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ANCILLARY SERVICE NEEDS AMONG PERSONS NEW TO HIV CARE AND THE RELATIONSHIP BETWEEN NEEDS AND LATE PRESENTATION TO CARE

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Abstract

Ancillary service needs likely influence time to diagnosis and presentation for HIV care. The effect of both met and unmet needs on late presentation to HIV care is not well understood. We used baseline data from 348 people with HIV (PWH) with no prior HIV care who enrolled in iENGAGE (a randomized controlled trial (RCT) of an intervention to support retention in care) at one of four HIV clinics in the US. A standardized baseline questionnaire collected information on ancillary service needs, and whether each need was presently unmet. We examined covariates known to be associated with disease stage at presentation to care and their association with needs. We subsequently assessed the relationship of needs with CD4 accounting for those other covariates by estimating prevalence ratios (PR) using inverse probability weights. Most patients enrolling in the RCT were male (79%) and the majority were Black (62%); median age was 34 years. Prevalence of any reported individual need was 69%. One third of the sample had a baseline CD4 cell count <200, 42% between 200–499 and 27% ≥500. There was no statistically significant association between need or unmet need and baseline CD4. In general, psychiatric health and SU issues (depression, anxiety, and drug use) were consistently associated with higher prevalence of need (met and unmet). Additionally, Black race was associated with higher basic resource needs (housing: PR 1.67, 95%CI 1.08–2.59; transportation: PR 1.65, 95% CI 1.12–2.45). Ancillary service needs (met and unmet) were common among patients new to HIV care and impacted vulnerable subgroups. However, we found no evidence that reporting a specific individual need, whether met or unmet, was associated with a timely presentation to HIV care. The impact of needs on subsequent steps of the HIV care continuum will be examined with longitudinal data.

Keywords

retention; needs; treatment naive

Background

Even with decreases in undiagnosed HIV infection in the US, late presentation for care persists (Lesko, Cole, Zinski, Poole, & Mugavero, 2013). Late presentation causes a delay in receipt of antiretroviral therapy (ART), leading to both negative health consequences for people with HIV (PWH) (Danel C; Group, 2015) and increased HIV transmission risk (Cohen, Chen, McCauley, & Gamble, 2011). Increasing HIV testing and linkage to care to ensure early diagnosis and treatment are necessary steps for ending the AIDS epidemic and are both domestic and global priorities (UNAIDS 2018). Prior research has revealed differences in the associations between various demographic factors and time to diagnosis and presentation to care. For example, while two prior studies revealed an association between female sex and delay in HIV diagnosis (Hall HI, 2015; Hall, Tang, & Espinoza, 2016), another did not (Mayben et al., 2007). Furthermore, male sex was associated with delayed presentation to medical care in one nationally representative study (Robertson et al., 2016). Older age has been associated with late diagnosis (Hall HI, 2015; Leeper et al., 2014), however younger age has been associated with delayed presentation (Wolitski 2018).

And Black race has been associated with delayed diagnosis (Hall HI, 2015) with different observed effects on delay in presentation – both association (Ulett et al., 2009) and inverse association (Robertson et al., 2016). These varying results stem from differences both in the definitions used and the populations studied.

The need for concrete services or resources may impact time to presentation to HIV care, and subsequently, HIV outcomes. For example, not having financial resources and not having a vehicle have been associated with later presentation to care (Leeper et al., 2014). Lack of housing (Aidala, Lee, Abramson, Messeri, & Siegler, 2007; Terzian et al., 2015), drug treatment (Altice, Kamarulzaman, Soriano, Schechter, & Friedland, 2010; Ashman, Conviser, & Pounds, 2002), transportation (Andersen et al., 2007), and mental health treatment (Ashman et al., 2002) have all been associated with worse ART adherence and HIV outcomes (Cornelius et al., 2017). Conversely, receipt of ancillary services such as case management, housing, food, transportation, mental health and substance abuse treatment has been associated with access to primary care (Chan, Absher, & Sabatier, 2002; Conviser & Pounds, 2002), and receipt of case management services has been associated with improved HIV outcomes. (Lo, MacGovern, & Bradford, 2002; Magnus et al., 2001)

Because of the known impact of ancillary services on HIV outcomes, the Ryan White CARE Act provides funding to address unmet needs for these vital services among PWH. Less is known, however, about how unmet needs for ancillary services impact time to presentation to HIV care. The iENGAGE study, a behavioral intervention to optimize HIV care continuum outcomes among individuals presenting for HIV care for the first time, offered an opportunity to examine this question and to describe the needs (both met and unmet) of people with HIV when they arrived at clinic for the first time.

One of the challenges for this analysis is that there are different definitions for what constitutes late presentation to care (Althoff et al., 2010; Antinori et al., 2011) and the date of infection is unknown for the overwhelming majority of people who test positive for HIV (Skar, Albert, & Leitner, 2013). Additionally, there are several ways that need or unmet need could impact CD4 at presentation to HIV care: need or unmet need could delay diagnosis of HIV or delay entry to care following diagnosis or delay both processes. Furthermore, a need or unmet need could create conditions in which time to HIV diagnosis and entry to care are unaffected, but physical health is compromised such that CD4 cell count decline is faster following infection. In this analysis, we conceptualized late presentation to care as first measured CD4 cell count that was clinically meaningfully suppressed.

The objective of our study was to describe the prevalence of needs in a sample of persons entering HIV care for the first time, and to evaluate the association between the presence of needs for ancillary services and late presentation to HIV care, indicated by low CD4 cell count at time to presentation to care. We hypothesized that a greater number of unmet needs would be associated with late presentation to HIV care, as indicated by an initial CD4 count <200 cells/mm3.

