

**THE
Epidemiologist
is
THE
DETECTIVE**

Shoe Leather
Epidemiology
in the 21st
Century

Bureau of Communicable Disease
NYC Department of Health
Northeast Epidemiology Conference
October 1, 2015

Adapted from *Emil and the Detectives*, by Erich Kastner


Epidemiologist

Detective

Microorganisms
Routes of Exposure: Ingestion, Injection, Inhalation

- Virus: HIV, Hepatitis, Dengue, Influenza
- Bacteria: E. coli, Clostridium, Salmonella
- Fungi: Candida, Aspergillus
- Protists: Amoeba


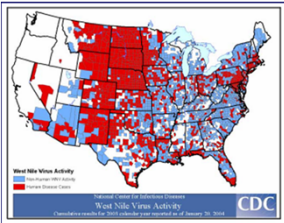
Usual Suspects



Epidemiologist

Detective

Surveillance



West Nile Virus Activity
CDC

Epidemiologist

Detective

Interrogation Methods



Epidemiologist Detective

Crime Scenes



Epidemiologist Detective

Fingerprints



This is a true and correct copy of the original on file in the office of the New York State Office of Forensic Science, Albany, New York. Date: 09/23/2015

Epidemiologist Detective

Media Icons



Shoe Leather Epidemiology

- Field work
- Who, what, where & how?
- Collection of clues, data, specimens...



NYC Health

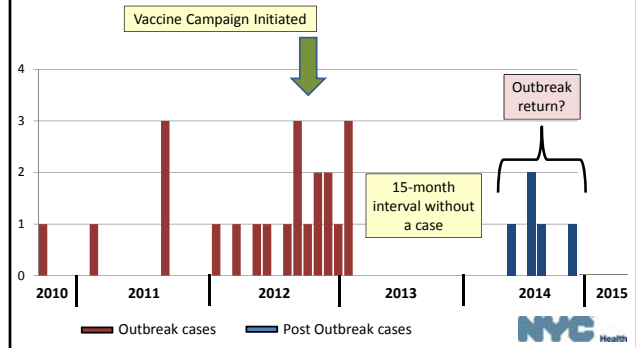
Finding Meningococcal Network Contacts

- Outbreak of meningococcal disease in gay men
- Sexual, social & drug-sharing contacts
- iTracing
 - Messages to “Friends” of cases
 - Hook-up apps
 - Banner ads- vaccinate



Ongoing Meningococcal Community transmission?

Serogroup C Meningococcal Disease Outbreak in Gay Men, NYC 2010-13



Finding Meningococcal Network Contacts

- Phone/Apps
- Call logs
- Contacts: multiple, long calls
- SAS match



Contact Numbers by Total Points

Obs	contact_nbr	total_points
1	347-XXX-XXXX	332
2	929-XXX-XXXX	300
3	646-XXX-XXXX	201
4	646-XXX-XXXX	176
5	917-XXX-XXXX	152

Contact Numbers Common Across Multiple Cases

Obs	contact	person_id1	person_id2	person_id3	total_points
1	XXX-XXX-XXXX	X	X	X	3
2	XXX-XXX-XXXX	X		X	2

Analyzing Reportable Disease Surveillance Data

1. Historical Limits Method-modifications

- Use consistent case inclusion criteria
- Adjust for trends
- Exclude previous clusters from baseline
- Account for delays in data receipt

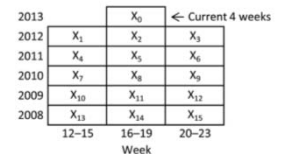


Figure 1. Following Stroup et al. (27), a schematic of the periods included in analyses using the historical limits method.

45% reduction in signals (May 20-August 5, 2013)

¹ Levin-Rector et al. Refining Historical Limits Method to Improve Disease Cluster Detection. EID 2015; 21: 265-272.




Analyzing Reportable Disease Surveillance Data



2. Building Identification Number Analysis

- Unique 7-digit number assigned by City Planning to a specific building
- Auto-populated by database (Maven) Can also use string search or X/Y coordinates
- Nursing homes, long-term care facilities, group homes, shelters...
- Single case of influenza, 2 or more cases of LD (w/in 1 year)

² Levin-Rector et al. Building-level analysis to prospectively detect influenza outbreaks in long-term care facilities. *Am J Invec Control* 2015; 43: 839-843.




Analyzing Reportable Disease Surveillance Data


LEG clusters with event dates through May 6, 2015
Confirmed, probable, suspected and pending cases

3. SaTScan analysis


- Space-time permutation scan statistic
- Uses a geographic unit (census tract)
- Are there more cases observed than expected (compared to baseline) inside the cluster vs. outside?



