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From Fentanyl Test Strips to Mass Spectrometry

A Case Study in Civilian Drug Checking

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Introduction

- Today's webinar is sponsored by RTI International, through the Comprehensive Opioid, Stimulant, and Substance Use Program (COSSUP). RTI is the State Technical and Training Assistance (TTA) Provider for COSSUP.
- **Agenda:**
 - **Introduction**
 - Dr. Bradley Ray, RTI's COSSUP Project Director
 - **Drug Testing Methods**
 - Christopher Moraff, Journalist/Analyst, Center For Forensic Science, Research & Education
 - **Philadelphia Action**
 - Carla Sofronski, Executive Director, PA Harm Reduction Network
 - **COSSUP Resources**



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January 4th, 2023

- HB 1393 Fentanyl Test Strip Bill
- Representative Jim Struzzi (R), Indiana County
- Passed 0-200
- Third party distribution
- All drug checking tools
- No decriminalization



Legal Status in the U.S.: A Hodgepodge of Laws

- Drug testing equipment became illegal in most states in the 1970s
- Based on the Drug Enforcement Administration (DEA) model law—which is expansive—and can include everyday household items
- 2021 study found drug checking equipment—including fentanyl test strips (FTS)—was illegal in 22 states (Davis, 2022)
- Since then, states have been rapidly working to reform their laws. Sixteen states have passed laws legalizing drug checking equipment
- Laws Vary greatly
- None tackle the elephant in the room--that drug checking equipment is legal but drug checking in practice, which implies the possession of drugs, can lead to arrest



US Drug Checking Primer

- Began in the 1990s in response to a series of bad reactions to MDMA
- Used color reagents to identify cathinones and hallucinogens (Dancesafe was one of the first groups)
- Rates of adulteration varied widely as did a person's likelihood of using an unfamiliar drug
- Near universal support for transparency
- RAVE Act & Illicit Drug Anti-Proliferation Act of 2003 made music venues responsible for drug use on their premises and had a chilling effect on pill checking



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Drug Checking Technologies

- Reagent testing
- Immunoassay Test Strips
- Raman Spectroscopy
- Fourier Transform Infrared Spectroscopy (FTIR)
- Gas/liquid chromatography mass spectrometry



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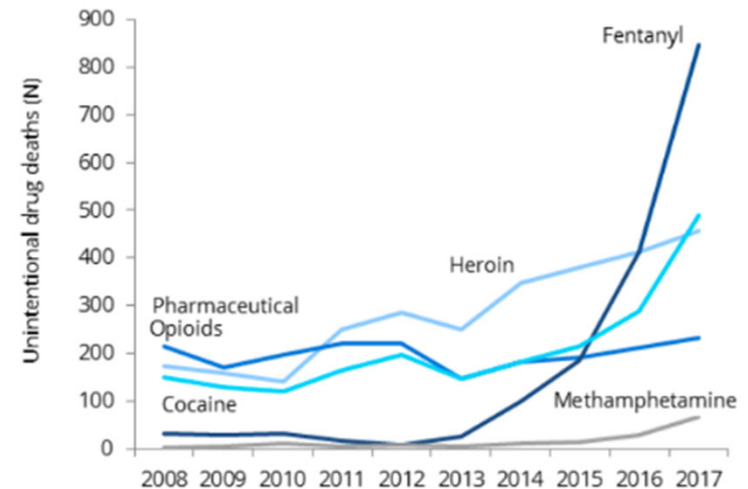


