C.H.A.I.N. REPORT

CHAIN 2012-3 Report

Food Insecurity, Food and Nutrition Services, and HIV Care and Health Outcomes

Angela Aidala
Maiko Yomogida
Yoav Vardy

Columbia University
Mailman School of Public Health
In collaboration with the NYC Department of Health and Mental Hygiene, the Westchester Department of Health, the HIV Health and Human Services Planning Council of New York, and Public Health Solutions

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The findings and recommendations in this report are solely the responsibility of the authors and do not necessarily represent the official views of the U.S. Health Resources and Services Administration, the City of New York , the New York City Department of Health and Mental Hygiene, Westchester Department of Health, Public Health Solutions, or the MAC AIDS Fund.

Note to Readers

This CHAIN Report 2012-3, *Food Insecurity, Food and Nutrition Services, and HIV Care and Health Outcomes*, was completed as a series of brief reports on a number of related topics.

All brief reports are based on analysis of interview data provided by adults with HIV, recruited from medical clinics and non-medical service agencies and enrolled as participants in the Community Health Advisory & Information Network (CHAIN) Project. Agencies and then individuals within agencies or programs were recruited using randomization procedures to enroll a broadly representative sample of HIV positive persons with some contact with the HIV service system in any of the five boroughs of New York City (NYC) or in the Tri-County (TriCo) northern suburban region of Westchester, Putnam, or Rockland counties. Strictly speaking, "PLWH" referred to in the following Fact Sheet reports refer to CHAIN study participants, almost all of whom were receiving HIV medical or supportive services at the time of interview. The study sample is similar to the demographic and risk profile of Ryan White clients. Compared to general HIV surveillance data, racial/ethnic minorities and persons with IDU risk exposure are over-represented.

All reports are based on analysis of data collected in 2003-2013 and include CHAIN study participants in New York City and the Tri-County region. Fact Sheet #3 also includes over-time data from New York City study participants.

Fact Sheet #1: HIV/AIDS, Food & Nutrition Service Needs

This brief report describes food and nutrition service needs, use of food and nutrition services, and select medical care and health care outcomes associated with food insecurity.

Fact Sheet #2: Who Needs Food & Nutrition Services and Where Do They Go for Help?

This brief report focuses on predictors of food insecurity and indicators of need for nutritional counseling as well as patterns of food and nutrition service utilization.

Fact Sheet #3: Food and Nutrition Services, HIV Medical Care, and Health Outcomes

This brief report examines food insecurity, receipt of food and nutrition services, and change over time in medical care and health outcomes.

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Fact Sheet #1

HIV/AIDS, Food & Nutrition Service Needs

While adequate food and nutrition are basic to maintaining health for all persons, good nutrition is crucial for the management of HIV infection. Proper nutrition is needed to increase absorption of medication, reduce side effects, and maintain healthy body weight. Several conditions associated with HIV/AIDS can be managed with proper nutrition. Good nutrition reduces the risk for or helps manage other chronic diseases such as heart disease, diabetes, and cancer. Food security and good nutrition are linked to improved health outcomes for PLWH both directly and indirectly. Food insecurity is a source of chronic stress that has consequences for immunological functioning, as well as for mental health and for adherence to medical treatments. In addition, providing food and nutrition services can serve to facilitate access and engagement with medical care, especially among vulnerable populations.

This Fact Sheet summarizes food and nutrition service needs, use of food and nutrition services, and medical care and health care outcomes associated with food insecurity among representative samples of adults living with HIV in New York City and the northern suburban region of Westchester, Putnam, and Rockland counties.

Need for food and nutrition services is almost universal

Based on rates seen in the study population, the great majority of persons living with HIV/AIDS (PLWH) in New York City (89%) and in the Tri-County region (85%) are experiencing food insecurity or rely upon food and nutrition programs to address their most basic needs (Figure 1).

Many PLWH rely upon food programs

Eighty percent (80%) of cohort members in NYC and 62% in Tri-County participate in SNAP, the Supplemental Nutrition Assistance Program commonly known as the food stamp program.

Over half of PLWH interviewed in NYC (55%) and in the Tri-County region (58%) receive services from a food/ nutrition program in the form of (1) meals provided in a group setting, (2) prepared meals delivered to the home, (3) receipt of a food voucher or a grocery bag from a food pantry, or (4) some other help with food or meals. Tri-County residents are more likely to receive food pantry bags than participate in a meal program; the reverse is true for NYC study participants who are more likely to use meal programs (Table 1).

Food insecurity remains widespread

Using standard measures of food insecurity, more than two of every five (42%) study participants in both NYC and Tri-County currently experience food insecurity. Regardless of receipt of food stamps or participation in a food or meal program, they report not having enough money for food that they or their family need, describe their food situation as sometimes or more often not enough to eat, have gone a whole day without anything at all to eat in the past 30 days, or report a continuing need for assistance regarding food, groceries or meals (Figure 1).

METHODOLOGY

- Data for analysis were provided by an ongoing study of persons living with HIV/AIDS in the NYC area: the CHAIN Project.
- The sample was designed to be representative of the HIV-infected population receiving medical and/or social services in either New York City or the Tri-County suburban area.
- Over 1000 individuals were interviewed in 2008-2010.
- Study participants answered questions about food and nutrition experiences, need for services and use of services
- Need for food and nutrition services was determined using a composite measure that took into account both "objective" criteria based upon reports of behaviors and experiences (e.g. not having enough money for food, going an entire day without eating anything at all, etc.) as well as self-reported need for services. The use of any food or meal services was also taken as evidence of need for these services.

