

Research Paper

Drug transactions and the dark web: Public perceptions of the locational setting of offenders and support for drug policy outcomes

Leanna Ireland^{a,*}, Eric Jardine^b^a Mount Royal University, 4825 Mt. Royal Gate SW, Calgary, AB T3E 6K6, Canada^b Chainalysis, 114 Fifth Avenue, New York City, NY, United States

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ABSTRACT

Background: Both legal and extra-legal factors influence judicial and non-judicial opinions about persons who use drugs. Yet, how the locational setting of drug transactions influences public perceptions of drug control policies remains understudied. In particular, the public's view of drug exchanges on the dark web could directly and indirectly influence drug policy, legal decision making, and spending decisions. The study's aim is to identify whether the location of a drug exchange, specifically the dark web, influences public preferences for drug policy and police resourcing.

Methods: A sample ($n = 1359$) from the United States of America was recruited and participated in a discrete choice experiment. The participants compared and repeatedly chose across five iterations between two drug offender profiles with nine set features, such as the location of drug transactions, all with randomized levels. The resulting sample included a total of 13,590 contest pairs.

Results: Averaging over the non-locational attributes, respondents indicated that, compared to the dark web, several locational settings for drug exchange (such as the street corner, social media, and an unknown location) needed fewer police resources and offenders were less deserving of longer punishments. No statistically significant difference was found for opinions about harm to communities, and offenders involved in drug exchanges on university campuses were considered more deserving of a substance abuse treatment program than offenders on the dark web.

Conclusion: There appears to be a preference for more punitive criminal justice policies for drug transactions occurring on the dark web relative to some other common settings. Such preferences may indicate a novelty effect driven by negative sentiment surrounding the dark web or a perceived deficit in the police's ability to deal with drug crimes on the dark web. These findings suggest that the public may prefer supply-side policing efforts over demand-side policies, which emphasizes harm reduction.

Drugs are consistently one of the most popular products for sale on cryptomarkets (e.g., Laferrière & Décary-Héty, 2023; Soska & Christin, 2015; Tzanetakis, 2018). An earlier joint study by the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) and Europol (2017), for example, found upwards of 60 percent of most darknet markets listed products were drug-related. Likewise, a more recent investigation found drugs accounted for 91 % of all sales on 28 major darknet marketplaces (UNODC, 2022).

These so-called cryptomarkets mirror the functionality of traditional e-commerce sites, including customer feedback ratings, comment sections, and escrow systems. Where cryptomarkets diverge from traditional e-commerce services is their location on the dark web and their

use of cryptocurrencies to facilitate monetary exchange, both of which provide (pseudo)anonymity to market participants (Barratt and Aldridge, 2016). In this paper, the terms 'darknet markets' or 'darknet marketplaces' will be used interchangeably with cryptomarkets.

Throughout the years, the number of vendors and listings on these marketplaces have steadily increased (e.g., Bhaskar et al., 2019; Soska & Christin, 2015). According to Chainalysis (2022), the total transfers of cryptocurrencies to darknet markets have regularly grown from 2012 to 2021, with darknet market revenues estimating more than 1.5 billion US dollars. Their more recent report indicates a decline in revenue for darknet markets from 2021 to 2022, attributed largely to the shutdown of the Hydra Marketplace in April, but the trend in inflows remains

* Corresponding author.

E-mail address: lireland@mtroyal.ca (L. Ireland).<https://doi.org/10.1016/j.drugpo.2023.104286>

upwards (Chainalysis, 2023).

This long-term growth in the appeal of darknet markets may partially come from how these services overcome some of the problems of traditional street sales. Buyers on cryptomarkets, for example, can rate transactions, which gives an incentive for vendors to provide higher quality products and lets buyers sort for more reputable vendors (Bhaskar et al., 2019; Espinosa, 2019). The option of an escrow system on marketplaces also increases the reliability of the transfer of illegal goods, preventing conflicts (Aldridge & Askew, 2017; Van Hardeveld et al., 2017). Darknet drug markets might also provide an opportunity for increased quantity and availability of drugs for sale in a given area, especially in more remote rural locations (Matthews et al., 2023).

Despite the growth and potential benefits of online sales for market participants, cryptomarkets account for only a fraction of the global drug trade (Aldridge & Décary-Héty, 2016). According to Global Drug Survey data reported by the United Nations Office on Drugs and Crime (2023), in 2022, 10.8 % of people who used any type of illegal drugs within the past 12 months procured them on darknet markets. This proportion, however, has significantly increased from 4.7 % in January 2014. The most popular method, regardless of the type of drug, for procurement is often in-person drug transactions, followed by friends or an unknown dealer (Barratt et al., 2022). All of which suggests that locations wherein individuals can engage in drug exchange have proliferated, and now include physical settings alongside digitally mediated environments such as social media, encrypted messaging applications, and cryptomarkets.

Although the market share for drug transactions on the dark web is relatively small, may reduce street violence (Barratt et al., 2016), and can facilitate harm reduction (Bancroft, 2017; Bancroft & Reid, 2016; Rhumorbarbe et al., 2016), the general public's perceptions of the role of cryptomarkets as a site of drug exchange may widely diverge from reality, with the media often portraying such sites as sinister (Jacobsen, 2021; Jardine et al., 2023; Sardá, 2020). Little research, however, exists on public perceptions of drug transactions on the dark web and no study to-date has explored the dark web as an extralegal factor influencing public opinions, which in turn can impact drug policy, judicial reasoning and law enforcement activities (Burstein, 2003; Jerre, 2013). This research is important because the public's view toward the location of a drug exchange might have material implications for drug policy and police resourcing.

Literature review

Policy, public perceptions, and drug offenders

Public perceptions act as a guide for drug policy, legal decision making, and spending decisions. Judicial authorities, for example, may modify their decisions to align with public opinion to protect institutional legitimacy (McGuire & Stimson, 2004). Politicians, likewise, can craft budgetary choices and draft legislation in order to cater to the public's attitude towards drug-related crimes, alternatively emphasizing supply- or demand-side policy efforts depending upon the prevailing sentiment of the day (Burstein, 2003). Drug laws, for example, are often more associated with public perception than the potential for harm (Rossi et al., 1997). For instance, persons who use drugs are often not considered a threat to society – but public support for criminalization has historically been high (Paulin et al., 2003).

With the potential to influence public policy in a number of ways, how the public views drug-related offenses is an important area of research. Prior research indicates that both legal and extralegal factors influence perceptions of harm and wrongdoing (e.g., Doerner & Demuth, 2010; Spohn & Beichner, 2000; Spohn & Holleran, 2000). For example, some research suggests that the public holds more negative perceptions toward racial minorities who use drugs (McGinty et al., 2015), males who use drugs (Goodyear et al., 2018; Sattler et al., 2017; Weeks & Stenstrom, 2020), persons using 'harder' drugs, such as cocaine

or crack (Kuettel, 2023; Lang & Rosenberg, 2017; Sattler et al., 2017; Sorsdahl et al., 2012), persons using drugs with past offending behavior (Bandara et al., 2020), and older persons who use drugs (Sattler et al., 2017). In one experimental study, for instance, respondents were given a vignette with changing offender profiles and asked what punishment each offender deserved. Respondents thought offenders depicted as using cocaine and having a criminal record were more deserving of punishment than those lacking these profile features (Kuettel, 2023). In another study, only about 40 % of respondents supported less punitive policies (i.e., the elimination of mandatory minimum sentences, removal of public housing and supplemental nutritional assistance program restrictions) for persons with felony drug convictions (Bandara et al., 2020). Largely absent from this previous research, however, is a detailed look at the public's view toward the location of a drug exchange.

