Food Security: Implications for HIV Treatment Outcomes and Adherence

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Overview

- Background:
  - Definitions and prevalence
  - Links with HIV/AIDS
  - Associations between food insecurity and risky sex
- Food insecurity and HIV treatment outcomes
  - Associations with VL suppression in San Francisco
  - Associations with mortality in British Columbia
- Food insecurity and ART adherence
  - Possible mechanisms and data from Mbarara, Uganda
  - Overview of research from other settings

Food Insecurity: Definition

- Limited or uncertain availability of nutritionally adequate, safe foods
- Components:
  - Insufficient quantity of foods (food insufficiency)
  - Insufficient quality and diversity of available foods
  - Feelings of deprivation or restricted choice
  - Inability to procure food in a socially acceptable manner
- Hunger and malnutrition are potential consequences

Food Insecurity: Prevalence

- Sub-Saharan Africa:
  - Chronic food insecurity affects 200 million individuals in sub-Saharan Africa and acute food insecurity affects additional 38 million*
- HIV-infected urban poor in resource-rich countries:
  - 48% of patients getting ARVs in Vancouver reported food insecurity**, 49% in San Francisco***

*National Agricultural Agricultural Advisory Services, Uganda, 2003
**Normen, J Nutrition, 2005
***Weiser, CROI, 2008

Food Insecurity: Links with HIV/AIDS

- HIV/AIDS adversely affects food security
- Food insecurity increases HIV transmission risk behaviors and susceptibility to HIV
- Food insecurity associated with worse health outcomes among PLWA, and can impact adherence to ART

Food Insecurity and HIV Transmission Risk

- Population based study in Botswana and Swaziland among 2,049 respondents*
- Among women, food insufficiency associated with:
  - Unprotected sex with non-monogamous partner (AOR=1.7, 95% CI=1.3-2.4)
  - Sex exchange (AOR=1.8, 95% CI=1.7-1.9)
  - Intergenerational sex (AOR-1.5, 95% CI=1.1-2.1)
  - Lack of control in sexual relationships (AOR=1.7, 95% CI=1.2-2.3)
- Associations much attenuated among men

