

Integrating nutrition security with treatment of people living with HIV: Lessons from Kenya

Elizabeth Byron, Stuart Gillespie, and Mabel Nangami

Abstract

Background. *The increased caloric requirements of HIV-positive individuals, undesirable side effects of treatment that may be worsened by malnutrition (but alleviated by nutritional support), and associated declines in adherence and possible increased drug resistance are all justifications for developing better interventions to strengthen the nutrition security of individuals receiving antiretroviral treatment.*

Objective. *To highlight key benefits and challenges relating to interventions aimed at strengthening the nutrition security of people living with HIV who are receiving antiretroviral treatment.*

Methods. *Qualitative research was undertaken on a short-term nutrition intervention linked to the provision of free antiretroviral treatment for people living with HIV in western Kenya in late 2005 and early 2006.*

Results. *Patients enrolled in the food program while on treatment regimens self-reported greater adherence to their medication, fewer side effects, and a greater ability to satisfy increased appetite. Most clients self-reported weight gain, recovery of physical strength, and the resumption of labor activities while enrolled in dual (food supplementation and treatment) programs. Such improvements were seen to catalyze increased support from family and community.*

Conclusions. *These findings provide further empirical support to calls for a more holistic and comprehensive response to the coexistence of AIDS epidemics with chronic nutrition insecurity. Future work is needed to*

clarify ways of bridging the gap between short-term nutritional support to individuals and longer-term livelihood security programming for communities affected by AIDS. Such interdisciplinary research will need to be matched by intersectoral action on the part of the agriculture and health sectors in such environments.

Key words: HIV, malnutrition, nutrition security, treatment

Introduction

The objective of this study is to examine the ability of a nutritional intervention to improve both the nutritional status of patients receiving antiretroviral treatment and their household resilience to the shock of a chronically ill adult member. We consider the intervention within the broader perspective of nutrition security in the context of HIV and AIDS. The research took place under the auspices of the Academic Model for Prevention and Treatment of HIV/AIDS (AMPATH). This study was developed and supported by the Regional Network on AIDS, Livelihoods and Food Security (RENEWAL), coordinated by the International Food Policy Research Institute (IFPRI).

At the time of this research in 2005, AMPATH cared for over 27,000 people living with HIV in western Kenya, of whom just over 50% were receiving antiretroviral treatment. As of January 2008, the number of people cared for was 55,000 with enrollment increasing by roughly 2,000 per month. In 2002, a nutrition intervention was linked to the provision of free antiretroviral treatment to bolster nutrition security of the most vulnerable patients over a short period of time. Using this intervention as a case study, this paper identifies programmatic lessons and challenges to linking nutritional and other comprehensive support services with antiretroviral treatment in a resource-poor setting.

Nutrition security is achieved for a household when secure access to food is coupled with a sanitary

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environment, adequate health services, and adequate care to ensure a healthy life for all household members. Although interventions that link nutritional support to AIDS treatment are relatively new, donors, program implementers, and clinical care providers are increasingly recognizing the critical importance of integrated programming that provides services beyond clinical care for HIV-positive individuals. One example is the 2005 World Health Assembly resolution WHA57.14 that “urged Member States, as a matter of priority, to pursue policies and practices that promote, inter alia, the integration of nutrition into a comprehensive response to HIV/AIDS”[1]. Another is the June 2006 UN General Assembly Political Declaration on HIV/AIDS where UN member states “resolve to integrate food and nutritional support, with the goal that all people at all times will have access to sufficient, safe and nutritious food to meet their dietary needs and food preferences, for an active and healthy life, as part of a comprehensive response to HIV/AIDS”[2].

The multiple impacts of HIV and AIDS on individuals and households continue to challenge development policy and programming. Here we assess the interaction of a formal nutrition intervention with individual, household, and community responses to the needs of patients receiving antiretroviral treatment to better understand how such a formal intervention fits into the web of available informal support. As with other forms of food aid, issues of enrollment criteria, targeting efficiency, and transitioning off support pose challenges to program design and implementation. Using data collected by qualitative research methods, we analyze observations and perspectives from patients and other key stakeholders on the impact of the program, identify constraints facing program implementers and beneficiaries, and highlight some of the future challenges to an integrated approach to meeting the needs of people living with HIV. This study contributes empirical data to the growing evidence base on the interactions between nutrition and antiretroviral treatment—evidence that is essential for moving forward with the provision of comprehensive treatments, linked as appropriate to targeted nutrition interventions, and underpinned by enabling policy.

