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Corresponding author:
Rachel K. Landis;
Email: rlandis@rand.org.

Trends in 2-1-1 Calls During Public Health Emergencies, Overall and By Gender: Hurricane Irma and COVID-19 in Broward County, Florida

Rachel K. Landis PhD, MPP[1], Shira H. Fischer MD, PhD[2], Joie Acosta PhD[1] and Laura J. Faherty MD, MPH, MSHP[2,3]

[1]RAND Corporation, Arlington, Virginia, USA; [2]RAND Corporation, Boston, Massachusetts, USA and [3]Department of Pediatrics, Maine Medical Center, Portland, Maine, USA

Abstract

Trends in 2-1-1 calls reflect evolving community needs during public health emergencies (PHEs). The study examined how changes in 2-1-1 call volume after 2 PHEs (Hurricane Irma and the coronavirus disease 2019 [COVID-19] pandemic declaration) in Broward County, Florida, varied by PHE type and whether variations differed by gender and over time. Examining 2-1-1 calls during June to December 2016, June to December 2017, and March 2019 to April 2021, this study measured changes in call volume post-PHEs using interrupted time series analysis. Hurricane Irma and the COVID-19 pandemic were associated with increases in call volume (+81 calls/d and +84 calls/d, respectively). Stratified by gender, these PHEs were associated with larger absolute increases for women (+66 and +57 calls/d vs +15 and +27 calls/d for men) but larger percent increases above their baseline for men (+143% and +174% vs +119% and +138% for women). Calls by women remained elevated longer after Hurricane Irma (5 wk vs 1 wk), but the opposite pattern was observed after the pandemic declaration (8 vs 21 wk). PHEs reduce gender differences in help-seeking around health-related social needs. Findings demonstrate the utility of 2-1-1 call data for monitoring and responding to evolving community needs in the PHE context.

Across the United States, 2-1-1 call centers answer 20 million calls annually, providing information and referrals to community resources to address health-related social needs[1] such as food insecurity,[2] childcare, and unstable housing as well as assistance with behavioral health concerns.[3] This resource may be particularly important during public health emergencies (PHEs), including for vulnerable populations most likely to call 2-1-1 for help.[4]

PHEs have immediate and lasting impacts on communities, and 2-1-1 call volume reflects both the level and duration of unmet need for services during PHEs.[5–7] Calls to 2-1-1 surged during Hurricanes Katrina and Rita in Texas in 2005,[4] and 2-1-1 calls have been shown to be a marker of increased social needs in the first months of the coronavirus disease 2019 (COVID-19) pandemic.[8] For example, calls to 2-1-1 for assistance with mental health and food insecurity markedly increased early in the pandemic.[9,10] However, prior research has not compared the magnitude and duration of changes in 2-1-1 call volume surrounding different PHE types in the same jurisdiction, nor examined gender-specific trends.

To better understand the utility of 2-1-1 data for monitoring and responding to health-related social needs during different PHE types, this study examined the relationship between 2-1-1 call volume in Broward County, Florida, and Hurricane Irma in September 2017 and the COVID-19 pandemic declaration in March 2020, overall and by gender.

Methods

This study analyzed 2-1-1 call data from Broward County, Florida. Hurricane Irma was declared a major disaster on September 10, 2017. Data for the 7 mo surrounding this PHE (June to December 2017) and for the same period 1 y earlier were analyzed. COVID-19 was declared a pandemic on March 11, 2020, and data for the years prior and following this declaration were analyzed (ie, March 2019 to April 2021).

