



Food insecurity, sexual risk taking, and sexual victimization in Ghanaian adolescents and young South African adults

Rainier Masa^{1,2,3}  · Lauren Graham³ · Zoheb Khan³ · Gina Chowa^{1,2,3} · Leila Patel³

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Abstract

Objectives The objectives of this study were to examine whether food insecurity is associated with sexual risk taking and victimization in young people (aged 16–24); and to investigate whether the relationship of food insecurity with sexual risk taking and victimization is moderated by gender.

Methods Cross-sectional data were obtained in 2014 from a sample of Ghanaian adolescents ($n = 773$) and in 2015 from young South African adults ($n = 823$). We used multilevel logistic regression given the study's binary outcome and clustered data. We tested a moderation effect of gender by including an interaction between gender and food insecurity.

Results Food insecurity was highly prevalent (72% in Ghana and 83% in South Africa). Food insecurity was significantly associated with unwanted sexual contact among Ghanaian adolescents (OR 1.05, 95% CI 1.02, 1.08) and age-disparate sex among young South African adults (OR 1.03, 95% CI 1.00, 1.06). Results indicated no moderating effect of gender.

Conclusions Our findings underscore the importance of food access on young people's sexual health, regardless of gender. Prevention efforts may be more relevant when integrated with food security interventions that target vulnerable adolescents and young adults, irrespective of gender.

Keywords Adolescents · Young adults · Food insecurity · Sexual risk taking · Sexual victimization · Moderation effect

Introduction

Food insecurity, defined as lack of access to adequate food at all times (Food and Agriculture Organization 1996), remains a global challenge with considerable public health consequences. In sub-Saharan Africa (SSA), food insecurity disproportionately affects young people, or those 15 to 24 years old (Amarnani et al. 2017). Irregular income, unemployment, minimal assets, and limited access to food

safety nets predict food insecurity in young people (Bruning et al. 2017). Further, the wide-ranging consequences of food insecurity on health of adolescents and young adults underscore the magnitude of the problem. Research shows adverse effects of food insecurity on young people's nutrition and physiological health (Cordeiro et al. 2012; Belachew et al. 2013), mental health (Pryor et al. 2016; Jebena et al. 2017), substance use (Baer et al. 2015; Pryor et al. 2016), and medication adherence (Singer et al. 2015). However, there is paucity of evidence pertaining to the relationship of food insecurity and sexual risk taking and victimization among adolescents and young adults. More is known about older adults where studies have shown that food insecurity heightens susceptibility to sexual risk taking among older, food-insecure adults, particularly women (Weiser et al. 2007; Miller et al. 2011; Fielding-Miller et al. 2014).

Research on transactional sex and age-disparate provides a conceptual underpinning as to why food insecurity may lead to sexual risk taking and sexual victimization, particularly among young women (Toska et al. 2015; Stoebenau et al. 2016). In many cases, young women

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✉ Rainier Masa
rmasa@email.unc.edu

¹ School of Social Work, University of North Carolina at Chapel Hill, 325 Pittsboro Street, CB #3550, Chapel Hill, NC 27599, USA

² Global Social Development Innovations, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

³ Centre for Social Development in Africa, University of Johannesburg, Auckland Park, South Africa

engage in transactional or age-disparate sex to obtain financial support and stable access to resources such as food (Underwood et al. 2011; Zembe et al. 2013; Toska et al. 2015). In other words, food insecurity can be a pathway that explains poor health outcomes in young people through heightened susceptibility to sexual risk taking and sexual victimization (Stoebenau et al. 2016; Toska et al. 2017). Further, transactional and age-disparate sex remain risk factors that heighten the susceptibility of young people, particularly adolescent girls and young women, to sexually transmitted infections such as HIV and intimate partner violence (Kalichman and Simbayi 2004; Evan et al. 2016; Nydegger et al. 2017; Schaefer et al. 2017). The increased risk is attributed to behavioral factors such as low condom use and multiple concurrent partnerships, defined as having two or more sexual partners overlapping in time, that regularly occur in transactional and age-disparate sex (Luke 2005; Beauclair et al. 2012).

