

This is an Accepted Manuscript version of the following article, accepted for publication in *Social Indicators Research*:

van Draanen, J., Hayashi, K., Milloy, M-J., Nosova, E., Shulha, H., Grant, C., & Richardson, L. (2021). Material security as a measure of poverty: A validation study with people who use drugs. *Social Indicators Research*, 157(501-521). <https://doi.org/10.1007/s11205-021-02663-1>

It is deposited under the terms of the Creative Commons Attribution-NonCommercialNoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

Material security as a measure of poverty: a validation study with people who use drugs

1.0 Introduction

Previous research has established the relationship between poverty and health for people who use illicit drugs (PWUD) using a variety of indicators (Galea and Vlahov 2002). However, the implications of using different measures of socioeconomic insecurity and the differential conclusions they produce about this population are underexamined. Income-based measures of poverty continue to dominate the literature (Galobardes et al. 2006) despite the growing recognition of their insufficiencies (Rosenfeld 2010; Besharov and Couch 2009; Turrell 2000; Richardson et al. 2015). Even measures of poverty that use combined measures of occupation, education, and income can still be problematically narrow because they fail to capture the full extent of resource scarcity for people with low socioeconomic status (SES). For PWUD, using narrow measures of poverty may be particularly problematic because of the information correlated with but excluded from these variables. Traditional measures of poverty do not therefore capture the full extent of insecurity and resource deprivation and may contribute to confusion in

understanding the relationship between socioeconomic marginalization and well-being for PWUD. There is a strong need to develop and employ more nuanced measures of socioeconomic disadvantage (Cassidy and Lynn 1991; Oakes and Rossi 2003). To respond to inadequacies in current measures, this study examines material security as a potentially informative measure of poverty and considers the relationship material insecurity – compared to other measures of poverty – may have with exposure to violence.

2.0 Background

2.1 Conceptualizations of Poverty

We conceptualize poverty as correlated adversity across multiple dimensions (material, social, bodily, psychological) and institutions (schools, neighborhoods, prisons) (Desmond and Western 2018). Material disadvantage is an experience often associated with exclusion from mainstream opportunities (Anand and Sen 1997; Levitas 2005) and inadequate resources in multiple domains necessary for full participation in society (Townsend 1979; Pfoertner, Andress and Janssen 2011). Our intention in conceptualizing poverty this way is firstly, to acknowledge that there are multiple types of disadvantage, and secondly, to measure the entrenched hardship created when different types of adversity cluster (Desmond and Western 2018). As scholars have articulated, informal and typically unmeasured resources may play a significant role in the socioeconomic well-being of low-income individuals and these resources are not otherwise captured in the most common measures of poverty (Sullivan, Turner and Danziger 2008). Informal and unmeasured benefits include social, material, and physical resources such as: food, housing and shelter, assets, relationships, and time and can vary from person to person (Narayan et al. 1999). Conceptualizing poverty as multi-faceted deprivation points to socioeconomic insecurity being neither inevitable

nor neutral. Rather, poverty is a phenomenon stemming from iniquitous social and economic relations and political choices (Green and Hulme 2005). Conceptualizing poverty in this way precludes reductionist conclusions about those living in poverty.

2.2 Material Security as a Measure of Poverty

Material security, or the absence of material deprivation, (e.g., housing, food, and service access) is an emerging construct aligned with understanding poverty as a multifaceted and latent variable (Townsend 1979). Our review of the literature revealed only one study to date that has investigated a comprehensive measure of material resources among PWUD (Ompad et al. 2012). This study established a modified 18-item version of the Family Resource Scale (Dunst and Leet 1987; Van Horn, Bellis and Snyder 2001) to be valid and reliable in measuring material security among PWUD as well as people who do not use drugs recruited from economically-disadvantaged neighborhoods in New York City. The 18-item FRS was also validated in a population of men who have sex with men in the United States and it was found to have high internal consistency in both cases (Ompad et al. 2012; Ompad et al. 2016). However, this measure of material security has yet to be validated and used across different populations of PWUD, in different geographic regions, or with different outcomes.

2.3 Exposure to Violence Among PWUD

People who use drugs are exposed to disproportionately high levels of violence (Marshall et al. 2008; Richardson et al. 2015; Kennedy et al. 2017). Both individual (Evans and English 2002) and structurally-produced inequities (Browning and Erickson 2009; Fagan, Wright and Pinchevsky 2015) make exposure to violence more common among PWUD. For example, social and

environmental factors such as: incarceration, street-based drug scene involvement, housing status, and individual socioeconomic marginalization, have all been shown to increase vulnerability to violence in past research (Wenzel et al. 2001; Wenzel et al. 2004a; Marshall et al. 2008; Wenzel et al. 2004b; Richardson et al. 2015). Associations between violence and social and environmental factors are consistent with theoretical approaches linking SES and health through multiple mechanisms and pathways (Link and Phelan 1995).

Exposure to violence is associated with further negative outcomes for PWUD, including: diminished social relationships, poor mental health, and increased problematic substance use (Gorman–Smith and Tolan 1998; Macmillan 2001; Finkelhor et al. 2011). The impact of violence-related morbidity and mortality is inequitably distributed and is disproportionately experienced in places where there are fewer resources to undertake effective violence prevention and response (Browning and Erickson 2009; Fagan, Wright and Pinchevsky 2015). This relationship can be understood through the Risk Environment Framework as occurring via interactions between individuals and the physical, economic, social and policy environments implicated in the production of drug-related harm (Rhodes 2009). Despite the frequent exposure of PWUD to violence and its associated morbidity and mortality, the relationship between poverty and violence has not been fully explored in this population. Moreover, while some studies have attempted to look at unconventional measures of SES (Richardson et al. 2015), to date research in this area has not approached the measurement of poverty in a robust way. Inadequately measuring poverty is a potentially significant oversight given the aforementioned limitations of traditional approaches to measurement and the theoretical rationale for alternative measures (Oakes and Rossi 2003), such as a material security scale, among PWUD.

2.4 Current Study and Hypotheses

To fill this gap in the literature, the current study further validates the FRS among PWUD by examining the relationship between material security and exposure to violence. Consistent with theories of SES and health (Link and Phelan 1995) and the Risk Environment Framework (Rhodes 2009), we expect poverty to be associated with exposure to violence for PWUD. We further seek to test the validity of a revised version of the FRS as a measure of poverty reflective of a variety of resources and elements of marginalization in a new study population. Additionally, we use analyses of the relationship between multiple indicators of poverty and exposure to violence to assess material security relative to other measures of low SES in this population. We hypothesize that: 1) the FRS will be a valid measure of poverty in this population, and; 2) low material security and other socio-structural indicators of low SES including employment and income generating activities, recent homelessness, and recent incarceration will be associated with increased likelihood of exposure to violence in a sample of PWUD in Vancouver, Canada.

