

# FOOD INSECURITY:

## Implications for ART Adherence and HIV Health Outcomes

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Adherence 2014; June 10, 2014

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# OVERVIEW



Background on Food Insecurity & HIV



Food Insecurity, Adherence & Patterns of Health Care Utilization



Food Insecurity & HIV Clinical Outcomes and Morbidity



Next Steps

**BACKGROUND**

# FOOD INSECURITY: **Definition**

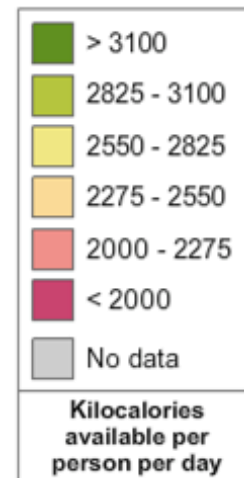
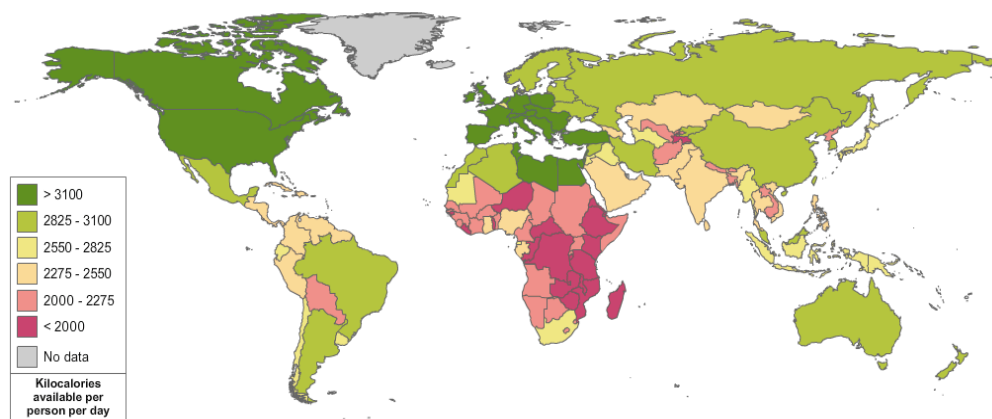
**Limited or uncertain availability of nutritionally adequate, safe foods<sup>1</sup>**

- Components:
  - Insufficient quantity of foods
  - Insufficient quality and diversity of available foods
  - Feelings of deprivation/anxiety
  - Inability to procure food in a socially acceptable manner
- Hunger and malnutrition are potential consequences
- **Food insecurity distinct from socioeconomic status<sup>2</sup>**

<sup>1</sup>United Nations Subcommittee on Nutrition: *Nutrition and HIV/AIDS. Statement by the Administrative Committee on Coordination, Sub-Committee on Nutrition at its 28<sup>th</sup> Session. Nairobi, Kenya; 2001.*

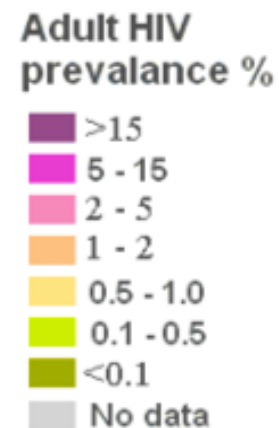
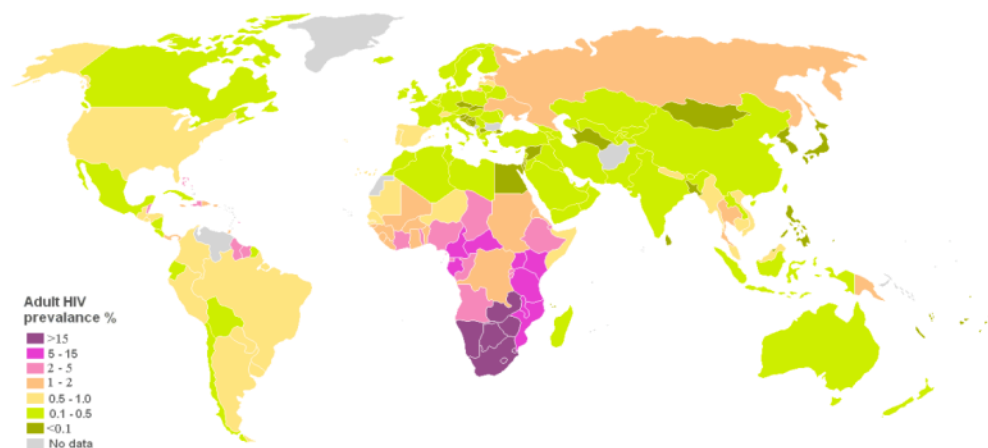
# HIV AND FOOD INSECURITY: SYNDEMIC ISSUES

**Food  
Insecurity**  
Kcal/per/day

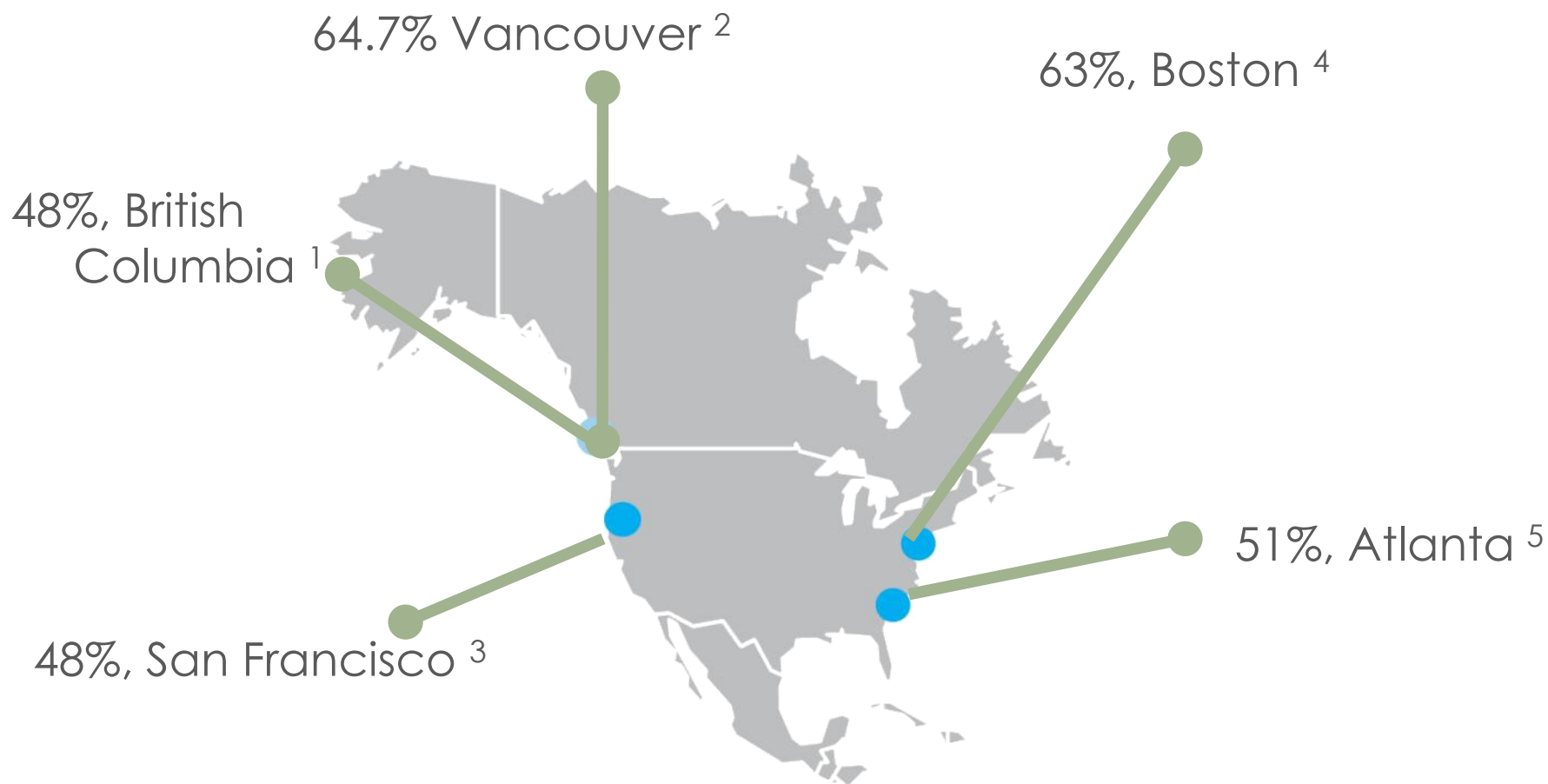


IFPRI (2010) Food Security CASE maps & UNAIDS 2010

**Adult HIV  
Prevalence**



# APPROXIMATELY HALF OF HIV-INFECTED INDIVIDUALS IN NORTH AMERICA ARE FOOD INSECURE



<sup>1</sup> Normen, J Nutrition, 2005; <sup>2</sup> Anema, Subs Abuse Tx, 2010; <sup>3</sup> Weiser, JGIM, 2012; <sup>4</sup> McMahon JAIDS, 2011; <sup>5</sup> Kalichman J Urban Health, 2010