Background

Nutrition and immunity in HIV-positive individuals can interact in two ways. First, HIV-induced immune impairment and heightened subsequent risk of opportunistic infection can worsen nutritional status. HIV infection often leads to nutritional deficiencies through decreased food intake, malabsorption, and increased utilization and excretion of nutrients, which in turn can hasten death [3]. Second, nutritional status modulates the immunological response to HIV infection, affecting the overall clinical outcome. Immune suppression

caused by malnutrition is similar in many ways to the effects of HIV infection [4]. Four decades ago, research started to shed light on this “malnutrition–infection complex” with the term “NAIDS” (nutritionally acquired immune deficiency syndrome) being coined [5].

While these interactions are under way within the bodies of individuals infected with the virus, households with a chronically ill adult member face progressive threats to their livelihoods [6–9]. Subsequent deterioration in household food security can in turn jeopardize not only the nutritional status of the ill individual but also the nutritional security of others in the household. Reduced income, increased expenditures (e.g., on health care and transportation), loss of labor productivity, and reallocation of time away from production to caring for sick members can all cumulatively precipitate and exacerbate household food insecurity. Such interactions are now well documented [10, 11].

Returning to the individual level, according to the World Health Organization (WHO), asymptomatic people living with HIV are recommended to increase energy intake by 10%, whereas symptomatic individuals should increase their intake by 20% to 30% [12]. People on antiretroviral treatment in resource-poor settings may lack access to food of sufficient quantity and quality to complement their treatment, offset side effects, and encourage adherence. The critical importance for people living with HIV of maintaining adequate food consumption and nutrition intake levels, regardless of whether they are receiving antiretroviral treatment, is now well documented [13]. Research has shown that independently of antiretroviral treatment, weight loss remains a predictor of mortality in HIV-infected individuals [14, 15]. There is now clear evidence that malnourished individuals starting antiretroviral therapy are far more likely to die in a given period than well-nourished individuals [16]. Research is also under way to investigate whether nutritional support of asymptomatic, HIV-positive individuals may delay the need for antiretrovirals.

Highly active antiretroviral therapy (HAART) improves nutritional status, although some side effects, such as nausea, vomiting, and dizziness—which are often worse in malnourished individuals—may affect adherence in the early months of treatment [17]. Compromised adherence may in turn lead to the development of widespread drug resistance and the need for a whole new regimen of second-line drugs that are significantly less accessible and affordable than first-line regimens.

In sum, increased caloric requirements for HIV-positive individuals, undesirable side effects of treatment that may be worsened by malnutrition (but alleviated by nutritional support), and the consequent threats of declines in adherence and increased drug resistance are all justifications for developing more and better

interventions to strengthen the nutrition security of individuals on antiretroviral treatment. Such urgency applies to any context where malnutrition and high or rising HIV prevalence coexist. Although more operations research is clearly needed to understand how such interventions are working and how to improve them, there is now growing interest in linking nutritional support to AIDS treatment programs.

The AMPATH nutrition intervention

The AMPATH nutrition intervention is one of a limited number of innovative programs aiming to provide comprehensive treatment and care services to HIV-positive people in East Africa. AMPATH began providing HIV preventive and treatment services in 2001 [18]. The program was established as a partnership between Moi Teaching and Referral Hospital, Moi University Faculty of Health Sciences, and the Indiana University School of Medicine. There are currently 19 centers in the western part of Kenya where patients receive treatment and care at Ministry of Health facilities. The AMPATH approach to care for people living with HIV is multidisciplinary, involving teams of physicians, clinical officers, nurses, nutritionists, pharmacists, social workers, and outreach workers.

In the early stages of the AMPATH treatment program, it became apparent that the majority of HIV-positive patients were malnourished. Several reasons were cited—most importantly, a lack of access to food, poor appetite, and poor preparation of food. In 2002, a project to provide supplementary food to AMPATH patients was initiated through the HAART and Harvest Initiative (HHI). The program established production farms in close proximity to four of the AMPATH treatment sites, enabling the provision of locally acceptable, nutritionist-prescribed food for any registered AMPATH patient found to be malnourished and food-insecure. It was determined from the inception that food rations would be based on household size rather than just the individual patient. HHI farm production includes eggs, milk, and fresh fruits and vegetables, as well as local and exotic herbs. The farm also purchases food from local markets and from patients who are not receiving food supplementation to augment its supply for distribution to program clients.

