Operational uses of NIBRS

David Bierie, Statistician

Paul Detar, Chief

Business Integration Center

Investigative Operations Division

United States Marshals Service

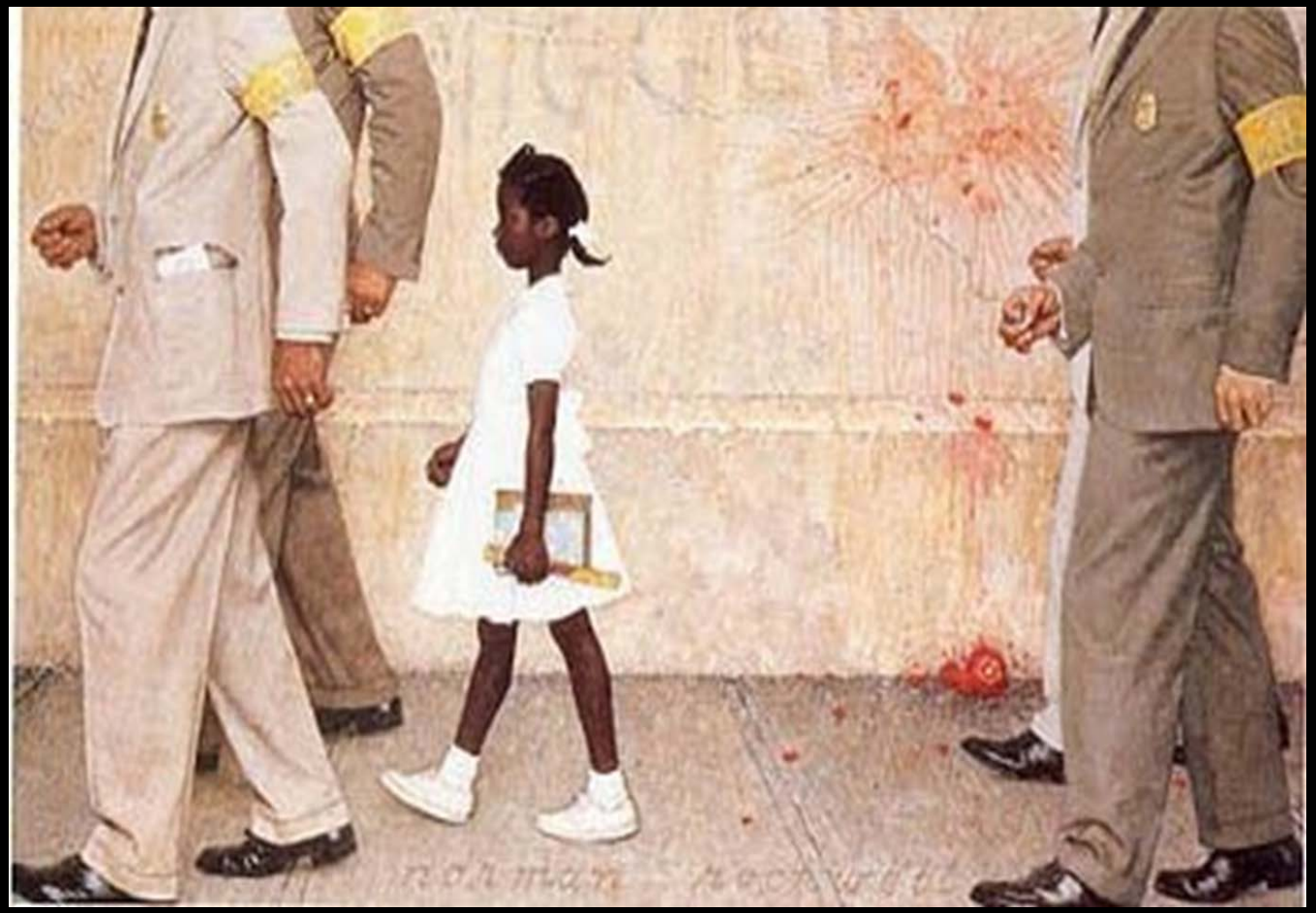
U.S. Department of Justice

Today's talk

1. The U.S. Marshals?
2. Applied Science
   - Who shoots at police?
3. Operational Tools
   - NIBRS Profiler (e-Profile)
   - Serial Crime Analysis (S.C.An.)
   - Community-Connector (c^2)
4. Three bold ideas for NIBRS

- ❑ The whole is greater than the sum of its parts
- ❑ NIBRS offers more than annual crime stats or dissertations
- ❑ Thank You!

Who are the U.S. Marshals?



- Similar to a federal sheriff
- Established in 1789
- 95 districts + FFOs
- 3000 sworn & 2000 support staff
- IOD (Fugitive) Mission:
  - ✓ 60 district fugitive task forces
  - ✓ 7 regional fugitive task forces
  - ✓ ~35,000 federal fugitive cases closed per year
  - ✓ ~75,000 state/local fugitive cases closed per year

Some themes in our history (and NIBRS):

Justice, Rule of Law, National, Innovation

What is the Business Integration Center?

