

Using GIS to quantify crime reduction potential of near repeats

*****DRAFT – NEEDS UPDATED*****

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Background

- Trends in research and practice laid the groundwork
 - Translational criminology
 - Evidence-based policing
 - Crime science

Translational criminology

- Championed by John Laub while director of NIJ
- Communication is key

The idea of translational criminology is simple, yet powerful: If we want to prevent, reduce and manage crime, we must be able to translate scientific discoveries into policy and practice.

-John Laub (2011)



Evidence-based policing

- *Evidence-based policing is the use of the best available research on the outcomes of police work to implement guidelines and evaluate agencies, units, and officers.*

--Sherman (1998, p. 3)

- *Evidence-based policing is about two very different kinds of research: basic research on what works best when implemented properly under controlled conditions, and ongoing outcomes research about the results each unit is actually achieving by applying (or ignoring) basic research in practice.*

--Sherman (1998, p. 4)

Crime science

- Roots in situational crime prevention movement
- Parallels with operations research (applying the scientific method to complex problems)

Crime science ... is the application of the methods of science to crime and disorder.
- Gloria Laycock (2005, p. 4)

Building on the foundation

- Identify information practitioners need – a realistic estimate of crime reduction potential
 - Draw from current evidence-base
 - Use technology to advance the field
 - Communicate the results of research to practitioners and researchers
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- Clearly, a scientific approach to evaluating a crime reduction program should include a measure of the crime prevention potential.

Setting expectations – an example

- 1000 burglaries per year
- New program proposed to focus on near repeat burglary is implemented
- Agency A
 - Burglaries go down by 5% (n = 50)
 - New program is shelved because the ROI was not high enough.
- Agency B
 - Prior to implementation, the number of burglaries that were near repeats is calculated as 100.
 - After implementation, burglaries in program areas go down by 5% (n = 50).
 - Which means near repeat burglaries went down by 50%.
 - Program is expanded because of its success.

Case study – Baltimore County, MD

- Near repeat burglary prevention initiative
- Previous research at macro level – large potential crime reductions
- Take near repeat to the micro level where police operate

Challenges with burglary data for near repeat

- Not all burglaries are reported to the police
 - May result in incomplete patterns
- Time until crime discovery
 - Translates into poor temporal resolution
 - Potential errors in temporal ordering
- Burglaries that occur on the same day as the originator event are not counted as repeats (not preventable because they occur before pattern is identified)

Macro level near repeat patterns

- Is there a macro level near repeat pattern for all of Baltimore County? (n = 902)
 - Yes! The chance of another incident is about **491 percent** greater than if there were no repeat victimization pattern.

	1 – 400 f 0 - 7 d	1 – 400 f 0 - 14 d	401 – 800 f 0 to 7 d	401 – 800 f 0 to 14 d	801 – 1200 f 0 to 7 d	801 – 1200 f 0 to 14 d
All	5.91	1.87	2.75	ns	2.36	1.94
Subset	6.09	ns	3.58	ns	3.55	2.49

- Is there a macro level near repeat pattern using the same criteria to identify a subset of residential burglary as we are using in our study? (n = 611)
 - Yes! The chance of another incident is about **509 percent** greater than if there were no repeat victimization pattern.

How many burglaries were part of a near repeat pattern?

- September 9, 2013 – September 8, 2014
- Created a geoprocessing model for spatial relationships
- Python script for temporal relationships
- Move to one Python script – slowed progress