3.0 Methods

3.1 Study Design and Study Sample

Data for this study come from two ongoing community-based prospective cohorts of PWUD: the Vancouver Drug User Study (V-DUS) and the AIDS Care Cohort to Evaluate exposure to Survival Services (ACCESS) study, which are described in detail elsewhere (Strathdee et al. 1998; Wood et al. 2008). Individuals were eligible to enroll in V-DUS if they were 18 years of age or older, had used injection drugs at least once in the previous month and resided in the Greater Vancouver area at the time of enrollment. Participants were eligible to participate in ACCESS if they used

any illicit drugs other than cannabis at least once in the thirty-day period prior to the baseline interview and were HIV seropositive. V-DUS participants who seroconverted during follow-up were transferred to the ACCESS study. All V-DUS and ACCESS participants completed a harmonized interviewer-administered questionnaire and provided blood samples for serologic testing at enrollment and subsequent semi-annual follow-up visits. The analytic sample for this study was restricted to individuals who answered questions on material security (n=1479). Both cohorts have received approval from the University of British Columbia/Providence Health Care Research Ethics Board.

3.2 Measures

The revised 18-item material security scale (Ompad et al. 2012; Ompad et al. 2016), modified from a 30-item FRS scale (Van Horn, Bellis and Snyder 2001) was added to the V-DUS and ACCESS questionnaires in June 2014. The scale asked participants how consistently they had adequate resources to meet a set of material needs including having food, adequate shelter, sufficient money for various expenditures and access to a range of services. Each item on the five-point scale had as possible response options: “never,” “occasionally,” “sometimes,” “usually,” and “always.”

The items included in the FRS measure multi-dimensional aspects of material security and in some respects are more thorough than other measures of poverty. For example, measuring how often participants have enough money for entertainment is indicative of the ability to participate fully in society and social experiences. The 18 items included in the scale can be seen in Table 1. The modified FRS was included in analyses as a total mean score (consistent with the way the scale has been used in previous analyses: Ompad et al. 2012; Ompad et al. 2016), computed with a possible range of 1 to 5 with higher scores indicative of more consistent access to resources. A

variety of explanatory variables were also included in bivariate and multivariate analyses. Sociodemographic characteristics included: age (years); ancestry (categorized as white vs. non-white); sex (male vs. female); educational attainment (\geq high school vs. $<$ high school); relationship status (in a stable relationship vs. not); sexual orientation (lesbian/gay/bisexual vs. heterosexual). A variety of variables identifying exposure to social-structural disadvantage were also included: foster care (ever living away from parents in an orphanage, foster home, group home, or as a ward of the state for a period of >1 month vs. never); recent homelessness (yes vs. no); recent incarceration (yes vs. no). Measures to capture employment and income generation activities in the previous six months were used including: employment (regular job, temporary job, or self-employed vs. no); income assistance (receiving regular payments from the government vs. no); illegal income generation (theft, robbing, or stealing; selling drugs; or other acquisitive criminal activity vs. no); street-based income generation (recycling, squeegeeing, or panhandling vs. no); sex work (yes vs. no) and total income (measured in dollars per month and operationalized per \$1000 of income). Drug use-related variables included in analyses were categorized as \geq daily vs. $<$ daily use in the past six months for the following: cocaine use; heroin injection; crack non-injection; methamphetamine use. Heavy alcohol use in the past six months was included (>14 drinks per week or >4 drinks on one occasion for male, and >7 drinks per week or >3 drinks on one occasion for female vs. no). Also included were public drug use (injecting drugs in public places vs. no); money spent on drugs ($<$ \$50/week vs. \geq \$50/week) and recent non-fatal accidental overdose (yes vs. no). The outcome measure was exposure to violence in the past six months (attacked, assaulted, or suffered other violence vs. no).

3.3 Analysis

First, an exploratory factor analysis (EFA) was done to establish the validity of the modified FRS in a Canadian sample of PWUD. The EFA was conducted to determine whether distinct factors exist in the revised FRS that represent distinguishable components of material security. We entered all items simultaneously and examined the factor loadings, eigenvalues, and fit. We determined fit to be present when items did not cross-load onto multiple factors and had a loading of 0.4 (i.e., a loading that is considered to be stable) or higher than loadings on other factors (Pituch and Stevens 2015). Criteria for adequate model fit (Hu and Bentler 1998) were as follows: root mean square error of approximation (Steiger 1980) below 0.05, standardized root mean square residual (Bentler 1995) below 0.08, comparative fit index (Bentler and Bonnett 1980) above 0.90, and the Tucker–Lewis index (Tucker and Lewis 1973) above 0.90. Exploratory factor analysis was conducted with data from the first follow-up after the revised FRS measure was introduced (June 2014) and was repeated with data from a later follow-up (June 2017) to confirm findings from the first EFA. We used the minimum residuals estimation method and the oblique (oblimin) rotation method in the EFA. Following the EFA, we conducted a confirmatory factor analysis with the more recent follow-up data (June 2019). Content validity was assessed with the presence of factors representing major conceptual components of material security. Criterion and construct validity for the revised FRS were assessed by examining the association between the mean FRS scale and sub scale scores and other known measures of low SES (i.e., living situation, income-generating activities, and educational attainment). Data were split to preform test-retest analyses of the established bivariate relationships to verify the robustness of results.

Examining the relationship of material security and violence, a multivariate generalized estimating equations (GEE) regression model was developed. Covariates included: age, sex, ethnicity,

educational attainment, foster care system involvement, employment/income generation variables, income level, recent incarceration, substance use variables, and revised FRS score. Because the outcome variable in this model was “yes/no” for exposure to violence; a binomial logistic regression was used. GEE models provide the ability to account for serial and unit correlation across longitudinal observations. This model type allows us to focus on population average effects at the observation level in a way that does not require joint distributional assumptions of the observed data and the individual-level random effects for robust inference (Hubbard et al. 2010). Baseline significance of covariates was assessed with t-tests. All p-values were two-sided. All statistical analyses were performed using R, version 3.2.4.

4.0 Results

4.1 Sample Characteristics

The majority of the sample identified as male (65.6%) and white (55.4%). At baseline, half of the participants finished high school (48.1%), nearly one-third were in a stable relationship (30.5%) and fifteen per cent identified as lesbian, gay, or bisexual (15.2%). Half of participants (49.0%) had experience with the foster care system. Baseline sample characteristics indicate the study population faced substantial economic and social precarity in the past six months. 94.0% of the sample received income assistance and 55.7% were living in Vancouver’s Downtown Eastside, an urban neighborhood characterized by an open drug market and high levels of poverty and criminalization. For the six months prior to interview, close to one in six participants (15.5%) experienced homelessness and 6.0% were incarcerated. In terms of daily drug use, cannabis was the most commonly used drug (by 49.6% of participants at most recent follow up), followed by heroin (44.1%), crack cocaine (43.4%), methamphetamine (34.0%), and cocaine (26.9%).

