Health and Socio-economic Impacts of Livelihoods Programs among People Living with HIV in Cambodia: A Case-Control Study

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Abstract **Background**: In Cambodia, the circumstances surrounding people living with HIV (PLHIV) remain serious conditions. To ameliorate these situations, KHANA has implemented livelihoods programs since 2010, including village saving and loans (VSL), skill trainings, and cash grants with on-going technical support. This study aims to evaluate the impacts of the programs in improving socio-economic conditions, health, and psychological well-being of PLHIV in Cambodia. **Methods:** In August 2014, a case-control study was conducted in six selected provinces. The cases were defined as PLHIV who lived in the selected operational districts where KHANA has implemented the livelihoods programs, and have participated in the programs for at least one year. Several indicators in socio-economic situations, food security, health conditions, and psychological well-being of the cases (*n*= 358) and the controls (*n*= 329) were compared. **Results:** The mean of monthly income of the cases who attended the programs for three years or more was 13.6% higher than that of the controls. A significantly higher proportion of the cases reported having three meals per day, while a significantly lower proportion of them received food assistance in the past 12 months. The mean total score for frequency of occurrence also indicated less severity of food insecurity among the cases. Regarding child education, the cases reported a significantly lower rate of out-of-school children. The proportion of the cases who rated their quality of life as good was significantly higher, and they were significantly less likely to report that they felt guilty being HIV-positive persons. Regarding psychological well-being, the mean total score of depressive symptoms for the cases was significantly lower than that for the controls, and the proportion of the cases with a cut-off score smaller than 1.75, which indicated less depressive symptoms, was also significantly higher than that of the controls. **Conclusions**: Findings from this study portray the positive impacts of KHANA's livelihoods programs in maintaining and upgrading the livelihoods and quality of life of PLHIV in Cambodia. With these noticeable impacts, the programs should be scaled up to support PLHIV and vulnerable households across the country.

Keywords: *health, impact evaluation, livelihoods programs, people living with HIV, psychological well-being, Cambodia*

Cite This Article: Sovannary Tuot, Kouland Thin, Mayumi Shimizu, Samedy Suong, Samrithea Sron, Pheak Chhoun, Khuondyla Pal, Chanrith Ngin, and Siyan Yi, "Health and Socio-economic Impacts of Livelihoods Programs among People Living with HIV in Cambodia: A Case-Control Study." *American Journal of Public Health Research*, vol. 4, no. 5 (2016): 159-169. doi: 10.12691/ajphr-4-5-1.

1. Introduction

Globally, it is estimated that 35.3 million people were living with HIV in 2012, and the proportion of people receiving antiretroviral therapy (ART) has tripled over the past five years [1]. ART has helped increase the lifespan of people living with HIV (PLHIV) [2,3] and averted approximately 6.6 million AIDS-related deaths worldwide from 1995 to 2012. The number of annual AIDS-related deaths decreased by 30% between 2005 and 2012 [1].

Despite this great improvement, socio-economic and psychological burden in the daily life of PLHIV on ART and their family are viewed to be important issues to address [4,5].

Food insecurity is considered to be an important barrier to adherence to ART for PLHIV [6-13]. It is defined as "a situation that exists when people lack secure access to sufficient amount of safe and nutritious food for normal growth and development and an active and healthy life" [14]. On the other hand, the concept of food security is defined as both physical and economic access to food that meets people's dietary needs as well as their food

preferences [14]. Food insecurity among PLHIV occurs in both resource-rich and -limited countries. Studies showed that more than half of PLHIV in Democratic Republic of Congo, Kenya, Uganda, Zambia, Canada, and USA were food insecure [6,8,15,16,17,18].

It is recognized that food insecurity and HIV are intertwined in a vicious cycle, with each heightening the vulnerability to and worsening the severity of the other condition [19]. HIV and AIDS worsen food insecurity due to deaths of income earners, loss of productive labor, reduction of access to credits, and increase of debts as well as expenditure on health care, transportation fee, and funeral cost [20,21]. Furthermore, food insecurity also affects in parallel HIV transmission risk and clinical outcomes among PLHIV [22,23]. Studies in Uganda, Botswana, and Swaziland showed that women facing food insecurity were more likely to engage in high-risk sexual behaviors such as transactional and unprotected sex [24,25]. Food insecurity is also associated with worse HIV treatment outcomes, including lower CD4 cell count [13,26], incomplete viral load suppression [13], increased opportunistic infections [27], poor mental health [18,28], and increased risk of mortality [23,29].

With the growing recognition of the importance of integrating HIV care and food security, a symposium on nutrition, food security, and HIV/AIDS was held in 2001 to stimulate collaboration between the nutrition and HIV/AIDS communities and to examine a broad range of nutrition issues that have a direct bearing on policies and programs, which aimed at stemming the spread of HIV and mitigating the worst effects of HIV and AIDS [30]. Following this initiative, food programs that provide supplemental food lasting between six to 12 months to PLHIV and their families have been developed and implemented by a number of governmental and non-governmental organizations (NGOs) [31]. Several intervention studies showed a positive impact of food assistance on HIV clinical outcomes such as increased body mass index (BMI) [32,33,34] and adherence to ART [35,36]. However, those programs have not addressed the underlying causes of food insecurity [31,37].

