

Effects of Depression Alleviation on Work Productivity and Income Among HIV Patients in Uganda

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Abstract

Purpose Depression is common among people living with HIV, and it is associated with impaired work functioning. However, little research has examined whether depression alleviation improves work-related outcomes in this population, which is the focus of this analysis.

Method A sample of 1028 depressed HIV clients in Uganda enrolled in a comparative trial of depression care models and were surveyed over 12 months. Serial regression analyses examined whether depression alleviation (measured by the nine-item Patient Health Questionnaire) was associated with change in self-reported weekly amount of hours worked and income earned, and whether these relationships were mediated by change in work-related self-efficacy.

Results Among those with major depression, depression alleviation was associated with nearly a doubling of weekly hours worked in bivariate analysis. The relationship between depression alleviation and hours worked was partially mediated by change in work self-efficacy among those with major depression, as well as those with minor depression, in multivariate regression analysis that controlled for demographic and health covariates. Depression alleviation was not significantly associated with change in weekly income.

Conclusion These findings suggest that depression alleviation benefits work functioning at least in part through improved confidence to engage in work-related activities. Integration of

depression care services into HIV care may be important for improving the economic well-being of people living with HIV.

Keywords HIV · Depression · Work · Income · Self-efficacy · Uganda

Introduction

Over 1.5 million Ugandans are HIV-infected, or 7% of its population, of whom 50% are on antiretroviral therapy [1]. Depression is common among people living with HIV in sub-Saharan Africa (SSA), with rates of clinical depression ranging from 10 to 20% [2, 3], and an additional 20–40% having elevated depressive symptoms [2, 4]. Depression has been associated with lower immune function or CD4 count [5], higher HIV viral load [6], greater likelihood of mortality [7, 8], and worse immunologic and virologic response to antiretroviral therapy (ART) [9, 10]. Aside from the mental and physical health consequences of depression, it may also have a role in the economic well-being of people living with HIV, as depression has been associated with lower work productivity and unemployment in this population [11, 12].

Uganda's latest employment rate was just 48% [13], and the poverty and literacy rates were 20% [14] and 73% [15], respectively. The vast majority of the population resides in rural settings and much of the labor force is in the informal labor market (e.g., small microenterprises and subsistence farming or fishing) and thus has no access to government social security safety net mechanisms. Drawing on social cognitive theory [16], depression may influence work-related outcomes through its effects on work-related self-efficacy or confidence in being able to work and function well in the work environment. Consistent with depression being one of the most disabling medical diseases [17], common symptoms of depression such as lack of

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motivation, hopelessness, poor concentration, and fatigue may diminish self-efficacy and make it difficult to work and perform productively. Furthermore, it is reasonable to posit that by alleviating depression, depression treatment may improve motivation and self-efficacy to engage in work-related activity. Improved mental health has been associated with improved economic outcomes in low- and middle-income countries [18], but few studies have been conducted with people living with HIV. In a prior study, we found that antidepressant treatment for people living with HIV in Uganda with major depression resulted in reduced work-related impairment and increased work self-efficacy, but not actual engagement in work activities [19], and it did not assess amount of hours worked or income earned.

This paper reports findings from a cluster randomized controlled trial of two depression care models for people living with HIV in Uganda, in which depressed HIV clients were followed prospectively for 12 months. Prior analyses from this study revealed that 63% of clinically depressed clients received antidepressant therapy and that 76% of depressed participants achieved full remission of depressive symptoms or depression alleviation by the end of the study [20]. For this paper, we examined whether depression alleviation was associated with work- and economic-related outcomes, specifically amount of hours worked and income earned. We also assessed whether these relationships were mediated by work self-efficacy and if the results differed between those with major and minor depression. Separate analyses for those with major versus minor depression will enable our findings to inform the importance of depression care models addressing less severe forms of depression and not only depression that meets criteria of a clinical disorder.

