained via blood draws	Social support was not directly related to adherence. The effects of social support on adherence were mediated by avoidance-oriented coping such that lower social support was associated with greater avoidance coping. In turn, avoidance-oriented coping was related to lower medication adherence, and in turn, higher viral load. Approach-oriented coping was not predictive of ART adherence.
Waldrop-Valverde, et al. (2014)	NR	Low health literacy and HIV-associated cognitive Impairment	Longitudinal	USA, Florida	210 PLWH; 52.8% female, 0.95% transgender; 46.1% male; Race/ethnicity: 82.86% Black or African American, 10.48% Hispanic, 4.29% White Non-Hispanic, 0.95% American Indian or Alaska Native, 1.43% Other	IV, moderator	Social Support: Social Support Questionnaire (support since becoming HIV positive); Patient-Provider Communication; Attitude Toward HIV Health Care Providers Scale and the Engagement with Health Care Providers Scale	Int	Adherence at scheduled HIV care outpatient visits obtained via medical records	Individuals with cognitive impairment who had greater use of social support were less likely to miss medical visits.
Atonito, et al. (2014)	NR	Neurocognitive impairment and substance use	Cross-sectional	USA, Florida	246 PLWH: 66% were male; Race/ethnicity: 77.3% Black and 14.9% White, and 13.5% reported Hispanic ethnicity	IV	Social support: Medical Outcomes Study tangible support subscale	Int	Viral load: participant provided documentation	Social support was not directly related to viral load; thus, ART adherence did not mediate this relationship. However, a significant path of marijuana use moderating the relationship between social support and viral load was evidenced.
Williams, et al. (1997)	NR	Living with HIV	Cross-sectional	USA, Connecticut	92 mothers living with HIV; 100% female; Race/ethnicity: 100% African American	DV	Social Support: Norbeck Social Support Questionnaire	Int	Use of healthcare services: Self-report	There were no significant differences in entire network social support between mothers



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Cook, et al. (2017)	NR	Living with HIV	Longitudinal	USA, Colorado	ethnicity: 19% Hispanic, 56% African American, 24% White and 1% other  53 PLWH: 75.5% male; 45.3% White, 26.4% Latino/Latina, 15.1% African American, 3.8% Native American, 3.8% Multiracial, 5.7% other/unspecified;	IV	Control Beliefs: Diary of Ambulatory Behavioral States Control Beliefs Scale and the Adherence Attitude Inventory; Coping: Assessment of Daily Coping Scale and Brief COPE; Social Support: Diary of Ambulatory Behavioral States Scale and Multidimensional Scales of Perceived Social Support	ML (I,Int)	Adherence: ART Adherence using Medication Event Monitoring System	who did not delay care and those who did delay care. There were also no significant differences in social support specific to network members aware of the mother's HIV status.
Cook, et al. (2017)	NR	Living with HIV	Longitudinal	USA, Colorado	87 PLWH: 68 men and 19 women. Race/ethnicity included White (45), Latino/a (21), African American (15), Native American (5), and Other/Unknown (3)	IV	Coping: Assessment of Daily Coping; Control Beliefs: Diary of Ambulatory Behavioral States; Social Support: Diary of Ambulatory Behavioral States	ML (I, Int)	Adherence: ART Adherence using Medication Event Monitoring System	Control beliefs and social support had indirect effects on ART adherence via motivation.
Bogart, et al. (2015)	NR	Living with HIV and HIV enacted stigma	Longitudinal	USA, California	147 PLWH; 24% female and 5% transgender; Race/ethnicity 100% Black	IV and moderator	Social support: MOS Social Support Survey and Social Network Assessment	ML (Int, C)	Adherence: Medication Event Monitoring System was used to measure medication adherence.	Neither measure of social support was significantly associated with ART adherence. However, the interaction of structural social support with stigma significantly related to ART adherence such that there was an inverse association between stigma and adherence for participants who decreased the frequency of their interactions with people in their social network.
Milam et al. (2004)	NR	Living with HIV	Longitudinal	USA, California	412 PLWH; 88.1% male; Race/ethnicity: 38.8% White, 40.3% Hispanic, 14.8% African American, 6.1% Other	IV	Optimism - Life Orientation Test Revised	I	Viral load and CD4 counts - ART records adherence - self-report	There was a curvilinear relationship between optimism at baseline and CD4 counts at follow-up; those with moderate levels of optimism had the highest CD4 counts. Higher optimism was associated with greater likelihood of achieving 95% or higher ART adherence. ART adherence did not mediate the effects of optimism on CD4.
