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PROJECT

Can we use Social Media as an Alerting Tool for Chemical Incidents and Flood Events?

Public Health England
Final Workshop, Loures
27th May 2020



Funded by
European Union
Civil Protection
and Humanitarian Aid

Public Health England. Who we are?

Part of the UK Department of Health and Social Care

Centre for Radiation, Chemical and Environmental Hazards (CRCE) provides advice on human health effects from chemicals and radiation in the environment.

CRCE Wales is based in Cardiff and provides advice to Wales and Ireland.

Also a WHO Collaboration Centre for chemical incidents worldwide and has been involved in European maritime research for several years.



Public Health
England

Protecting and improving
the nation's health



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- Evaluate social media and internet systems for early alerting of flooding and pollution incidents
- Develop an algorithm with potential application in social media platforms
- Define search terms relevant to Hazmat and Flooding incidents
- Assess terms using web and social media platforms
- Assess impact during incident or exercise including use of health messages

Key Objectives

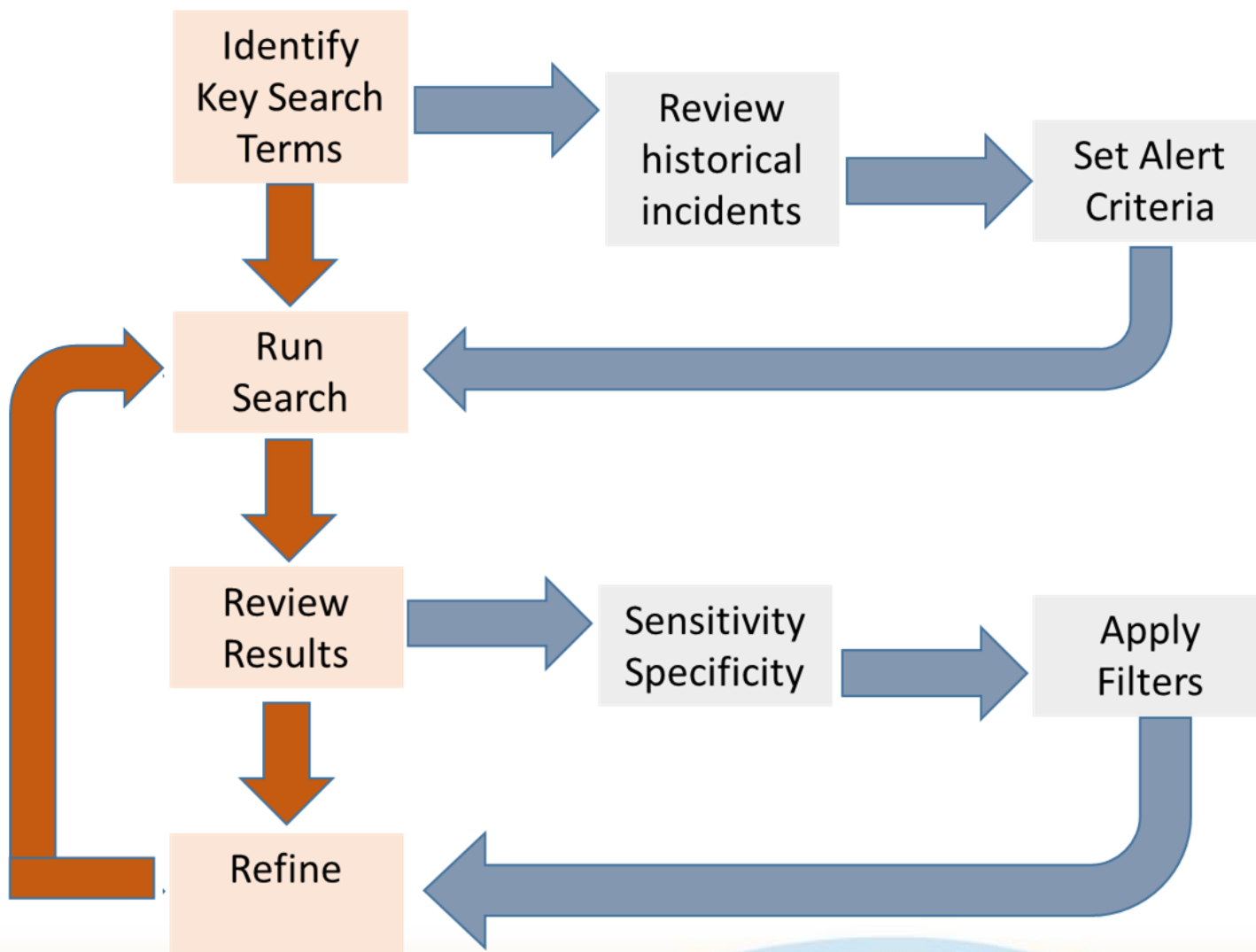


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Algorithm

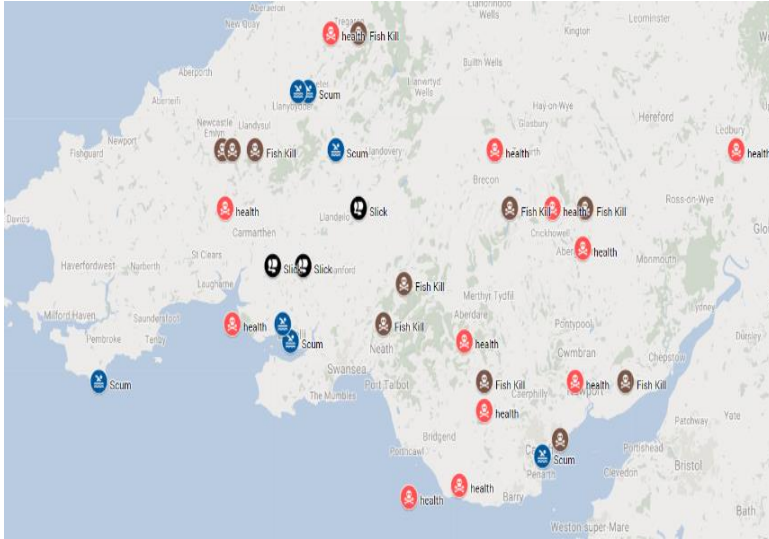