Methods

Study sample

The iENGAGE study recruited individuals who were new to HIV care at four academic medical centers in cities with a diverse patient population: Baltimore, MD (Johns Hopkins HIV Clinic); Birmingham, AL (University of Alabama, Birmingham 1917 Outpatient Clinic); Chapel Hill, NC (University of North Carolina- Chapel Hill); and Seattle, WA (University of Washington). Patients enrolling in any of the four clinics were screened for prior HIV care and patients deemed new to care were invited to enroll in the iENGAGE study. Patients who consented to participate were randomized with equal probability to intervention or standard of care arms; the intervention provided intensive four-session behavioral intervention with the goals of helping patients adapt to their new HIV diagnosis and optimize retention in care and ART adherence through information, motivation, and behavioral skill building.

In this analysis, we evaluated baseline data from the iENGAGE study. At baseline, patients enrolled in iENGAGE completed detailed assessments (with the assistance of study staff if patients had any literacy limitations) of demographics, medical history, socioeconomic indicators, substance use and mental health symptoms, and need for ancillary services. The need for ancillary services questionnaire was delivered by computer-assisted self-interview (CASI).

There were 941 patients new to HIV care screened and 372 patients who agreed to participate in iENGAGE. We excluded 16 patients who did not complete baseline needs assessment, and 8 patients who did not have a CD4 cell count measured within 6 months (in either direction) of screening and enrollment into iENGAGE (6.5% of the sample). The analytic sample included 348 patients, all of whom entered HIV care within the previous 14 days.

Dependent variable

The first available CD4 cell count was abstracted from the medical record, and was categorized as ≤200 cells/mm^3, 200–500 cells/mm^3 or ≥500 cells/mm^3. Patients without a CD4 count within 6 months of enrollment were excluded from the analytic sample as described above.

Primary independent variables

Need for ancillary services was assessed using the CDC Retention in Care (RiC) survey utilized for a multi-site retention in care trial (see Supplemental Materials 1). The survey items included perceptions of whether or not a given service was “needed” over the past 6 months (yes, no). A follow-up question for any service marked as needed asked if the participant was able to get the service (yes, sometimes, no). Participants were asked if they had a need for counseling, substance use (SU) treatment, housing, food, transportation, employment, benefits, or financial assistance.

Covariates

Depression was measured by PHQ-8 (Spitzer et al., 1994)and dichotomized as present (PHQ-8≥10) or absent. Anxiety was measured by PHQ-A and and dichotomized as present (panic symptoms or disorder) or absent. Social support was measured by MOS-4 (Sherbourne & Stewart, 1991) and reported as a summary score between 0 and 100. At-risk alcohol use was determined by an AUDIT-C (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993) score of 3 or more for women or 4 or more for men. Drug use (amphetamines, cocaine, opiates or marijuana) was categorized into never, ever or current use.

Analysis

The burden of ancillary service needs, both met and unmet, among this cohort of patients new to HIV care was first described. To identify groups with highest prevalence of needs and unmet needs, associations between patient demographic and clinical characteristics were reported with estimated prevalence ratios using Poisson models with no offset, which approximate a log-binomial model but converge more reliably. Reported associations between patient demographic and clinical characteristics were conditional on all other covariates in the models.

The prevalence ratio for the association between needs and unmet needs with category of CD4 cell count at presentation to HIV care (200–499 vs. ≥500 and <200 vs. ≥500) was estimated. To do so, log-binomial models for CD4 cell count category as a function of presence of a particular need (or particular unmet need) were fit. Each individual need and unmet need was evaluated in a separate model. Covariates were balanced among patients who reported and who did not report each need or unmet need with inverse probability of exposure weights. Weights were estimated by fitting logistic models for the presence of each individual need or unmet need to estimate the probability of presence or absence of need or unmet need conditional on: age, male sex, black race, log10 viral load copies/mL, ever use of any illicit drug (crack/cocaine, amphetamine, opioid, marijuana or other drug), current use of any illicit drug, depression, anxiety, hazardous alcohol use, type of insurance (public, private, or none), and site of HIV care.

Results

The demographic and clinical characteristics of the study sample are shown in Table 1. The sample was predominantly male (79%) and black (62%), and the median (IQR) age was 34 (27, 45) years. Insurance type was mixed, with 44% of the sample reporting private insurance, 34% with public insurance, and 22% uninsured. A high proportion of the sample reported moderate or severe depressive symptoms (31%), anxiety symptoms (31%) or both (16%). A third of the sample had a baseline CD4 ≤ 200 cells/mm^3, and the median (interquartile range [IQR]) baseline CD4 count was 344 (174, 554) cells/mm^3.

The overall prevalence of any ancillary service need was 69% (Table 2). The highest prevalence of any individual need was 36% for food assistance and the lowest prevalence was 3% for child care. Of the 10 people reporting a need for childcare, 1 was a woman (1% of women reported need for childcare) and 9 were men (3% of men reported need for

childcare). All but one reported that the childcare need was unmet (one male reported that the need was met). Because of the low prevalence of need for child care we were unable to examine its association with covariates or CD4 cell count due to imprecision of estimates. The highest prevalence of any individual unmet need was 24% for financial assistance and the lowest prevalence was 2% for substance abuse treatment.

Table 3 shows prevalence ratios for associations between patient demographic and clinical characteristics and ancillary service needs. While patterns varied across needs, in general, drug use and depression were consistently associated with higher prevalence of need. Black race was associated with higher need, in particular higher basic resource needs (housing: PR 2.38, 95%CI 1.23–4.59; financial assistance: PR 1.80, 95%CI 1.15–2.82; and employment assistance: PR 1.73, 95%CI 1.02, 2.91). Log_{10} viral load at baseline and public insurance (versus no insurance) were not generally associated with presence of needs. However, having private insurance was strongly and consistently associated with reduced needs.