# MEASURING FOOD INSECURITY



United States  
Department of  
Agriculture

Food and  
Nutrition  
Service

Office of  
Analysis,  
Nutrition, and  
Evaluation

## Measuring Food Security in the United States

### **Guide to Measuring Household Food Security**

**Revised 2000**



**USAID**  
FROM THE AMERICAN PEOPLE

**Household Food Insecurity  
Access Scale (HFIAS) for  
Measurement of Food Access:  
Indicator Guide**

**VERSION 3**

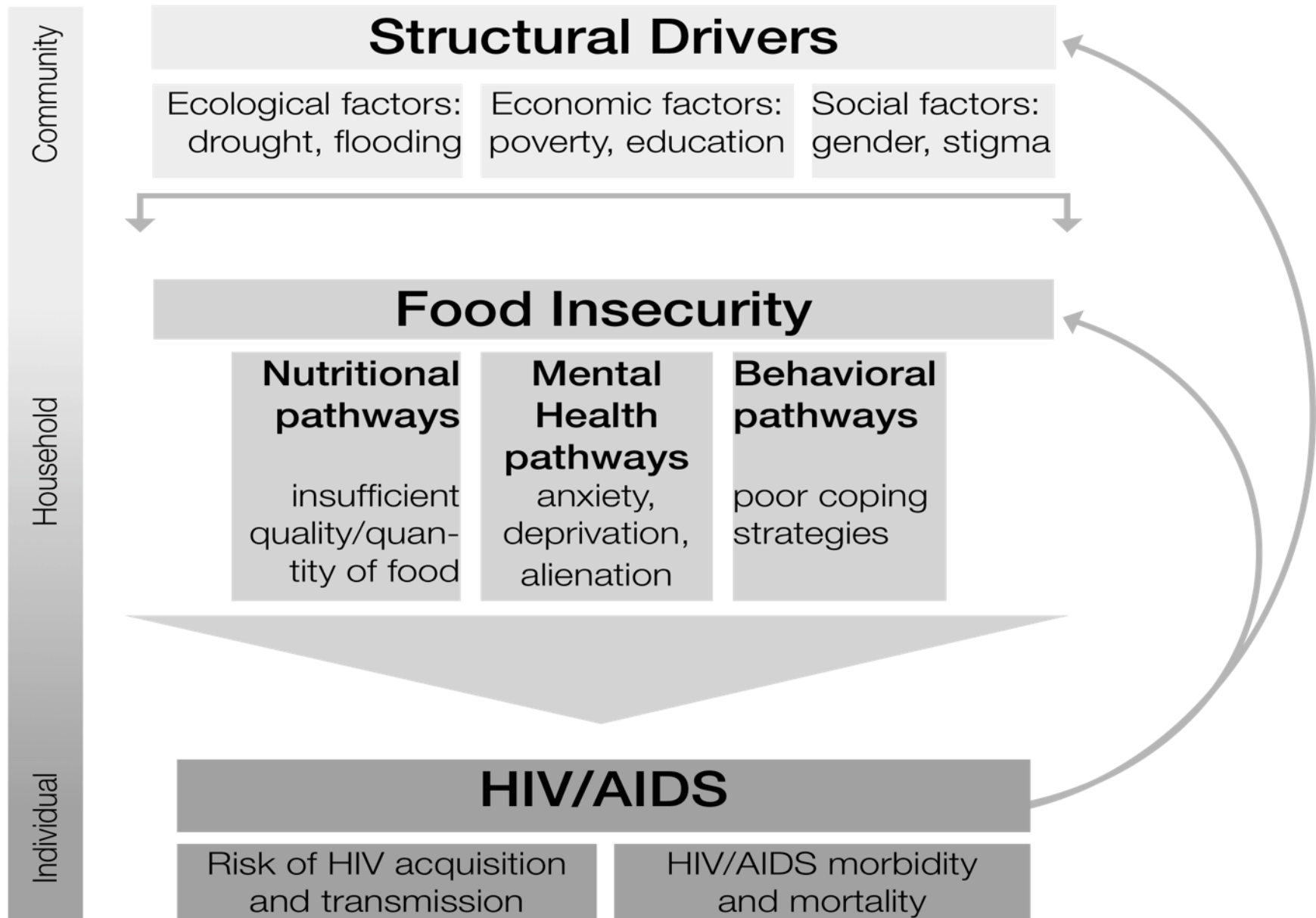
## **Most widely used tools:**

- USDA Household Food Security Survey Module
- FANTA Household Food Insecurity Access Scale (HFIAS)

## **Other measures:**

- Radimer/Cornell Measure<sup>1</sup>
- Coping Strategies Index
- Dietary Diversity Scale<sup>2</sup>

<sup>1</sup> Keenan, J Nutr Educ, 2001 <sup>2</sup> Maxwell DG, Food Policy, 1996; Arimond J Nutrition, 2004; Coates, J Nutrition 2006





# GENDER, FOOD INSECURITY & HIV RISK










## QUALITATIVE EVIDENCE

### Transactional Sex/ unprotected sex:

- **“Women are having sex because they are hungry.** If you give them food, they would not need to have sex to eat.”
- **“Either my children and I starve tomorrow, or I have sex with someone today,** and maybe get HIV, and will then die 5-10 years later.” <sup>1</sup>
- “Most of the time, when I’m desperate for something to eat...And **then the devil tempts you, and then you see a man...**and you ask yourself, If I slept with him, couldn’t I get 10,000 shillings [approx. \$5.00 US] to buy maybe a sack of charcoal?” <sup>2</sup>

<sup>1</sup> Epidemic of Inequality, PHR Report, 2008; <sup>2</sup> Miller et al. AIDS and Behavior, 2010

# Food Insecurity & **Risky Sex** *across diverse settings*

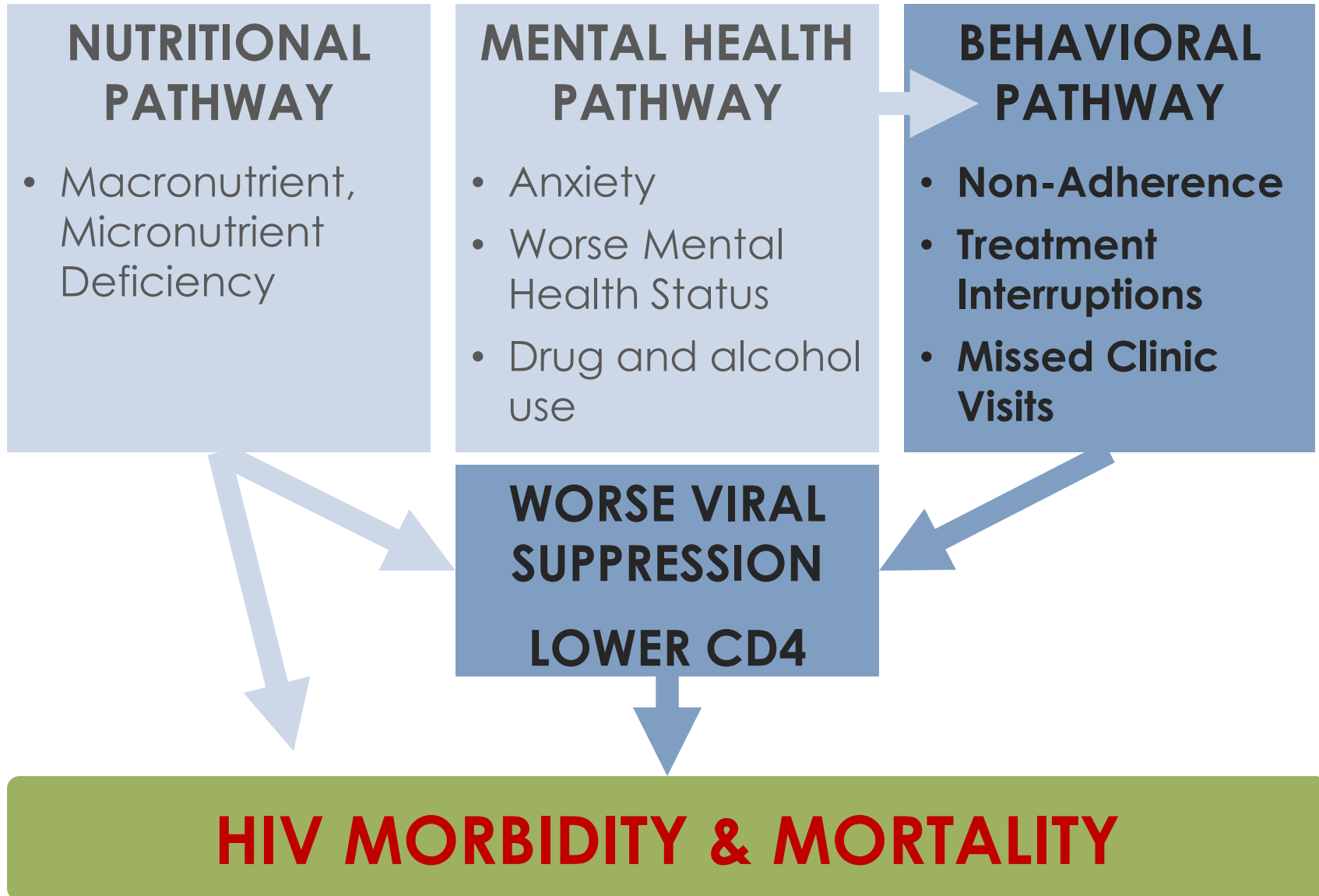
	Botswana/ Swaziland <sup>1</sup>	Brazil <sup>2</sup>	San Francisco <sup>3</sup>	Vancouver <sup>4</sup>	Nepal <sup>5</sup>
Unprotected sex					
Sex exchange					
Consistent condom use					
Multiple partners					
STI Symptoms					

\*Models adjusted for demographic, socioeconomic and clinical variables.