Internet-enabled drug transactions

Drug exchanges can happen in any number of locational settings, from street corners to university dorm rooms. Increasingly, Internet-based digital communication tools, such as social media platforms, encrypted messaging applications, and, increasingly, the dark web are a common transaction setting for drug exchanges. For instance, in one survey, about 10% of respondents from the United States of America (USA) and 8% from Spain who reported using drugs at any point indicated purchasing drugs through online sources. Of those individuals, 31% and 14% of respondents, respectively, bought drugs through the dark web. The remainder purchased drugs through social media sites, such as Instagram, Facebook, and Craigslist (Oksanen et al., 2021).

When compared to offline drug exchanges, drug sales on the Internet provide buyers and sellers with distinct structural and security features (Bakken & Demant, 2019; van der Sanden et al., 2022a, 2023). While the exact nature of these features differs between applications, transactions via social media are often highly visible and accessible, making for an open or public drug market. As a result, persons who purchase and/or sell drugs and transact on social media have expressed concerns about data persistence and the visibility of such activity to a broader audience, including law enforcement. To address some of these concerns, buyers and sellers often use code language, such as icons or emojis to represent products. In addition, transactions may be planned online but occur face-to-face, making social media transactions more regional and localized (van der Sanden et al., 2022a, 2023).

In contrast to social media, encrypted messaging applications, such as Telegram, often have more advanced security features, such as self-deleting data or messages, end-to-end encryption, and permissioned groups (Barratt et al., 2022). These applications are a location for drug transactions that can involve closed but extended social networks, where buyers and sellers are more likely to know one another, have transacted before via some other modality, or have a known third party who can facilitate an exchange (Bakken & Demant, 2019). Drug transactions with such features on encrypted messaging apps are more akin to closed drug markets (Hough & Natarajan, 2000). In addition, application-based drug transactions also involve an open drug market with large public groups (Barratt et al., 2022; Blankers et al., 2021). Persons who use drugs can join these public or permissioned groups on encrypted messaging applications to locate product; however, an analysis of messages on three Dutch language Telegram market groups indicate that messages pertaining to drugs are predominantly from sellers rather than interested buyers (Blankers et al., 2021).

Cryptomarkets, finally, are yet another Internet-based and increasingly common locale for drug exchange. These markets work like anonymized e-commerce platforms, employing reputation metrics that aggregated customer feedback ratings to facilitate trust between buyers and sellers (Barratt & Aldridge, 2016). Payments are made using cryptocurrencies such as Bitcoin. While these sites vary tremendously in size, it is common for multiple sellers of drugs to operate on any given site.

Products bought from darknet markets are typically delivered to the buyer via the postal network or dead drops (drugs dropped at hidden places for later pick up) (Jardine, 2021; Matthews et al., 2023). Because these sites mirror traditional e-commerce platforms but operate on the anonymized dark web, they are usually considered a hybrid of both open and closed markets (Aldridge & Décary-Héту, 2016). Unlike social media sites or most encrypted messaging applications which can be downloaded from an app store, darknet markets are only accessible via a special routing software (e.g., The Onion Router (Tor)) and are significantly harder to find and use effectively.

However, what cryptomarkets lack in terms of accessibility, they make up for in terms of security. Darknet markets provide buyers and sellers with a more secure, encrypted and anonymous platform than other internet-based locales (Barratt & Aldridge, 2016). In addition, many cryptomarkets employ escrow systems – where a third-party administrator ensures that transactions are completed to the satisfaction of both buyers and sellers. This feature provides a sense of security and confidence in supply for buyers (Bancroft & Scott Reid, 2017; Barratt et al., 2014). In addition, unlike offline markets, buyers and sellers do not need to be physically near each other and no face-to-face interactions are needed. Through the use of state postal services, sellers on cryptomarkets can reach a wider audience and buyers can access a wider range of drugs than might be otherwise available in their area, though many participants still choose to operate domestically because of the risks associated with shipping across international borders (Demant et al., 2018).

Overall, while each Internet-based location is nominally distinct, persons who use drugs appear to traverse platforms fairly readily (Bakken & Demant, 2019; Barratt et al., 2022; Childs et al., 2020; van der Sanden et al., 2023). Despite the permeable boundaries that exist between the various Internet-enabled locations for drug exchange, the public likely holds fairly distinctive views of the different technologies due to a mixture of variegated technical features, familiarity, and media framing.

Public perceptions of cryptomarkets

Broadly, the dark web is viewed unfavorably by the general public (Jardine, 2018). In a CIGI survey of 24 countries, 71 % of respondents thought the dark web should be shut down (Hampson & Jardine, 2017). Media coverage of the illicit and malicious content may influence public opinions and knowledge about the dark web. For instance, amidst a wide range of deterrent and publicity signals (Jardine et al., 2023), much of the popular media coverage of the dark web is suggestive of moral panics associated with Internet culture over the years (Gehl, 2016). A UK study, for instance, found that the British press represents the dark web in a sharply negative way, emphasizing dimensions of darkness and illegality (Sardá, 2020).

Similarly, a comparative study of two dark web documentaries found that a preponderance of film time was devoted to the negative dimensions of the dark web, such as drug sales, weapons, and paedophilia (Jacobsen, 2021). Another study which examined media coverage of darknet market takedowns in the USA found that more deterrence (i.e., severity, certainty and celerity) signals were present than publicity signals (e.g., financial gain, low risks), possibility dissuading people from using the dark web while simultaneously stressing its illicit functions (Jardine et al., 2023).

The negative representation of the dark web both generally and as a location of drug exchange might have implications for the public's support of various drug policy options. Notably, the public might feel that, compared to other locations, the dark web deserves greater police attention (i.e., additional dollars spent, officers assigned, and so forth) because it is viewed in largely negative terms. More precisely, we expect that:

H1: The public will prefer greater resources spent to catch drug transactions on the dark web compared to other locations

This hypothesis and each of the following three hypotheses have sub-components for each of the studied locations (i.e., social media, encrypted messaging applications, university campus, on a street corner and an unknown location). However, for practical constraints and readability, we included only the main hypotheses, where we broadly expect the dark web to perform differently from all other locations.

Drug purchases from darknet markets could alternately reduce and amplify the perceived harm caused by drug exchange. On the one hand, perceptions of the harm caused by drug exchange to a local community might be less pronounced for darknet drug transaction, when compared to similar exchanges in other settings. For example, drugs purchased from cryptomarkets might be purer and closer to the advertised product than street drugs, reducing the likelihood of an accidental overdose (Caudevilla et al., 2016). Additionally, many darknet markets include accompanying chat forums, which create a social network of persons who use drugs who can emphasize responsible drug use (Bancroft & Reid, 2016). Finally, traditional street exchange is often associated with violence, either between buyers and sellers or between rival sellers vying for territory or sales. By connecting buyers and sellers across geography, the individual risk of violence may be significantly reduced (Barratt et al., 2016; Martin, 2014).