Science, policy, innovation, integration

Read more at: http://cebcp.org/wp-content/TCmagazine/TC12-Spring2017

1. Science & policy

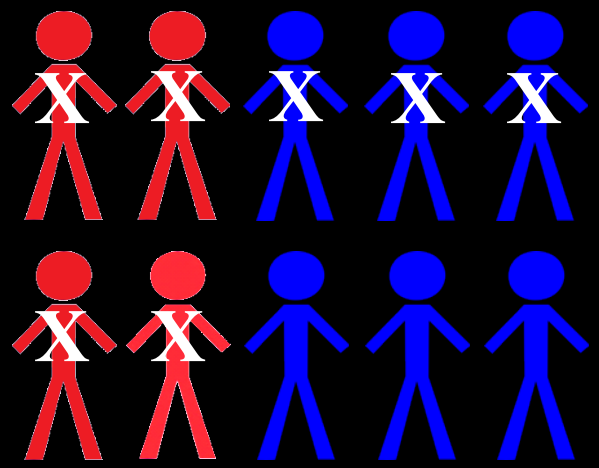
“Gun violence directed at police officers”

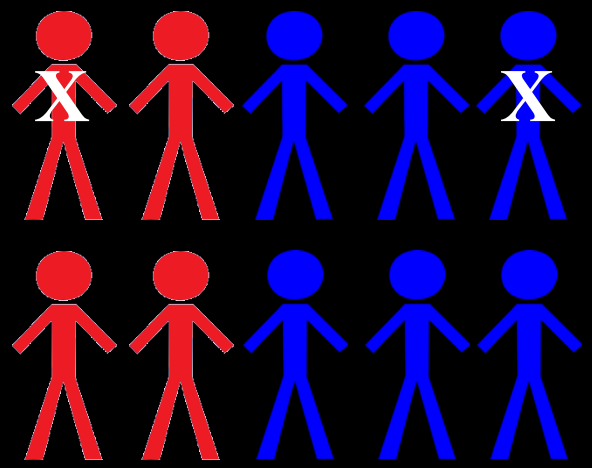
Why this analysis?

- Officer safety concerns after several LOD deaths in 2010-2011
- We engaged a number of steps to diagnose and mitigate that risk
- One of which was to obtain, read, & learn from every prior study on **risk factors** for firearm violence directed at police.
- That was easy…. there were none.
- Thus, we needed to create scientific facts for our use, and we also wanted to ensure the broader academic, policy, and police community had some facts available to them as well

➢ *We chose NIBRS because it is the single largest, relevant and useful data set in existence for this question*

Shooters	Non-shooter comparison group





- ✓ 60% of Shooters are "Blue"
- ✓ 70% of Shooters have "X"

60% of Non-Shooters are "Blue"

20% of Non-Shooters have "X"

Does being "Blue" or having "X" make you higher risk?

Descriptive vs. Comparison Studies

❑ Method

✓ **Data**: Compared all incidents with (a) officer-victim of (b) firearm-involved crime (c) at arrests occurring (d) at least one day after incident (n=860) to a random sample of arrests without this type of violence (n=3,000)

✓ **Estimation**: Case control design estimated via a variety of multivariate regression strategies (e.g., skewed, Random Effects)

❑ RESULTS

✓ Risk factors: Myriad offender and crime scene predictors, not all of which were mere common sense

✓ More specific info at:

➢ http://journals.sagepub.com/doi/pdf/10.1177/0011128713498330)

Increased Risk of Firearm Altercation:

—— Original Crime Involved a Weapon

—— Male

—— Road/Parking Lot or Home

—— Original Crime Involved Violence

—— Offender Under the Influence of Alcohol

—— # of Offenders

How was this useful?

- In conjunction with two other peer-reviewed studies we conducted on violence directed at police, we were able to:

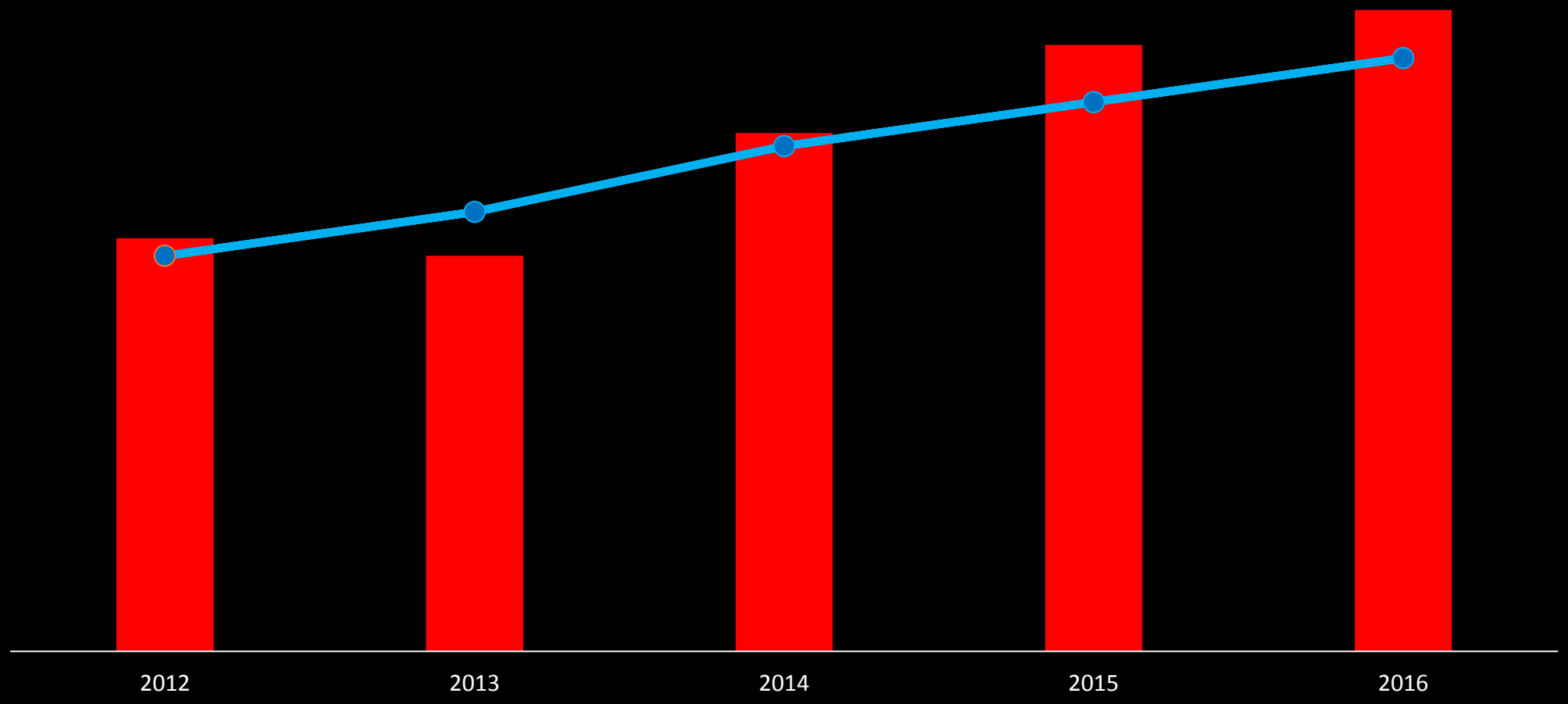
1. Training. Offer some new ideas for our trainers regarding what was risky and how risky, when engaging offenders

