Impact of food support on food security and body weight among HIV antiretroviral therapy recipients in Honduras: a pilot intervention trial

Kartika Palar, PhD,
Division of HIV/AIDS, Department of Medicine, University of California, San Francisco, San Francisco, CA; Tel: (310)-741-8492

Kathryn Pitkin Derose, PhD, MPH,
RAND Corporation, Santa Monica, CA USA; Tel: (310) 393-0411

Sebastian Linnemayr, PhD,
RAND Corporation, Santa Monica, CA USA; Tel: (310) 393-0411

Alexandria Smith, MPH,
RAND Corporation, Santa Monica, CA USA; Tel: (310) 393-0411

Hugo Farías,
United Nations World Food Program, Regional Office for Latin America and the Caribbean, Panama City, Panama; Tel: (507) 317-3939

Glenn Wagner, PhD, and
RAND Corporation, Santa Monica, CA USA; Tel: (310) 393-0411

Homero Martinez, MD, PhD
RAND Corporation, Santa Monica, CA USA and Hospital Infantil de Mexico Federico Gomez, Mexico City, Mexico; Tel: (310) 393-0411

Kartika Palar: kpalar@ucsf.edu; Kathryn Pitkin Derose: derose@rand.org; Sebastian Linnemayr: slinnema@rand.org; Alexandria Smith: asmith@rand.org; Hugo Farías: hugo.farias@wfp.org; Glenn Wagner: gwagner@rand.org; Homero Martinez: homero@rand.org

Abstract

Optimal strategies to improve food security and nutrition for people with HIV (PLHIV) may differ in settings where overweight and obesity are prevalent and cardiovascular disease risk is a concern. However, no studies among PLHIV have investigated the impact of food support on nutritional outcomes in these settings. We therefore assessed the effect of food support on food insecurity and body weight in a population of PLHIV with high prevalence of overweight and obesity. We implemented a pilot intervention trial in 4 government-run HIV clinics in Honduras. The trial tested the effect of a monthly household food ration plus nutrition education (n=203), compared to nutrition education alone (n=197), over 12 months. Participants were clinic patients receiving antiretroviral therapy (ART). Assessments were obtained at baseline, 6 and 12 months. Primary outcomes for this analysis were food security, using the validated Latin American and

Caribbean Food Security Scale, and body weight (kg). Thirty-one percent of participants were overweight (22%) or obese (8%) at baseline. At 6 months, the probability of severe food insecurity decreased by 48.3% (p < 0.01) in the food support group, compared to 11.6% in the education-only group (p<0.01). Among overweight or obese participants, food support led to average weight gain of 1.13 kg (p<0.01), while nutrition education alone was associated with average weight loss of 0.72 kg (p<0.10). Nutrition education alone was associated with weight gain among underweight and normal weight participants. Household food support may improve food security but not necessarily nutritional status of ART recipients above and beyond nutrition education. Improving nutritional tailoring of food support and testing the impact of nutrition education should be prioritized for PLHIV in Latin America and similar settings.

Keywords

food security; nutrition; HIV; antiretroviral therapy; food support; intervention; obesity; Latin America

INTRODUCTION

The negative relationship between food insecurity and HIV outcomes is now well recognized in resource-limited settings (Weiser et al., 2009; Weiser et al., 2012; Weiser et al., 2013; Young, Wheeler, McCoy, & Weiser, 2013). Yet strategies to improve food security and nutrition in order to achieve better HIV outcomes are still underdeveloped. Furthermore, optimal strategies may differ in settings where overweight and obesity are prevalent among food insecure people living with HIV (PLHIV). Food insecurity may contribute to obesity through both behavioral and biological pathways (Laraia, 2013). Yet, implications for food security programming among overweight or obese PLHIV for who weight gain is undesirable have not yet been explored.

Over the last 10 years, the World Health Organization (WHO) and other international organizations have issued recommendations that nutritional assessment, counseling and support be a standard part of comprehensive care for HIV (FANTA, 2004; World Bank, 2007; World Health Organization, 2008). While research generally finds a positive effect of supplemental feeding on the nutritional status and HIV outcomes of underweight PLHIV (Koethe, Chi, Megazzini, Heimburger, & Stringer, 2009; Tirivayi & Groot, 2011), providing food support to overweight or obese PLHIV may result in further weight gain even if food security improves (Larson & Story, 2011; Leroy, Gadsden, de Cossío, & Gertler, 2013), putting PLHIV at risk for chronic comorbidities such as diabetes and cardiovascular disease.