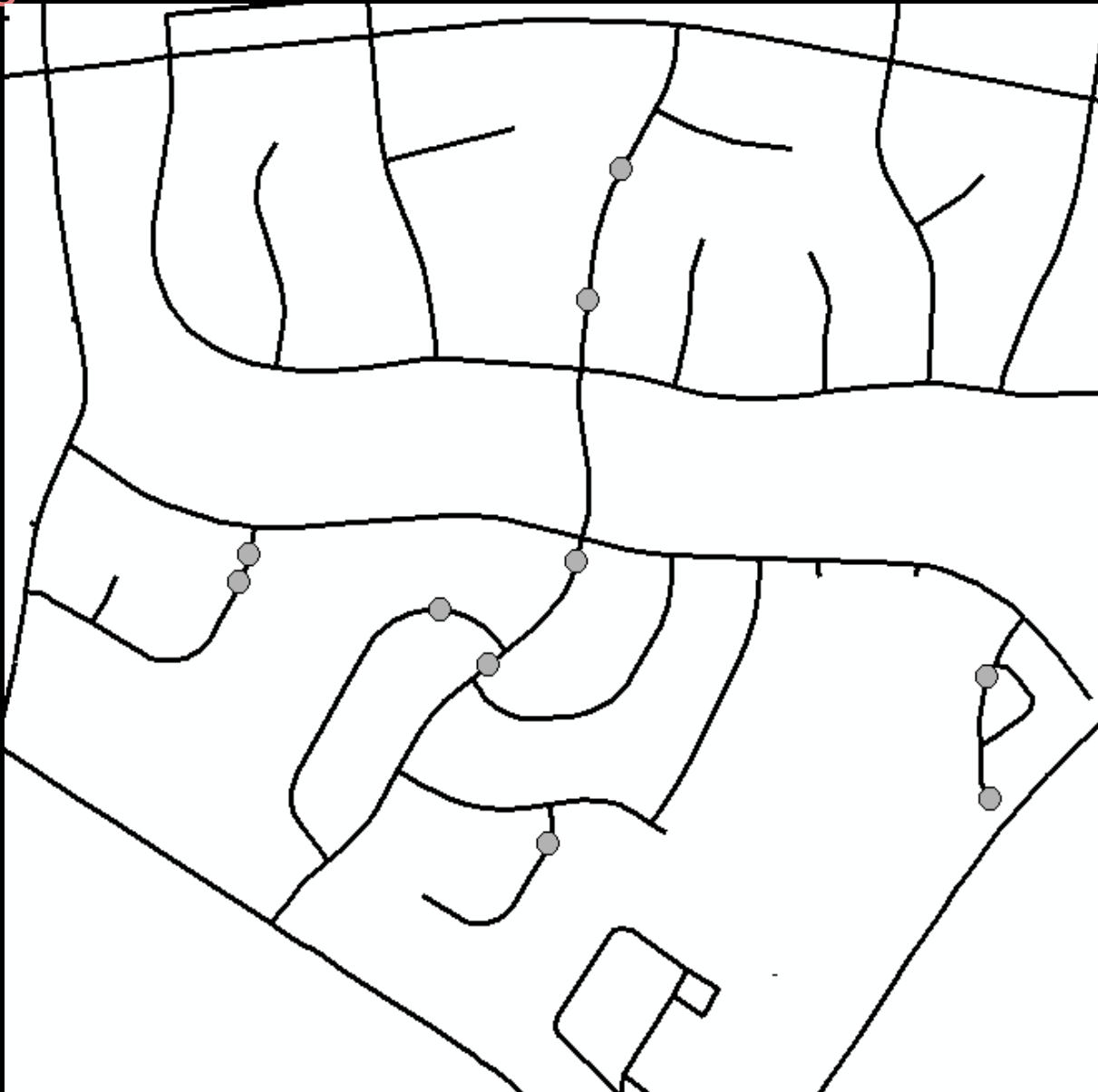
Crime prevention potential – number of actionable near repeat burglaries

Actionable burglaries previous year - 611

	Distance Threshold (feet)						
Days	400	800	1200	1600	2000	2400	2800
7	5	9	22	32	43	50	59
14	9	14	30	47	61	69	83
21	10	21	40	57	79	90	108
28	13	26	46	65	89	104	128
60	22	40	72	106	141	173	204