High incidence of sexual violence and high prevalence of HIV and other sexually transmitted infections among young people, particularly in adolescent girls and young women in SSA (United Nations 2015; UNAIDS 2017) underscore the importance of examining whether there is a relationship between food insecurity and sexual risk taking. Further, persistent gender inequalities and their adverse consequences on social, economic, and health outcomes for all women draw attention to the potential role of food insecurity on women's sexual health, particularly engagement in risky sexual behaviors to obtain food (Weiser et al. 2007; Fielding-Miller et al. 2014).

However, there is limited evidence that suggests a moderating effect of gender on the association between food insecurity and sexual risk taking. Current research may imply that food insecurity is associated predominantly with sexual risk taking among adults, particularly women. This interpretation may lead to food security programming that unintentionally ignores the conditions of young people, including adolescent boys and young adult men. It is plausible that gender moderates the relationship of food insecurity with sexual risk taking and victimization. However, empirical evidence that substantiates or contradicts a moderation effect of gender remains limited. Further, generalizing current findings from research with adults to young people appears problematic as these populations represent different life course stages with divergent roles, responsibilities, and expectations. Given critical evidence gaps and their implications for health promotion and disease prevention, this study examined the association of food insecurity with sexual risk taking and victimization in a sample of adolescent Ghanaians and young South African adults. We also investigated whether gender moderated the relationship between food insecurity and sexual risk taking and victimization.

Methods

Study design and sample

This study used a cross-sectional design. We analyzed a subset of the baseline data from an employability project in South Africa and follow-up data from a financial inclusion project in Ghana. The main intervention studies' research designs are described in (Chowa et al. 2015) and (Graham et al. 2016). Study protocol was approved by the Institutional Review Boards at the University of Ghana, University of Johannesburg, and University of North Carolina at Chapel Hill. In both study countries, research staff met with prospective participants (and their caregivers, if participant was a minor) to explain the project. For non-English speaking persons, the information sheet and consent form were translated in local languages. Recruitment was conducted at schools (Ghana) and at employment training sites (South Africa). Informed consent (and assent for those under 18 years old at the time of data collection) was obtained from all individual participants included in the study. For Ghanaian participants who were below 18 years old at the time of data collection, we first obtained consent from an adult caregiver. After receiving an adult informed consent, we obtained the assent of the adolescent participant. All South African participants were 18 years old and above at the time of data collection.

Baseline sample in the South Africa project included 1993 youth. Follow-up sample in the Ghana project included 4289 youth. We limited our study sample to adolescents and young adults between the ages of 15 to 24 and those who reported having had sex, which resulted in a final study sample of 888 Ghanaian and 1173 South African youth. Missing data on study variables reduced our final sample size to 773 Ghanaian and 823 South African youth. Results of cluster adjusted bivariable tests indicated no significant differences on outcome (i.e., sexual risk taking and sexual victimization) and food insecurity variables between the final study sample and the excluded observations due to missing data.

Study setting

Ghana The original study was conducted in eight of 10 administrative regions in Ghana. These eight regions account for more than 90% of the country's population (Ghana Statistical Service 2014). Fifty-four districts from the eight regions were included in the study. These regions and districts were selected based on the coverage of the financial service provider in the main study. Additionally, 100 public schools were randomly selected from an eligible pool of 581 junior high schools. At each school, between

61 and 63 youth were randomly selected to be part of the study.

South Africa The study was conducted in all nine provinces of South Africa. Forty-six training sites located across the country were included in the study. These 46 sites represented eight different youth employment organizations and, at the time of the data collection, their existing training sites. Each site's enrollment list was used to randomly select youth from each site. The average number of youth per site was 43.

Data collection and sources

Data were collected using interviewer-administered questionnaires in 2014 (Ghana) and 2015 (South Africa). The survey questionnaires in both countries included information on demographic, educational, and health characteristics of Ghanaian adolescents and young South African adults. Household socioeconomic variables, including food insecurity, were also included in the questionnaires.