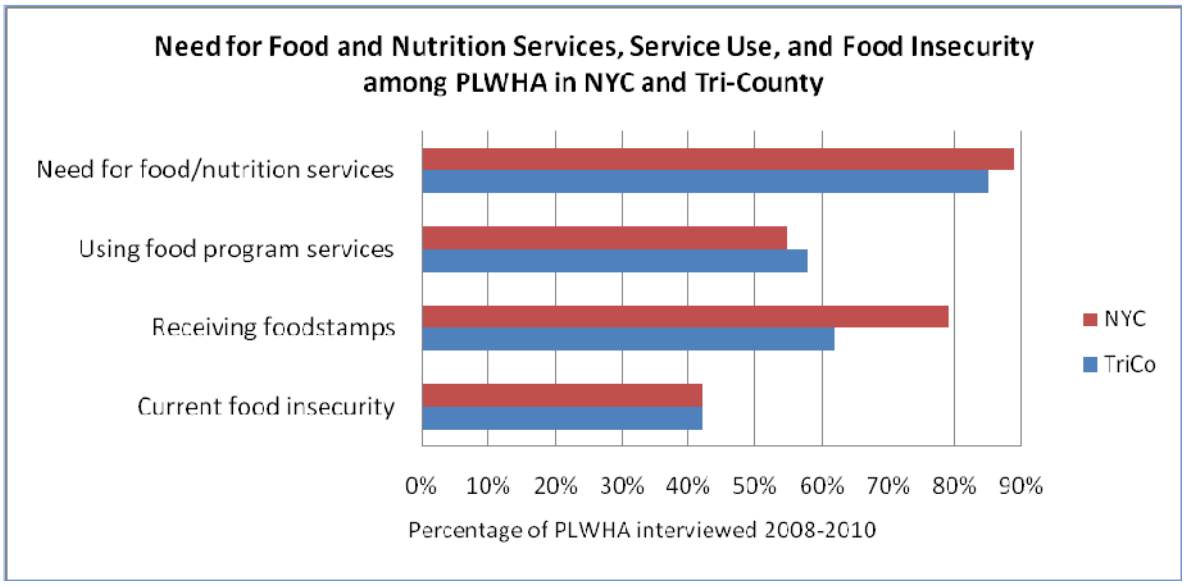

Figure 1. Indicators of Need for Food and Nutrition Services among Study Participants

Nutritional counselling is needed

Fewer than one-third of the study sample in either NYC or Tri-County report receiving nutritional counselling in the six to 12 months prior to interview – most often in the form of group presentations.

Approximately half of cohort members in NYC never reported receiving nutritional counselling during the past 5 years or longer, despite an increase in rates of nutrition-sensitive chronic conditions during this time period, and 60% of study participants were either under or overweight according to BMI at most recent interview. (Over time information on nutritional counselling is not available for the Tri-County sample).

Food insecurity is associated with poor medical care outcomes

Analyses of the CHAIN data show that PLWH who are food-insecure report more missed appointments for HIV primary care and more emergency room visits compared to those who do not report difficulties obtaining enough and appropriate food. The food-insecure are less likely to be receiving medical care that meets minimum clinical practice standards with regard to number of recommended visits, tests and procedures to monitor HIV disease, and antiretroviral medication therapies as indicated (Table 2).

Food insecurity is associated with poor functional health and clinical markers of HIV

Study results also show that PLWH who are food insecure score lower on standardized measures of physical health functioning, mental health functioning, and quality of life. They have lower CD4 counts and are less likely to have undetectable viral loads than the food secure (Table 3). Other research has shown that food insecurity is associated with increased morbidity and mortality among HIV infected persons.

Conclusions

Food insecurity has long been recognized as a serious problem for PLWH in low-resource countries. There is ample evidence that food and nutrition issues are increasing among PLWH in the U.S. as well. Given the broader economic downturn and multiple service cuts, the need for food and nutrition services among PLWH would only be expected to increase over the next several years with deleterious consequences for individual health and well-being and for the continuing HIV epidemic and associated health disparities.

- Food insecurity or continued unmet need for food/ nutrition services is widespread and associated with poor engagement with HIV medical care and poor health outcomes
- Food and nutrition services are essential to promote treatment effectiveness and maintain health among PLWH

This report was prepared by Angela Aidala with the assistance of Maiko Yomogida at Columbia University, in collaboration with an Advisory Group of food and nutrition service providers listed below. The CHAIN project is supported by HRSA grant HA00015. Funding for this report was provided by the MAC AIDS Fund.

Table 1. Use of food and nutrition services by PLWH[1]

	NYC	TRI-CO
Total Sample (n=)	*(702)*	*(394)*
Food stamps	79%	63%*
Home delivered meals	3%	10% *
Meals in a group setting	38%	22%*
Food from a food pantry	34%	23%*
Nutritional counseling/ group presentation	23%	38%
Received any assistance with food or meals (other than food stamps) • Home delivered meals • Meals in group setting • Food from food pantry or • Other help with food or meals	55%	58%*

Table 2. Food insecurity and health care outcomes among PLWH[1]

	Food INSECURE	Food SECURE
Total Sample (n=)	*(441)*	*(606)*
No visit with HIV primary care provider 6+ mos	3%	2%
Care does not meet minimal practice standards	36%	30% *
Missed 2+ scheduled medical appointments 6mos	28%	12%*
One or more ER visits past 6 months	34%	23%*
Any indicator of poor connection to medical care • No primary care visits • Care does not meet minimal practice standards • Multiple missed appointments or • ER visits	70%	60%*

Table 3. Food insecurity and health outcomes among PLWH[1]

	Food INSECURE	Food SECURE
Total Sample (n=)	*(441)*	*(606)*
Low mental health score	53%	46% *
Poor physical health functioning	54%	46% *
CD4 T-cell count		
Below 200	22%	13%*
200-499	39%	42%
500 or higher	39%	45%
Viral load		
10,000+ or 'bad'	16%	10%*
9999- 400	9%	8%
Undetectable, below 400	75%	83%

1. New York City and Tri-County study participants interviewed in 2008-2010

* Statistically significant differences comparing NYC and Tri-Co cohort members (Table 1) or comparing Food-Insecure and Food-Secure cohort members regardless of residence (Tables 2 & 3).

