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The Effect of Violence and Intersecting Structural Inequities on High Rates of Food Insecurity among Marginalized Sex Workers in a Canadian Setting

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Abstract Food security is both a basic human right and a public health necessity. Despite known gendered contexts of food insecurity, there is a dearth of research on prevalence and factors driving increased food insecurity for sex workers in a criminalized setting. The current study longitudinally examines the prevalence and structural and individual factors associated with increased odds of food insecurity among street and off-street sex workers in a Canadian urban setting. Prospective analyses drew on data from a community-based longitudinal cohort of cis and trans women in street and off-street sex work in An Evaluation of Sex Workers Health Access (2010–2014). The primary outcome was a time-updated measure of food insecurity, using the Radimer-Cornell scale. We used bivariable and multivariable logistic regression using generalized estimating equations to prospectively model correlates of food insecurity over a five-year period. Of 761 cis and trans women sex workers, 72.4% ($n = 551$) were food insecure over the study period. Over a third (35.2%, $n = 268$) identified as Indigenous and a quarter, 25.6% ($n = 195$) were of a gender/sexual minority. Within the 11.0% ($n = 84$) of women living with HIV, 96.4% ($n = 81$) were food insecure over the follow-up period. In multivariable analysis, Indigenous ancestry (AOR = 1.58 [95% CI 1.18, 2.10]), unstable housing (AOR = 1.27 [95% CI 1.03, 1.57]), stimulant use (AOR = 1.97 [95% CI 1.57, 2.45]), heroin use (AOR = 1.72 [95% CI 1.36, 2.19]), mental health diagnosis (AOR = 2.38 [95% CI 1.85, 3.05]), recent violence (AOR = 1.54 [95% CI 1.24, 1.91]), means of food access: reliant on food services only vs. self-sufficient (AOR = 1.78 [95% CI 1.38, 2.29]), and means of food access: both vs. self-sufficient (AOR = 2.29 [95% CI 1.84, 2.86]) were associated with food insecurity. In separate multivariable models, both recent and lifetime physical and/or sexual violence remained independently associated with food insecurity (AOR 1.54 [95% CI 1.24, 1.91]; AOR 4.62 [95% CI 2.99, 7.14], respectively). Almost all study participants living with HIV reported being food insecure. These intersecting risks demonstrate the negative impacts associated with living with HIV, experiencing food insecurity and/or physical or sexual violence. This study also highlights the potential for interventions that address structural inequities (e.g., decriminalizing sex work) to have crosscutting impacts to reduce barriers to accessing necessities (including food) or health and social services (e.g., methadone; primary care).

Keywords Food insecurity · Sex work · Gender-based violence

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Introduction

Food insecurity is the inability to access an adequate quantity and quality of food in socially acceptable ways [1]. While food is a necessity for survival, and therefore a basic human right, approximately one in four people is food insecure globally [2]. In high-income settings, food insecurity and poor nutrition are prevalent concerns among people who use drugs [3], homeless populations [4], and people living with or affected by HIV [5–7] especially as food insecurity is associated with HIV transmission and decreased access to HIV treatment [8, 9].

There is increasing evidence that gender plays a key role in food security, particularly where women support families and children [10, 11]. Studies have shown that gendered power dynamics and gender norms (i.e., sexism) contribute to food insecurity through social and cultural norms of discrimination, limiting women's access to resources, financial, or otherwise [12]. At the same time, restricted autonomy over, and access to, food contribute to women's disempowerment [13]. Three recent epidemiological studies among poor and marginalized women in Brazil [14] and women of the general population in the USA [11, 15] found associations between physical and/or sexual intimate partner violence and food insecurity. Gender has emerged as an important theme for marginalized women and women living with HIV who have the highest risk of food insecurity [9, 16] and are affected by other known associated factors (e.g., homelessness/housing instability and substance use) [17, 18].

Despite this growing work on gender dynamics and structural drivers of food insecurity among homeless women and women who use drugs [19], there remains limited evidence on rates of food insecurity among cis and trans women sex workers. Furthermore, to our knowledge, there is limited research on the role of broader gender-based violence on food insecurity among women, or how this may differ for women living with HIV compared to their HIV-negative counterparts, as non-partner violence is shown to exist in marginalized groups of women at similar levels to partner violence [20, 21]. To address this gap, this study prospectively adapts a standardized food insecurity scale used with marginalized women living with and affected by HIV to examine the prevalence of moderate-to-severe food insecurity among street and off-street cis and trans women sex workers, and factors associated with increased odds of acute food insecurity.

