



## Research Paper

# Behavior change after fentanyl testing at a safe consumption space for women in Northern Mexico: A pilot study



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## ARTICLE INFO

## Keywords:

Fentanyl test strips  
Mexico  
Border  
Safe consumption site

## ABSTRACT

**Background:** Fentanyl has led to an increased number of overdose deaths in North America. Testing substances for fentanyl may be a harm reduction strategy to prevent overdose. Little is known about behavior change after fentanyl testing and the attitudes around fentanyl knowledge and testing along the US-Mexico border in the context of a safe consumption site.

**Methods:** This was a pilot quantitative and qualitative study with 30 women who use drugs at an unsanctioned safe consumption site in Mexicali, Mexico. Women participated in a quantitative survey, a semi-structured interview, and fentanyl testing of substances. Injection behavior was observed after fentanyl testing results were provided. Qualitative data were collected to explore the meanings participants attributed to fentanyl and fentanyl testing.

**Results:** Half of the substances tested positive for fentanyl (n=15, 50%), and all of them were in samples of black tar heroin. Among those participants who tested positive for fentanyl, 7 (47%) subsequently used less of the intended substance, 1 did not use the intended substance, and 7 (47%) did not change their behavior (i.e., used as originally intended). In qualitative interviews, a predominant theme was a description of fentanyl as dangerous and deadly and fentanyl testing as being helpful for modifying drug use behaviors. However, participants recognized that there could be no change in behavior following a positive fentanyl test in the context of not being able to find substances free of fentanyl.

**Conclusion:** We observed mixed results related to behavior change after women's intended substance for use tested positive for fentanyl. Fentanyl testing was acceptable to women, but behavior change was hampered by the inability to find substances free of fentanyl. Further research is needed to maximize the potential of fentanyl testing as a harm reduction tool especially in the context of a changing drug supply.

## Introduction

Fentanyl was the predominant drug leading to overdose deaths in North America in 2019 (Mattson et al., 2021). Fentanyl related deaths increased in the United States (U.S.) as of 2013 (Mattson et al., 2021), and in Canada as of 2016 (BC Centre for Disease Control, 2021). In

the United States, prevalence of fentanyl has been variable by geographic area. Fentanyl has been the predominant opioid available in the illicit drug market in areas like the Northeast, Ohio, and Appalachia (Peters et al., 2020); whereas in the West, fentanyl prevalence is still low although increasing (Peters et al., 2020; Shover et al., 2020). Less is known about the epidemiology of fentanyl use and related deaths in

**Abbreviations:** CASI, Computer assisted self-interview; FTS, Fentanyl test strips; HCV, Hepatitis C virus; HIV, Human immunodeficiency virus; MWUD, Men who use drugs; PC-PTSD, Primary care post-traumatic stress disorder; PHQ, Patient Health Questionnaire; PWUD, People who use drugs; SCS, Safe consumption site; SU-SMS, Substance Use Stigma Mechanism Scale; WWUD, Women who use drugs.

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<https://doi.org/10.1016/j.drugpo.2022.103745>

Mexico, but pockets of incipient fentanyl use have been reported along the US-Mexico border primarily in the cities of Tijuana and Mexicali (Fleisz et al., 2020; Fleisz-Bautista C, 2019). However, waste water analysis detected fentanyl at low levels in 13 of 15 Mexican cities where testing was performed (Cruz-Cruz et al., 2021).

Multiple public health interventions have been proposed or introduced to decrease fentanyl related deaths. These include community distribution of naloxone, low barrier access to medications for opioid use disorder, safe consumption sites (SCS), and fentanyl test strips (FTS). FTS are disposable, point of care tests, that can be easily used and interpreted to detect the presence of fentanyl in a substance. They have shown high levels of specificity and sensitivity when used in point of care settings (Ti et al., 2020). Fentanyl test strips as a harm reduction tool have been shown to empower individuals using substances to make informed choices and modify their substance use behaviors to decrease their risk of overdose.

