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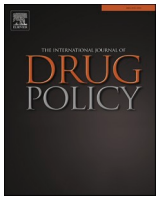

Research Paper

# The emergence of fentanyl in a stimulant landscape: Un/intentional use, social relations, and developing communities of care

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ABSTRACT

*Background:* The introduction of fentanyl into the unregulated drug supply has drastically altered drug landscapes across the United States and increasingly contributed to overdose. As part of a larger study about opioid overdose, we assessed how the emergence of fentanyl has shaped health outcomes and social relations in an underserved region of California.

*Methods:* From 2022–2024, we engaged in ethnographic fieldwork, surveys, and qualitative interviews with people 18+ years old and reporting opioid or stimulant use in the prior three months. We generated descriptive statistics and examined un/intentional fentanyl use among people using opioids (regardless of stimulant use) compared to those exclusively using stimulants. Qualitative interviews were thematically coded to lend insight into the social contexts of fentanyl use.

*Results:* Of 195 survey participants, 31 % were women, and 60 % identified as racialized groups, with an average age of 43; the qualitative sub-sample ($n = 53$ interviews) was similar. People using opioids were often initially unintentionally exposed to fentanyl through the heroin supply or prescription pills, but shifted to intentional use. People using stimulants attributed unintentional fentanyl use to adulterated methamphetamine, mistaking fentanyl for other drugs, and sharing smoking tools. Socially, fentanyl heightened overdose risk and fueled community stigma, while paradoxically instantiating forms of community care (i.e., overdose response, warning those experimenting with fentanyl).

*Conclusion:* Our research calls for evidence-based education about fentanyl, expanded access to harm reduction services, including community drug checking and safer smoking supplies, and low-barrier drug treatment as part of broader efforts to promote community care.

The introduction of fentanyl into the unregulated drug supply has drastically altered drug landscapes across the United States. Fentanyl has disproportionately contributed to the overall overdose burden (Spencer et al., 2022), increased racial disparities in overdose (Friedman et al., 2022), and spurned a retrograde shift to fear-based education campaigns and punitive law enforcement approaches (Collins & Vakharia, 2020; McKenna, 2023). Following earlier "waves" of overdose from prescription opioids, and later heroin, illicit fentanyl entered the drug supply in the early-2010s, first emerging on the East Coast and spreading westward (Friedman & Shover, 2023). Now amidst a "fourth wave" of overdose stemming from poly-drug use of fentanyl, stimulants, and other novel molecules (Ciccarone, 2021), it remains important to understand the contexts and consequences of intentional and unintentional fentanyl use and consider how fentanyl reshapes social relations in communities devastated by overdose.

To reduce the risk of fentanyl overdose, people using opioids have adopted harm reduction practices including using trusted dealers, reducing use, starting slowly, using with other people, and carrying naloxone to reverse overdose (Carroll et al., 2020; Walters et al., 2024). Fentanyl test strips have increased in popularity, enabling people to make informed choices and modify behaviors to reduce their risk, including not using particular batches or negotiating with dealers (Weicker et al., 2020). Community drug checking programs are also a critical tool to understand shifting drug supplies and how individuals

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leverage this information for overdose prevention (Park et al., 2023; Wallace et al., 2021). However, even when individuals know fentanyl is in their drugs, structural vulnerabilities (e.g., gender, race, housing status) may impede their ability to act on that information (Goodman-Meza et al., 2022; McKnight & Des Jarlais, 2018).

As fentanyl has become entrenched across drug landscapes, new preferences and social practices have evolved with changing tastes and tolerance (Urmanche et al., 2022). Many users have transitioned from injecting to smoking, which reduces the health (abscesses, endocarditis) and social (stigma) risks associated with injecting (Kral et al., 2021; Megerian et al., 2023). Research in San Francisco, California, documented an emerging "connoisseurship" of smoking fentanyl, or appreciation for the experience itself (Mars et al., 2024), signaling its hold on the West Coast. Simultaneously, refusing to smoke fentanyl with people with little to no tolerance enacts a form of overdose prevention (Ciccarone et al., 2024).

People who use stimulants are also impacted by expanding fentanyl markets. In one national drug checking study, 12–15 % of methamphetamine (hereafter "meth") and cocaine samples tested positive for fentanyl (Wagner et al., 2023). Studies have documented self-reported unintentional exposure to fentanyl (Daniulaityte et al., 2023; Lorvick et al., 2023; Mitra et al., 2020), even as toxicology data suggest discordance between urinalysis and self-reports (Lorvick et al., 2023; Park et al., 2022). Other research in the U.S. West found a low rate (6.9 %) of discordance between urinalysis and self-reported exposure, offering counterevidence to narratives of contamination (Kirk et al., 2024). Understanding contexts of unintentional exposure to fentanyl in stimulant markets is critical given the heightened risk of overdose due to opioid-naivety and limited experience with naloxone administration (Daniulaityte et al., 2022; Shin et al., 2022).

Taken together, variations across drug market landscapes differentially shape individuals' exposure to fentanyl, preferences and social practices, and risk for overdose, whether individuals intentionally seek out fentanyl or not, all of which carries implications for public health interventions and drug policy. We envision drug markets as more than economic exchange and chemical compositions; they are indicative of social relations across space and time. Using drugs is typically a social endeavor, and drug using relationships and practices are not only shaped by market forces, but discourses, attitudes, and personal experiences that also merit attention as part of a broad community response.

Our study charts the emergence of fentanyl in the Inland Empire of Southern California, a socioeconomically, geographically, and racially diverse but medically underserved area east of Los Angeles. In Riverside County, overdose rates have sharply risen, and are higher locally (34.2 per 100,000) compared to statewide (26.8). Reflecting trends in the Western U.S., fentanyl emerged in overdose death data around 2017 and 90 % of all overdose deaths in the county now involve fentanyl and/or meth (Hetherington, 2023). Harm reduction has only legally operated in the county since 2020, yet Riverside is a national leader in pursuing drug-induced homicide charges that levy prison time for those who sell drugs causing overdose (Corkery, 2024; District Attorney of Riverside County, 2024).

This analysis describes the rise of fentanyl in a historically meth-driven drug market. We draw on survey data to compare people using opioids (regardless of stimulant use) with people exclusively using stimulants, including unintentional fentanyl exposure and its health-related harms. Ethnographic and qualitative data lend further insights not only into the social contexts of unintentional fentanyl use, but transitions to experimentation and intentional fentanyl use. While fentanyl has aggravated drug-related harms and fueled stigma, it has also reshaped social relations amidst increased overdose risk. Studying the social implications of fentanyl can also help anticipate future market shifts.