In light of the above, some organizations have started implementing more sustainable long-term livelihoods activities to support and improve food security of PLHIV through microfinance, income generation, crop production, and animal husbandry [31,37]. In Kenya, microcredit has been shown to improve economic well-being, social status, and psychological well-being, and decreased stigma among HIV-positive clients [38]. Likewise, microcredit loans for business partnerships involving both HIV-positive and HIV-negative individuals in Thailand ameliorated not only economic conditions but also the quality of life of PLHIV [39]. A qualitative study in Uganda indicated that microcredit loans for PLHIV played a positive role in their lives, helped keep their children in school, and improved their self-esteem and status in the community [40]. Moreover, Holmes et al. showed that community-managed saving-led microfinance provided a valuable means of ensuring the effectiveness and sustainability of ART programs in resource-limited settings [41].

In Cambodia, the circumstances surrounding PLHIV and their families remain serious conditions [42], although the estimated prevalence of HIV in the general population has been declining [1]. HIV-affected households incur larger portion of expenditure on medical care, while their income is lower than the general households [43]. Children in HIV-affected households experience fewer meals in a day and increase frequency of hunger compared with children in non-HIV affected households [43]. To ameliorate this situation, KHANA, the largest national NGO providing HIV prevention, care, support, and treatment services in Cambodia, has implemented its livelihoods programs since 2010 to improve the socio-economic status of PLHIV and their families. The organization's long-term goal is to increase household asset retention and food security, and facilitate farm and non-farm business performance among PLHIV through village saving and loans (VSL), skill trainings, and small cash grants with on-going technical support [44]. From 2010 to mid-2013, a total of 2,063 infected and affected household members have received support from the programs. Thirty-nine livelihoods skill trainings had been delivered to 1,109 participants; 522 households had received cash grants; and 119 VSL groups had been initiated, with 1,881 members (68% of which were female) [45].

Despite its benefits for PLHIV and their families, studies on the impacts of livelihoods programs are limited in coverage and methodology; most of the studies are qualitative in nature [31,38,40,41]. In addition, only a few studies have measured the impacts of livelihoods programs on psychological well-being of PLHIV. This study aims to explore the impacts of KHANA's livelihoods programs in improving socio-economic conditions, health, and psychological well-being of PLHIV in Cambodia. Findings from this study are crucial for governmental bodies and NGOs for considering and adopting a more effective design and implementation of livelihoods programs for PLHIV. Furthermore, the results of this study will provide organizations, which have already implemented livelihoods programs, with important information to improve and strengthen the current livelihoods activities or to expand their programs.

2. Methods

2.1. Study Population

KHANA livelihoods programs had been implemented in 13 provinces through 23 community-based implementing partners (IPs). This case-control study was conducted in August 2014 in selected six provinces: Battambang, Kampong Cham, Kampong Speu, Pursat, Siem Reap, and Takeo. Selection of the provinces was agreed upon consultation with the livelihoods program teams by taking into account the number of cases and controls in each province. The cases in this study were defined as PLHIV who lived in the selected operational districts (ODs) where KHANA has implemented the livelihoods programs and have participated in the programs for at least one year, while the controls were defined as PLHIV who lived in the selected comparable ODs where livelihoods programs had not been implemented. This study included participants who: (1) were 18 years or older, (2) were able to speak Khmer language, (3) lived in the selected study areas, and (4) agreed to participate in the study voluntarily.

Those who could not give the interview because of a severe mental illness or/and health conditions were excluded.

2.2. Sample Size and Sampling Approach

OpenEpi (Odense, Denmark) was used to calculate a sample size for the unmatched case-control study with a power of 80%, two-sided confidence level of 95%, ratio of the controls to the cases of 1:1, proportion of PLHIV exposed to the livelihoods programs of 14% [46], least extreme odds ratio of 0.5, design effect of 1.0, and non-response rate of 10%. The minimum required sample size was 360 individuals for each group. For the cases, 12 health centers located in the selected ODs in the six provinces and have more than 30 PLHIV were chosen. Approximately 30 participants were randomly selected from the program member list in each health center. For the controls, 12 health centers with similar geographical and demographical characteristics to the health centers selected for the cases were chosen. Approximately 30 participants were randomly selected from the list of HIV registries in each health center. During field data collection, the teams were able to reach about 95.4% of the required sample size. The details of sampling procedures have been published elsewhere [46].