<sup>1</sup> Weiser et. Al. PLoS Medicine, 2007; <sup>2</sup> Tsai et al. PLoS Medicine 2012; <sup>3</sup> Vogenthaler et al. AIDS and Behavior, 2012 <sup>4</sup> Shannon K, et al AIDS, 2011 <sup>5</sup> Tsai et al. AIDS and Behavior, 2014

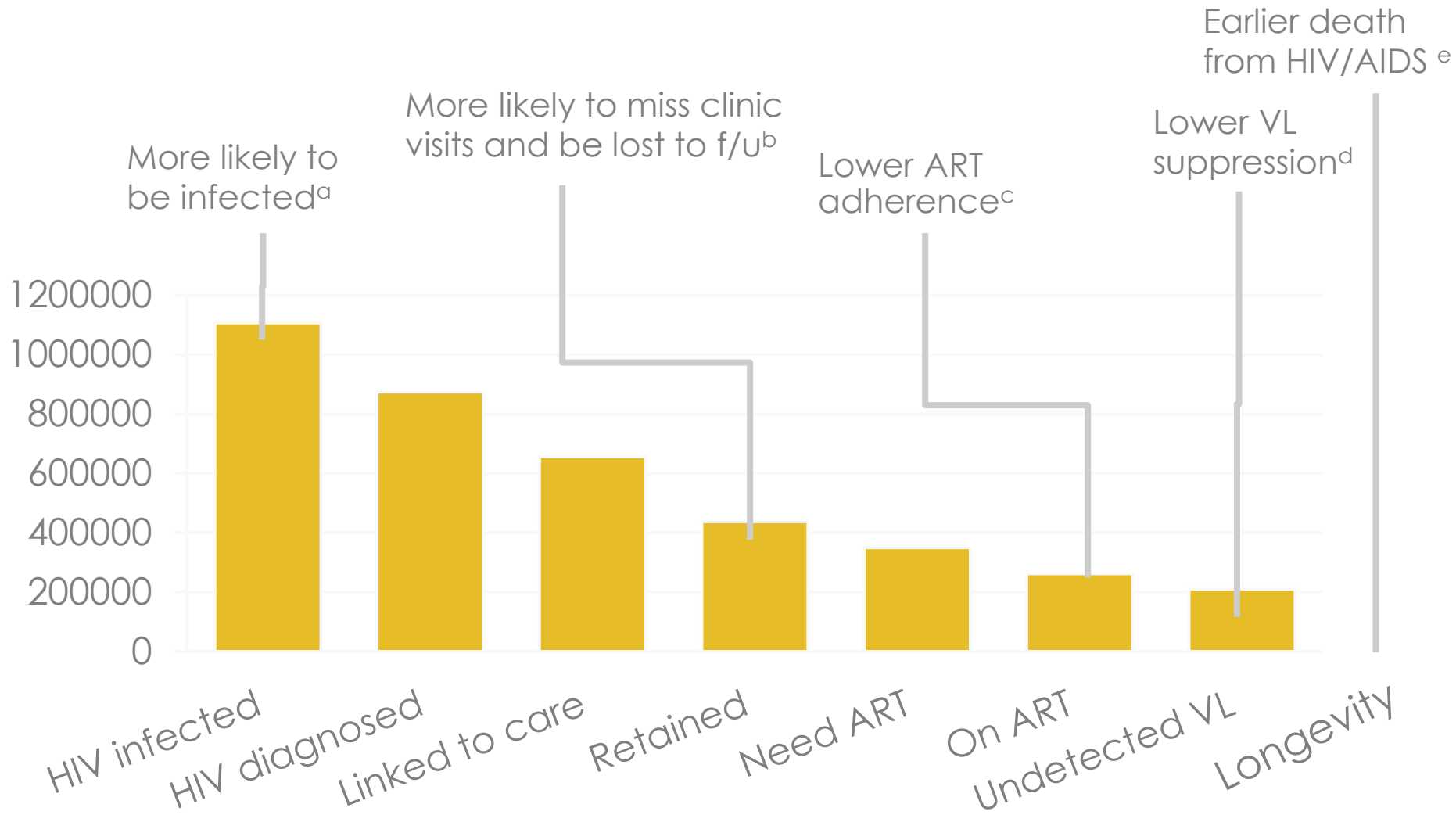
FOOD INSECURITY,  
**ADHERENCE &  
TREATMENT RETENTION**

# FOOD INSECURITY



# HIV TREATMENT CASCADE

## IMPACT OF FOOD INSECURITY

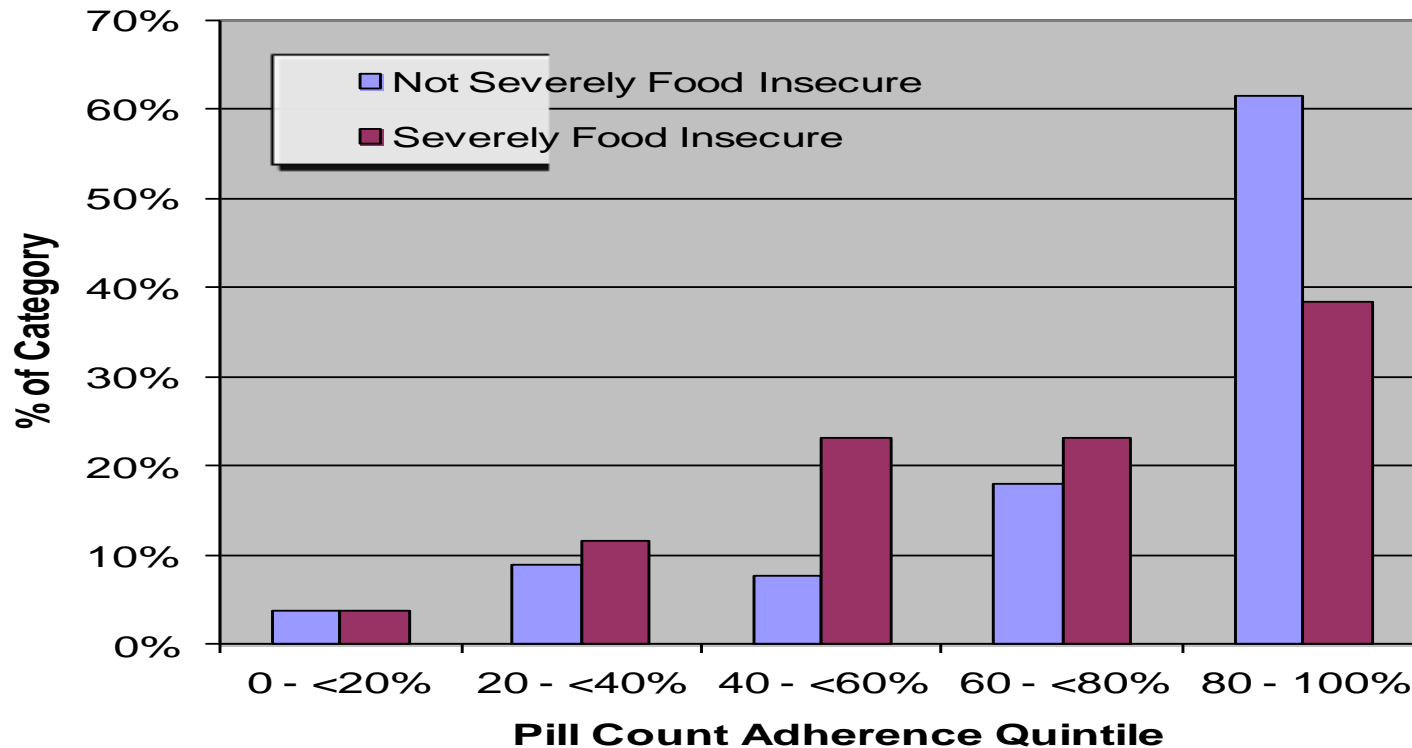


a. Vogenthaler 2012; b Weiser, 2012; Nash 2010; c Kalichman 2011; d Wang 2011; e Weiser 2009.