2. Academia. Spur additional academic research

3. Policy. Help explain shooting patterns at our agency
   - This was an important step because it provided risk context to patterns at USMS that might have otherwise been perceived differently.

Decomposing shooting trend

Rate of **Firearm Discharges** per 10,000 physical arrests
Average **Risk** of Fugitive Encountered



But what's the real point?

- Analyzing any single county or state would have generated:

  1. Too few cases to analyze rigorously. We need at least 200 cases (plus 10 per independent variable) to estimate a logistic regression equation.

  2. Too little variance to model. We need diversity in each of the measures and situations in order to better estimate relationships (i.e., cross state diff).

- *Analyzing a rare event like this was only possible because of the size/diversity of the <u>national</u> NIBRS data*

A few more examples

- Bierie, D. M., & Davis-Siegel, J. C. (2015). Measurement matters: Comparing old and new definitions of rape in federal statistical reporting. *Sexual Abuse*, *27*(5), 443-459.
  - **NIBRS made it possible to assess the impact of this change on total prevalence estimates and trends over time**.
- Bierie, D. M., & Budd, K. M. (2016). Romeo, Juliet, and statutory rape. *Sexual Abuse*, 1079063216658451.
  - **NIBRS made it possible to test the assumption that police (and the registry) was saturated in unintended sex crimes: 'statutory liaisons' between similarly aged teenager.**
- Bierie et al., "Sexual assaults at parks and playgrounds" (in progress)
  - **Exclusion laws presume parks/playgrounds are attractive target spaces for those who would target strangers/children. Is this assumption reasonable? NIBRS shows…..Yes.**
- Bierie et al., "Do registries improve clearance speed of sex crimes?" (in progress)
  - **Sex offender registries are intended, in part, to facilitate police investigations of <u>stranger</u> involved sexual offending. Do counties have a faster closure once they enacted a registry? NIBRS shows….Yes**

Other applied-science examples from our team

- Williams, K. S., & Bierie, D. M. (2015). An incident-based comparison of female and male sexual offenders. *Sexual Abuse*, *27*(3), 235-257.
- Bierie, D. M. (2015). Enhancing the National Incident–Based Reporting System: A Policy Proposal. *International journal of offender therapy and comparative criminology*, *59*(10), 1125-1143.
- Bierie, D. M., Detar, P. J., & Craun, S. W. (2016). Firearm violence directed at police. *Crime & Delinquency*, *62*(4), 501-524.
- Bierie, D. M. (2015). Assault of police. *Crime & Delinquency*, 0011128715574977.
- Budd, K. M., Bierie, D. M., & Williams, K. (2017). Deconstructing incidents of female perpetrated sex crimes: comparing female sexual offender groupings. *Sexual Abuse*, *29*(3), 267-290.
- Budd, K. M., Rocque, M., & Bierie, D. M. (2017). Deconstructing incidents of campus sexual assault: comparing male and female victimizations. *Sexual Abuse*, 1079063217706708.
- Budd, K. M., & Bierie, D. M. (2017). Injury Matters: On Female-Perpetrated Sex Crimes. *Journal of Interpersonal Violence*, 0886260517711178.

❖You can obtain FREE full-text version of any of these via www.google.com/scholar

2. Conceptualizing Operational Tools

1. e-profiler
2. Serial Crime Analysis
3. Community Connections

Behavioral Analysis Units

- How "profiling" usually works:
  - ❑ Scour the scientific literature for known facts/correlates of case details
  - ❑ Theoretically informed expansions from those empirical facts
- A common goal is:
  - ❑ Prioritize leads in the face of scarce resources
- Problems with profiling:
  - ❑ The weirder the case, the more likely that…..
    1. There are few or no prior studies or examples
    2. The studies that do exist have small sample sizes
       - ➢ E.g., Stranger sexual assaults at playgrounds→ largest study has N=12!

What is the NIBRS e-Profiler?

- ✓ **What**:
  - Visual analytic dashboard with all NIBRS data, myriad data elements as filters, and other data merged in as well (county level)

- ✓ **How**:
  - Dynamic use of filter combinations as information arrives (known) shows probabilistic information about ‘unknown’ information (non parametric)