2.3. Data Collection Procedures

Sixteen interviewers and four field supervisors were hired for field data collection. The interviewers and field supervisors selected for this study were either university students who previously engaged in similar work or freelancers who previously sub-contracted with KHANA Research Center. Both the interviewers and field supervisors went through one day classroom training on survey objectives and study questionnaire, and one day fieldwork practice. KHANA's research team members were the principal investigators for this study, whereas coordination and facilitation at study sites were channeled through KHANA's IPs. All completed questionnaires were checked and coded everyday by field supervisors before handing over to the field coordinator. After a brief explanation about the study and informed consent signed, participants were interviewed face-to-face for about 30 minutes. The interviews were conducted in the community settings such as pagodas or houses of community support volunteers, chief of village, or heads of self-help groups.

2.4. Questionnaire and Measurements

The questionnaire for this study was first developed in English using standardized tools taken from previous studies to measure key indicators related to the study objectives and then translated into Khmer by a KHANA's research fellow. It was also back-translated into English by a different research fellow to confirm semantic equivalence. The questionnaire was pre-tested with 20 PLHIV who were beneficiaries of the KHANA livelihoods programs and another 20 PLHIV who were not beneficiaries of the programs in order to ensure that the wording and contents were culturally suitable, acceptable, and easily understood by the study participants. The version in Khmer was revised according to inputs from the pre-test and researchers working on HIV and AIDS in Cambodia and then back-translated into English to ensure that the contents of each question was maintained. In the main survey, data were collected using the final revised questionnaire. Participants included in the pre-test were excluded from the main survey.

This study questionnaire contained four main sections. The first section included general information on participation in the livelihoods programs and demographic characteristics of the cases and the controls. The second section focused on socio-economic status of the two groups. The third section gathered information on food security using 9-item scale of Household Food Insecurity Access Scale (HFIAS) created by USAID's Food and Nutrition Technical Assistance (FANTA) [47]. The questionnaire developed by FANTA consists of nine occurrence questions that are used to assess the level of food security and nine questions on frequency of occurrence that are used to assess how often the situation occurred in the past four weeks. The questions cover several aspects of food insecurity including anxiety and uncertainty about household food supply, insufficient food quality and intake, and its physical consequences. The degree of food security is measured by summing the score of all the nine frequency of occurrence questions. A higher score indicates a higher level food insecurity [48]. The fourth section emphasized on health and ART.

Information on psychological well-being was covered in the fifth section. The depression section of the Hopkins Symptoms Checklist (DSHSCL), which consists of 15 items scaled from one to four, was used to measure the presence and degree of depressive symptoms during last week. The score is calculated by summing the responses to individual items and dividing by the total number of items. The standard cut-off score is 1.75 which indicates the presence of depressive symptoms [49]. For internalized stigma, the 6-item Internalized AIDS-Related Stigma Scale (IA-RSS) was used [50]. The items reflect negative beliefs about PLHIV, shamefulness of behaviors associated with HIV, and the endorsement of social sanctions against PLHIV. The items are type of dichotomous questions in which individuals can either "agree" or "disagree" with the questions related to internalized stigma [51]. The 19 items of Medical Outcome Study (MOS) scaled from one to five developed by RAND and MOS team were used to measure social support in this study. These items cover five dimensions: emotional support, informational support, tangible support, positive support interaction, and affection. The total score is derived by summing the score for all 19 items, with the higher score indicating better social support [52]. Last but not the least, self-esteem was measured by the 10-item Rosenberg Self-Esteem Scale (RSES). All items are answered using a 4-point Likert's scale, with a higher score indicating a higher level of self-esteem [53,54].

2.5. Data Entry and Statistical Analyses

Data entry began after the field data collection was completed. Data processing personnel consisted of a data processing supervisor and five entry operators. The collected data were coded and scaled continuously or categorically as dictated by the variables and entered into a computerized database using Epi Data version 3 (Odense, Denmark). Double data entry was performed to minimize

data entry errors. Consistency, verification, and additional editing were performed by the KHANA Research Center's staff to eliminate data entry errors. Descriptive statistics were performed to determine the frequency distribution of responses for ordinal and categorical variables. The mean and range were calculated for continuous variables. Chi-square test, Fisher's exact test, and *t*-test, characterized based on the nature of variables being analyzed, were used to detect the differences in key outcome indicators. *P* values of less than 0.05 were to be statistically considered significant. Statistical analyses were performed with STATA software, version 12.0 (Lakeway Drive College Station, TX).

2.6. Ethical Considerations

Participation in this study was completely voluntary. Participants could refuse or cease their participation at any time without penalties. All participants were briefed on the study objectives, procedures, possible risks, benefits, confidentiality, and withdrawal from this study during the consenting process. Participants were asked to provide their signature on an informed consent form prior to the interview if they agreed to participate in the study. The interviews were conducted in a place where privacy of the participants was secured. Confidentiality was ensured throughout the study by using identification code for all instruments and analyses. This study protocol was approved by the National Ethics Committee for Health Research (NECHR) of Ministry of Health (MoH) in

Cambodia and the Ethical Committee of the University of Tokyo in Japan.