Variables and measures

Dependent variables The dependent variables were sexual risk taking and victimization. In the Ghana data, sexual risk taking included: (a) transactional sex, (i.e., ever had sex for money or other resources); and (b) condom use at last sexual intercourse. Sexual victimization, defined as unwanted sexual contact (i.e., ever had sex against will) was another outcome variable measured in the Ghana study. In the South Africa data, sexual risk-taking outcomes included: (a) age-disparate sex, (i.e., ever had sex with someone five or more years older); (b) condom use at last sexual intercourse; (c) sex under the influence, (i.e., ever had sex while under the influence of drugs or alcohol); and (d) transactional sex, (i.e., ever had sex for money, shelter, food, gifts, or other resources). All dependent variables were dichotomous (yes/no) with no as the reference value. Our indicators of sexual risk taking and victimization are consistent with research on adolescent sexual health in SSA (Underwood et al. 2011; Toska et al. 2015, 2017; Evan et al. 2016).

Independent variable The independent variable, food insecurity, was measured using an adaptation of the Household Food Insecurity Access Scale (HFIAS) (Coates et al. 2007). HFIAS had been validated with various populations in SSA (Frongillo and Nanama 2006; Knueppel et al. 2010). HFIAS consists of nine items that ask respondents the frequency of experiencing different conditions and degrees of food insecurity within the past 30 days. A continuous HFIAS score was calculated by summing the score for all nine items. A higher HFIAS score indicates poor access to food and greater household

food insecurity. Additionally, for descriptive purposes we created a categorical measure of the different degrees of food insecurity based on the recommendations of the scale developers (Coates et al. 2007). This definition classified households as food secure, and mild, moderately, and severely food insecure.

Covariates In the Ghanaian models, covariates included gender (male or female), age (in years), parent-adolescent relationship, future orientation, motivations to engage in sex, and sense of belonging with peers. Parent-adolescent relationship was measured using two indicators: parental connection and parental monitoring (Skinner et al. 2005). Parental connection (PC) referred to the frequency of interaction that focused on expression of love, affection, and care within a 30-day period, whereas parental monitoring (PM) described how often parents check adolescents' activities within a 30-day period. PC was measured using four items from the Global School-based Student Health Survey, and PM was assessed using three items from the same survey (World Health Organization and US Centers for Disease Control and Prevention n.d.). Higher PC scores indicate a warm and affectionate relationship. Higher PM scores indicate more frequent parental supervision. Future orientation was measured using an adaptation of the School Success Profile (SSP) survey (Bowen et al. 2005). Youth were asked about their attitudes toward the future, including image of future selves, confidence about their future, and aspirations and expectations in life. We measured future orientation using two indicators: orientation toward success and uncertainty of the future. Orientation toward success was assessed using six items from the SSP survey, whereas uncertainty of the future was assessed using five items from the same survey. Higher orientation toward success scores and lower uncertainty of the future scores indicate positive future orientation. Motivations to engage in sex referred to beliefs about the reasons for having sex, while sense of belonging pertained to beliefs about peer influence and group membership. Motivations to engage in sex and sense of belonging were measured using three and four items, respectively, that were adapted from prior surveys about adolescent sexual attitudes and behaviors (Carvajal et al. 1999; Gillmore et al. 2002). Higher motivation scores indicate greater agreement that having sex will make a person feel good, loved, and popular. Higher belonging scores indicate greater agreement that young people are happier if they are part of the crowd and not considered an outsider.

In the South African models, covariates included gender (male or female), age (in years), ever attended a skills development program prior to joining the current study (yes or no), caregiver for any children (yes or no), marital status (married/partnered or not in a relationship), self-efficacy, and material hardship. Self-efficacy, defined as

beliefs about one's overall ability to perform across various circumstances (Judge et al. 1998) was measured using an 8-item self-efficacy scale (Chen et al. 2001). Higher scores indicate higher levels of general self-efficacy. Material hardship was measured by asking respondents how often, over the past year, they or their households had gone without enough: food to eat, clean water for home use, needed medical treatment; fuel to cook food; and cash income. Higher scores indicate greater inability to meet household needs.

Analysis We used multilevel logistic regression (MLR) to analyze our data because of the study's dichotomous outcome variables and clustered data, (i.e., adolescents within schools [Ghana] or young adults within training sites [South Africa]) (Snijders and Bosker 2012). We conducted moderation tests by adding a 2-way interaction between gender and food insecurity. Our analysis used a two-level model (i.e., youth as level 1 and schools or training sites as level 2) and a random-intercept logistic regression (for dichotomous responses) with covariates. We included predictors into the level-1 model, specified level-1 intercept as random at level 2 (with level 1 predictors having fixed effects at level 2), and posed unconditional models at level 2.