In June 2005, the AMPATH food supplementation program expanded when the World Food Programme (WFP) began donating food. Between June and December 2005, WFP distributed food to 60% of AMPATH patients living in absolute poverty. Patients receiving the WFP ration consisting of maize, beans, corn-soybean blended flour, and vegetable oil also receive HHI fresh farm foods. Similar to HHI, the WFP ration is considered supplementary and assumes the household has other sources of food.

The following criteria were developed to deter-

mine whether a patient should be enrolled in the food program: insufficient access to food to support patient recovery, body mass index below 19, household income less than 3,000 Ksh per month (at the time of the research, US\$1 was equal to approximately 73 Ksh; the monthly household income guideline for enrollment was less than US\$41/month), and CD4+ count less than 200. Meeting at least one of the guidelines would typically qualify a patient for enrollment, although AMPATH nutritionists often made decisions on a case-by-case basis. AMPATH staff conduct nutrition assessments during a patient's monthly clinical appointment. Weight is monitored, food prescriptions are renewed, and nutritional counseling is provided. Patients enrolled in either WFP or HHI then take their food prescriptions to the nearest distribution site to collect foodstuffs twice weekly or once a month, depending on the distance from their residence. The WFP program intends to support clients with free food for up to 6 months, at which time they are to be "weaned off" food support. The period of 6 months was predicated on observations that the majority of patients gain enough strength by then to engage in normal activities of daily living. However, because some patients need longer, there is some flexibility in extending the food support beyond the initial 6 months.

AMPATH also operates a program to assist clients with income generation or food production post-intervention. The purpose of the Family Preservation Initiative (FPI) is to assist, restore, and improve the income status of people living with HIV as part of the comprehensive recovery strategy to stabilize livelihoods. Core activities include agricultural microfinancing, business training, and technical support for poultry and horticulture, among others. An additional service available to all registered AMPATH patients, regardless of whether they are on treatment or enrolled in the food program, is the weekly patient-led support group meetings. Support group members encourage one another, learn to live positively, reinforce adherence to treatment and the need for a balanced diet, and help to deal with stigma-related stress.

At the time of the study in late 2005 and early 2006, it was estimated that 20% to 50% of all patients attending AMPATH clinics were food-insecure. These estimates are based on monthly reporting by each clinic in the network using the aforementioned enrollment criteria. The rapidly growing enrollment of patients in the AMPATH treatment and care program and the considerable level of food insecurity (varying by clinic location) suggest that there will be increasing demand for food supplementation services.

The nutrition support programs (both WFP and HHI) are intended to be short-term formal sources of support to assist patients on antiretroviral treatment to recover levels of nutritional and clinical health status in time of distress. In theory, these programs target the

most vulnerable patients, who in addition to their compromised health status may not have well-functioning informal support networks prior to learning their HIV status (e.g., widows caring for children).

Study objective

The broad objective of this study was to highlight key benefits and challenges relating to interventions aimed at strengthening the nutrition security of people living with HIV and receiving antiretroviral treatment. Following a brief description of the research design and methods, the various benefits and challenges of integrating nutritional support with antiretroviral treatment are discussed, drawing from in-depth patient and program staff interviews. For comparison, data from interviews with patients who were not enrolled in the supplementation program are woven into the discussion. We discuss the key perceived benefits of the nutrition intervention, including access to food, nutritional education, adherence to treatment, recovery of physical health, meeting household nutritional needs, household labor supply, reallocation of household resources, and impact on the community. We conclude by summarizing key benefits, lessons, and challenges—providing recommendations for the improved implementation of this and other similar nutrition interventions and for the types of policy change required to enable such interventions to be effective and sustained.

Methods

This study is part of a larger interdisciplinary research design incorporating clinical, longitudinal survey, and in-depth research methods. Approval of the qualitative research design was granted by the institutional research and ethics committee of Moi University–Moi Teaching and Referral Hospital as an amendment to the approved protocol on “Economic Impacts of Disease and Treatment on Household Welfare in North Rift Region, Kenya.” Here we present the results from

qualitative research conducted between December 2005 and February 2006 on the patient population of the Mosoriot Rural Health Center–AMPATH Clinic.