3. Results

3.1. Demographic Characteristics

The study population included 358 cases and 329 controls. Demographic characteristics of the cases and the controls are shown in Table 1. Compared with the controls, the cases were slightly older (44.4 years vs. 43.2 years; *p*=0.06), and more of them were female (73.7% vs. 62.3%; *p*<0.01). The mean number of years of formal education completed was almost the same (5.3 years vs. 5.2 years; *p*=0.66). In this study, approximately 18% of both groups never attended school. Household size of the two groups varied from a maximum of 16 members to as small as a single person, with an average of four persons per household. Both the cases and the controls had two children on average (2.6 persons vs. 2.4 persons; *p*=0.11). The majority of the cases and the controls were married (57.0% vs. 61.4%; *p*=0.10). The top three jobs reported among the cases and the controls were farmer (33.0% vs. 51.4%; *p*<0.01), business owner (28.8% vs. 20.7%; *p*<0.01), and employees of private and public sectors (14.5% vs. 26.1%; *p*<0.01). The mean number of income earners in the households was similar (1.9 persons; *p*=0.37). Of total, 81.0% of the cases and 63.5% of the controls reported receiving other support beside food from various institutions (*p*<0.001).

Table 1. Socio-demographic characteristics of the cases and the controls

Variables	Cases (*n*=358)	Controls (*n*=329)	*p*-value
Female	264(73.7)	205 (62.3)	<0.01
Heterosexual	357 (99.7)	325 (98.8)	0.51
Mean age in years (±SD)	44.4 ± 7.8	43.2 ± 8.9	0.06
Mean years of education completed (±SD)	5.3 (2.9)	5.2 (2.8)	0.66
Never attended school	64 (17.9)	61 (18.5)	0.82
Marital status			
Married	204 (57.0)	202 (61.4)	0.10
Never married	5 (1.4)	10 (3.0)	0.10
Divorced/separated/widower	149 (41.6)	117 (35.6)	0.10
Mean number of household member (±SD)	4.4 ±1.9	4.3 ±1.9	0.47
Mean number of children (±SD)	2.6 ±1.8	2.4 ±1.4	0.11
Occupation			
Unemployed	18 (5.0)	41 (12.5)	<0.01
Employed (private and public sectors)	52 (14.5)	86 (26.1)	<0.01
Farmer	118 (33.0)	169 (51.4)	<0.01
Self-employed	103 (28.8)	67 (20.7)	<0.01
Other	16 (4.5)	16 (4.9)	<0.01
Received supports beside food in past 12 months	290 (81.0)	209 (63.5)	<0.001
Mean number of income earners (±SD)	1.9 ±0.9	1.9 ±0.9	0.37

Note: SD, standard deviation.
Data are number (%) for categorical variables and mean (±SD) for continuous variables.

In this study, the majority of the beneficiaries participated in the livelihoods programs for one year (47.0%), followed by two years (35.2%), three years (17.3%), and four years or more (0.6%). The mean duration of participating in the programs was 1.7 years (SD=0.8). The livelihoods programs reported to join included VSL (97.2%), skill trainings (44.7%), and cash grants (32.9%). Approximately 18% of the cases reported that they participated in all the three livelihoods programs. The most common skill trainings received from the programs were animal husbandry (41.9%), home gardening (27.3%), and business start-up (12.8%). It is

worth-noting that about 79% of the beneficiaries said that they practiced what they had learnt.

3.2. Socio-economic Status

Table 2 shows comparisons of socio-economic status among the cases and the controls. The mean of monthly income varied according to the duration in the livelihoods programs. Overall, there was no significant difference between the cases and the controls with respect to mean of monthly income earned (USD121.0 vs. USD124.1; p=0.85).

Table 2. Comparisons of economic status among the cases and the controls

Variables	Cases (*n*=358)	Controls (*n*=329)	*p*-value
Mean monthly income (±SD, US$)	121 ±145	124±181	0.85
Had a loan	265 (74.0)	234 (71.1)	0.39
Source of loan			
Friend/neighbor	33 (12.3)	49 (20.8)	0.01
NGO	78 (29.2)	33 (14.0)	<0.01
Bank/microfinance institution	169 (62.3)	107 (45.3)	<0.01
Purpose of loan			
Medical expense	96 (40.6)	74 (27.7)	0.00
Household consumption	39 (16.5)	66 (25.5)	0.13
Agriculture activities	56 (23.7)	63 (23.6)	0.27
Mean amount of loan (±SD, US$)	577±145	639.2±112	0.52
Sold off assets	106 (29.6)	91 (29.2)	0.57
Sold off assets for medical expense	27 (25.0)	31 (34.3)	<0.01
Mean expense on medical care last month (±SD, US$)	49 ± 92	75 ± 345	0.16
Had an ID Poor card	212 (59.0)	220 (66.9)	0.03
Children currently not in school	26 (7.2)	36 (11.0)	0.04