Enter Fentanyl

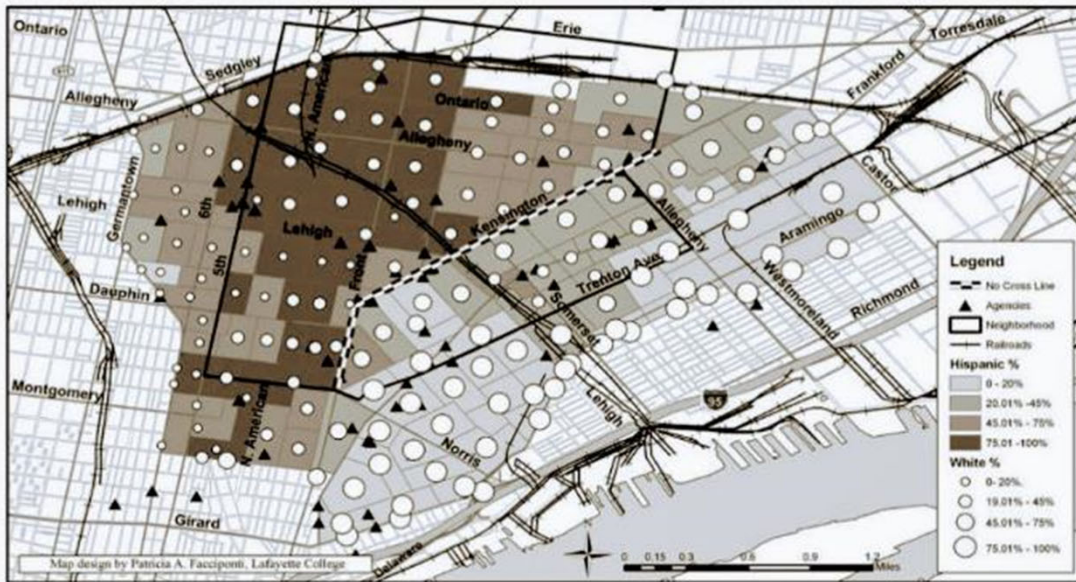
- For three decades, heroin fatalities held steady in Philadelphia, averaging 300-400 annually
- Supply-side imposition of illicit fentanyl: By 2016 most bags had dropped to \$5 from \$10 and overdoses tripled, exceeding 1200 from an average of 300-400 yearly
- This put enormous strain on law enforcement, many of whom found attending to medical emergencies outside the purview of their job

Fentanyl surpassed heroin as the leading cause of opioid-related deaths

Opioid-related deaths by drug-type, 2008 - 2017, Philadelphia



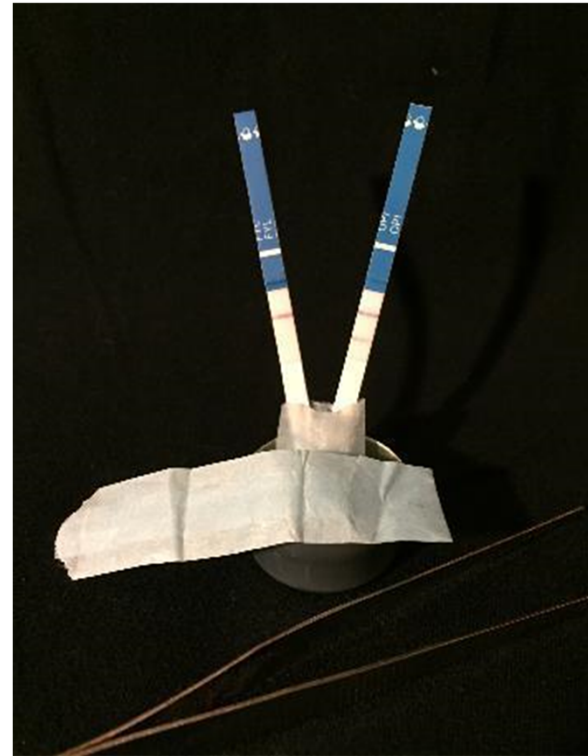
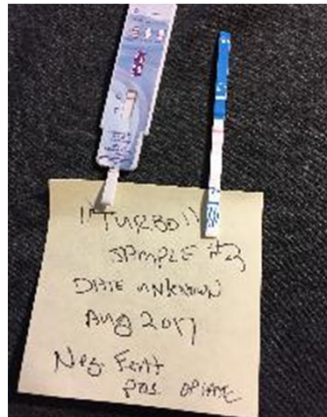
Area of Detail: Kensington, Philadelphia



- The epicenter of the drug trade in Philadelphia for 30+ years
- Nationally reputed for having the purest heroin in the U.S. (DEA)
- Latino West Kensington known as the “Badlands.”
- Largest 24/7 open air drug market in US
- Multiple failed policy approaches ranging from zero tolerance in the late 1990s to progressive, hands-off policing of open drug use more recently.