## Methods

### *Study design and data collection*

This analysis of un/intentional fentanyl use draws from a mixed methods study of community drug use and overdose. We did not distinguish between self-reported fentanyl use and its more powerful analogues (e.g., carfentanyl). Participants provided written informed consent for qualitative interviews and verbal consent for surveys. Eligibility included being at least 18 years old, living in Riverside County, and reporting any use of opioids or stimulants (i.e., meth or cocaine) in the past 3 months. Participants were compensated $30 per survey or interview and received information about harm reduction, overdose response, and naloxone. The PI trained students and community members with lived experience of drug use to conduct surveys and interviews. Human subjects approval was provided by the University of California, Riverside.

### *Fieldwork & formative qualitative interviews*

Throughout the project, the PI and study team members conducted ethnographic fieldwork, including attending meetings, public events, volunteering in harm reduction spaces, and building relationships with the community. The PI regularly wrote fieldnotes of events and reflections to aid the analytical process.

In spring 2022, the PI conducted 16 interviews with 13 individuals from a convenience sample recruited through the local harm reduction program and snowball sampling. We did not collect socio-demographic data. Formative interviews explored the social context of drug use and overdose to inform recruitment and develop our survey. For example, initially we were going to restrict eligibility to opioid use, but given widespread meth use and social differences among drug-using groups, we expanded our inclusion criteria to include stimulants and added questions about the drug market, including unintentional fentanyl use.

### *Surveys*

From November 2022 – November 2023, we conducted 195 surveys. Surveys covered socio-demographics, drug use histories, overdose, including personal experiences and responding to others, use of harm reduction services, health and wellbeing, and law enforcement encounters. Participants were recruited through our formative qualitative sample, referrals from the harm reduction organization, and snowball sampling. Surveys took place in parks, libraries, coffee shops, encampments, and other public spaces. Surveys lasting from 45 min – two hours were interviewer-administered on laptops via RedCap and paper copies were used as backups.

### *Qualitative interviews*

From January 2023 – October 2024, we conducted additional semi-structured interviews to better understand our quantitative data. Interviews followed a semi-structured interview guide informed by questions arising from the surveys and preliminary fieldwork. We purposefully over-sampled participants from our formative qualitative sample and survey who had experienced opioid overdose and/or often responded to overdose in the community so we could learn from these lived experiences. We conducted semi-structured interviews with 25 people, 19 of whom were newly recruited and 6 of whom also participated in formative interviews.

In total, 32 unique individuals participated in formative and/or qualitative interviews, of whom 14 were interviewed multiple times over the study, including 3 couples and a pair of siblings who opted to be jointly interviewed. The series of longitudinal interviews built on our established relationships and centered how personal circumstances, including social contexts of drug use, shift over time. These interviews

also provided an opportunity for member checking our preliminary analyses. Our final dataset includes 53 qualitative interviews (16 formative and 37 semi-structured interviews).

## Data analysis

### *Survey measures*

The survey outcomes of interest were lifetime "intentional" and "unintentional" fentanyl use. Intentional use was measured as "Have you ever intentionally used fentanyl? This means that you used fentanyl knowingly/on purpose." Those responding yes were asked a list of reasons (informed by the formative fieldwork) and selected all that applied. To assess unintentional use (i.e. accidental exposure), we asked, "Do you think you have ever unintentionally used fentanyl? In other words, you didn't set out to use fentanyl." Those responding yes were prompted: "Tell me more about the last time you unintentionally used fentanyl." We thematically coded the responses and totaled the number of responses per thematic category.

Covariates emerge from our formative fieldwork, *a priori* knowledge, and relevant literature. Drug use inventories included self-reported lifetime and past 3-month drug use, injection, experiencing an opioid overdose, and overamping on stimulants. While overamping does not have a singular agreed upon definition, it can include sweating, heart palpitations, dizziness, seizure, stroke, and other intense physical manifestations of stimulant use. The Two-Item Conjoint Screen (TICS) for Alcohol and Other Drug Problems asked if people used more drugs than intended and wanted or needed to cut down in the past year. Mental health measures included depression (Patient Health Questionnaire, PHQ-2) and anxiety (Generalized Anxiety Disorder screener, GAD-2). Indicators of structural vulnerability were adapted from a clinical questionnaire (Bourgois et al., 2017). In total, 12 questions assessed the frequency (rarely/never vs sometimes/often/always) of daily challenges, including how often people experienced discrimination, violence, problems accessing food, and other structural determinants of health.

### *Quantitative analysis*

Informed by our fieldwork, we stratified our analyses by opioid use versus stimulant use. Herein, when referring to opioid use, we mean current (past 3-month) opioid use, regardless of any stimulant use because nearly everyone in the sample used meth. We define current, exclusive stimulant use as cocaine or meth use in the past 3-months, *without* any opioid use during that period. "Current" use accounts for primary drug preferences, which is otherwise diluted in extensive lifetime drug use inventories. We examined lifetime measures of drug use and overdose among these groups to account for broader temporalities of drug use, experimentation, and harm. We generated descriptive statistics and assessed correlates of intentional vs unintentional fentanyl use between and within each drug group. Categorical variables were assessed with Pearson's Chi-square test and Fisher's exact test for small cell counts (<5) and T-test for continuous variables. Open-ended survey responses were thematically coded.

### *Qualitative analysis*

All formative and semi-structured interviews lasted one-two hours and were conducted in participants' preferred locations, audio recorded, transcribed by a professional service, and verified by the research team. The analysis was guided by a collaborative approach emerging from formative interviews and fieldwork (Sangaramoorthy & Kroeger, 2020). The PI generated a list of codes and definitions for preliminary content coding; codes were based on deductive and inductive reasoning and intentionally broad (e.g., overdose) to inclusively tag information. The PI trained student research assistants (RAs) to apply the codes, and the study team met regularly to discuss questions and debrief about emotionally challenging interviews. RAs also wrote memos to summarize and identify unique findings and cross-cutting themes to generate a deeper understanding of the data, including noting contexts of stigma, which emerged as a theme. We used MAXQDA to manage and code the data. All names are pseudonyms.

### *Data triangulation and interpretation*

We engaged in an iterative process of moving between different data sources to identify and confirm patterns of fentanyl use, including comparing similarities and differences in intentional and unintentional use by people currently using opioids versus stimulants. We shared study results with our community advisory board and a peer board at the local harm reduction organization; we took notes on our conversations and used their feedback and questions to deepen our analysis. For example, a lively discussion in the peer board meeting regarding disagreement over the extent of fentanyl in the drug market confirmed the aleatory nature of fentanyl's local emergence and its differential impacts on opioid and stimulant users, which guided our quantitative analysis. In follow-up qualitative interviews, the PI also asked questions to check initial assumptions.