On the other hand, darknet markets might potentially lead to increased perceptions of community harm. Three potential pathways run from darknet markets to heightened perceptions of community harm. First, by reducing the relevance of geography, cryptomarkets might result in novel and higher volume of drugs entering an area (Aldridge et al., 2018; Barratt et al., 2016). For instance, persons that sell drugs can acquire reliable quantity without prior connections to offline drug supplies and resell the product through social media, a more convenient locale for drug transactions (van der Sanden et al., 2023). Additionally, more remote locations that might not have had a market of sufficient scale to sustain a complex illicit substance ecosystem might now be flooded with drugs since delivery is handled via local mail (Barratt et al., 2016; Matthews et al., 2023), potentially resulting in more persons using drugs in local area than might otherwise be the case. Finally, and somewhat independently from the real harms that might be caused by cryptomarket use, darknet markets might be seen as more harmful to a person's community due to the mythology surrounding these sites (Hampson & Jardine, 2017; Sardá, 2020), particularly the real or implied criminogenic associations between darknet drug markets and other Tor sites, such as murder for hire or child abuse material sites.

While perceptions of both less and more harm to local communities might follow from the use of darknet markets, it is plausible that, on balance, the harm reductive effects are overshadowed by the perception of worsening harm from these sites. This is particularly the case for two reasons. First, the harm reductive effects tend to accrue most clearly to individuals (e.g., higher quality product and potential for decreased seller victimization) who use or buy drugs, while the negative spill overs from the use of darknet markets (e.g., more drugs, a wider range of drugs, etc.) might create more perceived aggregate harm, such as increased crime rates. Community members are more likely exposed through media accounts to the aggregate harms than the localized harm reduction potentials of cryptomarkets. Second, interrelatedly, the darknet is routinely presented in highly negative terms within the media and so the public, without knowledge of the potential harm reducing effects of cryptomarkets, might assume they are bound to cause additional harm to the community. As a result, we predict that:

H2: The public will view drug transactions on the dark web as more harmful to their community compared to other locations

Most nations use a mixture of supply (deterrence, enforcement, etc.) and demand-side drug policy to try to minimize the social issues that can follow from drug use. Core to the supply side of the drug policy equation is enforcement, and, in particular, incarceration of those involved in drug-related offenses. Historically, for example, the US public's support for being tough-on-crime has influenced more punitive policies which contributed to a high incarceration rate, including those involved in

drug exchange (Enns, 2014). Incarceration often has multiple purposes, from punishing the offender to deterring others through the threat of punishment.

While a number of factors influence a desire to see an offender punished (e.g., subject to longer sentences), perceived moral wrongfulness is the foremost predictor for crime seriousness (Adriaenssen et al., 2020), which, in turn, is a key consideration when determining the suitability of punishment. Since the public tends to hold a predominately negative view toward the dark web (Hampson & Jardine, 2017), it is plausible that persons conducting drug exchanges occurring in this location will be seen as more deserving of punishment than those conducting similar activities in other locational settings. We predict that:

H3: Persons procuring drugs on the dark web will be considered more deserving of longer punishments relative to other locations.

Finally, while punishment and substance abuse treatment programs are not mutually exclusive outcomes following a drug exchange, it is probable that people would tend to see offenders as deserving one or the other and not both. For example, compared to older individuals, youth who are involved in drug related offenses might be seen as more deserving of treatment programs (Scott et al., 2006), everything else being equal. Since there are good reasons to suspect that people will prefer to punish offenders who use the dark web to buy or sell drugs, then it follows that such offenders will also be seen as less deserving of inclusion in a treatment program compared to drug exchange participants in other settings. Thus, we predict:

H4: The public will consider persons procuring drugs on the dark web as less suited for a substance abuse treatment program relative to other locations

Methods

Design

Discrete choice experiments were used for our study. In discrete choice experiments, participants are given two or more options with different attributes (and feature levels) to choose from. As an example, participants might indicate their preference between two vaccination programmes with varying levels of effectiveness, price, and adverse events (Dong et al., 2020). These options are compared and weighed against each other simultaneously. In making a choice between two or more options, respondents make a trade-off between their preferred and less-than-preferred attribute levels. Although there are limitations with discrete choice experiments (such as the attributes cannot reflect all possible options and the scenarios are hypothetical), this design allows for a wide-range of attributes to be displayed in the possible options, more closely mirroring the complexity of real-world decisions (Hoyos, 2010). This study was approved by the Institutional Review Board at [INSITUATION REMOVED] and the Human Research Ethics Board at [INSITUATION REMOVED].

Sampling

The discrete choice experiment was launched and a sample recruited by Qualtrics, a survey company, in July 2021. Qualtrics has an existing pool of potential participants who have agreed to receive solicitations for survey recruitment. For the current study, they sampled participants using researchers' specified criteria from their membership panel. by distributing a descriptor of the survey topic and a link for the survey via email. Compensation, in the form of 'award' points, was provided directly by their company to participants. The exact amount of award points, however, was not revealed to us by Qualtrics.

The sample was based in the US. Despite the popularity of local marketplaces, the USA is a top country for cryptomarket drug activity (Norbutas, 2018; Tzanetakis, 2018; Van Buskirk et al., 2016). For instance, Christin (2013) found that 43.8 % of the countries of origin for drug transactions was the USA; the top country for acceptable shipping

destination according to vendor profiles was also the USA. Moreover, the USA has high levels of overall drug activity (UNODC, 2022), making the issue of drug enforcement highly salient. With such popularity of drug transactions, the USA is an ideal location to investigate how the public perceives the location of a drug exchange.

We used quota-based sampling to approximate a nationally representative US population in terms of gender, race and ethnicity, region, and age (See Appendix for full comparison). Quota-based sampling is a non-probability sampling method where participants are recruited to match the proportions in a given population. Although quota-based sampling can improve representativeness of the defined characteristics, other important characteristics may not be fully represented with resulting limitations to the generalizability of the findings.

Table 1 presents the demographics of the participants in the sample. While most demographic measures reasonably approximate the US population at large, a few under or over represent certain features. Compared to the US population, for example, Hispanic/Latinx respondents are underrepresented in the sample (9.8% versus 18.9%) (US Census Bureau, 2021). However, different measures of ethnicity might account for this difference. In the survey, respondents were asked which ethnicity or race they *most* identified with whereas the US Census records *any* identification with a Hispanic ethnicity. In terms of age, those aged 55 to 64 are underrepresented in the sample compared to the US population (7.8% vs 17%). In addition, those aged 65 to 74 are overrepresented in the sample compared to the US population (17.9% vs. 13.5%). In terms of region, the Northeast region is underrepresented (10.3 vs. 17.2), whereas the West region is overrepresented (35 vs. 23.7). The final sample consists of 1359 participants.

Survey design

In our discrete-choice experiment design, participants were asked to compare and choose between sets of two offender profiles characterised by nine distinct features. Each feature or attribute contained randomized levels. See Table 2 for the attributes and attribute levels for offender profiles.