* Weiser, PLoS Medicine, 2007

Food Insecurity and HIV Treatment Outcomes

Malnutrition and HIV Clinical Outcomes

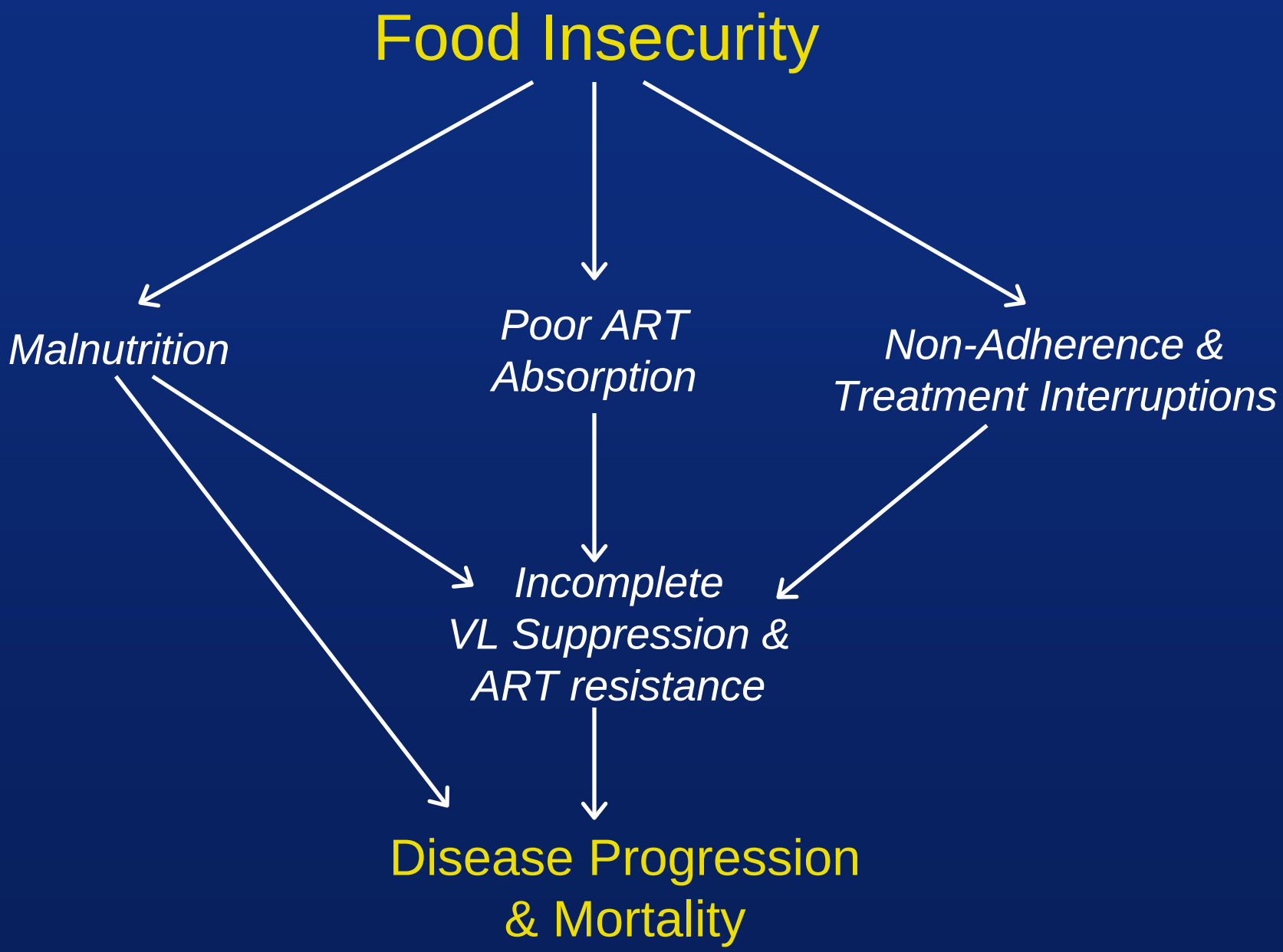
- Malnutrition hastens progression to AIDS and death in untreated individuals*
  - In resource-rich and resource limited settings, nutritional status (low BMI, weight loss and low albumin) predicts
    - opportunistic infections
    - immunologic decline
    - shorter survival time

*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

Malnutrition and HIV Clinical Outcomes, cont.

- Malnutrition also associated with poor clinical outcomes for individuals on HAART (but data less consistent)
  - Weight loss and low BMI independent predictors of mortality among ART-treated patients in Boston*
  - Low BMI and low hemoglobin independent predictors of early mortality on HAART in several studies in SSA**
  - Free fat mass, total body fat, BMI and albumin not associated with CD4 cell response, and only albumin associated with VL response among women initiating ART in Rwanda***

*Tang, JAIDS, 2002
**Zachariah, AIDS, 2007; Moore, CROI, 2007; May, CROI, 2008
***Anastos, CROI, 2008


Food Insecurity
Malnutrition
Poor ART Absorption
Non-Adherence & Treatment Interruptions
Incomplete VL Suppression & ART resistance
Disease Progression & Mortality

REACH Study

San Francisco

- REACH cohort: HIV-positive participants recruited from San Francisco homeless shelters, free-meal programs, and single room-occupancy hotels between July 1996 and October 2001
- Conducted cross-sectional study within REACH to assess following hypotheses
  - Whether food insecurity associated with incomplete HIV RNA suppression
  - Whether adherence to ARVs influences association between food insecurity and HIV RNA suppression