Methods

Study Design

INDEPTH-Uganda (INtegration of DEpression Treatment into HIV care in Uganda) is a cluster, randomized controlled trial that compared two task-shifting implementation models for integrating antidepressant treatment into HIV care within 10 health care facilities in Uganda. Five clinics were randomly assigned to implement a structured protocol for administering depression care (experimental arm), and five others relied on the clinical acumen of trained providers (control arm). The models were implemented over 24 months starting in January 2013. To evaluate the models, data were collected from a cohort of adult clients who screened positive for potential depression and were followed for 12 months with assessments at baseline and months 6 and 12. A more detailed description of the study protocol and the depression care models for implementing depression diagnosis and antidepressant treatment has been published elsewhere [21]. The

trial has been registered with the National Institutes of Health sponsored clinical trials registry (NCT02056106). The study protocol was approved by RAND's Human Subjects Protection Committee and the Makerere University School of Medicine Ethical Research Committee.

Setting

The study was conducted in collaboration with Mildmay Uganda, a nongovernment organization that provides holistic outpatient HIV care at its own clinics, as well as technical assistance in HIV care to healthcare facilities across Uganda. Of the 10 healthcare facilities that participated in the study, eight were run by the Ministry of Health and two were private, faith-based, not-for-profit healthcare facilities; the clinics were located in the districts of Mpigi, Mityana, Luweero, and Wakiso and in rural or peri-urban settings. Each facility operates an HIV clinic, in which the depression care was integrated; these clinics operate on 1 to 3 days per week, have a clientele of 350–3000, and a staff of one to two clinical or medical officers and two to five nurses.

Participants

Between January and December of 2013, clients who screened positive for potential depression on the two-item Patient Health Questionnaire [22] (PHQ-2 ≥ 3) at the triage station were eligible for enrollment into the cohort if they were at least 18 years of age, medically stable (not about to start [or recently started] ART or treatment for an acute opportunistic infection), and the research coordinator confirmed their depression status after readministering the PHQ-2. All clients who screened positive for potential depression on the days of recruitment (1 day per week at each site) were informed of the study and asked to provide written informed consent. Records on refusals were not kept, but research coordinators indicate that the vast majority (>95%) of eligible clients agreed to participate.

Measures

All measures were translated into Luganda using standard translation and back-translation methods and were interviewer-administered by trained study coordinators. Participants were paid 10,000 Uganda Shillings (\$3 USD) after each assessment to cover costs of transportation.

Demographic and Background Characteristics These included age, gender, and education level (classified as primary school or less vs. at least some secondary education). CD4 count and ART status were abstracted from the client's medical chart.

Depression The nine-item Patient Health Questionnaire (PHQ-9) was used to measure the presence of depressive symptoms

over the past 2 weeks [22]. The nine items correspond to the symptoms used to diagnose depression according to the diagnostic and statistics manual [23]; responses to each item range from 0 “not at all” to 3 “nearly every day.” Item scores are summed and a score of 10 or greater has been found to correspond highly to major depression [22]; scores of 5–9 reflect minor depression. The PHQ-9 has established validity and reliability when used with HIV-infected individuals in sub-Saharan Africa [24].

A PHQ-9 total score less than 5 at month 12 (month 6, if month 12 data is missing) was used to determine depression alleviation, a definition that has been used in other antidepressant research [25].

Work Productivity and Income To assess work productivity, respondents were asked to report the *average number of hours worked per week* on work-related activity (i.e., activities that generated income or food) over the past 6 months. Respondents were also asked to report the *average amount of income earned per week* over the past 6 months.

Work Self-Efficacy This was assessed by asking respondents to rate their level of confidence in being able to “find work to provide enough food or money for yourself (and your family)?” using a scale of 0–10 with 10 indicating high confidence.

