

Characterizing Nuclear Fallout Patterns in Atlanta, Georgia

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Introduction: Weather significantly affects the distribution of fallout radiation resulting from a nuclear detonation. Prior nuclear detonation models have either utilized a “typical” day for the city of interest or have chosen conditions that optimize fallout radiation. However, models that aid emergency planners should utilize representative weather conditions to capture the most likely distribution of fallout radiation for the region of interest.

Method: Fallout radiation resulting from an improvised nuclear device detonation in Atlanta, Georgia, USA was simulated for each day in 2019 using the Hazard Prediction and Assessment Capability (HPAC) software and weather from Modern-Era Retrospective analysis for Research and Applications, Version 2 (MERRA-2). A partition around medoids cluster analysis was conducted, based on the characteristics of the plumes, population at risk, and estimated proportion of fatalities. A multinomial logistic regression, a decision tree, and a random forest model were then used to predict the cluster from surface-level weather data.

Results: On average, the fallout plume was 160.25km long, had an area of 3,174.44 km², and was angled 83.5° from due north. The plume on average contained 3,668,173 individuals at risk for exposure and caused 416,8908 casualties. Four clusters were identified to represent the distribution of fallout radiation. The random forest model was best able to predict the cluster using surface-level weather data, with an average accuracy of 57.24% (kappa = 0.385). The variable importance plot suggests north-westerly winds, cloud coverage at detonation, whether it is summer, and average temperature are among the most important variables for classification.

Conclusion: Meaningful representation of the variation in the distribution of fallout radiation is imperative while creating nuclear detonation models. While an analysis of the fallout distribution throughout a calendar year provides important insight, future research may examine longer study periods to better understand the climatological impacts on fallout radiation.

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Wellbeing of Helicopter Emergency Medical Services (HEMS) Personnel in a Challenging Work Context: A Qualitative Study

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Introduction: Helicopter emergency medical services (HEMS) personnel provide on-scene trauma care to patients with high mortality risk. The HEMS work context is characterized by an exceptionally high exposure to critical incidents, emotionally demanding patient encounters, and having to perform under pressure with limited resources. The aim of this study was to further our understanding of the factors underlying HEMS personnel wellbeing given their challenging work context.

Method: Sixteen semi-structured interviews were conducted with HEMS personnel from a University Hospital in The Netherlands. Interview topics included work context, personal characteristics, coping, work engagement, and psychosocial support. To analyze the data, a generic qualitative research approach was used inspired by grounded theory, including open, axial and selective coding.

Results: The analysis revealed ten categories that provide insight into factors underlying the wellbeing of HEMS personnel and their work context: team and collaboration, coping, procedures, informal peer support, organizational support and follow-up care, drives and motivations, attitudes, other stressors, potentially traumatic events, and emotional impact. The findings show that HEMS personnel are highly motivated and have a strong team mentality. Various factors are important to their wellbeing, such as job resources and social support. The HEMS work can have an emotional impact but HEMS personnel use various coping strategies to deal with this. The perceived need for organizational support and follow-up care is low among participants.

Conclusion: This study identifies factors and strategies that support the wellbeing of HEMS personnel. It also provides insight into the HEMS work culture and help-seeking behavior in this population. The findings may be beneficial to understand and support employee wellbeing in other emergency services work contexts as well.

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Stress and Coping Strategies Among Those Affected by Ebola Virus Disease (EVD) Epidemic in Sierra Leone, West Africa

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Introduction: The 2014–2016 Ebola Virus Disease (EVD) outbreak in West Africa resulted in 28,000 infected and over 10,000 deaths. Sierra Leone was one of the hardest hit countries. The purpose of this study is to examine the coping strategies employed by those most affected by EVD and its related stressors in Sierra Leone.

Method: 228 EVD-infected individuals, EVD-affected individuals, and community leaders were recruited using purposive