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Detecting Covert Sex Trafficking Networks in Virtual Markets

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***Abstract*—Covert sex trafficking networks are increasingly using information and communication technologies (ICTs) to extend their operations. There is a need for systematic research and methods for the study of technology facilitated sex trafficking. This study examined how publicly available information can be used to uncover covert sex trafficking networks. The intent was to transform the types of data available in online advertisements into meaningful information that can be used to disrupt this activity. Content analysis was used to identify important data fields in online escort advertisement that presented virtual indicators of sex trafficking, and social network analysis methods were applied to identify provider networks.**

Keywords—Technology Facilitated Sex Trafficking, Covert Networks, Domestic Sex Trafficking

I. INTRODUCTION

Human trafficking is a crime that is often hidden in plain sight as organized crime groups find covert ways to exploit their victims [1]. The deceptive nature of this activity lends to the difficulty of truly capturing the extent of this global issue. Currently, there is a lack of empirical research and methods to study human trafficking activity [2,3,4,5,6]. This is an exploratory study focused on technology facilitated domestic sex trafficking. Human trafficking networks are increasingly using ICTs to extend their networks [3,4,5,6]. When operating in this environment cybercriminal organizations are continuously balancing security risk with operational necessity to engage with the demand side of the market willing to pay for their product/services [7,8,9,10,11]. Using established indicators identified by the United Nations Office on Drugs and Crime [2], Ibanez & Suthers [12] developed a virtual indicator index to identify potential sex trafficking activity in online markets by translating physical indicators to the virtual environment. The current paper further examines one of the primary indicators of sex trafficking in online advertisements: those of shared management. Shared management indicates providers are working together in a coordinated criminal network rather than as independent sex workers. The objective of this research is to explore the patterns of activity of sex trafficking in a new domain, the virtual environment, to address gaps in the literature and to develop a method to identify covert provider networks.

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II. BACKGROUND

The Trafficking Victims Protection Act of 2000 [13] defines sex trafficking as "the recruitment, harboring, transportation, provision, or obtaining of a person for the purpose of a commercial sex act" and defines severe forms of trafficking as "sex trafficking in which a commercial sex act is induced by force, fraud, or coercion, or in which the person induced to perform such act has not attained 18 years." This definition emphasizes the control mechanism involved with sex trafficking via force, fraud, or coercion, which makes it distinct from commercial sex work or prostitution.

The National Human Trafficking Resource Center (NHTRC) published a report of human trafficking trends in the U.S. using data from their human trafficking hotline from 2007 thru 2012 [14]. The report categorized various types of sex trafficking. This study is concerned with the subset of those categories linked to sexual exploitation and trafficking in persons. Pimp-controlled prostitution and commercial front brothels are of particular interest due to the prevalence of these two forms of sex trafficking within the U.S. [14]. At 42% of all reported cases, pimp-controlled prostitution was the leading form of sex trafficking. Although there are independent sex workers, research has found that a majority of sex workers are involved with a pimp: 53% of prostitutes entered sex work with a pimp, and over 80% eventually become involved with one [15,16]. Pimp-controlled prostitution entails a pimp coercing victims to participate in commercial sex acts. A review of NHTRC data from 2007 through 2012 found that many reports of these incidents were linked to online advertisements for sexual services [14].

Commercial front brothels were linked to 15% of reported cases of sex trafficking [14]. These disguise their illicit activities by registering as a legitimate business. Many are linked to massage parlors [17]. Operating as a legitimate business allows these types of businesses to be located in mainstream locations and to advertise openly in various venues, including directories, newspapers, and online classifieds. Backpage is currently the leading online classified for commercial sex [18].

This sub-culture has created an entire vocabulary to discuss and disguise their actions. The terms relevant to this study are as follows. A "pimp" or "madam" is the "term for the primary trafficker who is profiting from the sexual exploitation of the victim" [14]. Pimps refer to themselves as "players" and refer to their profession as "the game", while the overall context of

this sub-culture is called "the life" [16]. The product (person) being sold is referred to as the "provider". (We use the term "victim" to refer to involuntary or coerced providers.) The group of providers controlled by a pimp is called a "stable". The "bottom girl" refers to the provider the pimp charges with recruiting and managing the other providers in the stable. The clients of this trade are known as "Johns". The John community is referred to as "Hobbyists", "Punters", or "Mongers".

Although the Internet has been cited as the greatest facilitator of human trafficking, it also provides a means to observe human trafficking that did not exist before by making many facets of trafficking more visible [3]. By using the Internet as their communication platform the community leaves an abundance of information scattered across the Internet. This creates a pool of open data that can be tapped into to better understand these covert networks' operations. Using online data gained from websites, discussion groups, or other forums is a growing trend in research on deviant behavior [19].

Due to the criminal nature of this activity covert networks form in order to facilitate operations and elude law enforcement. Sparrow [20] and Xu & Chen [21] argued for the use of network analysis to study covert/criminal networks. Social Network Analysis (SNA) provides a framework, method and tools to conduct sophisticated network analysis to empirically measure and visualize diverse networks to include dark networks [22].