Data Analysis

Participants with either major or minor depression (based on the PHQ-9 score) at baseline were included in the analysis. Two-tailed, independent *t* tests were used to examine bivariate associations between depression alleviation and the two dependent variables of change in hours worked and change in income earned (from baseline to month 12), and between depression alleviation and change in work self-efficacy, with separate analyses conducted for those with major depression or minor depression at baseline.

We used a hierarchical regression analysis to examine depression alleviation as a predictor of each of the two dependent work variables, and whether change in work self-efficacy mediated these associations. We modeled total change in the work variables, and change in work self-efficacy, computed as the difference between the month 12 and baseline values so that zero indicates no change; a positive value indicates increase and a negative value indicates decrease over the study period. A set of two regression models was computed with change in each work measure between baseline and month 12 as the dependent variable, with the sample stratified by participant’s major or minor depression status at baseline. The first model consisted of depression alleviation as the only independent variable, aside from the covariates listed below. If depression alleviation was significantly associated with the dependent work variable in the first model, and depression

alleviation was significantly associated with change in work self-efficacy, then change in work self-efficacy was added to depression alleviation in the second model. All models included the following covariates: age, sex, secondary education, CD4, antidepressant status, depression treatment arm, and baseline measure of the dependent variable. We evaluated the significance of the direct and indirect effects associated with a mediation hypothesis using a Sobel test [26].

To include all cases missing a follow-up assessment, we included attrition weights in regression modeling. Attrition weights were calculated using a logistic regression model of retention status with baseline measures of demographics (age, gender, education, relationship status), HIV disease management (CD4 count, ART status, clinic attendance), depression, and variables associated with attrition (internalized HIV stigma, cognitive functioning, general self-efficacy) as predictors of retention. These attrition weights were calculated separately for those with major and minor depression. At month 12, 16.8 and 33.5% of participants did not have data related to weekly hours worked and weekly income earned, respectively. To account for item nonresponse for these work-related outcomes at follow-up, we generated 36 multiple imputations for each missing value [27, 28]. The coefficients of regression analyses are computed using multiple-imputation inference.

Results

Sample Characteristics

A sample of 1252 clients enrolled in the study, including 640 and 612 clients from sites in the protocolized and clinical acumen arms, respectively. All who enrolled in the study completed the baseline survey, and 1041 (83%) and 1061 (85%) completed the months 6 and 12 assessments, respectively. The sample’s mean PHQ-9 at study entry was 8.2 (SD = 4.3), with 17.7% ($n = 221$) having no/minimal depression symptoms (PHQ-9 < 5), 53% ($n = 659$) having minor depression (PHQ-9 5–9), and 30% ($n = 369$) having major depression (PHQ-9 > 9) (three cases had missing PHQ-9 data). The analysis for this paper used data only from those with minor or major depression ($n = 1028$) at baseline, given its focus on examining effects of depression alleviation. In this sample of 1028, 78% were female, mean age was 39.8 years (SD = 11.2), 18% had at least some secondary education, and 39% were in a relationship; average time since HIV diagnosis was 43.8 months (SD = 39.7), mean CD4 count was 426 cells/mm³ (SD = 266), and 71% were on ART.

Alleviation of Depression

Of the 1028 participants in the study who had either major or minor depression at baseline, 383 received antidepressants

during their participation in the study; 92% of those treated started antidepressants after entry into the study, including 82% at or within 3 months following study baseline and 10% between 3 and 6 months after baseline. At month 12, the mean PHQ-9 was 2.8 (SD = 3.9) among the 946 participants with follow-up data, with 80% ($n = 760$) having no/minimal depressive symptoms or complete depression alleviation, including 75% of the 342 participants with major depression at baseline and 82% of the 604 with minor depression. Participants who had no month 12 data did not differ significantly from the rest of the sample with regard to depression severity or any of the demographic and medical characteristics at baseline.