Weiser & Bangsberg, CROI, 2008

REACH: Methods

- Primary independent variable: Food insecurity measured by the Household Food Insecurity Access Scale (HFIAS)
- Primary outcome: VL suppression <50 copies/ml
- Adherence: monthly unannounced pill counts
- Multivariate logistic regression to assess associations between food insecurity and VL suppression

Weiser & Bangsberg, CROI, 2008

REACH: Participant Characteristics

Participant Characteristics (N=104)	n (%) or Mean (SD)
Food security	
Food secure	53 (51%)
Mildly or moderately food insecure	25 (24%)
Severely food insecure	26 (25%)
Education >=HS	69 (66%)
Male	66 (64%)
Recent street/shelter	3 (3%)
Nadir CD4	228 (202)
Pill count adherence >80%	58 (56%)
VL <50 copies/ml	58 (56%)

Weiser & Bangsberg, CROI, 2008

REACH: Factors Associated with VL Suppression <50 copies/ml*

	Models without Adherence AOR (95% CI)	Models with Adherence AOR (95% CI)
Severe food insecurity	0.28 (0.10-0.84)	0.33 (0.11-0.99)
Drug use past 30 days	0.69 (0.26-1.78)	1.17 (0.40-3.45)
Mono/dual NRTI use before HAART	0.15 (0.03-0.88)	0.21 (0.03-1.30)
Months on HAART prior to study	1.06 (1.04-1.39)	1.17 (1.02-1.35)
Nadir CD4 (per 50 cells)	1.20 (1.01-1.07)	1.03 (1.00-1.06)
Adherence >80%	---	4.70 (1.67-13.3)

*Model also controlled for age, race, gender, education, income, homelessness, depression, incarceration, problem drinking (Weiser & Bangsberg CROI, 2008)

HOMER Study

Vancouver, BC

- 1119 participants recruited from the British Columbia HIV/AIDS drug treatment program in 1998/1999 followed prospectively until June 2007
- Study hypotheses:
  - Food insecurity is a risk factor for mortality
  - Body mass index (BMI) modifies associations
- Primary outcome: non-accidental deaths
- Primary predictor: food insecurity as measured by Radimer/Cornell questionnaire
- Analysis: Cox proportional hazards

Weiser & Hogg, unpublished

HOMER: Results

- 48% of participants food insecure
- 14% categorized as underweight (BMI <18.5 kg)
- 13% died by non-accidental deaths by June 2007 (median follow-up 8.2 years)
- In adjusted models, food insecure individuals were over 1.5 times more likely to die than individuals who were not food insecure (95% CI=1.1-2.3)