## Results

### *Sample description*

Of 195 individuals surveyed, 31 % were women, the average age was 43 years, 60 % reported racialized identities, and nearly three-quarters lived outside. The qualitative sub-sample was an average of 39 years old, 40 % were women, 40 % reported racialized identities, and most were unhoused. Based on purposive sampling, the majority used opioids and had personal experiences of overdose.

As shown in Table 1, 60 % ($n = 117$) of our survey sample currently (past 3-months) used opioids (nearly all of whom also currently use stimulants, at least occasionally), while 40 % ($n = 78$) exclusively used stimulants, primarily meth. Compared to exclusive stimulant users, opioid users showed significant socio-demographic differences, more indicators of structural vulnerability, more extensive lifetime drug use inventories, and were more likely to experience an opioid overdose and have a positive TICS score. Below, we analyze the market conditions and social contexts of un/intentional fentanyl use, teasing apart the experiences of those who use opioids versus stimulants.

### *"Test subjects" in an emerging fentanyl market*

Qualitative interviews and ethnographic fieldwork suggest that local drug markets started shifting away from the dominant "black" (tar heroin) several years ago, with fentanyl becoming widely accessible during the coronavirus pandemic. Participants described the sudden saturation as "when fetty [fentanyl] popped up, it just started popping up everywhere."

Most people surveyed ($n = 161$; 83 %) "suspected that fentanyl is being added to the drug supply." Qualitatively, people who used opioids noted fentanyl first emerged in the heroin supply, but disagreed over whether fentanyl was in stimulant supplies. Many argued it did not make economic sense to adulterate the stimulant supply and risk "killing everyone" while others contended that fentanyl was "everywhere." Both opioid and stimulant users self-reported encountering fentanyl in the meth supply, described further below, but all reports herein are based on subjective experience rather than confirmatory laboratory testing of drugs.

Kelvin, a Black man in his 20s living outside, captured the market uncertainty best when he explained that people who use drugs are now "test subjects" who must navigate a shifting drug landscape. Like other opioid users, Kelvin was first unwittingly exposed to fentanyl through

**Table 1**
Characteristics of people using opioids (regardless of stimulant use) vs exclusively using stimulants, $n = 195$.

| Current (past 3-month) drug use | Opioid use (n,%) 117 (60.0) | Stimulant use (n,%) 78 (40.0) | Total (n,%) 195 (100) | p-value |
|---|---|---|---|---|
| ***Socio-demographics*** | | | | |
| Age (mean, SD) | 41.5 (11.7) | 45.7 (10.3) | 43.2 (11.3) | **0.011** |
| Non-Hispanic White | 50 (42.7) | 27 (34.6) | 77 (39.5) | 0.256 |
| Racialized groups | 67 (57.3) | 51 (65.4) | 118 (60.5) | |
| Black/African American | 11 (9.4) | 12 (15.4) | 23 (11.8) | |
| Hispanic/Latino | 31 (26.5) | 24 (30.8) | 55 (28.2) | |
| Multiracial | 21 (17.9) | 13 (16.7) | 34 (17.4) | |
| Other | 4 (3.4) | 2 (2.6) | 6 (3.1) | |
| Female gender | 34 (29.1) | 27 (34.6) | 61 (31.3) | 0.412 |
| Heterosexual | 105 (90.5) | 61 (78.2) | 166 (85.6) | **0.017** |
| ≥High School | 95 (81.2) | 72 (92.3) | 167 (85.6) | **0.03** |
| Unhoused | 88 (75.2) | 55 (70.5) | 143 (73.3) | 0.467 |
| In a steady relationship | 48 (42.1) | 26 (33.3) | 74 (38.5) | 0.22 |
| ***Drug Use (lifetime)*** | | | | |
| Intentional fentanyl use | 99 (84.6) | 6 (7.7) | 105 (53.8) | **<0.001** |
| Unintentional fentanyl use | 62 (53.0) | 47 (60.3) | 109 (55.9) | 0.317 |
| Methamphetamine | 115 (98.3) | 77 (98.7) | 192 (98.5) | 1 |
| Cocaine | 107 (91.5) | 57 (73.1) | 164 (84.1) | **<0.001** |
| Heroin | 106 (90.6) | 36 (46.2) | 142 (72.8) | **<0.001** |
| Prescription Opioids | 88 (75.2) | 36 (46.2) | 124 (63.6) | **<0.001** |
| Inject drugs | 88 (75.2) | 43 (55.1) | 131 (67.2) | **0.003** |
| Opioid Overdose | 71 (62.3) | 20 (26.7) | 91 (48.1) | **<0.001** |
| Stimulant overamping | 67 (58.8) | 44 (59.5) | 111 (59.0) | 0.925 |
| Use fentanyl test strips | 47 (40.5) | 27 (34.6) | 74 (38.1) | 0.407 |
| Positive TICS Score (past year) | 97 (83.6) | 53 (68.8) | 150 (77.7) | **0.016** |
| ***Health and Wellbeing*** | | | | |
| Self-Rated Health (fair/poor) | 40 (34.8) | 24 (32.0) | 64 (33.7) | 0.692 |
| Physical pain* | 55 (47.8) | 44 (58.7) | 99 (52.1) | 0.144 |
| Depression | 53 (47.3) | 37 (51.4) | 90 (48.9) | 0.59 |
| Anxiety | 54 (47.8) | 38 (51.4) | 92 (49.2) | 0.634 |
| ***Structural Vulnerability*** | | | | |
| Ever stopped by police | 107 (96.4) | 67 (93.1) | 174 (95.1) | 0.307 |
| Ever arrested | 103 (92.8) | 65 (91.5) | 168 (92.3) | 0.759 |
| Trouble accessing food* | 59 (51.3) | 31 (41.9) | 90 (47.6) | 0.206 |
| Feel safe in daily life* | 96 (85.0) | 62 (82.7) | 158 (84.0) | 0.675 |
| Experience Violence* | 70 (60.9) | 46 (61.3) | 116 (61.1) | 0.949 |
| Social support* | 90 (78.3) | 50 (67.6) | 140 (74.1) | 0.102 |
| Experience discrimination* | 97 (85.1) | 53 (70.7) | 150 (79.4) | **0.017** |

P values = bold, <0.05; italics, <0.10.
* Sometimes/often/always is displayed.

the heroin supply, but shifted to regular use. He has been "cautious" and "won't indulge" in fentanyl like other drugs; even as an experienced opioid user, he recognized he could "go out" (overdose) from any given batch. He has reversed dozens of fentanyl overdoses. Kelvin's conception of "test subjects" helped us think about how market uncertainty is translated into the social relations of drug use, particularly given the pervasive negativity we heard about fentanyl in the community.

