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Using an intersectionality framework to assess gender inequities in food security: A case study from Uganda

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Abstract

Prior research in health equity, including food security, indicates that disadvantaged groups, such as women with limited resources, face many obstacles in achieving food security. One of the first of its kind to draw on intersectionality and the social determinants of health frameworks, this study identified and tested gender differences in experiencing food security inequities using nationally representative data from the Gallup World Poll, Uganda 2019 ($N = 951$). Binary logit models disaggregated by gender were estimated to identify gender differences in food security. Three points of intersection were categorized: individual characteristics (gender, age, region, marital status, household number of children and adults); available resources (education, income, employment, shelter, social support); and the socio-political context (community infrastructures, corruption within the business). Testing the moderation effect of gender with each variable (difference-in-difference) showed that although most variables correlated with a difference in experiencing food security by gender, only two—marital status, and social support—presented a statistically significant difference. Accounting for this moderation effect, the final model showed that lacking shelter and residing in Eastern Uganda decreased food security. More adults in the household, higher education, higher income, available social support, and satisfaction with community infrastructures enhanced the odds of food security. Results suggest that (a) conventional food security quantitative approaches may not suffice to model inequities when

gender is a control variable rather than a foundation to explain inequities; and (b) gendered-centered analysis helps better identify disadvantaged groups and inform policies that target associated inequities.

KEYWORDS
food security, gender, inequity, intersectionality

Key points

- Using the social determinants of health framework while employing an intersectionality theoretical approach enhanced the identification of gender differences in experiencing food security inequities through new analytical approaches (i.e., difference-in-difference).
- Challenging the conventional analytical approaches that control for gender, results revealed layers of gender differences. Most previous studies narrowly focus on describing unequal food security outcomes by gender. Our study's diff-in-diff analysis revealed that the gender gap size differed significantly between levels of social support (social strata) and marital status (social identity), which is consistent with previous studies.
- This study provides evidence of the importance of including an intersectional lens in studying gender as a focal point in generating unequal experiences of food insecurity.
- Having shelter and being satisfied with everyday life, including infrastructure, air quality, water, healthcare, affordable housing, and education system are strong contributors to food security status, regardless of gender differences. Results highlight the importance of incorporating intermediary and structural determinants when studying food security equity and call for a more in-depth analysis of food security.

INTRODUCTION

Gender is one of the most studied variables associated with food security inequities. A *gender gap* when experiencing food insecurity results when men and women face disproportionate socioeconomic inequities (Broussard, 2019; Gebre et al., 2021). Equity refers to the "equal opportunity to be healthy [herein, food secure], for all population groups" (Braveman, 2003, p. 257) through equitable distribution of resources between more- and less-advantaged social groups.

Despite evidence that gender differences in food security exist in low-, middle-, and high-income countries (Broussard, 2019; Harris et al., 2021; Kassie et al., 2015; Sinclair et al., 2019; Sraboni et al., 2014; Wambogo et al., 2018), most studies on gender and food security have been conducted in low- and middle-income countries (LIMCs) in the context of agricultural settings. This is to be expected as most LIMC populations live in rural areas, where agricultural activities form their primary income source (Aryal et al., 2019; Gebre et al., 2021; Harris-Fry et al., 2020; Kassie et al., 2015; Lutomia et al., 2019; Sraboni et al., 2014).

Yet, few studies have assessed the relationship between food security and gender on a national or global scale, despite gender being a significant factor shaping variations in food security experiences. We were inspired by researchers who shifted from gender as a control variable to gender as a factor that helps illuminate gender differences and how they affect the complexities involved in food security dynamics (see, e.g., Abdi, 2018; Broussard, 2019; Sinclair et al., 2019; Smith et al., 2017; Wambogo et al., 2018).

Evidence shows that women are generally more food insecure than men. Broussard (2019) raises two arguments to this effect. First, there is a gender gap in mild to moderate food insecurity in most regions around the globe. Second, severe food insecurity is significantly different between men and women only in South-of-Sahara Africa (SSA) and South Asia (2.7% and 1.9% gender gap, respectively). Similarly, the 2022 report on the *State of Food Insecurity in the World* shows a growing gender gap worldwide in moderate or severe food insecurity from 2019 to 2021 reflecting the COVID-19 pandemic's disproportionate effect on women (Food and Agriculture Association [FAO] et al., 2002).

Although multiple definitions of food security exist, we adopted the FAO's (2002) definition: "food security exists when all people, at all times, have social, physical, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (p. 49). Research on food security consistently reveal that certain social positions/groups (e.g., gender, race, and class) have fewer resources and are, therefore, more disadvantaged when it comes to being food secure (Botreau & Cohen, 2020; Broussard, 2019; Gebre et al., 2021).

Gaps in access to social, human, and financial resources (e.g., education, information, training programs, and non-farm market) and gender norms are often considered important drivers of a higher probability of food insecurity in households headed by single, widowed, or divorced women. To illustrate, Aryal et al. (2019) report that Bhutan households headed by single, widowed, or divorced women are less likely to be food secure compared with households headed by men or households where there is a husband, but he is not physically present due to off-farm work.

These and similar situations lead to different food insecurity experiences beyond insufficient food to eat thus constituting a complex phenomenon encompassing sociocultural norms and structural determinants. Briones Alonso et al. (2018) argue that gender is a critical sociocultural determinant of food security along with family and decision-making power. Their review documents the direct and indirect impact of gender norms on women's food security at individual and household levels with examples including restricted mobility for traveling to the market, division of household labor, dietary practices, and intrahousehold food distribution.

In the broader institutional and political context, a review (between 1984 and 2018) of 124 countries in Asia, Africa, Europe, Latin America, and the Caribbean shows corruption, conflicts, military expenses, tensions related to religion and ethnicity, and poor quality of bureaucracy as the main political and institutional factors affecting food security (Abdullah et al., 2020). Other studies have likewise found that reducing corruption and promoting governance are positively correlated with food security (Helal et al., 2016; Nugroho et al., 2022; Olken & Pande, 2012; Sumaila et al., 2017; Uchendu & Abolarin, 2015).

Studies further indicate that well-known determinants of food insecurity include residing in rural areas, low education, low income, unemployment, age, and lack of social support (Broussard, 2019; FAO et al., 2022; Sinclair et al., 2019; Smith et al., 2017; Wambogo et al., 2018). Gender differences associated with such determinants can explain 23%–97% of the gender gap in food insecurity (Broussard, 2019). That said, most earlier studies reported the observed gender differences without examining their significance for food security. The latter is integral for providing evidence on whether these gender differences merit empirical and policy attention.