A single-group, linear interrupted time series (ITS) analysis with Newey-West standard errors was used to assess, overall and by gender, changes in daily call volume in response to 2 PHEs and the duration of these changes. Because 2-1-1 calls exhibited strong weekly patterns, the analysis controlled for day-of-the-week effects and allowed for up to 7-d lags in the autocorrelation structure. To assess percent change in call volume by gender, this study compared post-PHE peak call volume with pre-PHE average call volume for men and women. All P values were from 2-sided tests, and statistical significance was defined as $P < 0.05$. Analyses

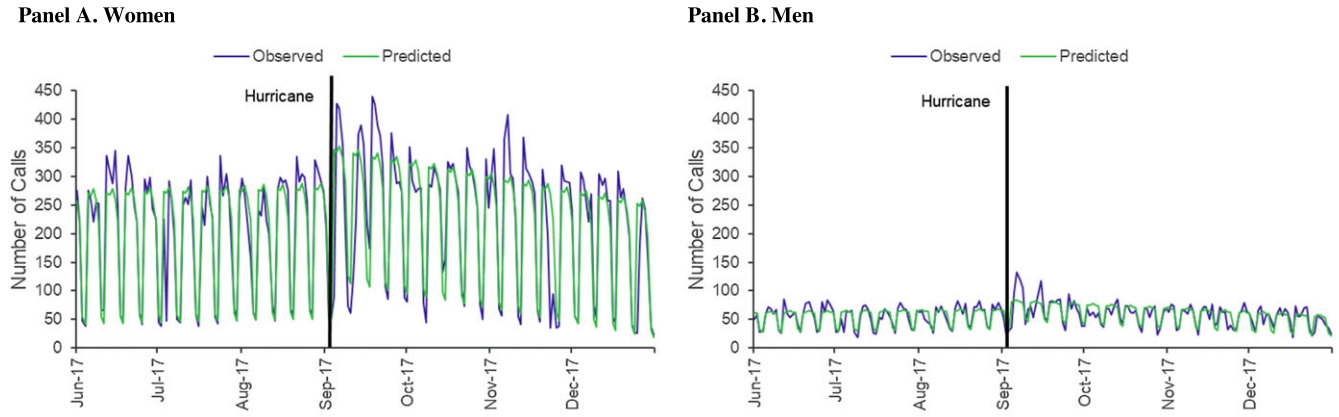

Figure 1. Observed versus predicted daily 2-1-1 call volume for women versus men before and after Hurricane Irma, Broward County, Florida, June to December 2017.

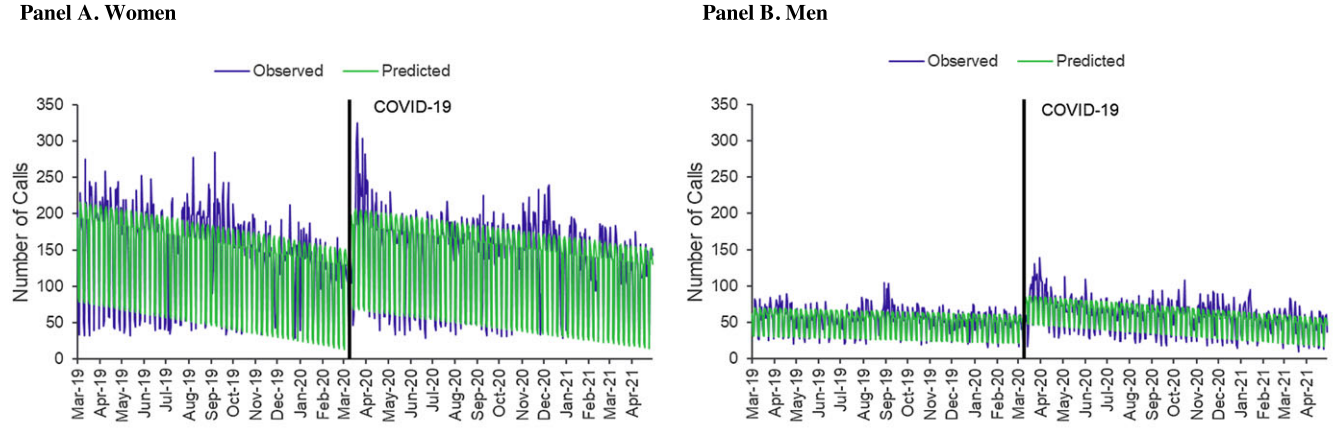

Figure 2. Observed versus predicted daily 2-1-1 call volume for women versus men before and after the COVID-19 pandemic declaration, Broward County, Florida, March 2019 to April 2021.

were conducted using STATA 17.0 (College Station, Texas). The RAND institutional review board deemed this study exempt.