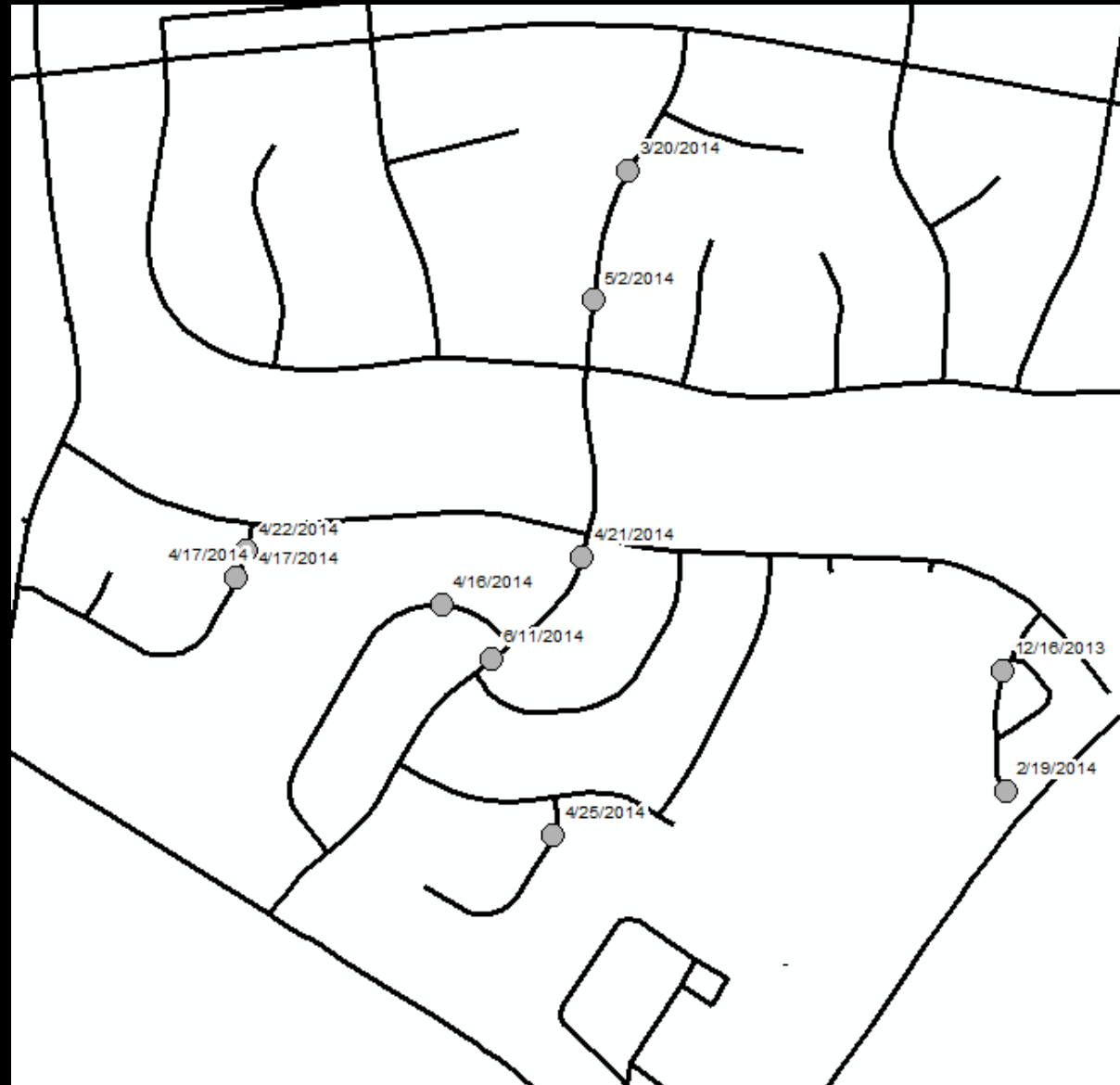
Example of issues

- 11 burglaries



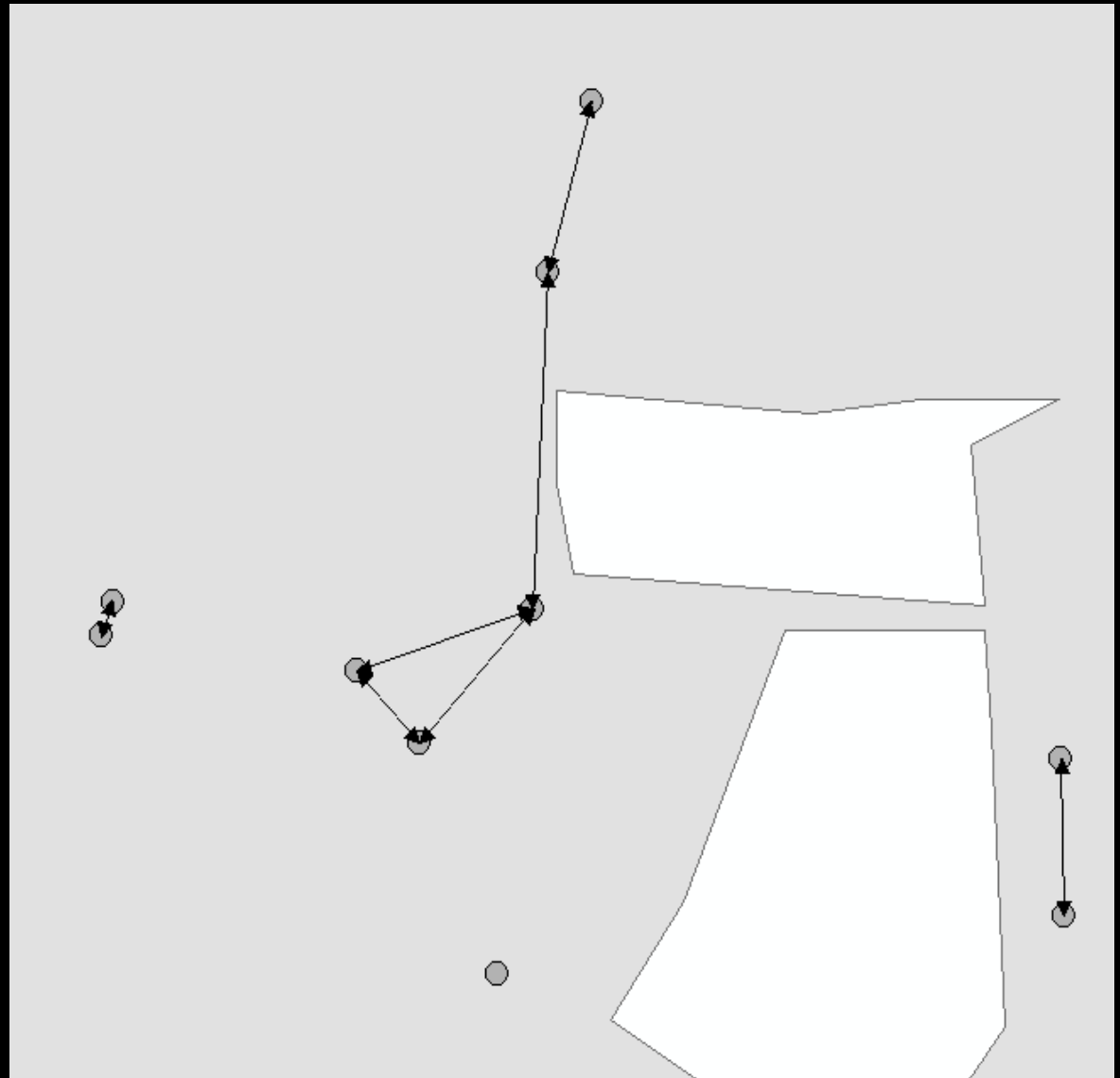
Examples of issues

- 11 burglaries
- 12/16/2013
6/11/2014
- High risk threshold:
 - Spatial - 800 feet
 - Temporal - 7, 14, 60