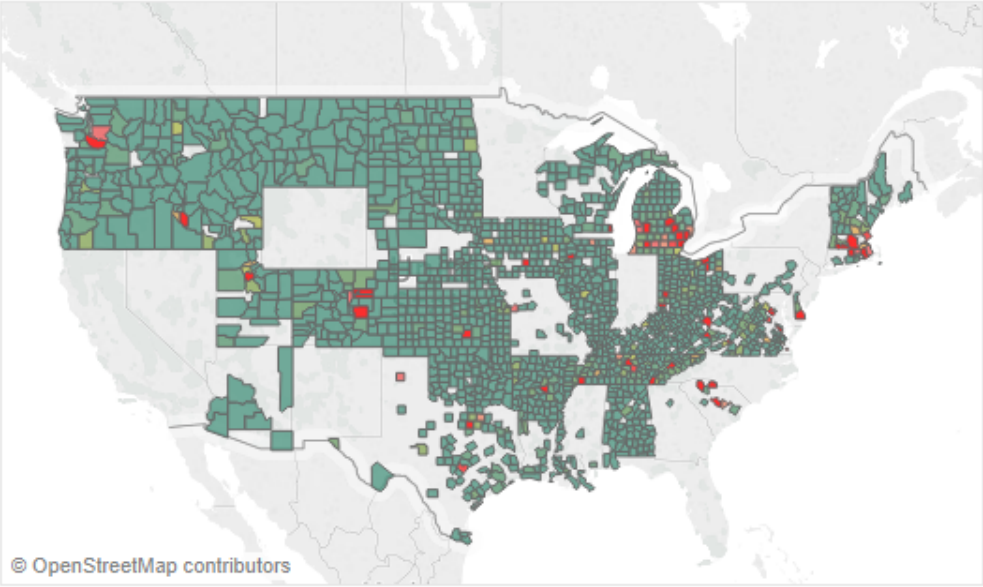
- ✓ **Why**?
  - Focus investigation toward or away from certain basic assumptions
  - Prioritize leads in the face of scarce resources

Case example:

Serial rapist targeting elderly

Num Incidents
19,818,707

Profiler: **Offender features**



Race

Wht or Hisp.	55.78%
Black	32.40%
Null	9.31%
Other	1.17%
Mix-Group	1.34%

Gender

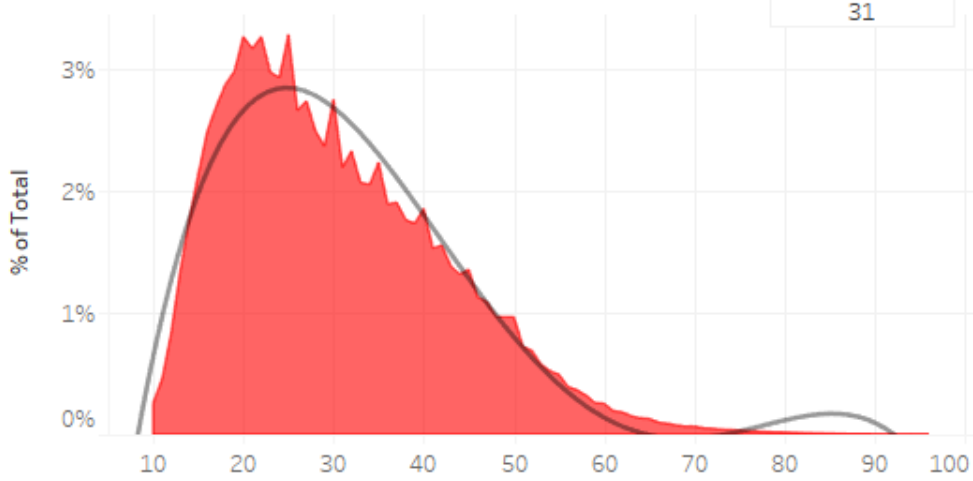
Male	68.79%
Null	7.21%
Female	19.32%
Both	4.68%

Non Resident?

Null	67.92%
No	26.24%
Yes	5.84%

Age

Average: 31

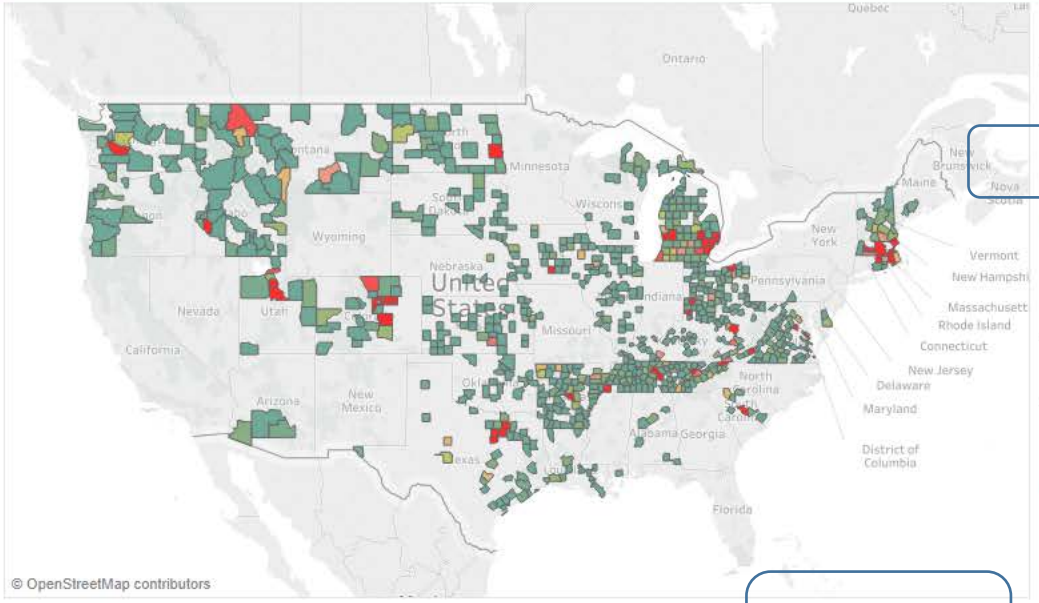


SPACE-TIME	INCIDENT	VICTIM	OFFENDER
State: (All)	Offense (1): (All)	V. Race: (All)	O. Race: (All)
County: (All)	Offense (2): (All)	V. Gender: (All)	O. Gender: (All)
Location (1): (All)	Crime Kill: (All)	V. Non Res: (All)	O. Non. Res.?: (All)
Location (2): (All)	Crime Kidnap: (All)	V. Stranger to O.?: (All)	O. Drug/Alch?: (All)
Month: (All)	Crime Sex: (All)	Victim Type: (All)	Gang: (All)
Day: (All)	CrimeSex Pimp: (All)	V. Age: 0 – 96	O. Age: 10 – 96
Hour: 0 – 23	Weapon: (All)	V. Count: 0 – 10	O. Count: 1 – 90
Inc Date: 1/1/91 – 12/31/15	Gun: (All)		
Days to Arr.: 0 – 730	Injury?: (All)		
	Offenses: 1 – 14		