Methods

We drew data from a community-based longitudinal cohort of street and off-street sex workers in Metro Vancouver, An Evaluation of Sex Workers Health Access (AESHA). The current analysis used prospective data collected between January 2010 and August 2014. AESHA was developed based on long-term community partnerships with sex work agencies since 2005 and an active Community Advisory Board of representatives from over 15 community agencies. Eligibility for the study includes being women (transgender and cisgender inclusive) aged 14 years and older, having exchanged sex for money within the last 30 days at baseline, and providing written informed consent. Experiential (current/former) sex workers are represented across interview, outreach and nursing staff, and all staff members have substantial community experience around sex work. Given the challenges of recruiting members of hard-to-reach criminalized and stigmatized populations in isolated/hidden locations, time-location sampling was used, as in previous studies [22], to recruit youth (defined as < 30 years; consistent with global guidelines) and adult cis and trans women sex workers through daytime and late night outreach to outdoor/public sex work locations (i.e., streets, alleys) and indoor sex work venues (i.e., massage parlors, micro-brothels, and in-call locations) across Metro Vancouver. Moreover, online recruitment was used to reach sex workers working through online solicitation spaces. Indoor sex work venues and outdoor solicitation spaces ("strolls") were identified through community mapping conducted together with current/former sex workers and continue to be updated by the outreach team. The study holds ethical approval through Providence Health Care/University of British Columbia Research Ethics Board.

At enrolment and on a bi-annual basis, women complete an administered questionnaire from a trained interviewer and HIV/STI/HCV serology testing by a project nurse. The main interview questionnaire elicits responses related to socio-demographics (e.g., age, gender/sexual identity, ethnicity, housing history), sex work patterns (e.g., number of clients, fees/types of sexual services, client characteristics, condom use), drug

use patterns of sex workers and their clients, physical work environment factors (e.g., type of work environment, access to condoms and other prevention resources), social/interpersonal environment factors (e.g., social cohesion among sex workers, exposure to intimate partner and occupational violence), and structural environment factors (e.g., adverse interactions with police, prostitution arrests). Following a pre-testing counselling questionnaire with the project nurse, Biolytical INSTI rapid tests are used for HIV screening, with reactive tests confirmed by blood draw for western blot. Voluntary self-swabs are collected for gonorrhea and chlamydia, and blood is drawn for syphilis. Sex workers can visit one of two office locations in Metro Vancouver or complete the interview-administered questionnaire and nursing component at their work or home location. All participants receive an honorarium of $40 CAD at each bi-annual visit for their time, expertise, and travel. Treatment is provided on-site by our project nurse for symptomatic STI infections, and free serology and Papanicolaou testing are also available, regardless of enrolment in the study.

Time-Updated Outcome

Moderate-to-severe food insecurity, the primary outcome, was a binary time-updated variable, defined as responding "often true" or "sometimes true" to at least one item on the Radimer-Cornell food insecurity scale [23] vs. "never true", with the last 6 months as a reference point. We measured household food insecurity using a validated version of the Radimer-Cornell food security scale (see Appendix A), which has been previously adapted, validated, and used in this setting with people who use drugs and people living with HIV [3, 6, 24]. For example, questions included "I worry about whether my food will run out before I get money to buy more", "I eat less than I think I should because I don't have enough money for food", and "the food I bought just didn't last and I didn't have money to buy more." Chronbach's alpha with the AESHA cohort was 0.87, indicating good internal consistency of the scale.