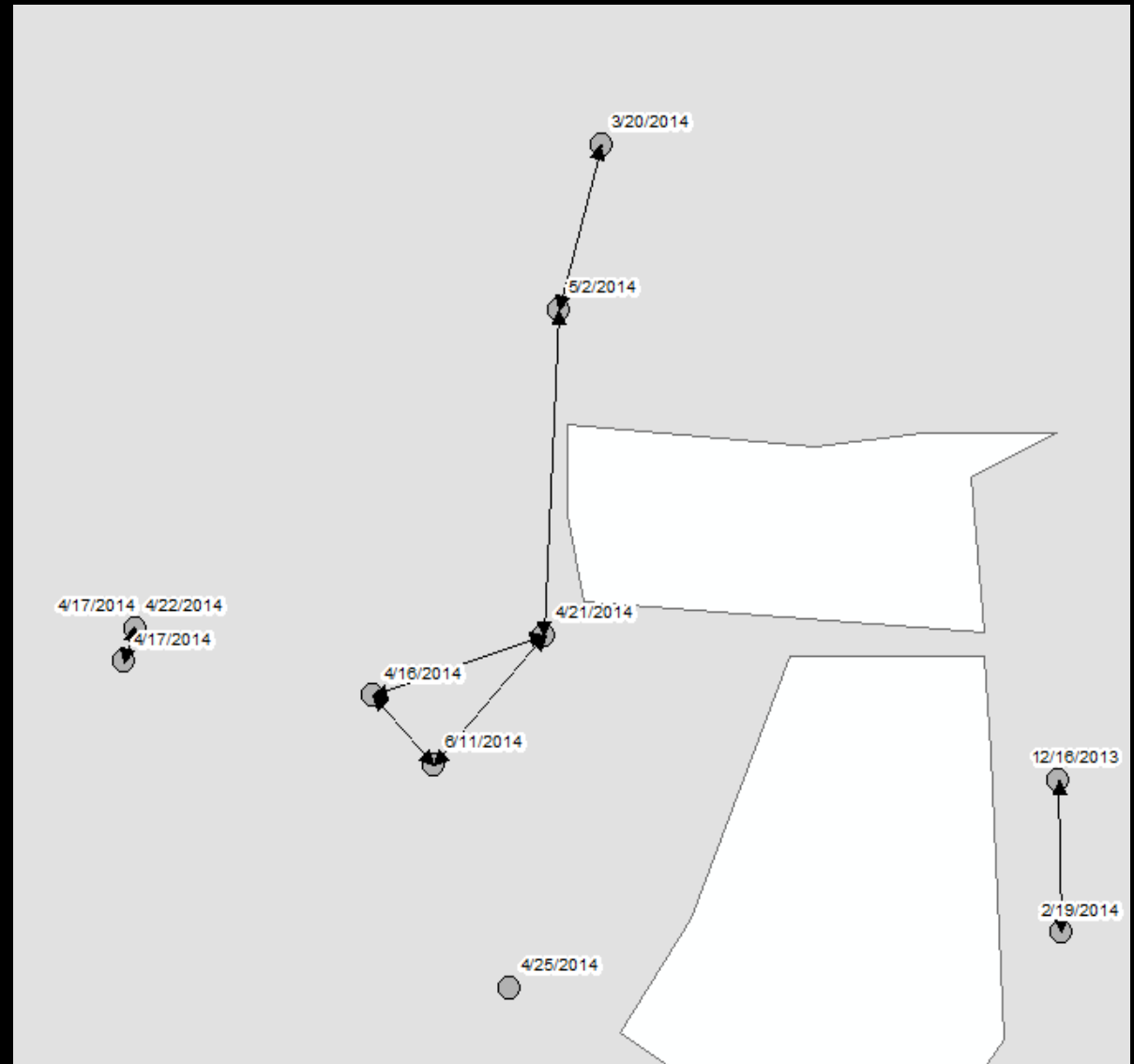
Which burglary events meet the spatial threshold?

- Measured along street network
- Only connections within spatial threshold are shown



Which burglary events meet the temporal threshold?