Loc All | Weapon | Harmony (Map) | Harmony Location | Harmon Ranks | SCAn | SCAn: Birth Year (avg) | Count | FILTER (location) | FILTER (crime) | FILTER (relation) | FILTER (all other) | Dash Incident

Num Incidents
5,744

Profiler: **Offender features**



Race

Wht or Hisp.	48.56%
Black	17.03%
Null	33.32%
Other	1.10%

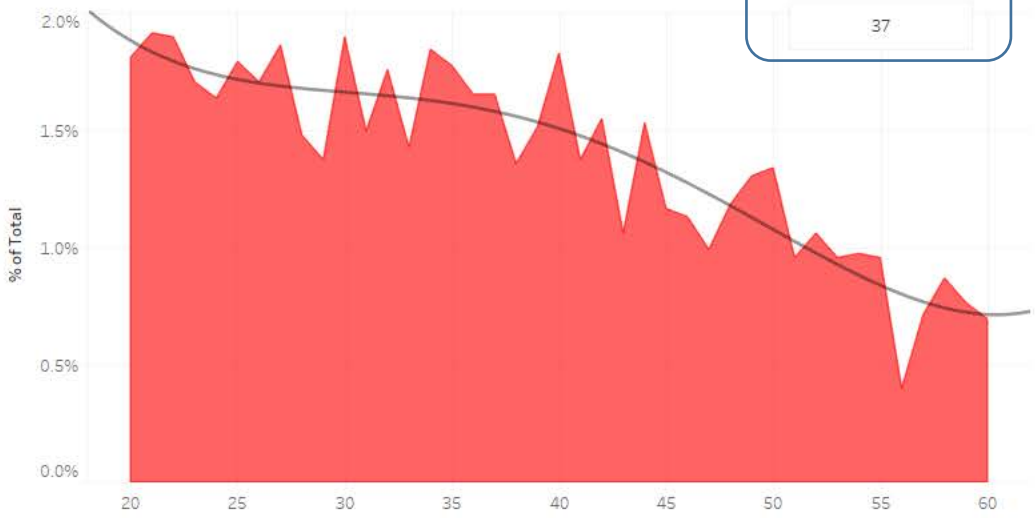
Gender

Male	79.23%
Null	20.77%

Non Resident?

Null	86.28%
No	11.28%
Yes	2.44%

Age



Average
37

SPACE-TIME	INCIDENT	VICTIM	OFFENDER
State: (All)	Offense (1): (All)	V. Race: (All)	O. Race: (All)
County: (All)	Offense (2): (All)	V. Gender: Female	O. Gender: (Multiple values)
Location (1): Home	Crime Kill: (All)	V. Non Res: (All)	O. Non. Res.?: (All)
Location (2): (All)	Crime Kidnap: (All)	V. Stranger to O.?: (All)	O. Drug/Alch?: (All)
Month: (All)	Crime Sex: Yes	Victim Type: (All)	Gang: (All)
Day: (All)	CrimeSex Pimp: (All)	V. Age: 70 – 97	O. Age: 20 – 60
Hour: 0 – 23	Weapon: (All)	V. Count: 0 – 1	O. Count: 1 – 1
Inc Date: 1/1/91 – 12/31/15	Gun: (All)		
Days to Arr.: 0 – 730	Injury?: (All)		
	Offenses: 1 – 14		

Another example: child sexual assault in FL

- Home surveillance camera captures attack
- Girl reports black male, approx. 55 years old
- E-Profiler "given" of:
  - 10 – 12 yo, white, female victim in open area, sexually assaulted by stranger, who was a black, male. (You could also add day of the week and time.)
  - E-profiler said age 23 was the most likely

- Arrest two days later of 23 year old man who was on leave from the military.

Serial Crime Analysis (S.C.An.)

What is S.C.An.?