We estimated seven multivariable MLR models that examined the direct relationship of a continuous measure of food insecurity with sexual risk taking and victimization. The first three models using the Ghana data examined the association of food insecurity with transactional sex, unwanted sexual contact, and condom use. The next four models using the South Africa data explored the relationship of food insecurity with transactional sex, condom use, age-disparate sex, and sex under the influence of alcohol or drugs. Additionally, we re-estimated the seven MLR models with the interaction term. These moderation models estimated both the main effects and the moderation effect of gender on the relationship between food insecurity and sexual risk taking and victimization. Significance level was set at $P \leq 0.05$, two-tailed test. All analyses were conducted using Stata 15 (Stata 2017).

Results

Sample characteristics

Table 1 lists the sample characteristics. Food insecurity was highly prevalent among Ghanaian and South African youth. The prevalence of food insecurity was higher among young South African adults (83%) compared to Ghanaian adolescents (72%). The proportion of severely food-insecure youth was also higher in South Africa (49%) than Ghana (41%). In Ghana, adolescent girls were slightly

more food insecure than adolescent boys. In contrast, young South African women were slightly less food insecure than their male peers. The prevalence of sexual risk-taking behaviors and sexual victimization varied between and within countries. For example, a higher proportion of young South African adults reported that they or their partners used condoms at last sexual intercourse than Ghanaian adolescents. In South Africa, condom use was higher among young men compared to young women. In contrast, condom use was higher among adolescent girls than adolescent boys in Ghana. Seven percent of Ghanaian adolescents and 3% of young South African adults reported engaging in transactional sex. In contrast, a higher proportion of the sample reported experiencing unwanted sexual contact (Ghana), having had age-disparate sex (South Africa), and engaging in sex while under the influence of drugs or alcohol (South Africa). In general, a higher proportion of young women reported engaging in a risky sexual behavior and experiencing an unwanted sexual contact compared to young men.

Relationship between food insecurity and sexual risk taking

Table 2 lists the bivariable and multivariable results of the relationship between food insecurity and sexual risk taking and victimization.

Ghanaian adolescents Our findings showed that food insecurity was not significantly associated with transactional sex and condom use. Other covariates showed statistical significance. Age was associated with higher probability of condom use at last sexual intercourse (OR 1.13, $P = 0.00$). Greater uncertainty of the future was associated with higher likelihood of engaging in transactional sex (OR 1.03, $P = 0.05$) and lower likelihood of experiencing unwanted sexual contact (OR 0.97, $P = 0.04$).

Young South African adults Food insecurity was not significantly associated with transactional sex, condom use at last sexual intercourse, and sex while under the influence of drugs or alcohol. In contrast, food insecurity was significantly associated with age-disparate sex (OR 1.03, $P = 0.05$). For every unit increase in food insecurity, the likelihood of age-disparate sex increased by 3%. Additionally, compared to young men, young women in our sample were significantly less likely to ever had sex under the influence of alcohol or drugs (OR 0.37, $P < 0.001$). Other covariates showed statistical significance. Age was associated with lower likelihood of condom use (OR 0.89, $P = 0.02$) and higher probability of age-disparate sex (OR 1.13, $P = 0.01$). Being in a relationship (either married or partnered) was associated with lower likelihood of condom use at last sexual intercourse (OR 0.51, $P < 0.001$) and higher probability of age-disparate sex (OR 1.13, $P = 0.01$).

