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Research Paper

Water and food insecurity and linkages with physical and sexual intimate partner violence among urban refugee youth in Kampala, Uganda: cross-sectional survey findings

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ABSTRACT

Water insecurity (WI) and food insecurity (FI), each associated with violence exposure, are understudied in urban humanitarian settings. We conducted a cross-sectional survey with urban refugee youth in Kampala, Uganda to examine: (a) social-ecological correlates of WI, FI, and concurrent FI and WI; (b) associations between WI and FI with recent sexual and physical intimate partner violence (IPV); and (c) associations between an Index of Vulnerability (IoV) comprised of social-ecological stressors (e.g., FI, WI) and recent physical/sexual IPV. Among participants ($n = 340$; mean age: 21.1 years, standard deviation: 2.6) almost half (47.8%) reported WI and two-thirds (65.0%) FI. In adjusted analyses, time in Uganda, age, and insecure housing were associated with increased odds of WI and concurrent FI and WI; household toilet sharing and insecure housing were associated with increased odds of FI. In adjusted analyses, WI, concurrent FI and WI, housing insecurity, and parenthood were associated with higher sexual IPV odds. FI and parenthood were associated with increased odds of physical IPV. IoV scores were associated with physical/sexual IPV, and IoV scores accounted for more variance in physical/sexual IPV than any individual indicator. Future research can address WI and co-occurring resource insecurities to reduce gender-based water-related violence risks.

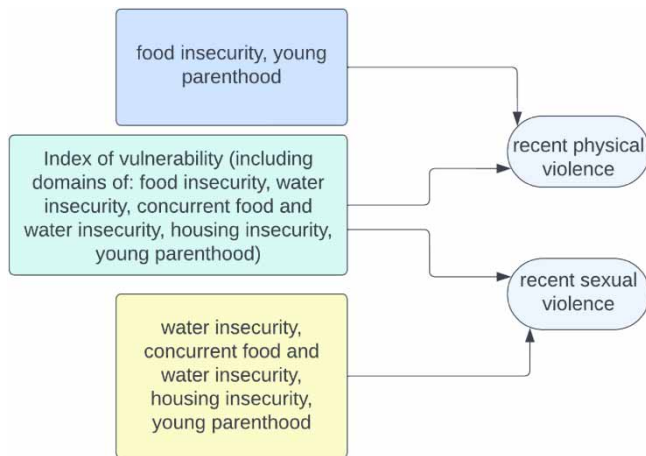
Key words: food insecurity, intimate partner violence, refugees, sexual violence, water insecurity, youth

HIGHLIGHTS

- Urban refugee youth are understudied in water insecurity and violence research.
- Urban refugee youth in Kampala experience co-occurring food and water insecurity that increase risks of sexual intimate partner violence (IPV).
- Water insecurity-related household stressors may be associated with sexual IPV, while food insecurity-related household stressors may be linked with physical IPV.

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GRAPHICAL ABSTRACT



INTRODUCTION

By the end of 2022, there were approximately 108.4 million forcibly displaced people globally (UNHCR 2023a), many experiencing water and food insecurity (Behnke *et al.* 2020; Calderón-Villarreal *et al.* 2022). Water and food insecurity, and their co-occurrence, have harmful consequences, including exposure to violence (Behnke *et al.* 2020; Boateng *et al.* 2022; Calderón-Villarreal *et al.* 2022). Social-ecological stressors such as poverty, gender norms, and psychosocial stress (Wutich & Brewis 2014; Logie *et al.* 2019, 2021a; Nisbet *et al.* 2022) may amplify violence exposure in contexts of food and water insecurity. Refugee youth (16–29 years) in urban low- and middle-income contexts (LMICs) may be at the nexus of resource scarcities, and associated risks of violence, yet are understudied. This is of particular concern in Uganda, the largest refugee-hosting nation in Africa with over 1.5 million displaced persons (UNHCR 2023b) of whom more than 100,000 live in the urban setting of Kampala.

Kampala hosts over 35,000 urban youth refugees, many of whom are women and children (60%), without jobs (94%), and forcibly displaced from nearby countries such as the Democratic Republic of Congo and South Sudan (UNHCR 2023b). Many urban refugees in Kampala live in informal settlements that experience precarious housing and limited access to water, sanitation, and hygiene (WASH) (Saliba & Silver 2020), food, and other basic necessities. Water insecurity itself is a widespread phenomenon in Kampala, as 19% of residents lack access to safe water (UMWE 2017). There is a growing body of evidence documenting linkages between water insecurity and food insecurity independently with increased exposure to violence.

Systematic reviews have documented multifaceted pathways from water insecurity, and constrained WASH access, to gender-based violence (GBV) risks (Pouramin *et al.* 2020; Nunbogu & Elliott 2022; Tallman *et al.* 2023). For instance, a review of $n = 29$ papers in LMICs conceptualized how *individual factors* (e.g., socio-economic status, physical ability, life stage) and complex *contextual factors* (socio-cultural [e.g., gender norms], environmental [e.g., distance, season], structural [e.g., infrastructure, policy]) contribute to multiple forms of GBV, including physical, psychological, and sexual violence (Nunbogu & Elliott 2022). In another review of $n = 18$ studies on water insecurity and GBV in African and South Asian contexts, authors documented *typologies of violence* (e.g., economic, sexual, physical, verbal) across *places* (households, walks to collect water, water collection points) and *types of water insecurity* (access, adequacy, reliability, safety, affordability) (Tallman *et al.* 2023). The third global review of $n = 59$ studies examined water, gender, and health interlinkages, and documented that women/girls were largely responsible for collecting water and this could involve travelling long distances (Pouramin *et al.* 2020). In many global contexts where water is sourced away from household premises, and women and girls carry the burden of accessing and managing household water needs, there are risks of sexual violence while travelling to water sources, and/or the need to engage in transactional sex (itself a risk factor for violence) to access clean and sufficient water (Pouramin *et al.* 2020; Tallman *et al.* 2023; UNICEF 2023). For example, a qualitative study in Bidi Bidi refugee settlement, Uganda, discussed how women and girls most often take on the role of water collectors and may face sexual assault risks when obtaining water, particularly during the dry season when water sources are insufficient and they need to travel to farther places for

water (Logie *et al.* 2022b). Importantly, while WASH insecurity may elevate GBV risks it does not cause them, as GBV across all global regions is rooted in gender-based inequity and its intersection with socio-political and economic inequities (True-love 2011, 2019; Pommells *et al.* 2018; Nunbogu & Elliott 2022).