Johnson, et al. (2006)	NR	Living with HIV	Cross-sectional	USA, California	551 PLWH; 2.4% transgender, 16.5% female, 80.8% male; 32.5% Black/ African American,	Exogenous and endogenous variables	Social support - Social Provisions Scale; Positive affect; Positive States of Mind Scale; Social Problem-	ML (I, Int)	Adherence: Self-reported ART Adherence ACTG measure	There was an indirect effect of social problem solving on ART adherence via psychological health (e.g., social provisions scale, positive states).

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Huyh, et al. (2013)	NR	Living with HIV	Cross-sectional	USA, California	6.3% Hispanic/Latino, 51.6% White, 9.6% Other  202 PLWH; 49% female, 1% transgender; 50% male; Race/ethnicity: 56% African American, 28% White, 10% Latino, 6% other	IV	Solving: Social Problem Solving Inventory Revised  Social support - Medical Outcome Study Social Support Survey	Int	Adherence: Self-reported ART adherence via the HIV Cost and Services Utilization Study measure	Social support was significantly positively associated with optimal ART adherence; however, this relationship was no longer significant once mental health symptoms were entered into the model.
Power, et al. (2003)	NR	Living with HIV	Cross-sectional	USA, California	73 PLWH; 53% male, 47% female; Race/ethnicity: 23% African American, 4% Asian American, 60% Caucasian, 10% Hispanic and 3% other	IV	Social support: UCLA Social Support Inventory;	Int	Adherence - ACTG Medication Adherence	Only social support from one's partner was significantly associated with lower odds of missing medication doses.
Turan, et al. (2016)	NR	Living with HIV; psychosocial factors (e.g., stigma, avoidance coping, attachment related anxiety)	Cross-sectional	USA, Alabama	109 PLWH; 100% male; Race/ethnicity: 59 Black and 50 White	IV	Self-efficacy: HIV Treatment Adherence Self-Efficacy Scale and experience sampling method measure of HIV treatment self-efficacy; Coping: revised Ways of Coping List; Social Support: Interpersonal Support Evaluation List-Short Form and experience sampling method measure of HIV-related social support	ML (I, Int)	HIV visit adherence, viral load, and CD4; Obtained from clinic records; ART Adherence: Self-reported adherence to ART	Average HIV treatment self-efficacy (measured via experience sampling method), predicted greater odds of medication adherence, high CD4 count, and suppressed viral load, and predicted higher visit adherence. Among PLWH with higher avoidance coping with HIV, psychosocial stressors and recent social support predicted higher current treatment self-efficacy (as measured via experience sampling method).
Nokes, et al. (2012)	NR	Living with HIV	Cross-sectional	USA (10 states) and Puerto Rico	1414 PLWH: Gender - 71.1% male, 26.3% female and 2% transgender. Race/ethnicity - 4.3% Asian/Pacific Islander, 39.5% African American/Black, 24.3% Hispanic/Latino, 20% Native American, and 26.1% White/Anglo.	IV, mediator	Self-efficacy - HIV Adherence Self-Efficacy Scale (HIV-ASES); Social Capital - Social Capital Instrument (I, Int, C); Social Support - Perceived Social Support Measure	ML (I, Int, C)	ART Adherence: Visual Analog Scale for Medication Adherence and the 30-day Adherence Rating	HIV adherence self-efficacy was associated with ART adherence. Social support and social capital were also associated with adherence. In the model with all exposure variables, only HIV adherence self-efficacy retained significance.
Chen et al., (2013)	NR	Living with HIV	Cross-sectional	USA, Canada, Puerto Rico, Namibia, China	2,182 PLWH; 28.6% female, 70.3% men, and 2.4% transgender/gender queer; Race/ethnicity: 36.8% African/African-American, 21.4%	IV and Outcome Variables	Self-efficacy: HIV Treatment Adherence Self-Efficacy scale; Self-esteem: Rosenberg self-esteem scale; Engagement with Health Care Providers: Engagement with Health Care Providers Scale	ML (I, Int)	ART adherence: ACTG HIV medication adherence measure	Medication adherence self-efficacy and ART adherence were positively related with higher health care provider engagement. Self-esteem was inversely associated with health care provider engagement.