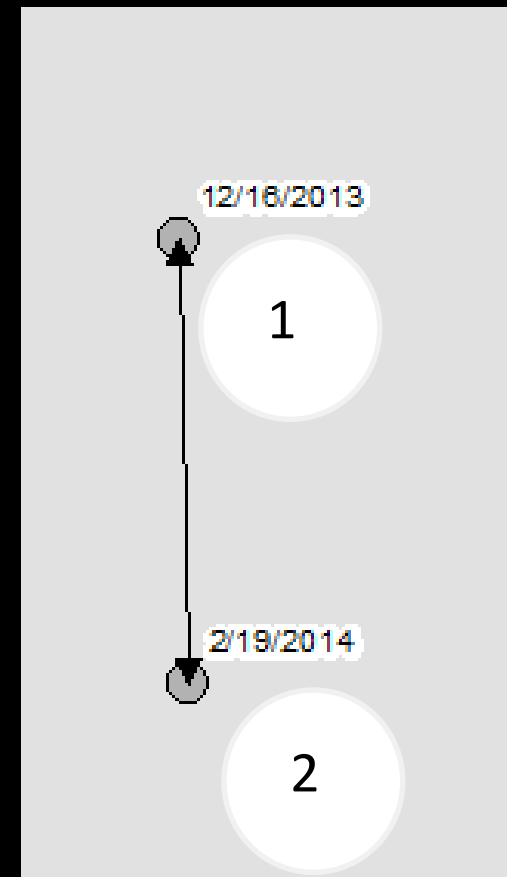
- Examine pairs of dates
- Relationship varies with temporal threshold



Temporal ordering and threshold

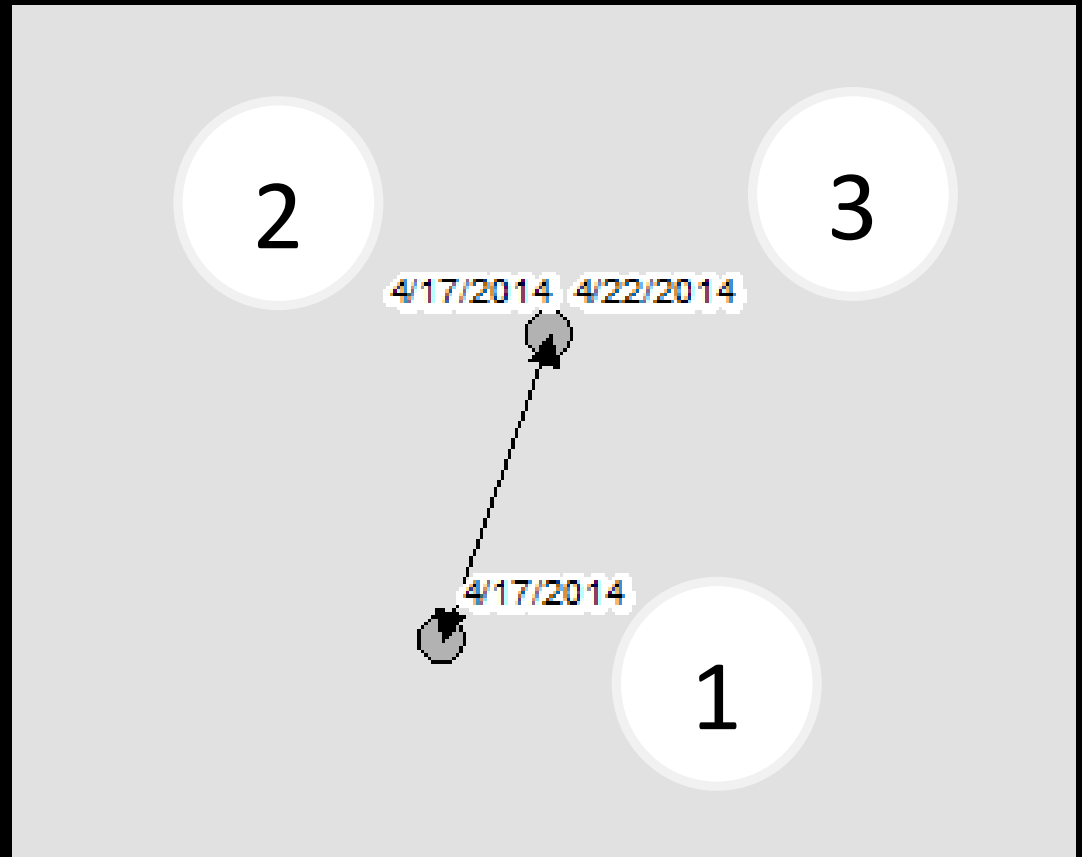
- To qualify:
 - Event 2 must occur after event 1
 - Event 2 must occur within the temporal threshold
 - Does it occur within 60 days?