Table 4 shows prevalence ratios for associations between patient demographic and clinical characteristics and reported unmet needs. The patterns of associations observed with reported needs (Table 3) were generally consistent with the patterns of associations for reported unmet needs although there were some differences. Older age was associated with reduced need for financial assistance (PR=0.84, 95%CI 0.70–0.99) and with counseling (PR=0.78, 95%CI 0.64–0.96). Additionally, there was a trend toward reduced need for food assistance, benefits assistance, and transportation among older individuals as well. Again, psychiatric health issues (current drug use, depression, anxiety) were associated with prevalence of unmet needs. Individuals with hazardous alcohol use were much more likely to report an unmet substance abuse treatment need than individuals not reporting hazardous alcohol use (PR=5.75, 95%CI 1.35–24.46). Again, private insurance was inversely associated with unmet needs.

Prevalence ratios were examined between unmet needs and initial CD4 count. There were no statistically significant associations ($p<0.05$) between needs (Table 5) or unmet needs (Table 6) and initial CD4 category. Indeed, most estimated prevalence ratios were quite close to the null value of 1. Standardization typically weakened (moved closer to the null) the associations between need and low initial CD4, while it typically strengthened (moved further from the null) the associations between unmet need and low initial CD4. Although not statistically significant, having an unmet ancillary need was typically associated with a lower prevalence of CD4 cell count <500 at initial presentation to care (Table 6).

Discussion

Prevalence of ancillary service needs (met and unmet) was high among patients new to HIV care and particularly high among disproportionately impacted vulnerable subgroups. Factors associated with met and unmet needs included being black, having depression, anxiety, or substance abuse. Having private insurance was associated with a lower prevalence of resource needs. In this sample of patients new to HIV care, both reported and unmet needs were not statistically significantly associated with CD4 cell count at first presentation to HIV care.

Our finding that the overall prevalence of any ancillary service need was 69% is comparable to findings by Katz et al, who showed that in a national probability sample of PWH, 67% had at least one need and that 27% of the overall sample had an unmet need for at least one service in the previous 6 months (Katz et al., 2000). This report highlights that close to two decades after Katz's work, substantial ancillary service needs persist, as do unmet needs. Our finding that the presence of needs or unmet needs was not statistically significantly associated with late presentation to HIV care was somewhat unexpected. We did observe an overall trend towards lower CD4 cell count at presentation to HIV care among persons with an ancillary services need, and in particular with unmet ancillary services need. We may have been underpowered to detect a statistically significant association. We may be missing data on individuals who have ancillary service needs that continue to prevent them linking successfully to HIV care. We consider these data important to publish although they represent individuals who successfully linked to care. Our results cannot speak to the impact of need and unmet need among people with newly diagnosed HIV who did not link to care in this study.

Consistent associations of psychiatric health problems on both met and unmet ancillary service needs were seen. SU disorder is very common among PWH (Hartzler et al., 2017), and disparities in engagement at all steps of the continuum persist among individuals with substance use (Giordano et al., 2005; King et al., 2009; Monroe et al., 2016; Rebeiro et al., 2013; Torian & Wiewel, 2011). For individuals with SU, dual diagnosis with a mental health disorder is common, with up to 38% of PLWH having both a mental health and substance use disorder (Tegger et al., 2008). Individuals with SU have increased mortality from HIV and substance use -related deaths (DeLorenze, Weisner, Tsai, Satre, & Quesenberry Jr, 2011; Lloyd-Smith et al., 2006; Samji, Chen, Salters, Montaner, & Hogg, 2014). Mental health disorders also negatively impact ART adherence, virologic suppression, and mortality (J. Ickovics & Meade, 2002; J. R. Ickovics et al., 2006; Pence, Miller, Gaynes, & Eron Jr, 2007). People with mental health or substance use disorders may be disenfranchised from the health care system. People with mental health or SU disorders may avoid engaging in HIV care due to stigma and/or difficulty accessing resources and may not be able to navigate social services and/or hospital structures; care is fragmented therefore needs are not met (Jain, Maulsby, Kinsky, Charles, & Holtgrave, 2016; Mizuno et al., 2015). For clinic patients who cannot engage with typical structures, extra resources may be needed to interact with behavioral health providers, housing agencies, social welfare and benefits offices, and other social service providers outside of clinic (Sarango, de Groot, Hirschi, Umeh, & Rajabiun, 2017)

As demonstrated with our data, Black individuals have more need for housing, food, and employment resources compared with members of other races. This is likely a reflection of structural inequalities: Blacks are more likely both to live in poverty (Bureau.) and to live in areas of concentrated poverty compared with whites ("Architecture of Segregation," 2015). Residential segregation contributes to increased HIV risk and worse HIV outcomes (Robinson & Moodie-Mills 2012). To continue progress on ending HIV, there must be progress on ending racial inequity (Robinson & Moodie-Mills 2012).

In our sample, individuals with private insurance were less likely to have other unmet needs, likely reflecting higher economic status. Having insurance is associated with better outcomes along the HIV care continuum (Hughes, Mattson, Scheer, Beer, & Skarbinski, 2014; Muthulingam, Chin, Hsu, Scheer, & Schwarcz, 2013; Yehia, Fleishman, Metlay, Moore, & Gebo, 2012). Although the number of people with HIV who have insurance has increased since the Affordable Care Act (ACA) (Kaiser Family Foundation 2016), insurance alone does not address social determinants of health. The services provided in the Ryan White HIV/AIDS Program can help fill in the needs for additional services to improve their health (Weiser et al., 2015). This study began enrollment in 2014 after the implementation of the Affordable Care Act, and participants were not directly queried about the role of the Affordable Care Act in their own personal insurance coverage.

The limitations of our study include the potential for response bias due to sensitive and potentially stigmatizing circumstances queried. Additionally, the date of HIV diagnosis was not captured; CD4 count at entry to care may be an imperfect proxy of time elapsed between diagnosis and entry to care. Low CD4 at entry to care could be the result of delayed diagnosis or delayed entry to care following diagnosis Additionally, the study population excludes patients not linked to care and patients who linked but did not enroll in study. The strengths of our study include that we have a geographically diverse sample population and a unique sample comprised of individuals who have never received HIV care before. Previous studies that have tried to make inference about initial presentation to HIV care have generally had to rely on non-specific criteria to identify patients, such as ‘no prior ART’ or ‘no prior AIDS-defining conditions’ and we did not have that limitation.