For example, Sinclair et al. (2019) report that rural men and women are more vulnerable to food insecurity in SSA and the Middle East and North Africa (MENA). In Latin America, in addition to rural residency, living in a small town for both men and women, and a large city's suburb for women only, is positively associated with food insecurity. Their results profile the different food security experiences by gender, residence area, and region. However, they do not further test the combined effect of (i.e., the intersection among) gender, residence area, and region. For instance, is the probability of experiencing food insecurity significantly different between a rural woman living in SSA and a woman living in a large city in Latin America or a man living in a small MENA town?

Intersecting gender with various vulnerabilities and barriers can exacerbate food insecurity experiences disproportionately between men and women. However, food security research has overlooked such differences and reported only the inequalities in the food security outcome without testing the statistical significance of these differences (Smith et al., 2017; Wambogo et al., 2018). To effectively direct policies and programs, an empirical analysis should identify and test not only a potential gender gap in outcomes but also model and test the significance of those gender differences for other relevant determinants.

Social determinants of health (SDH) Framework

In that spirit, we drew on the SDH framework, which posits that it is crucial to project the distinct difference between addressing determinants of health, or health inequities (Solar & Irwin, 2010). We were concerned with how gender intersects with other axes of inequity to shape men's and women's food insecurity experiences differently. The SDH framework accommodates the interactions between (a) the socioeconomic and political context and (b) a set of socioeconomic positions that stratify the population according to gender, race/ethnicity, income, and other determinants. These socioeconomic stratifiers reflect a person's position within social hierarchies (i.e., social strata). Each person is presumed to experience different privileges and vulnerabilities to health equity outcomes.

Intersectionality theoretical framework

Introduced and developed within Black feminist theory (Collins, 1990; Combahee River Collective, 1977; Crenshaw, 1989, 1991), intersectionality (i.e., the interconnected nature of social categorizations or positions such as race, gender, and class) is a theoretical framework used in public health to determine the combined effects of several social positions or social categories in generating individuals' unequal health experiences (Bowleg, 2012; Hancock, 2007). It allows for a multi-dimensional analysis of how the social-cultural context constructs those personal experiences at various socioeconomic and demographic intersections (Collins, 1990; Crenshaw, 1989).

Current intersectionality scholarship highlights how individual identities and social positions are occupied with processes of privilege and oppression in structural and institutional contexts to shape inequalities in health and well-being outcomes (Bauer, 2014). Intersectionality scholarship further emphasizes the non-additivity effects of social strata/positions and considers their joint and combined effects (Bowleg & Bauer, 2016; Bowleg, 2008, 2012; Dubrow, 2008; Hancock, 2007). Non-additive means not increasing when combined. To wit, intersectionality theory posits that studying "rich Asian men" is more informative than studying rich, Asian, and male individuals separately. The intersection of social positions is at the heart of this theory. "No social category or form of social inequality

is more salient than another…. Social categories are not additive and thus cannot be ranked" (Bowleg, 2012, p. 1271). What happens when they intersect is of foremost interest.

Although most intersectionality research has been mainly qualitative, quantitative studies are emerging (see Bauer et al., 2021; Phillips et al., 2020). To account for intersectionality in the quantitative research methodology, a broad array of methods exists (Bauer & Scheim, 2019a) ranging from common techniques, such as logistic regression, to more advanced ones, including multilevel modeling, structural equation modeling, and decomposition (Bauer et al., 2021; Phillips et al., 2020). Researchers have advanced and are still developing methodological debates for intersectional statistical analysis (Bauer & Scheim, 2019a, 2019b; Evans et al., 2018, 2020; Harnois & Bastos, 2019; Merlo, 2018).

To date, the use of an intersectional approach in the food security literature is very limited. In a 2021 scoping review, only two papers out of 243 (0.8%) papers studying equity in agriculture, nutrition, and health applied an intersectional approach (Harris et al., 2021). Unfortunately, associated studies (i.e., Abera et al., 2019; Jha et al., 2009) do not focus on food security as the primary outcome, and no definition or explanation of intersectionality is provided.[1] Interdisciplinary quantitative researchers encounter further barriers to incorporating intersectionality (Bauer et al., 2021; Phillips et al., 2020). A recent systematic review on intersectionality in quantitative research highlighted three main areas for improvement: theory (including in-depth engagement with intersectionality core concepts), sampling and measurement methods, and analytical approaches (Bauer et al., 2021).

An emergent demand for incorporating intersectionality into food security research reflects both its perceived ability to better ensure inclusion and the presumed merit of pairing it with the SDH framework. With this appreciation, we aimed to address gendered predictors of food security inequities by (a) describing food security inequities guided by the SDH framework, (b) identifying gender gaps in experiencing food insecurity and (c) examining the intersections between each predictor of inequity with gender and testing their significance within the intersectionality theoretical framework. The intent was to transcend the boundaries of conventional gender disaggregated analysis and embrace an intersectionality framework that reveals the complex interplay of factors predicting food security inequities.

MATERIALS AND METHODS

Data source

Our study focused on Uganda and its 2019 nationally representative Gallup World Poll (GWP) data ($N = 951$; men = 454; women = 497), which are cross-national and use individuals as the unit of analysis (ages >15 years). The GWP survey is conducted annually in over 150 countries and utilizes self-reported data on personal experiences, aspirations, and opinions to analyze issues affecting individuals' lives (Gallup Inc., 2020). The GWP national survey comprises standardized questions comparable across countries. Region-specific questions are also included to track progress toward the United Nation's Sustainable Development Goals (SDGs). Researchers from multiple disciplines are studying food security determinants using GWP data (e.g., Broussard, 2019; Sinclair et al., 2019; Smith et al., 2017; Wambogo et al., 2018).

Study context

Ugandan data were collected using a stratified multiple-stage cluster design. Face-to-face household interviews were conducted in local languages (i.e., English, Ateso, Luganda, and

Runyankole). The GWP sample aimed to achieve national representativeness, encompassing most regions within the country. Virtually the entire Ugandan population was represented. Only a small fraction (less than 4%) of residents was excluded in the 2019 round due to security considerations (three North Eastern regions—Kotido, Moroto, and Nakapiripirit).[2]

Uganda has one of the highest prevalence of severe food insecurity in SSA (FAO et al., 2022; Wambogo et al., 2018). When monitoring the progress toward SDG2 (Zero Hunger), Uganda seems far from meeting this goal.[3] The *State of Food Insecurity in the World* report (FAO et al., 2022) indicates that Uganda's moderate and severe food insecurity rate (2019–2021) had increased from 63% (2014–2016) to 72.5% compared with SSA's average food security rate which increased from 50.7% to 61%.

Key determinants of food insecurity in Uganda are rooted in a complex set of underlying conditions at the individual, household, community, and system levels. At the individual and household levels, common food security determinants include low income, low education, lack of land or asset ownership, lack of access to clean water and hygiene, and lack of skills or access to technology to mitigate or manage risks related to environmental and climate shocks (Feed the Future, 2018; Mfitumukiza et al., 2020; Mukasa et al., 2020; Nabuuma et al., 2021; Semazzi & Kakungulu, 2020).