Food insecurity and IPV are also strongly interrelated, particularly in LMICs in southern Africa (Hatcher *et al.* 2019, 2022; Macassa *et al.* 2022). This relationship is also complex and linked with inequitable gender norms, mental health challenges, and a response by men to feeling a lack of control when their traditional role of 'breadwinner' is compromised (Hatcher *et al.* 2019, 2022; Melzer 2002; Nunbogu & Elliott 2022). Although literature on the impacts of water and food insecurity on violence exposure is growing, these insecurities are often examined separately despite their frequent co-occurrence. A recent review of 25 LMICs reported that across global regions, including Africa, the odds of reporting food insecurity were over two-fold higher for those experiencing concurrent water insecurity (Young *et al.* 2023). A study in Kenya with women with mixed HIV serostatus found that water and food insecurity co-occurred, and over time water insecurity was associated with subsequent food insecurity (Boateng *et al.* 2022). A study in Lesotho also found co-occurring food and water insecurity was linked with poorer mental health (Workman & Ureksoy 2017).

Co-occurring water and food insecurity, and linkages with violence, are understudied in humanitarian settings, in particular urban settings where refugees may be living in informal settlements (Saliba & Silver 2020). This is important to further explore, as a review found that refugee camps/settlements in Uganda had WASH inequalities regarding basic sanitation and basic hand hygiene access when compared with national Ugandan non-refugee contexts (Calderón-Villarreal *et al.* 2022). This review, including 21 refugee camps in Bangladesh, Kenya, Uganda, South Sudan, and Zimbabwe, also found geographic disparities regarding WASH access, whereby refugee camps in Uganda had higher unimproved sanitation services (54%) and open defecation (10%) than the other country contexts, as well as the lowest sanitation privacy (8%) (Calderón-Villarreal *et al.* 2022). Water insecurity is a noted issue in rural refugee settlements in Uganda, with health and social impacts. For instance, a cross-sectional study examining associations between water insecurity and depression among refugee youth in Bidi Bidi Refugee Settlement in rural Uganda found that 80% of participants reported water insecurity, which was associated with depression severity (Logie *et al.* 2023b). Qualitative studies from the same population of refugee youth in Bidi Bidi found that co-occurring resource insecurities (e.g., food, water, firewood) produced excess stress and elevated GBV risks among refugee youth (Logie *et al.* 2021a, 2022b). Researchers have also discussed food insecurity in protracted refugee contexts such as Nakivale refugee settlement in Uganda (Oliver & Ilcan 2018), as well as inequitable food systems between refugee and host communities at Uganda's northern border (Kang *et al.* 2023). A study prior to the COVID-19 pandemic reported that food insecurity was associated with increased violence among urban refugee youth in Kampala (Logie *et al.* 2019), yet water insecurity and its potential linkages with violence were not examined. Kampala's chronic water insecurity (UMWE 2017) exacerbated food insecurity among Kampala's refugees during the COVID pandemic (Khan 2020; Okiror 2020). How these may interlinked and pose risk factors for violence warrants attention among urban refugee youth in Kampala.

Conceptual frameworks for exploring multiple co-occurring resource scarcities, such as water and food, include the resource insecurity framework (Wutich & Brewis 2014) and political ecology of health approaches to vulnerability (Leatherman 2005). The resource insecurity approach explores ecological (e.g., weather), socio-economic (e.g., poverty), and social (e.g., gender equitable norms) factors that elevate community exposure to food and water insecurity, while also examining how these factors may shape differential experiences and impacts of food and water scarcity (Wutich & Brewis 2014). Conceptual parallels between water and food insecurity have been tested in the context of mental health with non-refugees in diverse contexts, whereby both of these resource scarcities were associated with depression in Lesotho (Workman & Ureksoy 2017) and interacted to predict depression in Kenya (Boateng *et al.* 2022). A study in India found that food insecurity mediated the pathway from water insecurity to depression (Maxfield 2020). The separate and concurrent impacts of water and food insecurity on GBV among refugees are less explored.

Approaches to vulnerability aligned with the political ecology of health examine how structural and social inequities constrain coping capacities and ultimately contribute to poorer health outcomes (Leatherman 2005). Tallman (2016) applied a similar approach to vulnerability in the development of an Index of Vulnerability (IoV) that explores social-ecological life domains, including water and food insecurity, and linkages with health outcomes in the Peruvian Amazon. This study found that the IoV score was associated with several poor mental and physical health outcomes and in fact was a stronger predictor than any singular life domain, recommending future application across contexts (Tallman 2016). To our knowledge, the IoV has not been explored in relation to violence experiences in humanitarian settings.

As detailed above, knowledge gaps exist regarding experiences of water and food insecurity, their co-occurrence, and linkages with violence among urban refugees. To address this gap, we conducted a community-based cross-sectional survey with urban refugee youth in Kampala, Uganda, to examine: (a) social-ecological correlates of water insecurity, food insecurity, and concurrent water and food insecurity; (b) associations between water insecurity, food insecurity, and concurrent water and food insecurity, with recent sexual violence and IPV experiences; and (c) associations between an IoV that assesses social-ecological stressors (food insecurity, water insecurity, concurrent water and food insecurity, housing insecurity, young parenthood) and recent physical and sexual IPV.

