Outbreak of gastrointestinal illness following an open water event in the River Thames, London October 2012

Dr Paul Crook on behalf of Victoria Hall
Consultant Epidemiologist
Field Epidemiology Services
Outbreak alert

- Friday pm, 19 October 2012
- Hospitalised patient
- Swam in Thames 7 October
  - Fund-raising event
  - 1,100 other swimmers
- Other swimmers also ill
The course: 2.25 miles
Hampton Court to Kingston Bridge
Why investigate?

In order to:

• Describe outbreak (time, place, person)
• Identify risk factors for illness
• Inform public health action
• Build evidence base
# Epidemiological methods

<table>
<thead>
<tr>
<th>Study Design</th>
<th>Retrospective cohort study</th>
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<tbody>
<tr>
<td>Cohort</td>
<td>Participants in swim</td>
</tr>
<tr>
<td><strong>Data collection</strong></td>
<td>Online survey – emailed to all participants</td>
</tr>
<tr>
<td>Exposures</td>
<td>Demographics</td>
</tr>
<tr>
<td></td>
<td>Risk factors (e.g. duration swimming, stroke)</td>
</tr>
<tr>
<td></td>
<td>Protective factors (e.g. showering, hand-washing)</td>
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<tr>
<td><strong>Analysis</strong></td>
<td>Univariate</td>
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<tr>
<td></td>
<td>Multivariable</td>
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Thames Water Swim Outbreak
Case definition

- Participant in the event
- Ill within 9 days
  - Diarrhoea
  - Vomiting
  - Abdominal cramps
  - Nausea for over 24 hours

- Exclusion criteria
  - Ill pre-event
  - Travel abroad
  - Household diarrhoea and vomiting
Microbiological and environmental methods

Microbiological
• Survey asked if microbiological sample taken
  ⇒ followed up to find out tests & results
  ⇒ stored samples to be collected for further testing

Environmental
• Reviewed available microbiological testing information on Thames Water
• Acute raw sewage spillage events from sewage treatment works
• Rainfall around time of swim
Respondents

- Survey response: n=675 (61%)
- Included in study: 636

<table>
<thead>
<tr>
<th>Variable</th>
<th>N (proportion of total %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>15-72 years (median 40)</td>
</tr>
<tr>
<td>Male</td>
<td>401 (64%)</td>
</tr>
<tr>
<td>Proficiency: Beginner</td>
<td>116 (17%)</td>
</tr>
<tr>
<td>Swam in another open water event in past 24 months?</td>
<td>515 (81%)</td>
</tr>
</tbody>
</table>
### Description of cases

**n=338 cases, attack rate 53%**

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nausea</td>
<td>78%</td>
</tr>
<tr>
<td>Diarrhoea</td>
<td>75%</td>
</tr>
<tr>
<td>Abdominal cramps</td>
<td>70%</td>
</tr>
<tr>
<td>Vomiting</td>
<td>57%</td>
</tr>
<tr>
<td>Sweats</td>
<td>45%</td>
</tr>
<tr>
<td>Fever</td>
<td>42%</td>
</tr>
</tbody>
</table>

**Duration of symptoms**

- Median 4 days (range 1 to 36)

**Healthcare seeking**

- Visited GP: 66 (22%)
- Attended A&E: 8 (2%)
- Hospitalised overnight: 4 (1%)

**Time off work**

- 217 (64%)
Swim

Timing of symptom onset among cases (n=327*)
Exposure variables

- Median duration in water – 40 minutes
- 94% swam front crawl
- 94% wore wet suit
- 85% had water in mouth while swimming
- 73% swallowed water – median 3 mouthfuls
- 6% washed hands or used antibacterial gel within 30 minutes of leaving water
- 4% showered within an hour of leaving water
- 69% ate food / 86% drank before washing hands
## Exposures associated with illness in multivariable analysis

<table>
<thead>
<tr>
<th>Exposure variable</th>
<th>Exposed</th>
<th>Unexposed</th>
<th>Adjusted Relative Risk *</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Attack</td>
<td>n</td>
<td>Attack</td>
</tr>
<tr>
<td>Wore a wetsuit</td>
<td>600</td>
<td>55</td>
<td>18</td>
<td>11</td>
</tr>
<tr>
<td>Swallowed any water</td>
<td>465</td>
<td>53</td>
<td>69</td>
<td>35</td>
</tr>
<tr>
<td>Aged over 40</td>
<td>298</td>
<td>46</td>
<td>338</td>
<td>59</td>
</tr>
<tr>
<td>Aware of infection risks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swam in an open water event in a river in the last 24 months</td>
<td>350</td>
<td>47</td>
<td>286</td>
<td>61</td>
</tr>
</tbody>
</table>

*adjusted for wetsuit, swallowed water, age, river event experience
Frequency of illness following previous open water events

<table>
<thead>
<tr>
<th>Open water setting</th>
<th>Respondents who participated in other open water events in preceding 24 months N (%)</th>
<th>Proportion of respondents ill following previous events (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thames</td>
<td>310 (49%)</td>
<td>17</td>
</tr>
<tr>
<td>River (excl. Thames)</td>
<td>110 (17%)</td>
<td>4</td>
</tr>
<tr>
<td>Lake</td>
<td>423 (67%)</td>
<td>7</td>
</tr>
<tr>
<td>Sea</td>
<td>236 (37%)</td>
<td>5</td>
</tr>
</tbody>
</table>
Microbiology results

- 42 participants gave samples (7%)
- Test results known for 31/42:
  - 5 positive (4 *Giardia*, 1 *Cryptosporidium*)
  - Only 4 tested for viruses
- No samples for further testing
Environmental results

- Environment Agency
  - No chemical contamination event
  - No routine microbiological monitoring
  - Red alert in week prior, but amber on the day of race

- Thames Water
  - Water intake monitoring – nothing unusual
  - No acute occurrences of spillages of undiluted raw sewage

- Organisers
  - Thames water samples– Tested for *E. Coli* ‘no concern noted’

- UK Meteorological Office
  - Heavy rain pre-event
Map of race course showing Combined Sewer Overflows
Key findings

• High attack rate

• Risk factors
  • swallowing water
  • wearing wetsuit

• Protective factors
  • swum in river event in previous 24 months
  • aged over 40 years
Limitations

- Risk factors emerging
  - Wetsuits – small numbers
  - Hygienic behaviours – inappropriate questions?
  - Another factor?

- Little microbiology
  => Query GI virus
Recommendations

• Increase risk awareness
• Add hand-washing stations
• Wetsuit rinsing station
• Advice to avoid swallowing water
• Share with DEFRA bathing water forum
Acknowledgements

Co-authors:
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• Dr Jayshree Dave, Barts & London Public Health Laboratory

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