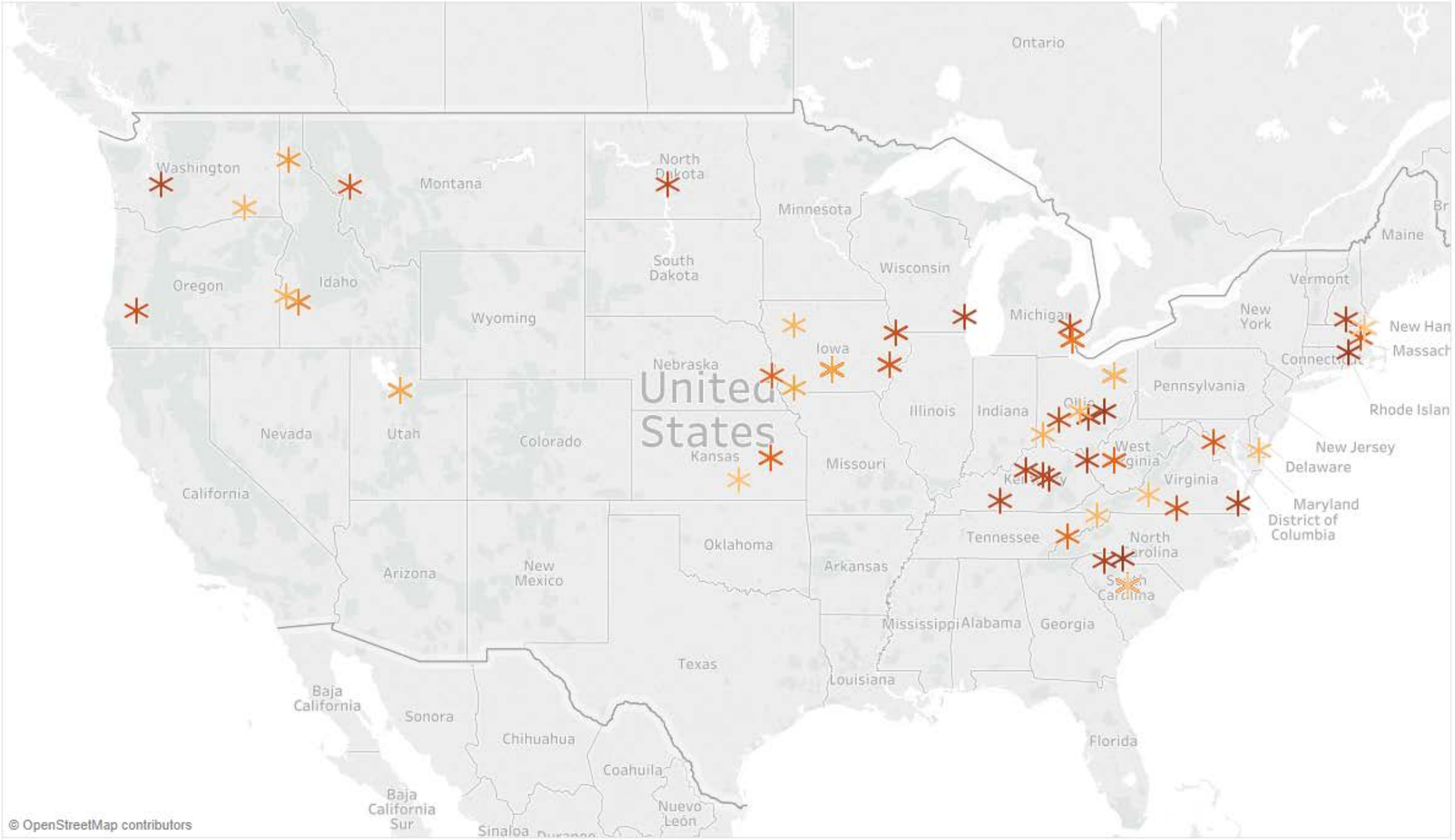
- ✓ **What?**
  - Visual analytic dashboard with all NIBRS data, all data elements as filters, and other data merged in as well (county level) in order to *find crimes that may be linked to the same offender(s).*

- ✓ **How?**
  - Identify "weird" features of a particular crime or series that are also NIBRS data elements, subset to see other incidents with similar features, and map them to view over time and space.

- ✓ **Why?**
  - Finding crimes linked to the same offender(s) could help identify that offender (e.g., combining evidence from different crime scenes).
  - NIBRS is a huge pool of cases in which a few weird features can be isolated

❑ Example: *Serial abductions in western state by a man and woman in their 20s abducting young girls (10 – 13) into a van, sexually assaulting them, and then dropping them off. A young couple working as a team engaged in forcible abduction/sexual assaults is kind of rare, and in NIBRS. So ……*

SCAn



ORI State

(All)

Year Birth

- Null
- 1907
- 1942
- 1944
- 1950
- 1953
- 1956
- 1958
- 1959
- 1960
- 1963
- 1964
- 1965
- 1966
- 1967
- 1969
- 1970
- 1971
- 1972
- 1973
- 1974
- 1976
- 1979
- 1980
- 1981
- 1982
- 1983
- 1985
- 1986
- 1987
- 1988
- 1989

SCAn | SCAn: Birth Year (avg) | Count | FILTER (location) | FILTER (crime) | FILTER (relation) | FILTER (all other) | Dash Incident | Dash Victim | Dash Offender | Offender Profiler | c-Profiler

c^2 Community Connections

What is Community Connector (c^2)

- **What?**
  - Visual analytic dashboard with all NIBRS data, all data elements as filters, and other data merged in as well (county level) in order to *find other communities that may have insight to offer.*

- **How?**
  - Articulate a feature of one community in terms of NIBRS elements in order to see other communities:
    - Who else is dealing with similar issues, having dealt with similar issues, or having avoided them.
    - Can I zero in on communities like mine (population, police size, unemployment, etc.) to get even more comparable insights?

- **Why?**
  - To avoid reinventing the wheel, get as many ideas on the table, and ultimately identify a faster and more reliable solution to a local problem.

- *Example*: Who else has experience with forcible rapes of elderly women at their homes—who can we call for help/insight?