The Mosoriot Rural Health Center is located approximately 25 km south of Eldoret town and is the main health care facility in Kosirai Division in the Nandi North District of Rift Valley Province. Kosirai Division has an area of 195 km² and a population of 35,383 persons in 6,643 households [19]. Kosirai Division is inhabited predominantly by the Nandi ethnic group. The health center mainly provides outpatient care and has a limited inpatient capacity. Mosoriot was the first rural site in the AMPATH treatment network and the first of four pilot sites for the food supplementation program.

Qualitative data were collected from 18 interviews with key informants, 9 focus group discussions, and 79 in-depth patient interviews. Key informants from the food supplementation program, AMPATH clinical staff, and village leaders were identified and invited for individual interviews during December 2005. The interviews followed a semistructured guide on issues related to individual and household vulnerability to food insecurity, nutritional needs of people living with HIV, the role of informal social support networks, and observations on the nutrition intervention. Next, focus groups were organized, stratified according to sex, marital status, and participation in the supplementation program and other AMPATH services. AMPATH program staff assisted the research team in inviting 8 to 12 individuals to attend a 2- to 3-hour meeting. Nine discussions were conducted in January 2006. The composition of the groups is shown in **table 1**.

The in-depth sample was designed to capture patients enrolled in the food supplementation program as well as others who initiated antiretroviral treatment at a similar time but were not eligible for food supplementation. Four groupings were constructed to include patients more recently initiating antiretroviral treatment and receiving both WFP and HHI food support, as well as patients with a longer history of antiretroviral treatment but receiving only HHI food support. The

TABLE 1. Composition of focus groups

Group no.	Composition	No. of participants	% women	Mean age (yr)
1	Current HHI/WFP food clients	10	80	39
2	Weaned HHI/WFP food clients	7	86	35
3	Caregivers of patients in food program	9	22	41
4	Female patients receiving antiretroviral therapy not in food program	6	100	33
5	Male patients receiving antiretroviral therapy not in food program	6	0	39
6	Single patient support group members	12	92	36
7	Male patient support group members	11	0	39
8	Widowed patient support group members	11	91	44
9	Family preservation initiative participants	13	62	36

HHI, HAART (highly active antiretroviral therapy) and Harvest Initiative; WFP, World Food Programme

sample groups, containing approximately 20 patients each, were as follows: group 1, newly enrolled patients receiving antiretroviral therapy (from July 2005) meeting the criteria for WFP and HHI and receiving food supplements from both sources; group 2, newly enrolled patients receiving antiretroviral therapy who did not meet the criteria for WFP or HHI supplementation; group 3, currently enrolled (before July 2005) patients receiving antiretroviral therapy who met the criteria for HHI supplementation before the WFP program was initiated and were possibly still on HHI food support; group 4, currently enrolled patients receiving antiretroviral therapy who were never in any of the food programs. For the purpose of this analysis, groups 1 and 3 are also referred to as food clients ($n = 39$). The sample of nonfood clients (groups 2 and 4; $n = 40$) is intended to serve as a comparison group, albeit an imperfect one, for the examination of nutrition security among patients on antiretroviral treatment.

The construction of a pure control group is impossible because patients who qualify for food supplementation cannot ethically be denied the free food support. The authors acknowledge an inherent sample bias of patients enrolled in the food program, in that they are more likely to be food-insecure and malnourished than nonfood clients. Challenges to accurately implementing the enrollment criteria may have further affected these groupings.

Patients were recruited for in-depth interviews at clinic visits during 3 weeks of February 2006. A random start date was selected, and the research team solicited interviews on site at the clinic until quotas of 20 patients per sample group were filled. All interviews were conducted in private at the Mosoriot Rural Health Center in Kiswahili, Kinandi, or English, according to the informant's preference. With the use of the preliminary findings from the key informant interviews and focus group discussions, in-depth interview guides were developed for these individual patient interviews. The main topics covered included patient experiences with the food supplementation program, use of food collected from the program, impact of the food, transition off food support, meeting nutritional needs while on antiretrovirals, adherence to antiretroviral therapy, economic activities of the household, and social support networks. Individual informed consent was solicited and collected before each interview, and patient names were not recorded at any time. Only one individual refused to be interviewed. Patients were reimbursed a flat rate for their transport costs to and from the clinic.