METHODS

Study design and setting

We conducted a cross-sectional survey between October 2021 and December 2021 in Kampala in collaboration with Ugandan organizations, including a refugee-serving community-based organization (Young African Refugees for Integral Development [YARID]), the International Research Consortium, and the Ministry of Health. These baseline survey data were collected before the implementation of a COVID-19 prevention study called *Kukaa Salama* ('Staying Safe' in Swahili) (Logie *et al.* 2021b, 2023a) focused on mobile health approaches to improving COVID-19 preventive practices with urban refugee youth. While methodological details are described in-depth in Logie *et al.* (2021b), in short, *Kukaa Salama* was a sub-study embedded within the *Tushirikiane* ('Supporting one another' in Swahili) cohort study that engaged a community-based sample of urban refugee youth in Kampala in HIV testing (Logie *et al.* 2021c, 2023c).

Positionality statement

Situating the individual and collective identities of our team within this work is vital because positionality shapes all facets knowledge production and dissemination. The first author is a mid-career academic social scientist from Canada living in Toronto, Canada, with extensive research in the areas of intersectional stigma, refugee health, and resource insecurities with over 20 years of experience working, living, and conducting research in various African countries. The senior author is an Ethiopian post-doctoral fellow currently living in Toronto, Canada with extensive research and nursing practice experience in East Africa. The co-authors collaborate on community-based research and reflect a diverse network of researchers, including different perspectives, lived experiences, and backgrounds. The team of co-authors includes persons with lived experience of resource insecurity, refugee journeys, im/migration journeys, as well as gender-based stigma, violence, racism, and lesbian, gay, bisexual and queer (LGBQ) stigma. Our team includes cisgender men and women, sexually diverse and heterosexual persons, majority Black and other racialized persons; the authors are comprised of persons living and working in Uganda from Uganda and the Democratic Republic of Congo, persons from Africa (Uganda, Ethiopia, Cameroon) living in North America, as well as persons from North and South America working in Africa. It includes people from various levels of training, including undergraduate, graduate, doctoral and post-doctoral levels, as well as academic faculty members, clinicians, and community-based service providers. Our team includes a range of disciplines, including psychology, social work, pharmacy, engineering, and public health. This community-based research approach, reflected in our inclusive approach to authorship, integrates various social positionalities and in turn, this helps to address and minimize bias, and increase the validity and relevance, of the findings.

Population and data collection

Kukaa Salama inclusion criteria included: identifying as a refugee or forcibly displaced person or having refugee parent/s; currently enrolled in *Tushirikiane*; aged 16–24 at enrollment; living in one of five informal settlements (Katwe, Kabalagala, Kansanga, Nsambya, Rubaga) in Kampala; able to provide informed consent; ownership or access to a mobile phone; and speaking English, French, Swahili, Kinyarwanda, and/or Kirundi, which were the study languages.

We trained 12 peer navigators, aged 18–24, living in the five selected informal settlements and identifying as refugees/forcibly displaced persons, to recruit study participants using purposive sampling, including peer-driven sampling and venue-based sampling at YARID (Logie *et al.* 2021b). *Tushirikiane* participants were subsequently contacted via phone, text messaging, and/or WhatsApp to assess interest in voluntarily enrolling in *Kukaa Salama*; participants could stay enrolled in *Tushirikiane* without enrolling in *Kukaa Salama*.

Trained research assistants collected data on tablets using standardized questionnaires in the five study languages on the SurveyCTO platform (SurveyCTO, Doblity, Cambridge, USA), in a private room at YARID or a private location of the

participant's preference in one of the informal settlements. We received Research Ethics Board approval from the University of Toronto (Protocol Number: 37496), Mildmay Uganda Research Ethics Committee (Ref: 0806–2019), and Uganda National Council for Science & Technology (Ref: HS2716). Written informed consent was obtained from all participants by a peer navigator prior to enrollment, and verbal informed consent was obtained by research assistants and witnessed by a peer navigator at the time of data collection.

The study aimed to recruit $n = 330$ participants; $n = 270$ were required to have 80% power ($p < 0.05$) to detect moderate effect size, at a level of significance of $\alpha = 0.05$, assuming an intraclass correlation of 0.01 and standard deviation of 7. Calculations were performed using RStudio version 3.3.0, based on the proportional multiple comparison formula and adjusted according to the design effect.

Measurement

Outcome variables were recent (past 3 months) physical intimate partner violence (IPV) (3 items) and sexual IPV (2 items), measured by five questions from the revised conflict tactics scale (Straus 2004). The questions assessed exposure to violence from an intimate partner in the past 3 months, including physical violence (hitting, kicking, slapping, pushing, shoving) and sexual violence (forced sex and other unwanted sexual contact). Participants were categorized as 'yes' if they experienced any form of sexual IPV and/or physical IPV in the past 3 months, otherwise they were categorized as 'no.'

Exposure variables included water insecurity, food insecurity, concurrent water and food insecurity, housing insecurity, and parenthood/having dependents. *Water insecurity* was measured by a single item (yes/no) question, 'In the last 14 days, have there been times when you did not have enough water when you need for hand washing or bathing?' 'Yes' was categorized as experiencing recent water insecurity. *Food insecurity* was assessed by a single item question 'How often do you go to bed hungry because you didn't have enough to eat?' with response options of never, sometimes, most days and every day. Participants who answered 'never' (No) were categorized as 'food secure', and those who reported sometimes, most days or every day were categorized as 'food insecure' (Yes). This single item measure has been used in prior research in Kampala (Logie *et al.* 2020, 2022a). *Concurrent water/food insecurity*: We examined the proportion of individuals classified as water insecure who also reported food insecurity. Participants who did not report both water and food insecurity were coded as 0 (no concurrent water/food insecurity), and those who reported both water and food insecurity were coded as 1 (concurrent water and food insecurity).

