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**INTELLIGENT SURGE: IMPROVING HEALTHCARE PREPAREDNESS IN TIMES OF DISASTER**

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**ABSTRACT**

Disasters are often unexpected and evacuees need to know where to go and the best way to get out in a hurry. With the increasing frequency of disasters and the resulting human displacement, understanding where individuals within a region decide to flee to seek shelter and medical care during disasters is critical to ensuring appropriate healthcare resource allocation and evacuee support.

Asteroid impacts, such as the hypothetical asteroid impact scenario presented at the 2019 IAA Planetary Defense Conference (PDC), have the capability to devastate metropolitan areas and create a true disaster situation. To manage this type of scenario the Johns Hopkins Applied Physics Laboratory (JHU/APL) team leveraged two APL-developed operational technologies: RTE-PM (Real time evacuation Planning Model, RtePM or "Route-PM") and ESSENCE (Electronic Surveillance

System for the Early Notification of Community-based Epidemics), to improve healthcare surge preparedness in times of disaster. Through integration of these two platforms, JHU/APL developed algorithms to predict health and shelter seeking behaviors of evacuees in order to inform healthcare providers and evacuees of potential surge in their region before, during, and after disaster events. This technology has two target user groups. The first group is emergency management decision makers who are responsible for healthcare resource allocation in response to disasters. The second user group is evacuees themselves who could utilize the output of our proposed tool on a public platform, like the FEMA website, for evacuation assistance and recommendations.

The RTE-PM tool provides real-time evacuation planning to the emergency management community. The tool can collect, process, and store traffic network and behavior model parameters in order to generate traffic flow information and clearance times in the event of an evacuation. It also provides its users with the ability to inject information and traffic conditions to model different scenarios for planning purposes.

The ESSENCE system is currently used by the Centers for Disease Control and Prevention, Department of Defense, and many state and local public health jurisdictions across the country to provide disease surveillance capabilities to public health epidemiologists. The system fuses data from hospitals, urgent care centers, schools, over-the-counter drug stores, poison control centers, death record systems, the National Weather Service and EPA air quality reports to provide users with indications of potential outbreaks and situational awareness of a community's health.

RTE-PM and ESSENCE integrated algorithms could be leveraged to benefit two asteroid specific scenarios. The first would be when an impending asteroid strike is detected and the integrated RTE-PM and ESSENCE platform could prompt early warning systems and support safe and timely evacuations. The second is in the aftermath of the impact the combined platform could assist in disaster management and awareness of the ongoing situation in areas outside of the impact area, while still serving evacuees and emergency responders.

By combining the capabilities in RTE-PM and ESSENCE, emergency managers and the public would benefit from better preparedness plans and expedited healthcare access during disaster situations like an asteroid impact.

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