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Identification of Key Search Terms



Incident Type	Key Words
Slurry	Fish Kill / Agricultural Pollution / Odour / Silt / River / Lake / beach
Oil Spill	Sheen / Odour / Slick / Staining / river / lake / canal / beach
Chemical	Discoloration / Gas cloud / Odour / Haze / Fish Kill / River / Lake / Health
Blue Green Algae	Algal Bloom / Scum / Lake / Dock / Canal / Health / Swimming
Fire	Smoke / Plume / Odour / Ship / Dock / Health
Vegetable Oil	Fats / Grease / wax / Odour / Beaches / Dogs / Pets
Flooding	Pollution / Health / Damage / Disease

Reviewed incidents for inland, estuarine and coastal waters (2014 - 2018) to develop search terms

Used in conjunction with Boolean Operators (AND, OR, NOT etc) for use in social media platform

Pilot study

Edit Query "Pollution Test"

Language: [English](#)

[Examples](#) | [Operators](#) | [Locations](#)

```
1 ((river* OR beach* OR estuary* OR canal* OR ocean* OR lake* OR dock* OR sea OR marina* OR harbour* OR shore* OR ship* OR boat*) AND (chemical* OR Sewage* OR slurry* OR algae NOT plastic*) AND (pollution* OR incident* OR accident* OR spill* OR fish-kill*) country:uk)
```

Operated from August to November

Multiple search strings

Real time dashboard filters for language, types of media, authors, geographical locations

Searched for pollution and flood events in UK (inc. Severn Estuary).