# FI & NON-ADHERENCE

## Cross-sectional evidence, US & Europe

**FIGURE 1: Adherence Quintile by Food Security Status**



# FI & **NON-ADHERENCE**

## *Cross-sectional evidence, Sub-Saharan Africa*



Location	Population Sample size	Food Insecurity Measure	Evidence for ART non-adherence
Cameroon <sup>1</sup>	Rural & urban N= 2381	<2 meals/day	1.93 (1.44-2.57)* AOR
DRC <sup>2</sup>	Urban N=898	HFIAS (mild, moderate, severe)	1.99 (1.36–2.90)***
Zambia <sup>3</sup>	Rural N=96	inadequate food in household over previous month	5.02 (1.81-13.76)* AOR
Ethiopia <sup>4</sup>	Rural N=348	<3 meals/day	10.9 (1.3-81.4)*

•p< 0.05, \*\* p<0.01, \*\*\*p<0.001

1 Boyer et al. 2011; 2 Musumari et al PLOS One 2014; 3 Sasaki et al. 2012; 4 Berhe et al. 2013

# FOOD INSECURITY & **NON-ADHERENCE** (<90%)

**Longitudinal Evidence: *Uganda, San Francisco***

Characteristic	Adjusted OR (95% CI)	
	UGANDA <sup>1</sup>	SAN FRANCISCO <sup>2</sup>
Any food insecurity	1.56 (1.10 – 2.10)*	1.48 (1.19 - 1.85)***
Homeless		1.56 (1.04 - 2.33)*
Illicit drug use		2.21 (1.70 - 2.88)***
Heavy drinking	2.56 (1.41-4.66)**	1.75 (1.15 - 2.68)**
Employed	0.58 (0.45-0.76)***	
Asset index	0.92 (0.85-0.99)*	
CD4 nadir	0.99 (0.99 – 1.00)*	0.88 (0.79-0.99)*

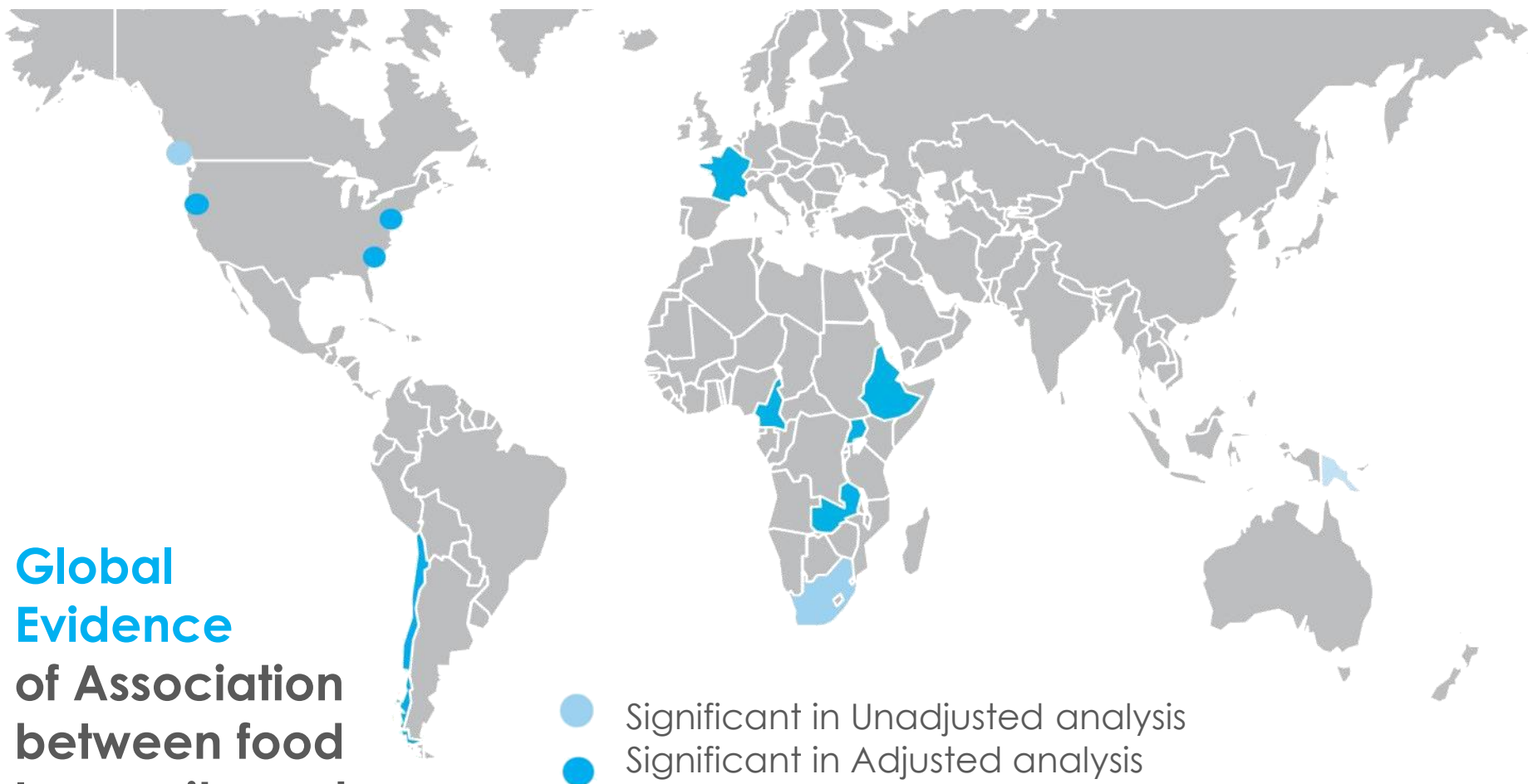
p< 0.05, \*\* p<0.01, \*\*\* p<0.001;

Uganda models also control for gender, age, and ART at baseline.



# FOOD INSECURITY & ADHERENCE

## SYSTEMATIC REVIEW



**Global  
Evidence  
of Association  
between food  
Insecurity and  
ART non-adherence**

# NON-ADHERENCE MECHANISMS:

## QUALITATIVE EVIDENCE

### Competing demands

*Sometimes there is stress between my medical needs and my food needs, because I have to spend a lot on food, but for medications I must spend on them also and its stressing me.*  
– Patient, Uganda

### Intractable Hunger

*The ARVs made me hungrier, even like you want to eat all the time... And two hours after taking ARVs, you're very hungry and feel like taking something.* – Patient, Uganda

### Meds without food lead to side effects

*When I swallow medicine before I've had food, I feel dizzy in my eyes, but when I have eaten, there is no side effect... I also get slashing pains in my stomach when I take medicine without food.*  
– Patient, Uganda

# FOOD INSECURITY & **ADHERENCE**, *pediatric populations*



- Food insecurity is also barrier to adherence and HIV outcomes in pediatric populations <sup>1, 2</sup>
- Mechanisms similar including competing demands, increased appetite on ARVs and worsened ARV side effects <sup>3</sup>
- Caregiver disease burden may also affect adherence and care

1. Vreeman, Qual Health Res, 2009; Fetzer, AIDS Patient Care & STDs, 2011
2. Mendoza et al 2013
3. Skovdal et al AIDS Care 2011

# FI & **ADHERENCE TO CARE**

## *among Pregnant PLHIV\**



- Food insecurity may impede<sup>1,2</sup>:
  - Adherence to weight gain recommendations
  - Access to antenatal clinic visits
  - Adherence to peri-natal/post-natal ARV prophylaxis and testing of infants
  - **All increase risk of vertical transmission**
- **More research needed in this vulnerable population** <sup>2, 3</sup>

1. Laraia, et al. J Nutr 2006
2. Young & Weiser 2013
3. Sellen & Hadley, Ann Anthropol Practice, 2011

# FOOD & HEALTHCARE

## COMPETING DEMANDS

All participants  
(*N* = 406)  
*N* (%)

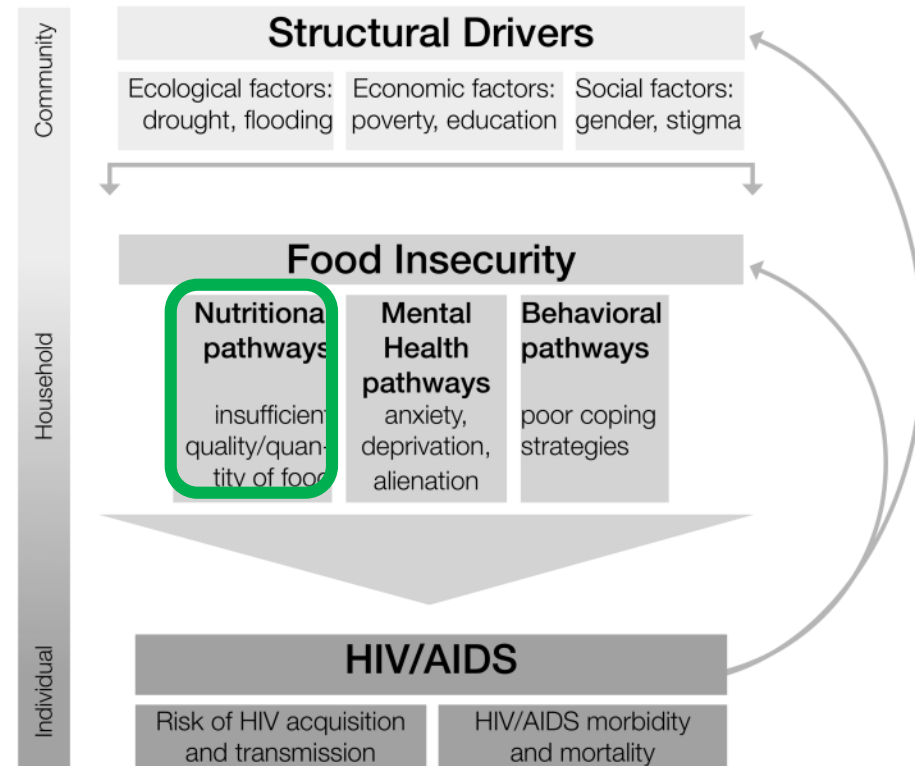
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Giving up medical care for food	
Giving up ART for food	71 (17%)**
Giving up other medications for food	98 (24)
Giving up needed outpatient care for food	122 (30%)
Giving up needed inpatient care for food	131 (32%)
Giving up food for medical care	
Giving up food for ART	349 (86%)
Giving up food to access outpatient care	325 (80%)*
Giving up food to access inpatient care	197 (49%)**

