B162 Methods to Detect Changes in Illicit Product Markets From Routine Forensic Casework

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Learning Overview: After attending this presentation, attendees will understand techniques to collect, monitor, and maintain surveillance datasets from routine forensic reporting workflows, as well as methods to detect changes in the underlying supply of illicit products in their local jurisdictions.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing a framework in which routine forensic casework can be organized into a single data stream, delivering a timely resource for investigators and their stakeholders. Illicit Product Surveillance (IPS), meaning the aggregation of per-case forensic analysis of illicit product characteristics and contents, provides a valuable source of data on local and regional trends in pathological behavior and subsequent risk to the public. IPS methodology has application to any forensic discipline involving the analysis of products exchanged in a loosely defined market system.

This presentation begins with a study of the mechanism by which forensic casework relates to the underlying distribution of drug contents in a hypothetical District of Columbia (DC) drug market. Methods for controlling for motivated sampling patterns by evidence collectors are discussed, and a simulation study is conducted to demonstrate advantages to the consideration of confounding covariates introduced by routine policing.

Demonstrative IPS studies using de-identified data are presented. Three products are selected for their diversity, prototypical features, and impacts to public health: synthetic opioid powders containing fentanyl, loose plant-like material containing Synthetic Cannabimimetic Agents ([SCA], commonly referred to as “Spice”), and crystalline solids containing synthetic cathinones (commonly referred to as “Bath Salts”).

A geospatial analysis detailing fentanyl’s transition from heroin adulterant to stand-alone powder product is conducted. A theory emerges, relying on unique combinations of demand-side forces and supply-chain pressures present in the synthetic opioid market. This theory is then applied to the initial detection and subsequent trends in illicit fentanyl pills, formed to look like legitimate oxycodone pills. Techniques to establish geospatial differentiation along product-composition zonal boundaries are discussed using the chemical composition of SCA exhibits. The detection of Phencyclidine (PCP) and SCA co-confirmations is then analyzed as a product-use-behavior change. Spatiotemporal zones of most-likely emergence are estimated from IPS of SCA and PCP and are shown to accurately describe the observed emergence zone. Initial threat assessment and surge analysis methods are presented using the example of crystalline solids containing eutylone, a synthetic cathinone.

This case study is generalizable beyond forensic chemistry data. An IPS analysis cycle for forensic products is outlined, providing a discipline-independent framework to guide inference from IPS data streams to their constituent supply populations. This presentation ends with a step-by-step guide to developing IPS capability at forensic laboratories of various resource categories.

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