Explanatory Variables

Explanatory variables of interest considered a priori based on the literature included the following time-fixed variables using baseline data included the following: youth (< 30 years of age); identifying as a gender/sexual minority (gay, lesbian, bisexual, transgender, transsexual, two-spirit or otherwise gender non-conforming [LGBT2S], vs. straight and cisgender); self-identifying as Indigenous (First Nations, Métis, Inuit vs. non-Indigenous). All other variables were time-updated at semi-annual visits using the last 6 months as a reference point. *Structural variables* included housing (unstable housing defined as "yes" to living in SRO; shelter/hostel; hotel; treatment/recovery house; couch surfing; staying with family; staying with a friend; in a vehicle; on the street/alley/park; squatting; jail; or other; or having lived at any residence for less than 6 months); financially supporting dependents (defined as responding "yes" to "does anyone depend on you for financial support (including money, food, shelter, clothing, necessities)?"); means of food access (financially self-sufficient, reliant on food services only, both); and place of accessing food (outside the Downtown Eastside (DTES) only, within DTES only, both); place of solicitation and service defined as (outdoor; informal indoor; indoor); and police harassment without arrest (including physical and/or sexual harassment, held against will without arrest, confiscation of condoms or other personal belongings). *Individual-level variables* included living with a mental health issue (self-reported diagnosis); recent stimulant use (cocaine, crack, methamphetamine) by injection and/or non-injection use; and HIV and STI serostatus, based on nurse testing at baseline/semi-annual follow-up. STIs included one or more of acute gonorrhea, syphilis, or chlamydia. We examined (1) time-updated exposure to physical and/or sexual violence, using the last 6 months as a reference point, and (2) lifetime exposure to physical and/or sexual violence. Physical and/or sexual violence was defined as responding "yes" to physical assault, rape, or sexual abuse by any perpetrator (e.g., intimate partner, client, police, exploitative manager, stranger).

Statistical Analyses

To prospectively examine factors associated with moderate-to-severe food insecurity, we constructed explanatory models using bivariable and multivariable logistic regression using generalized estimating

equations (GEE). First, bivariable comparisons according to the outcome of moderate-to-severe food insecurity were carried out using the chi-squared test for categorical variables (or Fisher's exact test for small cell counts) and the Wilcoxon rank-sum test for continuous variables. For descriptive purposes, we stratified the outcome by HIV status. We examined the outcome using bivariable and multivariable GEE to account for multiple measures on the same individual, with a logit link for the dichotomous outcome.

Variables that were statistically significant at $p < 0.05$ in the bivariable GEE analyses or that were a priori variables were candidates for inclusion in the multivariable models. We used a manual backwards model selection process to identify the multivariable model with the best fit, as indicated by the lowest quasi-likelihood under the independence model criterion value [25]. All p values are two-sided and we performed all analyses using SAS software version 9.4 (SAS Institute, Cary, NC, USA).

Results

Sample Characteristics

This analysis included 761 cis and trans women sex workers in AESHA contributing to 3141 observations (median visits = 4, IQR = 2–6) between 2010 and 2014. Table 1 summarizes the baseline sociodemographic characteristics of the sample, stratified by the outcome of moderate-to-severe food insecurity. Over the study period, the average age was 34.9 years with 31.4% ($n = 239$) youth (< 30 years old) at baseline. A total of 11% ($n = 84$) of sex workers were living with HIV. Youth were more likely than older women to be food insecure. A quarter of the sex workers in the study, 25.6% ($n = 195$), self-identified as a gender/sexual minority and were more likely to be food insecure than heterosexual, cisgender sex workers.

Food Insecurity

At baseline, almost two thirds of sex workers, 64.9% ($n = 494$), were moderate-to-severely food insecure based on the Radimer-Cornell standardized scale, and this increased over the study period to almost three-quarters, 72.4% ($n = 551$). Additionally, 96.4% ($n = 81$) of the sex workers living with HIV were food insecure at some point during the study compared to 69.3% ($n = 455$) of sex workers who were not living with HIV. Three-quarters of sex workers, 75.6% ($n = 575$), reported either only buying their own food or sometimes buying their own food at baseline. One third, 33.8% ($n = 257$), of sex workers responded "yes" to losing weight over the past year because they did not have enough food to eat; 32.2% ($n = 245$) responded "yes" to having hunger pains in the past 6 months but not being able to eat because they could not afford food. Furthermore, 8.8% ($n = 67$) of sex workers responded "yes" to exchanging sex (including oral sex) directly for food in the last 6 months.