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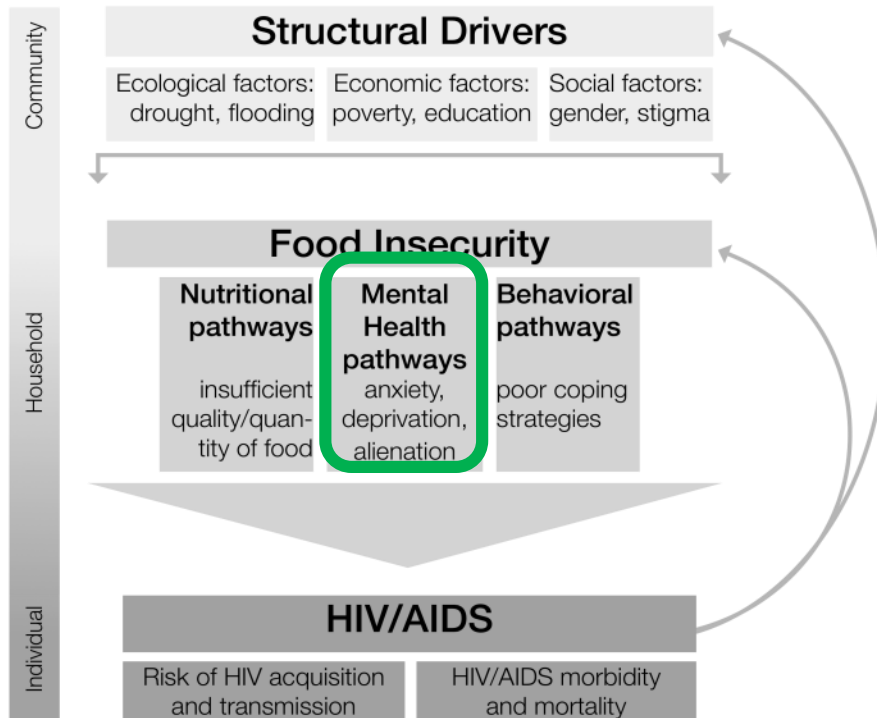
# NUTRITIONAL PATHWAY

- Malnutrition hastens progression to AIDS and death\*
- Nutritional status (low BMI, weight loss and low albumin) predicts
  - opportunistic infections
  - immunologic decline
  - shorter survival time
- Food insecurity also associated with obesity which predisposes to cardiovascular risk \*\*



\*Kotler, Am J Clin Nut, 1989; Wheeler, JAIDS, 1989; Cheblowski, Am J Gastroenterol, 1989; Guenter, JAIDS, 1993; van der Sande, JAIDS, 2004; Lindan, Ann Intern Med, 2004\*\*Sirotnin et al 2014, Under review, PLoS One

# MENTAL HEALTH PATHWAY



- Food Insecurity linked with depression<sup>1,2</sup> and worse overall mental health<sup>3</sup>
- Effects may be more pronounced in women<sup>2</sup>
- Depression and poor mental health status associated with worse virologic and immunologic outcomes

FOOD INSECURITY &  
**HIV HEALTH OUTCOMES**



# FOOD INSECURITY & HIV OUTCOMES

## Cross Sectional Evidence:

	Population	Unsuppressed Viral Load	Low CD4 count (<200 cells/ $\mu$ L)
<b>US National</b> <sup>1</sup>	Veteran HIV+ men & women; n= 2353	1.37 (1.09 – 1.73) AOR	1.45 (1.14, 1.86) OR
<b>Atlanta</b> <sup>2,3</sup>	HIV+ minority men & women; n=268	1.7 (1.1–3.0) OR	2.2 (1.2–4.2) OR
	HIV+ w/ alcohol use, n=183	2.96 (1.0–8.00) OR	--
<b>Houston</b> <sup>4</sup>	HIV+ children; n=62	4.07(1.02-13.92) AOR	–0.23, (–0.40, –0.01) $\beta$ (linear CD4)
<b>San Francisco</b> <sup>5, 6</sup>	HIV+ men & women	72% lower odds of VL suppression	2.08 (1.09, 3.94)

1. Wang, JGIM, 2011; 2. Kalichman JUH, 2010; 3. Kalichman et al. J Beh Med 2013;  
4, Mendoza et al A& B 2013 5. Weiser, JGIM 2009; 6. Weiser A&B 2009

# FOOD INSECURITY & HIV HEALTH OUTCOMES

## *Longitudinal Evidence:*

Location, Follow-up	Population	Unsuppressed Viral Load	Low CD4 count (<200 or <350 cells/ $\mu$ L)
<b>Uganda</b> <sup>1</sup> over 4 years	HIV+ men & women; n=438	1.52 (1.18-1.96)** AOR	1.47 (1.24 – 1.74)** AOR
<b>San Francisco</b> <sup>2</sup> over 2 years	HIV+ minority men & women; n=284	1.29 (1.04 – 1.61)** AOR	1.26 (1.01 – 1.56)* AOR
<b>Boston</b> <sup>3</sup> over 10 years	HIV+ men & women; n=592	FI had less gains in CD4 count: 94 cell vs. 194 cell in food secure***	

p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

<sup>1</sup>Weiser et al. AIDS 2013; <sup>2</sup>Weiser et al, AIDS 2013; <sup>3</sup>. McMahon, JAIDS 2011

# FOOD INSECURITY & **ACUTE HEALTH CARE UTILIZATION,** *San Francisco*<sup>1</sup>

	Hospitalizations AOR (95% CI)	ED Visits AOR (95% CI)
<b>Food security (HFAS)</b>		
Food secure	REF	REF
Mild/moderately food insecure	1.56 (1.06, 2.30)*	1.57 (1.22, 2.03)***
Severely food insecure	2.16 (1.50, 3.09)***	1.71 (1.30, 2.25)***
Homeless	--	1.53 (1.03, 2.27)*
Illicit drug use	--	1.56 (1.18, 2.07)**
Months on ARV	--	1.06 (1.04; 1.07)***
CD4 nadir (in 100 cells/ $\mu$ L)	1.22 (1.38, 1.07)**	1.11 (1.22, 1.01)**
Depression (BDI score)	1.02 (1.01, 1.04)**	1.02 (1.01, 1.03)**

\*p<0.05, \*\*p<0.01, \*\*\*p<0.001

# FOOD INSECURITY & **MORTALITY**

## **British Columbia<sup>1,2</sup>**

	Anema et al 2013 AHR (95% CI)	Weiser et al 2009 AHR (95% CI)
Food insecure	1.95 (1.07–3.53)	1.51 (1.01-2.27)
Age (10yr increase)	1.27 (0.98–1.65)	1.05 (1.03-1.07)
Baseline CD4 (+100 cells)	0.96 (0.87–1.06)	0.80 (0.73-0.87)
History of IDU	n/a	3.30 (2.25-4.85)
Stable housing	--	0.89 (0.48-1.65)
Viral Load (Log10)	1.42 (1.12–1.80)	-

Note: Both models also controlled for sociodemographic factors,  
Weiser model also controlled for adherence, alcohol use

# SUMMARY

## FI AND HIV OUTCOMES

- **Food insecurity associated with:**
  - Worse ART adherence, missed clinic visits
  - Worse virologic outcomes
  - Worse immunologic response
  - Increased hospitalizations
  - Higher mortality

NEXT STEPS:  
**FOOD INSECURITY AND HIV/AIDS,  
ADDRESSING THE CYCLE**

# INVESTIGATING MECHANISMS

## NEED FOR LONGITUDINAL STUDIES

**Longitudinal studies needed to assess pathways for how food insecurity contributes to:**

- HIV acquisition
- Worse HIV treatment outcomes
- HIV co-morbidities (ex: diabetes, hypertension, cardiovascular disease)
- Inflammation/immune activation

# POSSIBLE INTERVENTIONS

Targeted food  
supplementation



Food stamps/vouchers



Livelihood/Vocational  
Training Programs



Cash  
transfers



# INTERVENTION AND POLICY OPTIONS BY PATHWAY

NUTRITIONAL PATHWAYS		BEHAVIORAL PATHWAYS	MENTAL HEALTH PATHWAYS
<u>Obesity</u>	<u>Undernutrition</u>		
SNAP/food banks: fruits, vegetables	SNAP/food banks: high calorie/ nutrient dense food	Adherence counseling	Mental health counseling and referral
Diet counseling: decreasing fat intake	Diet counseling: Increasing caloric nutrient intake	Social work services or transport vouchers (to address competing demands)	Substance abuse counseling and referral
Exercise program for weight loss	Improved access to soup kitchens, meal delivery	<u>Both Behavioral and Mental Health</u>  Improve access to SNAP (income transfer for food) to decrease competing demands and anxiety over food supply  Skills and vocational training to decrease reliance on any type of food support	
<u>Immunologic Mediators</u>  Interventions to decrease immune activation/inflammation;  (e.g., pre or probiotics, nutritional supplementation, earlier initiation of ART among food insecure individuals)			

# NEED FOR INTERVENTION RESEARCH TO UNDERSTAND:

- Whether improving food insecurity improves HIV outcomes, and which outcomes will be effected?
- How long to continue food support programs?
- Which programmatic options will be most effective/cost-effective?