4.2 Factor Analysis and Content Validity

We conducted an EFA with both three and four factors and found the three-factor model to be a superior fit. The EFA revealed three distinct factors within the FRS. Factor 1 included: housing-related variables such as having a house/apartment, heat, water and furniture; Factor 2 referred to: economic resources including having a job as well as money for necessities, entertainment and savings; and Factor 3 included: items corresponding to basic needs such as food, clothes, medical/dental care and transport. Mean scale values, standard deviations, and loadings for each factor can be seen in Table 1. Two variables did not fit into any of the three factors: having a phone or access to a phone; and access to social assistance.

<< TABLE 1 ABOUT HERE >>

Model fit statistics for the EFA indicated acceptable fit of each of the items onto the corresponding factors with a χ^2 value of 345.6 ($p < 0.001$), a root mean square error of approximation of 0.048, a Tucker–Lewis index value of 0.94, and a standardized root mean square residual value of 0.028. Factors 1 and 2 had a correlation of 0.35. Factors 2 and 3 had a correlation of 0.32. Factors 1 and 3 had a correlation of 0.42. The mean revised FRS score is 4.02 ($SD = 0.64$, range 1-5), and variation exists across the scale items where access to medical care, for example, is high (mean = 4.85) for this population while scores for having money to save (mean=1.87) or a having a job (mean = 2.55) were substantially lower. The three factors identified in the EFA represent major substantive elements of material security: housing security, economic security, and basic necessities and service access (Ompad, Palamar et al. 2016). In our split data test-retest analysis

to ascertain the stability of the factor analysis; we found the results to be robust in three iterations of the analysis. The results in Table 1 are reflective of participants' first observations for the FRS and we subsequently repeated the EFA twice using: 1) the average FRS score across all observations; and 2) the most recent FRS score. We found that results were highly consistent regardless of the observation period used for the EFA.

Following the EFA, we conducted a confirmatory factor analysis (CFA) and found poor to mediocre fit (Browne and Cudeck 1992) with a χ^2 value of 684.5 ($p < 0.001$), root mean square error of approximation of 0.065, and a Bentler Comparative Fit Index of 0.634. Since the CFA did not confirm a multifactorial structure, we retain the EFA results, as suggested in the literature (Hurley et al. 1997). We then examined the suggested factors and their association with other indicators of low SES to better understand the structure and function of the scale. We suggest further examination of the factor structure of the revised 16-item material security scale, with the items representing having a phone or access to a phone; and access to social assistance removed.

4.3 Construct and Criterion Validity

Construct validity of the 16-item material security scale was examined to determine the extent to which the scale compares with other well-established measures of poverty and socioeconomic insecurity. Criterion validity was examined to determine how well the scale is associated with concurrent and future outcomes. Mean material security scores were compared across social and demographic variables, income-generating activities, and drug use variables to assess construct and criterion validity. We conducted sensitivity tests in the analysis of validity by estimating bivariate GEE for each of the covariates and the revised 16-item FRS twice, splitting the data in half temporally. When the coefficients from the split data test-retest analysis were plotted together,

the resulting r-squared value was 0.93; indicating a high degree of similarity between the bivariate relationships observed in the two periods studied.

As can be seen in Table 2, mean material security score varied across social and demographic factors, being higher for those who are male, in a stable relationship, and completed a high school diploma. In addition, those who had experienced homelessness or incarceration had substantially lower material security scores. In terms of employment and income generation – variables often used to represent SES – mean material security score was higher for those who reported full-time, part-time, or self employment than those without regular employment and also varied according to various income generating activities. See Table 2 for bivariate associations between key variables of interest and material security scores. Income assistance receipt was associated with statistically significantly lower mean scores on the economic resources factor of the scale. Informal, prohibited and illegal forms of income generation were associated with lower material security. For example, illegal income generation was associated with lower mean FRS scores both overall and on all subscales, as were street-based income generation and sex work.

For concurrent validity (an element of criterion validity), mean material security scores were negatively associated with several drug use variables indicative of higher socioeconomic marginalization or vulnerability including: money spent on drugs, borrowing money for drugs, recent overdose, daily heroin injection, daily crack use, and daily methamphetamine use. Mean material score and all of the subscales were additionally negatively associated with unmet service needs.

<< TABLE 2 ABOUT HERE >>

4.4 Exposure to Violence

As a second component of criterion validity to assess the predictive validity of the 16-item material security scale, we examine its association with our outcome of interest; exposure to violence in the last six months. In a full GEE model depicted in Table 3, controlling for demographic characteristics, income generation activities, social experiences, and drug use, we find that higher material security is strongly and significantly associated with lower odds of exposure to violence. Conversely and counterintuitively, total income is positively associated with exposure to violence. Certain forms of income generation increase exposure to violence, including: street-based income generation and sex work. Unsurprisingly, these variables are indicators of labour market marginality and income insufficiency. Individuals required to generate income in this way operate in a socioeconomic milieu in which they may be more likely to encounter violence. Two other measures of SES are not associated with exposure to violence: education and employment status. This model is also instructive about the role other factors play in exposure to violence. Lifetime interaction with the foster care system increases the odds of being exposed to recent violence, as does recent incarceration. Recent heavy alcohol use, recent public drug use, and recent overdose all increase the odds of being exposed to violence, holding other factors constant. The GEE model was also run with mean values for the subscales representing three factors from the material security scale: housing security (factor 1), economic resources (factor 2), and basic needs (factor 3). Factors 1 and 2 were statistically significantly associated with violence and factor 3 was not. All other variables in the model had similar associations with violence as the model with the full scale.

<< TABLE 3 ABOUT HERE >>

5.0 Discussion

5.1 Summary of Main Findings

Socioeconomic marginalization is a known correlate of exposure to violence among drug-using populations; however, studies in this area have historically relied on traditional or single dimensions measures of poverty and low SES (Cassidy and Lynn 1991; Chauvel 2002; Oakes and Rossi 2003). This study advances an alternative method of measuring important components of poverty among PWUD by validating a revised 16-item version of an existing material security scale in Canada. The EFA conducted indicated the revised material security scale has high internal consistency and three distinct factors representing: 1) housing security; 2) economic resources; and 3) basic necessities. These three factors are similar to those found by other authors (Ompad et al. 2012, Ompad et al. 2016) with some slight differences including health and social services being a unique factor, and the absence of a housing-related factor in the New York City populations. The confirmatory factor analysis found poor to mediocre fit of the multifactor model. Additionally, material security score was significantly negatively associated with exposure to violence, net of demographics, social experiences, and substance use.