HOMER: Factors associated with Non-Accidental Mortality*

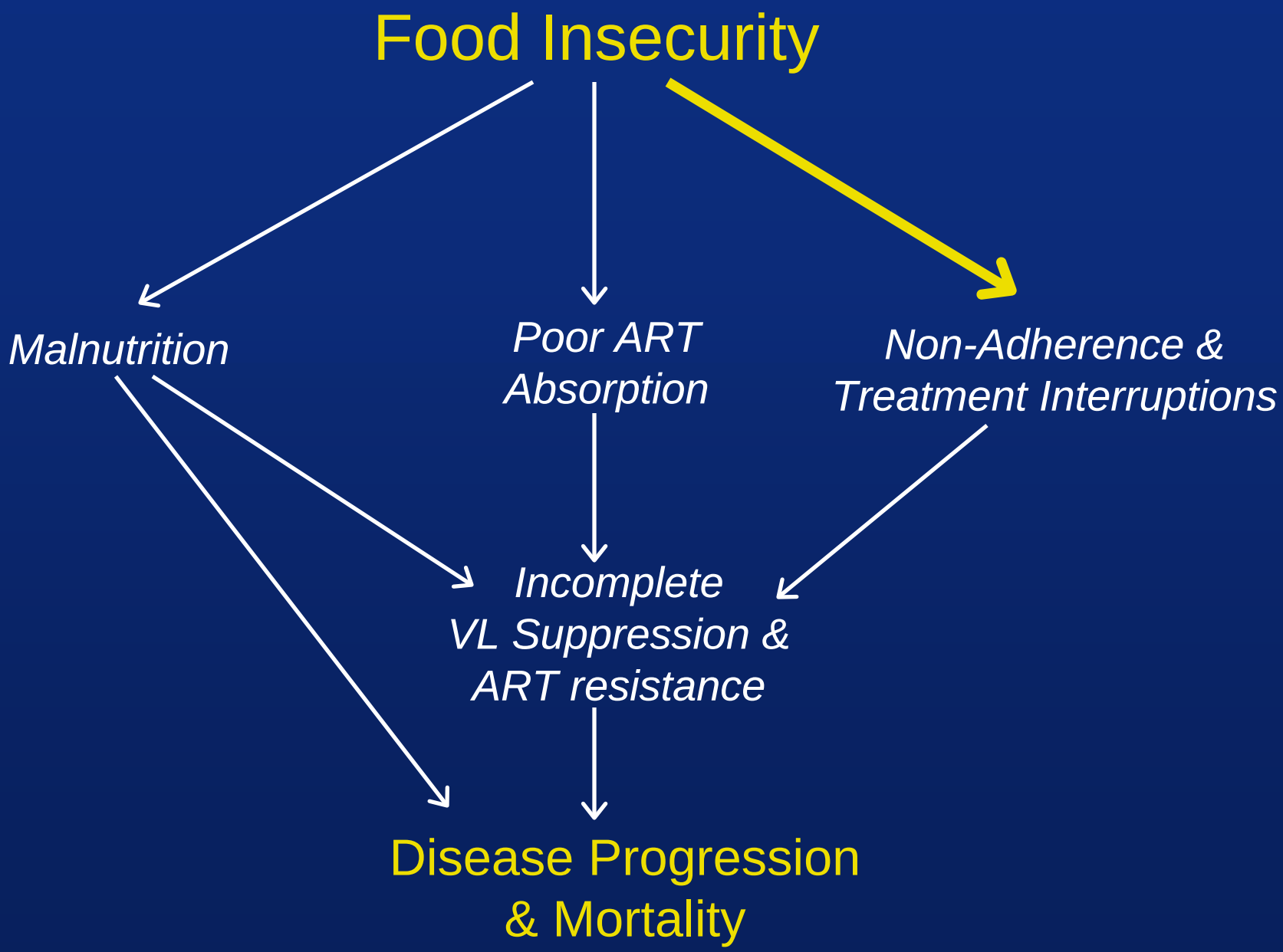
	HR (95% CI)	AHR (95% CI)
Age	1.04 (1.02-1.06)	1.05 (1.03-1.07)
Baseline CD4 (+100 cells)	0.79 (0.72-0.86)	0.80 (0.73-0.87)
History of IDU	3.44 (2.49-4.76)	3.30 (2.25-4.85)
Food secure and normal weight	1.0 (-)	1.0 (-)
Food secure and underweight	0.70 (0.28-1.76)	0.83 (0.33-2.11)
Food insecure and normal weight	1.93 (1.35-2.77)	1.40 (0.91-2.16)
Food insecure and underweight	2.81 (1.69-4.69)	1.90 (1.05-3.46)

*Model also controlled for adherence, socio-demographics, alcohol use

REACH & HOMER: Summary of Findings

- Half of urban poor HIV-infected individuals in North American settings are food insecure
- Food insecurity independently increases risk of incomplete VL suppression among HAART-treated individuals in San Francisco
- Food insecurity increases risk of mortality among HAART-treated individuals in drug treatment programs in BC

Food Insecurity and Adherence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Food Insecurity & Adherence: Overview

- Food insecurity cited in focus groups and key informant interviews as a barrier to ART adherence*
- Studies from TB literature show that food supplementation increases TB treatment adherence**
- Qualitative studies from SSA reported lack of food as key barrier to ART adherence***