Bivariable and Multivariable Results

In bivariable GEE analyses, exposure to lifetime or recent physical and/or sexual violence (OR 12.11 [95% CI 8.08, 18.15] and OR 1.99 [95% CI 1.70, 2.32], respectively), living with a mental health issue (OR 3.16 [95% CI 2.46, 4.07]), living with HIV (OR 1.62 [95% CI 1.15, 2.29]), recent homelessness or unstable housing (OR 1.97 [95% CI 1.65, 2.34]), and recent stimulant (cocaine, crack, or crystal methamphetamine) use (OR 3.35 [95% CI 2.78, 4.03]) were associated with moderate-to-severe food insecurity.

In multivariable analysis, Indigenous ancestry (AOR = 1.58 [95% CI 1.18, 2.10]), unstable housing (AOR = 1.27 [95% CI 1.03, 1.57]), stimulant use (AOR = 1.97 [95% CI 1.57, 2.45]), heroin use (AOR = 1.72 [95% CI 1.36, 2.19]), mental health diagnosis (AOR = 2.38 [95% CI 1.85, 3.05]), recent violence (AOR = 1.54 [95% CI 1.24, 1.91]), means of food access: reliant on food services only vs. self-sufficient (AOR = 1.78 [95% CI 1.38, 2.29]), and means of food access: both vs. self-sufficient (AOR = 2.29 [95% CI 1.84, 2.86]) were associated with moderate-to-severe food insecurity (Table 2). We also considered a separate multivariable confounder model with lifetime exposure to physical and/or sexual violence to assess the long-term impact of exposure to violence, which resulted in an increased AOR of 4.62, 95% CI 2.99, 7.14.

Table 1 Baseline descriptive statistics and moderate-to-severe food security status for 761 cis and trans women sex workers in Metro Vancouver, Canada

Characteristic	Total (%) $N = 761$	Food insecure (%) $N = 494$	p value
Age (median, IQR)	35 (28–42)	33 (27–42)	0.183
HIV positive			
Yes	84 (11.0)	74 (15.0)	< 0.001
No	671 (88.2)	416 (84.2)	
Youth < 30			
Yes	239 (31.4)	166 (33.6)	0.081
No	521 (68.5)	328 (66.4)	
Gender/sexual minority			
Yes	195 (25.6)	161 (32.6)	< 0.001
No	566 (74.4)	333 (67.4)	
Indigenous ancestry			
Yes	268 (35.2)	225 (45.6)	< 0.001
No	493 (64.8)	269 (54.5)	
STI positive			
Yes	84 (11.0)	62 (12.6)	0.051
No	626 (82.3)	394 (79.8)	
Means of food access			
Financially self-sufficient	322 (42.3)	116 (23.5)	–
Reliant on services only	176 (23.1)	142 (28.7)	< 0.001
Both	253 (33.3)	229 (46.4)	< 0.001
Any recent physical or sexual violence			
Yes	284 (37.3)	238 (48.2)	< 0.001
No	454 (59.7)	236 (47.8)	
Any lifetime physical or sexual violence			
Yes	601 (79.0)	470 (95.1)	< 0.001
No	155 (20.4)	21 (4.3)	
Any unstable housing in the last 6 months or housing for less than 6 months			
Yes	619 (81.3)	438 (88.7)	< 0.001
No	141 (18.5)	55 (11.1)	
Financially supports other dependent/s			
Yes	228 (30.0)	108 (21.9)	< 0.001
No	533 (70.0)	386 (78.1)	
Number of financial dependents			
0	531 (69.8)	384 (50.5)	–
1–2	166 (21.8)	80 (10.5)	< 0.001
3+	32 (4.2)	12 (1.6)	< 0.001
Any injection or non-injection cocaine, crack, or crystal meth use in the last 6 months			
Yes	513 (67.4)	434 (87.9)	< 0.001
No	248 (32.6)	60 (12.2)	
Any injection or non-injection heroin use in the last 6 months			
Yes	318 (41.8)	272 (55.1)	< 0.001
No	443 (58.2)	222 (44.9)	
Primary place of servicing clients in the last 6 months			
Outdoor	319 (41.9)	270 (54.7)	–
Informal indoor	205 (26.9)	173 (35.0)	0.053
Indoor	236 (31.0)	50 (10.1)	< 0.001
Isolated spaces for solicitation in the last 6 months			
Yes	312 (41.0)	268 (54.3)	< 0.001
No	449 (59.0)	226 (45.8)	
Any police harassment, including arrest, while working in the last 6 months			
Yes	279 (36.7)	230 (46.6)	< 0.001
No	482 (63.3)	264 (53.4)	
Rushed negotiation with client due to police presence in the last 6 months			
Yes	272 (35.7)	243 (49.2)	< 0.001
No	489 (64.3)	251 (50.8)	
Place of accessing food			
Outside DTES only	419 (55.1)	210 (42.5)	–
DTES only	145 (19.1)	118 (23.9)	< 0.001
Both	189 (24.8)	161 (32.6)	< 0.001
Ever diagnosed with any mental health condition			
Yes	367 (48.2)	306 (61.9)	< 0.001
No	386 (50.7)	184 (37.3)	