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Fact Sheet #2

Who Needs Food & Nutrition Services and Where Do They Go for Help?

Food insecurity refers to lack of access to enough food for an active and healthy life due to physical, social or financial constraints. Food security and good nutrition are crucial for the management of HIV infection. Persons living with HIV/AIDS (PLWH) have a higher demand for dietary quality in terms of energy, protein, and individual nutrients. Proper nutrition is needed to increase absorption of medication, reduce side effects, and maintain healthy body weight. Several conditions associated with HIV/AIDS can be managed with proper nutrition. Good nutrition reduces the risk for and helps manage other chronic diseases such as heart disease, diabetes, and cancer. Food insecurity is a source of chronic stress that has consequences for immunological functioning, as well as for mental health and for adherence to medical treatments.

This Fact Sheet is the second in a series of studies of food and nutrition service needs, use of food and nutrition services, and outcomes associated with food insecurity among representative samples of adults living with HIV in New York City and the northern suburban region of Westchester, Putnam, and Rockland counties.

Food insecurity is associated with poor outcomes for PLWH

Analyses of the CHAIN data show that PLWH who are food insecure report more missed appointments for HIV primary care and more emergency room visits compared to those who do not report difficulties obtaining enough and appropriate food. The food insecure are less likely to be receiving medical care that meets minimum clinical practice standards with regard to number of recommended visits, tests and procedures to monitor HIV disease, and antiretroviral medication therapies as indicated.[2]

The food insecure are significantly less likely to have an undetectable viral load, or good physical health functioning, controlling for a range of demographic and economic variables, mental health and substance abuse co-morbidities, competing needs for housing and/or transportation services, receipt of case management services, receipt of medical care, and use of a HAART antiretroviral medication regimen.[3]

Food insecurity is widespread and persistent

Using standard measures of food insecurity, more than two of every five (42%) study participants in both NYC and Tri-County currently experience food insecurity. They report not having enough money for food that they or their family need, describe their food situation as sometimes or more often not having enough to eat, answer that they have gone a whole day without anything at all to eat in the past 30 days, or report a continuing need for assistance regarding food, groceries or meals (Table 1).

Over 80% of the NYC continuing cohort has been food insecure at one or more times during a 6-year study period. More than half have been food insecure at more than one assessment, conducted approximately yearly. The modal pattern appears to be multiple episodes of food insecurity prior to resolution of need for food or meal assistance. However, substantial numbers cycle between episodes of security and insecurity.

METHODOLOGY

- Data for analysis were provided by an ongoing study of persons living with HIV/AIDS in the New York City area, the Com- munity Health & Information Network (CHAIN) Project.
- The sample was designed to be broadly representative of the HIV-positive population who are receiving medical and/or social services in either New York City or in the northern Tri-County suburban area.[1]
- This report is based on data from over 1000 HIV-positive adults who were interviewed in 2008-2010.
- Study participants answered a series of questions about their food and nutrition experiences, need for services and use of services.
- Need for food and nutrition services was determined using a composite measure that took into account both "objective" criteria based upon reports of behaviors and experiences (e.g. not having enough money for food, going an entire day with- out eating anything at all, etc.) as well as self-reported need for services. The use of any food or meal services was also taken as evidence of need for these services.

Table 1. Indicators of Food Insecurity among PLWH[1]

	NYC	Tri-Co
Total Sample (n=)	*(702)*	*(396)*
Not enough money for food	26%	33%
At least sometimes not enough to eat	11%	11%
Didn't have anything to eat for a whole day	13%	12%
Self-report problems or need for services regarding food, groceries, or meals	11%	12%
Any indicator of food insecurity • Not enough money for food • At least sometimes not enough to eat • Didn't have anything to eat for a whole day OR • Report problems or need for services regarding food, groceries or meals	42%	43%

1. New York City and Tri-County study participants interviewed in 2008-2010

PLWH rely upon food programs to meet their basic needs

Seventy-nine percent (79%) of cohort members in NYC but only 63% in Tri-County participate in SNAP, the Supplemental Nutrition Assistance Program commonly known as the food stamp program. More than half of PLWH interviewed in NYC (55%) and in the Tri-County region (58%) receive services from a food/nutrition program in the form of (1) meals provided in a group setting, (2) prepared meals delivered to the home, (3) a food voucher or a grocery bag from a food pantry, or (4) some other help with food or meals. Tri-County residents are more likely to receive food pantry bags than participate in a meal program; the reverse is true for NYC study participants, who are more likely to use meal programs (Figure 1).