Previous research has evaluated the extent to which FTS results in behavior change, and the willingness to use them, including within a SCS setting (Kennedy et al., 2018; Krieger et al., 2018; Park et al., 2020). For example, at Vancouver's largest SCS, Insite, a pilot FTS program found that a third of users with a positive pre-consumption FTS (n=142) decided to reduce the amount of drug to be used (Kennedy et al., 2018). In Rhode Island, a study recruited 93 individuals and provided them with FTS, of which 62 used them. Of the 33 with a positive result, 68% had a positive behavior change (i.e., used smaller amounts, went slower when using, used with someone else, or did a smaller test dose than initially intended) (Krieger et al., 2018). In a separate study in Baltimore among women engaged in sex work, 103 participants were provided with FTS, of which 58 had a positive result, with 69% exhibiting positive behavior change (Park et al., 2020). Of note, however, data from the studies were all collected in settings with high fentanyl prevalence.

The inequities that impact women who use drugs (WWUD) are unique compared to men who use drugs (MWUD) (Boyd et al., 2020; Greenfield et al., 2007; Ickowicz et al., 2020; Mitra et al., 2020; Roberts et al., 2010). WWUD may be living with HIV (Roberts et al., 2010; Spittal et al., 2002), engaging in sex work (Rhodes et al., 2012), and experiencing homelessness (Collins et al., 2018), but also WWUD are more likely to experience gender-based violence (Bardwell et al., 2021; Krüsi et al., 2012), and face gender-specific stigma and barriers to care (Roberts et al., 2010) than MWUD. Both drug use behavior and drug-related harm differ significantly between genders (Mazure & Fiellin, 2018), although historically, drug research has centered MWUD. Further, a recent study among 578 persons who use drugs in Vancouver, Canada found that WWUD were more than twice as likely to report unintentional exposure to fentanyl (Mitra et al., 2020), highlighting the augmented risk of intersecting structural vulnerabilities among WWUD, and the need to implement gender-informed programs in the prevention and treatment domains.

Mexicali, Baja California, Mexico is a city along the US-Mexico border that is experiencing a surge in injection drug use with fentanyl-laced street opioids. The city borders Imperial County, California a rural county east of San Diego. The cause of this surge is multifactorial, including Mexicali's location on a heavily trafficked drug transit route to Arizona and California, an increase in size of migrant and deported populations, and displacement of people who inject drugs from nearby Tijuana (17). In response, a community-based organization, *Integración Social Verter* (Verter), opened the first unsanctioned safe consumption site (SCS) in Latin America called "La Sala". This SCS is one of only four SCSs worldwide that provide access exclusively to women (Harm Reduction International, 2020). This setting provided us with a unique opportunity to examine the potential to implement evidence-based harm reduction strategies for WWUD in a community-based context. As part of this, we developed a pilot study to directly assess behavior change after a positive FTS at the SCS, using a quantitative plus qualitative approach to gain an enriched understanding of the correlates and attitudes that may be associated with any behavior change following positive FTS. Specifi-

cally, we applied quantitative methods to examine behavior change following a positive FTS result, and then qualitative data was examined to explore the meanings participants attributed to fentanyl and fentanyl testing, by focusing on themes in the qualitative data that could inform why some participants changed their behavior and why some did not.

## Methods

### Study design

This was a quantitative and qualitative cross-sectional study conducted at Verter SCS in Mexicali, Mexico. Study activities occurred between December 2020 and February 2021. Field staff recruited potential participants through outreach activities or individuals who were accessing services at the SCS. Potential participants were invited to participate in a quantitative survey followed by fentanyl testing, or a qualitative interview, or both. For women who completed both aims, they initially completed the quantitative survey, and then completed the qualitative interview within a two-week time frame. The inclusion criteria for the qualitative interviews were designed to enroll women regardless of their use of the SCS. This was done with the objective of including a broader perspective of women regarding fentanyl testing and the use (or lack of use) of the SCS. Inclusion criteria for the qualitative interview were: 1) self-identified as a woman, 2) age 18 or older, 3) self-reported recent drug injection (within the past 30 days), 4) willing to provide informed consent, and 5) participants had to be proficient in either Spanish or English. The quantitative section of the study included two additional requirements: 1) planned to use the SCS to inject, and 2) was willing to provide a wrapper or filter of intended drug to be used within the SCS. Individuals were excluded if: 1) they were acutely intoxicated, 2) in severe withdrawal that by the judgement of staff members would make completion of the survey challenging, or 3) if use of the SCS posed a risk to the individual (e.g., the person was somnolent or lethargic or visibly ill). Field staff assisted with the computerized survey and a separate staff member conducted the qualitative interview. Written informed consent was obtained prior to initiation of any study procedures. Participants were compensated with \$10 US dollars (or its equivalent in Mexican pesos) for participating in either the qualitative or quantitative activities, or \$20 US dollars for completing both. The study was approved by the UCLA Institutional Review Board (IRB) and by the Prevensa, A.C. IRB.