Table 2 presents the characteristics of the in-depth sample. Approximately 60% of AMPATH patients are women, reflecting the combined outcomes of women being more likely to be infected, to know their HIV status, and to seek treatment in Kenya [19]. Our sample captured a somewhat higher proportion of women

(77%) than is representative of the patient population. The respondents ranged in age from 20 to 63 years, with a higher median age among men (48 years) than women (33 years). The majority of women in the sample were either single or widowed, whereas marital status among men was highly skewed toward married men. A slightly higher proportion of men in the sample (39%) had postprimary schooling than women (36%). The data illustrate how more women than men regularly attend AMPATH-sponsored support groups.

All individual interviews and focus group discussions were recorded and first transcribed in the language in which they were conducted and then translated into English. The authors identified key themes to explore in the qualitative data in part on the basis of the findings from two earlier rounds of household surveys in Mosoriot. The following themes were explored in the qualitative data: the structure of support networks, norms that undergird mutual support, and any change

TABLE 2. Characteristics of in-depth patient sample

Variable	Women	Men	Overall
Composition of groups (%)			
Group 1 ($n = 18$)	89	11	
Group 2 ($n = 21$)	71	29	
Group 3 ($n = 21$)	62	38	
Group 4 ($n = 19$)	89	11	
Total sample ($n = 79$)	77	23	
Food clients in groups 1 and 3 (%)	74	26	39
Age (yr)			
Mean	35	48	37
Median	33	48	36
Marital status (%)			
Single	43	6	34
Married	15	78	29
Widowed	26	11	23
Separated	16	6	14
Household size			
Mean	5.8	4.2	5.4
Median	5	4	5
Range	1–18	1–12	1–18
Average no. of children < 18 yr living in household	2.8	1.6	2.5
Education (%)			
None	8	5	8
Primary incomplete	25	17	23
Primary complete	31	39	33
Secondary incomplete	16	17	16
Secondary complete	15	11	14
Postsecondary schooling	5	11	6
Regularly attends a support group (%)	46	28	42

over time; the role of stigma in disclosure of HIV status and how this may relate to support; norms on the distribution of food within the household; cultural appropriateness of the types of foods distributed through the intervention; and the impact of nutritional supplementation on household resource allocation (i.e., labor, time allocation, health expenditures, schooling etc). The authors coded interview transcripts for these preidentified themes as well as any additional themes of relevance using QRS N6 qualitative data analysis software. The coded data were analyzed across each of the four sample groups for comparison.

Results

In this section we address the key perceived benefits of linking nutritional intervention with antiretroviral treatment, and some of the current and future programmatic and policy challenges.

Benefits of the nutrition intervention

Nutrition interventions linked to treatment are relatively new, and there has been little evaluation to assess their impact. A food supplementation program of this type has the potential to impact patients and their households in different ways, including improved access to food, adherence to antiretroviral therapy, nutritional status, use of financial resources, household labor supply, and other sources of support. The qualitative component of this study provides preliminary evidence of individual- and household-level benefits, based on patient, caregiver, and programmer observations.

Access to food

Food clients reported increased dietary diversity and diet quantity as among the most important benefits of the program. For many past and current food clients, the food supplementation program provided access to different types of food previously unavailable in the homestead (e.g., eggs and milk) or unaffordable.

Upon initiation of antiretroviral treatment, many patients had an increase in appetite. The supplementation program helped clients meet their nutritional needs and satisfy their appetites by providing a secure source of food in the short term. Caregivers reported no longer needing to constantly ask neighbors and friends for assistance, because the patients they cared for could access their own food through the program. Patients further claimed they no longer had to beg for assistance. Data from focus group discussions also suggest that the food program plays an important role in the emotional well-being or mental health of patients. Eighty-two percent of food clients in our sample indicated that the food program reduced their stress and worries about where and how they would access

food for themselves and their households. One patient described the effect of collecting food:

I am no longer worried about what my children and myself will eat. I am never worried about lack of food. (Widowed woman age 32 with two household members under age 18, WFP client enrolled January 2006.)

Nutrition education

Application of the nutrition education provided by AMPATH extends beyond food clients to all patients receiving antiretroviral treatment. Both food clients and nonfood clients in the in-depth sample widely acknowledged the benefit of the nutrition education they received. Patients reported increased knowledge about the types of foods and frequency of meals that best complemented their drug regimen. Across the sample, patients claimed they now incorporated more vegetables and fruits into their diets. Nonfood clients also mentioned the importance of trying to balance their diet to improve their health status. The cooking demonstrations carried out by the nutritionists and food distribution workers have been useful to teach preparation of different types of recommended foods and introduce unfamiliar program foods to the local diet.