Results

Hurricane Irma

A total of 275,856 calls to 2-1-1 were made during the time periods of interest. Average weekly call volume was 1591 calls (range: 866 to 2733). Women made 73% of calls.

Hurricane Irma was associated with a significant increase in call volume, lasting approximately 4 wk (Supplemental Figure S1). After Hurricane Irma, calls per day increased by 80.9 calls (95% CI 39.7 to 122.1, representing a 32% increase in calls per day from the pre-PHE average) and returned to prehurricane levels in early October 2017. Differences by gender were found. Call volume for women increased by 65.7 calls (33% increase) and returned to baseline after 5 wk (Figure 1A). For men, call volume increased by 15.4 calls (28% increase) and returned to baseline after 1 wk (Figure 1B). Although the absolute increase in call volume was larger for women (65.7 vs 15.4 calls), the percent change from pre-PHE average to post-PHE peak was larger for men (143% vs 119%).

COVID-19

The pandemic declaration was also associated with a significant increase in 2-1-1 call volume, lasting approximately 10 wk (Supplemental Figure S2), (+84.4 calls; 95% confidence interval [CI] 64.0 to 104.9, representing a 45% increase in calls per day from the pre-PHE average). For women, call volume increased by 57.1 calls (42% increase) and returned to prehurricane levels after 8 wk (Figure 2A). For men, call volume increased by 27.0 calls (53% increase) and returned to baseline after 21 wk (Figure 2B). As with Hurricane Irma, the absolute change was larger for women (57.1 vs 27.0 calls), but the percent change in call volume was larger for men (174% vs 138%).

Discussion

Using a rigorous, quasi-experimental causal inference design, this study found that in Broward County, Florida, 2-1-1 call volume increased significantly after Hurricane Irma and the COVID-19 pandemic declaration. Call volume was higher after the hurricane than the pandemic declaration but returned to baseline more quickly. Calls by women remained elevated longer than calls by men after Hurricane Irma, but the opposite pattern was observed

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after the pandemic declaration. Furthermore, the percent change in 2-1-1 calls for men was greater than for women with both PHE types.

The duration of elevated call volumes is consistent with expected patterns given the PHE types. Hurricanes are acute emergencies, causing flooding, power outages, and structural damage. As recovery efforts progress, communities likely have fewer unmet needs. In contrast, the pandemic had both immediate impacts from business closures and stay-at-home orders,[11] as well as long-term impacts from economic and social disruption. Thus, increases in health-related social needs have persisted despite federal, state, and local recovery efforts.

This study demonstrated the utility of monitoring 2-1-1 call data during and after PHEs, as information about the magnitude and duration of significantly increased call volume can inform disaster planning and recovery efforts, including resource allocation, targeted outreach, and expanded services. The COVID-19 pandemic reversed the usual gender distribution of calls for assistance to 2-1-1, highlighting the importance of exploring PHE impacts on subgroups disproportionately affected by PHEs. With additional socio-demographic information on 2-1-1 callers (eg, age, race, ethnicity), interventions could be further tailored to address unmet needs.

Limitations

2-1-1 call data lacked information on caller race, ethnicity, and age. The reason for the call may be subject to systematic missingness and misclassification during PHEs, when call volume increases. Furthermore, increases in call volume may be affected by increased awareness of 2-1-1 if this service is advertised to communities impacted by PHEs. Finally, findings may not be generalizable to other locations or PHEs.

Supplementary material. The supplementary material for this article can be found at https://doi.org/10.1017/dmp.2023.51

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Author contribution. All authors (R.K.L., S.H.F., J.A., and L.J.F.) collaborated on the conceptualization of the research; R.K.L. drafted the manuscript and conducted the analysis; S.H.F. edited the manuscript; J.A. and L.J.F. offered significant feedback on the analysis and on the manuscript.

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Competing interests. None.

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