### *Unintentional fentanyl exposure among opioid users*

Given the widespread views of an unstable and adulterated drug supply, we assessed how the emergence of fentanyl impacted people already using opioids. As shown in Table 2, opioid users were split in terms of reporting unintentional fentanyl use. Those reporting unintentional use were more likely to report overamping, a positive TICS score, physical pain, and experiences of discrimination. However, unintentional fentanyl use was not associated with overdose.

Most people using opioids reported unintentional fentanyl exposure via the heroin supply, with several others mistaking M30 pills ("blues" or counterfeit pressed fentanyl pills) for other prescription opioids. Open-ended survey responses and qualitative interviews revealed that as fentanyl was increasingly introduced into the supply, people could

**Table 2**
Correlates of unintentional fentanyl use among people using opioids, $n = 99$.

| Unintentional fentanyl use | No (n,%) 50 (50.5) | Yes (n,%) 49 (49.5) | Total (n,%) 99 (100.0) | p-value |
|---|---|---|---|---|
| ***Socio-demographics*** | | | | |
| Age (mean, SD) | 40.7 (12.0) | 40.7 (11.6) | 40.7 (11.7) | 0.995 |
| Non-Hispanic White | 20 (40.0) | 25 (51.0) | 45 (45.5) | 0.271 |
| Racialized groups | 30 (60.0) | 24 (49.0) | 54 (54.5) | |
| Black/African American | 3 (6.0) | 5 (10.2) | 8 (8.1) | |
| Hispanic/Latino | 17 (34.0) | 9 (18.4) | 26 (26.3) | |
| Multiracial | 9 (18.0) | 8 (16.3) | 17 (17.2) | |
| Other | 1 (2.0) | 2 (4.1) | 3 (3.0) | |
| Female gender | 14 (28.0) | 15 (30.6) | 29 (29.3) | 0.775 |
| Heterosexual | 47 (94.0) | 42 (87.5) | 89 (90.8) | 0.265 |
| ≥High School | 37 (74.0) | 40 (81.6) | 77 (77.8) | 0.361 |
| Unhoused | 37 (74.0) | 36 (73.5) | 73 (73.7) | 0.952 |
| In a steady relationship | 20 (40.8) | 21 (44.7) | 41 (42.7) | 0.702 |
| ***Drug Use (lifetime)*** | | | | |
| Methamphetamine | 49 (98.0) | 49 (100.0) | 98 (99.0) | 1 |
| Cocaine | 47 (94.0) | 46 (93.9) | 93 (93.9) | 0.98 |
| Heroin | 48 (96.0) | 43 (87.8) | 91 (91.9) | 0.132 |
| Prescription opioids | 39 (78.0) | 39 (79.6) | 78 (78.8) | 0.846 |
| Inject drugs | 42 (84.0) | 35 (71.4) | 77 (77.8) | 0.133 |
| Opioid overdose | 29 (58.0) | 32 (68.1) | 61 (62.9) | 0.304 |
| Stimulant overamping | 22 (44.0) | 33 (70.2) | 55 (56.7) | **0.009** |
| Use fentanyl test strips | 18 (36.7) | 19 (38.8) | 37 (37.8) | 0.835 |
| Positive TICS score (past year) | 38 (76.0) | 45 (93.8) | 83 (84.7) | **0.015** |
| ***Health and Wellbeing*** | | | | |
| Self-Rated Health (fair/poor) | 12 (24.0) | 19 (40.4) | 31 (32.0) | *0.083* |
| Physical pain* | 17 (34.0) | 28 (59.6) | 45 (46.4) | **0.012** |
| Depression | 18 (37.5) | 25 (54.3) | 43 (45.7) | 0.101 |
| Anxiety | 20 (40.0) | 22 (48.9) | 42 (44.2) | 0.384 |
| ***Structural Vulnerability*** | | | | |
| Ever stopped by police | 45 (93.8) | 46 (100.0) | 91 (96.8) | *0.242* |
| Ever Arrested | 44 (93.6) | 44 (93.6) | 88 (93.6) | 1 |
| Trouble accessing food* | 21 (42.0) | 28 (59.6) | 49 (50.5) | *0.084* |
| Feel safe in daily life* | 41 (82.0) | 43 (93.5) | 84 (87.5) | *0.089* |
| Experience Violence* | 28 (56.0) | 31 (66.0) | 59 (60.8) | 0.315 |
| Social support* | 40 (80.0) | 36 (76.6) | 76 (78.4) | 0.684 |
| Experience discrimination* | 38 (76.0) | 42 (91.3) | 80 (83.3) | **0.044** |

P values = bold, <0.05; italics, <0.10.
* Sometimes/often/always is displayed.

subjectively tell something was different by its intensely sedating effects. Concerns around the shifting supply and rumors of deadly heroin – "*a batch of black that was killing everyone,"* as one put it - prompted many to test their drugs for fentanyl.

By the time we conducted our survey (2022–2023), most opioid users recognized the increasing presence of fentanyl in the heroin supply, if heroin could be found at all. Dealers played a key role amidst the shifting supply. One person got "*some bomb ass stuff*" from a particular dealer, only to later find out it was adulterated:

> *… I went back to buy it a third time from the same girl and she was like "be careful that shit has fentanyl." At the time I thought it was good shit, but that girl did me dirty, she could have given me a heads up. I have a homeboy that died of fentanyl, not from her, but she could have given me a heads up… you don't play with a person's life.*

This example illustrates the unanticipated market shift to fentanyl and its unintentional use, as many experienced. But it also gestures to the importance of social relations, trust, and communication about drug supply and overdose risk. This was a key emergent theme in terms of participants' relationships with dealers: they wanted trustworthy information to make conscious choices about their drug use.