In conclusion, patients presenting to HIV care for the first time should prompt providers to screen for both met and unmet needs pertaining to substance abuse treatment, financial needs, housing, food and transportation access. Longitudinal data from this trial will enable us to investigate whether having multiple needs enhances intervention delivery and outcomes because of the patient’s drive to work with the care team to meet his or her needs or whether having multiple needs hinders intervention delivery and outcomes because of the patient’s underlying social instability. Our findings highlight the importance of the Ryan White HIV/AIDS Program to provide clinics and community-based organizations resources to address the needs of PWH.

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Conflicts of Interest

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References

Aidala A, Lee G, Abramson DM, Messeri P, & Siegler A (2007). Housing need, housing assistance, and connection to HIV medical care. AIDS and Behavior, 11(6 Suppl), 101–115. doi: 10.1007/s10461-007-9276-x [PubMed: 17768674]

Althoff KN, Gange SJ, Klein MB, Brooks JT, Hogg RS, Bosch RJ, . . . Moore RD (2010). Late presentation for human immunodeficiency virus care in the United States and Canada. Clin Infect Dis, 50(11), 1512–1520. doi: 10.1086/652650 [PubMed: 20415573]

Altice FL, Kamarulzaman A, Soriano VV, Schechter M, & Friedland GH (2010). Treatment of medical, psychiatric, and substance-use comorbidities in people infected with HIV who use drugs. Lancet, 376(9738), 367–387. doi: 10.1016/S0140-6736(10)60829-X [PubMed: 20650518]

Andersen M, Hockman E, Smereck G, Tinsley J, Milfort D, Wilcox R, . . . Thomas R (2007). Retaining women in HIV medical care. Journal of the Association of Nurses in AIDS Care, 18(3), 33–41. doi: 10.1016/j.jana.2007.03.007 [PubMed: 17570298]

Antinori A, Coenen T, Costagiola D, Dedes N, Ellefson M, Gatell J, . . . De Wolf F (2011). Late presentation of HIV infection: a consensus definition. HIV Med, 12(1), 61–64. doi: 10.1111/j.1468-1293.2010.00857.x [PubMed: 20561080]

Ashman JJ, Conviser R, & Pounds MB (2002). Associations between HIV-positive individuals' receipt of ancillary services and medical care receipt and retention. AIDS Care, 14(Suppl 1), S109–118. doi: 10.1080/09540120220149993a [PubMed: 12204145]

Bishaw A US Census Bureau. Areas with concentrated poverty: 1999. Census 2000 Special Reports 2005.

Chan D, Absher D, & Sabatier S (2002). Recipients in need of ancillary services and their receipt of HIV medical care in California. AIDS Care, 14(Suppl 1), S73–83. doi: 10.1080/0954012021000009665 [PubMed: 12204143]

Cohen MS, Chen YQ, McCauley M, & Gamble T (2011). Prevention of HIV-1 infection with early antiretroviral therapy. New England Journal of Medicine, 365(6), 493–505 [PubMed: 21767103]

Conviser R, & Pounds MB (2002). Background for the studies on ancillary services and primary care use. AIDS care, 14 Suppl 1(March), S7–14. doi: 10.1080/09540120220149993 [PubMed: 12204138]

Cornelius T, Jones M, Merly C, Welles B, Kalichman MO, & Kalichman SC (2017). Impact of food, housing, and transportation insecurity on ART adherence: a hierarchical resources approach. AIDS Care, 29(4), 449–457. doi: 10.1080/09540121.2016.1258451 [PubMed: 27846730]

Danel C MR, Gabillard D, et al.;. TEMPRANO ANRS 12136 Study Group. A trial of early antiretroviral and isoniazid preventive therapy in Africa. . N Engl J Med. , 373(9), 808–822

DeLorenze GN, Weisner C, Tsai AL, Satre DD, & Quesenberry CP Jr (2011). Excess Mortality Among HIV-Infected Patients Diagnosed With Substance Use Dependence or Abuse Receiving Care in a Fully Integrated Medical Care Program. Alcoholism: Clinical and Experimental Research, 35(2), 203–210

Kaiser Family Foundation. Medicaid and HIV. October 14, 2016 https://www.kff.org/hivaids/fact-sheet/medicaid-and-hiv Accessed February 26, 2018

Giordano TP, Visnegarwala F, White AC Jr., Troisi CL, Frankowski RF, Hartman CM, & Grimes RM (2005). Patients referred to an urban HIV clinic frequently fail to establish care: factors predicting failure. AIDS Care, 17(6), 773–783. doi: 10.1080/09540120412331336652 [PubMed: 16036264]

Group, T. I. S. S. (2015). Initiation of antiretroviral therapy in early asymptomatic HIV infection. N Engl J Med, 373, 795–807 [PubMed: 26192873]

Hall HI SR, Szwarcwald CL,Green T. (2015). Time From Infection With the Human Immunodeficiency Virus to Diagnosis, United States

Hall HI, Tang T, & Espinoza L (2016). Late Diagnosis of HIV Infection in Metropolitan Areas of the United States and Puerto Rico. AIDS Behav, 20(5), 967–972. doi: 10.1007/s10461-015-1241-5 [PubMed: 26542730]

Hartzler B, Dombrowski JC, Crane HM, Eron JJ, Geng EH, Christopher Mathews W, . . . Donovan DM (2017). Prevalence and Predictors of Substance Use Disorders Among HIV Care Enrollees in

the United States. AIDS Behav, 21(4), 1138–1148. doi: 10.1007/s10461-016-1584-6 [PubMed: 27738780]