### Quantitative procedures

Eligible and consented individuals were administered an encrypted computer assisted self-interview (CASI) through REDCap in a private setting. Staff members were able to assist a participant if technical assistance was required. The instrument included questions regarding demographic information, patterns of substance use, injection practices (frequency of injection, volume of injection, substance of use, injecting with a partner, reuse of syringes, sharing of syringes, public injection, and experiences after injecting, overdose), mental health constructs (stigma, post-traumatic stress, depression, readiness to change), and attitudes, beliefs, barriers, and facilitators to harm reduction services. Substance use related questions were asked in a time frame of 3-months prior to the survey.

Stigma was evaluated using the Substance Use Stigma Mechanism Scale (SU-SMS); post-traumatic stress using the primary care PTSD screen (PC-PTSD) (Prins et al., 2004); depression using the Patient Health Questionnaire depression scale (PHQ-8) (Kroenke et al., 2009); and readiness to change with the Stages of Change Readiness and Treatment Eagerness Scale for Drugs (Socrates-8D) (Miller & Tonigan, 1996).

Rapid blood tests were used to determine HIV, hepatitis C virus (HCV), syphilis, and pregnancy status. Study staff counseled participants regarding test results, their implications, and initiated referrals to appropriate services if necessary. Additionally, all participants were provided with a safe injection kit that includes clean syringes, needles, a "cooker",

cotton filter, alcohol swab, and tourniquet. Participants were provided with a naloxone rescue kit and training on how and when to use it.

### Qualitative procedures

Qualitative in-depth interview data were also collected as part of the study. Interviews were conducted by the author AG over teleconferencing software using a semi-structured interview guide. Participants were in a private setting at the study site and a computer was set-up with audio only for the interview. The interview lasted approximately one hour. The interview guide was structured to include questions and probes on topics related to experiences using drugs, drug use as related to other co-occurring conditions (e.g., stigma, intimate partner violence, medical mistrust, mental health), drug treatment experiences, harm reduction services, and fentanyl knowledge and testing (or willingness to test).

The research team developed seven major qualitative topics for each in-depth survey: 1) history of drug use; 2) substance use treatment experiences; 3) income generation strategies; 4) access to harm reduction services; 5) fentanyl knowledge and testing; 6) COVID-19 general elements; and 7) stigma, violence, and access to health services. To understand the impact of the drug checking intervention, and the shifting dynamics of the introduction of fentanyl in the local drug supply, four fentanyl specific sub-topics were included: a) general knowledge; b) risk of overdose; c) drug checking; d) behavioral changes. This main sub-section was used primarily to add contextual information to the quantitative data from the CASI and individual fentanyl testing.

### Fentanyl testing

Substances that were brought by the participant to be used on-site were tested for fentanyl. The substances (e.g., black tar heroin, white powder heroin, methamphetamine) were indirectly tested using the plastic/paper wrapper that they were brought in, or by testing the cotton filter that was used to prepare the dose. Testing was performed prior to their use of drugs in the SCS. Rapid Response FTS (BTNX Inc., Ontario, Canada) were used for testing. These FTS have a reported sensitivity of 96-100% with a detection cut-off of 10 ng/ml, and specificity of 90-98% (Ti et al., 2020).