### *Shifting preferences for fentanyl amidst a changing market*

Kari and Ben are a white couple in their 20 s who shared a typical pathway to and preference for fentanyl. They used to inject meth and heroin before transitioning to fentanyl, which Kari said reflected others in the community: *"We all did it the same way. We all just transferred over the same way from heroin to fentanyl slowly."* Over the course of the study, they obtained housing through a county program, which they hoped would help them to stop using. Although they have not yet quit, they reduced their risk by stopping injecting and have "graduating" from smoking on foil to dabbing (i.e., drugs are vaporized through contact with a surface heated with a blowtorch and inhaled). Kari's untreated physical health issues and chronic pain reinforced their continued use, as she noted, "*if you're in a lot of pain, it [fentanyl] does what it's supposed to do."*

Our survey indicated that multiple factors contributed to intentional fentanyl use: while market availability (57 %) and personal preferences (e.g., shifting to smoking or dabbing from injecting) shaped by market changes (39 %) primarily drove transitioning to fentanyl, people also reported curiosity (24 %), pain management (21 %), and other reasons (7 %). Qualitatively, people using fentanyl shared long trajectories of opioid use, often experienced physical health ailments, and had social relationships that shaped their use, even as some were "scared" to try fentanyl. Parker, a Black man in his 40s, and his girlfriend Natasha, a white woman in her 30s, shared extensive drug use trajectories when they met, but he had not tried fentanyl before Natasha:

> *I was like, "Well, if I'm going to buy it for her now, I might as well do it too then." Then I tried it, and that's how I got hooked… And just being in love. Because I wasn't doing it, and she would always leave to go through her crowd of people to go do it, and I didn't like it. So, I started doing it, you know how that shit goes.*

Early on, when he "wasn't quite yet messing with fentanyl," his unintentional fentanyl use happened while trying to shoot heroin: "*I asked [Natasha] to prepare it for me. We had used fentanyl before, never injected it and I guess she used the same stuff to mix it and it had fentanyl residue in it…. She didn't mean it. At the time we didn't know how strong fentanyl was. I could feel myself about to OD and I OD'ed."* On that occasion, she used naloxone to revive him. Now regular users, they have transitioned to smoking.

Chronic pain was also important in shaping trajectories of fentanyl use. Like Kari, Kelvin's opioid journey started with prescribed opioids for a sports injury that transitioned to heroin before fentanyl. After a while, "*heroin didn't really affect me like it did before… my pain was still there. So, I kind of pushed into the fentanyl, left heroin behind."* Kelly, in her 60s, started injecting heroin in her 20s. She suffered physical health issues and traveled to another county for prescribed methadone for pain management. She quit heroin for 18 years until her physician retired; the younger replacement worried about her history of addiction and tapered her medication. Without adequate pain relief, Kelly returned to heroin, got "fired" from the clinic, and lost her health benefits. Back to regularly injecting heroin, she was introduced to fentanyl by a friend: "*So one day I tried it [fentanyl] and worked for me … and from that first day that I tried it, I liked it. It was so much better to me than heroin. I didn't have to use the needle anymore. I never went back to heroin."* However, she worried about her daughter who also recently transitioned to street fentanyl from her pain medication to manage her own physical health issues.

### *The social stigma of fentanyl*

As fentanyl took hold of the market, so did social changes that shaped drug use practices and how members of communities related to each other. Participants told us that specific areas became known for fentanyl sales and use - e.g., an area called "heroin hills" was now called "fentanyl flats." In some unhoused communities, people segregated into opioid and stimulant-predominant areas, as the latter did not want the risk of someone overdosing and bringing "heat" (i.e. police) to their area. Thus, the emergence of fentanyl not only changed the landscape of overdose, but spatial and social relations.

People often told us they avoided being around others who used fentanyl altogether. Throughout our fieldwork, we heard a lot of negative judgments, including that people who use fentanyl have a "death wish." When asked about the changing drug market, one woman shared, *"I get so disappointed when I hear … friends go start doing fentanyl. Like, 'Yo, you're gross, don't talk to me no more.'"* Although she felt bad about ostracizing people, she, like others, did not like how people behave on fentanyl (e.g., nodding out). Nevertheless, she regularly responded to overdose and distributed naloxone, as she does not want anyone to die.

Part of the stigma stemmed from perceptions that withdrawal impels people to "do anything" to get well: "*But now you've got people that are doing way out shit to prevent from getting sick, and that way out shit is noticeable*," as one person put it. Kari said some of their friends "basically tried to shun us" when they started using opioids. These friends stole their belongings, justifying that "everyone" on opioids steals and can't be trusted. According to Kari:

> *So that took a while for them to fucking see that we're not going to just change into these weirdo people [from using heroin]. And then we started doing fent, it was kind of all over again. People were like, "Ugh, you guys fucking smoke fentanyl. I got to Narcan myself before I leave your house."*

While the idea of preemptive naloxone use is an extreme example, it is nevertheless typical of the fear and stigmatizing beliefs about fentanyl we commonly heard. Yet, even as they experienced stigma from people they knew, Kari has her own stigma against others using fentanyl, but admitted, "*I mean if somebody's sick and I know they're sick, I'm not going to just be like, "Ha, fuck you, dude." I'll help them if I can…."* Kari recognized the agony of withdrawal and was willing to help just as others have helped her with a "wellness" shot or hit, also revealing the empathy embedded in shared experiences of drug use.

Fentanyl's role in increased overdoses also exacerbated community stigma. While many avoided situations of potential overdose, others became regular responders, like Parker, who acknowledged, *"talking about this used to be traumatizing, but now it's normal; it's happening all the time. I used to get really worked up but now I know to stay calm… I've never let anyone die."* The weight of responsibility in responding was intensified by multiple reports we heard during fieldwork of negative treatment by first responders, particularly police who threatened arrest of bystanders and did not administer naloxone while also preventing others from doing so.

Negative discourses about fentanyl have also been reinforced by fear-

based media campaigns. As one person remarked, *"They just say, "It's a bad drug and it's strong," but they don't really paint the picture well. You know what I mean?* Ella, a white woman in her 30s, recognized how stigma harms all people who use drugs. Well-connected in the community, she always offered sharp insight in her ongoing interactions with the PI, noting that "education is a big tool that people don't have" and campaigns focusing on "scare off tactics" contribute to discrimination:

> *Yeah, Fentanyl is terrifying and stuff. But really?… But whatever happens if someone around you does it and you don't know what to do then? Because now, you're just going to shun that person and be like, "Oh, I can't believe you did that." But you're not helping anybody with a loved one who does it already. You're just trying to scare people off of it, which is just causing more discrimination and more hatred towards people who are already using it.*

Taken together, these examples illustrate how fentanyl is stigmatized with paradoxical effects: it has heightened physical health risks and reshaped social relations, including perpetuating discrimination in some spaces while galvanizing practices of care in others.

### *Unintentional fentanyl exposure among stimulant users*

Generally, participants who currently and exclusively used stimulants tried to both personally and socially avoid fentanyl. Based on our fieldwork, this avoidance was grounded in fear of overdose, but also deeply linked to stigmatizing views of opioids. Despite disagreement over the extent of adulterated stimulant supplies, both people using opioids and stimulants reported unintentional fentanyl use through meth. In such contexts, unintentional exposure was disproportionately harmful to opioid-naive people.