Housing security was measured as a binary categorical variable to assess if participants reported living in a house with a secure roof (concrete, iron sheets, tiles), floor (wood, vinyl, ceramic, cement), walls (wood or cement), and electricity (Yes/No responses for each item) (UBOS and ICF 2018), in which case they were categorized as secure housing, otherwise they were categorized as 'non secure housing' (Iddi *et al.* 2022). To create a composite variable of housing security with these four variables (roof, floor, walls, electricity), we conducted a principal components analysis, where we found that these variables loaded onto a single component, with factor loadings ranging from 0.51 to 0.83 and a Cronbach α of 0.68, providing support for adequate construct validity for 4 items (Taber 2018). We also assessed if participants used a *shared toilet* as a binary variable (Yes/No), and for those who responded affirmatively, we asked if they shared with more than five households. We assessed *parenthood/having dependents* with a binary (Yes/No) item.

Socio-demographic factors examined included gender, age (continuous), place of birth, length of time in Uganda (≤ 5 years, 6–10 years, > 10 years), highest level of education (categorical: less than secondary school, some secondary school, and secondary school or higher), and employment (employed, not employed, student).

Index of Vulnerability

We created an IoV informed by Tallman's (2016) multi-dimensional measure of social-ecological factors linked with stress and poorer health outcomes. We included five life domains that are conceptually linked with increased vulnerability to IPV among youth and refugees, including *structural level factors* (food insecurity, water insecurity, concurrent food and water insecurity, housing insecurity) and an *interpersonal level* factor (parenthood/having dependents). This also aligns with a political ecology of health approach to vulnerability that moves beyond the individual level of analysis to focus on how marginality is socially produced and reflects power inequities that harm wellbeing (Leatherman 2005; Brown *et al.* 2017; Tallman *et al.* 2019).

We conceptualize water and food insecurity (and their co-occurrence) and housing insecurity as *structural level* variables as they reflect structural violence – inequitable social and structural arrangements that cause harm, poor social and health

outcomes, and ultimately limit people from realizing their potential (Farmer *et al.* 2006). For instance, at the policy level, urban refugees are not included in Kampala's strategic planning (Saliba & Silver 2020) which in turn reduces economic opportunities and contributes to resource insecurities; when refugees leave official refugee settlements in Uganda for urban areas they are no longer eligible for social assistance yet may experience language and other barriers to employment; and people living in Kampala's slums (refugees and non-refugees alike) have inadequate access to safely managed water (Tumwebaze *et al.* 2023).

There is also a high burden of adolescent parenthood among youth in many African contexts (Ajayi *et al.* 2023), including among non-refugee youth in Uganda (~20% prevalence) (Chemutai *et al.* 2022) and urban refugee youth in Kampala (23% prevalence) (Malama *et al.* 2023), which has been linked with social exclusion (e.g., stigma, educational exclusion) (Ajayi *et al.* 2023). Additionally, pregnant and parenting young women experience increased exposure to violence in African contexts compared with non-pregnant or parenting peers (Tetteh *et al.* 2020; Toska *et al.* 2020). Together these data reflect the importance of considering parenthood among urban refugee youth as an *interpersonal level* vulnerability to violence.

Aligned with the IoV development approach (Tallman 2016), we coded each IOV indicator as 1 (risk) or 0 (no risk) and these were then summed to calculate an IoV score that ranged from 0 (no risk) to 5 (high risk across each domain). This uniform coding of variables results in all IoV measures having the same valence, with higher scores implying higher vulnerability.

Statistical analysis

Socio-demographic characteristics were analysed using frequencies and percentages for categorical variables and means and standard deviations for continuous data. Bivariate analyses were conducted to determine the strength of the association between each study outcome (physical, sexual IPV) and socio-demographic and exposure variables, and then multivariable logistic regression analyses using a block regression approach were conducted to identify independent risk factors for physical and sexual IPV after adjustment for socio-demographic factors (informal settlement, age, and gender). Relationships between risk factors for recent physical/sexual IPV were expressed as odds ratio (OR), adjusted odds ratio (aOR), and 95% confidence intervals (CI).

For IoV analyses, we conducted multivariable logistic regression analyses to assess associations between higher IoV scores with recent sexual violence and physical IPV after adjusting for age, gender, and informal settlement. To compare IoV and its constituent parts on the prediction and strength of association with each IPV outcome, we conducted separate models where each variable (IoV, food insecurity, water insecurity, concurrent food and water insecurity, housing insecurity, parenthood) was included as exposure variables, and recent sexual and physical IPV as outcome variables, adjusting for age, gender, and informal settlement. Finally, we examined x-standardized ORs using the *listcoef* command as this produces ORs that are independent of the units of measurement for original variables and are comparable to one another. All statistical analyses were conducted using Stata Version 14.2 (StataCorp, College Station, TX).

RESULTS

Participants characteristics

As shown in Table 1, the mean age of participants ($n = 340$) was 21.1 years (SD: 2.6; range 16–24); nearly half ($n = 166$; 48.8%) were cisgender men and half ($n = 174$; 51.2%) cisgender women. Almost 5% ($n = 16$) of participants reported that they had recently experienced sexual IPV and 4.4% ($n = 15$) physical IPV. Almost half ($n = 162$; 47.8%) reported water insecurity, nearly two-thirds ($n = 221$; 65.0%) food insecurity, and over one-third concurrently reported water and food insecurity ($n = 123$; 36.3%).

Gender differences were observed in age, education, and likelihood of parenthood. Specifically, women were younger than men (mean age 20.6 vs. 21.6, $p < 0.001$); women were more likely than men to report their highest level of education as less than secondary school ($n = 67$; 39.4% for women vs. $n = 34$; 20.6% for men, $p = 0.001$); and women were more likely to be parents compared to men (18.4% vs 6.6%; $p = 0.001$).