Relationship Between Depression Alleviation and Work Outcomes

At baseline, average number of hours worked per week was 30.2 (SD = 22.7) in the sample of 1028; those with major depression worked significantly lower hours (mean = 26.7) compared to those with minor depression (mean = 32.1; $t = 3.58$, $df = 995$, $p = .0004$). Average amount of income earned per week was 21,133 shillings (SD = 41,212; median = 8000) at baseline in the sample of 1028, which did not vary between those with major (mean = 20,032) and minor (mean = 21,713) depression ($t = .54$, $df = 775$, $p = .60$).

Analysis of Subgroup with Major Depression At month 12, those with depression alleviation had a significantly greater mean number of hours worked per week (25.0 vs. 14.7; $t = -3.98$, $df = 330$, $p < .0001$) and mean income earned per week (17,374 vs. 3029; $t = -2.55$, $df = 330$, $p = .011$), compared to those who remained depressed. Depression alleviation was positively correlated with change in work self-efficacy ($r = .23$, $p < .001$).

In a separate set of analyses for each of the two dependent work variables, we used a series of regression analyses to examine depression alleviation as a correlate, and whether

change in work self-efficacy mediated its relationship to these work variables (see Table 1). Achievement of depression alleviation was positively associated with increase in number of hours worked per week, but not with change in income earned per week, when it was the sole independent variable (aside from the set of covariates). When change in work self-efficacy was added to the model of change in hours worked, increase in work self-efficacy was a significant predictor of greater hours worked per week, and depression alleviation remained a significant predictor. Work self-efficacy partially mediated the relationship between depression alleviation and change in hours worked, with a significant indirect effect [$b = 1.87$, $SE = .77$, $p = .008$] and a significant direct effect of depression alleviation [$b = 6.78$, $SE = 2.26$, $p = .003$].

Analysis of Subgroup with Minor Depression At month 12, those with depression alleviation had a significantly greater mean number of hours worked per week (28.9 vs. 20.4; $t = -4.27$, $df = 563$, $p < .0001$) and mean income earned per week (18,673, vs. 8770; $t = -1.98$, $df = 563$, $p = .048$), compared to those who remained depressed. Depression alleviation was positively correlated with change in work self-efficacy ($r = .31$, $p < .001$).

In the series of regression analyses (see Table 1), a similar pattern of findings resulted as was seen in the subgroup with major depression. Depression alleviation was a significant predictor of change in hours worked; change in work self-efficacy partially mediated this relationship, with a significant indirect effect [$b = 3.59$, $SE = .88$, $p < .0001$] and a significant direct effect of depression alleviation [$b = 1.33$, $SE = .29$, $p < .0001$]. Depression alleviation was not associated with change in income earned in the regression analysis.

Discussion

These findings show that alleviation of major depression is associated with better work-related functioning and

Table 1 Hierarchical regression analysis of the relationship between depression alleviation and change in work variables (weekly hours worked and income earned), and the mediating role of work self-efficacy, among those with major and minor depression

	Weekly hours worked beta (std. error)		Weekly income (shillings) beta (std. error)
Major depression	DA	DA + work SE	DA
Depression alleviation	8.01*** (2.23)	6.78** (2.26)	9799 (5017)
Change in work self-efficacy	–	.88** (.33)	–
Minor depression	DA	DA + work SE	DA
Depression alleviation	7.14*** (2.14)	4.30* (2.18)	6669 (4418)
Change in work self-efficacy	–	1.33*** (.30)	–

All models included the following baseline covariates: age, secondary education, sex, CD4 count, antidepressant treatment status, and depression treatment arm. Regression coefficient with robust standard error in parentheses

DA depression alleviation, SE self-efficacy

*** $p < .001$, ** $p < .01$, * $p < .05$

productivity, as measured by an increase in number of hours worked, but not associated with change in income earned, in people receiving HIV care in Uganda. In bivariate analysis, depression alleviation was associated with nearly a doubling of average weekly hours worked. Work-related self-efficacy partially mediated the relationship between depression alleviation and change in hours worked in those with major depression, suggesting that depression (and alleviated or treated depression) influences work functioning in part through its influence on confidence to engage in and successfully perform work-related activities. Similar findings were observed for alleviation of minor depression.