Set up same searches in partner countries

Reviewed one real time and one historical incident for impact of response agency messages

Used the commercial social analytics package



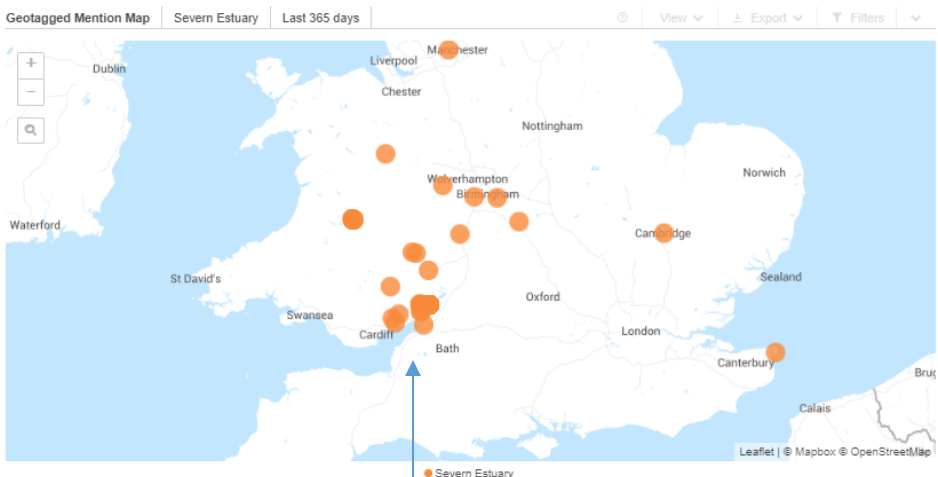
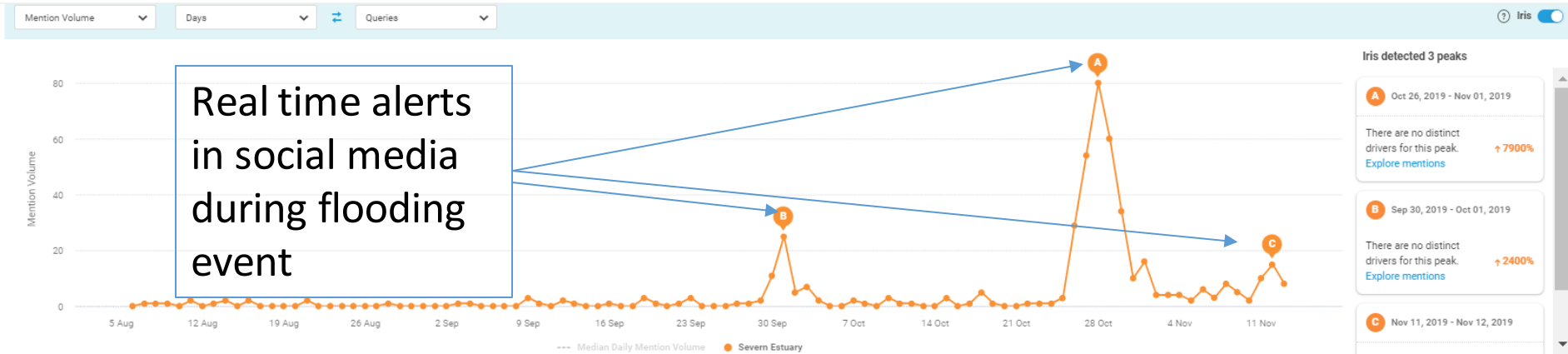
Brandwatch