III. METHOD

An analysis of Backpage online escort advertisements from three U.S. cities was conducted to identify ads with potential links to sex trafficking. Important data fields were extracted from the ads and analyzed for indicators of sex trafficking using a virtual indicator codebook (Table 1). A further analysis of one primary indicator, shared management, was performed to construct and visualize a network identifying which providers work together.

Backpage was selected as the data source for this study because it is the leading site hosting online classifieds for adult services, which can be found under the 'Escort' section. Other sites host online classified ads for adult services, but at the time of this writing Backpage dominated the market in terms of highest volume of posts and web traffic, with an estimated 3.3 million unique visitors generating approximately $2.6 million for Backpage in March 2012 [18]. Because Backpage is a mainstream online classified site, less stigma is attached to visiting this site.

TABLE I. VIRTUAL SEX TRAFFICKING INDICATORS

Indicator	Example
1. Movement	Transient language, out of state area code, ad posting in different locations
2. Shared Management	Ads reference multiple providers, shared phone, shared post ID
3. Controlled/ Restricted Movement	Incalls only –provider may be restricted to hotel room, massage parlor, etc.
4. Ad Posted by Third Party	Third person language
5. Advertised Ethnicity/ Nationality	Ad includes references to ethnicity or nationality
6. Ad for potential commercial front brothel	Advertisement for massage parlor or similar business as the location the service is provided.

Advertisements posted under three locations from different regions across the U.S. were selected to gain insight on regional trends. The locations selected for this study were Hawai'i; Portland, Oregon; and Miami, Florida. These locations were selected because they are known hub locations based on national statistics from the Department of Justice and the National Human Trafficking Resource Center [14].

Using web crawling software (import.io), important data fields were extracted from the online advertisements, including advertised location, advertised age, advertised name, phone number, area code origin, post ID, advertisement headline, text body, and images. The uniform resource locator for each ad was also collected, allowing access to the advertisements for further manual analysis. *Advertised location* indicates where the provider is operating. *Advertised age* is the listed age of the poster (typically inaccurate with many ads using ages older or younger than the true age). *Advertised name* serves as an identifier to distinguish unique posts and providers. *Phone numbers* distinguish unique posts and provide data on movement. *Area code* origin can indicate movement if the origin is different from the advertised location. *Post ID* is a unique numeric code assigned to each advertisement posted on Backpage. Post ID was used to identify ads reposted by the same person.

Data extracted from the ad analysis was used to identify provider networks. First, unique providers were identified from the sample (some providers posted multiple ads during the data collection period). Unique providers were identified using the name, phone number, and post ID data fields as well as images included in the advertisements. We focused on data related to the shared management indicator: shared advertisement, shared phone number, and shared post ID. A *shared advertisement* is one with multiple providers in a single ad. A *shared phone number* indicates that a central line is used to schedule services that could be linked to a provider or trafficker. *Shared post ID* links ads that have been reposted with the same ID and hence by the same person. If the ads were edited to advertise different providers then this provides evidence linking the advertised providers.

Provider relations were modeled as social networks. Nodes were the unique providers identified in the sample, and edges were installed between nodes that displayed evidence of shared management (a symmetric relation, so the graph is undirected). In this work, analysis was aimed at identifying which providers were working together. A bipartite provider by ad representation was also constructed and folded to observe the internal structure of provider clusters, as explained below.

IV. FINDINGS

Online advertisements for escort services from Backpage Hawai'i; Portland, Oregon; and Miami, Florida were collected on May 10, 2014. A total of 200 advertisements from each of

the three target locations were collected (n=600). The collected advertisement dates ranged from February through May 2014. A total of 603 unique providers were identified in the sample (Female=602, Male=1). The advertised age ranged from 18-51. The average advertised age was 25 (SD = 5.83). Of the 603 unique providers, 236 advertised their ethnicity. The top advertised ethnic groups included: Asian (30%), Hispanic/Latin (25%), two or more ethnicities (18%), and Black (11%). (Since the ethnicity of 367 providers is not advertised, the proportional ethnic composition of the population as a whole may differ.)

A. Shared Management

Based on the data available in the sample, 167 providers showed evidence that they were working with other providers and 436 were observed as isolates. Isolates may indeed be a part of a provider network, but relations between isolates may not observed due to the nature of covert networks and the brief sampling period. Table 2 below outlines the shared management indicators present among linked providers. The sample did not contain the shared post ID indicator: the data was collected on a single day so reposts are not visible.

TABLE II. SHARED MANAGEMENT INDICATOR PRESENT

Shared Management Indicators	Frequency in Overall Provider Network
Unique Providers	603
Providers Working Together	167
Shared Number	108
Shared Advertisement	154
Multiple Indicators	95

B. Provider-Provider Network Characteristics

Network characteristics are summarized in Table 3. The network was sparse and disconnected, composed of 44 components (with the isolates removed). There were 18 subgroups identified in the Hawai'i sample, 20 subgroups in the Florida sample, and six in the Oregon sample. Components ranged in size from two to 12 providers (Fig. 1).

