

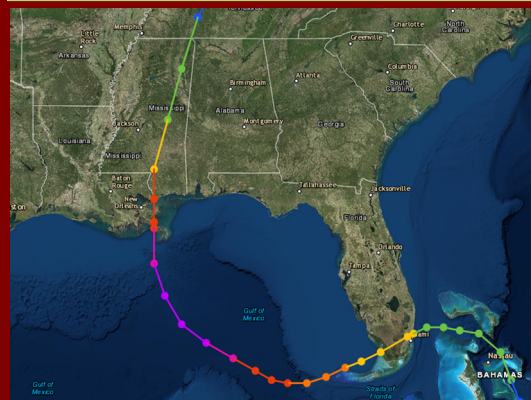
Factors Affecting Households' Evacuation Departure Timing: Empirical Evidence from Hurricanes Katrina and Rita

Shih-Kai Huang, Yuran Sun, Xilei Zhao, InYoung Dulick, Thomas Brindle, Matthew Van

Introduction

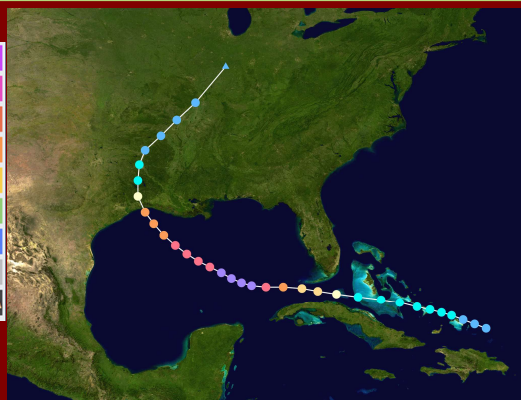
Previous studies on warning responses have emphasized that households' decisions regarding evacuation participation, departure timing, logistics, and destinations are all critical components shaping hurricane evacuation behavior. However, among these factors, the timing of evacuation departures has received relatively limited scholarly attention. To address this gap, the present study reanalyzes hurricane evacuation data collected from 1,036 coastal households in Texas and Louisiana affected by Hurricanes Katrina and Rita. The datasets include respondents' sociodemographic characteristics, evacuation resource needs, prior hurricane experiences, perceptions of storm conditions, expected storm impacts, perceived evacuation impediments, and actual departure times. Rather than measuring departure time as a continuous linear variable, this study incorporates evacuees' reported behaviors—specifically, their tendency to avoid traveling during nighttime hours and their reluctance to evacuate at the last minute before landfall. Accordingly, the study condenses nighttime hours and places greater analytical weight on the final 24-hour window preceding landfall. Using multivariate regression models, the analysis distinguishes between the evacuation timing decisions of coastal and inland residents.

Hurricane Katrina



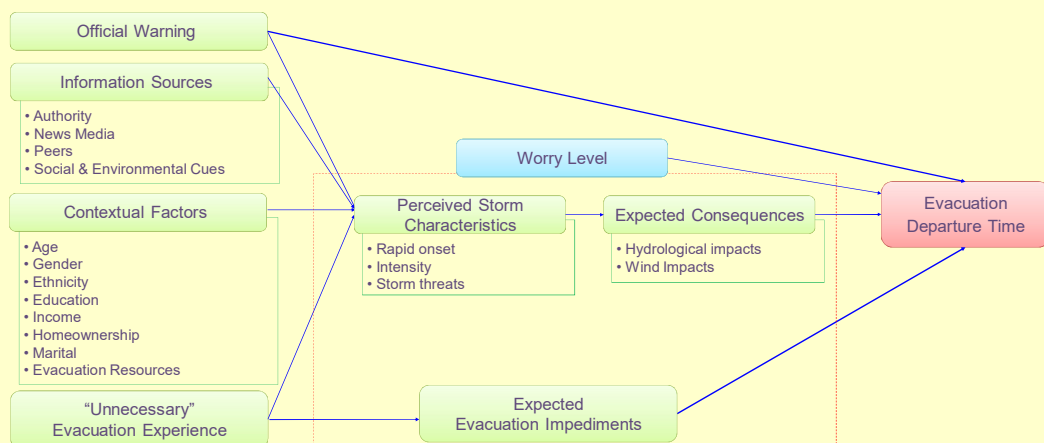
The National Hurricane Center issued a Hurricane Watch for Hurricane Katrina at 10:00 AM CDT on Saturday, Aug. 27 and a Hurricane Warning at 10:00 PM CDT that night. The hurricane eye made landfall on the Louisiana/Mississippi border about 11:00 AM on Monday, Aug. 29.