Cluster	Start date	End date	# days in cluster	Radius (miles)	Observed over Expected	Recurrence interval (days) ²
1	04/30/2015	05/06/2015	7	0.65	44.2	141




Data Mining-Social Media



- Scans text for key words: sick, vomiting, diarrhea, poisoning
- Multiple persons
- Timing

	Number of reviews pulled	Indicated food poisoning	Needed investigation	Completed interview	Number of outbreaks
Year 1	1015	590 (58%)	159 (27%)	30 (19%)	3
Year 2	3213	1448 (45%)	282 (19%)	24 (9%)	3
Year 3	3886	1981 (51%)	480 (24%)	31 (6%)	4
Total	8114	3855 (50%)	921 (24%)	85 (9%)	10

Next Step: Twitter




Data Mining-Emergency Department Syndromic Surveillance

Singe Word Analysis

- Limitation of syndromes
- Surveil for that which you don't know you should be looking for
- Example: *visits to receive prophylaxis for Nm exposure*

Obs	word	arch13_count	arch13_mean	mean_adj	Count_020115	ratio_020115
1	DIV	208	0.57	1.00	164	164.00
2	MV	70	0.19	1.00	80	80.00
3	MSF	1	0.00	1.00	26	26.00
4	FG	1	0.00	1.00	26	26.00
5	DP	6	0.02	1.00	21	21.00
6	07999	1	0.00	1.00	14	14.00
7	3029	1	0.00	1.00	13	13.00
8	R3	5	0.01	1.00	13	13.00
9	UNSPECI	563	1.54	1.54	20	12.97
10	FDNY	808	2.21	2.21	24	10.84
11	323	84	0.23	1.00	10	10.00
12	F2	1	0.00	1.00	9	9.00
13	Y222	1	0.00	1.00	9	9.00
14	78639	1	0.00	1.00	8	8.00
15	LEISHMANIOSIS	496	1.36	1.36	10	7.35
16	30500	1	0.00	1.00	7	7.00
17	56480	1	0.00	1.00	7	7.00



Data Mining-Emergency Department Syndromic Surveillance

Synthetic Cannabinoids

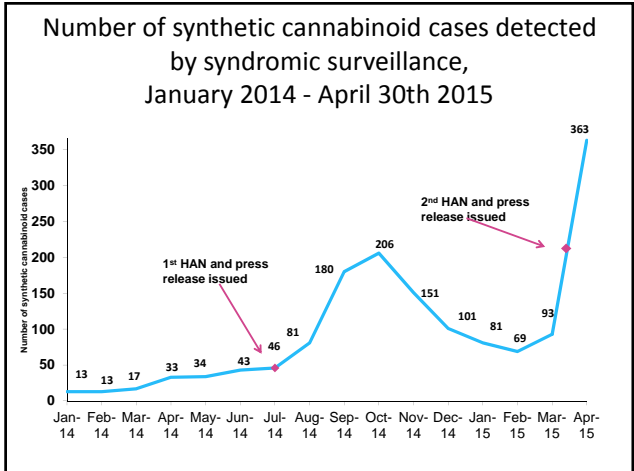
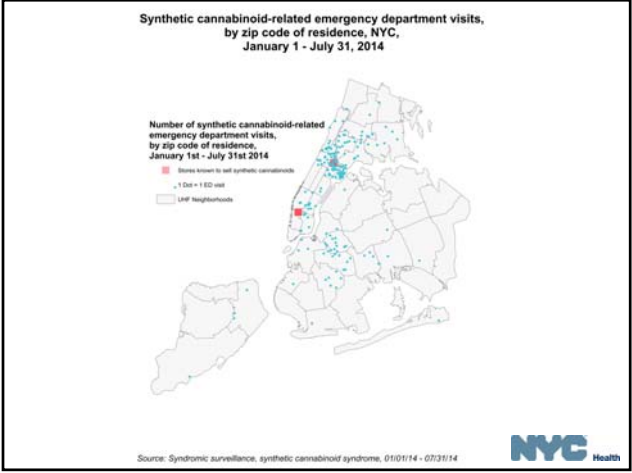
- Aka K2, Spice, Green Giant, Geeked Up, Caution, Smacked, Wicked X, AK-47, or legal marijuana.
- Shredded plants & chemical additives
- How to track?

New York City's Health Department Would Like to Remind You Fake Weed Is Dangerous and Stupid
 By Susan Slavov
 Published Mon., Jul. 28 2014 at 10:41 AM

New York City emergency rooms are seeing an outbreak of fake marijuana-related illnesses, according to the city's health department. The Department of Health and Mental Hygiene issued a [warning on Monday](#), urging people not to buy or use "synthetic cannabinoids," which are often sold at head shops under names like K2, Spice, and Green Giant. The agency says it's gotten reports of 43 fake-weed-related emergency room visits since the past Tuesday, concentrated in East Harlem, Central Harlem and Chelsea.

Search word/phrases	Exclusions
K2, K-2, K 2,	K2[0-9]
K TWO, K-TWO,	[A-Z]K TWO
Marijuana,	[A-Z]K-2
Spice	[A-Z]K
	TWO WEEK
	Hospice, Spicy, Spicey ,
	Spices

NYC Health



Data Mining-RHIOs

- Regional Health Information Organizations
- Hospital data sharing
- Public health access for investigations
- Meningococcal, Legionella

ADVANTAGES	DISADVANTAGES
Fast	Not all hospitals participate
No travel involved	Limited staff access
Paperless	Missing data
No need to bother hospital ICP	Navigating screens

NYC Health

Thank You

Contributors:

Don Weiss, Sharon K. Greene, Michelle Nolan, Robert W. Mathes, Robert Fitzhenry, Ramona Lall, Vasudha Reddy, HaeNa Waechter, Mike Antwi, Paula Del Rosso, Marie Dorsinville, Beth Nivin, Lucretia E. Jones, Kristen Forney, Eric R. Peterson, Hannah Mandel, Jennifer Baumgartner, Sharon Balter, Annie D. Fine, Ellen H. Lee and Marcelle C. Layton and the entire staff of the NYC DOHMH Bureau of Communicable Disease



Photo by W. Eugene Smith, 1948