5.2 Establishing a Valid Measure of Material Security

Through exploratory factor analysis, we find that two items previously included in the FRS are not associated with any of the three factors in the material security scale: namely, access to a phone and social assistance receipt. This is potentially explained by how access to a phone has become ubiquitous, even amongst impoverished populations, and may have insufficient variation in our

sample population. Similarly, social assistance receipt is very common in our sample. Nearly all participants receive government income support at baseline, making it an undiscerning marker of material insecurity. Given the relatively more comprehensive social assistance system in Canada, it is logical that the associations found in a U.S. population in this variable (Ompad, Nandi et al. 2012, Ompad, Palamar et al. 2016) were not present here.

Existing research on the material security scale in similar populations conducted only exploratory factor analyses (Ompad et al. 2012; Ompad et al. 2016), with this study being the first to also use a confirmatory factor analysis in a population of PWUD. We found disagreement between the EFA and CFA conducted, where the EFA suggested three factors and acceptable fit but the CFA did not demonstrate acceptable fit. We are unable to confirm the multifactorial nature suggested by the EFA, but present readers with information obtained in the EFA as suggested by other researchers (Hurley et al. 1997). It is common to have disagreement between EFA and CFA results (e.g. Hartman et al. 1999; Lonigan, Hooe, David and Kistner 1999; Wittkowski et al. 2008) and there exist possible methodological explanations for these findings. The EFA involves a data-driven approach to assessing factor composition while the CFA is a theory-driven approach that imposes more restrictions. The CFA is also more conservative than the EFA approach (van Prooijen and van der Kloot 2001). Therefore, while the new 16-item scale includes indicators of participants' housing security, economic resources, and basic necessities the modified FRS scale should be employed and interpreted with care. Further testing and validation in drug using and other populations for whom material security may be highly relevant and distinctly associated with key outcomes may provide additional insights into the use of the scale.

With the removal of the two items indicated above, the scale was found to have good construct validity in this population. Participants' mean material security scores aligned well with some single-domain indicators of socioeconomic marginalization (i.e., homelessness, education, employment), suggesting this scale robustly measures poverty and hardship for PWUD. In addition, it is more comprehensive than any of the single-domain measures to which it was compared. The mean material security was lower for those with lower educational attainment, and those without any employment in mainstream labour markets. Mean material score was additionally negatively associated with unmet service needs, a marker of lack of access to resources. Unmet service needs indicate participants' inability to obtain a health or social service needed, including: drug treatment, supervised injecting facilities, hospital access, housing assistance, counselling, or food services. Unmet service needs are suggestive of the structural deprivation experienced by this population. The findings reinforce the need to explore the role of health and social services in improving material security, as others have concluded (Salleh et al. 2020). The variation seen in mean material security score across different income generating activities was also indicative of the scale's ability to capture marginalization otherwise undetected in income-based measures of poverty. Precarious, informal and illegal forms of income generation were associated with lower material security scores. Although these activities may generate higher levels of income, they may produce added vulnerability. They are outside of the traditional labour market and may involve situated exposures to different risks (Richardson et al. 2015; Jaffe et al. 2018). The revised scale thereby captures components that single-domain SES measures do not address, particularly the vulnerability as well as the material risks and challenges of illegal income generation, street-based income generation, and sex work. Thus, we find strong construct validity for the revised 16-item scale.

In the assessment of concurrent criterion validity, associations between the revised 16-item FRS scale and a series of concurrent and related outcomes was tested. Mean material security scores were negatively associated with a significant variety of drug use variables that indicate vulnerability, including: money spent on drugs, borrowing money for drugs, recent overdose, and three daily drug use variables. Overall, the revised 16-item FRS yielded mixed findings from the factor analyses and strong findings from the other evaluations done to ascertain construct, and concurrent criterion validity. On the whole, we consider the FRS to hold considerable strength as a measure of socioeconomic marginalization in the population of PWUD and we recommend further testing and care when employing this measure.

5.3 Material Security and Exposure to Violence

We find, as hypothesized, that having a lower material security score is associated with higher odds of exposure to violence. This association demonstrates evidence of predictive criterion validity. Without the protection offered by housing, economic security, adequate food, clothing, and service access, violent experiences can become a more pervasive phenomenon (Bungay et al. 2010). Previous research with PWUD living in Vancouver's Downtown Eastside has documented their frequent exposure to street-based violence and their need to seek safety and security (Bungay et al. 2010). Looking at the results from the model run with each of the three factors within the revised FRS, it appears that housing insecurity and economic insufficiency may be driving the association with violence. Having adequate housing means less time is spent on the streets in environments where violence is more common, and allows for seclusion from the violence endemic in the drug trade (Shannon et al. 2008; Bungay et al. 2010; McNeil et al. 2014). Single

room-occupancy (SRO) housing is another environment where violence is common, and safe housing for PWUD should be prioritized given the dominance of SRO housing in many low-income communities including Vancouver's Downtown Eastside (Shannon et al. 2006; Knight et al. 2014). Saved money, reliable income sources, and resources that sufficiently cover basic needs offer economic security and protection from the vulnerability created by economic insecurity. Factor 3, encompassing basic necessities and service access, was not significantly associated with exposure to violence, *ceterus paribus*. Access to food, clothing, and health as well as social services can support mental and physical health (Galea and Vlahov 2002) but our analyses suggest they may not be inherently able to protect individuals from violence in the same way as housing and economic resources. This is a key finding, and an advancement in our understanding of how and why poverty is consistently linked to exposure to violence (e.g., Wenzel et al. 2001; Wenzel et al. 2004a; Marshall et al. 2008; Wenzel et al. 2004b; Richardson et al. 2015). As theorized, not all aspects of poverty are equally relevant to all outcomes. Our analyses point to housing and economic insecurity as particularly strongly associated with violence when controlling for other aspects of material security.

We found that certain forms of marginalized income generation, including street-based income generation, and sex work, increase exposure to violence. The association between marginalized income generation and violence may be related the absence of safe working conditions and protections provided in mainstream labour markets. The subsequent use of violence as a means of control and exploitation is thereby a risk in unregulated markets (Puyana et al. 2017). Conversely, in line with other scholarship in this area (Long et al. 2014), we found total income to be positively associated with exposure to violence. The counter-intuitive association between total income and

exposure to violence is an important indication of why it can be problematic to rely on single measure indicators of socioeconomic status, particularly among PWUD. In the current study, this unexpected finding is indicative of the reality that, for PWUD, added income can be a signal of more intensified drug use as well as signal of engagement in income generation activities that carry increased risk of exposure to violence (Richardson et al. 2015). Higher income for PWUD can also potentially result in individuals being targeted for their resources. In contrast, individuals who enjoyed higher levels of material security may have effectively leveraged these resources to avoid contexts or activities more likely to expose them to violence. Of note, most participants in our study have levels of income that fall near or below the federally established Low Income Cut-Off measure of poverty. As such, the findings about total income and violence should be understood within that context. Therefore, although we found that higher income levels were associated with greater exposure to violence, our findings are representative of trends in a population with income levels that are still very low relative to population averages. The use of a material security scale is further validated by these findings as a measure of SES reflective of the social and economic marginalization PWUD experience over and above single domain SES measures.