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Thomton, et al. (2000)	NR	Living with HIV	Longitudinal	United Kingdom, England	White: 20.2% Hispanic: 16.1% Asian/Pacific Islander, and 3.1% Native American	IV	Coping: Coping Orientations to Problems Experienced; Social Support: Intrapersonal Support Evaluation List	ML (I, Int)	AIDS-Related Complex (ARC)/ AIDS diagnosis: CD4 and Viral Load obtained from blood samples and medical records	Compared to men scoring in the upper tertile of the COPE acceptance scale, the risk of ARC or AIDS was nearly 5 times higher for men scoring in the lower tertile
Södergård, et al. (2006)	NR	Living with HIV	Cross-sectional	Sweden	946 PLWH; 63.4% male; Race/ethnicity NR	IV	Social support: social support for medication-taking	Int	Adherence - Self-reported ART adherence via Morisky Medication Adherence Scale	Social support for medication taking was not significantly related to medication adherence
Kekwaletswe, et al. (2017)	NR	Living with HIV	Cross-sectional	South Africa	304 PLWH; 98 males and 205 females; Race/ ethnicity: NR	Exogenous and endogenous variables	Self-efficacy - HIV Treatment Adherence Self-Efficacy Scale; Social support - Medical Outcomes Study (MOS) Social Support Survey	ML (I, Int)	Adherence: Self-reported ART adherence ACTG measure, CASE Adherence Index, and 1 month adherence	Social support was positively associated with ART adherence via a direct path. An indirect positive relationship between social support and ART adherence also existed by way of depression and self-efficacy beliefs. Self-efficacy beliefs fully mediated the relationship between depression and ART adherence. Adherence and self-efficacy beliefs partially mediated the relationship between alcohol use and ART adherence.
Wouters, et al. (2009)	NR	Living with HIV	Longitudinal	South Africa	268 PLWH; 34.7% male	IV	Social support: having a treatment buddy, having a community health worker, and participation in HIV/AIDS support group	ML (Int, C)	CD4 and viral load: Obtained from medical records	All three types of support were associated with higher CD4 cell count and viral suppression at 6, 12, and 24 months.
Tomakowsky, et al. (2001)	NR	Living with HIV	Cross-sectional and longitudinal	NR	78 PLWH; 100% male; Race/ethnicity 69.2% Caucasian and 30.6% African American	IV and mediator variable	Optimism: Explanatory style optimism - Expanded Attributional Style Questionnaire and Dispositional style optimism - Life Orientation Test; Coping: The COPE scale	I	CD4: CD4 counts obtained from blood samples and medical records	In cross-sectional analyses, explanatory style optimism was inversely associated with CD4. Prospective analyses indicated that explanatory style optimism was associated with decline in CD4 counts at 2-year follow-up. Coping was not related to explanatory optimism or baseline/follow-up CD4 counts
Kremer, et al. (2013)	NR	Living with HIV	Longitudinal	NR	177 PLWH; 30% female; Race/ ethnicity 36% African American, 31% White (non-Latino), 28% Latino;	IV	Compassionate Love (Giving, Receiving, Self); Coding of transcripts and assignment of Likert Scale ratings.	ML (I,Int)	Adherence: Self-reported ART Adherence ACTG measure; CD4 and Viral Load: Obtained from blood.	Compassionate love directed towards oneself was associated with undetectable VL at baseline, predicted 4-year cumulative undetectable viral load (was n.s. after controlling for compassionate love receiving), and predicted CD4-preservation

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Afolabi, et al. (2013)	NR	Living with HIV	Cross-sectional	Nigeria	379 PLWHA; 60.7% female and 39.3% male; Race/ethnicity: 86.3% Yoruba	DV	Social Support: Perceived Social Support-Family Scale; Family Functioning: Family Adaptability, Partnership, Growth, Affection, and Resolve (APGAR) measure	Int	Adherence: Self-reported adherence to HAART and pharmacy pill count	after controlling for compassionate love giving. Compared to PLWH who were non-adherent to ART, those who were adherent to ART had normal family functioning, APGAR scores and stronger perceived social support.
Poudel, et al. (2015)	NR	Living with HIV	Cross-sectional	Nepal	233 PLWH; 52.4% male and 47.6% female; Race/ethnicity: NR	IV	Social Support - Nepali Family Support and Difficulty Scale	Int	Adherence - Self-reported ART adherence	Compared to those with low levels of emotional support from family, medium and high levels were associated with lower risk of ART nonadherence.