At the systems level, prolonged drought, declining soil fertility, and reduced land size are key drivers of household food insecurity, mainly affecting crop yields and agricultural productivity (Apanovich & Mazur, 2018; Feed the Future, 2018; Semazzi & Kakungulu, 2020; Twongyirwe et al., 2019). Although 70% of Ugandans are involved in subsistence agriculture—predominantly women residing in rural areas—the country is quickly urbanizing (United Nations Development Programme, Uganda, 2020). The Ugandan urban population is projected to exceed the rural population by 2060, especially due to rural-urban migration (World Bank, 2020). The total population will double between 2020 and 2060 despite existing challenges in delivering basic needs such as education, electricity, water, and sanitation (Uganda Bureau of Statistics, & ICF, 2018; World Bank, 2020).

An UNDP report analyzing the socioeconomic impact of COVID-19 shows that the pandemic and public health policies intended to limit contagion mostly affected the poorest people in rural and urban areas (UNDP Uganda, 2020). In particular, the informally employed and refugee women disproportionately experienced food insecurity suggesting that the pandemic and health policies have worsened the situation of already disadvantaged and vulnerable populations.

To elaborate, strict COVID lockdowns in March 2020 occurred post-planting and pre-harvest for maize, millet, and beans—the main crops in rural Uganda (Mahmud & Riley, 2021). The immediate impact was a significant (60%) drop in household non-farm income in Uganda at large, mostly due to loss of income at that time in Western Uganda's rural areas (Mahmud & Riley, 2021). Ugandan households responded to this income loss by lowering food expenditure for each adult member (40% reduction on average) with a high likelihood of missing at least one meal per day. In their investigation of Ugandan households' experiences since the lockdown, Kansiime et al. (2021) report worsening diet quality and food insecurity in both rural and urban areas.

Gender in Uganda

Uganda's progress with gender equality is slow with several glaring gaps, including pervasive and widely accepted early and forced marriages, especially for girls; high rates of intimate partner violence; unequal distribution of unpaid care work; and limited land rights and management for women (Organization for Economic Co-operation and

Development, 2015). The adverse effect on food security has been well-studied in isolation from the other axes of inequities and depicts the complex nexus of food security, gender, and equity in Uganda, specifically in the COVID-19 context.

World Health Organization, (2002) defines *gender* as socially constructed characteristics of women, men, girls, and boys, including associated norms, behaviors, sociocultural roles, and relationships with each other. The scientific literature uses the terms "gender" (roles) and "sex" (biological) interchangeably, when they are in fact distinct (Krieger, 2003). In both measurement and description throughout the GWP documentation, sex and gender appear conflated as is the case in most health research surveys (Johnson et al., 2009). GWP respondents are asked about their gender with the response options of male or female (sex).

Due to the hostile public and political environment for lesbian, gay, bisexual, transgender, queer, intersex, and asexual (LGBTQIA) people in Uganda, we assumed gender is socioculturally identified as a binary concept in the Ugandan context. Expression of non-binary gender identity (more than just male or female sex) in Uganda is dangerous. LGBTQIA shelters and people are attacked, and some people killed (Human Dignity Trust, 2022) due to an anti-homosexuality bill passed into law in May 2023 (Anti-Homosexuality Act, 2023). "Among other things, [it] imposes a life sentence on consensual same-sex conduct among adults, which is already criminalized…adds the death penalty for so-called 'aggravated homosexuality' [and] criminalizes activities that promote homosexuality with up to 20 years in prison" (Shaw, 2023, p. 1).

In Uganda, gender is, therefore, extensively linked to the social and political context (structural determinants), which is prescribed for males and females through parliamentary legislation. We acknowledge this limitation in using the gender variable of GWP data, as some respondents might not be able to openly reveal their gender identity and must adhere to the binary man/woman. Accounting for these limitations arising from (a) sociocultural barriers in reporting gender and (b) survey shortcomings in distinguishing between sex and gender, we used the term *gender* to refer to variable sex (male or female) in GWP data.

This research design decision was based on the ongoing discussion in gender literature, wherein researchers argue that the health outcome under study can direct researchers to differentiate between sex and gender and clarify the concept when it is conflated in secondary data (Johnson et al., 2009; Krieger, 2003). Our study's primary outcome was food security, witih sociocultural determinants such as income, education, marital status, and social support considered contributing factors to achieving equity in experiencing food security. In effect, studying social factors rather than biological factors supports using gender as a social construct instead of sex as a biological construct.

Outcome: Food security status

We measured food security using the Food Insecurity Experience Scale (FIES). Since 2014, the FIES Survey Module (FIES-SM) has been included in the GWP, in the FAO *Voices of the Hungry* project, and is used to monitor progress toward SDG 2.1.2 (i.e., prevalence of a population's moderate or severe food insecurity based on FIES). The FIES-SM is an experience-based approach that directly measures the access dimension of food security through eight questions with binary response options (Yes/No) (see Table 1). The FIES questions were tested and validated to be cross-culturally comparable both globally (Cafiero et al., 2016) and in SSA (Wambogo et al., 2018).

Researchers using FIES normally categorize food insecurity into four levels (Ballard et al., 2013). From a theoretical and conceptual perspective, we focused on the *access* dimension of food security and conceptualized it as stages in which an individual does not experience a "lack of food" in terms of quantity but instead experiences compromising food

TABLE 1 Food Insecurity Experiences Scale (FIES) questions; Cafiero et al. (2016).

Binary outcome	FIES categories	Short reference	During the last 12 MONTHS, was there a time when because of a lack of money or other resources? (Yes/No/Do not know/Refused to answer)
Food security	Food secure	FS	No affirmative responses
	Mild FI	WORRIED	1) You were worried you would run out of food?
		HEALTHY	2) You were unable to eat healthy and nutritious food?
		FEWFOODS	3) You ate only a few kinds of foods?
Food insecurity	Moderate FI	SKIPPED	4) You had to skip a meal?
		ATELESS	5) You ate less than you thought you should?
		RANOUT	6) Your household ran out of food?
	Severe FI	HUNGRY	7) You were hungry but did not eat?
		WHLDAY	8) You went without eating for a whole day?

quality. We thus condensed the classification into two categories: food security and insecurity (see Table 1). A food insecure individual experiences both a "lack of food" and limitations to the quality of the food they consume. A similar measurement approach to SDG 2.1.2 (see Cafiero et al., 2018) allowed us to compare results with FAO estimates.

Predictors of food security inequities

Guided by the SDH framework and intersectionality theory, we categorized points of intersection into three levels: personal characteristics and demographics (*social identities*), human capital and available resources (*social strata)*, and the socioeconomic and political context that uses power hierarchies (*structural determinants)* (Evans et al., 2018; Harris et al., 2021; Solar & Irwin, 2010). The latter operates through intermediary determinants especially aspects of social strata (e.g., housing, food security, work, and available social supports).