Notes: ID, Identification; NGO, non-governmental organization; SD, standard deviation.
Data are number (%) for categorical variables and mean (±SD) for continuous variables.
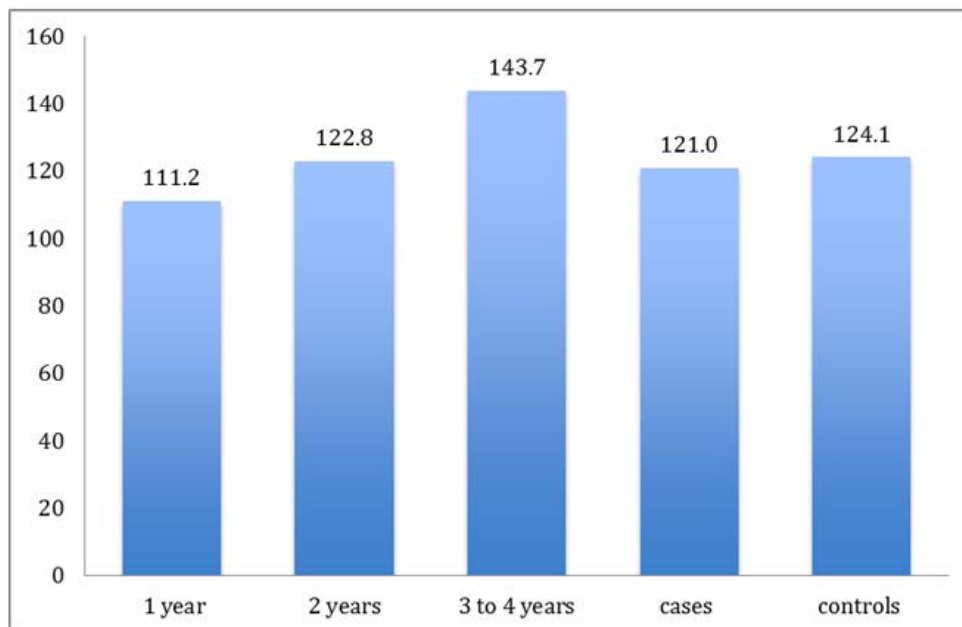

Figure 1. Comparisons of mean of monthly income by number of years in the livelihoods programs among the cases and the controls

Note: Mean monthly income is in U.S. dollars.

However, as depicted in Figure 1, the means of monthly income of the beneficiaries increased gradually when they stayed longer in the programs. The mean of monthly income of beneficiaries who attended the programs for three years or more was 13.6% higher than the controls.

Concerning debts, approximately 70% of the cases and the controls reported borrowing money from loan providers. Compared to the controls, the cases were significantly more likely to borrow from the banks/microfinance institutions or NGOs (62.3% vs. 45.2; *p*<0.01 and 29.2% vs. 14.0%; *p*<0.01, respectively) and less likely to borrow from friends or neighbors (12.3% vs. 20.8%; *p*<0.01). Although not statistically significant, beneficiaries in this study were less likely to borrow to supplement their household consumption (16.5% vs. 25.5%; *p*=0.13). However, they were significantly more likely to borrow for medical expense compared to the controls (40.6% vs. 27.7%; *p*<0.01). It is worth-noting that

the mean amount of money borrowed in the past 12 months for the cases was slightly smaller than the controls, but the deference was not statistically significant (USD577.5 vs. USD639.2, $p=0.52$).

Regarding household assets, a significantly lower proportion of the cases reported selling off their assets for medical expenses compared to that of the controls (25.0% vs. 34.3%; $p<0.01$). In addition, the mean amount of money spent on medical care was smaller among the cases (USD48.7 vs. USD74.9; $p=0.16$). Concerning child education, the proportion of children who were not currently in school was significantly lower among the cases (7.0% vs. 11.0%; $p=0.04$).

3.3. Food Insecurity

As shown in Table 3, the proportion of the cases who reported having three meals per day in the past week was significantly higher than that of the controls (72.1% vs.

60.2%; $p<0.01$). In addition, the proportion of the cases who reported receiving food assistance in the past 12 months was significantly lower than that of the controls (38.0% vs. 46.2%; $p=0.02$).

Although a higher proportion of the cases in this study reported having three meals per day and depending less on food assistance from NGOs, assessment through HFIAS still showed high level of food insecurity among both the cases and the controls. A high proportion of the cases and the controls reported having limited choices in the types of food that they consumed, eating a few kinds of food, and eating a smaller portion of food (79.0% vs. 78.1%, $p=0.82$; 63.4% vs. 72.0%, $p=0.01$; 63.1% vs. 67.8%, $p=0.19$, respectively). However, the HFIAS score for frequency of occurrence showed significantly less severity of food insecurity (access) among the cases than that among the controls (mean, 9.9 vs.10.8; $p=0.04$).