A set of $2^4 \times 3^3 \times 4 \times 6 = 10,368$ combinations are available for each offender profile, for a total of 10368^2 possible choice tasks. Not all possible combinations may be observed; the possible combinations were randomized, assuring the attributes are orthogonal (Huber & Zwerina, 1996; Kuhfeld, 2003). With all levels having an equal chance of being displayed, the design was relatively balanced (e.g., number of times the levels of 'history of prior arrest' were displayed: no (6782) and yes (6808)) (See Appendix for number of responses for each attribute level). A practical limit is placed on the number of attributes and attribute levels, as the cognitive burden placed on the respondents increases with each addition (Green & Srinivasan, 1990). The variance of the error component also increases with increases in the number of attributes (Caussade et al., 2005; DeShazo & Fermo, 2002) as well as attributes levels; however, the impact is more marginal for attribute levels (Caussade et al., 2005).

The attributes and levels included in this study were based on previous literature that has found differences in criminal sentencing, harm perceptions and desired allocation of policing resources depending on offender identities and drug transaction characteristics (e.g., Sattler

Table 1
Demographics of participants.

Gender	n	%	Race	n	%
Male	675	49.7	Asian	97	7.1
Female	679	50	Black or African American	170	12.5
Non-binary	5	0.3	Caucasian	923	67.9
			Hispanic/Latinx	133	9.8
			Modal category		
			Native Hawaiian	3	0.2
Age	35 to 44		Pacific Islander	2	0.2
Income	\$20,000 to 29,999		Prefer not to answer	31	2.3

Table 2

Attributes and attribute levels for offender profiles.

Offender attribute	Levels
Offender's age	young, middle age, elderly
Offender's race	Black, Hispanic, White
Offender's sex	female, male
History of drug dependence	no, yes
History of prior arrest	no, yes
Location of the transaction	unknown location, on a street corner, on a university campus, a social networking application, on an encrypted messaging application, on the dark web
Quantity of drug in possession	enough for a single use, enough for several uses, enough to resell to others
Offender role in the transaction	buyer, seller
Type of drug involved	cannabis, MDMA/ecstasy, cocaine, prescription opioids/fentanyl

et al., 2017; Spohn & Beichner, 2000; Spohn & Holleran, 2000). After identifying potential attributes from the literature, the authors engaged in an unstructured discussion until consensus was achieved on attribute and level selection. With the exception of location (the novel contribution of this study), the attributes had to be prominent features of a drug transaction and have empirical evidence of influencing public perceptions, such as drug type, offense type (i.e., buyer or seller) and quantity (Kirby & Jacobson, 2014).

About four-to-eight iterations are common for discrete choice experiments. There is no fixed rule; however, 16 runs represent a practical limit where boredom sets in (Ryan and Gerard (2003). Our choice experiments contained five iterations (i.e., the number of times participants were asked to compare the sets of offender profiles). With a final sample of 1359 participants and five iterations, the data includes 13,590 unique observations.

The sample meets the optimal number of respondents to detect effects at the 0.05 level, with a 90% statistical power. Considering the largest number of attribute levels (6), at the effect size of 0.05, a minimum effective sample size of 12,577 is needed for a statistical power of 90% to be achieved (alpha of 0.05). The minimum sample size required is therefore 1258, given two profiles and five tasks. For an effective effect size of 0.03 at the statistical power of 90%, however, the minimum required effective sample size is 34,993, with the minimum required sample size being 3499. Because of feasibility issues with data collection, the study may not detect relatively small effects for the attribute levels of concern (location), presenting a potential for Type II error or false negatives. In sum, we cannot state definitively that the non-statistically significant attributes levels for location are from a lack of power or truly no difference (Stefanelli & Lukac, 2020).

Outcome variables. After being presented with the two profiles, respondents chose either Offender A or Offender B in response to four questions corresponding to the hypotheses: “1) the police should spend more resources on catching offenders like? 2) which offender is more harmful to your community? 3) which offender deserves a longer punishment? and 4) which offender is better suited for a substance abuse treatment program”.

Analysis

We estimated average marginal component effects (AMCEs) using R and R Studio with the Conjoint package. AMCEs represent the causal effect of a single profile attribute while averaging over the remaining attributes. ACMEs regress a dummy variable, showing whether participants preferred a scenario when attributes were present or not. In other words, the AMCEs represent how much one attribute level is preferred over another. Although the study includes both experimental (i.e., attributes) and pre-treatment (i.e., demographic variables) covariates, the model estimates only apply to the experimental variables. Accounting

for within-respondent clustering, the approach uses cluster-robust standard errors (Hainmueller et al., 2014). The main estimation strategy uses linear regression. For a robustness check, we estimated the data using binominal logit regression with cluster-robust standard errors; similar results were found for all four models.

Results

Estimating allocation of resources

Fig. 1 summarizes the AMCEs of respondents' probability of preference towards allocating more police resources with 95 % confidence intervals. See Appendix A for the estimates, standard errors and significant values for all of the AMCE models.

The dots represent the means, whereas the whiskers show 95 % confidence intervals under the condition that everything else is equal. Estimates that are left of the vertical dotted line indicate that respondents are less likely to indicate that police should spend more resources on offenders, whereas estimates to the right of the vertical dotted line indicate respondents are more likely to indicate that police should spend more resources on offenders. Aligned with hypothesis 1, a drug transaction on a street corner (*Coefficient*=−0.037, *SE*=0.015, *p*< 0.05), a social networking application (*Coefficient*=−0.041, *SE*=0.014, *p*< 0.01) or unknown location (*Coefficient*=−0.038, *SE*=0.014, *p*< 0.01) are all less likely to be considered in need of allocating more police resources compared to the dark web (i.e., baseline), on average.

Neither transactions on university campuses nor encrypted messaging application are statistically more or less likely to be chosen for the allocation of more police resources, relative to the dark web (*Coefficient*=0.002, *SE*=0.015, *ns*; and *Coefficient*=−0.012, *SE*=0.015, *ns*, respectively).

Estimating most harmful to community

Fig. 2 summarizes the AMCEs of respondents' probability of choosing the most harmful to their community with 95 % confidence intervals.

When considering which profile is most harmful, changing the drug transaction location of the offender from the dark web to any of the studied locational settings (e.g., on a street corner) did not decrease or increase the probability of choosing the offender profile.

Estimating most deserving of punishment

Fig. 3 summarizes the AMCEs of respondents' probability of picking the most deserving of a longer punishment with 95 % confidence intervals.

The probability of picking the offender whose transaction occurred on a street corner as more deserving of longer punishment is 3.9 % less likely than the dark web (*Coefficient*=−0.039, *SE*=0.014, *p*< 0.01). Similarly, compared to the dark web, respondents were also less likely to choose deserving of longer punishment for on a social networking application (*Coefficient*=−0.039, *SE*=0.014, *p*< 0.01) and an unknown' location (*Coefficient*=−0.047, *SE*=0.014, *p*< 0.01). Neither on a university campus (*Coefficient*=−0.008, *SE*=0.015, *ns*) nor on an encrypted messaging application (*Coefficient*=−0.007, *SE*=0.015, *ns*) are statistically different from the dark web baseline.