Immunoassay Test Strips



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CSSUP
Comprehensive Opioid, Stimulant,
and Substance Use Program

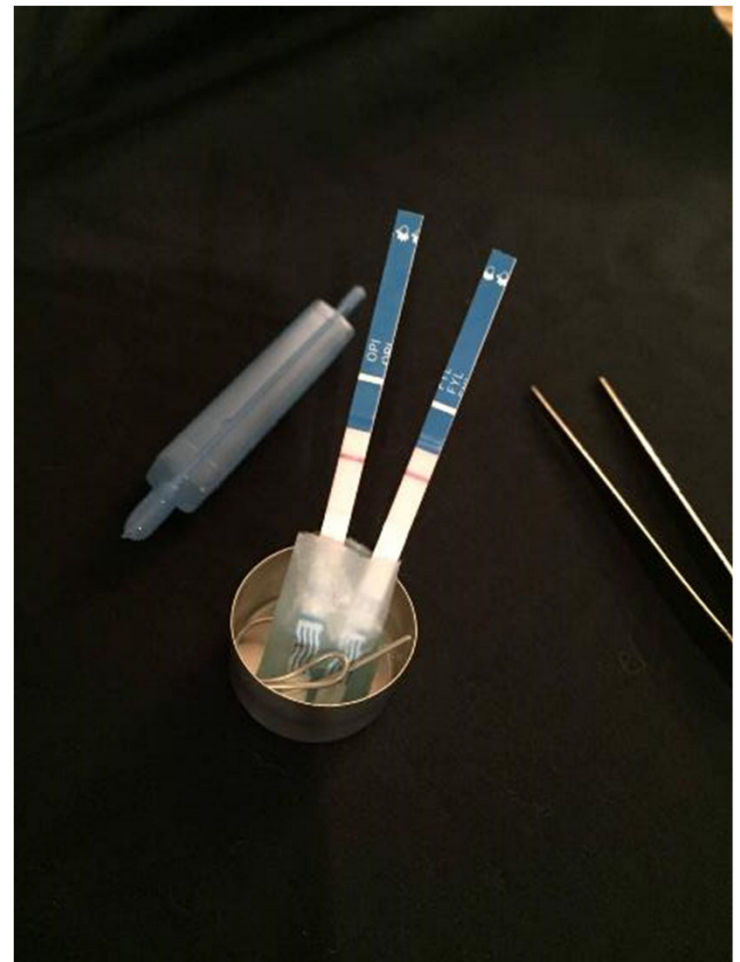


Winter 2017: First Use of FTS in Pennsylvania



Not Just Fentanyl

- Hundreds of samples of street drugs between 2017-2019 tested using immunoassay strips for fentanyl, morphine, cocaine & benzodiazepines
 - Findings public through social media
- Department of Public Health use and Subsequent investment by the city
- However, fentanyl rapidly reached saturation levels, and was present in nearly all heroin samples
- Distributors began experimenting with new adulterants to lengthen & potentiate the high of fentanyl



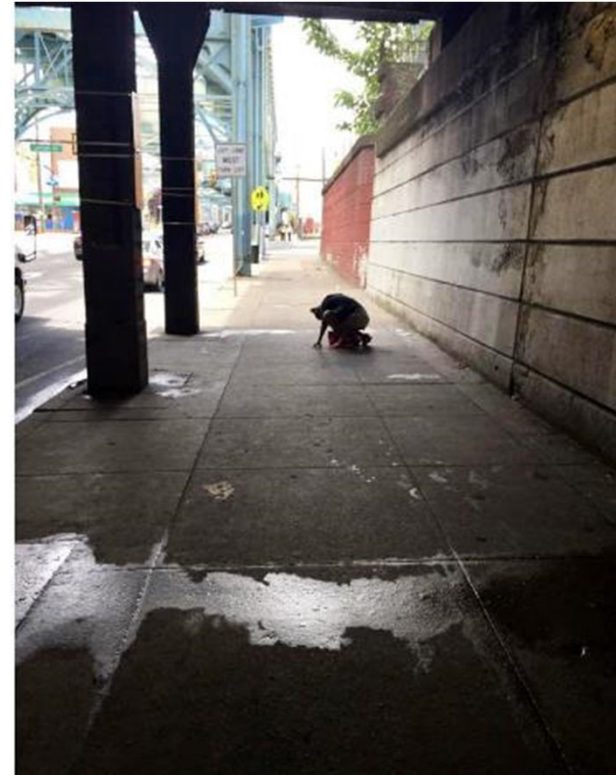
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Mass Adulteration