Staff placed the wrapping in a paper cup (88 ml capacity) and mixed with 10 ml of tap water. In case the paper wrapping was accidentally discarded, or the person did not have one, the staff used instead a sterile cotton filter soaked in the cooker used for the dose preparation. These techniques allowed us to detect for fentanyl prior to injection, while not using any of the participants drug sample, minimizing the likelihood of refusing a drug check. Strips were read at 5 minutes per the manufacturer's recommendation.

Positive and negative results were identified by single and double red lines, respectively. Results were provided to the women, along with information about the higher potency of fentanyl laced substances and risk reduction strategies (e.g., go slow, use a little). Staff also offered referrals to additional social and health services if they were required (e.g., HIV/HCV testing, medications for opioid use disorder, wound care). After the test, injection behavior within the SCS was recorded by study staff in a database. Options for the staff member to register behaviors after fentanyl testing included: a) did not use the drug tested; b) shared with someone else; c) tried a tester dose before the rest of the dose; d) used a smaller dose than what would be usually used; e) did not change; or f) other.

### Analysis

Data sources included both quantitative and qualitative data. Although the quantitative and qualitative data were collected concurrently, the analysis was conducted in sequential stages. First, interviews were transcribed verbatim and then translated by bilingual, trained staff

(AG and PG). All transcripts and translations were reviewed for accuracy by JA. Personal identifiers were removed, and each participant was identified by a unique number. The de-identified transcripts were saved in an encrypted file on a secured server. Atlas.ti was used for coding, and a codebook was created a priori using the interview guide and previous research conducted by JA. Then, we used the quantitative data to allow us to first identify the proportion of participants who exhibited behavior change (less use or no use of the intended substance) following a positive FTS result using the quantitative data. Finally, we conducted a thematic analysis (Braun & Clarke, 2006) to identify patterns around the attitudes participants attributed to fentanyl and fentanyl testing, by focusing on topics that could inform why some participants changed their behavior and why some did not.

## Results

### Quantitative findings

Of the 30 women who enrolled in the quantitative section of this pilot study, the mean age was 35.9 years (standard deviation [SD] 11.3 years). Twenty-nine reported their gender as women, while one woman was transgender; 24 were born in Mexico, 4 in the U.S., and 1 in El Salvador (1 did not report); and 14 reported to be experiencing homelessness. Self-reported substances used via injection in the past 3 months included black tar heroin (83%), powdered heroin (50%), methamphetamine (27%), benzodiazepines (13%), and cocaine (7%). Via the non-injection route, participants reported using methamphetamine (77%), benzodiazepines (60%), inhalants (60%), cannabis (37%), and cocaine (7%). One participant tested reactive for HIV, six tested reactive for syphilis, and 87% were HCV seropositive. None had a positive pregnancy test.

Over three-quarters (77%) of women screened positive for depression (mean PHQ8 14.5, SD 7.0), and 70% for PTSD (mean PC-PTSD 2.1, SD 1.6). Mean stigma scores on the SU-SMS were: enacted stigma 19.0 (SD 5.90), anticipated stigma 23.0 (SD 6.5), and internalized stigma 20.9 (SD 5.7). Mean readiness to change scores on the Socrates 8D were: recognition 27.4 (SD 1.6), ambivalence 14.6 (SD 2.3), and steps 26.9 (SD 6.2).

Regarding perspectives around fentanyl use, 78% believed they had used fentanyl in the last 3 months, 43% reported they believed the last heroin they used was mixed with fentanyl, and 60% believed they could get fentanyl if they desired, while only 13% were actively looking for it. The risk of an overdose from fentanyl was rated as high by 50% of the participants, and 40% reported that they either entered substance use treatment, or are thinking of entering treatment, due to the risk of fentanyl laced substances.

Participants reported bringing black tar heroin (28), brown heroin (1), and methamphetamine (1) to use in the SCS. Staff tested a wrapper in 57% of the occasions, the remaining tests were conducted on cottons soaked in the cooker (43%). Half of the samples tested positive for fentanyl (n=15, 50%), and all of them were in samples of black tar heroin. Among those participants who tested positive for fentanyl, 7 (47%) subsequently used less of the intended substance, 1 did not use the intended substance, and 7 (47%) did not change their behavior (i.e., used as originally intended).