Estimating better suited for a substance abuse treatment program

Fig. 4 summarizes the AMCEs of respondents' probability of picking the offender profile feature better suited for a substance abuse treatment program with 95 % confidence intervals.

Aligned with hypothesis 4, for this model, the offender profile with the drug transaction on a university campus is statistically different from the dark web (*Coefficient*=0.040, *SE*=0.015, *p*< 0.01). However, no other locational settings were statistically different from transactions on

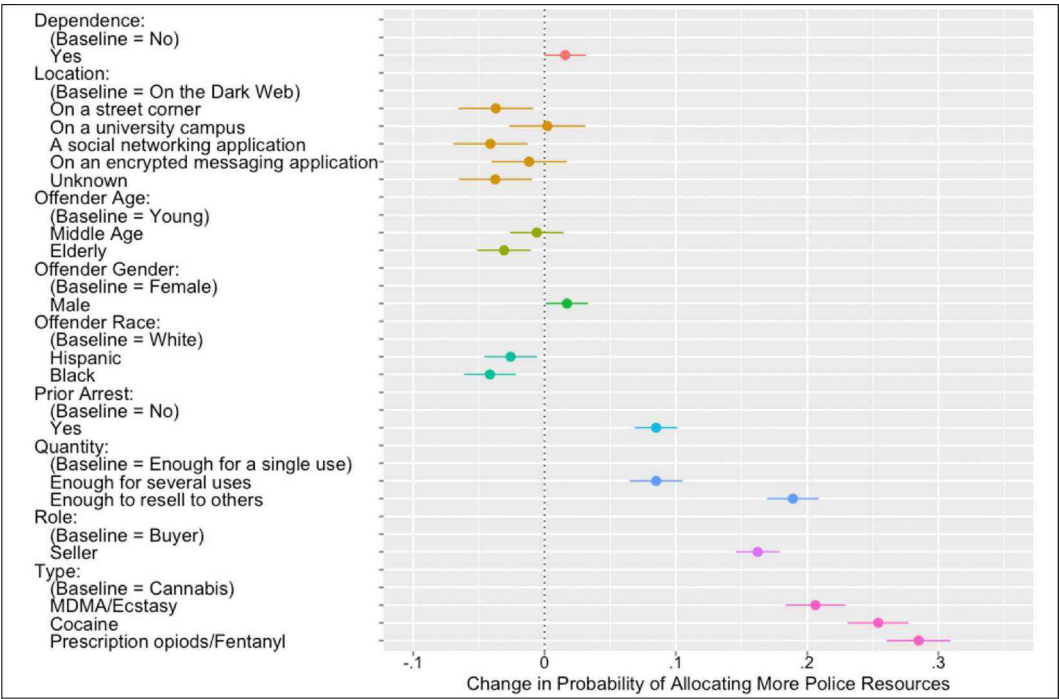


Fig. 1. AMCEs of respondent's probability of preference towards allocating more police resources with 95 % confidence intervals.

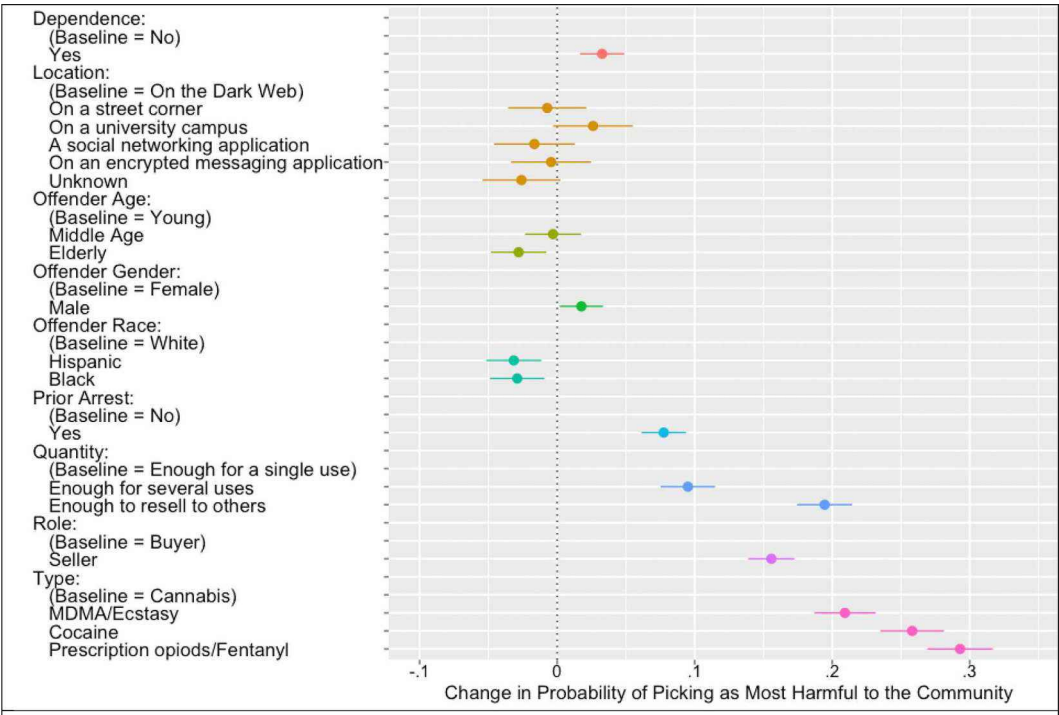


Fig. 2. AMCEs of respondent's probability of choosing the most harmful to their community with 95 % confidence intervals.

the dark web.

Discussion

In this study, we explored the public's opinions toward drug transactions that occurred in differing locational settings, controlling for other relevant features of such an exchange. The baseline in the models is drug exchange on the dark web, which allows us to assess how other

locales differ from this setting across all four outcome measures. Consistent with hypothesis 1 and 3, respondents wanted fewer police resources and shorter punishments for those involved in a drug exchange on the street, social media, or an unknown location compared to a drug transaction with similar profile features on the dark web. Framed differently, drug exchanges on the dark web were seen as needing more resources and those involved deserved additional punishment compared to these other settings. Interestingly, there was no difference on these