Community Profiler

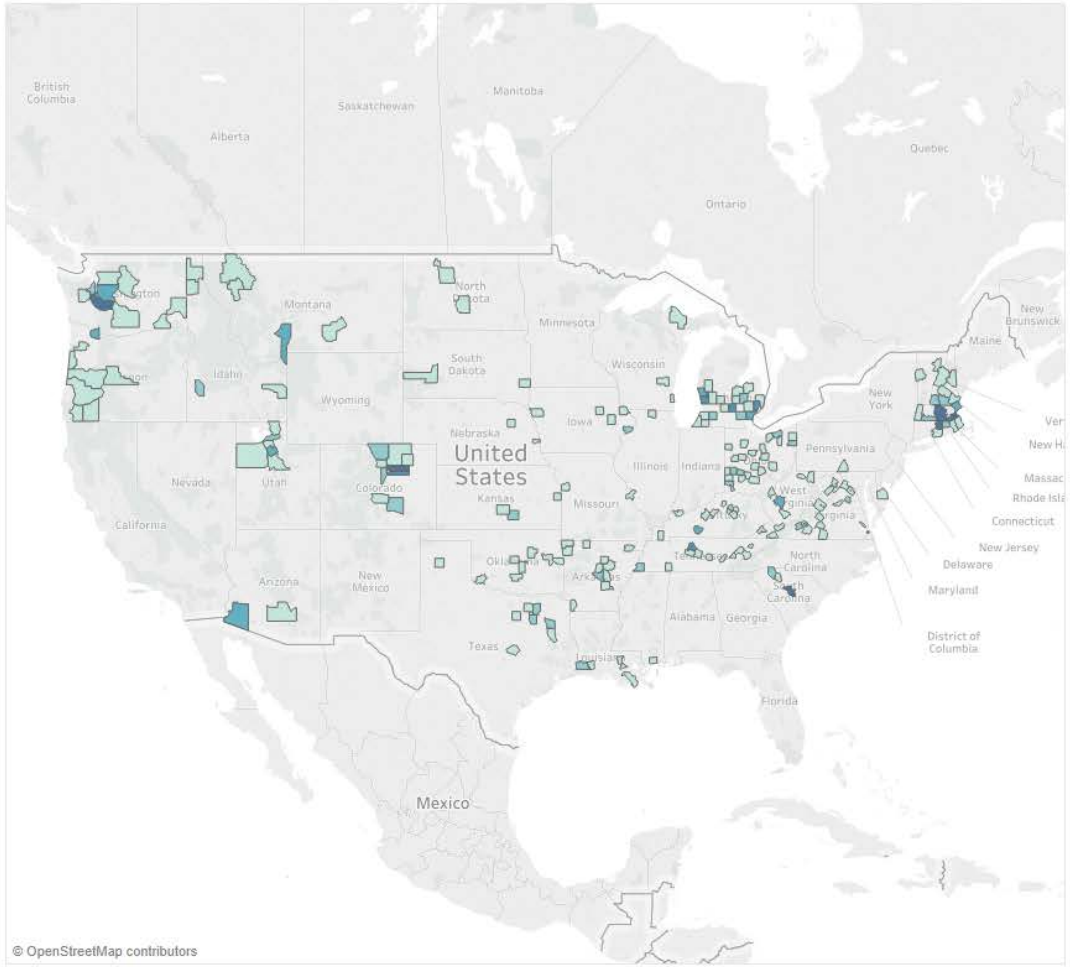
Connecting communities to solve problems

U.S. Marshals Service

County Details

County-State	Number of Incd.	Days to Arr	Population	SQmiles	Police Tot	Income	HS Dropout (%)
NORFOLK-MA	18		12,528,414	148,698	30,330	90,039	6
WORCESTER-MA	18	30	14,741,334	148,698	27,594	65,217	10
ADAMS-CO	15		7,370,055	1,560,075	33,975	59,316	18
NORFOLK-VA	15	0	3,695,895	236,550	50,895	42,567	13
RICHLAND-SC	15	45	6,105,765	467,265	63,810	49,782	10
PIERCE-WA	10	83	8,439,540	251,870	11,570	60,397	9
ARAPAHOE-CO	8	5	5,048,768	832,040	34,448	65,359	8
DAVIDSON-TN	8		5,431,112	117,640	39,744	48,195	14
MACOMB-MI	8		6,918,720	173,216	12,736	54,865	12
OTTAWA-MI	8		2,239,640	292,032	3,704	60,577	9
RICHMOND-VA	8	1	71,264	126,160	49,272	42,204	24
SUFFOLK-MA	8	1	6,224,968	66,088	38,200	54,280	16
INGHAM-MI	7	0	2,002,595	255,528	29,995	45,840	9
GALLATIN-MT	6		604,434	878,346	1,494	51,569	4
KING-WA	6		12,702,750	151,122	25,866	75,738	8
SALT LAKE-UT	6		6,643,884	508,902	17,778	62,536	11
WAYNE-MI	6	0	10,556,010	129,912	33,312	41,434	16
CLARK-WA	5		2,297,475	125,935	2,615	61,747	9
ESSEX-MA	5	0	3,880,215	41,305	8,085	70,074	11
KANAWHA-WV	5		941,660	57,430	5,710	43,936	12
MUSKEGON-MI	5		863,950	182,520	1,500	42,588	12
WARREN-KY	5		614,255	99,095	1,310	48,925	13
YUMA-AZ	5		1,021,375	570,120	3,655	39,700	28
ADA-ID	4		1,736,844	333,572	6,392	57,908	6
CUYAHOGA-OH	4		5,023,684	72,476	23,544	44,138	12
FAYETTE-KY	4		1,257,952	82,272	3,560	48,552	11
GENESEE-MI	4		1,643,396	86,608	3,608	41,787	11
GREENE-OH							

County Counts



Number of Incidents

1 — 10

County features

Population
25000 — 10170292

Number of Incidents
1 — 7,126

Poverty (%)
3.70 — 52.20

Square Miles
68 — 146391

Unemployment (%)
1.80 — 21.80

Police assaulted
0 — 2788

Police Employees
1 — 14227

Avg. Days to close
0 — 730

Communities with sexual assaults of elderly people at home etc. (same filters as before)

Now for the ask…..