Drawing on the variables available in the GWP dataset, we selected variables to assess each level (i.e., social identities, social strata, and structural determinants) (see Table S1). We measured (a) personal characteristics (social identities) using gender, age, region, marital status, and household number of children aged <15 and adults aged >15; (b) human capital and resources (social strata) using education, income, employment, shelter (i.e., housing), and social support; and (c) socioeconomic and political context (structural determinants) using the Community Basics Index (CB-index), and corruption within the business.

We used two variables to measure structural determinants because, first, the comprehensive CB-index reports individuals' satisfaction with everyday life, including infrastructure, air quality, water, healthcare, affordable housing, and the educational system. Few studies in the food security literature have examined the structural determinants of food security within an equity framework (Harris et al., 2021). Explicit consideration of environments lacks quantitative intersectional analyses to consider the structural mechanisms and processes that shape power and policies (Bauer, 2014). Second, corruption can also adversely affect food security at individual and household levels (Helal et al., 2016;

Olabiyi, 2022; Uchendu & Abolarin, 2015); reducing corruption promotes governance and is a strategy to mitigate food insecurity (Olabiyi, 2022).

Analytical strategy

Accounting for the complex survey design,[4] our analysis involved three steps: (1) run disaggregated analysis by gender, (2) apply the difference-in-difference (diff-in-diff) approach to (a) test the intersection of gender with variables exhibiting a gender difference in step one and (b) test the statistical significance of such differences, and (3) compare models before and after including significant interactions with gender.

In the first step, we estimated binary logit models for the total sample. In doing so, the difference in the predicted probabilities (Pr) was computed[5] and referred to as marginal effect (MEs). MEs are the change in Pr of food security for a change in one specific independent variable while holding other independent variables at specific values (Long & Freese, 2014). For example, for the binary variable of gender, the Pr of food security was computed at two levels, men (=0) and women (=1). This generated two Pr (s) for food security outcome while holding other variables at a specific value (such as average marginal effect [AME])[6] in the analysis). MEs are the differences between the Pr of food security for men and women:

$$\text{ME (gender)} = \text{Pr (food security|women)} - \text{Pr (food security|men)}$$

In the second step, we selected variables that showed a gender difference between men and women in terms of significance and direction of MEs. To test the significance of gender differences, we used the diff-in-diff approach to test the interaction effect of each selected variable with gender. In doing so, separated binary logit models were estimated for each interaction between gender and each selected variables while controlling for other variables.

Although the intersectionality literature acknowledges the "measurement difficulty of capturing the intersections" (Bauer, 2014, p. 12) in quantitative research, Hinze et al. (2012) argue that creative use of existent statistical techniques, such as using interaction terms or stratification in logistic regressions, can capture the intersections (Hinze et al., 2012). In the context of an intersectionality framework, researchers commonly use interaction terms to examine the multiplicative (non-additive) effect beyond the sum of the main effects (Bauer et al., 2021). Methodological literature across different disciplines has shown that the coefficient for the interaction term, in terms of predictions as described earlier, is not a proper way to interpret and test an interaction effect (Mize, 2019). Nevertheless, researchers tend to use only the statistics for the coefficient on the interaction term to conclude whether an interaction effect is significant or not (Mize, 2019).

We thus applied the diff-in-diff approach to test the significance of the interaction effects in terms of the predictions (Mize, 2019). WE estimated four Pr (s) for each level when using an interaction term between two binary variables. To illustrate, for testing the interaction between gender (men/women) and education (low/high), four levels were generated: (a) high-educated men, (b) high-educated women, (c) low-educated men, and (d) low-educated women. In the diff-in-diff approach, first, we estimated MEs of gender (gender gaps) for each education category, referred to as first difference (1st diff):

$$\text{ME}_1\,[\text{Gender Gap}_{\text{high education group}}] = \text{Pr (food security|women)} - \text{Pr (food security|men)}$$

$$\text{ME}_2\,[\text{Gender Gap}_{\text{low education group}}] = \text{Pr (food security|women)} - \text{Pr (food security|men)}$$

Then, we estimated the differences in effects of gender across levels of education, referred to as the second difference (2nd diff): $ME_1 - ME_2$.

In the last step, we included significant interactions in the final model to account for the intersection of gender with the variables that showed an interactive effect. Odds ratios were computed from the initial model estimated in the first step (main effects model before including interactions) and the final logit model that included interactions. This analytical approach examines associations rather than establishes causality. We used STATA (version 17.0) for all steps of our analysis.

RESULTS

Among the studied population ($N = 951$), 52% were women ($n = 497$) (Table 2; see also Table S2). Compared to women, a higher proportion of men were employed, had higher education, and an above-average income. However, a higher proportion of men than women responded affirmatively to almost all FIES items.

Table 3 presents the difference in the predicted probabilities of food security for each variable, disaggregated by gender. In the total population, being a woman tended to increase the probability of food security ($\Delta = 0.05$; $p < 0.1$). Although being unmarried did not significantly change the predicted probability of food security in the total sample, when disaggregated by gender, a different pattern emerged. Marital status was associated with food security differentially; the association was positive for men and negative for women ($\Delta_{men} = 0.09$; $p < 0.1$ vs. $\Delta_{women} = -0.09$; $p < 0.05$). On average, one additional child was related to a 0.02 increase in the predicted probability of food security ($p < 0.05$). After disaggregation by gender, a similar pattern remained significant only for men.

The predicted probability of food security for high-educated compared to low-educated men was 0.10 higher ($p < 0.05$) while in the total sample, education showed a 0.07 increase in food security ($\Delta = 0.07$; $p < 0.05$). Although, on average, a one-unit increase in income was significantly associated with an increase in food security for men and women, this increase was twice for men ($\Delta_{men} = 0.06$; $p < 0.01$ and $\Delta_{women} = 0.03$; $p < 0.05$). A lack of housing in the previous 12 months was related to a significant decrease in food security in all models (all $p < 0.01$). Similarly, men and women with a family or a relative's help had, respectively, 0.10 and 0.24 ($p < 0.05$ and $p < 0.01$, respectively) higher food security compared to those without social support. Satisfaction with basic community infrastructures was associated with improved food security with almost similar probability ($\Delta_{men} = 0.15$ and $\Delta_{women} = 0.14$; $p < 0.05$).

For the next analysis stage, variables that exhibited a gender difference in direction or significance were selected: age, region, marital status, household members under and over 15 years, education, income, employment, social support, and corruption within a business.

Table 4 and Figures S1–3 present the results of testing whether (a) these differences (gender gaps) were statistically significant and (b) gender significantly intersected with each variable using the test of interaction effect (diff-in-diff). The results for marital status showed a significant gender gap between married men and women with married women having a significantly higher probability of food security (0.32) than married men (0.19; $\Delta = 0.13$; $p < 0.01$).