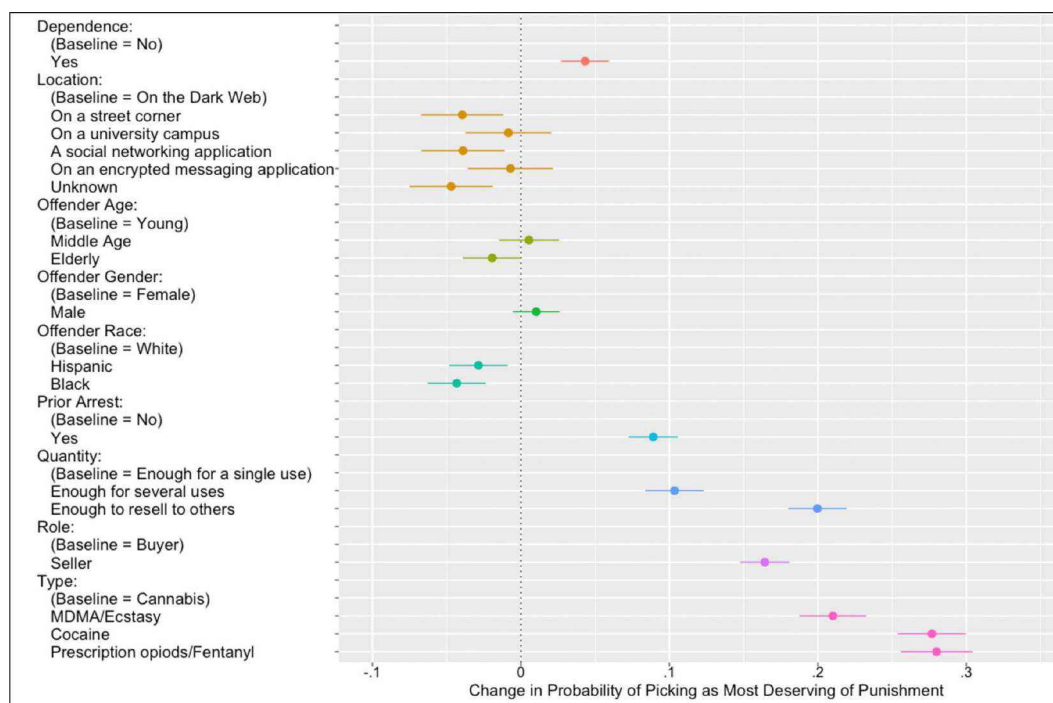


Fig. 3. AMCEs of respondent's probability of choosing the most deserving of a longer punishment with 95 % confidence intervals.

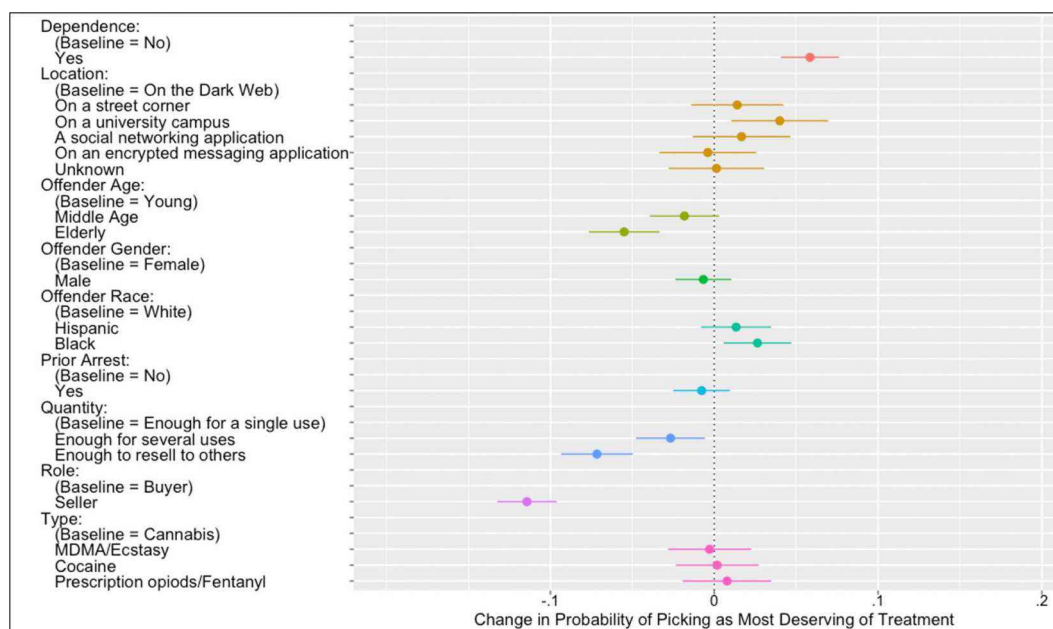


Fig. 4. AMCEs of respondent's probability of picking the better suited for a substance abuse treatment program with 95 % confidence intervals.

variables between the dark web and encrypted messaging applications, suggesting the public views these technologies somewhat similarly. Hypothesis 2, involving perceptions of community harm, was insignificant at $p < 0.05$. Somewhat aligned with hypothesis 4, when compared to the dark web, only those involved in drug exchange on university campuses were considered more deserving of treatment programs. All other locations are statistically indistinguishable from the dark web on this outcome measure.

Generally, these results imply several things for drug policy. First, they suggest that potentially more punitive responses seem to be preferred by the general public when drug transactions involve the dark

web, at least compared to most other settings. Although the allocation of additional resources does not strictly mean additional punitiveness, in conjunction with preference for longer sentences (hypothesis 3), these findings may represent the public's desire for more celerity and certainty in policing drug transactions on the dark web when compared to places like the street, social media or unknown venues.

It is not clear, however, whether the mechanism driving these findings is a novelty effect associated with the dark web or, interrelatedly, a perceived deficiency in the police's ability to deal with crime on the darknet. Both might be at play in some measure. For instance, although public knowledge of the dark web has become more widespread in the

United States over time, the technology is still unfamiliar to most people (Hampson & Jardine, 2017). Unfamiliarity with the technology, mixed with negative media attention surrounding the dark web (Jacobsen, 2021; Sardá, 2020), may increase the perception of its 'sinister' nature and, therefore, result in public attitudes that favor additionally punitive responses.

The challenges associated with policing the dark web might also help explain why the public thinks additional resources to tackle drug crimes in this setting are warranted. In terms of policing capability, while law enforcement has closed a number of cryptomarkets, drug sales on these services appear somewhat resilient to law enforcement efforts (Aldridge & Décary-Héty, 2016; Bhaskar et al., 2019; Décary-Héty & Giommoni, 2017; Soska & Christin, 2015; Tzanetakis, 2018). After Operation Onymous (Décary-Héty & Giommoni, 2017), for example, sales on cryptomarkets were almost twice as high as before the operation after only a few months. Buyers and vendors also appear to migrate to new marketplaces when existing ones are shut down (Chainalysis, 2023; Van Wegberg & Verburgh, 2018) and the darknet market ecosystem tends to adapt technologically with each new closure (Horton-Eddison & Di Cristofaro, 2017). Many US media coverage and press releases of darknet market takedowns suggest similar sentiments, indicating that the drug trade is resilient to law enforcement disruptions (Jardine et al., 2023). Additionally, operations targeting cryptomarkets are often transnational, with attendant geopolitical implications (Chertoff & Jardine, 2021; Ghappour, 2017). For example, Hydra Marketplace was sanctioned by the US Office of Foreign Assets Control (OFAC) in April of 2022, but the servers of the site itself were seized by German law enforcement as a part of a joint operation (Mangan, 2022).

Given the real and perceived difficulties in policing the dark web, the preference for longer sentences may indicate a desire for increased deterrence mechanisms. The concern, however, is that these more punitive preferences are often expensive, less cost-effective than harm reduction policies, and, at best, have marginal impacts on drug use and recidivism. For instance, although incarceration is estimated to reduce violent and property crime, the impact is minimal (Kuziemko & Levitt, 2004).