Among the 78 survey respondents exclusively using stimulants, 60 % ($n = 47$) reported unintentional fentanyl use in the course of their drug use. As shown in Table 3, unintentional exposure was associated with indicators of extensive lifetime drug use histories and experiencing violence and discrimination. Most surveyed blamed an adulterated stimulant supply. Many used fentanyl test strips and complained to their dealers after getting sick or encountering "sleepy meth" that didn't give the usual energetic effects:

> *"I was so mad I called my dealer and said "I didn't order this shit!" I haven't had sleepy meth in a while but that time I was sure there was fentanyl in it. Someone else's tolerance might be different! Hell yeah I called my dealer!"*

This is an important point in terms of opioid tolerance and differential overdose risk: exposure to adulterated meth among participants using opioids was viewed as manageable; people could subjectively tell and it did not affect them like opioid-naive stimulant users. In many cases, they alerted their friends or loved ones:

> *I was with friends smoking dope [meth] and it was in our dope without knowing, but I do fetty so it didn't bother me really, but I knew it had it in it cause I do it so I noticed right away and told my friends it was in their dope. Thank god nobody overdosed.*

> *I test the meth for my partner. I have a higher tolerance so I try all his drugs, I am the only one that does opioids so if it's in the drugs I know it and I don't let him do it.*

Of stimulant users unintentionally exposed to fentanyl, about two-thirds reported getting sick or overdosing during their last encounter. Indeed, opioid overdose was significantly associated with unintentional fentanyl use among stimulant users in our survey. Even if they did not overdose, stimulant users often experienced negative health effects:

> *It was mixed in with the speed, I went to stand up and I couldn't stand up, I felt funny, different than I usually feel. I fell to the ground and it felt like everything inside of me was shutting down. It was hard to breathe, hard to move, I was crawling on my hands and knees, calling out to my friend. I threw up and my friend told me I did fentanyl. I was so scared, one of my boyfriends had just overdosed on fentanyl … I was so scared I asked my friend "what should I do" and he said "just keep on throwing up" and I did, eventually I felt better.*

**Table 3**
Correlates of unintentional fentanyl use among people exclusively using stimulants, $n = 78$.

| Unintentional fentanyl use | No (n,%) | Yes (n,%) | Total (n, %) | p-value |
|---|---|---|---|---|
| | **31 (39.7)** | **47 (60.3)** | **78 (100)** | |
| ***Socio-demographics*** | | | | |
| Age (mean, SD) | 46.6 (9.5) | 45.0 (10.8) | 45.7 (10.3) | 0.506 |
| Non-Hispanic White | 7 (22.6) | 20 (42.6) | 27 (34.6) | *0.07* |
| Racialized groups | 24 (77.4) | 27 (57.4) | 51 (65.4) | |
| Black/African American | 9 (29.0) | 3 (6.4) | 12 (15.4) | |
| Hispanic/Latino | 10 (32.3) | 14 (29.8) | 24 (30.8) | |
| Mixed race | 5 (16.1) | 8 (17.0) | 13 (16.7) | |
| Other | 0 (0.0) | 2 (4.3) | 2 (2.6) | |
| Female gender | 9 (29.0) | 18 (38.3) | 27 (34.6) | 0.40 |
| Heterosexual | 26 (83.9) | 35 (74.5) | 61 (78.2) | 0.325 |
| ≥High School | 30 (96.8) | 42 (89.4) | 72 (92.3) | 0.393 |
| Unhoused | 19 (61.3) | 36 (76.6) | 55 (70.5) | 0.147 |
| In a steady relationship | 10 (32.3) | 16 (34.0) | 26 (33.3) | 0.87 |
| ***Drug Use (lifetime)*** | | | | |
| Methamphetamine | 31 (100.0) | 46 (97.9) | 77 (98.7) | 1 |
| Cocaine | 20 (64.5) | 37 (78.7) | 57 (73.1) | 0.166 |
| Heroin | 10 (32.3) | 26 (55.3) | 36 (46.2) | **0.046** |
| Prescription Opioids | 10 (32.3) | 26 (55.3) | 36 (46.2) | **0.046** |
| Injection drug use | 12 (38.7) | 31 (66.0) | 43 (55.1) | **0.018** |
| Opioid Overdose | 3 (10.0) | 17 (37.8) | 20 (26.7) | **0.008** |
| Stimulant overamping | 14 (46.7) | 30 (68.2) | 44 (59.5) | *0.064* |
| Use of fentanyl test strips | 2 (6.5) | 25 (53.2) | 27 (34.6) | **<0.001** |
| Positive TICS Score (past year) | 17 (54.8) | 36 (78.3) | 53 (68.8) | **0.03** |
| ***Health and Wellbeing*** | | | | |
| Self-Rated Health (fair/poor) | 10 (33.3) | 14 (31.1) | 24 (32.0) | 0.84 |
| Physical pain* | 19 (63.3) | 25 (55.6) | 44 (58.7) | 0.503 |
| Depression | 13 (46.4) | 24 (54.5) | 37 (51.4) | 0.502 |
| Anxiety | 16 (55.2) | 22 (48.9) | 38 (51.4) | 0.598 |
| ***Structural Vulnerability*** | | | | |
| Ever stopped by police | 28 (96.6) | 39 (90.7) | 67 (93.1) | 0.642 |
| Ever arrested | 25 (89.3) | 40 (93.0) | 65 (91.5) | 0.674 |
| Trouble accessing food* | 4 (13.3) | 7 (15.9) | 11 (14.9) | 1 |
| Feel safe* | 25 (83.3) | 37 (82.2) | 62 (82.7) | 1 |
| Experience Violence* | 14 (46.7) | 32 (71.1) | 46 (61.3) | **0.033** |
| Social support* | 20 (66.7) | 30 (68.2) | 50 (67.6) | 0.891 |
| Experience discrimination* | 17 (56.7) | 36 (80.0) | 53 (70.7) | **0.03** |

P values = bold, <0.05; italics, <0.10.
* Sometimes/often/always is displayed.

While the uncertain stimulant market created health risks, these examples show that fentanyl simultaneously heightened the need for community care and communication about overdose risk among dealers and drug using companions.