The second difference showed that the size of the gender gap differed significantly between married and single status (second difference = –0.14; $p = 0.03$); the effect of gender significantly differed between married and single status (Figure S1B). Results indicated that the probability of food security for single women (0.24) tended to be less than married

TABLE 2 Sample characteristics overall and by gender in Uganda.[a]

Characteristics	Overall[b] (*n* = 951)	Men (*n* = 454)	Women (*n* = 497)
Independent variable			
Personal characteristics			
Age (in years), %			
15–25	45.3	45.1	45.5
26–45	37.6	37.6	37.5
>45	17.1	17.3	16.9
Region, %			
Central	27.6	25.6	29.6
Eastern	27.3	30.6	24.3
Northern	17.7	19.9	15.7
Western	27.4	23.9	30.5
Marital status, %			
Married	43.9	44.0	43.7
Single[c]	56.1	56.0	56.3
Household size <15 years	2.5 (0.1)	2.3 (0.1)	2.6 (0.1)
Household size >15 years	2.8 (0.1)	2.9 (0.1)	2.8 (0.1)
Human capital and resources			
Education, %			
Low education	45.2	40.5*	49.5
High education	54.8	59.5	50.5
Income[d]	5.8 (0.1)	6.0 (0.1)*	5.7 (0.1)
Employment, %			
Employed	54.1	63.6***	45.3
Underemployed	19.8	17.7	21.8
Out of workforce	26.1	18.7	32.9
Shelter, %			
No	53.5	55.4	51.8
Yes	46.5	44.6	48.2
Social support, %			
No	19.8	20.2	19.4
Yes	80.2	79.8	80.6
Structural determinants			
CB-index,[e] %			
Dissatisfied	64.5	67.2	62.0

TABLE 2 (Continued)

Characteristics	Overall[b] ($n = 951$)	Men ($n = 454$)	Women ($n = 497$)
Satisfied	35.5	32.8	38.0
Corruption within business, %			
No	20.9	20.0	21.8
Yes	79.1	80.0	78.2
Outcome variable: Food security items[f]			
WORRIED, %	71.3	72.0	70.6
HEALTHY, %	73.5	73.0	74.1
FEWFOODS, %	79.1	80.0	78.3
SKIPPED, %	65.7	68.4	63.2
ATELESS, %	70.7	70.7	70.6
RANOUT, %	63.3	66.4	60.5
HUNGRY, %	62.5	67.2*	58.2
WHLDAY, %	44.0	46.8	41.4

Note: *$p < 0.05$, **$p < 0.01$, ***$p < 0.01$; two-tailed tests.

[a]Values are means (SDs) or percentages (weighted).

[b]Chi-square and adjusted Wald tests were used to evaluate the distributions between groups.

[c]Never married, divorced, separated, widowed.

[d]Per capita annual log income in international dollars estimated by dividing the annual household income by the total number of individuals living in the household. Income ranged from $0 to ~$45 K dollars with a mean of $964. To normalize the income distribution, we transformed it into log income, and we refer to this variable as income.

[e]Community Basic Index measuring the seven items of public transportation systems, roads and highways, quality of air, water, and healthcare, availability of affordable housing, and educational system.

[f]Only affirmative responses (%) were reported.

women (0.32) ($p = 0.06$). No significant difference was observed between married and single status for men.

The predicted probability of food security for the four combinations of gender and social support status showed a significant gender gap in food security between men and women who had social support ($\Delta = 0.07$; $p < 0.05$). The difference of 0.12 increase in the probability of food security for socially supported men and women was statistically significant ($p < 0.05$). Another pattern that merits attention is the marginally significant gender gap across low-education level ($\Delta = 0.09$; $p = 0.057$). Testing the effect of education between men and women showed no significance, although the first difference of men's group was significant ($\Delta_{men} = 0.1$; $p = 0.02$ vs. $\Delta_{women} = 0.03$; $p = 0.45$; second Difference = – 0.07; $p = 0.27$). Other variables, such as business corruption, age, region, and employment did not exert a significant difference within any group (see Figures S1D and S2A–C).

To test for significant group differences between men and women at different income levels, information about the significance of the group difference (men vs. women) was directly incorporated into Figure S3A. That is, the gender gap was significant with women having significantly higher food security with income between zero and six compared to men (all contrasts $p < 0.05$). No gender differences were found in food security when income was between six and 11 (all contrasts $p =$ ns).

TABLE 3 Predicted probabilities of food security overall and by gender.[a]

Variables	Overall	Men	Women
Gender			
Women vs. Men	0.05*(0.03)	–	–
Age			
26-45 vs. 15–25	– 0.04 (0.03)	0.01 (0.04)	– 0.08* (0.04)
>45 vs. 15–25	0.03 (0.05)	0.13 (0.09)	–0.01 (0.07)
>45 vs. 26–45	0.07 (0.05)	0.13 (0.08)	0.07 (0.07)
Region			
Eastern vs. Central	– 0.10** (0.05)	– 0.08 (0.06)	– 0.13** (0.06)
Northern vs. Central	– 0.03 (0.04)	– 0.03 (0.07)	– 0.06 (0.05)
Western vs. Central	– 0.01 (0.05)	– 0.01 (0.07)	– 0.01 (0.05)
Northern vs. Eastern	0.07 (0.05)	0.05 (0.06)	0.08 (0.06)
Western vs. Eastern	0.09* (0.05)	0.07 (0.06)	0.12** (0.06)
Western vs Northern	0.02 (0.05)	0.02 (0.07)	0.05 (0.05)
Marital status			
Single vs. Married	– 0.02 (0.03)	0.09* (0.05)	– 0.09** (0.04)
Household size <15 years[b]	0.02** (0.01)	0.03** (0.01)	0.01 (0.01)
Household size >15 years[b]	– 0.001 (0.01)	–0.01 (0.01)	0.01 (0.01)
Education			
Secondary or higher vs. <Secondary	0.07** (0.03)	0.10** (0.04)	0.04 (0.05)
Income[b]	0.04*** (0.01)	0.06*** (0.02)	0.03** (0.01)
Employment			
Underemployed vs. Employed	– 0.07* (0.04)	– 0.03 (0.06)	– 0.09** (0.05)
Out of workforce vs. Employed	0.01 (0.04)	– 0.01 (0.05)	0.03 (0.06)
Out of workforce vs. Underemployed	0.08* (0.05)	0.02 (0.07)	0.12** (0.06)
Shelter			
Yes vs. No	– 0.16*** (0.03)	– 0.18*** (0.04)	– 0.14*** (0.05)
Social support			
Yes vs. No	0.18*** (0.03)	0.10** (0.05)	0.24*** (0.04)
CB-index			
Satisfied vs. Dissatisfied	0.15*** (0.03)	0.15** (0.05)	0.14** (0.05)
Corruption within business			
Yes vs. No	– 0.02 (0.04)	0.01 (0.05)	– 0.05 (0.06)

Note: *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$; two-tailed tests.