### Qualitative findings

Of the 30 women who participated in the quantitative aim, 25 participated in the qualitative aim. An additional five women participated in the qualitative aim that did not participate in the quantitative aim. Mean age was 36.2 (SD 11.1) and 29 reported their gender as woman, and one as transgender. The sub-topics described here included: general knowledge about fentanyl, risk of overdose, drug testing, and behavior change.

### General knowledge

Most of the participants had limited knowledge about fentanyl, mainly that it was stronger than regular heroin and had a different smell. Only one participant, an American citizen with a past history of substance use in the United States, had prior knowledge of fentanyl.

*"I know what fentanyl is yeah, I worked on the medical field, plus back home we had fentanyl for years and years and years, it's new out here but, I know what it is, but people out here they don't know what it is yet, really" (Participant 11, Age 27)*

*"And it doesn't smell like heroin, fentanyl doesn't smell like anything, it doesn't have smell and heroin smells like acid very ugly. Fentanyl smells like nothing, nothing" (Participant 8, Age 39)*

*"There is a heroin that hits me machin (very high), and there is another that doesn't hit me as much, and I go to the one that is more machin. I say, that has to be the one with fentanyl" (Participant 8, Age 39)*

### Risk of overdose

A predominant theme was a description of fentanyl as dangerous and deadly, sometimes even designed to get rid of drug users. This can be illustrated by the following sample quotes:

*"The only thing I know is that it's for putting elephants to sleep. And so yes, it's true, but you can see that a lot of people have died because of fentanyl, supposedly because of fentanyl" (Participant 2, Age 53)*

*"Okay, so what I've heard and what I also think is true, is that they got it out on purpose to kill people. Got it? I mean, the fentanyl. I also think that it's the same thing, for getting rid of so many drug addicts, because they all die, I mean, you know you're going to die and since fentanyl came out, they're all dying too. Didn't they come out at the same time?" (Participant 10, Age 27)*

*"Of Fentanyl, well, it is a drug that is killing heroin users" (Participant 15, Age 35)*

*"Well, I didn't know about it (fentanyl), but lately, they have been putting it in almost all of the heroin (in the city). What happens is that it put us to sleep, for a little while and we lose our senses. To tell you the truth, I completely lose consciousness and wake up after a little bit, but other people don't come back, they sleep forever. I don't know, maybe they used too much, I don't know." (Participant 4, Age 42).*

### Drug testing

Independent of post-FTS behavior change, fentanyl testing offered by the SCS was described as helpful by other participants, acting as an additional tool within the harm reduction services that help bring participants to Verter and its SCS:

*"The truth is, that it's very good they got this thing and are doing it (drug checking), and for that reason I try to come more often to this because at least they tell you if it has or not (fentanyl), and that makes it safer to stick it in, that's the good thing." (Participant 9, Age 27)*

*"Every time I go to the 'Sala' they always test my substance to see if it has fentanyl and that helps me, because that way I look for another place where I am sure that doesn't have fentanyl. And so yeah, they always help me." (Participant 13, Age 24)*

*"Here in 'La Sala', when I come and I ask to use it, they test for it (fentanyl). Since the first time they did it, I feel more safe, at ease, that I walk in there and I will keep walking. You know what I am saying? That I am not going to be out there laying, crawling, sitting somewhere" (Participant 16, Age 68)*

### Behavioral changes

Another theme that arose was a description of fentanyl testing as being helpful for modifying drug use behaviors that could reduce risk of overdose, such as a change in the amount used or a shift in buying patterns.