Factors associated with water insecurity and food insecurity

Table 2 summarizes the associations between socio-demographic characteristics with food insecurity, water insecurity, and concurrent food and water insecurity. In multivariable analysis adjusted for gender, age, and informal settlement, participants who had lived in Uganda for more than ten years had higher odds of water insecurity (OR = 3.13; 95% CI = 1.72–5.71;

Table 1 | Socio-demographic characteristics among *Kukaa Salama* urban refugee youth participants in Kampala, Uganda ($N = 340$)

Variable	N (%) , or mean (SD)	Women (n = 174)	Men (n = 166)	P value
Socio-demographic variables				
Age, years	21.1 (2.6)	20.6 (2.5)	21.6 (2.6)	< 0.001*
Place of birth $\diamond^{n=10}$				0.641
Democratic Republic of Congo	253 (77.8%)	122 (77.2%)	129 (79.1%)	
Burundi	34 (10.5%)	17 (10.8%)	16 (9.8%)	
Uganda	14 (4.3%)	9 (5.7%)	5 (3.1%)	
Other ^A	24 (7.4%)	10 (6.3%)	13 (8.0%)	
Length of time in Uganda				0.987
≤5 years	132 (38.8%)	68 (39.1%)	64 (38.6%)	
6–10 years	123 (36.2%)	62 (35.6%)	61 (36.8%)	
>10 years	85 (25.0%)	44 (25.3%)	41 (24.6%)	
Employment				
No employment	174 (51.2%)	91 (52.3%)	83 (50.0%)	0.160
Student	78 (22.9%)	45 (25.9%)	33 (19.9%)	
Employed (paid/unpaid)	88 (25.9%)	38 (21.8%)	50 (30.1%)	
Highest level of education $\diamond^{n=5}$				0.001*
Less than secondary school	101 (30.2%)	67 (39.4%)	34 (20.6%)	
Some secondary school	206 (61.5%)	91 (53.5%)	115 (69.7%)	
Secondary school or higher	28 (8.3%)	12 (7.1%)	16 (9.7%)	
Structural factors				
Food insecure				
No	119 (35.0%)	58 (33.3%)	61 (36.8%)	0.509
Yes	221 (65.0%)	116 (66.7%)	105 (63.2%)	
Water insecure $\diamond^{n=1}$				
No	177 (52.2%)	87 (50.3%)	90 (54.2%)	0.469
Yes	162 (47.8%)	86 (49.7%)	76 (45.8%)	
Concurrent food and water insecurity $\diamond^{n=1}$				
No	216 (63.7%)	106 (61.3%)	110 (66.3%)	0.339
Yes	123 (36.3%)	67 (38.7%)	56 (33.7%)	
Housing insecurity				
Secure	155 (45.6%)	82 (47.1%)	73 (44.0%)	0.560
Insecure	185 (54.4%)	92 (52.9%)	93 (56.0%)	
Interpersonal factors				
Have children (dependents)				
No	297 (87.4)	142 (81.6)	155 (93.4)	0.001*
Yes	43 (12.6)	32 (18.4)	11 (6.6)	
IPV in past 3-months				
Experienced sexual IPV				
No	324 (95.3%)	164 (94.2)	160 (96.4)	0.353
Yes	16 (4.7%)	10 (5.8)	6 (3.6)	
Experienced physical IPV				
No	325 (95.6%)	165 (94.8)	160 (96.4)	0.484
Yes	15 (4.4%)	9 (5.2)	6 (3.6)	

Note: SD, standard deviation; Other^A = Kenya, South Sudan, Rwanda, Tanzania, and Somalia. \diamond^n = missing values. * $p < 0.01$. **Bold** reflects statistical significance of $p < 0.05$.

Table 2 | Unadjusted and adjusted multivariable logistic regression models for experiencing water and food insecurity among *Kukaa Salama* urban refugee youth participants in Kampala, Uganda (*N* = 340)

Variables	Water insecurity		Food insecurity		Concurrent food/water insecurity	
	Unadjusted OR ^a (95% CI)	Adjusted OR ^b (95% CI)	Unadjusted OR ^a (95% CI)	Adjusted OR ^b (95% CI)	Unadjusted OR ^a (95% CI)	Adjusted OR ^b (95% CI)
Age						
16–18	Ref	Ref	Ref	Ref	Ref	Ref
19–21	0.76 (0.41, 1.40)	0.79 (0.43, 1.45)	1.41 (0.75, 2.66)	1.45 (0.77, 2.74)	0.76 (0.39, 1.46)	0.79 (0.41, 1.52)
22–24	0.88 (0.47, 1.62)	0.94 (0.50, 1.75)	1.17 (0.62, 2.20)	1.23 (0.65, 2.36)	1.11 (0.58, 2.10)	1.20 (0.62, 2.30)
25 +	2.78 (1.22, 6.33)*	3.11 (1.34, 7.26)**	2.02 (0.87, 4.70)	2.21 (0.93, 5.25)	2.33 (1.02, 5.30)*	2.67 (1.15, 6.24)*
Gender						
Man (cisgender)	Ref	Ref	Ref	Ref	Ref	Ref
Woman (cisgender)	1.17 (0.76, 1.81)	1.33 (0.85, 2.11)	1.15 (0.73, 1.83)	1.25 (0.78, 2.02)	1.25 (0.79, 1.98)	1.44 (0.89, 2.32)
Place of birth						
Uganda	Ref	Ref	Ref	Ref	Ref	Ref
DRC Congo	0.43(0.15, 1.24)	0.35 (0.12, 1.05)	0.26 (0.06, 1.18)	0.24 (0.05, 1.13)	0.34 (0.12, 0.97)*	0.29 (0.09, 0.83)*
Burundi	0.21 (0.06, 0.74)*	0.17 (0.05, 0.60)**	0.20 (0.04, 0.99)*	0.19(0.04,0.95)*	0.15 (0.04, 0.56)**	0.12 (0.03, 0.47)**
Other	0.39 (0.11, 1.34)	0.42 (0.12, 1.48)	0.50 (0.09, 2.64)	0.54 (0.09, 2.90)	0.40 (0.12, 1.35)	0.44 (0.13, 1.52)
Length of time living in Uganda						
1–5 years	Ref	Ref	Ref	Ref	Ref	Ref
6–10 years	2.43 (1.44, 4.09)**	2.28 (1.33, 3.89)**	1.36 (0.80, 2.31)	1.34 (0.78, 2.30)	1.60 (0.92, 2.76)	1.55 (0.89, 2.72)
>10 years	3.53 (1.96, 6.35)**	3.13 (1.72, 5.71)**	1.80 (0.98, 3.30)	1.68 (0.91, 3.12)	2.61 (1.43, 4.74)**	2.36 (1.28, 4.36)**
Employment						
Unemployed	Ref		Ref		Ref	
Student	0.86 (0.49, 1.49)		0.71 (0.39, 1.27)		0.94 (0.53, 1.67)	
Employed	0.68 (0.40, 1.15)		1.18 (0.68, 2.08)		0.85 (0.49, 1.49)	
Educational status						
<Secondary	Ref		Ref		Ref	
Some secondary	0.92 (0.57, 1.49)		1.08 (0.65, 1.79)		0.94 (0.57, 1.57)	
>Secondary	0.53 (0.21, 1.30)		1.05 (0.43, 2.56)		0.79 (0.31, 2.03)	
Parenthood/have dependents						
No	Ref		Ref		Ref	
Yes	1.61 (0.84, 3.12)		2.25 (1.05, 4.83)*	2.04 (0.91, 4.57)	1.53 (0.78, 3.00)	
Share toilet (yes vs. no)						
No	Ref		Ref		Ref	
Yes	1.14 (0.68, 1.93)		1.83 (1.04, 3.21)*	1.88 (1.06, 3.32)*	1.30 (0.75, 2.27)	
Share toilet with >5 households						
No	Ref		Ref		Ref	
Yes	0.59 (0.32, 1.08)		1.69 (0.91, 3.14)		0.80 (0.42, 1.51)	