With data from a pilot intervention study in Honduras, we investigated how food support combined with nutrition education influences food security and body weight, compared to nutrition education alone, in a population with high food insecurity and diverse nutritional statuses.

METHODS

We pair matched four urban government-run HIV care centers by region and patient number. Within each pair, clinics were randomly assigned to provide 12 months of food support (monthly household food ration from the UN World Food Programme) plus nutrition education, or nutrition education only. Nutrition education consisted of monthly nutritional counselling and assessment, and group education sessions. Patient eligibility criteria included: local residence, age 18+, receiving ART, and food insecurity and/or BMI 18.5. Assessments were conducted at baseline, 6 and 12 months. The study was approved by RAND's Human Subjects Protection Committee and the Institutional Review Board at the National Autonomous University of Honduras. Written informed consent was obtained from all participants. A fuller description of the study design has been published elsewhere (Martinez et al., 2014).

Measures

We used the validated 15-item Latin American and Caribbean Food Security Scale (Comité Científico de la ELCSA & United Nations Food and Agriculture Organization, 2012) to assess household food security. Weight and height measurements were taken by study nutritionists using methods to promote standardization (Habicht, 1974). Nutritional status based on body mass index (BMI) (kg/m^2) was classified as underweight (< 18.5), normal (18.5 to 25), overweight (25 to 30), and obese (30) (World Health Organization).

We considered the following as potential confounding variables: sex, race/ethnicity, age, presence of children in the household, having primary school education or above, having paid work in the last month, receiving economic support from a relative, friend or other source, CD4 count (in cells/μL), taking protease inhibitors, and being on ART less than 100 days.

Analysis

We used multilevel mixed effects linear regression analysis to investigate intervention effects on food insecurity and weight, and to take into account correlations within clinic clusters and within individuals across time. We specified our food insecurity regression using a linear probability model (LPM) in order to ease interpretation of the program effect interaction term. We stratified the weight regressions by baseline BMI classification to identify differential effects of the intervention for underweight, normal, and overweight or obese participants. We controlled for factors differentiating the intervention groups at baseline. Finally, we included clinic indicators to account for clustering, and the month-of-interview to account for seasonal changes in food availability. All statistical analyses were conducted in STATA/IC 11.1 (StataCorp: College Station, Texas).

RESULTS

The sample consisted of 400 participants (203 receiving food support). Table 1 describes baseline sociodemographic and health characteristics of the sample. Eighty-eight percent of the food support group and 76% of the education-only group completed the 12-month assessment.

Two-thirds of study participants were severely food insecure [65%] (Table 2) and approximately one-third were either overweight [23%] or obese [8%]. Only 11% of participants were underweight. We found significant co-occurance of food insecurity and high BMI (i.e. overweight or obesity) in the study population at baseline (Figure 1).

In the multivariable regression models, the probability of severe food insecurity (Table 3) was 11.6% lower on average for the education-only group (p<0.01) and an additional 36.7% lower (p<0.01) (i.e. 48.3% total decrease) for the food support group at 6 months. There was no significant change in the probability of severe food insecurity from 6 to 12 months.

In the multivariable regression models for weight (Table 4), underweight participants in both study groups gained 3.15 kg (p<0.01) on average after 6 months, while normal weight participants in both study groups gained 1.34 kg in the same time period. Among overweight or obese participants, the education-only group lost –0.72 kg on average (p=0.068) after 6 months, while the food support group gained an average of 1.13 kg (i.e. 2.03 – 0.72). There were no significant program effects for any of the weight analyses between 6 and 12 months.

DISCUSSION

In our study of PLHIV in Honduras with high dual prevalence of food insecurity and overweight and obesity, we find that food support plus nutrition education improves food security compared to education alone, but also leads to weight gain for overweight or obese participants in contrast to weight loss among those who received education only. These results emphasize growing concern over the ability of targeted food support to improve the health of food insecure overweight PLHIV, particularly when calorically-dense provisions are typically used in emergency food aid to populations at risk of undernutrition.

Improving food security through food support may play an important role in alleviating suffering and improving the mental and physical health of PLHIV. However, our results suggest that improving nutritional tailoring of food support by reducing excessive calories and favoring micronutrient-rich foods including fruits and vegetables may be needed to fully benefit food insecure PLHIV with higher BMI. Excess weight can exacerbate metabolic syndrome which is sometimes a side effect of ART and is associated with increased risk of type 2 diabetes mellitus and cardiovascular disease (Friis-Møller et al., 2003). Obesity is also associated with poorer immunologic response to ART (Crum-Cianflone et al., 2010). However, changing food support composition may be difficult if the agencies providing food support are constrained by policy or logistical considerations to rely on calorically-dense staple foods.