Interestingly, preferences for drug offenders whose drug transactions occurred on encrypted messaging applications were similar to darknet drug transactions, suggesting these locations are often seen as roughly equivalent. The security and convenience of using some encrypted messaging applications (i.e., Wickr, Signal and Telegram) has been viewed by persons who use or sell drugs as more similar to darknet markets than social media platforms, such as Facebook or Instagram (Barratt et al., 2022). In practice, encrypted services such as Telegram are often an intermediary locale between transactions on the dark web and street sales, and share similar benefits (e.g., anonymity, convenience etc.) for persons who buy and/or sell drugs (Moyle et al., 2019; van der Sanden et al., 2022a). In times of law enforcement crackdowns of cryptomarkets, for instance, direct dealings with vendors on encrypted services appear to be more common as a temporary medium for drug transactions (Childs et al., 2020). In some instances, vendors offer discounts to buyers to move away from the markets and towards encrypted messaging applications (Childs et al., 2020; Kamphausen & Werse, 2019). Because of these shared similarities, comparable negative connotations may be affiliated with encrypted messaging applications for drug transactions as with the dark web.

Drug transactions through encrypted messaging applications were also indistinguishable from those on the dark web when it came to the question of additional police resources. Again, the perceived similarity of encrypted messaging applications and the dark web might explain the common response (Barratt et al., 2022; van der Sanden et al., 2022a). Like the dark web, encrypted messaging applications may elicit beliefs that users have something to hide because of the secure nature of the platform (Akgul et al., 2021; van der Sanden et al., 2022a). A perception barrier of local and commercial drug markets may exist between social media platforms and encrypted messaging applications for drug trading

(van der Sanden et al., 2022a). Despite this common public perception, there are important differences between the dark web and encrypted messaging applications as seen by the users themselves. Here, encrypted messaging applications are perceived as less technically complex and secure than the dark web by buyers and sellers, exposing them to more security risks (Childs et al., 2020; Moyle et al., 2019). In addition, app-mediated transactions may more often occur at the local-level, where public meetings or home drop offs occur (Borromeo, 2016; van der Sanden et al., 2022b).

Social media's lack of comparable privacy and security features might also explain why respondents thought these settings deserved fewer policing resources and shorter punishment for drug transactions, relative to the dark web. Persons who buy and/or sell drugs on social media and encrypted messaging applications frequently indicate concerns of low security, data persistence and visibility of their activities (Barratt et al., 2022; van der Sanden et al., 2023; van der Sanden et al., 2022a). Some interviewed persons who buy/and or sell drugs, for example, have indicated preference for encrypted messaging applications over social media because of these privacy concerns (van der Sanden et al., 2023). However, the greater concern may be tied to quantity of drugs. Persons selling or buying larger quantities or higher risk drug classes of drugs have expressed more concern about law enforcement exposure on social media platforms (van der Sanden et al., 2023). In addition, because of their unique nature, social media transactions may be more regional and localized (van der Sanden et al., 2022a, 2023). Persons buying drugs, for example, have indicated that an advantage to purchasing drugs via social media is the faster delivery (van der Sanden et al., 2021). These features may provide a perceived advantage for law enforcement reducing the need for additional resources or punitiveness.

The results suggest that drug transactions on the dark web are largely not seen as more harmful to communities than those done in other locations (contrary to Hypothesis 2). Two mechanisms lead from darknet drug exchange to community harm, but these pathways point in contending directions. On one side, the darknet markets can present a safer environment for drug transactions by reducing multiple risks – such as violence, coercion, or uncertainty in drug quality – often associated with street sales (e.g., Aldridge & Décary-Héty, 2016; Aldridge et al., 2018; Barratt et al., 2016; Tzanetakis, 2018). Many online vendors, for example, are explicit about the purity and quality of their products (Aldridge et al., 2018; Bancroft & Reid, 2016; Bhaskar et al., 2019; Galenianos et al., 2012). Anonymized darknet forums also encourage and facilitate information sharing about drug purchases and effects, a novel way of harm reduction (Aldridge & Décary-Héty, 2016; Aldridge et al., 2018).

On the other side, however, darknet markets are argued to spread more novel and higher quantities of drugs to new markets (Matthews et al., 2023). Rural locations which might not have immediate physical access to a large volume of a particular type of hard drug may now see the drug appear in wholesale volumes through postal delivery (Aldridge & Décary-Héty, 2016; Barratt et al., 2016). Some persons who buy drugs, for example, may not have access to drug supply because of their location or social networks. Cryptomarkets instead can become their entry into drug-using activities (Barratt, Lenton, et al., 2016). The security and convenience features of the darknet markets may also increase buyer and seller confidence (van der Sanden, Wilkins, Rychert, et al., 2023). For instance, buyers of drugs from cryptomarkets have reported purchasing larger quantities of drugs from darknet markers and selling them to friends, converting these buyers into suppliers; however, drug-use trajectories for some may not be drug location specific (Barratt et al., 2016). In addition, buyers on the dark web now have access to higher variations of hard-to-access drugs (Barratt & Aldridge, 2016). Increased volume of drugs may equal higher volume of drugs consumed or more people in the community consuming drugs. Either way, if the public equates drug consumption in itself as harmful or associated with crime, increased quantities may cause increased perceived local-area

harm.

Likely, these contending mechanisms are working in opposite directions, cancelling each other out to some degree rather than the results indicating an insensitivity towards the dark web as a location of drug exchange. Additionally, the small effect sizes on this outcome measure might make it difficult to detect statistically significant differences given our sample size, attribute levels and resulting statistical power. In a future iteration of this study, the type of community harm should be teased apart to further test different types of harm (e.g., participant violence, bystander violence, concerns of 'harder' drugs within communities).

Hypothesis 4 predicted that offenders involved in a drug exchange on the dark web would be deemed less well suited for inclusion in drug treatment programs. Only one location, university campus, was positive and statistically significant different from the dark web in this regard. Given that respondents might reasonably assume that those involved in a drug exchange on a university campus have a fair chance of being younger, this result might suggest a preference among respondents to give youth a second chance that they might not otherwise afford to older individuals. This concern for youth is also likely influencing hypotheses 1 and 3, where an exchange on a university campus was not statistically different from one on the dark web. These results suggest that respondents preferred more punitive measures and police resources dedicated to this setting than to locations such as the street, social media or an unknown locale, likely because enforcement in this venue involves the protection of youth.

The study has numerous other implications for drug policy and several macro-trends in the US drug and criminal justice landscape. First, when it comes to dark web drug exchange the results suggest that the US public has a preference towards supply-side policing efforts that emphasize punishment and deterrence over demand-side policies that might emphasize treatment. Second, the models consistently suggest that, relative to cannabis as a baseline, drug exchanges involving fentanyl and opioids were seen as doing more community harm, requiring more police resources to combat, and offenders were more deserving of harsher punishment. While the models did not explicitly test for interaction effects between, say, the role (buyer/seller), location and type of drug involved in the exchange, it stands to reason that to the extent that the dark web starts to act as a conduit for fentanyl, the public's views toward drug exchange in this location will grow additionally hostile.

The results also have interesting implications for macro drug liberalization trends, wherein many US states have legalized or decriminalized cannabis. Across all the models expect for those investigating treatment programs, other drug types (cocaine, MDMA, and opioids) were consistently associated with a perceived need for 1) additional police resources, 2) longer sentences for drug offenders, and 3) heightened perceptions of community harm. This finding could be interpreted as evidence of a normalization of cannabis use in US society. It also suggests that other drugs are not yet viewed as similar to cannabis.