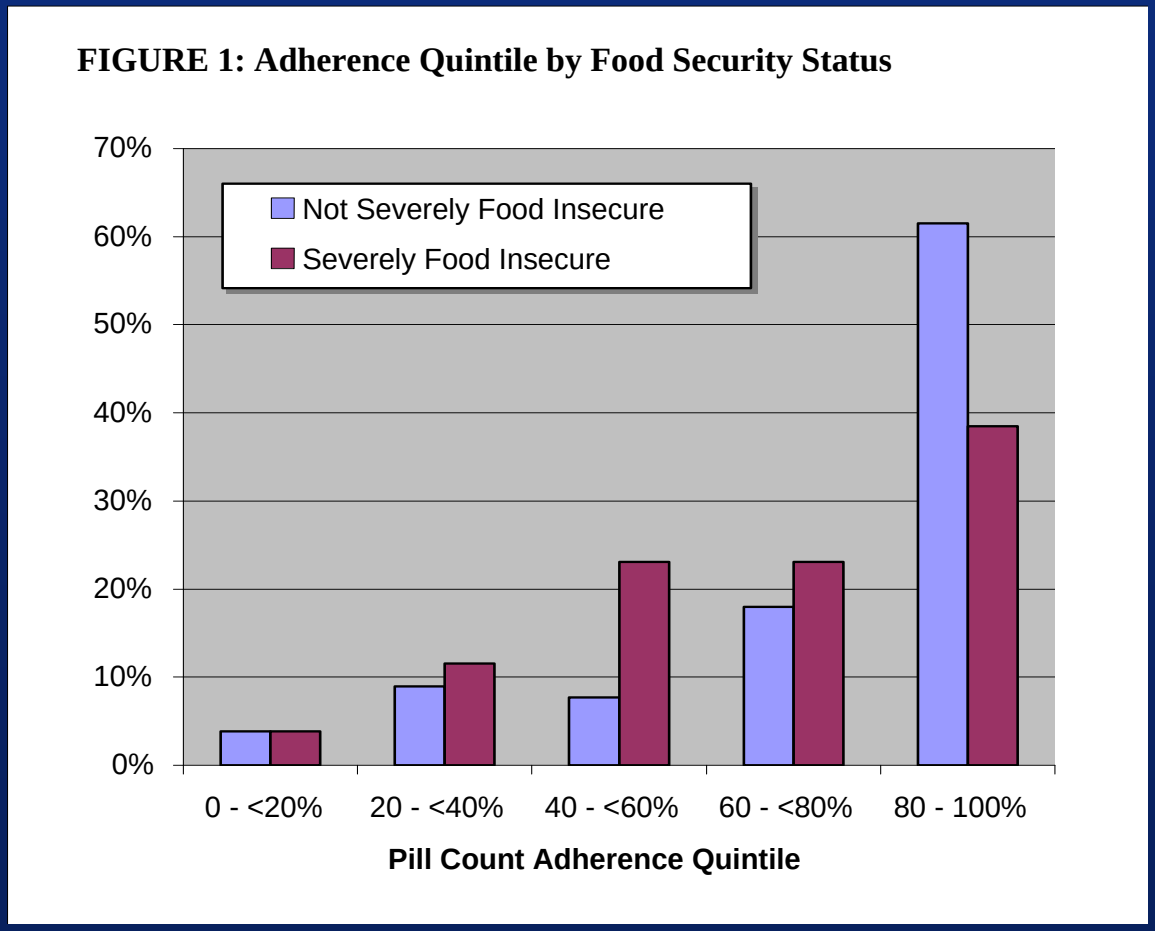
*Marston, NEJM, 2004; Agnarson, AIDS, 2007;
**Farmer, Semin Resp Infect, 1991
***Nachega, JAIDS, 2006; Au, AIDS, 2007; Hardon, AIDS Care, 2007

Food Insecurity & Adherence: Overview, cont.