Table 1 Sample characteristics by country and gender (Ghana 2014 and South Africa 2015)

	Ghana			South Africa		
	Overall (<i>N</i> = 773)	Male (<i>n</i> = 354) (46%)	Female (<i>n</i> = 419) (54%)	Overall (<i>N</i> = 823)	Male (<i>n</i> = 329) (40%)	Female (<i>n</i> = 494) (60%)
Food insecurity [mean (SD)]	6.11 (6.17)	6.09 (6.31)	6.14 (6.05)	7.02 (6.55)	7.10 (6.56)	6.97 (6.55)
Prevalence of food insecurity (%)						
Food secure	28%	29%	27%	17%	17%	16%
Mildly food insecure	7%	6%	8%	15%	14%	17%
Moderately food insecure	24%	24%	24%	19%	16%	21%
Severely food insecure	41%	41%	41%	49%	53%	46%
Transactional sex (%)	7%	7%	7%	3%	3%	3%
Unwanted sexual contact (%)	20%	14%	26%			
Condom use at last sexual intercourse (%)	33%	31%	34%	78%	81%	76%
Age-disparate sex (%)				33%	32%	33%
Sex under the influence of drugs or alcohol (%)				19%	26%	13%
Age (in years) [mean (SD)]	17.46 (1.95)	17.47 (2.10)	17.45 (1.83)	22.09 (1.70)	22.09 (1.70)	22.08 (1.70)
Parental connection [mean (SD)]	13.75 (3.86)	14.06 (3.60)	13.48 (4.05)			
Parental monitoring [mean (SD)]	8.47 (3.61)	9.03 (3.57)	7.99 (3.59)			
Motivations to engage in sex [mean (SD)]	7.35 (3.59)	7.67 (3.72)	7.08 (3.45)			
Sense of belong with peers [mean (SD)]	9.66 (3.16)	9.63 (3.10)	9.68 (3.21)			
Orientation toward success [mean (SD)]	51.50 (7.10)	51.95 (6.40)	51.11 (7.62)			
Uncertainty of the future [mean (SD)]	10.07 (8.94)	9.63 (8.48)	10.45 (9.30)			
In a relationship (%)				20%	13%	25%
Caregiver for a child (%)				32%	21%	40%
Ever attended a skills training program (%)				53%	54%	53%
General self-efficacy [mean (SD)]				33.99 (4.10)	34.38 (4.07)	33.72 (4.10)
Material hardship [mean (SD)]				9.93 (3.98)	10.11 (4.05)	9.81 (3.92)

SD standard deviation

Greater material hardship was associated with lower likelihood of engaging in age-disparate sex (OR 0.95, $P = 0.04$).

Relationship between food insecurity and sexual victimization

Ghanaian adolescents Results showed that food insecurity was significantly associated with unwanted sexual contact (OR 1.05, $P = 0.002$). For every unit increase in food insecurity, the likelihood of having had an unwanted sexual contact increased by 5%. Additionally, compared to adolescent boys, adolescent girls were more likely to report having experienced an unwanted sexual contact (OR 2.12,

$P = 0.001$). Higher uncertainty of the future was associated with lower likelihood of having experienced an unwanted sexual contact (OR 0.97, $P = 0.04$).

Moderation effect of gender

Table 3 displays the results of the moderation tests. Two-way interaction results indicated that gender did not significantly moderate the relationship of food insecurity with sexual risk taking and victimization. In Ghana, the association of food insecurity with transactional sex, condom use, and unwanted sexual contact did not significantly differ by gender. Similarly, in our sample of young South

Table 2 Associations of food insecurity and covariates with sexual risk taking and victimization (Ghana 2014 and South Africa 2015)