5.4 Limitations

Several limitations in this study should be accounted for in interpreting these results. First, our sample of PWUD is drawn primarily from Vancouver's Downtown Eastside. Thus, our sample may not be representative of PWUD more broadly, and may not be generalizable to other contexts. Costs of living in Vancouver are higher than most other settings in Canada, and the relationships between material resources, income, and violence seen in this study may not extend directly to geographic areas where costs of living and levels of housing insecurity are lower (Albouy,

Leibovici and Warman, 2013). It is possible that data on employment and income generation in this study are not reflective of the fluctuation in participants' economic situations (Moore, Stinson and Welniak 2000), as these variables require participant recall, combining multiple income sources, and are collected only every six months. Such limitations offer further encouragement for the use of a nuanced measure of socioeconomic marginalization like the 16-item FRS.

5.5 Implications for Measurement of Poverty

Having a robust measure of material security that includes dimensions of poverty not captured in single-domain measures of low SES has proven useful in differentiating the various risks and protections offered by these key material resources. Solely relying on total income, educational level, and/or occupation as a marker of SES may be misleading in populations of PWUD. Income, education, and employment variables do not properly account for the protection which comes from having a stable shelter, heat, water and furniture. Income, education, and employment variables additionally fail to capture the difference between cashflow and how much of that one is able to dedicate to their basic necessities, entertainment and savings, or able to reflect job precarity, informal labour and labour market exclusion experienced by PWUD (Richardson, Wood and Kerr 2013; Richardson et al. 2015). Finally, for those who are experiencing socioeconomic marginalization, there are often community-based resources or friend and family networks that can be leveraged to enable food security, access to clothes, and medical/dental care, transportation – all elements reflected in material security measures. Using measures of material security as we do in this study aligns measurement with the theoretical conceptualization of poverty as correlated adversity crossing multiple dimensions and brings awareness to the entrenched, intersecting nature of dimensions of hardship (Desmond and Western 2018). Thus, the modified 16-item FRS is an

acceptably robust tool that can be used in populations of PWUD to more accurately understand deprivation and its impact on health and well-being.

6.0 Conclusion

This study examined measurement of poverty among PWUD by determining the validity of a revised 16-item FRS, a measure of material security, in a sample of PWUD. We found mixed results from the factor analyses and strong indication of validity from multiple analyses, and as such recommend further investigations be performed on the FRS in other settings. Higher FRS scores were associated with lower odds of exposure to violence indicating that access to material resources might be able to protect against violence. By examining several additional measures of socioeconomic marginalization in this study, we conclude that the measure of material security used is robust and more accurately reflective of poverty, scarcity, and low SES for PWUD than single-domain income, education, or employment-based measures.

References

- Albouy, D., Leibovici, F., & Warman, C. (2013). Quality of life, firm productivity, and the value of amenities across Canadian cities. *Canadian Journal of Economics/Revue canadienne d'économique*, 46(2), 379-411.
- Anand, S., & Sen, A. (1997). Concepts of human development and poverty: A multidimensional perspective. *United Nations Development Programme, Poverty and human development: Human development papers*, 1-20.
- Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin* 107(2): 238.
- Bentler, P. M., & Bonett, D.G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin* 88(3): 588.
- Besharov, D. J., & Couch, K. (2009). European measures of income, poverty, and social exclusion: Recent developments and lessons for US poverty measurement. *Journal of Policy Analysis and Management*, 28(4), 713-715.
- Brady, D. (2018). Theories of the Causes of Poverty. *Annual Review of Sociology* 45, 155-175.
- Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological Methods & Research* 21(2): 230-258
- Browning, S., & Erickson, P. (2009). Neighborhood disadvantage, alcohol use, and violent victimization. *Youth Violence and Juvenile Justice*, 7(4), 331-349.
- Bungay, V., Johnson, J. L., Varcoe, C., & Boyd, S. (2010). Women's health and use of crack cocaine in context: Structural and 'everyday' violence. *International Journal of Drug Policy*, 21(4), 321-329.
- Cassidy, T., & Lynn, R. (1991). Achievement motivation, educational attainment, cycles of disadvantage and social competence: Some longitudinal data. *British Journal of Educational Psychology*, 61(1), 1-12.
- Chauvel, L. (2002). Educational Inequalities: Distribution of Knowledge, Social Origins and Social Outcomes. *Changing Structures of Inequality: A Comparative Perspective*, 10, 219.
- Foundation for Statistical Computing. (2016). R: A Language and Environment for Statistical Computing. Vol. 3.2.4, Vienna, Austria
- Desmond, M., & Western, B. (2018). Poverty in America: New directions and debates. *Annual Review Of Sociology*, 44, 305-318.
- Dunst, C. J., & Leet, H. E. (1987). Measuring the adequacy of resources in households with young children. *Child: Care, Health And Development*, 13(2), 111-125.

- Evans, G. W., & English, K. (2002). The environment of poverty: Multiple stressor exposure, psychophysiological stress, and socioemotional adjustment. *Child Development, 73*(4), 1238-1248.
- Fagan, A. A., Wright, E. M., & Pinchevsky, G. M. (2015). Exposure to violence, substance use, and neighborhood context. *Social Science Research, 49*, 314-326.
- Finkelhor, D., Turner, H., Hamby, S. L., & Ormrod, R. (2011). Polyvictimization: Children's Exposure to Multiple Types of Violence, Crime, and Abuse. *National Survey Of Children's Exposure To Violence 1*, 1-12.
- Gagné, T., & Ghenadenik, A.E. (2018). Rethinking the Relationship between Socioeconomic Status and Health: Challenging How Socioeconomic Status Is Currently Used in Health Inequality Research. *Scandinavian Journal of Public Health 46*(1):53-56.
- Galea, S., & Vlahov, D. (2002). Social determinants and the health of drug users: socioeconomic status, homelessness, and incarceration. *Public Health Reports, 117*(Suppl 1), S135.
- Galobardes, B., Shaw, M., Lawlor, D. A., Lynch, J. W., & Smith, G. D. (2006). Indicators of socioeconomic position (part 2). *Journal of Epidemiology & Community Health, 60*(2), 95-101.
- Gorman-Smith, D., & Tolan, P. (1998). The role of exposure to community violence and developmental problems among inner-city youth. *Development and psychopathology, 10*(1), 101-116.
- Green, M., & Hulme, D. (2005). From correlates and characteristics to causes: thinking about poverty from a chronic poverty perspective. *World Development, 33*(6), 867-879.
- Hartman, C. A., Hox, J., Auerbach, J., Erol, N., Fonseca, A.C., Mellenbergh, G.A. et al. (1999). Syndrome dimensions of the Child Behavior Checklist and the Teacher Report Form: A critical empirical evaluation. *Journal of Child Psychology and Psychiatry 40*(7): 1095-1116.
- Hu, L., & Bentler, P.M. (1998). Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychological Methods 3*(3): 424
- Hu, L., & Bentler, P.M. (1995). Evaluating model fit. In R. H. Hoyle (Ed.), *Structural Equation Modeling: Concepts, Issues, And Applications* (pp. 76-99). New York: Sage Publications, Inc.
- Hubbard, A. E., Ahern, J., Fleischer, N. L., Van der Laan, M., Satariano, S. A., Jewell, N., Bruckner, T., & Satariano, W. A. (2010). To GEE or not to GEE: comparing population average and mixed models for estimating the associations between neighborhood risk factors and health. *Epidemiology, 46*7-474.
- Hurley, A.E., Scandura, T.A., Schriesheim, C.A., Brannick, M.T., Seers, A., Vandenberg, R.J. et al. (1997). Exploratory and confirmatory factor analysis: Guidelines, issues, and alternatives. *Journal of Organizational Behavior, 66*7-683.