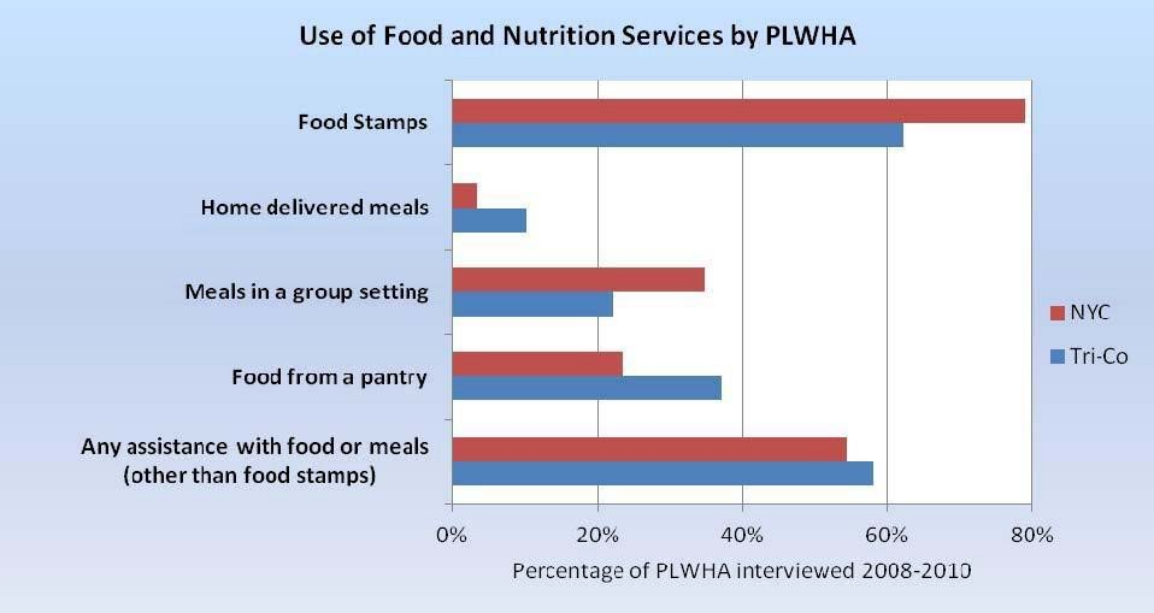
Nutritional counseling is needed

There are multiple indicators of need for nutritional counseling among PLWH in the sample. Nutritional counseling may be medically indicated based on being underweight or overweight according to BMI, being pregnant, and/or having a diet-sensitive health condition such as hypertension, heart problems, diabetes, high cholesterol, kidney disease, wasting syndrome, or severe diarrhea. Poor dietary practices (e.g., lack of fresh fruits and vegetables) and poor understanding of role of nutrition for the health of persons living with HIV also indicate need for nutritional education and counseling. Using these indicators, the vast majority of both NYC and the Tri-County residents demonstrate a need for nutritional counseling (Table 2). However half have never received such counseling since becoming diagnosed with HIV; only one-third have received nutritional counseling within the past six months, most often in the form of group presentations.[4]

Most PLWH use services from general community providers

The agency or program providing food or nutrition services was classified according to whether it was a Ryan White (RW)-funded program located at a social service or medical provider, a non-RW-funded program or service located at a medical center, or a general community-based food assistance program, typically a general social service agency or church/faith based organization. Most study participants in NYC who used food services received assistance from general community-based providers (57%); another 28% were served by a RW-funded program, and the remainder, 15%, received food or nutrition services in a medical setting. Study participants in Tri-County were more likely than those in NYC to get food assistance from a RW provider (45%). However, general-community programs and churches were used most often (50%) in Tri-County as well.

Figure 1: Past Six-Month Use of Food and Nutrition Services by Persons Living with HIV/AIDS



Food insecurity

For many persons, accessing food and nutrition services does not eliminate their food insecurity. Few food programs provide all meals. Clients report barriers to receiving the full benefit of available assistance including reduction in service locations or hours of operation, or living arrangements which lack facilities to store or cook food. More than two of five study participants (43% of PLWH in NYC and 45% in Tri-County) who are receiving food program services still score as food insecure on the standardized measure.

Predictors of food insecurity among PLWH

Food insecurity and need for food assistance is widespread across all population subgroups among study participants.[5] The odds of food insecurity are lower among older PLWH and higher among heterosexual men compared to women or MSM in the study. Persons with low mental health functioning and to a lesser extent, active drug users, are more likely to be food insecure. However, mental health needs and problem drug use are not significant predictors when controlling for other individual, clinical, and service need characteristics (Table 3). Food insecurity is most strongly associated with need for transportation and housing assistance, suggesting PLWH who are food insecure experience multiple forms of hardship and an inability to meet basic subsistence needs, which other research has shown is associated with poor medical care and health outcomes.[6]

Receipt of food or nutrition services is associated with food insecurity. This finding is consistent with other study results showing that food assistance programs are used by persons who are food insecure and food and nutrition needs are not necessarily eliminated by accessing available services. In a separate, over-time analysis, we found that receipt of effective food and nutrition services – services that resolve food insecurity – is associated with improved outcomes. A companion report will investigate further the challenge of meeting increased needs for medically appropriate food and nutrition services for persons living with HIV/AIDS.

Conclusions

Food insecurity is widespread among adults living with HIV and while enrollment in the SNAP program and use of food and meal services is relatively high, available food and nutrition resources do not appear to be sufficient to address the need for assistance. Further, many PLWH utilize local, voluntary food and meal programs that are less likely to provide meals and food tailored to the needs of persons living with HIV, or to provide HIV-informed nutritional counseling, which is needed especially among the growing numbers of HIV-positive persons with multiple chronic conditions. Given the current economic situation and increased challenges faced by providers to secure funding for food, nutrition, and appropriate supportive services, unmet need for these services is expected to grow.[7] Not only CHAIN but other research has provided strong evidence that food insecurity and poor nutrition impede access to HIV treatment and care and are associated with worse clinical outcomes for PLWH.[3,8] Appropriate and effective services can make a substantial difference, improving treatment effectiveness for individuals as well as advancing 'treatment as prevention' goals at the community level.