*"For example, when they test it and it has (fentanyl), what do you do? Well, I reduce the amount of the substance, because it hurts me, it was happening to me the first time. I do not use the same, the same amount, when they tell me it has that" (Participant 17, Age 27)*

*"The other day I brought some Chiva (heroin) because it was hitting me stronger than usual, and I brought it to get it tested, and yes, it had fentanyl. That's why I stop buying where I was buying and I went to buy in another place, because I was told that fentanyl is bad for the veins" (Participant 3, Age 27)*

*"Mainly we decided to come for my protection, because we heard a lot of people was dying and that the drug was really strong. Maybe it sounds bad, but we brought the drug here to see if it had fentanyl or not. Then, us as addicts, we knew what places – we call "conectas" to the places they sell drugs - had fentanyl. So this guy's "conecta" has fentanyl, or the other "conecta" too, so we avoided them. You know what I am saying? To avoid having an overdose" (Participant 14, Age 38)*

However, some participants also recognized that there could be no change in behavior following positive FTS, even when they acknowledged the danger of using fentanyl. This behavior can be partly explained by the lack of access to another substance free of fentanyl before injecting.

*"I have to keep using it, because I need it and I have to get it in. I mean, I do try to use less because it is scary. I do get scared, but when you are about to use it, you don't think about it" (Participant 4, Age 44)*

*"Well, at that moment (after positive test), I do not have another choice. Because, sometimes I do not have any more dope, but if I could, if I could use one that didn't had any (fentanyl) I would do it" (Participant 13, Age 24)*

One participant described how her experience using fentanyl and the potential risk of overdose led her to seek treatment:

*"Fentanyl it is much stronger, people want to dose the same, particularly first-timers, and that's how it happens (overdose). First time it happened to me, it was in January, it was the first time I tried fentanyl without knowing it. After that, I went into rehab because I got scared" (Participant 10, Age 30)*

### Discussion

In this small pilot study, we found mixed results regarding behavior change after testing substances for fentanyl prior to use in a SCS exclusively for WWUD, and gained rich insight into potential reasons behind behavior change. The majority of participants (78%) reported exposure to fentanyl in the past 3 months, although only 13% reported actively seeking fentanyl, underscoring the risk of unintentional fentanyl exposure and related overdose among WWUD, as previously described elsewhere (Mitra et al., 2020). In qualitative in-depth interviews participants described fentanyl as a dangerous substance, and also described FTS as being helpful for modifying drug use behaviors that could reduce risk of overdose. While half of the participants in the quantitative section of the study decided to use less to reduce the risk of accidental overdose, the same proportion of women decided to keep using their substance as originally intended. Upon examination of the narratives of women who continued using the substance as intended, we found that they appeared to have less agency around finding substances free of fentanyl. In contrast, the women who used less or none of the intended substance described fentanyl as deadly, and described fentanyl testing

as helpful to inform safe choices around drug use. As this pilot study was conducted with a small sample caution is warranted in the interpretation of these findings, especially the quantitative findings. Future research should evaluate the utility and acceptability of FTS and examine the reasons for FTS resulting in behavior change among WWUD with varying access to fentanyl-laced opioids (Bardwell et al., 2021), with the goal of developing future interventions.

Of note, the awareness of fentanyl in the local supply may motivate some of the SCS clients to enroll in substance use treatment. For example, 11 women answered that the availability of fentanyl in the drug supply has made them think of going into substance use treatment and one had started treatment. The willingness of the women to engage in drug checking at the SCS seems to replicate other results that see this intervention as a promising harm reduction tool among PWUD (Kennedy et al., 2018; Krieger et al., 2018; Park et al., 2020), although data focusing specifically on WWUD is lacking.

In addition to motivating behavioral changes, drug checking has the potential to monitor adulteration trends in illegal drug markets. Previous studies have found that other versions of street opioids in the region, such as China White, are exclusively laced with illicit manufactured fentanyl (Fleiz et al., 2020). However, in our sample, the totality of positive FTS samples occurred when testing black tar heroin. This could prove challenging for people who are seeking to reduce overdose events by shifting between different presentations of street opioids (black tar vs powder heroin). These trends could change at any time and emphasize the need to continue providing drug checking longitudinally among SCS clients and the broader community of PWUD in Mexicali and elsewhere.