[a]Marginal effects (MEs) were computed at average marginal effects (AME) with standard errors in parentheses.

[b]For continuous variables, a one-unit discrete change was reported.

TABLE 4 Probability of food security by gender and variables of interest with test of interaction effect.

	Pr (FS)[a] Women	Pr (FS) Men	Gender gap[b] (1st difference)	Contrasts[c] (2nd difference)
Binary × binary interactions				
Education				
Secondary or higher	0.29 (0.03)	0.27 (0.03)	0.29–0.27 = 0.02 (0.04)	0.02 to 0.09 = –0.07 (0.06)
<Secondary	0.26 (0.04)	0.17 (0.04)	0.26–0.17 = 0.09* (0.05)	
Marital status				
Single	0.24 (0.03)	0.25 (0.03)	0.24–0.25 = – 0.01 (0.04)	–0.01 to 0.13 = –0.14** (0.06)
Married	0.32 (0.04)	0.19 (0.03)	0.32–0.19 = 0.13*** (0.05)	
Social support				
Have social support	0.31 (0.03)	0.24 (0.03)	0.31–0.24 = 0.07** (0.03)	0.07 to (–0.05) = 0.12** (0.05)
No social support	0.08 (0.03)	0.13 (0.04)	0.08–0.13 = – 0.05 (0.05)	
Corruption within business				
No corruption	0.31 (0.05)	0.21 (0.05)	0.31–0.21 = 0.1 (0.06)	0.1 to 0.04 = –0.06 (0.07)
With corruption	0.27 (0.03)	0.23 (0.03)	0.27–0.23 = 0.04 (0.03)	
Multi-category × binary interactions				
Age				
15–25	0.29 (0.03)	0.23 (0.03)	0.29–0.23 = 0.06 (0.04)	None[d]
26–45	0.24 (0.04)	0.20 (0.03)	0.24–0.20 = 0.05 (0.05)	None
>45	0.31 (0.06)	0.26 (0.07)	0.31–0.26 = 0.05 (0.09)	None
Region				
Central	0.32 (0.04)	0.25 (0.04)	0.32–0.25 = 0.07 (0.05)	None
Eastern	0.19 (0.05)	0.18 (0.04)	0.19–0.18 = 0.01 (0.05)	None

(Continues)

TABLE 4 (Continued)

	Pr (FS)[a] Women	Pr (FS) Men	Gender gap[b] (1st difference)	Contrasts[c] (2nd difference)
Northern	0.28 (0.04)	0.23 (0.05)	0.28–0.23 = 0.06 (0.07)	None
Western	0.31 (0.04)	0.24 (0.05)	0.31–0.24 = 0.07 (0.05)	None
Employment				
Employed	0.29 (0.03)	0.23 (0.03)	0.29–0.23 = 0.06 (0.04)	None
Underemployed	0.19 (0.04)	0.20 (0.06)	0.19–0.20 = –0.01 (0.06)	None
Out of workforce	0.31 (0.04)	0.23 (0.05)	0.30–0.23 = 0.08 (0.06)	None

Note: Because of rounding, the differences do not always equal the discrete change coefficient in women minus the discrete change coefficient in men, similar for the 2nd differences. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$; two-tailed tests.

[a]Marginal effects (MEs) were computed at average marginal effects (AME) with standard errors in parentheses.

[b]Statistics for gender gap is the difference in the effect of interest variable between men and women.

[c]The second differences column reports whether gender gaps are significantly different across levels of interest variable. For multi-category variables, the "contrasts" column reports which gender gaps are significantly different across levels of interest variable (second differences).

[d]"None" indicates that none of the paired second differences were significant.

TABLE 5 Odds ratios from logit model for being food secure, comparing two models; before and after including interactions.

Variables	Main effects model OR (95% CI)	Model with interactions OR (95% CI)
Personal characteristics [Social identities]		
Gender (ref. Men)		
Woman	1.39 (0.96, 2.02)*	0.89 (0.27, 2.97)
Age (ref. 15–25)		
26–45	0.76 0.51, 1.13)	0.77 (0.52, 1.14)
>45	1.17 (0.65, 2.08)	1.39 (0.75, 2.56)
Region (ref. Central)		
Eastern	0.52 (0.26, 1.03)*	0.51 (0.25, 1.01)*
Northern	0.85 (0.51, 1.41)	0.84 (0.50, 1.40)
Western	0.96 (0.55, 1.69)	0.95 (0.54, 1.67)
Marital status (ref. Married)		
Single	0.88 (0.60, 1.27)	1.50 (0.82, 2.74)
Household size <15 years	1.13 (1.01, 1.25)**	1.15 (1.03, 1.27)**
Household size >15 years	0.99 (0.88, 1.12)	0.99 (0.88, 1.12)
Human capital and available resources [Social strata]		
Education (ref. Secondary or higher)		
<Secondary	1.56 (1.02, 2.39)**	1.58 (1.03, 2.42)**
Income	1.26 (1.13, 1.42)***	1.28 (1.14, 1.44)***
Employment (ref. Employed)		
Underemployed	0.63 (0.37, 1.08)*	0.63 (0.37, 1.10)
Out of workforce	1.08 (0.67, 1.75)	1.13 (0.70, 1.80)
Shelter (= Yes)	0.360 (0.24, 0.54)***	0.36 (0.24, 0.54)***
Social support (= Yes)	3.99 (2.02, 7.88)***	2.37 (1.08, 5.20)**
Socioeconomic and political context [Structural determinants]		
CB-index (= Satisfied)	2.46 (1.65, 3.67)***	2.39 (1.58, 3.62)***
Corruption within business (= Yes)	0.90 (0.53, 1.52)	0.86 (0.51, 1.46)

Note: *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$; two-tailed tests.
Abbreviations: CI, confidence interval; OR, odds ratio.

The second difference showed that the size of the gender gap marginally differed across income levels (–0.04, $p = 0.07$). Testing the effect of income between men and women—high-income men vs low-income men and high-income women vs low-income women—indicated that for men, the income effect was marginally greater than for women ($p < 0.1$). Table 5 presents the odds ratios from binary logit models before and after, including the significant interaction terms. Most variables' effects remained similar after having interactions of gender with marital status and social support. One important difference

manifested for the gender variable, which showed a different direction between the main effects and final models. In the final model, women had lower odds of food security than men by a factor of 0.89 (95% confidence interval [CI]: 0.27, 2.97; $p = 0.85$), while in the main effects model, women had higher odds of food security (odds ratio: 1.39; 95% CI: 0.96, 2.02; $p = 0.08$), controlling for other factors.

