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Climate Change 2019: Long-Term Effects of Residential Rainfall Levels on Post Heavy-Rainfall Waterborne Disease Hospitalizations in Young Children in New Zealand- Hakkan Lai, Caroline Walker, Alistair Woodward, Peter Tricker, Susan Morton- University of Auckland, New Zealand

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Climate change models have recently projected increased heavy rainfall events in both wet and dry regions. It is well established that heavy rainfall events are associated with increased risks of waterborne diseases (WD). However, there is a paucity of epidemiological evidence for how wet and dry regions influence the risk of WD due to heavy rainfall. In New Zealand, the annual total rainfall can differ by up to 3500mm in different locations.

We aimed to determine if residing in wet or dry regions was associated with the risk of experiencing WD immediately following heavy rainfall. Using our cohort of 6853 children born between 2009 and mid-2010 in New Zealand, we defined possible WD hospitalization if the primary and/or secondary causes were intestinal infections (ICD10:A00-09), non-intestinal E. coli infections (B96.2), leptospirosis (A27), mycobacterial infections (A31), adenovirus (B97.0), enterovirus (B97.1), and/or unspecified-site viral infections (B34). We only considered admissions within a lag window of 1-4 days after the heavy rainfall dates to ensure short-term temporality. To define wet or dry regions, we assessed time-weighted long-term exposure using median annual rainfall levels at individual home locations at five different data collection time points. We used logistic regression model adjusted for child's sex, ethnicity, rurality and individual deprivation.

Based on the third quintile of residential long-term rainfall level, the adjusted odds ratios [95%CI] of post heavy-rainfall WD hospitalizations in the dry (first, second) and wet regions (fourth and fifth quintiles) were 1.84 [1.08-3.14], 1.23 [0.70-2.17], 1.35 [0.77-2.37] and 2.24 [1.25-4.01] respectively. A U-shape exposure-response relationship was found (quadratic trend P-value = 0.002).

Living in the wettest and driest rainfall locations were both associated with childhood WD hospitalizations shortly after heavy rainfall dates. We suggest a need to review preventive policy to address the rainfall-associated WD risks among residents in vulnerable locations.

Image:

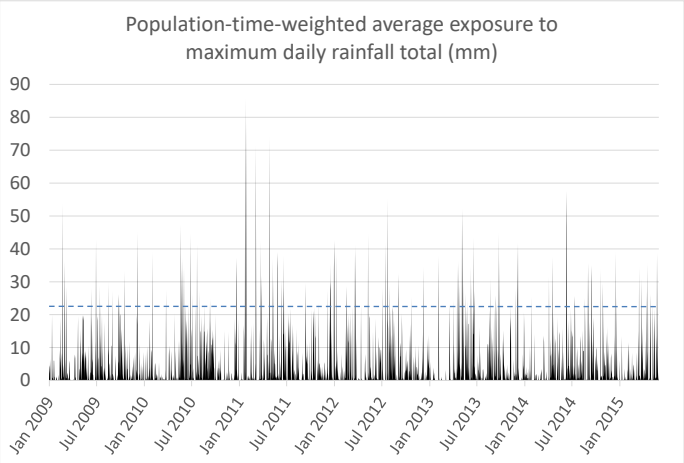

Figure 1: Time-series of the population-time-weighted average exposure to daily rainfall levels among the GUiNZ cohort children in New Zealand (dotted line represents the 95th percentile of the population-time-weighted average exposure level (22.3mm) in 2009-2015).