Table 2. Indicators of Need for Nutritional Counseling among PLWH[1]

	NYC	Tri-Co
(n=)	*(702)*	*(486)*
Fruit/ vegetable consumption per day < 5 servings[1] NYC Tri-Co < 1 48% 37% 1-2 42 50 3-4 8 13 5+ 2 0	**98%**	**100%**
Nutrition knowledge among PLWH[1] One or more questions answered incorrectly	**50%**	**43%**
Nutrition-sensitive illness hypertension, CVD, heart problems, high cholesterol, kidney disease, wasting syndrome, diarrhea for a month or more	**75%**	**69%***
Medically indicated need for nutritional counseling Nutrition-sensitive Illness OR BMI >25.0 OR BMI <18.5 OR Pregnant	**89%**	**87%**

1. Preliminary data: n=509 NYC, N=155 Tri-Co

Table 3. Predictors of Food Insecurity among PLWH

	OR	AOR
SOCIODEMOGRAPHICS		
Older Age[1]	0.99	0.98*
Male	1.77***	2.13*
Black[2]	0.87	0.91
Latino[2]	0.99	0.90
Less than HS education	1.10	1.06
Income below poverty line	0.99	0.88
RISK EXPOSURE GROUP[3]		
MSM	1.05	0.59*
IDU	1.10	0.96
CO-MORBIDITIES		
Physical health co-morbidity	0.95	1.02
Low mental health functioning	1.43**	1.27
Used drugs past six months	1.39*	1.25
SUPPORTIVE SERVICE NEEDS		
Need housing assistance	2.14***	1.83*
Need transportation help	3.47***	3.10*
SERVICES RECEIVED		
HIV medical care meets practice standards	0.78	0.86
Medical case management	1.40**	1.17
Social services case management	1.52**	1.15
Food/ Nutrition services	1.77***	1.59*
AREA OF RESIDENCE		
Tri-County Region[4]	1.02	1.04

Logistic regression showing increase or decrease in odds of food insecurity; Adjusted Odds Ratios (AOR) show relationship between individual or service characteristics and food insecurity, controlling for all other variables in the model.

[1] Continuous variable [2] Reference category White Non-Hispanic /Other
[3] Reference Heterosexual/ Other [4] Compared to New York City

* p <.05 ** p<.01 ***p<.001

Other resources:

1. For description of the CHAIN program of research see Health and Human Services Planning Council of New York website: http://www.nyhiv.com/data_chain.html

2. Aidala A, Yomogida M, and the HIV Food & Nutrition Study Team (2011). HIV/AIDS, Food & Nutrition Service Needs and Health Outcomes. Community Health Advisory Fact Sheet 1. New York Health & Human Services Planning Council.http://www.nyhiv.com/pdfs/chain/Food%20Need%20Medical%20Care_factsheet%20v8.pdf

3. Aidala A A, et al. (2012). Food Insecurity, Medical Care, and Health Outcomes among PLWH in a High Resource Setting: The Importance of Food and Nutrition Services. Poster presented at the XIX International AIDS Conference Washington DC http://pag.aids2012.org/EPosterHandler.axd?aid=20339

4. Yomogida M et al. (2011). Service Needs and Utilization New York City: 2009-2011. Community Health Advisory Report 20011-1a. New York Health & Human Services Planning Council.http://www.nyhiv.org/pdfs/chain/CHAIN%2020111a%20Service_Needs_and_Utilization_Report_NYC.pdf

5. Messeri, P & Berk, S (2009). Demographics of Food Program Users. Community Health Advisory Report 2009-1. New York Health & Human Services Planning Council. http://www.nyhiv.com/pdfs/chain/CHAIN%2020091%20Brief%20Report_Demographics%20of%20Food%20Program%20Users.pdf

6. McMahon J. et al. (2011). Poverty, Hunger, Education, and Residential Status Impact Survival in HIV. *AIDS & Behavior* 15(7): 1503–1511.

7. Pearl, Karen (2012). The Food As Medicine Advocacy Initiative: Using New Research to Secure Public Funding for Food and Nutrition Services for PLWHA. Poster presented at the meetings of the American Public Health Association San Francisco, CA. https://apha.confex.com/apha/140am/webprogram/Paper270968.html

8. Anema A et al. (2009). Food Insecurity and HIV/AIDS: Current Knowledge, Gaps, and Research Priorities. *Current HIV/AIDS Reports* 2009, 6:224–231.

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Fact Sheet #3

Food and Nutrition Services, HIV Medical Care, and Health Outcomes

Food security and good nutrition – access to sufficient and nutritious food - are essential for people living with HIV/AIDS (PLWH) to maintain an active and healthy life. The physiological consequences of inadequate nutrition for PLWH have long been recognized.[2] Evidence also supports the role of food insecurity as an important barrier to adherence to HIV care and antiretroviral treatment regimens, thus limiting the health benefits of treatment advances.[3] There are public health consequences as well. The promise of universal treatment for HIV for improving the health of PLWH and curtailing continued transmission depends on timely and sustained engagement in care and treatment, and maintaining very low or suppressed viral load. However, multiple studies have shown that this is not accomplished for most persons living with HIV. There is substantial fall off at each stage of the "HIV Care Continuum" from diagnosis, linkage to care, retention in care, adherence to treatment regimen, to viral suppression. In the U.S., barely half of all HIV infected persons are sustained in regular medical care, and only about a quarter achieve viral suppression.[4] Integrating effective food and nutrition services into HIV treatment programs is essential for the health and quality of life of infected persons, but also to achieve treatment as prevention goals and the promise of ending the AIDS epidemic in the U.S. and globally.

This Fact Sheet is the third in a series of studies of food and nutrition service needs, use of food and nutrition services, and outcomes associated with food insecurity among representative samples of adults living with HIV in New York City and the northern suburban region of Westchester, Putnam, and Rockland counties.