(Continued.)

Table 2 | Continued

Variables	Water insecurity		Food insecurity		Concurrent food/water insecurity	
	Unadjusted OR ^a (95% CI)	Adjusted OR ^b (95% CI)	Unadjusted OR ^a (95% CI)	Adjusted OR ^b (95% CI)	Unadjusted OR ^a (95% CI)	Adjusted OR ^b (95% CI)
Housing insecurity						
Secure	Ref	Ref	Ref	Ref	Ref	Ref
Insecure	4.35 (2.73, 6.94) **	4.05 (2.50, 6.57) **	2.02 (1.27,3.21)**	1.96 (1.20,3.18) **	3.61 (2.20, 5.92) **	3.39 (2.03, 5.67) **

Note: OR, odds ratio; CI, confidence interval.

^aAnalyses adjusted for informal settlement.

^bAnalyses adjusted for age, gender, and settlement.

* $p < 0.05$; ** $p < 0.01$. **Bold** reflects statistical significance of $p < 0.05$.

$p < 0.001$) and more than two-fold higher odds of concurrent water/food insecurity (aOR = 2.36; 95% CI = 1.28–4.36; $p = 0.006$) compared to newer residents (1–5 years). In addition, participants who shared a toilet reported significantly higher food insecurity compared to those who did not share a toilet (aOR = 1.88; 95% CI = 1.06–3.32; $p = 0.031$). In analyses adjusted for gender and informal settlement, participants aged ≥ 25 were three times more likely to report water insecurity (aOR = 3.11; 95% CI = 1.34–7.26; $p = 0.008$) and over twice as likely to report concurrent water/food insecurity (aOR = 2.67; 95% CI = 1.15–6.24; $p = 0.023$) than younger participants (aged 16–18). Insecure housing was associated with increased odds of reporting water insecurity (aOR: 4.05; 95% CI: 2.50–6.57; $p < 0.001$), food insecurity (aOR: 1.96; 95% CI: 1.20–3.18; $p = 0.007$), and concurrent water and food insecurity (aOR: 3.39; 95% CI: 2.03–5.67; $p < 0.001$) in adjusted analyses.

Factors associated with recent sexual and physical intimate partner violence

Sexual violence

In adjusted analyses, participants who reported water insecurity (aOR = 3.34; 95% CI = 1.06–10.55; $p = 0.039$) and concurrent food and water insecurity (aOR = 3.22; 95% CI = 1.07–9.65; $p = 0.037$) had three-fold higher odds of recent sexual IPV compared to water secure counterparts (Table 3). Insecure housing (aOR: 3.52; 95% CI: 1.02–12.07, $p = 0.045$) and parenthood/having dependents (aOR: 4.62; 95% CI: 1.43–14.94, $p = 0.011$) were also associated with significantly higher odds of recent sexual IPV.

Physical violence

Compared to food secure participants, food insecure participants were over five-fold more likely to experience physical IPV (aOR = 5.14; 95% CI = 1.11–23.82; $p = 0.037$). Those with dependents were over four-fold more likely to report recent physical IPV (aOR: 4.36; 95% CI: 1.25–15.28, $p = 0.021$) than those with no dependents.

Index of vulnerability and physical and sexual violence

Respondents' mean IoV score was 2.2 (SD = 1.5), with no significant differences between women (2.3; SD = 1.6) and men (2.1; SD = 1.5; $p = 0.21$). Participants with higher total IoV scores (reflecting higher vulnerabilities across dimensions) had greater odds of reporting recent sexual IPV (aOR: 1.77; 95% CI: 1.22–2.58, $p = 0.003$) and physical IPV (aOR: 1.78; 95% CI: 1.21–2.62, $p = 0.003$) compared with those with lower IoV scores in adjusted analyses. In terms of magnitude, a higher IoV score was associated with the largest increases in risk of experiencing recent physical and sexual IPV compared to independent effects of each variable (Table 4). IoV, water insecurity, concurrent food and water insecurity, having dependents, and housing insecurity were associated with recent sexual IPV, while IoV, food insecurity, and having dependents were associated with recent physical IPV.