Treatment adherence

AMPATH outreach staff reported that the nutrition education and food supplementation program facilitated adherence to antiretroviral therapy. Among food clients in the sample, 58% perceived that access to food from the program made their adherence to their treatment regimen easier because the food they collected lessened unfavorable side effects of antiretrovirals, including reduced appetite, dizziness, and vomiting.

[The food program]...assisted because I could take antiretrovirals easily as now the side effects were lessened. Before, the drugs used to really affect me. (Single woman age 20 with two household members under age 18, weaned off WFP program.)

Eleven percent of food clients reported no change in their ability to adhere to treatment. Among the 40 nonfood clients in our sample, 78% self-reported perfect adherence to their antiretroviral treatment. The main causes cited by patients reporting some adherence problems in the past (23%) were lack of money to pay for transport to collect their refills or stress at home.

In Zambia, a food supplementation program for patients receiving antiretroviral treatment in Lusaka, based on similar WFP commodities and high-energy protein supplements, was piloted as part of a comprehensive adherence support package. The study found that food assistance improved adherence by 40% compared with case-controls without supplementation, but

that the effects were not noticeable during the first 6 months of support. The CD4+ response was also significantly better at 12 months of therapy for patients in the food program. It is also important to note that 90% of the patients in this pilot required extension of supplementation for an additional 6 months.

Recovery of physical health

The qualitative data do not allow us to isolate the effect of food supplementation from the effect of antiretroviral treatment on physical health status, because there are no matched controls in the sample, but the data suggest that some patients would not be able to meet their recommended nutritional needs without the program. In interpreting their health improvements, patients inevitably blend the effects of antiretrovirals and food supplementation. Nevertheless, self-reported observations about recovery of strength, weight gain, and return to labor activities illustrate the tangible benefits patients experience from the combined effects of supplementation and treatment. All but one patient in our in-depth sample (97%) claimed that the food program led to improvements in their physical health status. In a group discussion, current food clients claimed that before starting antiretroviral treatment they were often too sick to do any work, including household chores. Initiating antiretroviral treatment led to an increase in appetite and consumption of a greater quantity and variety of foods, as recommended by the clinical staff. In the discussion with weaned food clients, the participants stated that prior to antiretroviral treatment they did not eat a balanced diet and that the variety of food they collected from the farm greatly improved their health status.

What remains inadequately understood is how the physical health of former food clients is affected after their transition or “weaning” off food supplementation. Former food clients discussed their experiences with the transition off food supplementation during focus group discussions and individual interviews. Thirty percent responded that although they struggled at times, they were generally able to meet their food needs after transitioning, whereas in contrast, almost half (48%) claimed they were unable to meet their nutritional needs or eat a balanced diet as compared with the period when they collected food from the program. Many patients in the latter group were stressed about accessing food and reported postprogram declines in food consumption. Five of the patients interviewed restarted food support in some capacity; one of these patients described her situation thus:

After weaning, my health went down because I wasn't eating well. This led the nutritionist to reintroduce me back to the program. As my health deteriorated, I could not do more work to get an income, which made me weaker because there was less to eat. This

made me start collecting again. (Single woman age 46 with three household members under age 18, reenrolled HHI client.)

We triangulated such patient accounts with program staff, who confirmed that patients, once weaned, might have to restart food supplementation for several reasons, including problems with adherence to antiretrovirals, need for food on starting a regime of second-line drugs, a change in socioeconomic status, inadequate preparation and poor timing of weaning, inability to resume productive activities despite FPI training, or a change in resource needs, such as increased educational expenses that compete with resources for food.

Household nutritional needs

Food rations were distributed on the basis of each patient's household size, with recognition of the importance of supporting not just the individual but also household food security. Twenty-four new and current food clients in the sample (62%) reported a spillover effect of improved health status in other members of their households, especially young children. Collecting food from the program enabled their households to consume a diet that was better in both quantity and quality than before.

It improved the health of the children, and in fact they increased their weight too. We had a chance to have a variety of foods that were balanced, and this enhanced the health of the kids. (Widowed woman age 40 with two household members under 18 in the household, former HHI client who chose to stop collections.)