Key Research Findings

- **Food insecurity is widespread among PLWH**
- **PLWH who are food insecure have multiple clinical and social service needs**
- **Poor diet among PLWH is much more common than healthy eating**
- **Food insecurity is associated with poor engagement with HIV care – missed appointments, lack of adherence to treatment**
- **Food insecure PLWH have more ER visits and inpatient stays**
- **Food insecurity is associated with poor health outcomes among PLWH**
- **More than half of all PLWH rely upon food programs to help meet their basic needs**
- **Effective food and nutrition services improve retention in HIV care, adherent ART use, and health outcomes**

METHODOLOGY

- Data for analysis were provided by an ongoing study of persons living with HIV/AIDS in the New York City area, the Community Health & Information Network (CHAIN) Project.[1]
- The sample was designed to be broadly representative of the HIV-positive population who are receiving medical and/or social services in either New York City or in the northern Tri-County suburban area.
- This report is based on data from over 1000 HIV-positive adults who were interviewed in 2003-2012. Over-time analyses are based on the NYC cohort only, interviewed every 12-18 months. Rates of follow-up are over 80% for each interview period.
- Study participants answered a series of questions about their food and diet experiences, need for services and use of services
- Food insecurity was measured based upon standardized indicators of food insecurity (e.g. not having enough money for food, going an entire day without eating anything at all etc.) as well as self-reported need for assistance with obtaining food or meals.

Table 1. Indicators of Food Insecurity and Poor Diet among PLWH[1]

	NYC	Tri-Co	Total
(n=)	*(702)*	*(396)*	*(1098)*
Indicators of food insecurity • Not enough money for food • At least sometimes not enough to eat • Didn't have anything to eat for a whole day OR • Report problems or need for services regarding food, groceries or meals	42%	43%	42%
Poor dietary pattern • Less than one serving of fruits or vegetables per day • Sweet or salty snacks more than two times per day OR • Meals at fast food restaurant three or more times /week	71%	63%	69%

1. New York City and Tri-County study participants interviewed in 2008-2011

Food insecurity is widespread among PLWH

Using standard measures of food insecurity, more than two of every five study participants (42%) in both NYC and Tri-County currently experience food insecurity, rates 2-3 times as high as among the general adult population in New York. [5] At most recent interview, they report not having enough money for food that they or their family need, describe their food situation as sometimes or more often not having enough to eat, answer that they have gone a whole day without anything at all to eat in the past 30 days, or report a continuing need for assistance regarding food or meals (Table 1).

Over 80% of the NYC continuing cohort has been food insecure at one or more times during a 6-year study period. More than half have been food insecure at more than one assessment, conducted approximately every 12- 18 months. The most common pattern appears to be multiple episodes of food insecurity prior to resolution of need for food or meal assistance. However, substantial numbers cycle between episodes of food security and insecurity.[6]

Poor dietary practices are much more common than healthy eating

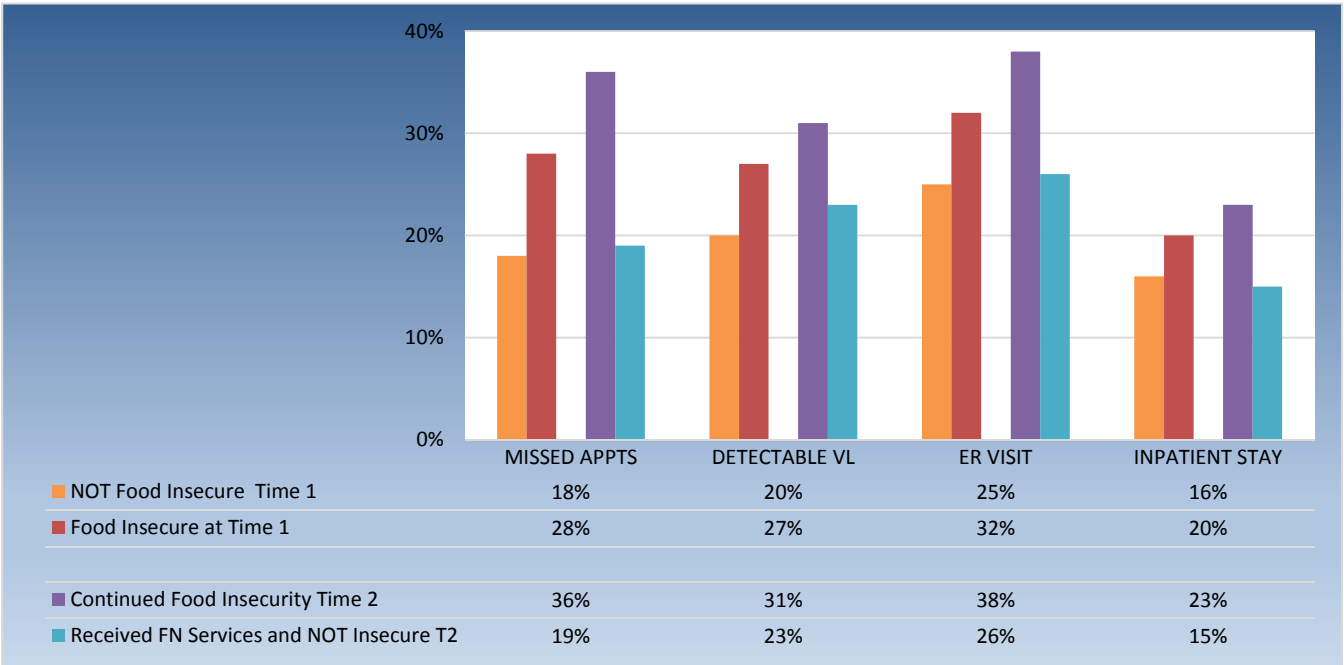
Dietary patterns are poor among the entire study sample of PLWH. Almost half of all study participants (46%) report eating less than one serving of fruit or vegetables or juice per day. Sugary (candy, cookies) or salty (chips, crackers) snacks are consumed more often, an average of two servings a day. Approximately 40% eat at fast food restaurants more than three times per week, and 15% regularly have at least one meal per day at MacDonald's, Burger King, Taco Bell or other low cost, fast food venues. Fewer than 5% of the sample met established criteria for good diet and nutritional intake. We created a composite indicator of less adequate (or 'poor') diet, defined as less than one serving of fruit or vegetables per day, or sugary or salty snacks more than two times each day, or three or more meals per week at fast food restaurants. The great majority of all CHAIN study participants, 69%, fall in the poor diet category (Table 1). Consistent with other research, there is a strong association between food insecurity and diet; 80% of PLWH who are food insecure have a very poor diet.