Sagarthy, et al. (2017)	NR	Living with HIV	Cross-sectional	Mexico	172 people living with HIV; 61.6% male and 38.4% female; Race/ethnicity: NR	Endogenous variable	Social Support: Duke-UNC Functional Social Support Questionnaire adapted for Mexico	Int	ART adherence: Psychological Variables and Adherence Behaviors Questionnaire; CD4 and Viral Load: Obtained from medical records	Social support was not associated with the hypothesized endogenous variable, medication adherence, and was thusly excluded from analyses.
Zachariah, et al. (2007)	NR	Living with HIV	Longitudinal	Malawi	1634 PLWH; 65% female and 35% male	IV	Community Support - Community activities linked to HIV care (e.g., patient referrals, defaulter tracing, community centers, support to family cares)	C	Adherence and CD4 count: Obtained by review of patient master cards and ART patient register	PLWH in areas with greater community support were more likely to be alive and on ART and had higher CD4 count.
Peltzer, et al. (2010)	NR	Living with HIV	Cross-sectional	South Africa	519 PLWH; 26.6% male and 73.4% female; Ethnicity - 98.8% Zulu and 1.2% Other	IV	Social Support - Social Support Questionnaire; Spirituality - the Spirituality subscale of the WHOQOL-HIV BREF	ML (I, Int)	ART adherence - 30-day Visual Analog Scale; the AACTG adherence measure	Higher social support scores was associated with higher odds of medication adherence (Visual Analog Scale). Spirituality/religion/personal beliefs were associated with lower odds of medication adherence (Visual Analog Scale).
Kamau, et al. (2011)	NR	Living with HIV	Cross-sectional	Kenya	354 PLWH; 71.47 women; Race/ethnicity: NR	IV	Coping Self-Efficacy: Coping Self-efficacy Survey	ML (I, Int)	Adherence: Self-reported ART Adherence ACTG measure	Coping Self-Efficacy was positively and significantly associated with ART adherence. However, only the "stop unpleasant emotions and thoughts" coping self-efficacy subscale had a statistically significant association with ART adherence.
Kioko, et al. (2017)	NR	Living with HIV	Cross-sectional	Kenya	301 PLWH; 37.2% Male, 62.7% Female; Race/ethnicity: NR	IV	Social support - Perceived Social Support (measured at the interpersonal and community levels)	ML (Int, C)	Adherence: Self-reported ART adherence and pill count	In the full model, perceived social support was not significantly associated with increased odds of adherence.
Pandey, et al. (2017)	NR	Living with HIV	Cross-sectional	India, Chhattisgarh	200 PLWH	Exogenous and endogenous	Hardiness - Psychological Hardiness Scale; Social support - Social Support Scale	ML (I, Int)	CD4 - CD4+ T-lymphocyte count	Hardiness was associated positively with CD4. Social support partially mediated the

First Author, Year	How Was Resilience Defined?	What was the adversity?	Research Design (Longitudinal, Cross-Sectional)	Location	Sample	Resilience is independent or other variable	Resilience Measure	Level of Resilience Resource	HIV Health Behavior or Health Outcome	Key findings between resilience & outcome measure
Luszczynska, et al. (2007)	NR	Living with HIV	Cross-sectional	India	104 PLWH; 63.5% female; Race/ethnicity: NR	IV, mediator	Social support- Berlin Social Support Scales; Self-efficacy - General self-efficacy scale; Finding benefit in being an HIV patient; Benefit Finding Scale	ML (I, Int)	Adherence: Self-reported adherence to ART	relationship between hardiness and CD4 cell count. Self-efficacy was directly related to adherence; benefit finding partially mediated this relationship. Self-efficacy also mediated the relationship between social support and adherence.
Mo, et al. (2009)	NR	Living with HIV	Longitudinal	Hong Kong	102 PLWH; 87.3% male, 12.7% female. Race/ethnicity: NR	DV	Adherence self-efficacy - Adult AIDS Clinical Trial Group (AACTG) Adherence Measure); Coping - Brief COPE;	I	Adherence - Self-reported ART adherence using the AACTG adherence measure	Compared to participants who were classified as unintentional or intentional non-adherers all adherers to ART had high adherence self-efficacy.
Motassiotis, et al. (2002)	NR	Living with HIV	Cross-sectional	Hong Kong	136 PLWH; 92.5% male and 7.5% female Race/ethnicity: 88.3% Chinese, 9.6% Caucasian, and 2.2% Thai/Indian	IV	Multidimensional Health Locus of Control Scale; Mental Adjustment to HIV Scale (coping and adjustment to HIV); Adherence self-efficacy; Family/friends support for medication taking	ML (I, Int)	Adherence - Self-reported ART adherence using the AACTG and additional study-specific adherence questions	Predictors of adherence included high self-efficacy, more internal health locus of control, denial-avoidant coping, and less family support for remembering to take medication.