Discussion

The present study found that 72.4% of sex workers were chronically and acutely food insecure over the five-year period, with close to a fivefold increased odds among those who experienced lifetime violence and 50% increased odds among those experiencing recent physical and/or sexual violence. Violence against sex workers is a human rights and public health concern globally [26] and it is elevated and exacerbated in settings where sex work is criminalized and where sex workers lack legal rights and protections [27, 28]. There is also some evidence to suggest that beyond workplace violence, structural and gendered barriers may place some sex workers at higher risk of intimate partner violence and other interpersonal violence, including physical and/or sexual violence perpetrated based on gender, heterosexism, homophobia, and transphobia [29–31].

Table 2 Multivariable logistic regression for moderate-to-severe food insecurity among 761 women and trans sex workers in Metro Vancouver, Canada

Variable	Food insecurity		
	Unadjusted odds ratio (OR)	Adjusted odds ratio (AOR)	95% confidence interval (CI)
Indigenous ancestry (yes vs. no)	2.82 (2.18–3.65)	1.58	1.18–2.10
Any unstable housing† (yes vs. no)	2.00 (1.65–2.34)	1.27	1.03–1.57
Any stimulant* use† (yes vs. no)	3.35 (2.78–4.03)	1.97	1.57–2.45
Any heroin use† (yes vs. no)	2.62 (2.16–3.19)	1.72	1.36–2.19
Ever diagnosed with mental health condition (yes vs. no)	3.16 (2.46–4.07)	2.38	1.85–3.05
Physical and/or sexual violence† (yes vs. no)	1.99 (1.70–2.32)	1.54	1.24–1.91
Means of food access			
Reliant on food services only vs. self-sufficient	2.89 (2.33, 3.60)	1.78	1.38–2.29
Both vs. self-sufficient	3.46 (2.85, 4.20)	2.29	1.84–2.86

*Crack, cocaine, or methamphetamine

† In the last 6 months

While growing research has focused on the scope and drivers of workplace violence against sex workers, including laws, policing, stigma, and poor working conditions and to some extent intimate partner violence far less is known about the impact of physical and/or sexual violence on access to basic necessities (e.g., food, housing) for sex workers. Ethnographic and qualitative work suggests that in settings where violence is ubiquitous and largely unaddressed, gendered power dynamics may severely limit sex workers' control over resources. A number of studies in San Francisco and Vancouver among street-involved, drug-using sex workers and among migrant sex workers have shown that sex workers who lack legal protections have less control over their income and may be more likely to have an intimate non-paying partner, regular client, or manager who is exploitative or violent [32–36]. The findings herein suggest that both recent physical and/or sexual violence and lifetime/historical exposure to physical and/or sexual violence, regardless of perpetrator, have a direct link to higher risk of food insecurity. While the exact mechanism of the relationship between physical and/or sexual violence and food insecurity is still unclear, this research suggests that structural barriers of criminalization and stigma previously shown to create poor working conditions and isolated and exploitative housing for sex workers may undermine sex workers' access to a basic human right adequate and secure access to food.

Studies among other marginalized populations in similar high-resource settings show equally high rates of food insecurity and a relationship to HIV risk. For example, a study from San Francisco revealed that food insecurity could lead to economic coercion and condomless sex (i.e., a risk factor for HIV transmission) because the need for food was a more urgent priority than condom use [37]. Another study among people living with HIV in San Francisco and among drug users living with HIV in Vancouver found associations between food insecurity and measures of high-risk sexual behavior [8, 38], a known correlate of past exposure to violence [39, 40], and a factor for HIV transmission.