	Ghana (<i>N</i> = 773)						South Africa (<i>N</i> = 823)							
	Transactional sex		Unwanted sexual contact		Condom use at last sexual intercourse		Transactional sex		Condom use at last sexual intercourse		Age-disparate sex		Sex under the influence	
	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>
Bivariable														
Food insecurity	1.00 (0.95, 1.04)	0.87	1.04 (1.01, 1.07)	0.00	1.00 (0.97, 1.02)	0.85	1.04 (0.98, 1.09)	0.18	0.99 (0.97, 1.01)	0.45	1.02 (0.99, 1.04)	0.18	1.00 (0.97, 1.03)	0.87
Multivariable														
Food insecurity	0.99 (0.94, 1.03)	0.61	1.05 (1.02, 1.08)	0.00	1.00 (0.97, 1.03)	0.86	1.05 (0.98, 1.12)	0.14	0.98 (0.95, 1.01)	0.27	1.03 (1.00, 1.06)	0.05	0.99 (0.96, 1.03)	0.74
Gender (0 = male, 1 = female)	1.15 (0.65, 2.02)	0.63	2.12 (1.43, 3.15)	0.00	1.12 (0.80, 1.56)	0.50	0.96 (0.42, 2.18)	0.92	0.87 (0.61, 1.25)	0.49	0.94 (0.69, 1.28)	0.69	0.37 (0.25, 0.55)	0.00
Age	0.99 (0.85, 1.15)	0.91	1.02 (0.92, 1.13)	0.71	1.13 (1.04, 1.24)	0.00	1.14 (0.90, 1.45)	0.29	0.89 (0.80, 0.99)	0.02	1.13 (1.03, 1.23)	0.01	1.12 (0.99, .126)	0.06
Parental connection	0.97 (0.89, 1.05)	0.42	0.97 (0.91, 1.02)	0.23	1.05 (1.00, 1.10)	0.08								
Parental monitoring	1.01 (0.92, 1.12)	0.81	0.95 (0.89, 1.01)	0.12	0.96 (0.91, 1.01)	0.13								
Motivations to engage in sex	1.06 (0.98, 1.15)	0.13	1.01 (0.96, 1.07)	0.69	1.00 (0.95, 1.05)	0.99								
Sense of belonging with peers	0.97 (0.88, 1.06)	0.45	1.04 (0.98, 1.11)	0.22	1.05 (1.00, 1.11)	0.07								
Orientation toward success	1.02 (0.97, 1.06)	0.46	0.99 (0.96, 1.02)	0.58	0.98 (0.96, 1.01)	0.16								
Uncertainty of the future	1.03 (1.00, 1.07)	0.05	0.97 (0.95, 1.00)	0.04	0.99 (0.97, 1.01)	0.20								
In a relationship (0 = no, 1 = yes)							2.14 (0.91, 5.00)	0.08	0.51 (0.34, 0.75)	0.00	1.56 (1.09, 2.24)	0.01	1.50 (0.95, 2.37)	0.08
Caregiver for a child (0 = no, 1 = yes)							0.66 (0.27, 1.61)	0.46	0.96 (0.66, 1.38)	0.81	1.24 (0.89, 1.72)	0.20	0.90 (0.59, 1.38)	0.63
Ever attended a skills training program (0 = no, 1 = yes)							1.31 (0.60, 2.89)	0.50	0.97 (0.69, 1.36)	0.84	0.85 (0.63, 1.14)	0.29	0.73 (0.49, 1.07)	0.10
General self-efficacy							1.02 (0.93, 1.12)	0.68	1.04 (0.99, 1.08)	0.09	1.01 (0.98, 1.05)	0.54	0.97 (0.93, 1.02)	0.25

Table 2 (continued)

	Ghana (<i>N</i> = 773)						South Africa (<i>N</i> = 823)							
	Transactional sex		Unwanted sexual contact		Condom use at last sexual intercourse		Transactional sex		Condom use at last sexual intercourse		Age-disparate sex		Sex under the influence	
	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>	OR (95% CI)	<i>P</i>
Material hardship							0.96 (0.85, 1.09)	0.54	1.02 (0.97, 1.08)	0.37	0.95 (0.91, 0.99)	0.04	1.00 (0.95, 1.07)	0.82

Results were based on two-tailed tests and multilevel logistic regression models that adjusted for the clustering of young people within schools (in Ghana) and training sites (in South Africa)

OR odds ratio, *CI* confidence interval

African adults, the association of food insecurity with sexual risk taking did not significantly differ by gender.

Discussion

Our findings indicate that food insecurity, or inadequate food access, is associated with heightened risk of experiencing unwanted sexual contact among Ghanaian adolescents and higher likelihood of engaging in age-disparate sex among young South African adults. These associations describe how food insecurity may heighten risk of poor sexual health among young people. Unwanted sexual contacts and age-disparate sex are associated with various adverse health consequences (Chung and English 2015; Toska et al. 2015), including elevated risk of intimate partner violence (IPV) and HIV infection (Evan et al. 2016; Nydegger et al. 2017; Schaefer et al. 2017). In addition to behavioral factors such as low condom use and multiple concurrent partnerships, the increased risk of IPV and HIV infection results from limited agency and inability to negotiate sexual practices, which are influenced by inadequate food access and reliance on sexual partners for food and other resources (Miller et al. 2011; Lentz 2018). In SSA, studies have shown that inadequate food access compel individuals, particularly women, to engage in transactional or age-disparate sex to obtain food or resources to purchase food (Weiser et al. 2007; Miller et al. 2011). These descriptions may also explain the association of food insecurity with unwanted sexual contact and age-disparate sex among youth. Further, young people may engage in age-disparate sex and experience unwanted sexual contact to manage physical and emotional consequences of not having enough food to eat. Food insecurity