**Expected to vary with country/context**

# IMPACT ON ADHERENCE OF FOOD SUPPORT INTERVENTIONS

**Zambia:** **70% of patients in food supplementation group vs. 48% in controls** achieved >95% adherence (RR 1.5; 95% CI 1.2-1.8)<sup>1</sup>

**Kenya:** Qualitative study found **greater ART adherence and fewer treatment side effects** among patients enrolled in food support program <sup>2</sup>

**Haiti:** In a cohort study, food assistance associated with **fewer missed clinic visits and reported fewer problems taking ART up to 12 months after the intervention**, in addition to experiencing improved food security and BMI.<sup>3</sup>

**Honduras:** Monthly food basket led to **19.6% greater improvement in on-time prescription refills** at 6months over nutritional education (NE) alone.<sup>4</sup>

# FOOD ASSISTANCE & ART & HIV TREATMENT ADHERENCE

Niger

India

**5 out of 6 studies** among adults and children in 5 countries found that provision of food can improve ART adherence

Zambia

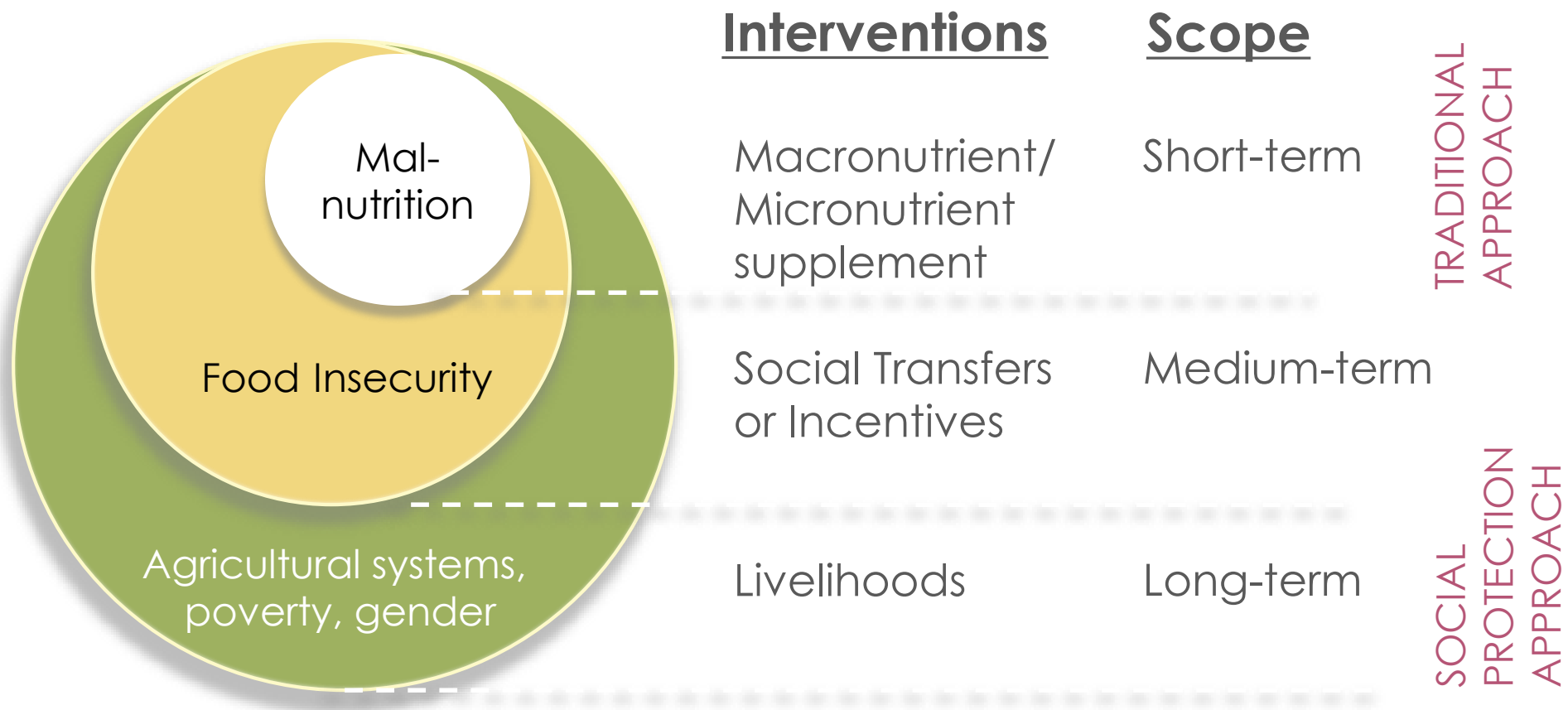
Mozambique

Timor Leste

- Positive Association
- Negative Association

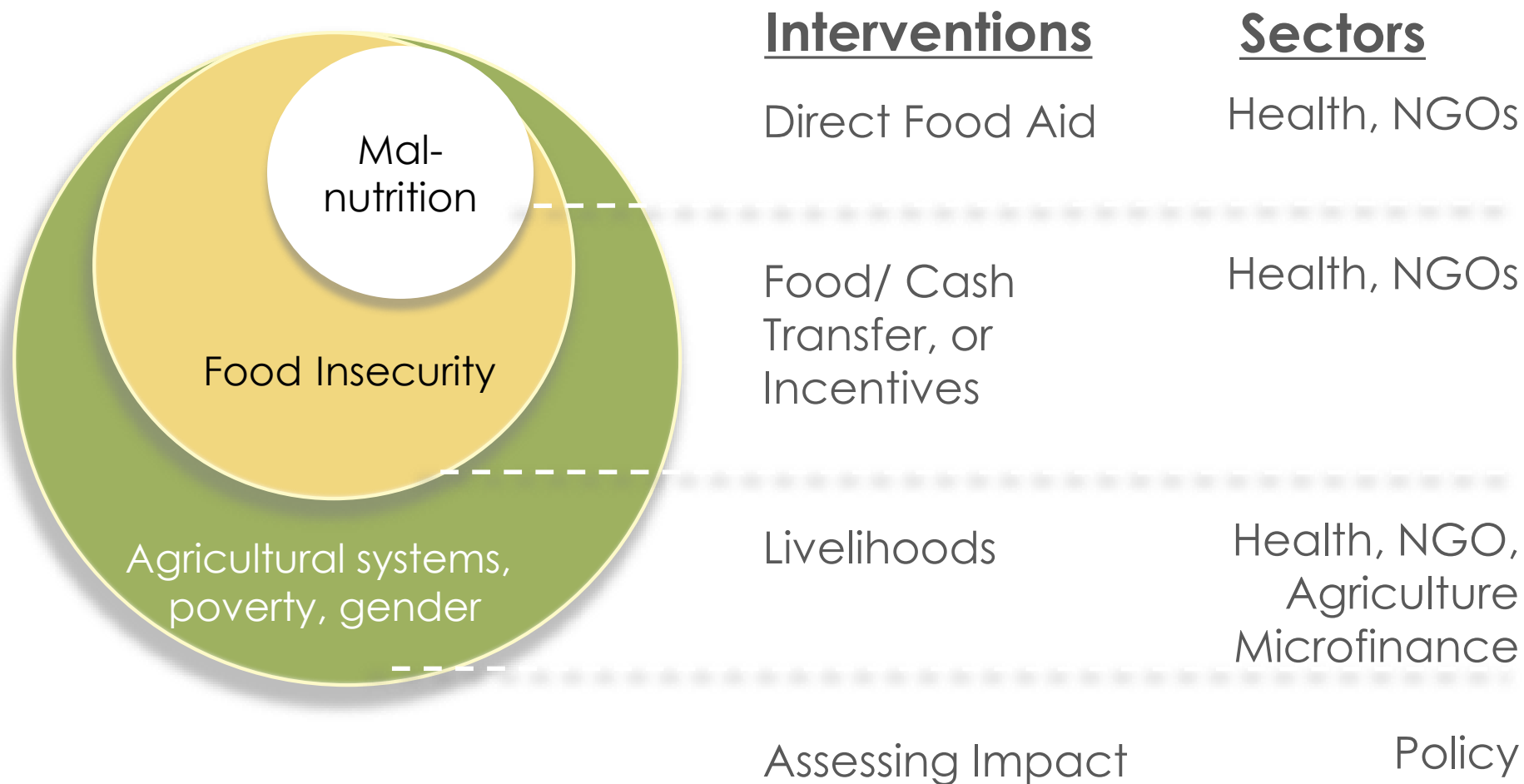
# SOCIAL PROTECTION APPROACHES:

## MOVING TOWARD LONG-TERM STRATEGIES



# ENGAGING MULTIPLE SECTORS

## SOCIAL PROTECTION APPROACHES TO FOOD SECURITY



# SHAMBA MAISHA PILOT, KENYA

NIMH R34 (WEISER/COHEN/BUKUSI PIS)



“Farm Life” in Kiswahili

Targets poverty & agriculture

2 clusters; n=140 people

## **Intervention components :**

- Microfinance
- Agricultural/finance training
- Micro irrigation pump

# SHAMBA MAISHA: IMPROVING FOOD SECURITY OF HIV-INFECTED KENYANS

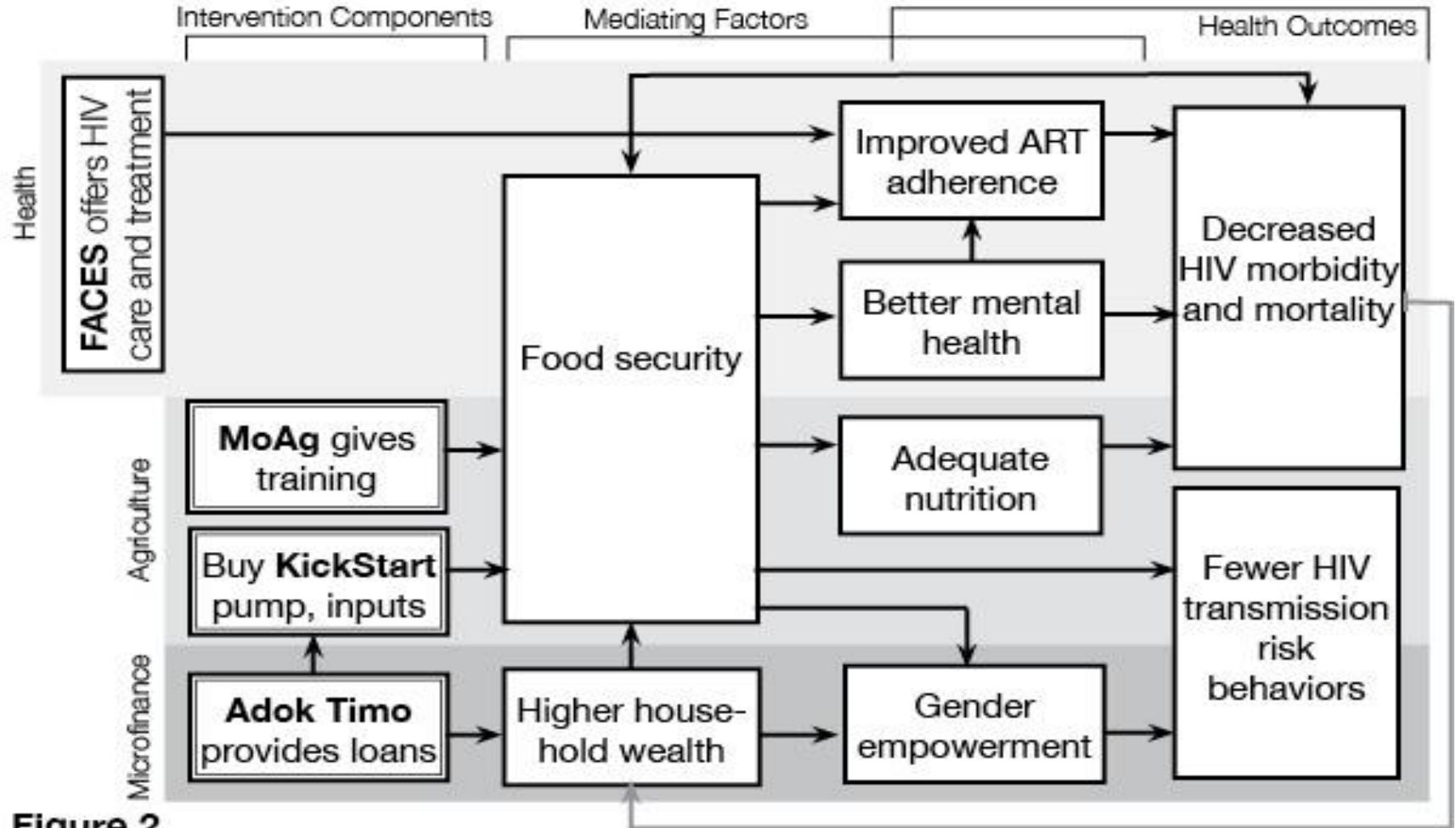


Figure 2



# PRELIMINARY QUALITATIVE RESULTS

SHAMBA MAISHA, KENYA (NIMH R34)