- Among 4963 HIV-positive individuals in France, food privation was associated with:
  - increased odds of ART non-adherence among heterosexual men (AOR=2.4; 95% CI=1.5-3.7)
  - trend towards increased odds of ART non-adherence among heterosexual women (AOR=1.3; 95% CI=0.8-2.1)*

* Parreti-Watel, Soc Sci Med, 2005

Food Insecurity & Adherence in REACH Cohort, San Francisco



* Weiser & Bangsberg, CROI, 2008

Mbarara, Uganda: Qualitative Study

- Consecutive convenience sample of 48 patients from the ISS clinic in Mbarara, Uganda*
- Open-ended interviews exploring links between food insecurity and access to care/adherence

* Weiser, Tuller, Ware, Senkungu, Emenyonu, Bangsberg, Unpublished

Mbarara: Results

- Food insecurity is an important barrier to adherence:
  - *“In a week when I missed, that is when I have not gotten food to eat. Like sometimes you could have had a bad breakfast, you didn’t have any lunch, and supper is also not good, and so you really don’t feel like taking the medicine, so you don’t take it.”*
  - *“The most difficult or painful thing that I find about taking my medicine is when the time for taking medicine approaches and I don’t have something to eat. If I don’t have something to eat, then I don’t take my medicine until I have what to eat.”*

Mbarara: Hunger with ART

- ART increases appetite which is difficult in presence of food insecurity:
  - "*Sometimes when we swallow this medicine we get appetites and feel like eating all the time. So you eat and feel satisfied but in a few minutes you feel hungry and want to eat again...and yet you have nothing to eat.*"

Mbarara: Food Insecurity & ART Side Effects

- Food insecurity worsens ART side effects
  - *“Most of the time when I swallow the 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 pains in my stomach, like slashing pains in my stomach when I take medicine without food.”*
  - *“When I have to take my medication and I have not eaten, I get stomach aches and I feel like my heart has been misplaced—plucked out from it’s normal place—and then I get a runny stomach and I get diseases or infections that I didn’t have when I take it with food.”*

Mbarara: Food Insecurity & Competing Demands

- Competing demands between food expenses and medical expenses
  - *“What happens is that all the money you get you have to eat... By the time it comes to the clinic, you don’t have the money...so you can not afford to come.”*
  - *“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, and I find I am spending a lot on food, and it stresses me.”*

