After Hurricane Sandy, implementation of the expanded syndromic surveillance for recovery workers and residents

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Objectives Hurricane Sandy brought widespread devastation in the region of New York and New Jersey in USA. To our knowledge, there have been no official reports of the health effects from Hurricane Sandy since the day of Hurricane arrival 10/29 in 2012.

Methods To rapidly assess the health impacts of Hurricane Sandy among recovery workers and residents in the affected area, we are building an expanded syndromic surveillance system that integrates the near real-time electronic Emergency Department (ED) visit records collected from 14 EDs within a large health system in NY, the air quality index data from the Environmental Protection Agency (EPA), and the weather data from the National Oceanic and Atmospheric Administration (NOAA). Recovery workers will be identified from billing database. Approximately 50% of occupational/industrial information of ED patients are missing, however patients with work-related injuries and illnesses required to provide this information according to Worker’s Compensation system in US. Through a multilevel case-crossover design, we aim to rapid identification of elevated health effects during four exposure windows we developed (the Pre-, During-, Short-term, and Long-term Post-Hurricane) by comparing ED records before (from 2005) and after Hurricane Sandy while adjusting for air pollution levels and weather conditions. The continuing monitoring during the fourth exposure window (i.e. Long-term Post-Hurricane) will ensure early detection of potential occurrences of chronic diseases stemmed from the initial disaster-related acute forms. The implementation of the syndromic surveillance within a large health system will not only improve the healthcare delivery, but also provide important information to the outside stakeholders such as public health agencies to enhance strategic planning for rapid post-disaster response.

Attenuation of exposure effects over time: A simulation study

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Background Positive exposure-response trends often diminish at higher cumulative exposure, correlated with longer follow-up time. Depletion of susceptibles, increased measurement error at higher cumulative exposure, and saturation of biological pathways, have all been postulated as reasons for attenuation.

Methods We conducted simulations to evaluate rate ratios over time under different assumptions about susceptibility to exposure effects and measurement error; we evaluated exposure-response trends to determine whether attenuation was evident. We simulated a dynamic cohort in which entry occurred over time; the metric of interest was duration of exposure. We also considered cross-sectional analyses in which follow-up started only after a certain point of time. Simulations considered 10,000 subjects enrolled from 1940–2010 and followed through 2020. Ten simulations were conducted for each scenario and exposure–response parameters varied. An excess relative risk model was used to generate the relationship between duration of exposure and disease, controlling for age. Measurement error of both classical and Berkson type were simulated, with increasing error with increasing exposure. Cox regression was used to evaluate exposure-response trends.

Results Under all scenarios considered with less than 100% susceptibility among the exposed, there was evidence of depletion of susceptibles over follow-up time. However, under realistic scenarios considered here, there was only modest evidence of attenuation of a linear exposure-response trend due to depletion of susceptibles. Classical measurement error, but not Berkson error, produced attenuation. Cross-sectional analyses did not dramatically change attenuation patterns.

Conclusions Marked attenuation of exposure-response trends over follow-up time is more likely due to saturation of biological pathways or, perhaps less likely, to classical measurement error - than to either the depletion of susceptibles or Berkson measurement error.