The socioeconomic survey in the larger research design includes anthropometric measurement of children under 5 years of age. Analysis of data from the first-round socioeconomic survey in this population found children in households with at least one HIV-positive patient in the AMPATH program to have significantly worse weight-for-height indexes than their counterparts from a random sample.

Household labor supply

The majority of food clients (61%) reported that as a result of the food supplementation, they regained enough strength to return to their household chores, farming activities, or income-earning activities. The amount of labor available in the household increased as the patient recuperated. Eleven percent reported having time to look for employment while enrolled in the food program. However, another 11% reported that they were still too weak at the time of the interview to seek any employment.

Since I started the food program, I began feeling better and had a lot of appetite, and so it has given me

strength and a chance to go on with my clothes and shoe business. (Single woman age 35 with two children under 18 in the household, weaned off HHI and restarted short-term corn–soya blend flour.)

Analysis of the first and second rounds of Mosoriot survey data found that within 6 months after initiation of antiretroviral treatment, patient households had a significant increase in labor supply. The patients also had a 20% increase in the likelihood of participating in the labor force [20].

Reallocation of household resources

Participation in the food supplementation program enabled the majority (76%) of patients and their households to reallocate resources within the household while collecting food. Money previously used to buy recommended foods was allocated for other expenses, including education, basic necessities, rent, clothing, and transport. The impact on educational expenditures was of particular importance to our respondents. More than a third of food clients in our sample (38%) reported redirecting money that would have been spent on food toward educational expenses such as school fees, uniforms, and stationery supplies. At the same time, 28% of food clients reported no observable change in their expenditures on education, because the savings from food were not enough to cover educational needs. The families still needed to use money to buy additional food, or their household's education expenses were particularly high. A small number of respondents (13%) reported an indirect impact on education, whereby the food collected from the program enabled their children to attend school on full stomachs and concentrate better.

Community impact

The AMPATH nutrition intervention focuses on how individual and household nutrition security can be strengthened in the context of HIV. Community-level linkages in addressing long-term treatment and care needs are weaker. AMPATH does, however, link with community-based initiatives in other program areas, such as training of traditional birth attendants and patient-to-patient outreach for support in adherence to treatment, but the food component is primarily aimed at patients and their dependents. The respondents did not provide much evidence of community-level impacts of the food supplementation program, probably because of limited knowledge within their communities that they collected food from the program. Almost half of the food clients admitted that only their families knew they collected or had previously collected food from the program.

Indirectly, patients residing in communities where there was wider awareness of the AMPATH food supplementation program reported that members

viewed the program favorably when they observed visible improvements in the health of a sick community member. There is mixed evidence from focus group discussions suggesting a reduction in stigma arising from direct improved health status of the people living with HIV and improved nutrition knowledge of balanced diets for chronically ill people through community forums.

During implementation of a formal intervention to provide food support to people living with HIV, it is important to understand the role of informal social networks in providing food and other forms of support. The potential impact of the nutrition intervention on an individual's access to informal support largely depends on the extent of preexisting support. For some individuals in our sample, the formal intervention acted as a catalyst for additional support. In other cases, the food program substituted for or temporarily alleviated the demand for assistance from their informal network. Still, some individuals in our sample never had a well-functioning support network before they knew their HIV status, and others lost support because of stigma, poor economic circumstances, or marital dissolution. In such instances, the food program filled a void where no informal support previously existed or had been withdrawn. In other examples, an HIV-positive individual may have received no assistance from community members initially, but as his or her health status and physical appearance improved after initiation of antiretroviral treatment and improvement in the diet, some people's attitudes changed. Patients reported being welcomed back into the homes of neighbors and friends despite earlier discrimination.

We found no evidence that the food program was negatively impacting informal support networks or eroding informal systems of support. Although the program may have the indirect objective of improving community nutrition, the nutrition intervention program does not directly benefit the patients' communities.

Key lessons and challenges

Experiences from the AMPATH nutrition intervention provide practical lessons for modifying program delivery as well as for informing the future development of similar initiatives to effectively link nutritional support to treatment and care for people living with HIV. These findings demonstrate impact but also illustrate the need for comprehensive interventions to bolster nutrition security and address concomitant challenges.

Lessons

The nutrition intervention provides an important source of support to the most vulnerable patients receiving treatment. Supplemental food contributes to increased dietary diversity for patients and their house-

holds, enabling access to a wider range of foods that are not normally available or easily accessed. Similarly, the nutrition education provided to all patients receiving antiretroviral treatment appears to have a positive effect on dietary diversity.