Relatedly, the social nature of drug use itself also shaped unintentional exposure to fentanyl, as smoking is often a communal experience. Beyond the supply, a significant number of stimulant users attributed their unintentional exposure to using someone else's drugs that they mistook for meth or cocaine, or sharing cross-contaminated drug equipment (e.g., pipes that had been used to smoke fentanyl). Throughout our fieldwork, we recognized the ubiquity of smoking meth and heard stories of people using pipes they did not realize had been used to smoke fentanyl. This was also illustrated in open-ended survey responses:

> *I bought meth and smoked it in my brother's pipe. I think there was fetty in it [residue in the pipe]. I got sick and was throwing up off & on for four hours.*

> *I found a pipe that had resin in it, I took a hit and it took my breath away.*

*I used my friend's rig, and the other time I used my friend's electric nail [dab rig] that had residue.*

*My friend had found some dope in the dumpster and he filled my bong with it and I went to go hit it and I instantly knew that it wasn't dope … I felt weird, instantly hot, and I didn't like it and it tasted different.*

Taken together, participants' experiences with unintentional fentanyl use suggest that both the supply and sharing practices contributed to unintentional exposure and health harms for people using stimulants.

### *Stimulant users experimenting with fentanyl*

Despite the social stigma of fentanyl use, perceptions and practices around drug use can shift and categories do not always remain discrete. Qualitatively, we found that as fentanyl became more prevalent and people using opioids also smoked meth with friends, some opioid-naïve people initially resistant to fentanyl grew curious and tried it. This invited overdose risk for experimental users while also creating stressful situations for those using fentanyl who then needed to respond to overdose.

Jorge, an unhoused Hispanic man in his 30s with a long history of drug use, including fentanyl, has reversed overdoses *"way too many times to count."* The incident that stands out is when unbeknown to him, his "homegirl" smoked from his foil and he had to use naloxone to revive her:

*And we're in the mid-conversation, I noticed she stopped talking and I realized she hit my foil and she went out. I freaked the fuck out. I was like, "What the fuck? Why? Why'd you do this?" And I'm panicking…I thought for a second she was done. I thought she died. And even when she came back, I had to explain to her, "Dude, that's something you don't fuck with. You don't know how much of a scare you just gave me. I thought you were donezo. Like it was a wrap."…. That was an eyeopener, like fuck don't leave your shit out. That was a good slap in the face.*

The story of Chip and Mikey, also part of the unhoused community, is not as fortunate. Both had lifelong drug use histories and called themselves "addicts." In an interview in spring 2022, Chip discussed his heroin preference:

*I mean, I'll smoke [fentanyl] if it's around, because I'm an addict. It doesn't matter what it is, I do it. Because I'm a fucking junkie. So my main thing is heroin, because I got a relationship with it already. I know heroin. I know what I can do and I can't. I know when I need to lay off it, and we have an understanding.*

At the time, Chip was mostly using heroin, but two weeks prior, he took a couple of hits of fentanyl and nearly overdosed. In contrast to his "relationship" with heroin and their "understanding" that kept him safe from overdose, the uncertainty of fentanyl reflected Chip's personal experience as a "test subject" in an evolving market.

Mikey, on the other hand, had a long history of meth use and occasionally dabbled in heroin, but never enough to create a "monkey on my back." He initially held negative views of fentanyl in his 2022 interview:

*Mikey: What's this fentanyl? Oh my God. People are ODing on this shit right and left. What's wrong with them? I mean, I got my addictions and everything, but they're like, "Oh, come on. This shit's killing people." I ain't smoking that shit.*

*Interviewer: Have you ever tried it?*

*Mikey: No, I won't. I've heard from some people, one hit and they're face first in the dirt. It's like, "You call that fun?" But I guess it's their opiate addiction because most of them start out doing heroin and then they go to fentanyl… I mean, yeah, I am an addict. I freely admit it, but I don't want to die because of it…. I don't understand what is wrong with these people… I mean, you got a death wish, because everybody knows what these drugs do you.*

Later that year, however, Mikey started experimenting with fentanyl with a mutual friend. Mia is of mixed race in her 40s; she's divorced from her husband who introduced her to drugs and now lives in a park. She regularly responded to overdoses in the community, including the time she gave Mikey a "shotgun" hit of fentanyl and he needed to be revived with naloxone. Mia forewarned Mikey "lots of times" and urged him not to use on his own. But one night, Mikey helped himself to the foil while Chip stepped out of the tent; when Chip returned, he found Mickey slumped over and he could not be revived. Members of the study team attended his funeral organized by community members of their encampment, where coffee and his favorite cereal were served and we honored positive memories of Mikey's life.

Even a year later, Chip remained visibly shaken in his interview when reflecting on Mikey's death; he blamed himself even as he too warned Mikey about fentanyl. Mia was also devastated:

*I just don't understand why would he reach for the foil? Why? He knows he couldn't do it. I just don't understand why he would do that. Why he would've abandoned me.*

While the market set the conditions, Mikey's social world reshaped his drug use trajectory; his stigma toward fentanyl changed in seeing his friends using, even as they attempted to shield him from harm. Mikey's death reverberated in the community, altering the social landscape and illustrating the grief and emotional weight of fentanyl overdose.

## Discussion

Our research in an under-resourced and understudied region of California documents an evolving landscape of fentanyl use that has propelled overdose and reshaped social relations. The emergence of fentanyl in this entrenched stimulant market is complicated by its historical conservative politics that has prioritized criminalization over harm reduction, generating both risk for people using drugs and community resistance through practices of care that can transform risky conditions. Amidst a fourth wave of overdose driven by fentanyl and stimulants, our analysis examines not only drug market dynamics, but how people experience being "test subjects" navigating an evolving drug supply, including those who are opioid-naive. Our work underscores how fentanyl use is not a monolithic experience, and its social implications require thinking beyond current fear-based educational campaigns and criminalization. Understanding how fentanyl reshapes the social dynamics of drug use and overdose risk is critical to informing interventions, while also anticipating future shifts in the U.S. drug supply. We offer several points of reflection below.

First, people reporting current (past 3-month) opioid use showed more social vulnerabilities and extensive lifetime drug use histories compared to people currently and exclusively using stimulants. These groups were also differentially impacted by the emergence of fentanyl in local markets. Most opioid users were unintentionally exposed through the heroin supply and M30 pills and their options became constrained to fentanyl as the market shifted. However, transitions to intentional use also occurred within the contexts of their preexisting vulnerabilities and social relationships. Those reporting unintentional fentanyl use were in particularly precarious health, including being significantly more likely to experience daily pain and report worse overall health. These health concerns also permeated our qualitative interviews, suggesting that adequate pain management could provide access to a safe supply and improve overall health (Benintendi et al., 2021). Further, indicators of more extensive drug use histories and structural vulnerability call for comprehensive harm reduction programming and low barrier medication-assisted treatment (Simon et al., 2022).