We found improved weight and food security among PLHIV who received *only* nutrition education. It is plausible that nutrition education could improve food insecurity and weight via improved diet quality, the ability to make the most of existing food resources, and decreased anxiety about procuring healthy food (Eicher-Miller, Mason, Abbott, McCabe, & Boushey, 2009). However, without a comparable control group of PLHIV not receiving any intervention, we cannot formally test these effects.

Limitations of our study included that the food support group differed systematically from the nutrition education group, including in their level of food insecurity. While we controlled for observed characteristics that differentiated the study groups at baseline in the analysis, unobserved variables may still bias our regressions. In addition, while we implemented multilevel mixed models to deal with clinic-level clustering, the small number of clusters is a limitation and our results should be taken as preliminary.

Despite positive results of the food support intervention on food security, resource constraints and the rise of food prices makes it increasingly difficult for HIV treatment programs to provide adequate and sustainable food support to those in need (Sztam, Fawzi, & Duggan, 2010). Thus, while nutritional tailoring of food support is an important step to improve its efficacy for overweight or obese PLHIV, sustainable interventions such as locally-tailored nutrition education may have significant benefits and should be made more widely available.

Acknowledgments

LIST OF ABBREVIATIONS

ART	antiretroviral therapy
PLHIV	people living with HIV
WHO	World Health Organization
BMI	body mass index
CD4	cluster of differentiation 4
LPM	linear probability model

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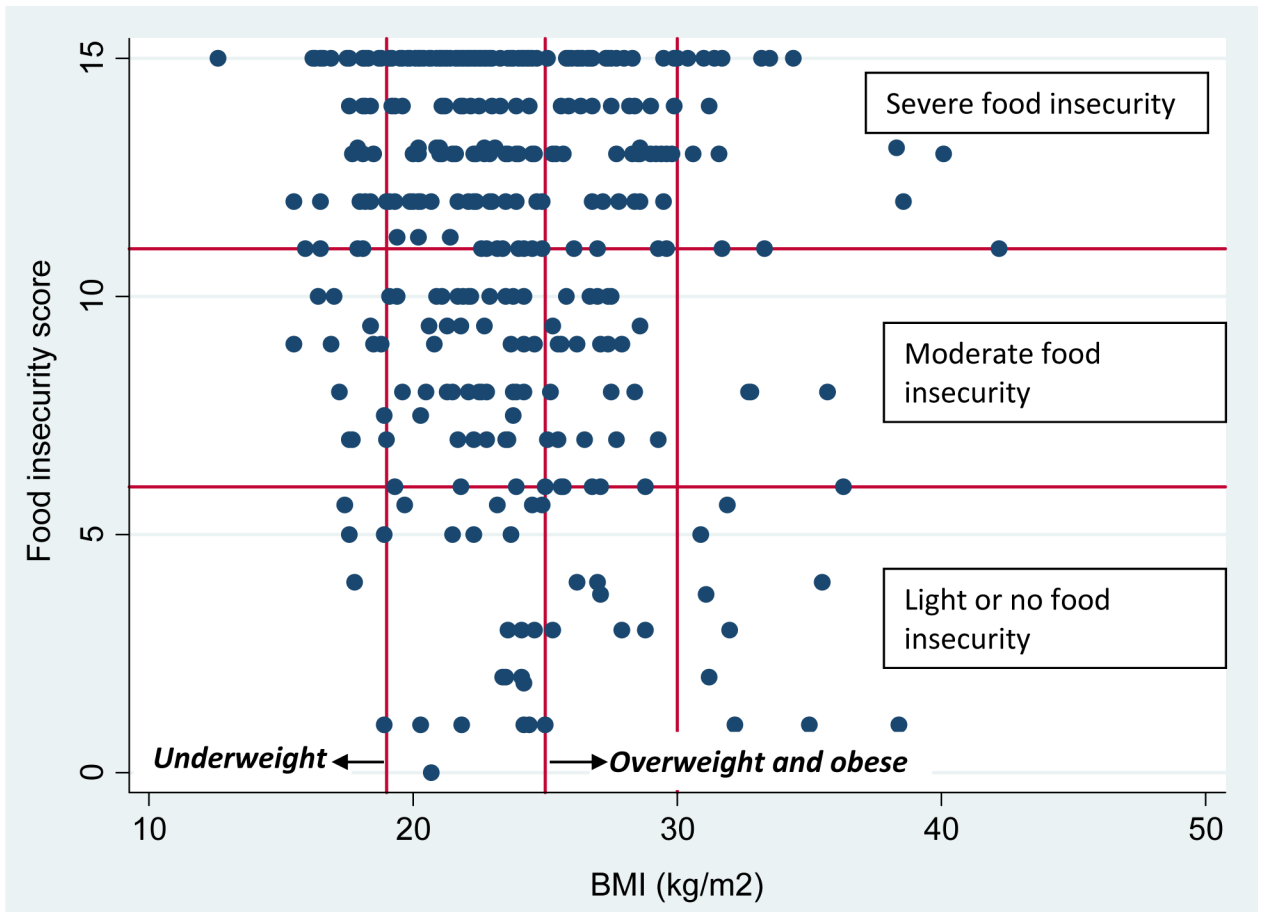
Figure 1. Correlation between food insecurity and BMI at baseline
Note: Correlation = − 0.12 (p < 0.01)