Table 3. Comparisons of food insecurity indicators among the cases and the controls

Variables (in the past 4 weeks)	Cases ($n=358$)	Controls ($n=329$)	p-value
Had three meals per day last week	258 (72.1)	198 (60.2)	<0.01
Received food assistance in past 12 months	136 (38.0)	152 (46.2)	0.02
Worried about food	302 (84.3)	287 (87.2)	0.24
Occurred often	151 (50.0)	183 (63.8)	<0.01
Unable to eat preferred foods	283 (79.0)	257 (78.1)	0.82
Occurred often	98 (34.6)	114 (44.3)	<0.01
Ate just a few kinds of foods	227 (63.4)	237 (72.0)	0.01
Occurred often	97 (42.7)	120 (50.6)	0.14
Ate a smaller meal	231 (64.5)	221 (67.1)	0.43
Occurred often	58 (25.1)	66 (29.7)	0.52
Mean total score ($\pm$SD)	9.9 (5.6)	10.8 (5.9)	0.04

Note: SD, standard deviation. Data are number (%), unless specified.

3.4. Health and Antiretroviral Therapy (ART)

As shown in Table 4, although not statistically significant, the proportion of the cases who rated their overall health as good was higher than that of the control subjects (22.9% vs. 19.4%; $p=0.29$). The proportion of the cases who rated their QOL as good was significantly higher than that of the controls (15.7% vs. 12%; $p=0.02$). Level of adherence to ART was generally high among both groups, and no significant difference was found.

Table 4. Comparisons of health and ART use among the cases and the controls

Variables	Cases ($n=358$)	Controls ($n=329$)	p-value
Self-rated health			
Good	82 (22.9)	64 (19.4)	0.29
Self-rated quality of life			
Good	56 (15.7)	46 (12.5)	0.02
Currently on ART	350 (97.8)	322 (97.8)	0.92
Mean of duration using ART (in years, $\pm$SD)	6.8 $\pm$3.2	6.8 $\pm$3.6	0.40
Mean of distance to ART center (km, $\pm$SD)	21.4 $\pm$27.4	18.5 $\pm$24.5	0.16
Mean of transpiration free (USD, $\pm$SD)	3.6 $\pm$4.2	3.9 $\pm$6.3	0.46
Taking ART one or two times per day	347 (99.1)	317 (98.4)	0.90
Did not miss ART in past four days	349 (99.7)	321 (99.7)	0.95
Took ART on schedule	302 (86.3)	273 (84.7)	0.54
Never skipped taking ART	326 (93.1)	298 (92.5)	0.94
Missed ART in the past 30 days (days, $\pm$SD)	2.6 $\pm$2.6	1.5 $\pm$1.2	0.17
Mean CD4 count at last blood test ($\pm$SD)	519.0 $\pm$528.6	495$\pm$260.2	0.26

Notes: Data are number (%) of subjects, unless otherwise indicated; ART, antiretroviral therapy.

3.5. Psychological Well-being

Figure 2 shows that, compared to the controls, the cases were significantly less likely to report that they felt guilty being HIV-positive persons (64.5% vs. 71.7 %; *p*=0.04). Although statistically not significant, the proportion of the cases who said they felt ashamed, dirty, and worthless being HIV-positive persons was smaller than that of the controls (62.6% vs. 65.9%, *p*=0.35; 52.0% vs. 57.4%; *p*=0.15; 38.7% vs. 42.5%, *p*=0.34, respectively). Furthermore, the proportion of the cases who said that they had difficulty revealing their HIV status to others and hid their HIV status from others was also smaller than that of the controls (40.8% vs.45.9%, *p*=0.18; 17.3% vs. 19.7%, *p*=0.41, respectively).
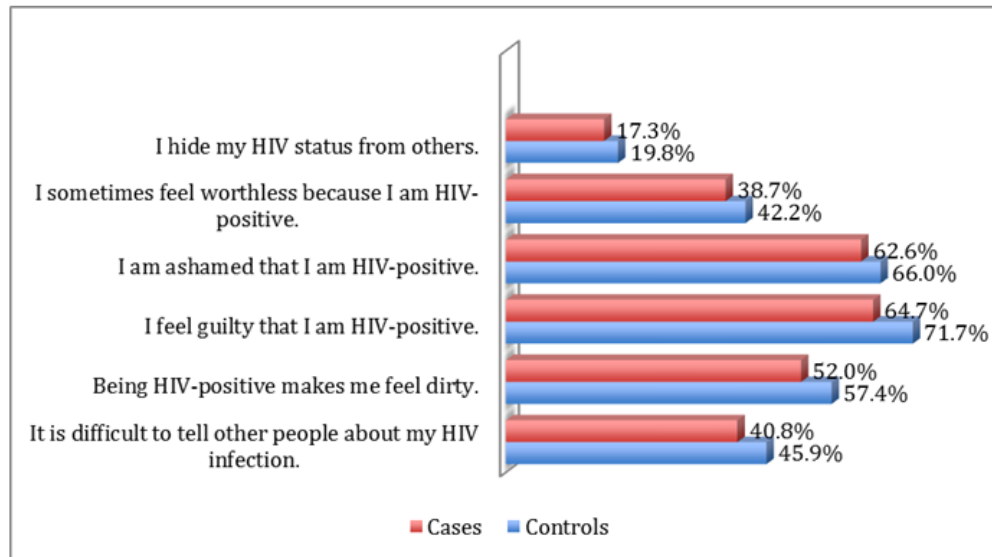