Safren, et al. (2014)	NR	Living with HIV	Longitudinal	Haiti, USA, Brazil, India, Malawi, Peru, South Africa, Thailand and Zimbabwe	1568 PLWH; 52.9% male and 47.1% female; Race/ethnicity: NR	IV	Social support: general satisfaction with social support	Int	Adherence: Medication adherence via ACTG QOL061 adherence questionnaire and pill counts; Viral Load (treatment failure) - HIV-1 RNA	In multivariable analyses, satisfaction with social support was not predictive of medication non-adherence, pill count, or treatment failure.
Corless, et al. (2017)	NR	Living with HIV	Cross-sectional	Canada, Namibia, Thailand, USA and Puerto Rico	1811 PLWH; 71% male and 29% female; Race/ethnicity: 23.6% White	IV	Engagement with healthcare provider: Engagement with healthcare provider scale; Self-esteem: Rosenberg self-esteem scale; Social capital: revised Social capital scale; Sense of coherence: Sense of coherence scale; Self-efficacy: HIV adherence self-efficacy scale and Chronic disease self-efficacy scale; Self-compassion: Neff self-compassion scale	ML (I, Int, C)	Adherence: 30-day Visual Analog Scale for Medication Adherence	Higher self-efficacy scores were associated with lower odds of being in the non-adherence (0%), low adherence, and medium adherence categories.
O'Cleirigh, et al. (2007)	Focus is on conscientiousness with the hypothesis that it may be related to "slower disease progression" through greater resilience to distress (e.g., less catastrophic disease-related	Living with HIV	Longitudinal	USA, NR	119 PLWH; 67% male; Race/ethnicity - 26.9% non-Hispanic White; 42% African American; 28.6% Hispanic; 2.5% other	IV, mediator	Consistentness: 12-item scale of the NEO-FFI (IV); Coping - Carver, Scheier, and Weintraub's COPE scales (Mediator)	I	CD4 and Viral Load: Blood draws to obtain	Conscientiousness predicted significant increases in CD4 number and significant decreases in viral load at 1 year. Conscientiousness was related positively to active coping. Active coping did not mediate the relationship between conscientiousness and CD4 or viral load change

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Pecoraro, et al. (2016)	stressor appraisals and lower levels of depressive symptomatology)." "Resilience, the ability to resist negative psychological responses when confronted with stress or trauma."	Living with HIV	Cross-sectional	Russia	240 PLWH; 58% male and 42% female. Race/ethnicity included 99% White	DV	Coping: Proactive Coping Inventory; Spirituality: The View of God Inventory	ML (I, Int)	Engaged-in-Care or Lost-to-Care. Care measures assessed by ART adherence and clinic attendance	PLWH Engaged-in-care (EICs) had higher proactive coping scores, social support, less avoidance coping, described themselves as more spiritual, had stronger spirituality/religious beliefs, and positive views of God and engaged in more spiritual/religious activities.
Dale, et al. (2014)	"A combination of personality characteristics and successful coping that allows an individual to function adaptively in the face of or following adversity..." "Process of bouncing back from an adversity, as an adaptive outcome... and/or as a trajectory over time that consists of adaptive functioning."	Living with HIV, abuse history (e.g., sexual, physical)	Cross-sectional	USA, Illinois	138 PLWH; 100% female; Race/ethnicity: 4.3% White/non-Hispanic, 4.3% White/Hispanic, 87% African-American/non-Hispanic, 0.7% African-American/Hispanic, 1.4% Other/Hispanic, 0.7% Asian/Pacific Islander, 0.7% Native American/Alaskan, 0.7% Other	IV	Resilience: Connor-Davidson Resilience Scale	I	Adherence: Self-reported ART adherence; HIV disease progression; CD4 count and HIV RNA load	Higher resilience scores were associated with increased odds of having ART adherence $\geq$ 95% and having undetectable viral loads. The association between resilience and ART adherence was moderated by abuse histories. Resilience did not significantly relate to ART adherence for women without abuse histories.

NR = Not Reported; IV = Independent Variable; WHOQOLHIV BREF = World Health Organization Quality of Life HIV BREF; I = Individual Level; Int = Interpersonal Level; C = Community Level; ML = Multilevel; ART = antiretroviral