Table 1

Demographic, health and socio-economic characteristics at baseline

	All participants	Food support + Nutrition education	Nutrition education only	*p-value*
		Intervention Group		
Demographics				
Female, %	69	74	62	*<0.01*
Afrodescendent, %	12	4	19	*<0.01*
Primary school or more, %	54	49	58	*0.06*
Age in years, mean [SD]	40 [9.8]	40 [9.9]	41 [9.6]	*0.12*
HH w/children < 18 y.o, %	82	87	77	*<0.01*
HH size incl. participant, mean [SD]	4.9 [2.5]	5.1 [2.5]	4.7 [2.5]	*0.05*
HIV-related health				
Years since HIV diagnosis, mean [SD]	5.3 [3.9]	5.1 [3.7]	5.4 [4.1]	*0.25*
Years receiving ART, mean [SD]	3.7 [2.4]	3.6 [2.3]	3.8 [2.6]	*0.24*
Receiving ART < 100 days, %	9	7	11	*0.14*
Takes protease inhibitors, %	7	8	6	*0.14*
CD4 (cells/mm^3) category, %	28	26.1	30	
200–349	27.5	26.1	28.9	*0.46*
350–499	19.8	22.7	16.8	
500	24.8	25.1	24.4	
Socio-economic status				
Had paid work in last month, %	38	33	44	*0.02*
Material support from family or friends, %	32	28	35	*0.04*
Number of observations	400	203	197	

Note: HH = "household". *p*-values denote significance of comparison in baseline characteristics between the food support group and education-only group. Bolded values are significant at p<0.05.

Table 2

Food security and nutrition characteristics at baseline

		Intervention Group		
	All participants	**Food support + nutrition education**	**Nutrition education only**	*p-value*
Household food insecurity				
Mean standard score [SD]	11.4 [3.9]	12.0 [3.3]	10.7 [4.4]	*<0.01*
Severe, %	65	72	58	
Moderate, %	24	22	26	
Light, %	10	5	15	*<0.01*
None, %	1	0	1	
Body mass index (BMI)				
Mean BMI [SD]	24 [4.5]	23 [4.3]	24 [4.7]	*0.12*
Underweight, %	11	12	9	
Normal, %	58	58	58	
Overweight, %	23	23	24	*0.47*
Obese, %	8	7	9	
Weight (kg) [SD]	58.4 [12.2]	57.0 [11.4]	60.0 [12.8]	*<0.01*
Number of observations	400	203	197	

Note: p-values denote significance of comparison in baseline characteristics between the food support group and education-only group.

Table 3

Effect of food support on the probability of severe food insecurity

Outcome: Severe food insecurity		
Months:	*0–6*	*6–12*
	β (SE)	
Time	−0.116*** (0.039)	0.005 (0.054)
Food support group X Time	−0.367*** (0.051)	0.043 (0.070)
Baseline covariates:		
Food support group	0.353*** (0.124)	−0.504** (0.226)
Female	0.032 (0.030)	0.080* (0.042)
Afrodescendent	−0.014 (0.048)	−0.029 (0.065)
Child dependents in household	0.010 (0.035)	0.029 (0.051)
Completed primary school	−0.031 (0.026)	−0.024 (0.036)
Severe food insecurity	0.707*** (0.027)	0.311*** (0.038)
Had paid work in the last month	−0.003 (0.026)	0.011 (0.037)
Material support from family/friends	0.013 (0.028)	−0.004 (0.039)
CD4 category (cells/μL)		
<200		
200–349	−0.018 (0.035)	−0.049 (0.049)
350–499	−0.074* (0.039)	−0.114** (0.054)
500	0.007 (0.038)	−0.008 (0.053)
Observations	684	611
Number of groups	4	4

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 $p < 0.01$,

**
 $p < 0.05$,

*
 $p < 0.10$;

Notes: Food support group also received the nutrition education. Regressions in Table 3 use linear probability models with the binary food insecurity outcome. Beta coefficients represent the change of probability of the outcome with one unit increase in the independent variable. In addition to the covariates shown here, we adjusted for clinic and a set of indicators for month of interview.