Since Event 2 (2/19) is not within 60 days of Event 1 (12/16), it is not part of a near repeat pattern associated with Event 1



Events that occur on the same day

- Disregard events that occur on the same day as the event being evaluated
- Assumption – we cannot act quickly enough to prevent them.



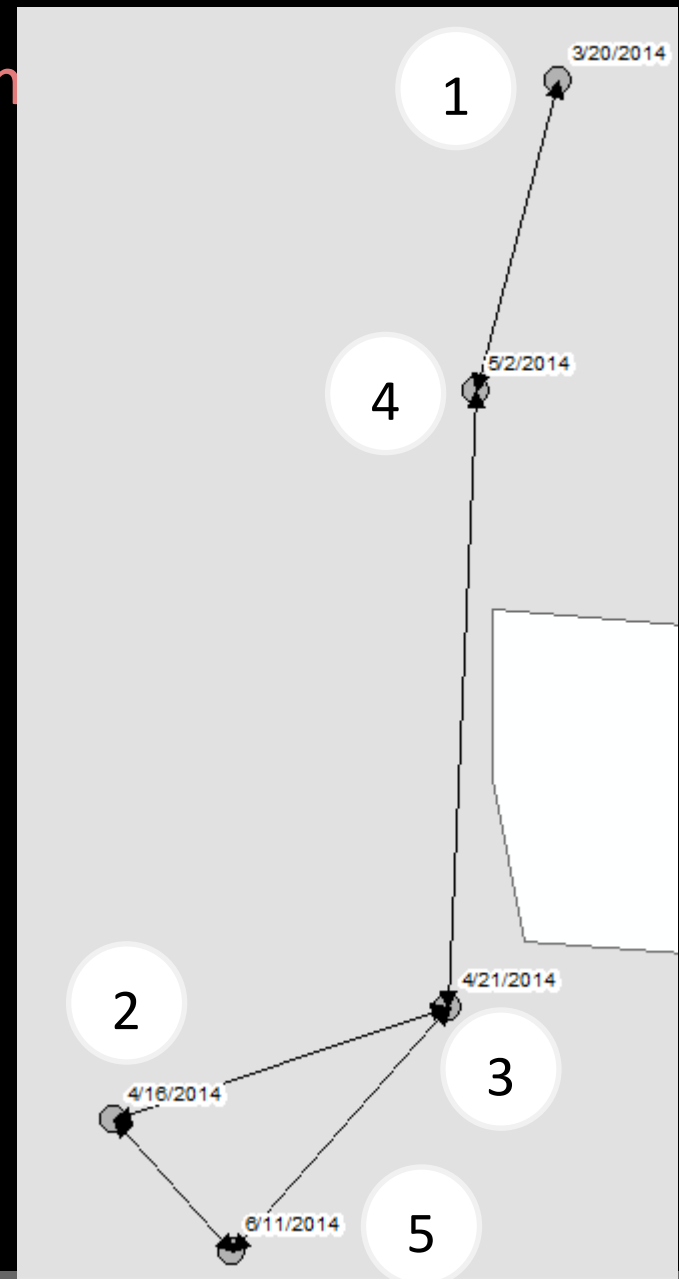
Events 1 and 2 are not counted as near repeats for each other.

Only count each event one time

- 800 ft, 60 days
- Event 1 – Event 4 is a near repeat
- Event 2 – Events 3 and 5 are near repeats
- Event 3 – Already counted
- Event 4 – Already counted
- Event 5 – Already counted

Total preventable near repeats = 3

Allowing events to count in more than one pattern would produce a total of 10 near repeats – 3x too many



Automation is crucial

- Not able to use OD matrix analysis
- Too many manual steps
- Answer: Write a program
 - Saves time
 - Increases accuracy
 - Makes assumptions explicit

Conclusions

- For practice:
 - Calculating crime reduction potential prior to undertaking an evaluation grounds agency and citizen expectations in empirical reality
 - Provides critical information in a landscape of shrinking budgets
- For research:
 - Crime prevention potential measured using micro level unit of analysis (see Bowers, Johnson and colleagues for earlier work)
- For both research and practice:
 - Offers a specific and realistic metric for evaluating program success

References

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