Beyond violence, other intersecting inequities were independently associated with increased odds of food insecurity in the multivariable model for recent physical and/or sexual violence including unstable housing, stimulant or heroin use, and ever being diagnosed with a mental health condition, while youth and Indigenous women had among the highest rates of food insecurity. In the multivariable model for recent physical and/or sexual violence, diagnosis with a mental health condition approximately doubled the odds of food insecurity. Physical and mental health conditions are associated with,

and have been shown to increase, vulnerability to food insecurity and this vulnerability increases as the number of concurrent health conditions increases [41, 42]. Among injection drug users, a 2012 study found that in Ontario, Canada, 54.5% were food insecure due to a lack of money to buy food [43]. Our study found that heroin or stimulant use was associated with almost twice the odds of moderate-to-severe food insecurity. This may be because the immediacy of addictions can override the perceived necessity to buy food or due to stimulant use to suppress the appetite and stay awake [44]. It has also been suggested that the competing costs of food and drugs for people with addictions may contribute to food insecurity [45]. Unstable housing in the last 6 months was associated with increased odds of food insecurity. Vancouver's cost of living can make housing unaffordable for some and presents an unjust choice between shelter and food for others. Due to the long-lasting and intergenerational effects of colonialism, discrimination, and racism, Indigenous people in Canada often suffer from negative health outcomes associated with poverty and a lack of access to healthcare [46]. Ongoing systemic oppression leaves many Indigenous women and trans women with limited access to resources, employment, and family or community support, which may further impact food security.

In the Downtown Eastside (DTES), similar to other urban inner city centers in North America, access to fresh produce is scarce. Although some not-for-profit food services provide meals, they may not be safe or friendly for women or be accessible to sex workers' available hours. Not surprisingly, our findings suggest that sex workers who are reliant on food services have almost twice the odds of moderate-to-severe food insecurity compared to sex workers who are financially self-sufficient. One third of sex workers use not-for-profit food services or other non-paying means in conjunction with buying food for themselves. This may allow sex workers the agency to choose their own food when they are able, while supplementing their diet with not-for-profit services when necessary. Besides some convenience stores, sex workers who bought their own food within the DTES were most frequently accessing food from the only large fresh produce store in the area, and from a grocery chain with a store bordering the DTES.

Strengths and Limitations

Food insecurity assessment varies widely in the literature. Previous studies have used a single item from the scale or created a binary yes/no food insecurity measure [3], while some have combined and reported the full-scale measures to assess the broad impact of food insecurity [47]. Very few women in the present study are currently parenting children so there was insufficient statistical power for a separate children's hunger subscale. This study sample may not be representative of all sex workers in all contexts because identifying a representative sample is challenging when investigating criminalized and stigmatized environments. However, we include highly experienced interview, outreach, and nursing staff, including current/former sex workers, as well as multilingual mobile and sex worker outreach that allows for a large and diverse sample of sex workers. As with all self-reported data, responses may be vulnerable to social desirability bias, although, through the peer-to-peer nature of experiential staffing, interviewer rapport with sex workers, and explicit confidentiality, there is no reason to believe this would have differentially impacted our results.

Implications for Policy and Future Research

Since Canada's sex work laws force women to work in isolated areas where they are more vulnerable to violence, decriminalizing sex workers' means of obtaining money for food would allow women more security in meeting their basic nutritional needs. When women's ability to earn a living is threatened by criminalization, so too is their food security. Key international health and policy organizations including WHO, UNAIDS, and UNFPA encourage the decriminalization of sex work [48] because evidence shows that criminalization endangers sex workers [49] and limits access to services and support [50, 51]. Policy and law changes should reflect this growing body of evidence in support of sex work decriminalization in order to eliminate a key structural barrier to basic food security. Because lifetime exposure to violence is associated with drastically elevated odds of food insecurity, this particular relationship should be further examined through both

