INNOVATING CROSS-DOMAIN SOLUTIONS TO DETECT EMERGING BIOLOGICAL THREATS

Global Event-based Surveillance Of Chemical Incidents From Open-source Intelligence

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Background: While we heavily rely on chemicals, the ever-increasing risk of chemical incidents continues to grow exponentially, creating increased opportunities for incidents that can negatively impact the environment and human and animal health. However, global surveillance of chemical incidents is lacking. Event-based surveillance (EBS)(1) of chemical incidents can provide early warning to initiate response while also providing situational awareness of global chemical incident threats, including agents used in a specific location and the associated morbidity and mortality. Such surveillance can inform of trends in technological incidents, natural disasters, conflicts, and chemical warfare, which can have international implications. With ever-increasing volumes of data on the internet, and particularly in news articles, collectively referred to as open-source intelligence (OSINT), publicly available data has the potential to provide rapid intelligence in detecting signals of chemical health threats with public health significance (2). Using EBS for chemical incidents derived from OSINT, the epidemiological features of chemical incidents can be explored.
Purpose: To detect signals of chemical incidents from OSINT.
Objective: Identify what chemical search terms can be used to detect signals of chemical incidents from OSINT.
Rationale for research: Between 2000 and 2020, over 1.85 million people were affected by incidents involving chemicals worldwide (3). Understanding the epidemiology of chemical incidents worldwide is imperative to strengthening preparedness and response to future chemical incidents.
Relationship to other areas of study: OSINT can be used to identify early warnings for wider CBRN applications, including radiation, biological and nuclear events.
Methods: Search terms 'chemical', 'incident', 'accident' and 'spill' and combinations of these terms were added to Google Alerts in 32 languages to receive daily emails. Between 1 September 2023 and 1 March 2024, 1,388 Google Alerts were received. The articles were translated using Google Translate. Data were extracted into a predefined spreadsheet. Analysis of these data were undertaken in Excel.
Preliminary results: The study identified 128 separate chemical incidents, shown in Figure 1. Chemical incidents were most frequently reported in the United States (n=57; 44.5%), India (n=21; 16.4%) and Australia (n=15; 11.7%). These incidents most frequently took place in chemical businesses (n=34; 26.6%), road accidents (n=31; 24.1%) and public schools (n=6; 4.7%). The incidents involved unknown chemicals (n=68; 53.1%), chlorine (n=6; 4.7%) and hydrochloric acid (n=6; 4.7%). It was reported that 121 (94.5%) incidents were accidental, and 7 (5.5%) were deliberate attacks. In such incidents, a minimum of 1,344 injuries, 538 hospitalisations and 112 deaths were recorded. Epidemiological syndromes and symptoms were infrequently reported. Incidents were mapped.
Preliminary conclusions: The methodology presented here of EBS to detect signals of chemical incidents from OSINT offers an opportunity to explore the epidemiological features of such events. The outputs can be used to identify geospatially and over time trends in emerging risks and inform preparedness planning and training in chemical incident response.
Impact to the JSTO mission and Joint Force: Envisioning the future of chemical incident detection through EBS using OSINT is a new paradigm in the fight against emerging chemical threats.

Figure 1: Chemical incidents worldwide between 1/9/23 and 1/3/24