PLWH who are food insecure have multiple needs

Food insecurity and poor diet are no less common among PLWH who have diet sensitive health comorbidities; over 80% report unhealthy BMI (>25.0 or <18.5) or hypertension, CVD, heart problems, high cholesterol, kidney disease, wasting syndrome, or diarrhea for a month or more. Rates of food insecurity are high among persons with unmet need for treatment for behavioral health problems (mental illness, substance abuse). PLWH who are food insecure typically experience multiple forms of economic hardship. Research shows that food insecurity is strongly associated with housing insecurity among HIV positive persons as well as among others with chronic illness.[7] One-third (33%) of study participants who were food insecure were homeless or unstably housed or at risk of housing loss; 40% reported not enough money to pay utility bills. Transportation needs were high among food insecure PLWH both in NYC and in suburban Tri-County. Hardship indicators are twice to three times as high comparing food insecure vs. food secure PLWH.

Most HIV positive persons who are food insecure have multiple complex vulnerabilities and an inability to meet basic subsistence needs, which contributes to poor engagement with HIV care, compromised quality of life, and poor health outcomes.

Figure 1. Food Insecurity, Food & Nutrition Services, and Change in Outcomes over Time



	MISSED APPTS	DETECTABLE VL	ER VISIT	INPATIENT STAY
NOT Food Insecure Time 1	18%	20%	25%	16%
Food Insecure at Time 1	28%	27%	32%	20%
Continued Food Insecurity Time 2	36%	31%	38%	23%
Received FN Services and NOT Insecure T2	19%	23%	26%	15%

Food insecurity is associated with poor engagement with HIV care

Both cross-sectional and over time analyses of the CHAIN data show that PLWH who are food insecure report more missed appointments for HIV primary care, an indicator of poor engagement with care that is independently associated with poor health outcomes. The food insecure are less likely to be receiving medical care that meets minimum clinical practice standards with regard to number of recommended visits, tests to monitor HIV disease, and antiretroviral medication therapies as indicated. They are less likely to be on ART and those who are on ART are less likely to be adherent to treatment. Not uncommon among persons with HIV disease who are less than fully engaged in HIV care and treatment, rates of emergency room visits and hospital inpatient admissions are higher among those who are food insecure compared to similar PLWH who do not report difficulties obtaining enough and appropriate food.[8]

Food insecurity is associated with poor health outcomes among PLWH

There is increasing evidence that food insecurity is associated with poor clinical and functional health outcomes among persons living with HIV in the U.S. and other high resource countries.[9] Among the CHAIN study cohort, the food insecure are significantly less likely to score high on standardized measures of good mental health and physical health functioning, and more likely to have a detectable viral load and a viral load count above 10,000 copies/ml. Food insecurity is independently associated with medical care and health outcomes in analyses controlling for a range of socio-demographic variables, housing status and area of residence, mental health and substance abuse co-morbidities, receipt of case management, medical care, and ART medication use. Food insecurity has implications for program cost effectiveness. Due to worse clinical and functional health and higher morbidity, client health care needs increase, and ER and inpatient care is more likely.[10]

Effective food and nutrition services improve engagement with HIV care and health outcomes

More than half of PLWH interviewed receive services from a food or nutrition program in the form of meals provided in a group setting, meals delivered to the home, a food voucher or a grocery bag from a food pantry, or some other help with food or meals. However, few programs address all needs and substantial proportions of PLWH who have accessed food and nutrition services continue to be food insecure.[11] Nonetheless, over time analysis shows that 20-25% of formerly food insecure individuals who access services are no longer food insecure by the next interview period. Very few (<5%) resolve food insecurity without food assistance. We conducted a series of longitudinal analyses, examining outcomes among PLWH who are food insecure at one interview and receive food and nutrition services and are not insecure by the next interview (referred to here as receiving "effective" food/nutrition services), compared to those who continue to be food insecure. Figure 1 (above) shows some of these relationships.

The general pattern is very clear: food insecurity is associated with worse medical care and health outcomes; and continuing food insecurity is even more strongly associated with poor outcomes – missed medical appointments for HIV, having a detectable viral load, and using high cost emergency room and hospital inpatient services. However, formerly food insecure PLWH who receive food /nutrition services and are no longer food insecure are at much lower risk for these negative outcomes. For example, 28% of PLWH who were food insecure at one interview period reported missing two or more scheduled appointments for HIV care in the six months prior to interview. If these same persons received food/nutrition services and by the next interview were no longer food insecure, only 19% missed two or more appointments. In contrast, among those who continued experiencing food insecurity, almost twice as many, 36%, reported missing multiple appointments.

Table 2. presents results of a series of statistical analyses, looking across interview periods. Each interview with each CHAIN study participant constituted an opportunity to examine the relationship between food insecurity and receipt of food and nutrition services for each of the medical care and health outcomes. Each model examines predictors of the outcome at Time 2 among respondents who were food insecure at the prior interview (Time 1), controlling for a range of individual characteristics, other needs and services received. Numbers shown in Table 2 are the odds for each outcome – e.g. missing multiple appointments – among PLWH who had been food insecure at one interview, received services and then were no longer food insecure by the next interview, compared to PLWH who continued to experience food insecurity. The analyses control for other factors known to be associated with HIV outcomes.