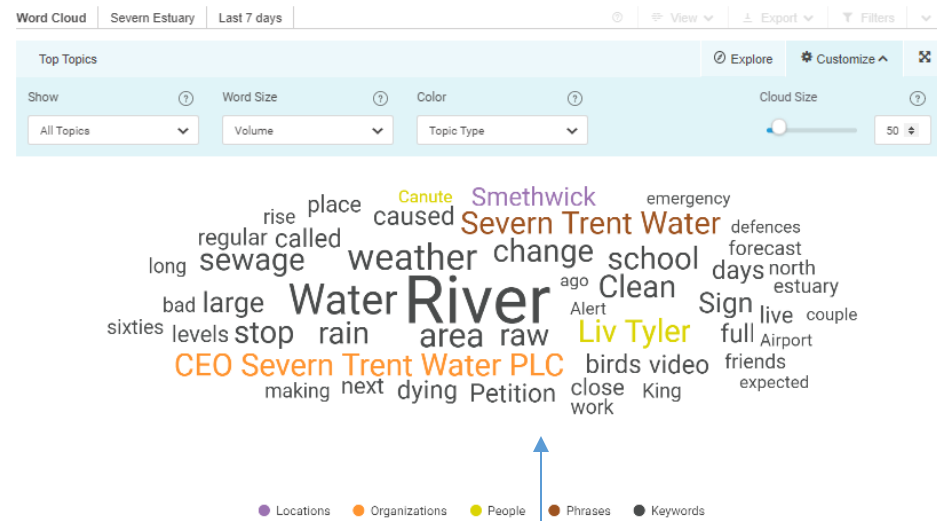
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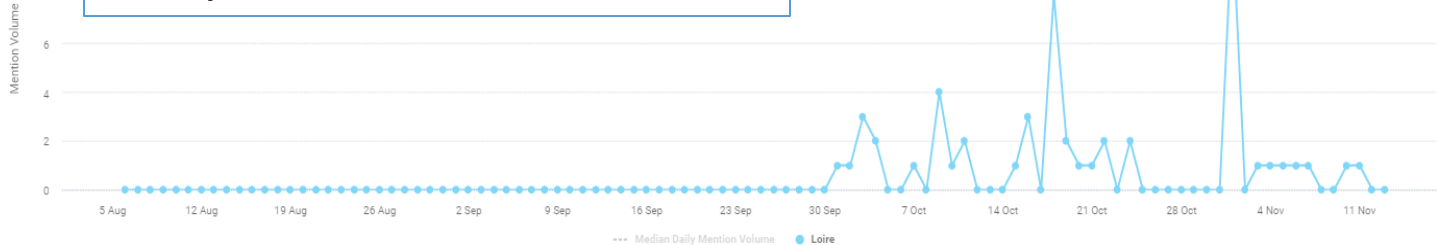


Geographical mapping of social media activity



Word cloud of trending terms

Analysis of River Loire, France



Benchmark Loire Last 30 days

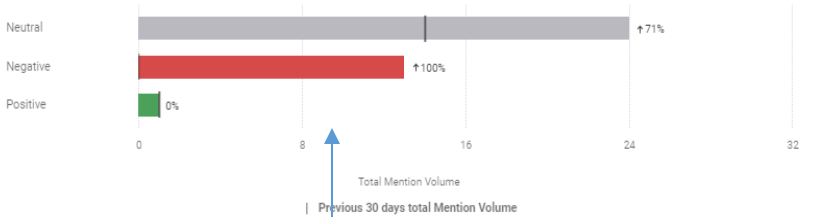
Benchmark Mention Volume for Sentiment for the last 30 days against data from the previous 30 days

Show: Mention Volume For: Sentiment Sorted by: Total Volume

Word Cloud Loire Last 10 days

Top Trending Topics

Show: All Topics Word Size: Trending Color: Sentiment Cloud Size: 50



Sentiment analysis showing negative response to flooding event



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Results – How well does it perform?

	Search Term met	Search Term not met	Total
Incident Identified	25 True Positive	175 False Positive	200
No Incident Identified	15 False Negative	4.5 x10 ⁸ True Negative	4.5 x10 ⁸
	40	4.5 x10 ⁸	4.5 x10 ⁸

Specificity (Noise removal) = 100%

- The proportion of social media data that did not meet the search definition and were removed

Sensitivity (True incidents) = 63%

- The proportion of social media tweets that met the search criteria that were relevant

Positive Predictive Value (PPV) = 12%

- Can mis-identify incidents

In summary, the tool was good at removing “noise” but a large proportion of tweets that met the search criteria were actually not relevant

Can it detect incidents?

