Public Health Response to Disease Cluster Reports

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Learning Objectives

- Describe space, temporal, and space-time clusters.

- Describe several statistical and geographic methods for analysis of disease cluster reports.

- Discuss citizen concerns and public health responses.

- Discuss risk communication issues, including media roles.
Progression to date

- 1775 – Percivall Pott Scrotal Cancer among Chimney Sweeps
- 1965 – National Cancer Institute Symposium
- 1989 – CDC/ATSDR Conference: Special Issue of AJE, National Guidelines in MMWR
- 1995 – International Congress on Environmental Epidemiology and GIS
- 2002 – PA: 02179 National Environmental Public Health Tracking System
- 2006 – PHIN Criteria for Aberration Detection
Growth Areas

- Assisting epidemiologists and public health staff in small areas and new programs with implementing disease tracking programs

- Training with studies of Global Clustering
  - GIS technology

- Training with Assessment of Community-based Indicators

- Training in Risk Communication methods
The Myth

What exactly IS a cluster?

“A cluster is an unusual aggregation, real or perceived, of health events that are grouped together in time and space, and are reported to a health agency.”

MMWR, 39/No.RR-11; 7/27/90.
TEMPORAL CLUSTER

TIME (years)
SPACE–TIME CLUSTER

TIME (years)
“While I don’t play poker often, I do know that four-of-a-kind can be beaten by a straight flush. But, when I draw four-of-a-kind, I am going to bet on it.”

Alexander Langmuir, M.D.
Director, Epidemiology Section
Centers for Disease Control, 1965
IS THERE A CLUSTER HERE?

TIME (years)
“The constructive approach to this situation, in my opinion is not to develop highly refined statistical techniques to determine whether or not a certain cluster might have resulted by chance alone. But, rather to investigate each cluster as it is reported and see if additional association of possible interest can be found. If none turn up, there is obviously a cold trail, and any good hunting dog will abandon it and go look for a better one. If the scent strengthens, then hot pursuit is in order.”

Alexander Langmuid, M.D.
Director, Epidemiology Section
Centers for Disease Control, 1965
The Method

These guidelines represent a range of options and a recommended systematic strategic approach to the practice of investigating clusters of health events.

MMWR, 39/No.RR-11; 7/27/90.
Search for Local Clustering

Case-to-case Nearest Neighbor Sentinel Events
“The closer the [geographic] approach, the more rates should increase, if the data are sensitive to the underlying causal process.”

Dr. Tom Mason, USC SPH
Tampa, FL. February 14, 1995
Address Matching Using TIGER Line Files

275 Main ST
Breast Cancer
1-Localized
Age 56

ID  22001  22002  22003
Name Main ST  Main ST  Main ST
From left 100  200  300
To left  198  298  398
From right 101  201  301
To right  199  299  399
Point in Polygon
By Radius

Map

Database

<table>
<thead>
<tr>
<th>Point</th>
<th>Cancer Site</th>
<th>Stage at Diagnosis</th>
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<tr>
<td>3</td>
<td>174.3</td>
<td>2– regional</td>
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<td>5</td>
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<td>6</td>
<td>174.1</td>
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Point in Polygon
By Region

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<th>Stage at Diagnosis</th>
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<tr>
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<td>2– regional</td>
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<tr>
<td>5</td>
<td>174.1</td>
<td>0– in situ</td>
</tr>
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</table>

Map

Database
Pleural Cancer Incidences Distribution, South Carolina, 1996

SIGNIFICANCE OF RISK (P-VALUE)

NONE  LOW  HIGH

Tri-County Area: Berkeley, Charleston, Dorchester
Figure 1. Initial Computer Screen Displaying CLUSTER Main Menu
Search for Global Clustering

Spatial Progression
Visualization
Deterministic Correlates
Response Monitoring
African-American Males
Stroke Mortality Rates, for Non-Metropolitan Districts of Appalachia

Non Metro Comparison

<table>
<thead>
<tr>
<th>State</th>
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<th>WM</th>
<th>AAF</th>
<th>AAM</th>
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Caucasian Males: Stroke Mortality, by County 1999-2002

Please notice the state rate and the East Tennessee aggregate.
Caucasian Females: Stroke Mortality, by County 1999-2002

Tennessee Stroke Rates by County
Caucasion Females
1999-2002

- Low (below 71.1)
- Moderate (Between 71.2 and 79.6)
- High (Between 79.7 and 88.1)
- Very High (above 88.2)

*State rate = 71.1

Please notice the state rate and there is not such an East Tennessee aggregate.
African American Females: Stroke Mortality, by County 1999-2002

There are provocative ‘consistencies’ for the ‘Very High’ Counties.
African American Males: Stroke Mortality, by County 1999-2002

Tennessee Stroke Rates by County
African American Males
1999-2002

- Low (below 107.3)
- Moderate (between 107.4 and 117.8)
- High (between 117.9 and 128.3)
- Very High (128.4 and above)