Hughes AJ, Mattson CL, Scheer S, Beer L, & Skarbinski J (2014). Discontinuation of antiretroviral therapy among adults receiving HIV care in the United States. J Acquir Immune Defic Syndr, 66(1), 80–89. doi: 10.1097/qai.0000000000000084 [PubMed: 24326608]

Ickovics J, & Meade C (2002). Adherence to HAART among patients with HIV: breakthroughs and barriers. AIDS care, 14(3), 309–318 [PubMed: 12042076]

Ickovics JR, Milan S, Boland R, Schoenbaum E, Schuman P, Vlahov D, & Group, H. E. R. S. (2006). Psychological resources protect health: 5-year survival and immune function among HIV-infected women from four US cities. Aids, 20(14), 1851–1860 [PubMed: 16954726]

Jain KM, Maulsby C, Kinsky S, Charles V, & Holtgrave DR (2016). 2015–2020 national HIV/AIDS strategy goals for HIV linkage and retention in care: Recommendations from program implementers. American Journal of Public Health, 106(3), 399–401. doi: 10.2105/AJPH.2015.302995 [PubMed: 26885958]

Jargowsky P Architecture of Segregation. The Century Foundation 8 9, 2015 http://apps.tcf.org/architecture-of-segregation Accessed February 26, 2018

Katz MH, Cunningham WE, Mor V, Andersen RM, Kellogg T, Zierler S, . . . Shapiro MF (2000). Prevalence and predictors of unmet need for supportive services among HIV-infected persons: impact of case management. Med Care, 38(1), 58–69 [PubMed: 10630720]

King WD, Larkins S, Hucks-Ortiz C, Wang P-C, Gorbach PM, Veniegas R, & Shoptaw S (2009). Factors associated with HIV viral load in a respondent driven sample in Los Angeles. AIDS and Behavior, 13(1), 145–153 [PubMed: 18064555]

Leeper C, Mugavero M, Willig J, Chamot E, Kerbawy S, & Zinski A (2014). Social determinants of late presentation to HIV care. Journal of Health Disparities Research and Practice, 7(1), 4 [PubMed: 25419491]

Lesko CR, Cole SR, Zinski A, Poole C, & Mugavero MJ (2013). A systematic review and meta-regression of temporal trends in adult CD4(+) cell count at presentation to HIV care, 1992–2011. Clin Infect Dis, 57(7), 1027–1037. doi: 10.1093/cid/cit421 [PubMed: 23921882]

Lloyd-Smith E, Brodkin E, Wood E, Kerr T, Tyndall MW, Montaner JS, & Hogg RS (2006). Impact of HAART and injection drug use on life expectancy of two HIV-positive cohorts in British Columbia. Aids, 20(3), 445–450 [PubMed: 16439879]

Lo W, MacGovern T, & Bradford J (2002). Association of ancillary services with primary care utilization and retention for patients with HIV/AIDS. AIDS care, 14(Suppl 1), S45–S57. doi: 10.1080/09540120220149920499 84 [PubMed: 12204141]

Sarango M, de Groot A, Hirschi M, Umeh C, Rajabiun S. The Role of Patient Navigators in Building a Medical Home for Multiply Diagnosed HIV-Positive Homeless Populations. J Public Health Manag Pract. , 23(3), 276–282 [PubMed: 28079645]

Magnus M, Schmidt N, Kirkhart K, Schieffelin C, Fuchs N, Brown B, & Kissinger PJ (2001). Association between ancillary services and clinical and behavioral outcomes among HIV-infected women. AIDS patient care and STDs, 15(3), 137–145. doi: 10.1089/108729101750123607 [PubMed: 11313026]

Mayben JK, Kramer JR, Kallen MA, Franzini L, Lairson DR, & Giordano TP (2007). Predictors of delayed HIV diagnosis in a recently diagnosed cohort. AIDS patient care and STDs, 21(3), 195–204 [PubMed: 17428187]

Mizuno Y, Purcell DW, Knowlton AR, Wilkinson JD, Gourevitch MN, & Knight KR (2015). Syndemic vulnerability, sexual and injection risk behaviors, and HIV continuum of care outcomes in HIV-positive injection drug users. AIDS Behav, 19(4), 684–693. doi: 10.1007/s10461-014-0890-0 [PubMed: 25249392]

Monroe AK, Lau B, Mugavero MJ, Mathews WC, Mayer KC, Napravnik S, . . . Chandler G (2016). Heavy alcohol use is associated with worse retention in HIV care. Journal of Acquired Immune Deficiency Syndromes, 1–5. doi: 10.1097/QAI.0000000000001083

Muthulingam D, Chin J, Hsu L, Scheer S, & Schwarcz S (2013). Disparities in engagement in care and viral suppression among persons with HIV. J Acquir Immune Defic Syndr, 63(1), 112–119. doi: 10.1097/QAI.0b013e3182894555 [PubMed: 23392459]

Pence BW, Miller WC, Gaynes BN, & Eron JJ Jr (2007). Psychiatric illness and virologic response in patients initiating highly active antiretroviral therapy. JAIDS Journal of Acquired Immune Deficiency Syndromes, 44(2), 159–166 [PubMed: 17146374]

Rebeiro P, Althoff KN, Buchacz K, Gill J, Horberg M, Krentz H, . . . Gange SJ (2013). Retention among North American HIV-infected persons in clinical care, 2000–2008. J Acquir Immune Defic Syndr, 62(3), 356–362. doi: 10.1097/QAI.0b013e31827f578a [PubMed: 23242158]

Robertson M, Wei SC, Beer L, Adedinsewo D, Stockwell S, Dombrowski JC, . . . Skarbinski J (2016). Delayed entry into HIV medical care in a nationally representative sample of HIV-infected adults receiving medical care in the USA. AIDS Care - Psychological and Socio-Medical Aspects of AIDS/HIV, 28(3), 325–333. doi: 10.1080/09540121.2015.1096891