- Jaffe, K., Dong, H., Godefroy, A., Boutang, D., Hayashi, K., Milloy, M.-J., et al. (2018). Informal recycling, income generation and risk: Health and social harms among people who use drugs. *International Journal of Drug Policy*, 60, 40-46.
- Kennedy, M. C., McNeil, R., Milloy, M.-J., Dong, H., Kerr, T., & Hayashi, K. (2017). Residential eviction and exposure to violence among people who inject drugs in Vancouver, Canada. *International Journal of Drug Policy*, 41, 59-64.
- Knight, K. R., Lopez, A. M., Comfort, M., Shumway, M., Cohen, J., & Riley, E. D. (2014). Single room occupancy (SRO) hotels as mental health risk environments among impoverished women: the intersection of policy, drug use, trauma, and urban space. *International Journal of Drug Policy*, 25(3), 556-561.
- Levinson, N. (1946). The Wiener (root mean square) error criterion in filter design and prediction. *Journal of Mathematics and Physics*, 25(1-4), 261-278.
- Levitas, R. (2005). *The inclusive society?: Social exclusion and new labour*. New York: Springer.
- Link, B. G., & Phelan, J. (1995). Social conditions as fundamental causes of disease. *Journal Of Health And Social Behavior*, 80-94.
- Long, C., DeBeck, K., Feng, C., Montaner, J., Wood, E., & Kerr, T. (2014). Income level and drug related harm among people who use injection drugs in a Canadian setting. *International Journal of Drug Policy*, 25(3), 458-464.
- Macmillan, R. (2001). Violence and the life course: The consequences of victimization for personal and social development. *Annual Review Of Sociology*, 27(1), 1-22.
- Marshall, B. D., Fairbairn, N., Li, K., Wood, E., & Kerr, T. (2008). Physical violence among a prospective cohort of injection drug users: a gender-focused approach. *Drug And Alcohol Dependence*, 97(3), 237-246.
- McNeil, R., Shannon, K., Shaver, L., Kerr, T., & Small, W. (2014). Negotiating place and gendered violence in Canada's largest open drug scene. *International Journal of Drug Policy*, 25(3), 608-615.
- Moore, J. C., Stinson, L. L., & Welniak, E. J. (2000). Income measurement error in surveys: A review. *Journal Of Official Statistics Stockholm*, 16(4), 331-362.
- Narayan, D., Patel, R., Schafft, K., Rademacher, A., & Koch-Schulte, S. (1999). *Can anyone hear us? Voices from 47 countries*. The World Bank. <https://doi.org/10.1596/0-1952-1601-6>
- Oakes, J. M., & Rossi, P. H. (2003). The measurement of SES in health research: current practice and steps toward a new approach. *Social Science & Medicine*, 56(4), 769-784.
- Ompad, D. C., Nandi, V., Cerdá, M., Crawford, N., Galea, S., & Vlahov, D. (2012). Beyond income: Material resources among drug users in economically-disadvantaged New York City neighborhoods. *Drug and Alcohol Dependence*, 120(1-3), 127-134.

- Ompad, D. C., Palamar, J. J., Krause, K. D., Kapadia, F., & Halkitis, P. N. (2016). Reliability and Validity of a Material Resources Scale and Its Association With Depression Among Young Men Who Have Sex With Men: The P18 Cohort Study. *American Journal Of Men's Health, 12*(5), 1384-1397.
- Pfoertner, T.-K., Andress, H.-J., & Janssen, C. (2011). Income or living standard and health in Germany: different ways of measurement of relative poverty with regard to self-rated health. *International Journal of Public Health, 56*(4), 373-384.
- Pituch, K. A., & Stevens, J. P. (2015). *Applied multivariate statistics for the social sciences: Analyses with SAS and IBM's SPSS*. Routledge.
- Puyana, J. C., Puyana, J. C. J., Rubiano, A. M., Montenegro, J. H., Estebanez, G. O., Sanchez, A. I., et al. (2017). Drugs, Violence, and Trauma in Mexico and the USA. *Medical Principles And Practice, 26*(4), 309-315.
- Rank, M.R. (2004). *One Nation, Underprivileged: Why American Poverty Affects Us All*: Oxford University Press.
- Rhodes, T. (2009). *Risk Environments and Drug Harms: A Social Science for Harm Reduction Approach*. Elsevier.
- Richardson, L., Wood, E., & Kerr, T. (2013). The impact of social, structural and physical environmental factors on transitions into employment among people who inject drugs. *Social Science & Medicine, 76*, 126-133.
- Richardson, L. A., Long, C., DeBeck, K., Nguyen, P., Milloy, M. S., Wood, E., & Kerr, T. H. (2015). Socioeconomic marginalisation in the structural production of vulnerability to violence among people who use illicit drugs. *J Epidemiol Community Health, 69*(7), 686-692.
- Rosenfeld, J. (2010). 'The meaning of poverty and contemporary quantitative poverty research. *The British Journal of Sociology, 61*, 103-110.
- Salleh, N. A. M., van Draanen, J., Nosova, E., Barrios, R., & Richardson, L. (2020). Material security and adherence to antiretroviral therapy among HIV-positive people who use illicit drugs. *AIDS 34*(7): 1037-1045.
- Shannon, K., Ishida, T., Lai, C., & Tyndall, M. W. (2006). The impact of unregulated single room occupancy hotels on the health status of illicit drug users in Vancouver. *International Journal of Drug Policy, 17*(2), 107-114.
- Shannon, K., Kerr, T., Allinott, S., Chettiar, J., Shoveller, J., & Tyndall, M. W. (2008). Social and structural violence and power relations in mitigating HIV risk of drug-using women in survival sex work. *Social Science & Medicine, 66*(4), 911-921.
- Steiger, J.H. (1980). Statistically based tests for the number of common factors. In *the annual meeting of the Psychometric Society. Iowa City, IA. 1980*.