may compel young people to prioritize the now (i.e., having access to food) and lose sight of the future. Food insecurity may also negatively influence the ability of young people to think about longer-term consequences of risky behaviors. As young people remain without adequate access to food, they may become less concerned about the future and more worried about satisfying their basic needs.

Our findings also suggest that gender does not significantly moderate the relationship of food insecurity with sexual risk taking and victimization. These findings contradict results of other studies that have shown a gender element in the association of food insecurity with sexual risk taking and victimization. Several factors may explain these inconsistent results. First, research has focused mostly on the association between food insecurity and sexual behaviors among women (Toska et al. 2017), which includes studies with women-only sample (e.g., Miller et al. 2011; Fielding-Miller et al. 2014). Second, the few research studies that included men and women have focused primarily on older adults (Weiser et al. 2011; Wang et al. 2013; Eaton et al. 2014). Third, these studies have not investigated the moderation effect of gender (e.g., Wang et al. 2013). Nonetheless, the interplay of gender inequality and food access may heighten sexual risk taking and victimization among women than men. For example, traditional norms often assign women with subordinate roles to men. These subordinate roles are illustrated by limited bargaining power and lack of control over food, income, and assets, which contribute to food insecurity and sexual risk taking to procure food (Hyder et al. 2005; Weiser et al. 2007; McCoy et al. 2013) and exacerbate gender-based socioeconomic disparities (Kamndaya et al. 2015).

Table 3 Moderation effect of gender on the relationship between food insecurity and sexual risk taking and victimization (Ghana 2014 and South Africa 2015)

	Ghana (N = 773)						South Africa (N = 823)							
	Transactional sex		Unwanted sexual contact		Condom use at last sexual intercourse		Transactional sex		Condom use at last sexual intercourse		Age-disparate sex		Sex under the influence	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Food insecurity	0.94 (0.87, 1.02)	0.12	1.03 (0.98, 1.08)	0.22	1.01 (0.97, 1.05)	0.55	0.98 (0.88, 1.09)	0.70	0.96 (0.92, 1.00)	0.07	1.03 (0.99, 1.07)	0.16	0.99 (0.95, 1.04)	0.70
Gender (0 = male, 1 = female)	0.71 (0.33, 1.54)	0.39	1.75 (1.00, 3.08)	0.05	1.32 (0.84, 2.07)	0.23	0.43 (0.13, 1.44)	0.17	0.66 (0.38, 1.12)	0.12	0.95 (0.61, 1.50)	0.83	0.36 (0.20, 0.63)	0.00
2-way interaction														
Female x Food insecurity	1.09 (0.99, 1.20)	0.09	1.03 (0.97, 1.09)	0.36	0.97 (0.92, 1.02)	0.31	1.10 (0.98, 1.25)	0.10	1.04 (0.99, 1.09)	0.16	1.00 (0.95, 1.04)	0.93	1.00 (0.95, 1.06)	0.84

Results were based on two-tailed tests and multilevel logistic regression models that adjusted for the clustering of young people within schools (in Ghana) and training sites (in South Africa). The Ghanaian models are adjusted for parental connection, parental monitoring, motivations to engage in sex, sense of belonging with peers, orientation toward success, and uncertainty of the future. The South African models are adjusted for relationship status, caregiver status, prior skills training program participation, general self-efficacy, and material hardship