Robinson R, Moodie-Mills AC, HIV/AIDS Inequality: Structural Barriers to Prevention, Treatment, and Care in Communities of Color. Center for American Progress 7 27, 2012 https://www.americanprogress.org/issues/lgbt/reports/2012/07/27/11834/hivaids-inequality-structural-barriers-to-prevention-treatment-and-care-in-communities-of-color/ Accessed Feb 26, 2018

Samji H, Chen Y, Salters K, Montaner JSG, & Hogg RS (2014). Correlates of unstructured antiretroviral treatment interruption in a cohort of HIV-positive individuals in British Columbia. AIDS and Behavior, 18(11), 2240–2248. doi: 10.1007/s10461-014-0776-1 [PubMed: 24781638]

Saunders JB, Aasland OG, Babor TF, de la Fuente JR, & Grant M (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption--II. Addiction, 88(6), 791–804 [PubMed: 8329970]

Sherbourne CD, & Stewart AL (1991). The MOS social support survey. Soc Sci Med, 32(6), 705–714 [PubMed: 2035047]

Skar H, Albert J, & Leitner T (2013). Towards estimation of HIV-1 date of infection: a time-continuous IgG-model shows that seroconversion does not occur at the midpoint between negative and positive tests. PLoS One, 8(4), e60906. doi: 10.1371/journal.pone.0060906

Spitzer RL, Williams JB, Kroenke K, Linzer M, deGruy FV 3rd, Hahn SR, . . . Johnson JG (1994). Utility of a new procedure for diagnosing mental disorders in primary care. The PRIME-MD 1000 study. Jama, 272(22), 1749–1756 [PubMed: 7966923]

Tegger MK, Crane HM, Tapia KA, Uldall KK, Holte SE, & Kitahata MM (2008). The effect of mental illness, substance use, and treatment for depression on the initiation of highly active antiretroviral therapy among HIV-infected individuals. AIDS patient care and STDs, 22(3), 233–243 [PubMed: 18290749]

Terzian AS, Irvine MK, Hollod LM, Lim S, Rojas J, & Shepard CW (2015). Effect of HIV housing services on engagement in care and treatment, New York City, 2011. AIDS and Behavior, 19(11), 2087–2096. doi: 10.1007/s10461-015-1003-4 [PubMed: 25631320]

Torian LV, & Wiewel EW (2011). Continuity of HIV-related medical care, New York City, 2005–2009: Do patients who initiate care stay in care? AIDS Patient Care and STDs, 25(2), 79–88. doi: 10.1089/apc.2010.0151 [PubMed: 21284498]

Ulett KB, Willig JH, Lin HY, Routman JS, Abroms S, Allison J, . . . Mugavero MJ (2009). The therapeutic implications of timely linkage and early retention in HIV care. AIDS Patient Care STDS, 23(1), 41–49. doi: 10.1089/apc.2008.0132 [PubMed: 19055408]

UNAIDS. 90–90-90 An Ambitious Target to Help end the HIV epidemic http://www.unaids.org/sites/default/files/media_asset/90-90-90_en.pdf Accessed February 26, 2018.

Weiser J, Beer L, Frazier EL, Patel R, Dempsey A, Hauck H, & Skarbinski J (2015). Service Delivery and Patient Outcomes in Ryan White HIV/AIDS Program-Funded and -Nonfunded Health Care Facilities in the United States. JAMA Intern Med, 175(10), 1650–1659. doi: 10.1001/jamainternmed.2015.4095 [PubMed: 26322677]

Yehia B, Fleishman J, Metlay J, Moore R, & Gebo K (2012). Sustained Viral Suppression in HIV-Infected Patients Receiving Antiretroviral Therapy. JAMA: the journal of the American Medical Association, 308(4), 339 [PubMed: 22820781]

Wolitski R, Improvement Needed STAT: Linkage to HIV Care. September 27, 2017 https://www.hiv.gov/blog/improvement-needed-stat-linkage-hiv-care. Accessed February 26, 2018

Table 1.

Characteristics of 348 patients new to HIV care enrolled in the iENGAGE study

	N(%) [unless otherwise indicated(*)]
Site	
1	145 (42)
2	73 (21)
3	74 (21)
4	56 (16)
Male	275 (79)
Race/ethnicity	
Black	217 (62)
White	98 (28)
Hispanic	17 (5)
Other	16 (5)
Age, median years (IQR)*	34 (27, 45)
Insurance type	
Private	152 (44)
Public	117 (34)
Uninsured	76 (22)
Missing	3
Log_{10} viral load copies/mL, median (IQR)*	4.6 (3.8, 5.1)
Drug use, current	
Any illicit	60 (18)
Crack/cocaine	32 (9)
Amphetamines	21 (6)
Heroin/opiates	17 (5)
Alcohol use, AUDIT-C score, median (IQR)*	2 (0, 4)
Hazardous use	114 (33)
Missing	7
PHQ-8 score, median (IQR)*	6 (3, 11)
Moderate major depression (10–19)	89 (27)
Severe major depression (≥20)	12 (4)
Missing	21
PHQ-Anxiety	
Panic symptoms	72 (21)
Panic disorder	35 (10)
Missing	9
Anxiety AND depression (any)	51 (16)
Anxiety, no depression	48 (15)
Depression, no anxiety	45 (14)
No anxiety, no depression	176 (55)
Missing anxiety or depression	28

	N(%) [unless otherwise indicated(*)]
CD4 cells/μL, median (IQR)*	344 (174, 554)
<200 cells/μL	108 (31)
200–499 cells/μL	146 (42)
≥500 cells/μL	94 (27)

Table 2.

Prevalence of ancillary service needs and whether or not needs were met

Service	N(%) Reporting Need	N(%) Reporting Unmet Need	% of those with Need in whom Need went Unmet
Food assistance	127 (36)	81 (23)	64
Financial assistance	121 (35)	84 (24)	69
Benefits assistance	113 (32)	77 (22)	68
Counseling	112 (32)	58 (17)	52
Transportation	112 (32)	72 (21)	64
Housing	85 (24)	59 (17)	69
Employment assistance	83 (24)	71 (21)	86
Substance abuse treatment	28 (8)	8 (2)	29
Child care	10 (3)	9 (3)	90
Any need	241 (69)	174 (50)	72
Median (IQR) number of needs	2 (0, 4)	0.5 (0, 3)	

Table 3.