- During the study period the tool correctly identified and alerted us to 25 actual UK incidents
- 10 incidents matched with response agency alerts
- All major incidents were identified.
- Found additional 15 not recorded on agency databases (minor incidents)
- Identified a number of international incidents / threats e.g. harmful algae in Brittany
- However, it failed to detect 15 minor incidents that were notified to agencies

Date	Incident	Posts	Source	Time
5 and 6/8/19	Pollution in River Sheppey Devon	13	News 5, Twitter 8	Post event
11/8/19	Incident on Worthing Beach East Sussex	57	News 54, Twitter 3	12:00
11/8/19	Pollution in River Frome Somerset	7	News 6, Twitter 1	12:00
25/8/19	Incident on Frinton / Clacton beaches. Essex	100	News 99, Twitter 1	15:00
28/8/19	Incident at Pontins Burnham on sea. Somerset	5	News 5, Twitter 0	Post Event
22/9/19	Sewage in River Ilkley Yorkshire	4	Twitter 3 news 1	14:39
23/9/19	Dead Whale washed ashore Northumberland	77	News 77	
26 -27/9/19	Chemical Release Minehead Sewage works Somerset	7	News 7 & 6	15:24
26 - 27/9/19	Sewage in River Hogsmill Yorkshire	4	News 4	Post Event
30/9/19	Sewage warning for beaches Cornwall and Devon	3	News 3	09:18
23 - 24/10/19	Red Tide - skin rashes (Algae) Cornwall	8	News 8	Post Event
26-10-19	Slurry Pollution River Teifi Wales	2	News 2	Post Event
30-10-19	Blue Green Algae in lake Wales	2	Twitter 2	17:00
25 - 27/10/19	Flood Alerts Wales	335	335 Twitter	13:00



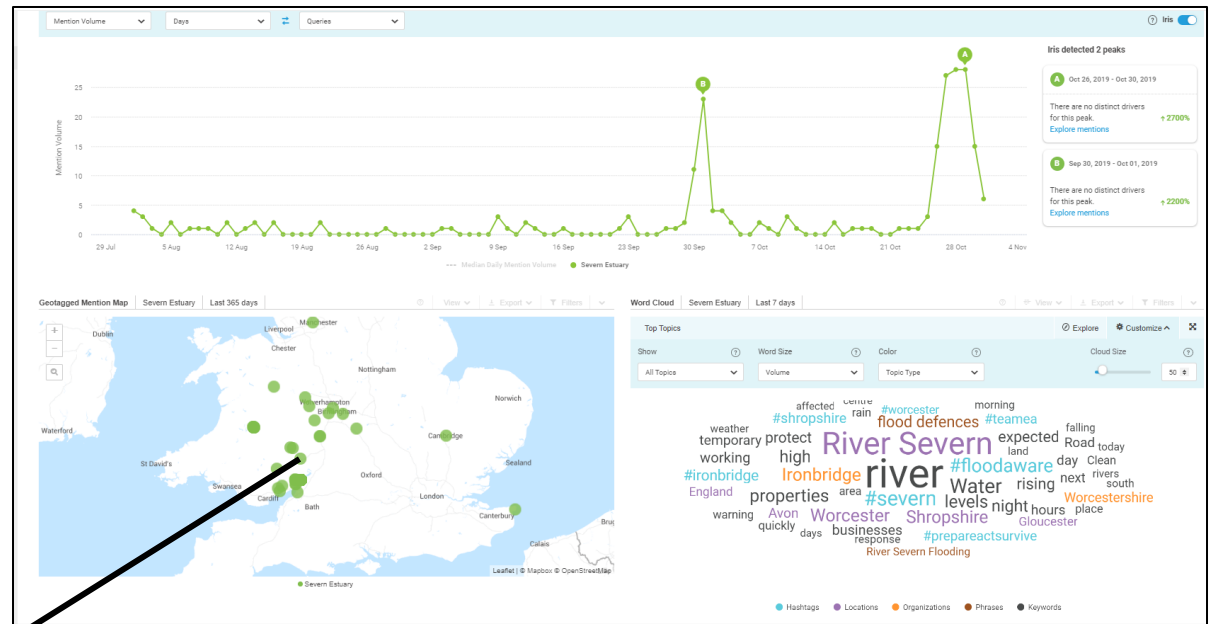
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Useful details