Hurricane Rita



The National Hurricane Center issued a Hurricane Watch for Hurricane Rita at 4:00 PM CDT on Wednesday, Sept. 21 and a Hurricane Warning at 11:00 AM CDT on Thursday, Sept. 22. The hurricane eye made landfall near Sabine Pass about 4:00 AM on Saturday, Sept. 24.

Adapted Protective Action Decision Model



Regression Models

		Model 1: Katrina Evacuation Zone				Model 2: Rita Evacuation Zone				Model 3: Rita Inland Areas			
		r	B	SE	Beta	r	B	SE	Beta	r	B	SE	Beta
Socioeconomic	Majority	-.14*	-1.32	0.57	-0.15*	.07	1.30	0.47	0.13**	.16**	0.00	0.00	0.15**
	Income					-.17***	0.00	0.00	-0.20***				
Official Warning	Financial level for Eva												
		-0.09	-0.51	0.22	-0.15*	-.07	-0.31	0.20	-0.07	-.06	-0.47	0.29	-0.09
Other Information Sources	Peers	.13*	0.37	0.10	0.14*								
	News Media					.06	0.42	0.17	0.12*	-.03	-0.17	0.24	-0.04
Information-Processing	Perceived Storm Characteristics					-.13**	-0.43	0.20	-0.11*	-.15**	-0.54	0.22	-0.13*
	Expected Hydro-Impacts					-.12**	-0.55	0.19	-0.16**				
Worry Level	Expected Eva Impediment									.13**	0.70	0.23	0.17**
		.15**	0.37	0.15	0.16*	.06	0.39	0.13	0.16**	-.03	-0.15	0.19	-0.04
(Constant)			5.93	1.02			1.66	1.22			4.56	1.55	
F			4.71***				6.91***				4.48***		
df			(4, 222)				(7, 448)				(6, 346)		
R Square			0.28				0.31				0.27		
Adjusted R Square			0.08				0.10				0.07		

Results

- Coastal Louisiana residents, on average, launched their evacuation trip 36.7 ($sd = 12.7$) hours before Hurricane Katrina made its landfall. Departure was 46.4 ($sd = 15.7$) hours before landfall for coastal Texas residents and 34.3 ($sd = 16.0$) hours before landfall for inland Texas residents during Hurricane Rita, respectively.
- For coastal Louisiana respondents, reliance on peers as an information source ($\beta = 0.14$, $p < .05$) and worry level ($\beta = 0.16$, $p < .05$) had positive effects on departure time, while majority status ($\beta = -0.15$, $p < .05$) and receiving official warning ($\beta = -0.15$, $p < .05$) had negative effects.
- Similarly, coastal Texas respondents revealed that majority status ($\beta = 0.13$, $p < .01$), reliance on news media as an information source ($\beta = 0.12$, $p < .05$), and worry level ($\beta = 0.16$, $p < .01$) were positive predictors of evacuation timing, while income status ($\beta = -0.20$, $p < .001$), perceived storm characteristics ($\beta = -0.11$, $p < .05$), and expected hydrological impacts ($\beta = -0.16$, $p < .01$) were negative predictors.
- Unlike coastal households, considered financial costs ($\beta = 0.15$, $p < .01$) and perceived evacuation impediments ($\beta = 0.17$, $p < .01$) were major factors delaying Texas inland households' travel, whereas perceived threats ($\beta = -0.13$, $p < .05$) expedited their travel behaviors.

Takeaways

- Given that the majority of evacuees departed between 24 and 60 hours before hurricane landfall, a significant number may have been at risk of being impacted by the hurricane before reaching shelters.
- The results showed that coastal residents had a window of less than 12 hours to evacuate without encountering traffic interference from inland evacuees during Hurricane Rita.
- Socioeconomic status, as an indicator of social vulnerability, contributed to delayed departures among coastal residents. One possible explanation is that vulnerable groups may tend to wait until the last minute before deciding whether to evacuate.
- Although a comprehensive decision-making process reflects individuals' conscious efforts, multiple concerns—combined with uncertainties and misinformation from private information channels—may delay coastal households from evacuating within the optimal time window.
- For inland households, once the decision to evacuate is made, their level of travel preparedness appears to be a key factor determining whether they follow through.



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