Table 4

Effect of food support on body weight (kg), stratified by baseline BMI classifications

Outcome: Weight (kg)	Full sample		Baseline BMI classification					
			Underweight (BMI<18.5)		Normal weight (18.5 BMI<25)		Overweight or obese (BMI 25)	
Months:	**0–6**	**6–12**	**0–6**	**6–12**	**0–6**	**6–12**	**0–6**	**6–12**
Column	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
				β (SE)				
Time	0.863***(0.282)	−0.140(0.488)	3.150***(1.083)	−0.251(1.678)	1.343***(0.367)	−0.002(0.595)	−0.724*(0.397)	−0.328(0.855)
Food support group X Time	0.632*(0.370)	−0.045(0.634)	1.639(1.421)	1.997(2.263)	−0.321(0.477)	0.361(0.766)	2.027***(0.536)	−1.180(1.145)
Baseline covariates:								
Food support group	−0.925(0.909)	0.031(2.025)	−3.666(3.263)	−5.245(6.771)	0.254(1.168)	−0.936(2.442)	−2.227*(1.350)	2.669(3.699)
Female	−0.446**(0.216)	−1.167***(0.376)	0.240(1.260)	−0.394(2.153)	−0.533*(0.303)	−1.353***(0.491)	0.369(0.479)	1.206(1.147)
Afrodescendent	−0.145(0.356)	−0.164(0.605)	−1.949(1.775)	−6.812**(2.822)	−0.577(0.478)	−0.661(0.772)	0.562(0.535)	0.263(1.110)
Child dependents in household	−0.462*(0.250)	−1.203***(0.449)	−2.011*(1.195)	−1.532(2.265)	−0.695**(0.310)	−1.498***(0.517)	0.014(0.433)	−1.051(1.018)
Completed primary school	0.021(0.188)	0.428(0.325)	−1.792**(0.909)	−0.562(1.526)	0.148(0.241)	0.640(0.390)	−0.216(0.297)	−0.079(0.655)
Severe food insecurity	0.010(0.198)	0.100(0.343)	0.276(0.806)	2.641**(1.290)	−0.050(0.264)	0.007(0.423)	0.285(0.290)	0.500(0.639)
Weight	0.977***(0.008)	0.927***(0.015)	0.986***(0.084)	1.077***(0.141)	0.983***(0.020)	0.934***(0.033)	0.990***(0.014)	0.967***(0.032)
Had paid work in the last month	−0.144(0.193)	−0.142(0.336)	−0.850(1.041)	−1.012(1.831)	−0.448*(0.249)	−0.603(0.414)	0.320(0.285)	0.505(0.629)
Material support from family/friends	0.195(0.201)	0.071(0.353)	−0.494(0.833)	0.956(1.439)	0.545**(0.273)	0.932**(0.448)	0.258(0.322)	0.324(0.713)
CD4 category (cells/µL)								
200–349	−0.546**(0.253)	−1.411***(0.444)	0.015(1.027)	−2.930*(1.563)	−0.405(0.319)	−1.184**(0.521)	−0.295(0.436)	−0.324(1.026)
350–499	−0.439(0.278)	−1.082**(0.482)	−0.545(1.197)	−4.231**(1.996)	−0.628*(0.371)	−1.249**(0.588)	−0.057(0.456)	(1.062)
500	−0.082(0.272)	0.012(0.480)	3.198***(1.045)	6.533***(1.932)	−0.119(0.362)	−0.016(0.590)	−0.394(0.450)	0.130(1.045)
Observations	704	629	78	68	401	363	225	198
Number of groups	4	4	4	4	4	4	4	4

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p<0.01,

**
p<0.05,

*
$p < 0.10$;

Notes: Food support group also received the nutrition education. Beta coefficients represent the change in the magnitude of the outcome with one unit increase in the independent variable. In addition to the covariates shown here, we adjusted for clinic and a set of indicators for month of interview.