OR odds ratio, CI confidence interval

Several factors may also explain young people's higher risk for age-disparate sex and unwanted sexual contacts, under conditions of food insecurity. First, young people tend to have less skills and workplace experience, which restricts their employment opportunities. For many young people who work, their incomes are insufficient to meet their daily needs such as food (International Labor Organization 2016). In turn, lack of employable skills, limited employment, and inadequate income may compel young people to engage in risk taking such as age-disparate sexual relationships or to experience unwanted sexual contacts as strategies to obtain food or money to buy food. Second, adolescence and young adulthood demand different social roles and responsibilities, which may affect their competence in identifying and judging risks (Millstein and Halpern-Flesher 2001). For example, young people may not view their behaviors as extremely risky or unsafe, particularly if such behaviors occur periodically (Cohn et al. 1995; Millstein and Halpern-Flesher 2001). Third, exclusion of young people in decision-making, particularly on issues that directly affect them such as access to health services and economic opportunities, may weaken their agency and confidence in their ability to communicate or to negotiate. In contrast, young people's participation in decision-making can be a tool for health promotion (Wong et al. 2010). In sum, the combined weight of limited economic opportunities, perceived risk and vulnerability, and exclusion in decision-making may drive young people to engage in age-disparate sex and to experience unwanted sexual contacts.

Our findings have implications. First, the high prevalence of food insecurity and its association with age-disparate sex and unwanted sexual contact require a programmatic response to reduce food insecurity among young people. Findings also underscore the potential value of food security interventions as health promotion and prevention strategies for young people. Food security programming should target young people, irrespective of gender. Our findings indicate that, under conditions of food insecurity, young women and men are susceptible to risky behaviors. A gender-neutral approach to food security programming may be more appropriate to improve food access and to reduce sexual risk taking and victimization among young people.

Second, underlying factors that drive food-insecure young people to engage in risky sexual behaviors and to experience sexual victimization need to be addressed. One salient factor is limited economic opportunities for young people. Employability and entrepreneurial programs must attract and retain more young people so that they can acquire skills needed to sustain a livelihood. Multifaceted economic-strengthening interventions, or those that promote livelihood development, have been shown to increase

food access (Banerjee et al. 2015; Masa et al. 2018) and reduce harmful sexual behaviors (Minnis et al. 2014; Zakaras et al. 2017).

Third, our findings are consistent with evidence that adolescent girls, in general, are at a higher risk of engaging in sexual risk taking and victimization. Health promotion strategies for adolescent girls should address other risk factors, in addition to food insecurity. In a separate subgroup analysis, we found that parental connection and motivations to engage in sex were significant and distinct predictors of young women's sexual risk taking and victimization. In sum, effective programs may be those that address immediate and longer-term food needs of young people, in addition to gender-specific factors that worsen young women's risk.

Although findings suggest an association between food insecurity and sexual risk taking and victimization in young people, our study has some limitations. First, our final study sample may not be representative of all youth who participated in the Ghana and South Africa projects given potential differences pertaining to sexual experience. Further, the overall sample may not be representative of adolescents in Ghana and young adults in South Africa. Findings should be interpreted considering the current study's inclusion criteria and the main projects' sampling design—schools in Ghana and training sites in South Africa. Similarly, generalizability of our results is weakened by possible sample selection and social desirability bias. Social desirability bias might have influenced accuracy of self-reported risky sexual behaviors and experience of unwanted sexual contacts. Second, cross-sectional data provide weak evidence of causal relationship. Lack of temporal order does not eliminate reverse causality and may alter true direction of relationship. Third, our measures may not fully capture dimensions of our study variables. For example, we only measured the access component of food insecurity. Our findings do not tell us about food choice and intake, or access to food over time. Future research should address these limitations to achieve a deeper understanding of the effects of food insecurity on young people's sexual health.

Conclusions

Food insecurity among adolescents and young adults is associated with higher risk of engaging in precarious sexual practices and experiencing unwanted sexual contacts. In turn, these behaviors are associated with adverse health outcomes. Thus, improving access to food may be critical to efforts aimed to reduce sexual risk taking and prevent sexual victimization among young people, as well as programs to reduce sexual violence and incidence of HIV and other sexually transmitted infections. Last, a gender-neutral

food security programming may be a more appropriate approach for adolescents and young adults.

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Compliance with Ethical Standards

Conflicts of interest The authors declare that they have no conflict of interest.

Informed consent Informed consent was obtained from all individual participants included in the study.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Human and animal rights This article does not contain any studies with animals performed by any of the authors.

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