Association between baseline characteristics and reported ancillary service needs

	Food assistance	Financial assistance	Benefits assistance	Counseling
10-year increase in age	0.87 (0.73, 1.03)	**0.84 (0.70, 0.99)** *	0.93 (0.79, 1.10)	1.02 (0.90, 1.15)
Male sex	1.11 (0.65, 1.88)	0.94 (0.58, 1.52)	1.11 (0.67, 1.81)	0.71 (0.51, 1.00)
Black race	1.16 (0.75, 1.80)	**1.80 (1.15, 2.82)** *	1.42 (0.88, 2.29)	0.91 (0.67, 1.24)
1-log increase in viral load	0.98 (0.84, 1.14)	1.07 (0.92, 1.23)	0.94 (0.79, 1.12)	0.98 (0.87, 1.10)
Ever used drugs	0.81 (0.48, 1.37)	0.75 (0.43, 1.32)	0.57 (0.30, 1.09)	1.12 (0.75, 1.66)
Current drug use	**1.83 (1.03, 3.24)** *	**2.41 (1.36, 4.28)** *	**2.09 (1.09, 3.99)** *	**1.64 (1.08, 2.47)** *
Depression	**1.64 (1.10, 2.44)** *	**2.07 (1.41, 3.03)** *	**1.55 (1.04, 2.30)** *	**1.72 (1.26, 2.35)** *
Anxiety	1.39 (0.94, 2.05)	1.44 (0.97, 2.12)	**2.11 (1.41, 3.16)** *	**1.45 (1.05, 2.00)** *
Hazardous alcohol use	1.21 (0.77, 1.91)	0.86 (0.54, 1.35)	1.11 (0.69, 1.80)	0.93 (0.67, 1.28)
Public insurance	0.93 (0.55, 1.60)	0.73 (0.45, 1.17)	0.77 (0.47, 1.25)	1.04 (0.69, 1.56)
Private insurance	**0.59 (0.36, 0.96)** *	0.63 (0.39, 1.03)	**0.38 (0.22, 0.65)** *	1.33 (0.90, 1.96)
	Transportation	**Housing**	**Employment assistance**	**Substance abuse treatment**
10-year increase in age	0.87 (0.73, 1.04)	0.94 (0.78, 1.13)	1.01 (0.86, 1.19)	1.24 (0.66, 2.34)
Male sex	0.84 (0.50, 1.41)	0.83 (0.47, 1.46)	1.39 (0.78, 2.45)	1.08 (0.17, 6.89)
Black race	1.35 (0.82, 2.23)	**2.38 (1.23, 4.59)** *	**1.73 (1.02, 2.91)** *	1.94 (0.32, 11.69)
1-log increase in viral load	1.03 (0.86, 1.22)	1.07 (0.89, 1.29)	0.93 (0.78, 1.10)	0.78 (0.57, 1.05)
Ever used drugs	0.82 (0.44, 1.54)	1.12 (0.58, 2.15)	**0.51 (0.27, 0.98)** *	0.55 (0.10, 2.90)
Current drug use	**2.02 (1.02, 3.99)** *	1.74 (0.91, 3.30)	**2.33 (1.14, 4.76)** *	3.56 (0.53, 23.85)
Depression	1.17 (0.76, 1.81)	1.22 (0.76, 1.98)	1.44 (0.94, 2.20)	1.98 (0.47, 8.32)
Anxiety	0.93 (0.59, 1.46)	1.49 (0.91, 2.43)	1.32 (0.84, 2.08)	1.68 (0.51, 5.53)
Hazardous alcohol use	1.07 (0.67, 1.73)	1.31 (0.78, 2.21)	0.87 (0.51, 1.46)	**5.75 (1.35, 24.46)** *
Public insurance	0.93 (0.57, 1.54)	0.58 (0.31, 1.07)	0.87 (0.51, 1.46)	0.56 (0.08, 4.09)
Private insurance	**0.35 (0.18, 0.66)** *	**0.42 (0.22, 0.79)** *	**0.39 (0.21, 0.72)** *	0.26 (0.03, 1.98)

* $p<0.05$

Table 4.

Association with baseline characteristics and reported **unmet** ancillary service needs