More than half of exclusive stimulant users surveyed reported unintentional fentanyl exposure, mostly attributed to adulterated meth. Unintentional fentanyl use was also associated with extensive lifetime drug use histories and structural vulnerabilities, suggesting that the most vulnerable are disproportionately impacted by drug market

uncertainties. Unintentional fentanyl use was also significantly associated with overdose among exclusive stimulant users, but not among opioid users, underscoring growing concerns around stimulant-related overdose (Bazazi et al., 2024; Daniulaityte et al., 2022). People using opioids already had a tolerance, which likely offered protection to overdose compared to those only using stimulants. Stimulant users reporting unintentional fentanyl use were more likely to use fentanyl test strips and many complained to their dealers about adulterated batches, suggesting the feasibility of establishing community drug checking programs. Such programs are most effective with the meaningful involvement of people who use drugs (Schmidt & Yarelix Estrada, 2024), including dealers who could be valuable sources of community information about overdose prevention.

Beyond narratives of the evolving drug supply, the importance of social contexts in unintentional fentanyl use support the need for pragmatic harm reduction. Some participants mistakenly took drugs they thought were meth, while others shared cross-contaminated smoking tools. Smoking supplies have been excluded from federal funding initiatives, but this is based on politics and racism rather than public health evidence (Dennis, 2024). Our work underscores that sharing smoking tools is a risk factor for unintentional fentanyl exposure and should be prioritized in harm reduction programming, including overdose education tailored for stimulant users to impart the skills and confidence to respond to overdose and encouragement to carry naloxone (Fleming et al., 2020). Distributing safer smoking kits is also associated with reductions in injecting and greater participant engagement and naloxone distribution (Chung et al., 2024; Fitzpatrick et al., 2022). Linking stimulant users who might be inadvertently exposed to fentanyl with harm reduction programs is critical to give people the information and tools they need to prevent and respond to unintentional exposure and overdose resulting from fentanyl and other emerging synthetic opioids in drug supplies.

More broadly, the complex social implications of the emergence of fentanyl require unpacking. As a relatively recent addition into a drug landscape entrenched with the historical production and consumption of meth (the American TV show about rogue meth production “Breaking Bad” was originally to be set in Riverside (Freñán, 2010)), we also observed a social stigma emerging with fentanyl. This reflected many individuals’ desire to avoid exposure to fentanyl and its harms, but discounts the often-difficult pathways that opioid-dependent individuals traverse into fentanyl use. Criminalization and punishment not only create antagonistic landscapes that impede the delivery of harm reduction services (Syvertsen & Pollini, 2020), but fuel social stigma (Sauer, 2024), thereby heightening overdose risk.

Stigma (negative attitudes) and discrimination (unfair treatment resulting from negative attitudes) become internalized and circulated within drug-using communities: not only were people using opioids more likely to report discrimination compared to stimulant users in our survey, unintentional fentanyl use among both opioid and exclusive stimulant users was also associated with discrimination, suggesting that any affiliation with opioids, and fentanyl specifically, was socially harmful to people. While our survey measure was broad, qualitatively people said their intersecting drug use and unhoused status drove their discriminatory experiences. Moreover, negative discourses in the community about fentanyl permeated our fieldwork and contributed to individual negative experiences. Now that Proposition 36, otherwise known as the "Homelessness, Drug Addiction, and Theft Reduction Act," was approved in 2024, California has essentially criminalized the stigma that participants experience. Compassionate legislation and stigma reduction campaigns are urgently needed to reframe conversations about fentanyl.

To this end, we see points of social intervention to build upon that could transform the uncertainty of being “test subjects” into new routines of care. For example, opioid users who encountered adulterated meth often warned others to help them avoid exposure, showed compassion for those experiencing opioid withdrawal, and drew parameters around sharing fentanyl with opioid-naïve people. Others transformed into the self-proclaimed “real first responders” in the community to regularly reverse overdoses. As such, our findings support leveraging and uplifting forms of community care that are already happening. Not only do we need material support for harm reduction, we call for a more capacious praxis of harm reduction to encompass a political ethos of caring for one another (Levenson et al., 2023). This includes addressing the social and emotional ramifications of fentanyl, such as community grief and loss. We also call for more compassionate practices by first responders, expanded harm reduction-based educational campaigns, and a shift away from prosecutorial approaches as part of the structural efforts needed to change harmful narratives and build empathy. These initiatives will remain relevant as the drug supply invariably continues to shift to other novel synthetic opioids.

Our research is limited by self-reported drug use without toxicological confirmation, including our inability to distinguish fentanyl from its more potent analogues. Our non-random sample hampers generalizability, but, our community-engaged approach of building relationships people who use drugs to center their perspectives is a strength; the participants are on the frontlines of a rapidly changing market and offer valuable insights that are often ignored by policy makers. It is also difficult to capture the temporality of changes in a cross-sectional survey; for example, asking about the most recent unintentional exposure misses other experiences and limits our ability to establish direct causal links. The disagreement we found over the extent of drug market contamination reflects how failed U.S. drug policy has created an unregulated supply in which none of us are entirely sure of what is happening in our communities. Sensationalized rhetoric from law enforcement and media would lead us to believe that “all” drugs are contaminated with fentanyl, but this is likely exaggerated. Nonetheless, if people assume that fentanyl is in the supply, they may be more likely to self-report exposure to it. Another explanation is that meth manufacturing techniques could produce sedating effects assumed to be fentanyl (we consistently heard complaints of meth not being as potent as it once was). Notably, while we did not systematically inquire about fentanyl-related stigma, this emerged as a key qualitative theme that merits further attention as part of a comprehensive overdose response.

As a final point, our research probably raises more questions than it answers, signaling that current approaches to addressing fentanyl are inadequate and must better attend to the social contexts and consequences of its use. People who use drugs must be central in interventions to address overdose and provided with support to build communities of care. Studying the social implications of fentanyl can also better prepare us for future supply challenges and resist the failed drug policies favoring enforcement approaches over communities that created deadly drug market conditions in the first place.

## CRediT authorship contribution statement

**Jennifer Syvertsen:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Alejandra Cabral:** Writing – review & editing, Investigation, Formal analysis, Data curation. **Elijah Knaap:** Writing – review & editing, Funding acquisition, Conceptualization. **Sergio Rey:** Writing – review & editing, Funding acquisition, Conceptualization. **Robin A. Pollini:** Writing – review & editing, Funding acquisition, Conceptualization.

## Declaration of competing interest

All authors disclose that we do not have any financial and personal relationships with other people or organizations that could inappropriately influence or bias our work.

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