TABLE III. PROVIDER NETWORK DESCRIPTIVE STATISTICS

Measures	Overall Provider Network	Shared Management Network (436 Isolates Removed)
Nodes (n)	603	167
Edges (m)	387	387
Density (d)	0.002	0.03
Average Degree	1.28	4.64
Transitivity	1.0	0.99
Components	480	44

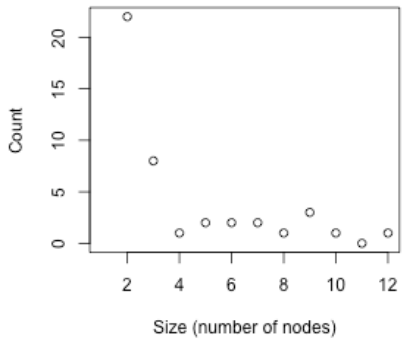

Fig. 1. Component size distribution (isolates removed)

Examining the ads, the larger components were linked to potential commercial front establishments such as massage parlors. In this sample, there was no indication that providers from different advertisement source locations were working together.

C. Internal Structure of Provider Components

The network in the previous section was based on the shared phone number indicator, resulting in k-cliques that do not expose the internal structure of each clique (since all providers share a phone number). However, the shared ad and shared post ID indicators have the potential to show structure and roles: if multiple advertisements are posted with varying providers, then structures other than k-cliques would be observable. The provider networks were manually reanalyzed by shared ad and post ID, allowing some structure and roles to be observed. For example, a triad shows a provider linked to two other providers who are not linked to each other (Fig. 2, left). This could indicate that the central provider holds a special role in the stable, perhaps being the "bottom girl" who trains new recruits. In a larger cluster (a massage parlor), one node is linked to only a few others (Fig. 2, right): this may be a new recruit. These examples illustrate the potential for network analysis to detect not only stables, but also special provider roles in the stables that may merit different interventions.

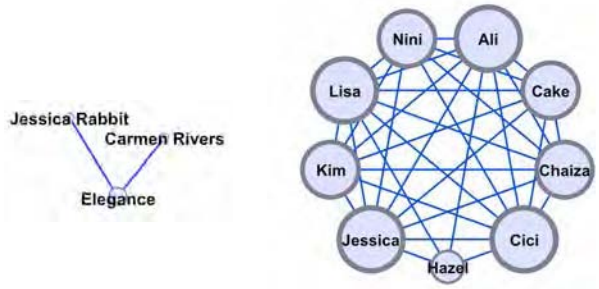

Fig. 2. Internal structure of two provider groups. Node size is proportional to degree.

V. DISCUSSION

This study demonstrated that the content available in online escort advertisements can be used to identify provider networks and potentially roles. Using the data related to the shared management indicator allowed provider networks to be constructed and visualized. This data included shared ad, shared phone number, and shared post ID. Provider networks were observed across the sample depicting the various criminal subgroups operating within an area. However, there were no indications of providers at different locations working together. Highly connected graph components indicate that groups of women are working together or belong to the same pimp.

The use of social network analysis proved to be an effective method in identifying provider networks. It allowed the subgroups of providers working together to be identified; this displays a pimp's stable. With further data over time, individual roles may become visible. The provider networks identified in the sample ranged in size from two to twelve. There were different trends associated with different sized networks. The larger networks appeared to be linked to massage parlors, which are often commercial front brothels.

Advertisements for massage parlors were more common in Hawai'i and Florida and often included multiple women in one ad. Numerous ads were posted for duos, which is a trend in the market. Offering duos allows traffickers to 'break-in' new providers. Newer providers are often paired with a seasoned provider to learn the rules and expectations of the "game". It is the same concept as job shadowing found in other industries. Identifying the size of a trafficker's stable provides insight on the size of the operation.

The network structure observed may only partially reflect the covert network. These graphs represent a portion of a larger network, data being not easily accessible due to the illicit nature of the network. Often times there are hidden actors not visible through public data and missing edges due to incomplete data (hence the large number of isolates). However, it does allow a portion of the network to be observed and exploited to obtain further information on the larger network. Collecting data over time may allow larger portions of the network to be observed.

Limitations of this study include the single day of sampling of a single site (Backpage). Exploration of other online sites is needed. The study used non-probability sampling methods, so results are not generalizable. In addition, network boundaries were determined using a methodological approach (based on sampling method), which has known limitations. Another improvement to the design for future studies may include the analysis of nodal attributes (age, ethnicity, gender, pricing information, etc.), which could be used to uncover other patterns of activity. For example, such information could help discriminate domestic versus internationally trafficked victims, or the existence of a front business (e.g., if credit cards are accepted).

Future research could expand data collection to other sites used by the supply side of the market to solicit customers (apps, social media, etc). Research examining John networks or the demand side of the market is also needed. Are John networks observable in online environments? Research focused on network structure is needed to provide a better understanding of how this covert network operates in order to develop intervention strategies. Structural analysis would allow researchers to identify key roles of providers and to observe or infer hidden actors in provider networks.

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