	Food assistance	Financial assistance	Benefits assistance	Counseling
10-year increase in age	0.87 (0.73, 1.03)	**0.84 (0.70, 0.99)***	0.93 (0.79, 1.10)	**0.78 (0.64, 0.96)***
Male sex	1.11 (0.65, 1.88)	0.94 (0.58, 1.52)	1.11 (0.68, 1.81)	**0.43 (0.25, 0.74)***
Black race	1.16 (0.75, 1.80)	**1.80 (1.15, 2.82)***	1.42 (0.88, 2.29)	1.14 (0.66, 1.97)
1-log increase in viral load	0.98 (0.84, 1.14)	1.07 (0.92, 1.23)	0.94 (0.79, 1.12)	**1.19 (1.00, 1.42)***
Ever used drugs	0.81 (0.48, 1.37)	0.75 (0.43, 1.32)	0.57 (0.30, 1.09)	1.04 (0.57, 1.93)
Current drug use	**1.83 (1.03, 3.24)***	**2.41 (1.36, 4.28)***	**2.09 (1.09, 4.00)***	**2.27 (1.20, 4.28)***
Depression	**1.64 (1.10, 2.44)***	**2.07 (1.41, 3.03)***	**1.55 (1.04, 2.30)***	**1.93 (1.21, 3.07)***
Anxiety	1.39 (0.94, 2.05)	1.44 (0.97, 2.12)	**2.11 (1.41, 3.16)***	1.13 (0.69, 1.87)
Hazardous alcohol use	1.21 (0.77, 1.91)	0.86 (0.54, 1.35)	1.11 (0.69, 1.80)	0.67 (0.39, 1.17)
Public insurance	0.93 (0.55, 1.58)	0.73 (0.45, 1.17)	0.77 (0.47, 1.25)	0.63 (0.34, 1.18)
Private insurance	**0.59 (0.36, 0.96)***	0.63 (0.39, 1.03)	**0.38 (0.22, 0.65)***	0.89 (0.50, 1.61)
	Transportation	**Housing**	**Employment assistance**	**Substance abuse treatment**
10-year increase in age	0.87 (0.73, 1.04)	0.94 (0.78, 1.13)	1.01 (0.86, 1.19)	1.24 (0.66, 2.34)
Male sex	0.84 (0.50, 1.41)	0.83 (0.47, 1.46)	1.39 (0.78, 2.45)	1.08 (0.17, 6.89)
Black race	1.35 (0.82, 2.23)	**2.38 (1.23, 4.59)***	**1.73 (1.02, 2.91)***	1.94 (0.32, 11.69)
1-log increase in viral load	1.03 (0.86, 1.22)	1.07 (0.89, 1.29)	0.93 (0.78, 1.10)	0.78 (0.57, 1.05)
Ever used drugs	0.82 (0.44, 1.54)	1.12 (0.58, 2.15)	**0.51 (0.27, 0.98)***	0.55 (0.10, 2.90)
Current drug use	**2.02 (1.02, 3.99)***	1.74 (0.91, 3.30)	**2.33 (1.14, 4.76)***	3.56 (0.53, 23.85)
Depression	1.17 (0.76, 1.81)	1.22 (0.76, 1.98)	1.44 (0.94, 2.20)	1.98 (0.47, 8.32)
Anxiety	0.93 (0.59, 1.46)	1.49 (0.91, 2.43)	1.32 (0.84, 2.08)	1.68 (0.51, 5.53)
Hazardous alcohol use	1.07 (0.67, 1.73)	1.31 (0.78, 2.21)	0.79 (0.47, 1.35)	**5.75 (1.35, 24.46)**
Public insurance	0.93 (0.57, 1.54)	0.58 (0.31, 1.07)	0.87 (0.51, 1.46)	0.56 (0.08, 4.09)
Private insurance	**0.35 (0.18, 0.66)***	**0.42 (0.22, 0.79)***	**0.39 (0.21, 0.72)***	0.26 (0.03, 1.98)

Table 5.

Crude and standardized prevalence ratios for the association between ancillary needs and first CD4 cell count upon entry to HIV care for the first time among 348 patients enrolled in the iENGAGE study

	Crude		Standardized	
	<200 (ref) vs ≥500	**200–499 (ref) vs ≥500**	**<200 (ref) vs ≥500**	**200–499 (ref) vs ≥500**
Food assistance	0.81 (0.59, 1.12)	0.92 (0.74, 1.15)	0.89 (0.62, 1.26)	0.96 (0.74, 1.24)
Financial assistance	0.87 (0.64, 1.20)	0.85 (0.67, 1.08)	0.91 (0.64, 1.25)	0.82 (0.60, 1.08)
Benefits assistance	1.01 (0.73, 1.39)	1.09 (0.87, 1.35)	0.90 (0.46, 1.40)	0.93 (0.58, 1.28)
Counseling	0.74 (0.52, 1.06)	0.92 (0.73, 1.16)	0.87 (0.56, 1.20)	1.03 (0.79, 1.31)
Transportation	1.14 (0.85, 1.54)	0.96 (0.76, 1.21)	0.94 (0.62, 1.33)	0.89 (0.65, 1.16)
Housing	0.90 (0.62, 1.29)	0.97 (0.76, 1.24)	0.81 (0.37, 1.41)	0.77 (0.41, 1.16)
Employment assistance	0.78 (0.52, 1.19)	1.09 (0.87, 1.37)	0.93 (0.30, 1.71)	0.99 (0.53, 1.46)
Substance abuse treatment	0.75 (0.37, 1.55)	1.07 (0.75, 1.51)	0.40 (0.03, 1.65)	0.62 (0.11, 1.54)

Table 6.

Crude and standardized prevalence ratios for the association between unmet ancillary needs and first CD4 cell count upon entry to HIV care for the first time among 348 patients enrolled in the iENGAGE study

	Crude		Standardized	
	<200 (ref) vs ≥500	**200–499 (ref) vs ≥500**	**<200 (ref) vs ≥500**	**200–499 (ref) vs ≥500**
Food assistance	0.95 (0.66, 1.36)	1.00 (0.78, 1.28)	1.20 (0.74, 1.74)	1.09 (0.81, 1.40)
Financial assistance	0.78 (0.53, 1.14)	0.88 (0.68, 1.14)	0.71 (0.39, 1.10)	0.76 (0.51, 1.05)
Benefits assistance	0.72 (0.47, 1.12)	1.04 (0.82, 1.31)	0.58 (0.14, 1.32)	0.89 (0.39, 1.43)
Counseling	0.89 (0.59, 1.33)	0.91 (0.68, 1.22)	0.59 (0.15, 1.41)	0.62 (0.23, 1.14)
Transportation	0.90 (0.62, 1.29)	0.78 (0.58, 1.06)	0.66 (0.31, 1.11)	0.73 (0.38, 1.06)
Housing	0.85 (0.56, 1.29)	0.87 (0.64, 1.18)	0.66 (0.25, 1.28)	0.64 (0.28, 1.03)
Employment assistance	0.69 (0.43, 1.11)	1.04 (0.81, 1.32)	0.51 (0.18, 1.01)	0.91 (0.41, 1.39)
Substance abuse treatment	Inestimable	0.87 (0.46, 1.62)	Inestimable	0.56 (0.07, 1.58)