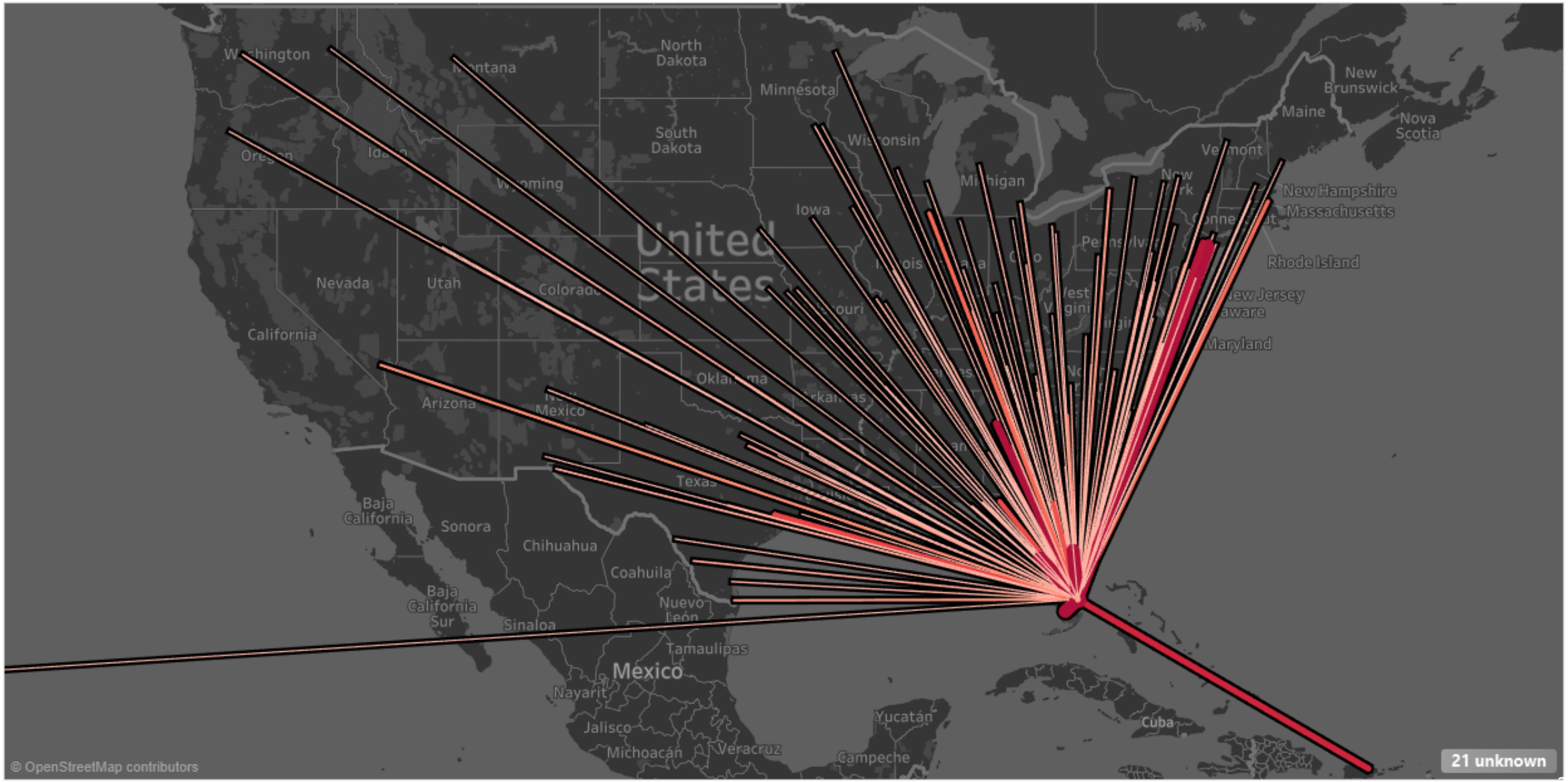
Two ideas about NIBRS

1. Record arresting ORI in arrestee table?

- **Effort Level?**
  - ✓ We probably all have this in our data systems already and its an easily accepted item for FBI/NIBRS (I assume)?

- **Why do it?**
  - ✓ You need to know how many, what kind, and who's criminals are being arrested in your jurisdiction, and who is likely to flee.
  - ✓ We want to create nuanced predictive models of who flees a jurisdiction and where they go.
    - Partly this is so we can justify our mission/budget as the agency that crosses any jurisdiction – we clear 100,000 local cases per year and have no way to show that in NIBRS!
    - Mostly this is so we can create tools to help us catch bad guys faster
    - We think this would help all NIBRS contributors with myriad NIBRS uses

Fugitive Location & Evasion Dashboard (F.L.E.D.)
U.S. Marshals Service



SELECT

Path Size

2 32,725

OPEN LOCATI..

Open State

FL

Open County

BROWARD

CLOSED LOCATION

Closed State

(All)

Closed County

(All)

WARRANTS

Foreign

(All)

Traveler

(All)

Warrant Entered

1984 Q3 2017 Q4

County Open | Path Count | CountyPath | CountyPath2 | FIPS_Close | TOTAL | FIPS_PathName | Testing area | Fugitive Migration

2. Can we include the FBI# of arrestees?

- **Effort level**
  - If it exists for that offender, we probably all have it in our systems
  - This could be protected / encrypted just as FBI already does for OCA

- **Why do it?** It would enhance our ability to ….
  1. fill in missing data from other NIBRS entries or other federal data systems
  2. analyze criminal careers over time and space
  3. analyze linked crimes (serial offending)
  4. analyze criminal networks (social network analysis/change
  5. and correct a HUGE statistical error in many uses of NIBRS data: violation of the independent observations assumption

❖ <u>That is a lot of incidents</u>: ~50% of crime is committed by ~5% of offenders!

Summary

- ❑ NIBRS is also useful for operational applications
  - Applied science & Policy guidance
  - Perhaps Investigative guidance tools

- ❑ The national data has value beyond the sum of the parts
  - Especially for rare events

- ❑ I bet there is room to discover and increase value of NIBRS
  - In addition to adding new elements to NIBRS, or new contributors,
  - Can we add new *functionality* such as facilitate network, criminal career, or migration capacity?
    - ➢ Would that be hard? Yes. Crazy? Maybe. And yet……

Thank you

David Bierie &

Paul Detar

Business Integration Center

Investigative Operations Division

U.S. Marshals Service

David.Bierie@usdoj.gov