DISCUSSION

In this study with urban refugee youth in Kampala, we found widespread food insecurity (65.0%), water insecurity (47.8%), and concurrent food and water insecurity (36.3%). We identified water insecurity, concurrent food and water insecurity, housing insecurity, and parenthood as social-ecological stressors associated with higher odds of reporting sexual IPV, and food

Table 3 | Unadjusted and adjusted logistic regression models for recent (past 3 months) sexual and physical IPV experiences among *Kukaa Salama* urban refugee youth participants in Kampala, Uganda ($N = 340$)

Variable	Experienced recent sexual IPV		Experienced recent physical IPV	
	Unadjusted OR ^a (95% CI)	Adjusted OR ^b (95% CI)	Unadjusted OR ^a (95% CI)	Adjusted OR ^b (95% CI)
Age	1.36 (0.81, 2.31)	1.51 (0.87, 2.61)	1.20 (0.70, 2.04)	1.30 (0.75, 2.27)
Gender				
Man (cisgender)	Ref	Ref	Ref	Ref
Woman (cisgender)	1.68 (0.59, 4.77)	2.09 (0.70, 6.22)	1.54 (0.53, 4.49)	1.78 (0.58, 5.47)
Water insecurity				
No	Ref	Ref	Ref	Ref
Yes	3.09 (1.03, 9.23)*	3.34 (1.06, 10.55)*	2.95 (0.97, 8.98)	3.16 (0.97, 10.24)
Food insecurity				
No	Ref	Ref	Ref	Ref
Yes	3.12 (0.86, 11.33)	3.09 (0.84, 11.39)	5.08 (1.11, 23.22)*	5.14 (1.11, 23.82)*
Concurrent water and food insecurity				
No	Ref	Ref	Ref	Ref
Yes	3.25 (1.14, 9.23)*	3.22 (1.07, 9.65)*	3.12 (1.07, 9.12)*	3.07 (0.99, 9.54)
Parenthood/Have dependents				
No	Ref	Ref	Ref	Ref
Yes	5.65 (1.96, 16.31)**	4.62 (1.43, 14.94)*	4.55 (1.49, 13.86)**	4.36 (1.25, 15.28)*
Housing insecurity				
Secure	Ref	Ref	Ref	Ref
Insecure	3.06 (0.95, 9.81)	3.52 (1.02, 12.07)*	2.96 (0.91, 9.66)	3.42 (0.97, 11.99)

Note: OR, odds ratio; CI, confidence interval.

^aAdjusted for informal settlement.

^bAdjusted for age, gender, and settlement.

* $p < 0.05$; ** $p < 0.01$. **Bold** reflects statistical significance of $p < 0.05$.

Table 4 | Comparisons between an IoV and constituent parts in predicting recent sexual and physical IPV among *Kukaa Salama* urban refugee youth participants in Kampala, Uganda ($N = 340$)

Variable	Sexual IPV			Physical IPV		
	Adjusted model OR (95% CI)			Adjusted model OR (95% CI)		
IoV	1.77 (1.22, 2.58)**			1.78 (1.21, 2.62)**		
	Standardized OR – ORx					
Outcomes	IoV	Food insecurity	Water insecurity	Concurrent food/ water insecurity	Having dependents	Housing insecurity
Sexual IPV	2.39**	1.71	1.83*	1.76*	1.66*	1.87*
Physical IPV	2.41**	2.18*	1.78	1.72	1.63*	1.85

Note: ORx – standardized odd ratio, IoV – Index of Vulnerability. Each cell is a separate model adjusting for age, gender, and informal settlement.

* $p < 0.05$, ** $p < 0.01$.

insecurity and parenthood as factors linked with reporting physical IPV. We adapted an IoV method to include multiple resource insecurities (food, water, concurrent food and water, housing) as well as parenthood among refugee youth, and this IoV was associated with higher odds of both physical and sexual IPV and was a stronger predictor of each type of IPV than any singular domain. Taken together, our findings signal the potential utility of an IoV approach for identifying recent IPV with urban refugee youth. Water insecurity and its interlinkages with food insecurity are important considerations

in future urban refugee IPV research and programming, and conversely, WASH research can assess and address multiple interconnected resource scarcities and associations with vulnerability to violence especially among multiply marginalized populations.

Our findings build on past research in several ways. First, our finding that water insecurity was associated with sexual IPV in urban refugee settings aligns with past qualitative research with youth in rural refugee settings in Uganda that discussed multiple pathways from water insecurity to sexual violence, including via inequitable gender norms that elevate risks for violence in times of resource insecurity and when accessing off-site resources (Logie *et al.* 2021a, 2022b). This aligns with a global review that identified common pathways from water insecurity to violence include risk of exposure while walking a distance to access water, as well as increased IPV when women cannot meet gendered household water expectations (Tallman *et al.* 2023). This review called for additional research on the spectrum of violence and presents a typology of gender-based water violence that includes sexual and physical violence associated with water collection, and physical and verbal violence in water insecure households (Tallman *et al.* 2023). However, we found recent sexual (and not physical) IPV linked with water insecurity, suggesting sexual IPV may occur in water insecure households. As our study focused on COVID-19 and not WASH or IPV specifically, study measures did not assess all dimensions of water insecurity in WASH standards (e.g., accessibility, quality, safety, affordability, acceptability), or examine control and verbal dimensions of IPV, thus may have overlooked complex pathways to IPV. This is an important future research area, as a review of drought and IPV in 19 Sub-Saharan African countries found associations between drought and a controlling partner, physical violence, and sexual violence (Epstein *et al.* 2020). Nunbogu & Elliot's (2022) conceptual model also examines how WASH-related GBV includes psychological violence, which involves insults and threats.

Second, our finding that food insecurity was associated with physical IPV aligns with systematic review findings of the mechanistic pathways from food insecurity to GBV (Hatcher *et al.* 2022). For instance, Hatcher *et al.* (2022) describe multiple dimensions of food insecurity (e.g., hunger) linked with GBV via individual (e.g., alcohol-related coping), relationship (e.g., inequitable gender norms), and social (e.g., social isolation) pathways. Our findings also align with past research with urban refugee youth in Kampala on food insecurity as a risk factor for poly-victimization in young adulthood (Logie *et al.* 2019), and extends beyond this to underscore the importance of considering food insecurity's co-occurrence with water insecurity as an additional IPV risk. We also build on past research on higher odds of food insecurity among parenting vs. not parenting urban refugee young women in Kampala (Malama *et al.* 2023) to show that parenting is associated with increased odds of both physical and sexual IPV. These findings on youth parenthood as a risk factor for recent IPV aligns with literature showing young mothers are at elevated risk for violence in African settings (Tetteh *et al.* 2020; Ajayi *et al.* 2023).