- Images and videos from public
- Conditions “on the ground”
- Timestamps
- Geolocation

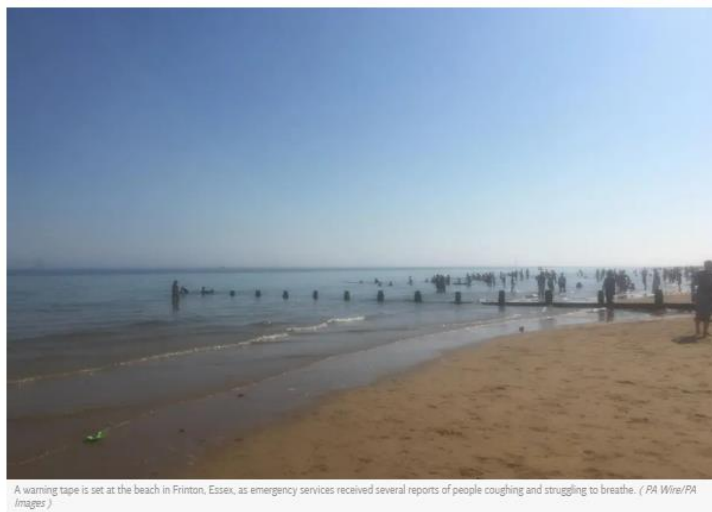


Essex Beach Incident (August 2020)

- Beachgoers reported breathing difficulties following swimming / contact with sea water.
- Police, ambulance and fire service attended. Public advised to stay out of the sea.
- Health advice issues to shower and drink fresh water.
- Multiple persons attended local hospital.
- All affected persons recovered overnight.
- Cause unknown? Spillage? Marine algae?

The screenshot shows the BBC News website interface. At the top, there are navigation links for 'Your account', 'News', 'Sport', 'Weather', 'iPlayer', and 'Sounds'. Below this is a red 'NEWS' banner with sub-links for 'Home', 'UK', 'World', 'Business', 'Politics', 'Tech', 'Science', 'Health', and 'Family & Education'. Underneath, there are regional links for 'England', 'Local News', 'Regions', and 'Essex'. The main headline reads 'Frinton beach incident: Police advice to avoid the sea', dated '26 August 2019'. Social media sharing icons for Facebook, WhatsApp, Twitter, Email, and a general 'Share' button are visible.

This screenshot shows a news article from BBC News. The main headline is 'Beachgoers left struggling to breathe after mystery incident at Essex seaside'. A sub-headline reads 'News > UK > Home News'. The article text begins with 'A mother said one of her daughters told her it 'hurt to breathe in' while the other was 'gasping and couldn't form words''. The author is identified as 'Vincent Wood | @wood_vincent | Sunday 25 August 2019 19:53 |' with '14 comments'. A small image shows two people in a boat on the water. A caption below the image says 'Test were taken offshore to discover the...'. Social media icons for Facebook, Twitter, and Email are also present.



Impact of health messages – Day 1

Police scramble to Essex beach as people left 'struggling to breathe' standard.co.uk/news/uk/frinton...



Police scramble to Essex beach as people left 'struggling to breathe'... Emergency services have scrambled to a seafront in Essex after receiving several reports of beachgoers coughing and struggling to breathe. standard.co.uk