## **Behavioral:**

- Improved clinic attendance
- ART adherence

## **Nutritional:**

- More fruits and vegetables
- Gaining weight

## **Mental health:**

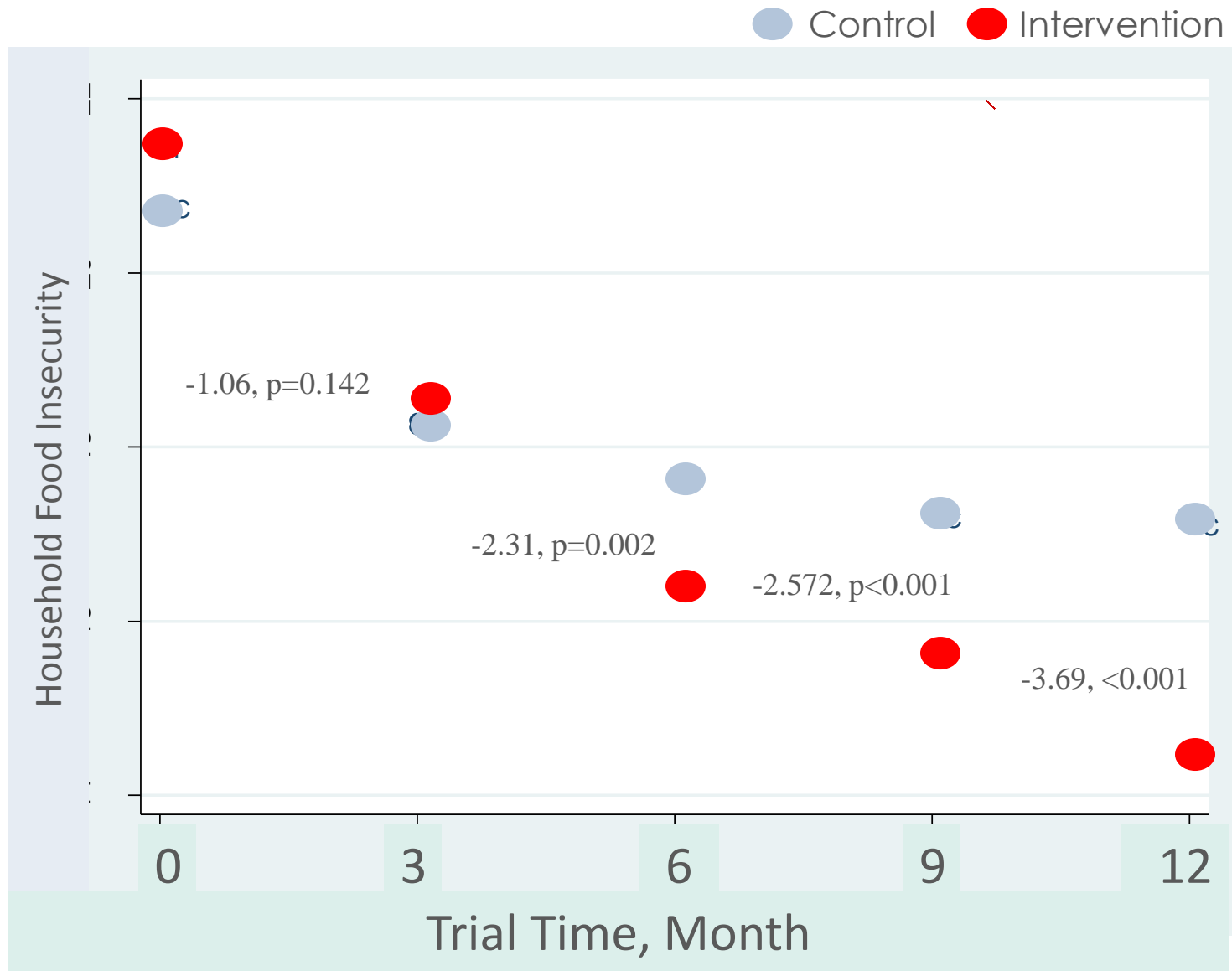
- Less stress/depression, more hope

## **Empowerment:**

- Self-sufficiency increased
- Decision making power among women improved

# SHAMBA MAISHA:

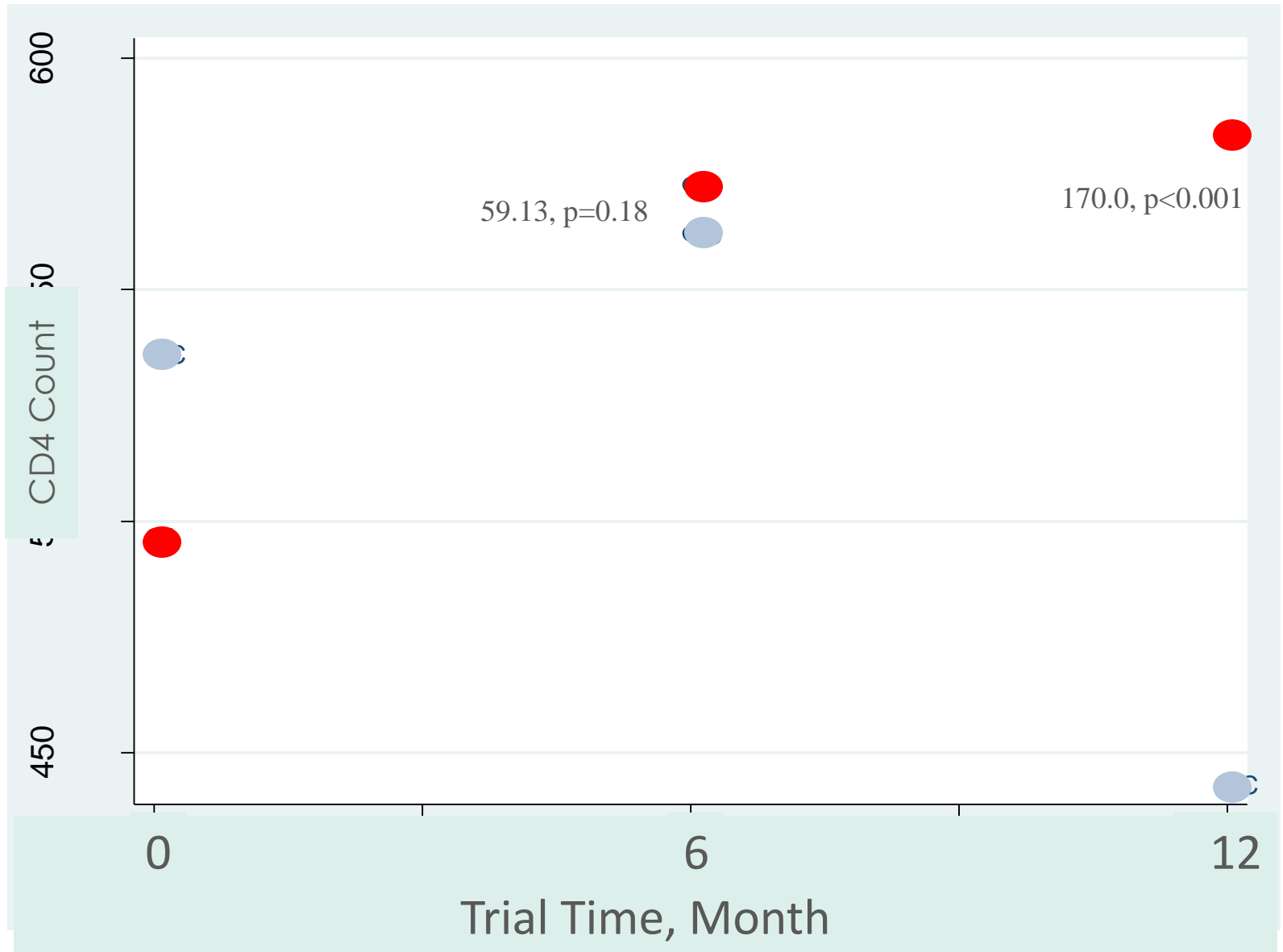
## REDUCED HOUSEHOLD FOOD INSECURITY



# SHAMBA MAISHA:

## INCREASED CD4 COUNT

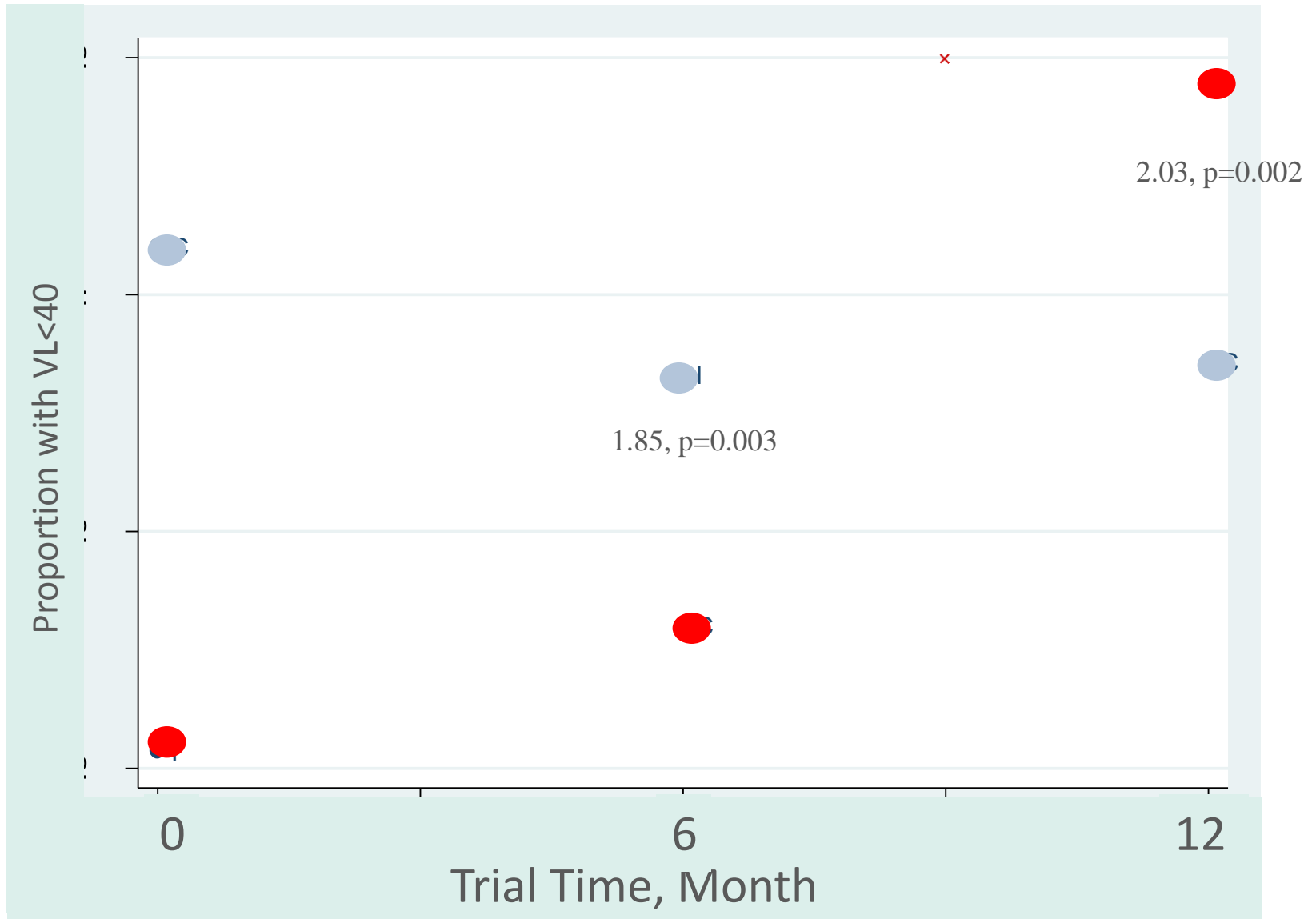
● Control ● Intervention



# SHAMBA MAISHA:

## INCREASED VIRAL SUPPRESSION (VL<40)

● Control ● Intervention



# SUMMARY

- **Food insecurity and HIV interact in vicious cycle**
  - Many points of intervention to interrupt cycle
  - Ensuring food security can **enable, multiply, and sustain benefits**
- **Upstream/midstream/downstream interventions:**
  - Food support needs to be linked to longer-term livelihood supports

# IMPLICATIONS

Addressing fundamental human rights, such as access to food, should be an integral component of HIV programs serving impoverished populations worldwide

# ACKNOWLEDGEMENTS

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## KEY COLLABORATORS:

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**San Francisco:** David Bangsberg, Margot Kushel, Edward Frongillo

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**Kenya:** Craig Cohen, Elizabeth Bukusi, Shari Dworkin, Lisa Butler, Rachel Steinfeld, Elly Weke, Kyle Pusateri

**Research Coordinator:** Manali Nekkanti