- Strathdee, S. A., Palepu, A., Cornelisse, P. G., Yip, B., O'Shaughnessy, M. V., Montaner, J. S., et al. (1998). Barriers to use of free antiretroviral therapy in injection drug users. *Jama*, 280(6), 547-549.
- Sullivan, J. X., Turner, L., & Danziger, S. (2008). The relationship between income and material hardship. *Journal of Policy Analysis and Management: The Journal of the Association for Public Policy Analysis and Management*, 27(1), 63-81.
- Ti, L., Richardson, L., DeBeck, K., Nguyen, P., Montaner, J., Wood, E., & Kerr, T. (2014). The impact of engagement in street-based income generation activities on stimulant drug use cessation among people who inject drugs. *Drug and Alcohol Dependence*, 141, 58-64.
- Townsend, P. (1979). *Poverty in the United Kingdom: a survey of household resources and standards of living*. California: Univ of California Press.
- Tucker, L. R., & Lewis, C. (1973). A reliability coefficient for maximum likelihood factor analysis. *Psychometrika*, 38(1), 1-10.
- Turrell, G. (2000). Income non-reporting: implications for health inequalities research. *Journal of Epidemiology & Community Health*, 54(3), 207-214.
- Van Horn, M. L., Bellis, J. M., & Snyder, S. W. (2001). Family resource scale-revised: Psychometrics and validation of a measure of family resources in a sample of low-income families. *Journal of Psychoeducational Assessment*, 19(1), 54-68.
- Van Prooijen, J-W., & Van Der Kloot, W.A. (2001). Confirmatory analysis of exploratively obtained factor structures. *Educational and Psychological Measurement* 61(5): 777-792.
- Wenzel, S. L., Leake, B. D., & Gelberg, L. (2001). Risk factors for major violence among homeless women. *Journal Of Interpersonal Violence*, 16(8), 739-752.
- Wenzel, S. L., Tucker, J. S., Elliott, M. N., Hambarsoomians, K., Perlman, J., Becker, K., et al. (2004). Prevalence and co-occurrence of violence, substance use and disorder, and HIV risk behavior: a comparison of sheltered and low-income housed women in Los Angeles County. *Preventive Medicine*, 39(3), 617-624.
- Wenzel, S. L., Tucker, J. S., Elliott, M. N., Marshall, G. N., & Williamson, S. L. (2004). Physical violence against impoverished women: A longitudinal analysis of risk and protective factors. *Women's Health Issues*, 14(5), 144-154.
- Wittkowski, A., Richards, H.L., Williams, J., & Main, C.J. (2008). Factor analysis of the Revised Illness Perception Questionnaire in adults with atopic dermatitis. *Psychology, Health and Medicine* 13(3): 346-359
- Wood, E., Hogg, R. S., Lima, V. D., Kerr, T., Yip, B., Marshall, B. D. et al. (2008). Highly active antiretroviral therapy and survival in HIV-infected injection drug users. *Jama*, 300(5), 550-554.

Table 1. Results of Exploratory Factor Analysis with Oblique Rotation for the Revised 18-item Material Resource Scale among PWUD in Vancouver (n=1479) 2014-2017.

Variables	Mean Score (SD)	Factor 1: Housing	Factor 2: Economic Resources	Factor 3: Basic Needs and Service Access
House or Apartment	4.57 (1.07)	0.920	0.007	-0.031
Adequate Furniture	4.20 (1.38)	0.530	0.126	0.215
Indoor Plumbing and Water	4.65 (0.95)	0.948	-0.024	-0.035
Heat for Housing	4.53 (1.12)	0.846	-0.020	0.038
Job for Self /Partner	2.55 (1.75)	0.006	0.321	-0.025
Money to Buy Necessities	3.92 (1.23)	0.038	0.438	0.353
Money to Spend on Self	3.48 (1.42)	-0.006	0.773	0.098
Money for Entertainment	3.16 (1.54)	-0.006	0.830	-0.068
Money for Saving	1.87 (1.41)	0.010	0.599	-0.057
Enough Clothing	4.41 (1.12)	0.096	0.194	0.371
Food for 2 Meals per day	4.27 (1.12)	0.039	0.108	0.464
Money to Pay Regular Bills	4.28 (1.23)	0.237	0.158	0.391
Medical Care	4.85 (0.58)	-0.059	-0.117	0.519
Dependable Transportation	4.29 (1.26)	0.013	0.089	0.390
Time for Sufficient Sleep	4.24 (1.20)	0.073	-0.029	0.480
Dental Care for Self	4.38 (1.29)	-0.067	0.022	0.400
Phone/Access to a Phone	4.01 (1.57)	0.087	0.148	0.195
Access to Social Assistance	4.80 (0.81)	0.089	-0.253	0.231
Full Scale	4.02 (0.64)			

Table 2: Baseline mean FRS scores for each characteristic, by Factor 1 (housing), Factor 2 (economic resources) and Factor 3 (basic needs and service access) in Vancouver (n=1479) 2014-2017.