1 6:05 PM - Aug 25, 2019

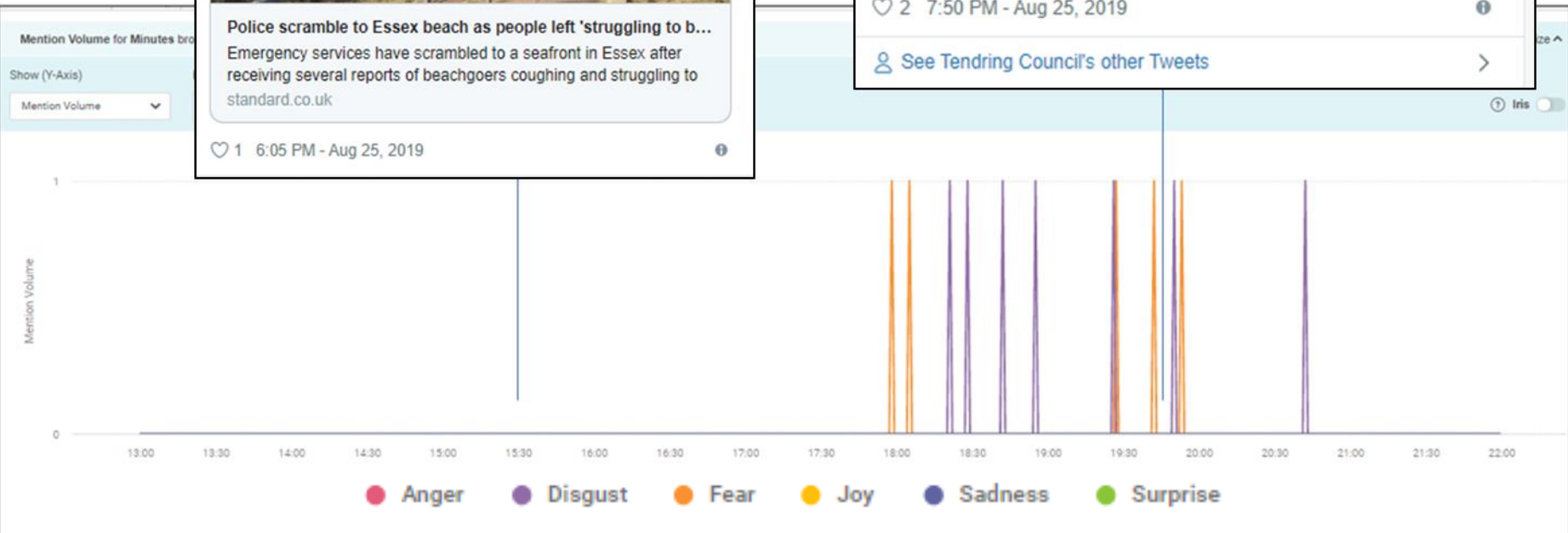


Tendring Council
@Tendring_DC

For the latest on the incident affecting Frinton & Walton, please see here: essex.police.uk/news/news-and-...
Advice from @EastEnglandAmb is: - Wash/change after leaving sea
- Drink fresh water
- Call 111 if still concerned.
Patients have found symptoms improved after leaving the water.