Overall, the final model showed that residing in the Eastern region of Uganda and having no shelter decreased the odds of food security. On the contrary, having an additional household member under 15 years, higher education, higher income, more social support, and satisfaction with the community infrastructures enhanced the odds of being food secure after accounting for gender variability.

DISCUSSION

The primary research objectives were to determine the sources of gendered food security inequities in Uganda employing an intersectionality perspective and to measure their relative significance using nationally representative GWP data. By challenging the conventional analytical approaches that control for gender, results revealed different layers of gender differences. Most previous studies (e.g., Broussard, 2019; Sinclair et al., 2019; Smith et al., 2017) have focused on describing unequal food security outcomes by gender. By using diff-in-diff analysis, our results went further and revealed that the size of a gender gap differed significantly (statistically) between levels of social support (social strata) and marital status (social identity), which is consistent with previous studies (to be discussed).

Furthermore, although results in the final model did not identify causal relationships, the statistically significant associations provided thought-provoking information about gender and food security consistent with previous studies. This central finding emphasized the importance of accounting for gender as a meaningful source of variation in studying food security and any health outcome instead of treating it as a control variable. Indeed Shapiro et al. (2021) argue that framing sex/gender in quantitative analysis models as a controlling or confounding variable is a "considerable danger" [resulting in] incorrect findings [that are] detrimental to equitably improving global health" (p. 2) as confirmed in our study. We used three intersectional categories to organize the discussion: social identities, social strata, and structural determinants.

Social identities

Marital status

Our results also demonstrated that the effect of gender was statistically significant between levels of marital status. The overall impact of marital status on food security has been well studied. In a comparative global analysis, Broussard (2019) reports mixed effects for gender differences in marital status across regions, exhibiting a significant contribution of gender differences in marital status to explain gender differences in severe food insecurity in SSA. In another SSA study, Wambogo et al. (2018) report no significant association between marital status and severe food insecurity. Only older married adults (>50 years) have lower severe food insecurity than their single counterparts (Wambogo et al., 2018). Like our results, a cross-country analysis of FIES in 134 counties shows that being single (i.e., never or previously married) is positively associated with food insecurity (Smith et al., 2017).

Because results from earlier studies do not disaggregate results by gender, we could not use our results to draw comparative discussion points or conclusions about the final

association of marital status with food insecurity in Uganda. However, our results *do* highlight the importance of generating gender-specific results and testing them before drawing conclusions. Due to small marginal distributions, our analysis combined the two categories of never- and previously-married into one category of "single." The unobserved differences between these two categories could affect the overall outcome. Consider that Kassie et al. (2015) report that female-headed households run by a single, widowed, divorced, or separated woman are more disadvantaged than male-headed households in many areas, and women are most likely to be food insecure.

It is thus not surprising that single women in our study had about 0.08 lower food security than married women. Another potential explanation for the lower food security status of single women, particularly in Uganda, is the social and gender barriers that other types of single women face, such as unmarried adolescent mothers, and older widowers (Brown, 2019). Over and above these socioeconomic and demographic disadvantages, structural and institutional context (e.g., ethnicity, living in poor urban areas, political marginalization, and refugee status) can add more complexity to food insecurity experiences of disadvantaged groups such as single women (Brown, 2019; Kwiringira et al., 2014).

Household members

Another result meriting discussion was the positive association between food security and having an additional household member under 15 years old. There is limited evidence to explain the mechanisms of such associations specifically in the context of LIMCs. In a high-income country example, Men et al. (2023) report that having an additional child aged <6 years is correlated with 16.5% lower odds of food insecurity (Men et al., 2023) in Canada. They conclude that Canadian child-benefit programs assist low-income households in coping with food insecurity. In Uganda, some programs assist households with children to alleviate the adverse effects of poverty on child health and nutrition: the Social Assistance Grant for Empowerment (SAGE), and the World Food Program, which provides cash/food assistance to meet the food and nutrition needs of refugees and Ugandan children (Tran & Ghadially, 2021). Future Ugandan food security studies should explore this policy dynamic.

Education and income

Though previous studies found education to be strongly associated with higher food security, including the combined effect of other variables reveals even more layers. In Uganda, 67% of women and 59% of men (aged 15–49) have low education with considerable regional variation (Uganda Bureau of Statistics [UBOS] & ICF, 2018). From the intersectionality perspective herein, gender, age, region, living in urban areas, and income contribute to low education in Uganda. Other scholars propose that only having higher education for women does not translate into a better job, higher income, or improved food security because they face more socioeconomic inequalities, including cultural stereotypes and continued exclusion from active participation in social life (Bhandari & Burroway, 2018; Tanankem et al., 2017).

Similar context complexity exists for income inequalities in Uganda, where women have less access to credit, economic resources, and wage-earning opportunities compared to men (Uganda Bureau of Statistics [UBOS] & ICF, 2018). This disparity may explain the doubled increase in the probability of food security in men found in our study.

The lack of a significant gender gap in our study across different levels of other well-studied predictors of food security (e.g., age, region, and employment) does not mean that these social identities (personal characteristics) and social strata (resources) failed to

account for gender gaps. Instead, our results support the call for more in-depth analysis by examining various intersections, not only by gender but also with other social identities and social strata such as ethnicity, religion, and migration status.

Social strata

Social support was statistically significant in our study. Having someone to count on in times of need is associated with a decrease in food insecurity at a globe scale and across different economic development rankings (Smith et al., 2017). Broussard (2019) reports that gender differences in social support significantly contribute to 7%–20% of the gender gap in food insecurity worldwide, excluding SSA. The positive impact of social support on food security is at the household level in Broussard's study. Schmeer et al. (2015) report that increased maternal social support is associated with 0.16 lower odds of household food insecurity. Hadley et al. (2007) observe that Tanzanian women with higher social support encounter lower seasonal food insecurity with stronger associations for wealthier communities. In a quantitative study, Lemke et al. (2003) confirm the protective effect of social support, especially for women, showing that higher social ties and networks are associated with higher food security.

Structural determinants

Infrastructure

Our results indicate that other strong predictors of food security included shelter and the CB-index. The strong association of these less-studied variables, regardless of gender differences, highlights the importance of incorporating structural and intermediary variables when studying food security equity. Previous research suggest that infrastructural development is a possible means of addressing the growing challenge of food insecurity (Frayne & McCordic, 2015; O'Brien et al., 2022). For example, households in South Africa without consistent access to cash income, cooking fuel, medical care, electricity, or water have higher odds of experiencing food insecurity than more advantaged households (Frayne & McCordic, 2015).