Pharmacology of NPS: Xylazine (left)



Synthetic cannabinoid 5F-ADB (right)



SOLUTIONS JOURNALISM

Synthetic Weed Is Back, Bigger Than Ever, and Scary as Hell

| REEFER MADNESS |

Just when the overdose crisis fueled by fentanyl couldn't get any worse, a flood of synthetic cannabinoids is here. Experts say the new generation is more unpredictable than ever.



Christopher Moraff Updated Jun. 02, 2018 10:50AM ET / Published Jun. 01, 2018 10:44PM ET



Meanwhile, at least three separate street sources who provide information regularly to The Daily Beast confirmed last month that a substance with pharmacological properties similar to K2 has been turning up in retail level packages of heroin, in some cases without the knowledge even of the dealers.

- Increase in combined use of smokable synthetic cannabis with a variety of side effects, from lethargy to aggressive behavior not typically seen in opioid population.
- Street intel that cannabinoids were turning up in adulterated heroin/fentanyl without the knowledge of the user
- My Article from **June 1, 2018**



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Health officials report significant overdose spike in Philadelphia

by Aubrey Whelan,



JOSE F. MORENO / STAFF PHOTOGRAPHER

- At the end of July, hundreds are sickened by a synthetic cannabinoid that was added to several brands of Philadelphia dope.
- Though still effective with opioids, many had adverse reactions to naloxone
- Compound identified within days by CFSRE as 5F-ADB
- Revealed limitations of strip technology.
 - There are no strips for 5F-ABD, or countless other NPS



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Police Crime Labs Overburdened

- Police crime labs are often under-budgeted, and lack bandwidth for non-investigatory testing
- It can take upwards of a year for individual reports to become available as cases move to court



Philadelphia Police State-of-the-Art Crime Lab



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Transit Police Experiment (2018)

- Officers responsible for public transit routes in five counties including Philadelphia
- 24/7 access to a Smith Detections Elite FTIR machine the city acquired following anthrax scares after 9/11 & two officers to operate
- Letter of immunity from arrest for carrying small amounts of drugs for checking
- Barriers to long term sustainability



SEPTA Transit Police Chief Thomas Nestel (Ret)



The Philadelphia Pilot

- 2019: Partnered with Center for Forensic Science, Research & Education to begin a lab-based mass spectrometry testing program.
 - First randomized street-to-lab surveillance program run by civilians for the purpose of harm reduction
 - Collected dozens of samples prior to COVID, which halted the program
- 2020-2021: Philadelphia Department of Public Health joins the project, invests resources into a full-time collection team with a staff of four.
 - The Program Recently Tested its 1000th Sample, is Building a Public-Facing Database
 - Recently Cited By CDC as “The most robust testing program.”