Depression has been associated with work- and economic-related outcomes such as work status (i.e., whether or not someone was engaged in work activity) in studies of people living with HIV [11, 29], but few studies have examined the economic associations of depression alleviation in this population. In a prior study of the work-related effects of antidepressant treatment in a small sample of people living with HIV in Uganda, we found that treatment resulted in improved work functioning and self-efficacy [29], but had no effect on engagement in actual work activity; this led us to suggest that supplementary therapeutic strategies (e.g., behavioral activation, problem solving) may be needed to more directly impact work-related behavioral change. However, this larger study now shows that when depression is alleviated, whether as a result of antidepressant treatment (which was the case for most in this study) or not, work activity in the form of hours worked increases significantly among those who have major depression. This finding notwithstanding, depression alleviation does not necessarily cause improved work productivity; for some people, improved work status and functioning may lead to improved mood and mental health. Among those with minor depression, depression alleviation was also associated with increased hours worked, which suggests that treatment for depression, regardless of its severity, is likely to have benefits for work performance and therefore should be aggressively managed. Our negative findings with regard to change in income suggest that the benefits of depression alleviation for increased work hours do not necessarily translate into significant gains in income in this population. A possible explanation may be that much of our study population engages in subsistence farming or selling of food or small goods, and increased work hours may result in more food cultivated rather than income earned, and more hours spent selling good does not necessarily result in more goods sold.

Drawing from social cognitive theory [16], we examined how self-efficacy mediates the influence of depression alleviation on hours worked. Change in work-related self-efficacy partially mediated the relationship between depression alleviation and change in hours worked in those with major depression, as well as those with minor depression. These findings suggest that depression alleviation improves work functioning

and productivity at least in part through improved cognitive processes such as confidence and belief in one's ability to work and perform well. Evidence-based depression treatments such as cognitive behavioral therapy may therefore be particularly well suited to helping depressed clients overcome work-related challenges, although our study shows that antidepressants are effective in this regard as well. It is also important to note that while improved work self-efficacy may result in improved work functioning, this relationship is likely to flow in the opposite direction as well, with improved work outcomes contributing to increased work self-efficacy.

The analyses were limited by a number of measurement limitations. Hours worked and income earned were both measured by self-report, which are subject to recall and social desirability biases. Similar to other studies [30], about a third of our sample had missing data related to income, most of whom were subsistence farmers who may have solely been earning food rather than monetary compensation from their work; although our use of imputation allowed us to overcome for this missing data, more complete data from the respondents would improve our ability to evaluate this outcome. The data regarding depression diagnoses were limited by the reliance on the PHQ-9, rather than a more rigorous diagnostic interview, although the PHQ-9 has been found to have high correspondence with diagnostic interviews [22]. Work self-efficacy was measured with a single item only, as opposed to a validated scale. Also, the study design does not allow us to infer causal relationships between depression alleviation and these work variables; these relationships are likely to be bidirectional, with better work performance and income perhaps being just as likely to improve mood and reduce depression.

In summary, this study provides evidence of the benefits of depression care for work functioning and economic well-being in people living with HIV and insight into the cognitive mechanisms by which depression alleviation serves to improve these variables. Furthermore, these data together with other findings showing that depression alleviation is associated with improved HIV care adherence and retention [29, 31–33] bolster the argument for the need for mental health and depression care to be fully integrated into HIV care services in Uganda and the larger region of SSA. Other findings from this study have demonstrated the feasibility and effectiveness of task-shifted depression care in this setting [20, 34]. Evidence of the economic benefits of depression treatment, as demonstrated in this study, may be key to moving the policy debate and mobilizing funders and budget allocations to place greater priority on provision of mental health services for people living with HIV.

Compliance with Ethical Standards

Funding Funding for this research was provided through a grant from the National Institute of Mental Health (R01MH098996).

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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