Limitations and future research

This study has limitations and yet opens up avenues for future research. The sampling strategy for the study was non-random, using a quota as oppose to a probability-sampling approach. While the resulting sample fairly closely matches the general US population on most demographic vectors, some under or over representation remains. The implication of these mismatches is that the study results might not generalize fully to the wider US public. Certainly, the results of the study could not be stretched beyond the United States. Future research could usefully explore this topic using probability sampling across multiple jurisdictions in order to construct a cross national sense of how the

location of drug exchange affects preferences toward supply- and demand-side drug policy and perceptions of community harm.

The sample size is also a potential limitation, particularly with regards to hypothesis 2 (null results). While the sample is large enough to detect an effect size of 0.05 with 90% confidence, smaller effects might still go unnoticed due to a lack of statistical power. Expanding the sample, increasing the iterations, and parsing hypotheses around community harm into sub-hypotheses could all address this concern over false negatives.

Lastly, the attribute levels combined prescription opioids and fentanyl. The public may be more tolerant of prescription opioid than fentanyl use, affecting supportive or punitive preferences for drug exchanges and persons that use such drugs. Future research could tease apart the motivations for use (e.g., recreational, physician prescribed, self-medicated, etc.).

Conclusion

The current study represents the first analysis of how the location of a drug exchange, particularly the dark web, influences public perceptions of drug policies and perceptions of harm. Public perceptions about drug transactions can have serious social and financial implications for the criminal justice system and for persons who use drugs. Public preference for more punitive drug policies can influence legal decision making and spending decisions, potentially decreasing the options for harm reduction programs for persons who use drugs.

The study is also the first to showcase the importance of the location of drug-related offenses in the public's calculus. Other demographic and situational features of a drug exchange, such as the race of the offenders or previous criminal record, are known variables of interest when the public assesses the contours of an offense to decide on supporting various policies or judicial outcomes. Location proves to be another such feature, suggesting that future academic inquiries into drug offenses and public attitudes ought to consider where the exchange takes place as a relevant variable of interest.

Ethics approval

The authors declare that they have obtained ethics approval from an appropriately constituted ethics committee/institutional review board where the research entailed animal or human participation.

Virginia Tech's Institutional Review Board #19-809

Mount Royal University's Human Resource Ethics Board #103,348

The authors declare that the work reported herein did not require ethics approval because it did not involve animal or human participation.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. This publication is not affiliated with Chainalysis and the views represented herein are those of respective authors.

Appendix

Table A1, Table A2, Table A3

Appendix Table 1

ACME estimates, standard errors and significant values for all models.

Attribute Level	M1: Resources		M2: Harmful		M3: Punish		M4: Treatment	
	Est.	Std. Err	Est.	Std. Err	Est.	Std. Err	Est.	Std. Err
Dependence: Yes	0.016	0.008	0.033***	0.008	0.043**	0.008	0.058***	0.009
Street corner	−0.037*	0.015	−0.007	0.015	−0.039**	0.014	0.014	0.014
University campus	0.002	0.014	0.026	0.015	−0.008	0.015	0.040**	0.015
Social networking application	−0.041**	0.014	−0.017	0.015	−0.039**	0.014	0.017	0.015
Encrypted messaging application	−0.012	0.015	−0.004	0.015	−0.007	0.015	−0.004	0.015
Unknown	0.038**	0.014	−0.004	0.015	−0.047**	0.014	0.001	0.015
Middle age	−0.006	0.010	−0.003	0.010	0.005	0.010	−0.018	0.011
Elderly	−0.031**	0.010	−0.028**	0.010	−0.020	0.010	−0.055***	0.011
Male	0.017*	0.008	0.018*	0.001	0.010	0.008	−0.007	0.009
Hispanic	−0.026*	0.010	−0.032**	0.010	−0.029**	0.010	0.013	0.011
Black	−0.042***	0.010	−0.029**	0.010	−0.043***	0.010	0.026*	0.011
Prior arrest: yes	0.085***	0.008	0.078***	0.001	0.089***	0.008	−0.008	0.009
Several uses	0.085***	0.010	0.010***	0.010	0.103***	0.010	−0.027*	0.011
Resell to others	0.189***	0.010	0.200***	0.010	0.200***	0.010	−0.072***	0.011
Seller	0.162***	0.009	0.156***	0.009	0.164***	0.009	−0.114***	0.009
MDMA/Ecstasy	0.206***	0.012	0.209***	0.011	0.210***	0.012	−0.003	0.013
Cocaine	0.254***	0.012	0.258***	0.012	0.277***	0.012	0.002	0.013
Prescription opioids/fentanyl	0.285***	0.012	0.293***	0.012	0.280***	0.013	0.008	0.014

Note: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Appendix Table 2

Demographics comparison of sample and US population (2021).

	Sample%	Population%		Sample%	Population%
Gender			Race/ Ethnicity		
Male	49.7	49	Asian	7.1	5.9
Female	50	51	Black or African American	12.5	12.6
Non-binary ^a	0.3		Caucasian	67.9	59.3
Age			Hispanic/Latinx ^c	9.8	18.9
18–24	15	8.6 ^b	Native Hawaiian	3	0.2
25–34	18.3	18.4	Pacific Islander	2	
35–44	21.8	17.1	Prefer not to answer	2.3	
45–54	11.6	16.2	Region		
55–64	7.8	17	Midwest	17.7	20.7
65–74	17.9	13.5	Northeast	10.3	17.2
75 or older	7.6	9.3	South	37.1	38.4
			West	35	23.7

^a US Census Bureau Annual Social and Economic Supplements records sex and not gender, excluding non-binary.^b The US Census Bureau separates ages into the categories '15 to 19' and '20 to 24'. Those aged 18 to 19 are not included in this figure, underestimating the percentage of youths.^c The US Census Bureau records any identification with a Hispanic ethnicity. Respondents were asked to identify the ethnicity/race they most identified with.

Appendix Table 3

Responses for attribute levels for offender profiles.

Offender attribute	Levels	n	%
Offender's age	young	4501	33.1
	middle age	4556	33.5
	elderly	4533	33.4
Offender's race	Black	4500	33.1
	Hispanic	4565	33.6
	White	4525	33.3
Offender's sex	female	6689	49.2
	male	6901	50.8
History of drug dependence	no	6733	49.5
	yes	6857	50.5
History of prior arrest	no	6782	49.9
	yes	6808	50.1
Location of the transaction	unknown location	2325	17.1
	on a street corner	2302	16.9
	on a university campus	2252	16.6
	a social networking application	2190	16.1
	on an encrypted messaging application	2290	16.9
	on the dark web	2231	16.4

(continued on next page)

Appendix Table 3 (continued)

Offender attribute	Levels	n	%
Quantity of drug in possession	enough for a single use	4616	34
	enough for several uses	4501	33.1
	enough to resell to others	4473	33
Offender role in the transaction	buyer	6795	50
	seller	6795	50
Type of drug involved	cannabis	3440	25.3
	MDMA/ecstasy	3460	25.5
	cocaine	3340	24.6
	prescription opioids/fentanyl	3350	24.7

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