Corruption

Although we did not find a significant association between corruption and food security, previous research suggests that reducing corrupt practices within business and government and promoting good governance are fundamental strategies to address food insecurity (Helal et al., 2016; Olabiyi, 2022; Uchendu & Abolarin, 2015). We only assessed corruption within businesses by measuring community perceptions of corruption levels and the extent to which residents view corruption as widespread. The GWP data include another variable about corruption within the government, but it was missing for most respondents in the 2019 Uganda data. As a result, our analysis could not include it. We recommend studying corruption at different levels because it can provide insights into improving food insecurity at structural levels, as discussed in previous studies (see Helal et al., 2016; Nugroho et al., 2022; Olken & Pande, 2012; Sumaila et al., 2017; Uchendu & Abolarin, 2015; Abdullah et al., 2020).

As a final structural determinant comment, existing food security research often overlooks the role of women's legal rights in closing gender gaps in association with food security (Bhandari & Burroway, 2018; Burroway, 2015). In Uganda, the struggle to institutionalize women's rights has been in a "stop-start" process for years and is ongoing (Brown, 2019; Burgess & Campbell, 2016). Food insecurity goes beyond food availability and includes food access as well. Some food security predictors used in our research design are well-studied; yet the role of gender differences and how a lack of women's legal entitlement affect food access is less investigated (Bhandari & Burroway, 2018). We recommend that researchers address this lacuna by focusing on how policy programs and legislative efforts can target structural determinants of food security inequities rooted in a lack of rights and governance for disadvantaged groups, including women (per Collins, 2021).

Study limitations

First, the selection of variables for the analytical model was limited by the variables in the GWP dataset. For instance, lack of information about intrahousehold gender dynamics, patriarchal belief systems, and gender-specific policies and institutional practices disallowed for studying social processes further, as recommended within the intersectionality framework. Second, the performance of two-level interactions only might be limited in satisfying feminist criteria for intersectional analysis for two reasons. (a) because the study focused on gender, the exploratory approach included only the intersections between gender and other variables that exhibited gender inequality.

In addition, (b) there were concerns about model parsimony and difficulties in interpreting high-order interactions when moving beyond two-way interactions. To embrace the complexity of intersectionality, we considered both between and within interaction for each intersection by testing both sides. Testing the intersection of gender with various variables allowed for a heuristic approach in that different independent variable were introduced and assessed in the model. We acknowledge that, on both technical and interpretive grounds, two-way interaction effects have limited capacity to bring the context and complexity of intersectionality into the analysis. Further work should thus be extended to other suggested approaches that are more compatible with feminist understandings of intersectionality, such as multilevel regression analysis and mixed-methods approach (quantitative and qualitative).

Third, while we applied a descriptive intersectionality approach, we did not assess the structural mechanisms of social power to explain why these inequities happened nor did we elaborate further on the mechanisms. Advancing knowledge about inequities in food security within the intersectionality framework must go beyond describing unequal food security outcomes; more analytical work is required to identify root causes. Furthermore, cross-sectional studies have certain limitations. For instance, they cannot establish a cause-and-effect relationship nor analyze outcome patterns over time. Additionally, when interpreting results, the general limitations of survey methods must be considered, including self-report data.

CONCLUSION AND POLICY IMPLICATIONS

Our results contribute to the current knowledge base on the nexus of food (in)security, gender, and equity. First, FIES was used as an experience-based individual measure of food security; accordingly, the gender gap was quantified as the difference between gender

means of the FIES. Second, our analysis went beyond identifying gender differences in experiencing food security. We know of no study in this area that has applied a diff-in-diff approach to model gender differences between and within the underlying factors, guided by the intersectionality framework. Third, food security predictors were modeled at different levels of equity recommended by the SDH framework, which provided new insights into less-studied predictors of food insecurity. Using the SDH framework, we were able to draw policy attention to the social identities, strata, and structural variables that intersect and work within different mechanisms to generate health inequities among different groups (Solar & Irwin, 2010).

By demonstrating the interplay between the socioeconomic and political contexts, on the one hand, and socioeconomic strata, on the other, the SDH framework helped us emphasize the importance of including contextual factors when analyzing the impact of structural determinants on health inequities including food security inequities. We established the significance of future researchers incorporating the SDH framework alongside an intersectional approach when conducting quantitative analyses of food security.

Although data were from 2019, illnesses, and deaths due to COVID-19, and policies designed to reduce contagion from 2020 onward, negatively affected food security in all nations including Uganda (Boero et al., 2021). The pandemic also imposed changes in already existing determinants and widened inequalities mostly in terms of income (FAO et al., 2021, 2022). Others can use our Ugandan results to support comprehensive policies developed in situ and elsewhere that include integrating equity-based strategies to tackle food insecurity, considering the extra burden owing to the COVID-19 pandemic and other crises (e.g., refugee crises and natural disasters).

Our study is timely because, in South Africa, households with low levels of education were acutely affected by the adverse economic effects of the pandemic, as they must rely on reduced labor income influenced by lockdown and quarantine policies (Arndt et al., 2020). Kansiime et al. (2021) report similar results for Uganda and Kenya, where poor households dependent on labor income must use food-based coping strategies such as involuntarily changing dietary patterns. Moreover, the documented adverse effect of gender discrimination against women during the pandemic reveal it as one of the main contributors to their higher food insecurity (Béné et al., 2021; International Food Policy Research Institute [IFPRI], 2021; United Nations, Uganda, 2020).

Concerning policy action on food security inequities, we recommend that policymakers consider three broad approaches: (a) identify disadvantaged groups through an intersectionality lens and consider joint, non-additive effects of being disadvantaged rather than independent effects; (b) include context-specific strategies, specifically by benefiting from mixed-methods approaches; and (c) focus on advancing women's rights in the context of food security by targeting inequalities in the socioeconomic, political, and cultural context.

To tackle food security inequities, policymakers should not limit themselves to socioeconomic (social strata) and demographic (social identity) determinants. They should intentionally include the social processes and hierarchical power dynamics (structural determinants) that shape a system of oppression and privilege, which is complicit in the inequitable distribution of food security determinants when observed through an SDH and intersectionality lens.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

ETHICS STATEMENT

Gallup is not affiliated with political or advocacy groups, and all collected information regarding respondents' identities is strictly confidential. Gallup data are collected using scientifically proven methodologies to provide reliable and impartial data that are allowed to be used by individuals, governments, and organizations. Consultation with the research ethics board office at McGill University established that ethical approval for GWP secondary data analysis was not required.

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ENDNOTES

[1] For more details about intersectionality criteria, see Bauer et al. (2021).

[2] Design effect = 1.51; margin of error = 3.8.

[3] By 2030, end hunger and ensure year-round access by all people, particularly among poor and vulnerable people, including infants, to safe, nutritious, and sufficient food, https://www.un.org/sustainabledevelopment/hunger/

[4] Gallup weighs data to ensure each country's sample is nationally representative. In the presented analytic approach, the data were `svyset` and respondent-level weighting variables were included.

[5] We used `mchange` command in STATA.

[6] Average marginal effects (AME) represent an effect on average across the sample, which is the average (mean) of the marginal effects calculated for each observation in the sample; for further details, see Mize (2019).

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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