Third, our finding that housing insecurity was associated with increased odds of sexual IPV aligns with discussions of the pervasive social problem of violence within slum and informal settlement contexts and its interlinkages with larger contexts of poverty, constrained WASH access, and overcrowded living conditions (Ezeh *et al.* 2017; Lilford *et al.* 2017), including in Kampala (Swahn *et al.* 2015, 2021). We also build on research that identifies housing insecurity as a conceptually distinct social determinant of health and predictor of violence in diverse geographies such as the US (Breiding *et al.* 2017), Canada (Goldenberg *et al.* 2023), South Africa (Meth 2016), and Tanzania (Silberg *et al.* 2022). Housing insecurity may have a cyclical relationship with IPV, whereby economically insecure persons may be dependent on intimate partners for housing and have less agency to leave violent relationships; women may also be at greater risk of housing insecurity after leaving an abusive relationship (Silberg *et al.* 2022). Notably, we found housing insecurity was associated with increased odds of food and water insecurity (and their co-occurrence), underscoring the importance of examining housing insecurity alongside food and water insecurity.

Our findings signal the importance of applying a conceptual framework that considers multiple resource insecurities and their interlinkages, such as the resource insecurity framework (Wutich & Brewis 2014) when examining larger contexts that elevate violence exposure in LMIC. We found water and food insecurity (and their co-occurrence) were each associated with IPV, suggesting similar conceptual pathways as noted in resource scarcity and mental health research (Workman & Ureksoy 2017; Boateng *et al.* 2022). Yet we found differences in *types of IPV* that were associated with each, signalling the need to better understand mechanistic pathways from dimensions of resource insecurity to types of violence. Our findings also underscore the relevance of applying a political ecology approach to vulnerability (Leatherman 2005; Tallman *et al.* 2019) that explores multiple social-ecological stressors that produce a space of vulnerability with human–environment interactions

that reflect ‘a mutually constitutive dialectic’ (Leatherman 2005, p. 66). This space of vulnerability includes access to multiple resources (e.g., water, food, housing) that shape exposure to IPV.

There are several study limitations. First, as this was a non-random community sample, findings cannot be generalized to all urban refugee youth in Kampala. Second, the cross-sectional analyses preclude understanding of causality, and there may have been bidirectional linkages between resource insecurities and IPV we were unable to examine. Water and food insecurity do not directly affect IPV, yet are proxies for larger social contexts of marginalization, stress, and constrained relationship power, and further research with longitudinal approaches can disentangle mechanistic pathways (Nunbogu & Elliott 2022). Third, our IPV measures were brief and did not include control or verbal abuse elements of IPV; future research can include more fulsome violence measures that also examine community and non-partner violence. Finally, the assessment of water and food insecurity would be strengthened by using more comprehensive and multi-dimensional measures, such as the Household Water Insecurity Experiences (Young *et al.* 2019) measure and the Household Food Insecurity Access Scale (Coates *et al.* 2007).

CONCLUSIONS

Our findings reveal the importance of considering multiple resource insecurities and their linkages with recent IPV among urban refugee youth in Kampala. We also identify an IoV approach as a helpful and interpretable tool for assessing multiple life domains that increase risks for IPV, and show its applicability to a new context (urban humanitarian LMIC) and social issue (recent IPV) (Tallman 2016). Findings have implications for better understanding and addressing vulnerabilities of young refugee parents to IPV, including addressing stigma and building community and family support (Webb *et al.* 2023). Water insecurity interventions may have additional benefits of reducing stress that could in turn reduce vulnerability to IPV (Wutich 2020; Wutich *et al.* 2020), and could consider means to assess and/or address food insecurity to respond to the global associations between water and food insecurity that require integrated policies and interventions (Young *et al.* 2023). Housing insecurity among youth participants living in Kampala’s informal settlements was also linked with water and food insecurity. Together findings signal the need for integrated, comprehensive strategies and social policies that focus on advancing GBV prevention, food security, WASH access, and poverty reduction in Kampala to reduce vulnerability to IPV and promote refugee youth wellbeing.

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AUTHOR CONTRIBUTIONS

CHL as principal investigator contributed to the conceptualization and methodology, provided resources, participated in investigation and writing the original draft and also supervised the work. MO contributed to the conceptualization and methodology, participated in investigation, supervision, writing the original draft, and also reviewed and edited the manuscript. Lauren Tailor participated in writing the original draft and assisted with revisions. Lina Taing participated in writing the original draft and also reviewed and edited the manuscript. CD participated in writing the original draft and also reviewed and edited the manuscript. LM contributed to the conceptualization and methodology, prepared resources and data curation, participated in writing the original draft, and also reviewed and edited the manuscript. RH and DKM contributed to the conceptualization and methodology, provided resources, participated in investigation and writing the original draft, and also reviewed and edited the manuscript. BK and AN supervised and investigated the work, participated in writing the original draft, and also reviewed and edited the manuscript. PK contributed to the conceptualization and methodology, participated in writing the original draft, and also reviewed and edited the manuscript. FM supervised the work, participated in writing the original draft, and also reviewed and edited the manuscript. ZA prepared formal analysis and data curation, and participated in writing the original draft.

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ETHICS APPROVAL

We received Research Ethics Board approval from the University of Toronto (Protocol Number: 37496), Mildmay Uganda Research Ethics Committee (Ref: 0806–2019), and Uganda National Council for Science & Technology (Ref: HS2716). We obtained written informed consent from all participants prior to study participation.

DATA AVAILABILITY STATEMENT

Data cannot be made publicly available; readers should contact the corresponding author for details.

CONFLICT OF INTEREST

The authors declare there is no conflict.

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