Characteristic	Full Scale Mean (SD)		Factor 1 Mean (SD)		Factor 2 Mean (SD)		Factor 3 Mean (SD)	
Demographics								
Ethnicity								
White	4.04(1.47)	***	4.51(1.14)	***	3.02(1.65)	***	4.40(1.15)	***
Non-white	3.84(1.50)		4.25(1.25)		2.76(1.59)		4.21(1.23)	
Sex								
Female	3.98(1.49)	***	4.44(1.20)	*	2.91(1.65)	**	4.34(1.19)	**
Male	4.05(1.46)		4.51(1.13)		3.04(1.64)		4.41(1.13)	
Sexual Orientation								
Heterosexual	4.02(1.47)		4.47(1.17)		3.01(1.65)		4.39(1.15)	
LGB Identity	4.01(1.46)		4.52(1.08)		2.92(1.62)		4.36(1.16)	
Relationship Status								
No Stable Relationship	4.00(1.49)	***	4.46(1.17)	***	2.96(1.65)	*	4.38(1.17)	
In a Stable Relationship	4.08(1.43)		4.55(1.09)		3.07(1.62)		4.40(1.12)	
Social Experiences								
Education								
≥ High school	4.00(1.49)	*	4.45(1.21)	*	2.97(1.66)		4.36(1.19)	
< High school	4.04(1.45)		4.51(1.11)		3.02(1.63)		4.40(1.13)	
Homelessness ^a								
Yes	3.34(1.61)	***	2.99(1.57)	***	2.51(1.51)	***	3.92(1.40)	***
No	4.17(1.40)		4.81(0.70)		3.10(1.66)		4.49(1.06)	
Incarceration ^a								
Yes	3.57(1.56)	***	3.65(1.59)	***	2.63(1.51)	***	4.03(1.32)	***
No	4.05(1.46)		4.54(1.10)		3.02(1.65)		4.41(1.14)	
Unmet service needs ^a								
Yes	3.29(1.61)	***	3.09(1.60)	***	2.41(1.46)	***	3.81(1.44)	***
No	4.09(1.44)		4.61(1.02)		3.05(1.65)		4.44(1.11)	
Employment and Income Generation								
Employment ^a								
Yes	4.24(1.29)	***	4.65(0.90)	***	3.50(1.51)	***	4.50(1.04)	***
No	3.95(1.52)		4.43(1.22)		2.83(1.65)		4.35(1.19)	
Social assistance income ^a								
Yes	4.02(1.47)		4.49(1.15)		2.96(1.64)	***	4.39(1.15)	
No	4.09(1.51)		4.46(1.28)		3.69(1.63)		4.41(1.23)	
Street-base income ^a								
Yes	3.79(1.54)	***	4.29(1.31)	***	2.70(1.54)	***	4.17(1.29)	***
No	4.09(1.44)		4.54(1.10)		3.08(1.66)		4.45(1.11)	
Illegal income generation ^a								
Yes	3.64(1.55)	***	3.94(1.54)	***	2.64(1.48)	***	4.03(1.33)	***

No	4.05(1.46)		4.52(1.11)		3.02(1.65)		4.41(1.14)	
Sex work ^a								
Yes	3.77(1.55)	***	4.15(1.38)	***	2.73(1.58)	***	4.08(1.36)	***
No	4.06(1.46)		4.53(1.12)		3.03(1.65)		4.42(1.12)	
Substance Use								
Money Spent on Drugs								
>= \$50/ week	3.89(1.51)	***	4.27(1.32)	***	2.86(1.60)	***	4.26(1.23)	***
<= \$50/ week	4.11(1.44)		4.63(1.00)		3.08(1.67)		4.47(1.09)	
Daily cocaine use ^a								
Yes	3.97(1.53)		4.37(1.33)		3.03(1.70)		4.32(1.20)	
No	4.03(1.47)		4.49(1.14)		3.00(1.64)		4.39(1.15)	
Daily heroin injection ^a								
Yes	3.73(1.56)	***	4.00(1.49)	***	2.76(1.59)	***	4.09(1.33)	***
No	4.10(1.44)		4.62(1.01)		3.06(1.65)		4.46(1.09)	
Daily crack non-injection ^a								
Yes	3.93(1.53)	***	4.39(1.28)	*	2.96(1.66)		4.25(1.28)	***
No	4.04(1.46)		4.50(1.13)		3.00(1.64)		4.41(1.13)	
Daily methamphetamine use ^a								
Yes	3.77(1.56)	***	4.14(1.39)	***	2.79(1.60)	***	4.12(1.34)	***
No	4.06(1.45)		4.54(1.11)		3.03(1.65)		4.42(1.12)	
Overdose ^b								
Yes	3.67(1.57)	***	3.91(1.53)	***	2.69(1.57)	***	4.04(1.35)	***
No	4.06(1.46)		4.54(1.10)		3.02(1.65)		4.42(1.13)	

a Measured for the 6 month period prior to the last interview

*p<0.05, ** p<0.01, *** p<0.001

Table 3. Bivariable and Multivariable generalized estimating equation of material security and violence, among PWUD in Vancouver (n=1479) 2014-2017.

Characteristic	Unadjusted		Adjusted (Model 1: Full FRS Scale)		Adjusted (Model 2: FRS Factors)	
	Odds Ratio (95% CI)		Odds Ratio (95% CI)		Odds Ratio (95% CI)	
Demographics						
Age	0.95 (0.95, 0.96)	***	0.99 (0.98, 1.00)		1.00 (0.98, 1.01)	
Sex (/Female)	0.95 (0.78, 1.16)		1.22 (0.94, 1.57)		1.20 (0.93, 1.55)	
White Ethnicity (/Other)	1.18 (0.98, 1.43)		1.10 (0.88, 1.37)		1.10 (0.88, 1.38)	
Education (/Less than HS)	0.92 (0.76, 1.11)		1.07 (0.86, 1.33)		1.07 (0.86, 1.34)	
Employment and Income Generation						
Employed ^a (/No)	0.85 (0.72, 1.02)		1.13 (0.90, 1.40)		1.08 (0.86, 1.35)	
Social Assistance Income ^a (/No)	1.70 (1.14, 2.55)	**	1.29 (0.81, 2.06)		1.54 (0.94, 2.52)	
Street-Based Income ^a (/No)	1.90 (1.58, 2.27)	***	1.54 (1.25, 1.91)	***	1.55 (1.23, 1.94)	***
Sex Work ^a (/No)	2.46 (1.95, 3.11)	***	1.70 (1.22, 2.35)	**	1.64 (1.17, 2.29)	**
Income ^a (per \$1,000)	1.22 (1.14, 1.29)	***	1.16 (1.08, 1.28)	***	1.13 (1.04, 1.23)	**
Social Experiences						
Foster Care (/No)	1.57 (1.29, 1.90)	***	1.42 (1.13, 1.78)	**	1.41 (1.12, 1.78)	**
Incarceration ^a (/No)	3.24 (2.37, 4.43)	***	1.77 (1.19, 2.61)	**	1.70 (1.12, 2.61)	**
Drug Use						
Heavy Alcohol Use ^a (/No)	1.53 (1.25, 1.89)	***	1.68 (1.32, 2.15)	***	1.61 (1.25, 2.07)	***
Binge Drug Use ^a (/No)	1.85 (1.58, 2.27)	***	1.14 (0.94, 1.40)		1.11 (0.90, 1.37)	
Public Drug Use ^a (/No)	2.88 (2.41, 3.43)	***	1.47 (1.16, 1.88)	**	1.35 (1.03, 1.76)	*
Overdose ^a (/No)	2.62 (2.11, 3.26)	***	1.78 (1.37, 2.32)	***	1.73 (1.32, 2.26)	***
Material Security Score						
Full FRS	0.46 (0.40, 0.52)	***	0.60 (0.51, 0.70)	***		
Factor 1: Housing security	0.67 (0.61, 0.75)	***			0.71 (0.59, 0.85)	***
Factor 2: Economic resources	0.62 (0.57, 0.67)	***			0.82 (0.71, 0.94)	**
Factor 3: Basic needs	0.52 (0.46, 0.59)	***			1.04 (0.91, 1.19)	

^a Measured for the 6 month period prior to the last interview

*p<0.05, ** p<0.01, *** p<0.001