quantitative and qualitative research. Working towards the elimination of gender-based violence on structural, institutional, and interpersonal levels may improve health outcomes for sex workers, particularly those living with HIV, and result in increased levels of food security when gender-based violence is targeted through long-term, evidence-based education and policy. Trauma-informed clinical interventions by service providers at different levels of the healthcare system should connect women who have experienced violence to appropriate care and support services [52]. In Vancouver, these services may include Women Against Violence Against Women (WAVAW) and Battered Women's Support Services (BWSS) in Vancouver. At the same time, governments should initiate food programming and policies for marginalized populations in Vancouver to alleviate the pressure of food insecurity for sex workers in partnership with anti-violence and women-centered healthcare organizations. These programs should incorporate elements of choice and nutritional variety as sex workers who may try to supplement the food services they access are in fact more vulnerable to food insecurity. Programs to support women who experience violence should work to explicitly include and support Indigenous sex workers and women living with HIV. Sex workers who work in the DTES are buying their own food with their own money but do not have places in their communities to buy it. This is an area rampant with opportunity for supporting current initiatives (e.g., urban farms, reduced-cost grocery stores) and for innovative community-based, government-funded interventions to address this concern (e.g., online grocery shopping and delivery, pop-up/mobile produce stores).

Conclusion

Almost three-quarters of sex workers were food insecure over the study period, a prevalence that is three times higher than the global average [2] and approximately nine times higher than the Canadian national average [53]. Physical and/or sexual violence is significantly and independently associated with food insecurity among sex workers in Metro Vancouver. This association is alarming given the already marginalized status of sex workers in Canada due to laws that endanger their health and safety. Furthermore, almost all women living with HIV in this study experienced food insecurity. This indicates a major gap in services and may have significant population health implications for HIV treatment. Municipal and provincial governments must support and broaden the reach of programs that alleviate the pressure of food insecurity for marginalized women and are competent in addressing the needs of women who experience gender-based violence. They must work to specifically include Indigenous women, trans women, and women living with HIV. Service providers should be trained in assessing exposure to violence as well as their clients' food security status. Simultaneously, policy and law changes should reflect the growing evidence for sex work decriminalization to increase women's safety. Decriminalizing sex workers' means of obtaining money for food would allow women much more security in meeting their basic nutritional needs. Qualitative research into the reasons behind food insecurity for women who have experienced violence may provide more definitive explanations for this concerning association and provide insight into much needed interventions and supports for sex workers. Food security is a fundamental human right intrinsic to survival; gender-based violence impedes women's right to life, liberty, and security of person. Their demonstrated association in this study is cause for targeted action towards equity and social justice.

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Appendix

Table 3 Radimer-Cornell food insecurity scale, adapted for use in marginalized populations

Radimer/ Cornell Scale	
a. I worry about whether my food will run out before I get money to buy more ❑ N/A (eats meals only at drop-ins)	❑ Often true ❑ Sometimes true ❑ Never true
b. I worry about whether the food that I can afford to buy for my household will be enough ❑ N/A (eats meals only at drop-ins)	❑ Often true ❑ Sometimes true ❑ Never true
c. The food that I bought just didn't last, and I didn't have money to buy more ❑ N/A (eats meals only at drop-ins)	❑ Often true ❑ Sometimes true ❑ Never true
d. I ran out of the foods that I needed to put together for a meal and I didn't have money to get more food ❑ N/A (eats meals only at drop-ins)	❑ Often true ❑ Sometimes true ❑ Never true
e. We eat the same thing for several days in a row because we only have a few different kinds of food on hand and didn't have money to buy more ❑ N/A (eats meals only at drop-ins)	❑ Often true ❑ Sometimes true ❑ Never true
f. I am often hungry, but I don't eat because I can't afford enough food	❑ Often true ❑ Sometimes true ❑ Never true
g. I eat less than I think I should because I don't have enough money for food	❑ Often true ❑ Sometimes true ❑ Never true
h. I can't afford to eat properly	❑ Often true ❑ Sometimes true ❑ Never true
i. My child (children) are not eating enough because I just can't afford enough food ❑ N/A (no dependent children)	❑ Often true ❑ Sometimes true ❑ Never true
j. I know my child (children) are hungry sometimes, but I just can't afford more food ❑ N/A (no dependent children)	❑ Often true ❑ Sometimes true ❑ Never true
k. I cannot afford to feed my child (children) a balanced meal because I can't afford that ❑ N/A (no dependent children)	❑ Often true ❑ Sometimes true ❑ Never true

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