Figure 2. Comparisons of feelings related to HIV among the cases and the controls

As shown in Table 5, the mean total score of DSHSCL for the cases was significantly lower than that for the controls (1.9 vs. 2.0; *p*=0.02). In addition, the proportion of the cases who had a cut-off score smaller than 1.75, which indicated less depressive symptoms, was also significantly higher than that of the controls (42.4% vs. 36.2%; *p*=0.05). The mean total score of self-esteem was 21.2 (SD= 3.3) among the cases and 21.4 (SD= 3.4) among the controls, indicating moderate self-esteem. If looking at the individual questions, both the cases and the controls still reported having less respect for themselves. The support received by the cases and the controls were not significantly different. The mean total score was about 60 points, which indicated good social support for both the cases and the controls in this study.

Table 5. Comparisons of depressive symptoms, self-esteem, and emotional support received among the cases and the controls

Variables	Cases (*n*= 358)	Controls (*n*= 329)	*p*-value
Mean total scores of depressive symptoms (±SD)	1.9 ± 0.5	2.0 ± 0.5	0.02
Scores of depressive symptoms <1.75	152 (42.4)	119 (36.2)	0.05
Mean total scores of self-esteem (±SD)	21.2 ± 3.3	21.4 ± 3.4	0.60
Mean total scores of emotional support received (±SD)	59.9 (12.5)	59.4 (12.7)	0.57

Note: Standard deviations are in the parentheses.

4. Discussion

KHANA's livelihoods programs aim to improve the socio-economic conditions of the vulnerable households, including PLHIV and key populations, and to alleviate the socio-economic and human impacts of HIV on the individuals, families, and communities. Several positive outcomes are spotted through the comparisons of key indicators, such as income, debt, food security, mental health, and QOL among the cases and the controls in this study.

At the end of 2015, KHANA expected to see about 80% of the households supported by the livelihoods programs increase their income. Although the baseline data were not collected, the control group was used to tell the difference.

The mean of monthly income of the cases was moderately higher than that of the controls in the third year of the programs. The analysis of the cases' monthly income according to the number of years in the livelihoods programs showed that it rose gradually from the first year onwards. This steady improvement in the monthly income highlights the important role of KHANA's livelihoods programs in upgrading PLHIV's economic status, which has also been illustrated in previous studies in Cambodia [45,55]. A study to evaluate a homestead food production program conducted by Helen Keller International Cambodia showed that the median of monthly income from home gardening of PLHIV in Battambang province who participated in the program for two years rose from USD12.5 to USD20. Similarly, studies in other developing countries have also indicated the effectiveness of livelihoods programs in mitigating the socio-economic

impacts of HIV. The VSL of CARE Cote d'Ivoire has been proved to be effective in improving access to loans to restart or expand PLHIV's income generation activities [56]. In Thailand, the Positive Partnership Project established by the Population and Community Development Association, in which an HIV-negative individual was required to team up with an HIV-positive person to be eligible for loans for income generating activities, has been shown to improve the economic conditions of participating PLHIV [39].

In addition, KHANA also expected to see about 80% of the supported households improve their livelihoods and vocational capacity. In this study, we found that about 72% of KHANA's beneficiaries reported having three meals per day in the past week compared to only 60% of the controls. Moreover, the mean total score for frequency of occurrence also showed less severity of food insecurity among the cases than that among the controls. This improvement reflects the strength of the programs in securing livelihoods of the supported households. As indicated in a qualitative review of KHANA's livelihoods programs conducted in 2013, the beneficiaries who were in the VSL groups were able to borrow loans from their groups with a low interest rate to expand their business, to buy inputs for their vegetable gardens, or to start animal husbandry. Raising chicken was rather popular among the beneficiaries because they could get cash in hands quickly from selling them to settle family urgency or consume them when they did not have money to buy other preferred foods. This quick cash generation together with access to loans from the VSL groups also helped keep children in school and divert the risk of borrowing money from private moneylenders with high interest rate [45]. Similarly, findings in this study showed that the number of 6-17 year-old children of the beneficiaries who were not currently in school was smaller than that of the controls. On the other hand, the cases were more likely to get loans from formal institutions such as NGOs, microfinance institutions or banks, and were less likely to borrow to supplement food consumption compared to the controls. Concerning vocational trainings, although we cannot tell how many households in this study improved their vocational capacity, about 79% of the beneficiaries reported practicing what they had learnt from the livelihoods programs.