We found that the odds of missing multiple appointments are one fourth as high (AOR 0.26) for food insecure PLWH who received effective food and nutrition services, as for those who continued to be food insecure, and the odds of an ER visit or inpatient stay are about half as high. When we consider positive outcomes – adherent ART use, viral suppression, and good physical functioning, the odds of good outcomes are much higher for formerly food insecure PLWH who receive effective food and nutrition services. Taking ART medications is the strongest predictor of suppressed viral load. However, in other analyses,[5, 9] we found that food insecurity appears to be a barrier to achieving or sustaining viral suppression by reducing the likelihood that food insecure PLWH will be on ART medications as well as reducing adherence among those on a prescribed regimen.

Conclusion

Food insecurity and nutritional needs are widespread among adults living with HIV, and highest among PLWH with multiple complex needs. While use of food and meal services is high in the CHAIN cohorts, available resources do not appear to be sufficient to address needs. Given the increasing costs to PLWH of purchasing healthy food and the challenges faced by providers to secure funding for food and other supportive services, unmet need for food and nutrition services is expected to grow.[12] Not only CHAIN but other research has provided strong evidence that food insecurity and poor nutrition pose barriers to HIV treatment and care and are associated with worse clinical outcomes for PLWH. On the other hand, effective food and nutrition services (services associated directly or indirectly with resolving food insecurity and improving nutrition) can make a substantial difference in both engagement with care and health outcomes. Food and nutrition programs may improve outcomes for PLWH directly by addressing nutritional needs and improving absorption and efficacy of ART as well as indirectly by reducing stress and barriers to care associated with competing subsistence priorities, and/or by providing health education and service linkages facilitating access to and engagement with medical care. Effective food and nutrition services contribute to improved H IV treatment outcomes for individuals and, since treatment effectiveness reduces forward transmission, help achieve HIV prevention goals as well. Healthy and active PLWH save health care costs. Evidence supports integrating medically informed food and nutrition support as a critical component of HIV care, consistent with "food is medicine" initiatives.[13]

Table 2. Receipt of 'Effective" Food and Nutrition Services[1] and HIV Medical Care and Health Outcomes among formerly Food Insecure Persons Living with HIV/AIDS

	Missed App's[2] AOR	Adherent ART Use[3] AOR	ER Visit Past 6 mos AOR	Inpatient Stay AOR	Health Functioning[4] AOR	Suppressed Viral Load[5] AOR
Food & Nutrition Services						
Effective Food & Nutrition Services[1]	**0.32***	**1.82***	**0.55***	**0.56***	**2.72***	**1.29**
Resolved food insecurity w/o services	0.46	1.59	0.48	0.48	1.73	0.63
Socio-demographics						
Age[6]	0.99	1.04*	0.99	0.99	0.94*	1.05*
Gender: Female	2.56*	0.64#	2.04*	1.95*	0.28*	0.74
Race/Ethnicity: Black[7]	0.67	0.96	0.56*	0.46*	3.40*	1.03
Race/Ethnicity: Latino[7]	0.86	0.94	0.65	0.72	1.67	1.36
Income below poverty line[8]	1.67#	0.95	1.43#	0.92	1.25	0.88
Stably housed[9]	1.18	1.26	0.87	0.91	1.03	0.79
Behavioral Health Challenges						
Low Mental Health[10]	0.65#	1.09	1.01	1.65*	0.36*	1.22
History of problem substance use[11]	1.70#	0.74	1.28	1.61#	0.89	0.48*
Current problem substance use[11]	4.19*	0.26*	1.56#	1.73#	0.44#	0.14*
Services Received						
Antiretroviral Treatment	0.91	n/a	0.87	0.84	0.63	3.67*
Medical Case Management[12]	0.48*	1.23	0.97	1.20	0.45*	0.99
Social Service Case Management[13]	1.02	1.53#	1.63*	1.35	0.83	0.84

Note: AOR = adjusted odds ratio from random effects logit models which adjust for the dependency among multiple observations contributed by the same individual. Analysis based on 453 NYC respondents who were food insecure at one or more interview periods during 2003-2013 in NYC, 806 observation points. * p ≤.05; # p ≤ .10

1. All models examine receipt of effective FNS services (services followed by resolution of food insecurity) and other predictors of each outcome among respondents who were food insecure at the previous interview.
2. Missed two or more scheduled appointments for HIV medical care in the six months prior to interview.
3. Prescribed ART and adherent to treatment regimen v. no ART or non-adherent.
4. Score > 50 on the MOS-SF12v2 Physical Component Summary Score, the mean population score indicating average or 'good' physical health functioning and well-being (Ware et al., 2007. User's Manual for the SF-12v2 Health Survey. Lincoln, RI: QualityMetric Inc.).
5. Self-report viral load as 'undetectable' or below 400 (Messeri et al., 2013. Validating Self-Reported HIV Test Results Using Surveillance Registry Data. CHAIN Report 2012-8).
6. Continuous variable, age 20-80 years.
7. Reference category = White/other
8. Annual household income <$7500
9. Stably housed – no experience in past six months of homelessness (in a homeless shelter, single room occupancy or welfare hotel (SRO), street or public place not meant for sleeping) or unstable housing (in a temporary or transitional housing program, or temporarily doubled up in someone else's home).
10. Score < 42 on the on the MOS-SF12v2 Mental Component Summary Score, indicating clinically significant mental health symptoms of depression, anxiety, and/or impaired social functioning (Ware et al., 2007).
11. Current problem drug use indicated by use of heroin, cocaine, crack, or problem drinking within the six months prior to interview; history of problem substance use refers to lifetime use but not within the prior six months.
12. Case manager has helped respondent get medical services, coordinated medical services, or referred to medical services
13. Case manager developed a care plan, helped get or referred to specific social services, coordinated social services, or filled out forms for entitlements

CHAIN Report 2012-3.3

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