Patients who were enrolled in the supplementation program while already receiving antiretroviral treatment self-reported greater adherence to their medication, fewer food-related side effects, and a greater ability to satisfy increased appetites.

The majority of current and former food clients in the study sample reported health outcomes of weight gain, recovery of physical strength, and return to labor activities while enrolled in the food supplementation program and receiving antiretroviral treatment.

The food program played an important role in the emotional well-being of patients and lowered stress caused by insufficient access to food.

Because poverty and stigma associated with HIV and AIDS remain significant barriers to accessing support from informal social networks, formal support programs such as the AMPATH nutrition intervention are necessary for many patients in the clinic population. Such programs may be the only source of supplementary food support for some patients.

The data suggest that the supplemental foods were reaching the intended beneficiaries. Collected foods were shared among the household members, with some preferential allocation to HIV-positive members.

The types of foods distributed by the program were widely accepted, especially the fresh farm foods. Some foreign foods require initial education and demonstration, but overall patients accepted them because they regarded the foods as part of their comprehensive treatment and balanced diet.

Challenges

The main opportunity costs of participation in the program were transport and stigma associated with food collection.

Determining program eligibility can be difficult for cases that fall near enrollment guideline cutoffs. Limited human resources to verify the borderline candidates may impact targeting efficiency.

Six-month periods of supplementation may be too short for many patients to recover sufficiently and make long-term plans for food security. Programmers, clinical care providers, and researchers need to collaborate in determining what constitutes an appropriate duration of food supplementation for patients receiving antiretroviral treatment.

Monitoring is crucial. Tools for individual assessment need to be further developed; for example, anthropometric and clinical indicators could be coupled with assessments of a patient's ability to meet his or her nutritional needs postintervention to determine suitable time frames for ending supplementation.

Many households become seasonally vulnerable to food insecurity during the dry season and may require seasonal food supplementation, despite adequate access to food during harvest and immediate preharvest seasons.

Transition from short-term food supplementation to long-term strategies for nutrition security is a complex process and a major challenge. Nutrition interventions may be short-term in delivery, but the overall objective is to foster longer-term nutrition security for people living with HIV and their households. Several factors affect the ability of a patient to successfully make the transition off food support, including the patient's degree of livelihood security (amount, type, and control of assets and resources), patterns of dependency, insufficient program resources, socioeconomic status, and individual trajectories of nutritional recovery. Programs need to establish strategies for transition off food support from the outset of program design. Individual and household resilience to the impacts of HIV and AIDS involves both short- and long-term strategies. One key informant working closely with the transition process stated that:

There is a lot of anxiety among the patients about weaning; some have done nothing toward sustainable food provision during the 6 months. Or maybe FPI may not have worked or hasn't reached them yet. There is a gap between food aid and an alternate strategy to provision your own food.

Other tough programmatic questions relevant to the international community emerge from this research. Clearly all malnourished individuals, HIV-positive or not, are in need of improved nutrition through whatever means are appropriate and feasible. We now know the critical importance of good nutritional status at the time of initiation of antiretroviral therapy, as mentioned earlier. For those who are living with HIV, knowing that energy requirements increase even in asymptomatic individuals raises the question of when nutrition interventions should be initiated. It is plausible (and currently being researched) that better nutrition may prolong the asymptomatic period of relative health and delay the need to initiate antiretroviral therapy. The universal provision of nutrition education to all patients, regardless of whether they are receiving antiretroviral treatment or not, is one measure to address these needs. But more may be needed. This is a critical area for further research.

Conclusions

Through local and international partnerships, the AMPATH comprehensive model for patient care, medical education, and research has proven a success in delivering antiretroviral treatment in resource-poor

settings [21]. But no single institution can be expected to meet all the needs of patients and their households. Linkages and external partnerships are needed, based on comparative advantage. Since most rural patients depend on agriculture for their livelihoods, alliances with local and national agriculture and rural development institutions can help address the challenge of long-term needs. The complex and wide-reaching impact of the AIDS epidemic on individuals, households, and communities necessitates a comprehensive approach to treatment and care.

An evaluation of the cost-effectiveness of such nutrition interventions compared with other interventions, such as cash transfers, should be undertaken to inform future planning. Donor funding has been considerable up to this point, but longer-term financial planning for a sustainable initiative is important to ensure that these services can continue to meet the growing demand.

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