The high levels of depression and PTSD among participants of the study suggest that there is a need to develop psychosocial interventions to improve mental health outcomes among women who inject drugs attending a SCS. Additional data from this study around potential barriers and facilitators to harm reduction services can inform next steps to increase health care access for WWUD in the community (Shirley-Beavan et al., 2020). Stigma attached to substance is one of those barriers, and on average women in the study reported high levels of anticipated and internalized stigma. Several studies suggest that fear of stigma influences WWUD seeking treatment in different areas of health care, including harm reduction services, treatment programs, and social services (Iversen et al., 2015; Pinkham et al., 2012). Interventions should not only incorporate gender-specific factors that shape drug use differences, but also tailor strategies to address how perceived stigma surrounding drug use impacts engagement in health care and patient activation (Pinkham et al., 2012).

In terms of readiness to change drug use behavior, scores and distributions across the Socrates subscales suggest that most of the women appeared to label or recognize their situation as having a “drug problem,” as opposed to reporting ambivalence that their drug use is problematic. This is in line with scores on the “steps” subscale showing that on average women reported taking steps to change their drug use. In this study, half of the participants acknowledged the high risk of overdose associated with fentanyl use, and as a result were open to the uptake of effective harm reduction approaches, including medications for opioid use disorder.

Limitations of this pilot study are many. We would advise the reader to interpret these findings with caution due to the preliminary nature of the data. The small sample of participants in the quantitative aim precluded our ability to make statistical associations between sociodemographic and behavioral variables and behavior change. As well, due to the small sample participating in fentanyl testing, the proportion undergoing behavioral change is not generalizable to the larger population of WWUD in Mexicali or elsewhere. The cross-sectional nature of the study limits our ability to make longitudinal conclusion related to behavior change in the presence of repeated testing for fentanyl. The setting of the study may limit the generalizability of our findings as this was done in the setting of a SCS and in Mexicali, where fentanyl appeared to enter the market only recently before the study. This limits our ability to

extrapolate our findings to geographic locations where fentanyl is the predominant substance in drug markets, or the use of FTS outside of a SCS (e.g., at home). Finally, we did not apply a fully mixed-methods approach and instead focused on specific themes in the qualitative data to shed light on meanings ascribed to fentanyl and testing, as doing so would be beyond the primary objective of this paper.

Safe consumption services are a harm reduction intervention that are consolidated in higher-income countries (Kerr et al., 2017). However, their operation in under-resource settings, like in the city of Mexicali are still rare (Beletsky et al., 2018). A recent ethnographic analysis of the first women-only SCS in Canada suggests that such a space may offer some reprieve from the structural vulnerabilities that inform the experiences of WWUD (Boyd et al., 2020). Furthermore, the integration of other services like drug checking and overdose prevention strategies, like naloxone distribution (Goodman-Meza et al., 2021), offers the possibility to generate a new model of harm reduction in the Global South. Our findings from this small sample show that FTS in the context of a SCS was acceptable and important to promote behavior change in some women. Future studies are needed to evaluate behavior change longitudinally, and interventions are needed to maximize the efficacy of FTS as a harm reduction tool.

### Ethics statement

The study was approved by the UCLA Institutional Review Board (IRB) and by the Prevensa, A.C. IRB. Written informed consent was obtained prior to initiation of any study procedures.

### Funding

The funders had no role in the content of this manuscript. This work was funded by a UCLA Center for HIV Identification, Prevention, and Treatment Services (CHIPTS) (U.S. National Institute of Mental Health [NIMH] grant P30MH58107) pilot grant. D.G.M. was supported by the U.S. National Institute on Drug Abuse (grant K08DA048163). M.C.C. was supported by NIMH (T32MH080634, PI: Currier and Gorbach). S.S. was supported by CHIPTS, the UCLA Center for AIDS Research (grant 5P30AI028697), and the UCLA Clinical Translational Science Institute (grant UL1TR001881). The views expressed in this publication are those of the authors and not necessarily those of their institution or funders.

### Declarations of Interest

The authors declared that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Acknowledgements

We acknowledge the community members who took part in the study. We also want to acknowledge Dallas Swendeman and Norweeta G. Milburn from the CHITPS Development Core for their support.

### Data statement

Data is available by request to the corresponding author.

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