Further, KHANA also expected to see 80% of the supported households have a dedicated budget source to improve health outcomes. Even though the study did not include specific indicators to measure the budget allocated for improving health for the cases and the controls, several key indicators in the health section indicated that the cases were in a better health condition compared to the controls. The proportion of the cases who self-rated their quality of life as good was higher than that of the controls. In addition, the CD4 cell count of the cases was also higher than that of the controls. Again, this positive outcome underscores the effectiveness of KHANA's livelihoods programs and several forms of support that KHANA's IPs have provided to its beneficiaries including transportation fee to the ART center, health education, food, children's schooling, and so on. In addition, monthly VSL meetings might as well play roles in upgrading the quality of life of the beneficiaries because they did not only meet to discuss VSL business, but various issues including personal health,

ART, family situation, farming, and animal husbandry [45]. Studies from Nepal, Thailand, China, and Africa have also shown that community support is crucial in upgrading quality of life of PLHIV [56,57,58].

Concerning psychological well-being, even though the level of internalized stigma among the cases was lower than that among the controls in this study, the prevalence of feeling guilty among the cases remained high compared to regional data [59]. A regional study illustrated that the proportion of PLHIV who reported feeling guilty ranged from 43% in Sri Lanka to 76% in the Philippines. The prevalence in this study was 64.7% among the cases. Similarly, the proportion of the cases who reported feeling ashamed was also fairly high (62.6%) compared to the regional study, which ranged from 54% in Sri Lanka to 76% in Pakistan [59]. The level of depressive symptoms among the cases was also relatively high; although, the mean total score among the cases was lower than that among the controls. The mean total score was higher than the standard cut-off score, which indicated the presence of depressive symptom among this group. Discussion about their issues or concerns during self-help group and VSL meetings, and health education, may have helped to reduce stigma and increase self-esteem among this population, but might not have been enough. Increasing support from partners, family members, and friends may counteract the negative impacts of HIV on psychological well-being of PLHIV. Issues related to internalized stigma, mental health, self-esteem, and emotional support should be reinforced during health education and social gatherings to expand support and build self-confidence among this population. It is important to note that women with HIV were dominant in this study. Gender sensitivity and differences should be considered given a cultural norm controlling women's behaviors in Cambodia. A cross-sectional retrospective study in Europe depicted that women with HIV received less emotional support than men with HIV and did not benefit from the emotional support they reported receiving [60].

There are some limitations in this study. First, the baseline survey had not been conducted, thus we did not really know what would have happened to the cases if they had not participated in the livelihoods programs. Second, due to the self-reported measures, the results might be affected by social desirability and recall biases in their responses to the interviews. Third, only six out of the 13 provinces where the livelihoods programs had been implemented were purposively selected as study sites due to a budget constraint. This might limit the generalizability of the study findings. Fourth, the initial plan was to interview the cases who were in the programs for at least two years, but the size of the population was too small. Thus, to get the required sample for the cases, the beneficiaries who just entered the programs for one year were also included in the survey. It was somehow difficult to detect the difference extensively in the early stage of support.

5. Conclusions

Consistent with other studies in Asia and Africa, the findings of this study portray the positive impacts of KHANA's livelihoods programs in maintaining and

upgrading the livelihoods and QOL of PLHIV in Cambodia. In this study, the beneficiaries could cope with the economic difficulties better than the non-beneficiaries. Income of the supported households has improved gradually from the first year onwards. In addition, the beneficiaries' ways of getting loans had also changed through these programs. They were more likely to turn to formal loan providers than private moneylenders, which usually charge higher interest rates, compared to the non-beneficiaries. Further, they owed smaller amount of money to loan providers and were less likely to sell off household assets for medical expenses, compared to the non-beneficiaries. The level of food insecurity was also lower among the beneficiaries, and they depended less on food assistance from outside. It is worth-noting that the rate of dropouts from schools among the beneficiaries' children was also smaller than that of the non-beneficiaries'. With these positive changes in the livelihoods of the beneficiaries, KHANA's livelihoods programs should be scaled up to support PLHIV and vulnerable households across the country.

Despite the significant improvements in the livelihoods of the beneficiaries, the levels of stigma and psychological problems among the beneficiaries reported in this study remained high compared to the regional data. Although the psychological well-being of the beneficiaries was better than that of the non-beneficiaries, more need to be done to bolster it. Future studies should collect additional information to identify factors that could potentially impact on mental health of the beneficiaries. It will be helpful to understand why the beneficiaries still felt this way although they had received several forms of support from KHANA's IPs. Special intervention programs are necessary to downgrade the stigma and improve the psychological well-being of PLHIV in Cambodia.

Statement of Competing Interests

The authors declare that they have no competing interests.

Authors' Contributions

Principal investigator: SY. Developed the protocol and tools: MS, ST, KT, SS, SS, and SY. Drafted the manuscript: KT and ST. Performed the statistical analyses: KT and ST. Led data collection: MS and SS. Reviewed literature and wrote the manuscript: KT, ST, CN and SY. Provided comments and inputs on the manuscript: KT, ST, MS, SS, SS, CN, and SY.

Acknowledgements

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