2 7:50 PM - Aug 25, 2019

See Tendring Council's other Tweets

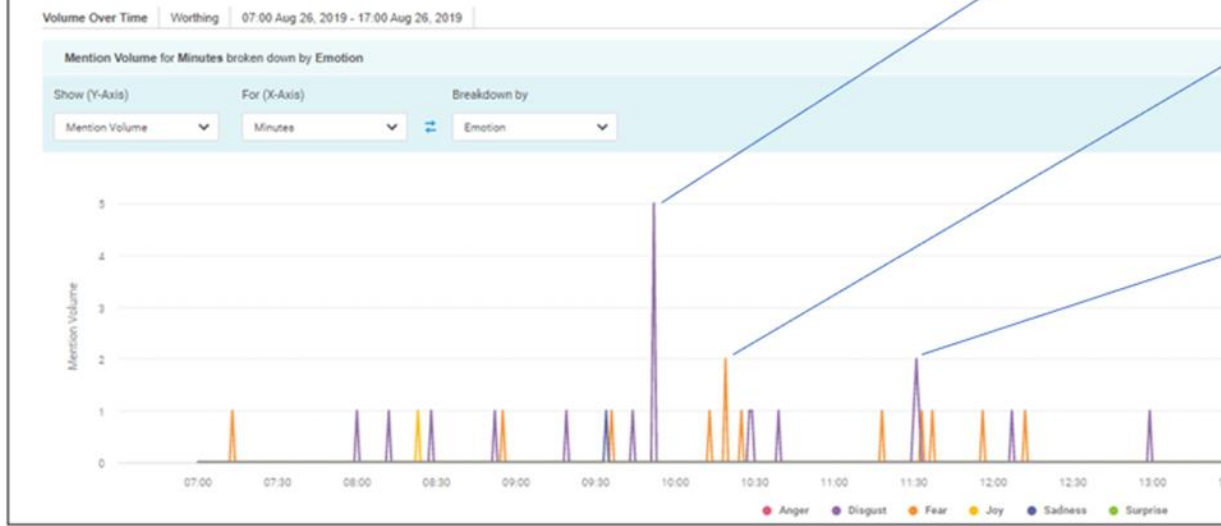


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Essex Beach Incident – Day 2



News
Everything we know after children fell ill after swimming in sea off north Essex coast

Most read Commented

When is someone going to investigate this? Two weeks ago Worthing beach was evacuated for same reason. Previously Beachy Head. SOMETHING is going on. Joint the dots. What is happening? Frinton-on-Sea: Police called as beachgoers left 'struggling to breathe' bbc.co.uk/news/uk-englan...



Beachgoers left 'struggling to breathe'
Emergency services were called after people at a beach in Essex reported havin
bbc.co.uk

News
Tourists reassured the south Essex sea is safe after concerns raised along coast

By Matthew Critchall

Most read Com

Safe - Southend Beach

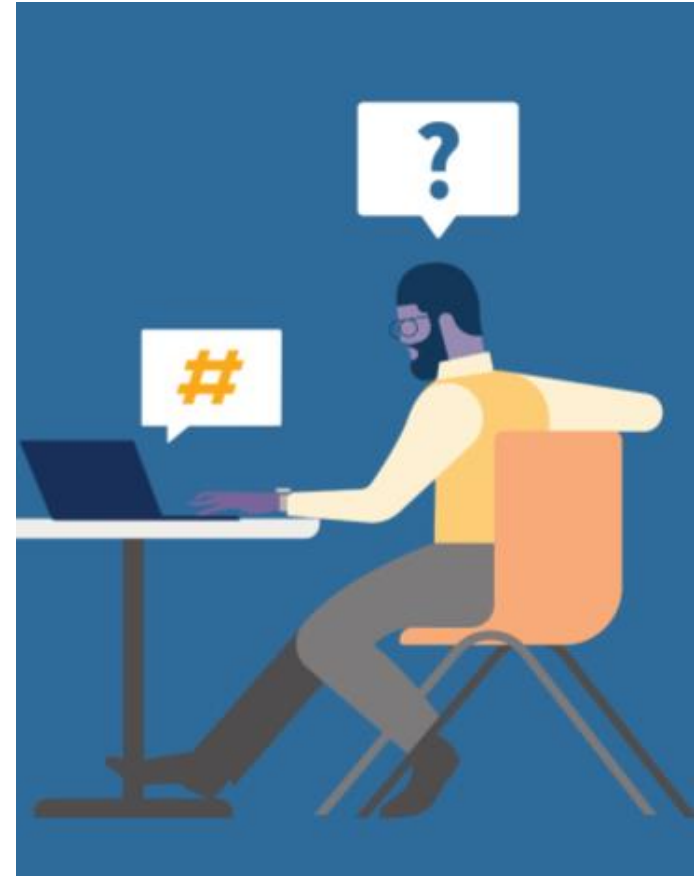
7 comments

Tourists and sunseekers have been reassured the sea around south Essex is safe after concerns were raised along the Essex coast.

Get involved with

Conclusion

- Social media alerting can be useful as part of the emergency response but not as an alternative
- Search criteria important in helping reduce noise
- Tools available to improve detection and alerting but can still miss identify incidents and events
- Can provide real time data, images and videos from affected areas
- Most social media data is not geotagged which limits tracking potential
- Sentiment analysis has potential and study was able to pick up emotional responses to incidents. Some uncertainty on the accuracy of the algorithms used by the tools
- Full report will be available from project website <http://www.hazrunoff.eu/results/>



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