Fentanyl (1p), 4-ANPP, Xylazine (3p)	Fentanyl cut with xylazine
Fentanyl (1p), para-Fluorofentanyl (0.3p), 4-ANPP, Xylazine (4p)	Fentanyl cut with xylazine containing a small amount of para-fluorofentanyl
Fentanyl (1p), Xylazine (0.5p), Lidocaine, Caffeine	Fentanyl cut with xylazine and a small amount of lidocaine and caffeine
Fentanyl (1p), Xylazine (20p)	Fentanyl cut with xylazine
Fentanyl (1p), N-Propionyl Norfentanyl (small, tentative), Phenethyl-4-ANPP, Cocaine (0.1p), Xylazine (1p)	Fentanyl cut with xylazine containing a small amount of cocaine
Fentanyl (1p), para-Fluorofentanyl (trace), 4-ANPP, N-Propionyl Norfentanyl (tentative), Phenethyl-4-ANPP, Heroin (trace), Xylazine (1p), Lidocaine, Tramadol	Fentanyl cut with xylazine and a trace amount of lidocaine and tramadol, containing a trace amount of para-fluorofentanyl and heroin
Fentanyl (1p), 4-ANPP, Phenethyl-4-ANPP, Xylazine (3p), Lidocaine (1p), Acetaminophen	Fentanyl cut with xylazine containing a small amount of lidocaine and trace amount of acetaminophen
Fentanyl (1p), N-Propionyl Norfentanyl (small, tentative), para-Fluorofentanyl (1p), Fluoro-4-ANPP, Xylazine (1p)	Fentanyl and para-fluorofentanyl cut with xylazine

What We Are Learning, What Is In Our Drug Supply



Early Warning System For New Psychoactive Substances

1	Agency/Submitter	Agency Case# 1	XTS	Testing Results (Qualitative)	Testing Results (Quantitative)
818	PDPH	808	N/A	Fentanyl (1p), Xylazine (1.8p), 4-ANPP (0.1p), Phenethyl-4-ANPP (0.1p)	Not Quantified
819	PDPH	809	N/A	PCP (1p)	Not Quantified
820	PDPH	810	N/A	Fentanyl (1p), Xylazine (3.3p), 4-ANPP (trace), Heroin (trace), Phenethyl-4-ANPP (trace)	Fentanyl (14.5%), Xylazine (41.7%), Heroin (4.2%), 4-ANPP (1.0%)
821	PDPH	811	N/A	Fentanyl (1p), Xylazine (9.6p), 4-ANPP (0.4p), Caffeine (0.2p), para-Fluorofentanyl (0.1p), Phenethyl-4-ANPP (trace)	Fentanyl (5%), Xylazine (46.4%), para-Fluorofentanyl (1.0%), 4-ANPP (1.1%), para-Fluoro-4-ANPP (0.7%), Caffeine (0.8%)
822	PDPH	812	N/A	Cocaine (1p), Lidocaine (0.1p)	Not Quantified
823	PDPH	813	N/A	Fentanyl (1p), Xylazine (17.8p), Bromazolam (0.4p), Flubromazepam (0.2p), 4-ANPP (0.2p), Caffeine (0.1p), N-Desethyl Isotonitazene (0.014p), Quinine (trace), Phenethyl-4-ANPP (trace)	Fentanyl (4.2%), Xylazine (60.0%), 4-ANPP (0.8%), N-Desethyl Isotonitazene (~0.06%)
824	PDPH	814	N/A	Fentanyl (1p), Xylazine (18.8p), Bromazolam (0.4p), 4-ANPP (0.2p), Caffeine (0.2p), Flubromazepam (0.1p), N-Desethyl Isotonitazene (0.01p), Quinine (trace), Phenethyl-4-ANPP (trace)	Fentanyl (4.2%), Xylazine (62.6%), 4-ANPP (1.0%), N-Desethyl Isotonitazene (~0.4%)
825	PDPH	815	N/A	Fentanyl (1p), Xylazine (16.2p), Bromazolam (0.4p), 4-ANPP (0.2p), Flubromazepam (0.2p), Caffeine (0.1p), N-Desethyl Isotonitazene (0.013p), Quinine (trace), Phenethyl-4-ANPP (trace)	Fentanyl (4.2%), Xylazine (59.6%), 4-ANPP (0.7%), N-Desethyl Isotonitazene (~0.05%)
826	PDPH	816	N/A	Cocaine (1p), Dimethylsulfone (2.9p), Lidocaine (1.6p)	Cocaine (10.3%), Lidocaine (16.2%)
827	PDPH	817	N/A	Fentanyl (1p), Xylazine (0.9p), 4-ANPP (0.2p), Lidocaine (0.1p), Acetaminophen (trace), Acetylfentanyl (trace), Phenethyl-4-ANPP (trace)	Fentanyl (32.5%), Xylazine (41.1%), 4-ANPP (4.2%), Lidocaine (5.7%)
828	PDPH	818	N/A	Fentanyl (1p), Xylazine (3.5p), 4-ANPP (trace), Phenethyl-4-ANPP (trace)	Fentanyl (16.4%), Xylazine (53.3%), 4-ANPP (1.0%)
829	PDPH	819	N/A	Fentanyl (1p), Xylazine (2.5p), 4-ANPP (trace), Phenethyl-4-ANPP (trace)	Fentanyl (24.6%), Xylazine (57.2%), 4-ANPP (0.9%)