If the Caucasian rates were used for shading: the WHOLE state would be ‘Very High.’
Descriptive Analysis of Factors [County Level] Associated with ‘High’ Stroke Mortality Rates in TN

Logistic Regression for Tennessee Counties for 'High' Stroke Mortality Rates: 1999-2002

- **WM**: Odds Ratio = 2.98, Statistically Significant (p < 0.05)
- **WF**: Odds Ratio = 3.28, Statistically Significant (p < 0.05)
- **AAM**: Odds Ratio = 1.68
- **AAF**: Odds Ratio = 1.46

* Statistically Significant p < 0.05
Tale of the Tail
(statistical significance, $p < 0.00001$)

These extremes rates warrant follow-back studies. Notably the three-county aggregate.
Current state of practice:

‘Real time' monitoring and ‘situational awareness.’ Currently CDC-funded case studies are being used with simulations to develop solutions for aberration detection and ‘outbreak’ decline. SatScan software is prominent option. Monitors space and time; ‘Great Circle’ software for health care utilization. GeoViz is new CDC product for chronic disease monitoring.
GeoViz Software; freeware from CDC to assist States with Visualization Prostate Cancer Incidence, with Late Stage
Incidence and Late Stage with Star Plots
Stars are $r^2$ or proportional representations of correlates for underlying attributes.
Risk Communication

And Working with Community Organizations
Communication Paradigm

Media

Concerned/Affected
Public

Technical Experts

Public Officials
Effective Risk Communication

- Accept and involve the other two groups as legitimate partners
- Plan carefully what you want to communicate and evaluate how well you communicated
- Listen carefully to both words and underlying concerns
- Be honest, open, and frank
- Coordinate and collaborate with other two groups
- Understand the role of the media and communicate with them
- Communicate clearly and with compassion
Working with the Media

- Reporters have limited time and expertise
- Reporters cover viewpoints not “truths.”
- Claims of risk are more newsworthy than claims of safety
- Environmental risk is not a big story: politics is more newsworthy than science
- There is a tendency to simplify to a dichotomy
- Attempts are often made to personalize the risk.
ATSDR Lessons Learned

- Be honest. Define the issue accurately
- Understand the health risk communication process.
- Improve planning of messages, materials, strategy
- Improve communication between stakeholders
- Be accessible and demonstrate personal interest
- Keep it simple.
- Take the initiative.
- Evaluate the impact and feedback to improve the program.

ATSDR, 1995
Message Paradigm

State the Message

Elaborate

Illustrate

ATSDR, 1995
Risk = Hazard + Outrage

Some adages on outrage:

- The public responds to outrage more than to hazard.
- Activists and media amplify outrage, but they do not create it.
- Outraged people don’t pay much attention to hazard data.
- Outrage isn’t just a distractions from hazard. Both are legitimate and important.

### Some components of outrage

<table>
<thead>
<tr>
<th>Safe</th>
<th>Risky</th>
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</thead>
<tbody>
<tr>
<td>Voluntary</td>
<td>Coerced</td>
</tr>
<tr>
<td>Natural</td>
<td>Industrial</td>
</tr>
<tr>
<td>Familiar</td>
<td>Exotic</td>
</tr>
<tr>
<td>Not Dreaded</td>
<td>Dreaded</td>
</tr>
<tr>
<td>Knowable</td>
<td>Unknowable</td>
</tr>
<tr>
<td>Trustworthy Sources</td>
<td>Untrustworthy sources</td>
</tr>
<tr>
<td>Responsive Process</td>
<td>Unresponsive process</td>
</tr>
</tbody>
</table>

“The reason for collecting, analyzing, and disseminating information on a disease is to control that disease. Collection and analysis should not be allowed to consume resources if action does not follow.”

Aldrich E-mail: aldrich@etsu.edu

‘It's amazing what you can see when you look...”

Yogi Berra
The Commission went to talk to Dr. Finley., and that old gentleman …everybody had laughed at him., nobody had listened to him. –was very glad to explain his fool theory to the Commission… shouting, “Yellow fever is caused by a mosquito….’

Walter Reed: Science and Humanity from the Microbe Hunters
Paul Dekruf, 1926
Advantages to working with CO

- CO knowledgeable of local people/conditions
- Contributions of insights and observations of CO
- CO access to community resources
- CO willingness to work non-regular hours, days
- Provides opportunity for health agency to offer health education
- Potential reduction in costs of survey/study
- Opportunity to lessen confrontational atmosphere

Disadvantages to working with CO

- Maybe distrustful/suspicious of health agency
- May lack understanding of scientific issues.
- CO members may possess rigid opinions of the potential disease cluster or hazardous site.
- Potential for the study to be criticized as nonscientific
- Variable or waning enthusiasm/involvement
- Possibility of invasion of privacy due to involvement of local individuals in survey.