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Supplemental Material

Assessing United States County-Level Exposure for Research on Tropical Cyclones and Human Health

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Figure S1. Examples of storms where some storm-related rainfall occurred 500 km or further from the storm's track. The red line on each map shows the track of the storm. The color of each county in the map gives the cumulative precipitation in the county from two days before to one day after the storm's closest approach (in mm). The blue outline identifies the collection of counties that were classified as "exposed" based on the rainfall exposure criteria (Table 1 of main text), which includes the constraint that the storm must have come within 500 km of the county.

Figure S2. Comparison of county-level estimates of peak sustained surface wind for Hurricane Ike in 2008 (top) and Hurricane Sandy in 2012 (bottom). Each map shows the estimated peak sustained surface wind classification (<34 kt; 34–49.9 kt; 50–63.9 kt; >64 kt) for each study county. The maps labelled "Modeled" (left) shows the classifications based on modeled peak sustained surface wind, which were included in the open-source data as the main wind metric and used in further analysis in this research. The maps labelled "Extended Best Tracks" (right) show classifications based on the wind radii given in HURDAT2 (included as a secondary wind metric in the open-source data). The red lines show the storms' tracks.

Figure S3. Average number of storm exposures per decade in U.S. counties for each single-hazard exposure metric, limited analysis to years for which data on all five exposures were available (1996–2011). The criteria behind each of the five metrics is given in Table 1 of the main text.

Figure S4. Differences in the counties assessed as “exposed”, based on different exposure metrics, for a sample of storms. These sample storms were selected as the storms with largest extent (as measured by the number of counties exposed based on any metric) from each of the clusters shown in the Jaccard heatmap in the main text (Figure 7; a similar map for Hurricane Ivan in 2004 is shown in Figure 6 of the main text).

Table S1. Reasons behind the choices of thresholds for binary exposure classifications, as well as discussion of some other reasonable choices. These are provided for the three exposure metrics for which our database includes continuous data, and so a threshold is selected to determine binary exposure based on the metric. This table provides reasoning for the choice of threshold used in this paper as well as guidance on other thresholds that could be considered, depending on the hypothesized pathways for an epidemiological study.

Table S2. Precipitation correlation during all versus high-precipitation events. The same sample of counties is shown as in Figure 2 of the main text. Events are cases where a tropical cyclone came within 500 km of each of the listed counties. The number of total events gives the sum of all points shown on the main plot for the county in Figure 2 of the main text. The Spearman correlation for all events is the same as that shown in Figure 2 of the main text. High-precipitation events are those for which storm-associated precipitation was 75 mm or higher based on at least one of the two measures considered in this comparison (NLDAS-2 reanalysis data and ground-based stations). The Spearman correlation between these two precipitation data sources is given for these high-precipitation events in the last column of the table.

Table S3. Agreement between wind-based exposure assessment and a distance-based proxy of storm exposure for tropical cyclones with at least 200 counties assessed as exposed based on at least one exposure metric considered in this study. Numbers are out of 2,396 counties in the study area (states in the eastern half of the US; Figure 1 of the main text). Exposure assessment is based on the thresholds given in Table 1 of the main text. The Jaccard index shown in Figure 7 of the main text is calculated as the value in the second column divided by the sum of numbers in the second through fourth columns. Storms are ordered based on the number of counties assessed as exposed to at least one of these two exposure metrics.

Table S4. Agreement between rain-based exposure assessment and a distance-based proxy of storm exposure for tropical cyclones with at least 200 counties assessed as exposed based on at least one exposure metric considered in this study. Numbers are out of 2,396 counties in the study area (states in the eastern half of the US; Figure 1 of the main text). Exposure assessment is based on the thresholds given in Table 1 of the main text. The Jaccard index shown in Figure 7 of the main text is calculated as the value in the second column divided by the sum of numbers in the second through fourth columns. Storms are ordered based on the number of counties assessed as exposed to at least one of these two exposure metrics.

Table S5. Agreement between flood-based exposure assessment and a distance-based proxy of storm exposure for tropical cyclones with at least 200 counties assessed as exposed based on at least one exposure metric considered in this study. Numbers are out of 2,396 counties in the study area (states in the eastern half of the US; Figure 1 of the main text). Exposure assessment is based on the thresholds given in Table 1 of the main text. The Jaccard index shown in Figure 7 of the main text is calculated as the value in the second column divided by the sum of numbers in the second through fourth columns. Storms are ordered based on the number of counties assessed as exposed to at least one of these two exposure metrics.

Table S6. Agreement between tornado-based exposure assessment and a distance-based proxy of storm exposure for tropical cyclones with at least 200 counties assessed as exposed based on at least one exposure metric considered in this study. Numbers are out of 2,396 counties in the study area (states in the eastern half of the US; Figure 1 of the main text). Exposure assessment is based on the thresholds given in Table 1 of the main text. The Jaccard index shown in Figure 7 of the main text is calculated as the value in the second column divided by the sum of numbers in the second through fourth columns. Storms are ordered based on the number of counties assessed as exposed to at least one of these two exposure metrics.

References