Mbarara: Other Mechanisms for Food Insecurity & Adherence

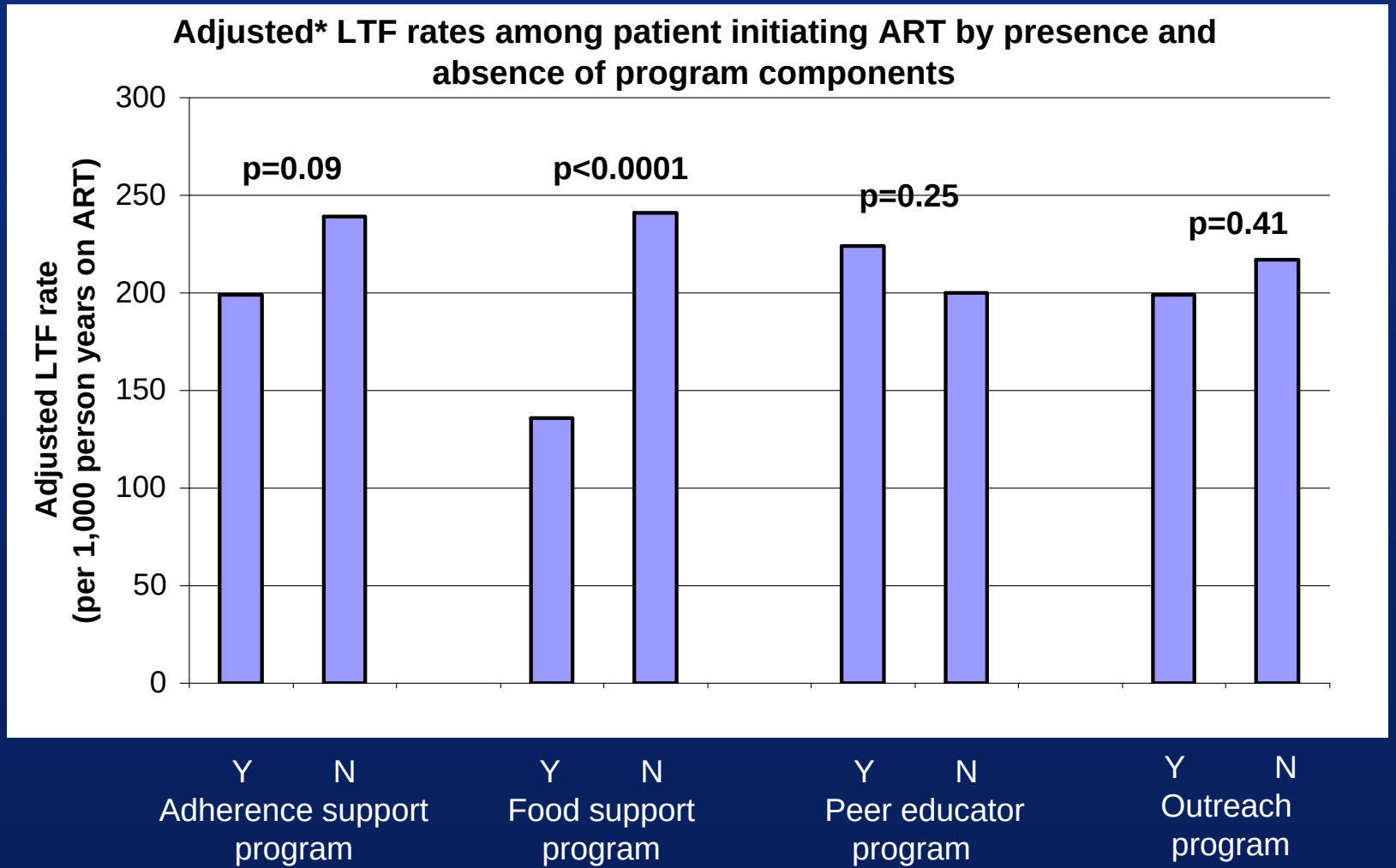
- Individuals not starting ART due to fears around increased food expenditures with ART
- Individuals busy in the fields working for food, leading to forgetting doses

Other Studies: Similar Mechanisms

- Intractable hunger with ART:
  - Reported also in qualitative studies from Tanzania, Botswana, Rwanda and Mozambique*
- Food insecurity and competing demands:
  - In Northern Tanzania, sacrificing healthcare to pay for food, education or housing was significantly associated with ART non-adherence**

*Hardon, AIDS Care, 2007; Au, AIDS, 2007; Kalofonos, PhD Thesis Defense, UC Berkeley, 2008
** Ramadhani, CROI, 2006

ART Programs in sub-Saharan Africa: Food Insecurity &Treatment Retention



•Adjusted for type of site, location, provider to patient ratio, year program began, and country (Nash, CROI, 2008)

Conclusions

- Food insecurity associated with worse HIV treatment outcomes
- Food insecurity important barrier to ART adherence
- Impact of food insecurity on HIV treatment outcomes not fully explained by poor adherence or low BMI

Implications

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

Unanswered Questions

- Impact of food insecurity on HIV outcomes in RLS
- Mechanisms: Adherence vs. nutrition vs. pharmacokinetics
- Food insecurity as proxy for poor SES, social support, mental illness or drug abuse
- Impact of sustained ART on family food security
- How to design sustainable and cost-effective interventions

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