Next Steps: Regional Drug Checking

- Create a test strip distribution program that may easily be replicated by local county government (fentanyl, xylazine, benzodiazepines) and support the next evolution of drug checking
- Provide quantitative data to the medical community, public health officials and harm reduction workers to develop appropriate protocols for withdrawal management, make informed triage decisions in the field, and learn to identify changes in the pharmacology & purity of street drugs and new psychoactive (NPS).
- Employ “anticipatory intelligence” drawn from the fields of toxicology, ethnography, social science and harm reduction to lessen the impact of tainted drugs, mitigate the risk of overdose, and educate stakeholders on appropriate responses.



How?

- Partner with the Syringe Service Programs, hospitals, EMTs, public safety and health agencies and drug using populations across the state for the purpose of gathering and testing small samples (10mg or less) of illicit drugs.
- Use mass spectrometry to derive *quantitative* data on regional illicit drug supply (including purity levels/variations, adulteration & cuts, and, where applicable, unique pharmacologic/medical side effects).
- Combine this data with information from other sources (known trafficking patterns, medical admissions, overdose trends, and human intelligence from doctors, harm reduction workers, people who use drugs, people who sell drugs, etc.) to analyze the movement of high purity or tainted drugs with the goal of warning stakeholders about future trouble spots.



Who Benefits?

Who needs drug checking the most?

- People who use drugs (PWUD)
 - Injection drug users
 - Recreational use/nightlife participants
- Public Health Agencies
- Physicians/additional medical experts
- EMTs/First Responders/Law Enforcement
 - Including harm reduction outreach



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Challenges

- Drug checking technologies like FTS remain illegal in many states
- Acquiring samples
 - Some states do not have a public health exemption for possession of small amounts of drugs
- Hospitals destroy samples
- Lack of political will, due to stigma
- Cost





Bureau of Justice Assistance's Comprehensive Opioid, Stimulant, and Substance Use Program (COSSUP) Resource Center

The screenshot shows the homepage of the Bureau of Justice Assistance's Comprehensive Opioid, Stimulant, and Substance Use Program (COSSUP) Resource Center. At the top left is the COSSUP logo. A navigation menu includes 'Program', 'Topics', 'Learn', and 'Resource Library'. The main content area features a large image of a diverse group of people. On the left, the text reads 'DISCO IMPACTFUL RESPONSES TO THE OPIOID CRISIS'. A dark blue overlay on the right contains a search bar with the text 'I want to ...' and a dropdown menu showing 'Find Learning Opportunities'. Below the search bar is a 'Get Started' button. At the bottom right of the overlay is a 'Subscribe' button with a bell icon. At the bottom of the page are two buttons: 'Site-Based Grants' and 'Request Assistance'.

www.cossup.org



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COSSUP Resources

Tailored Assistance—The COSSUP training and technical assistance (TTA) program offers a variety of learning opportunities and assistance to support local, tribal, and state organizations, stakeholders, and projects in building and sustaining multidisciplinary responses to the nation’s substance abuse crisis. ***You do not need to be a COSSUP grantee to request support.*** TTAs are provided in a variety of formats, including virtual and in-person training events, workshop and meeting presentations, and online resources. Request TTA to support your activities at <https://cossup.org/Program/TTA/Request>.

Funding Opportunities—Current COSSUP and complementary funding opportunities are shared at <https://cossup.org/Program/Funding>.

Join the COSSUP community!—Joining is as easy as completing the form available at <https://cossup.org/subscription>. We’ll be happy to ensure you receive the latest-and-greatest COSSUP opportunities, resources, and updates.

