

Hurricane-Related Disruptions to Work and Associations with Health

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INTRODUCTION

Extreme weather events are increasing in frequency and intensity worldwide.

Hurricanes can bring heavy rains, high winds, storm surge, and rainfall-induced flooding.

These can inflict substantial damage on communities and on the families and individuals that live in them.

Research has highlighted how certain short-term impacts like flood-induced damage and disruption (Pistrika & Jonkman, 2010) and higher levels of traumatic exposure (LaJoie et al., 2010; Soreasen, 1991) can negatively affect psychosocial health in the long term (Frankenberg et al., 2012; Raker et al., 2019).

However, less is known about flood-related work disruption and job loss, and the resulting impacts on post-disaster psychosocial health (Peek-Asa et al., 2012).

Our research uses data from the Dynamics of Extreme Events, People, and Places (DEEPP) survey, a household survey following Hurricane Dorian (September 6th, 2019), to explore how variation in exposure to extreme weather events and hurricane-related work disruptions are associated with post-traumatic stress reactivity (PTSR).

METHODS

Data:

North Carolina (NC) Tax Parcels database and Buildings database
 Household- and individual-level data from the DEEPP survey.

Sample information:

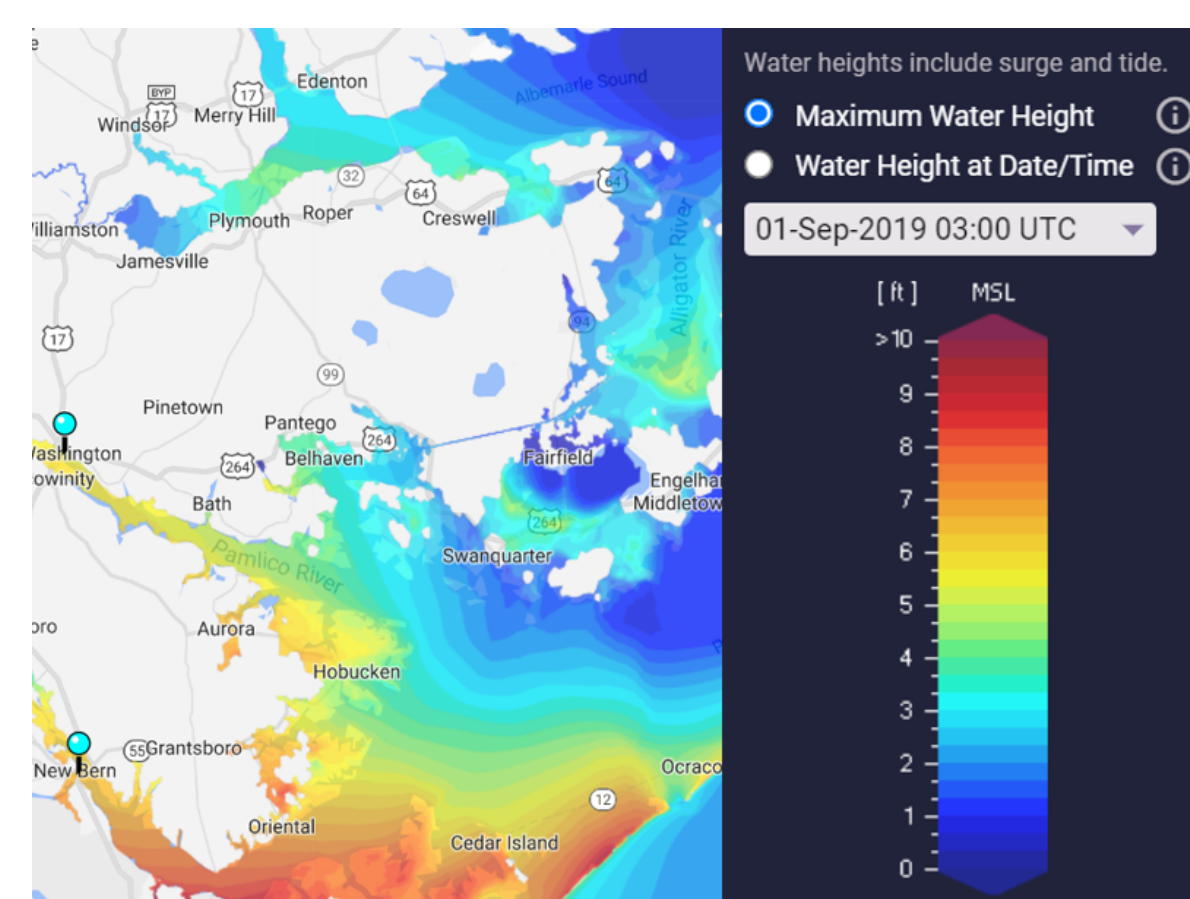
553 households; 711 individuals; 5 sites across 4 counties in eastern NC.

Work disruptions: among respondents who had worked in the past 12 months. Data were recorded by fiscal quarters, ranging from Q4 in 2019 to Q1, Q2, and Q3 in 2020. Respondents were asked about work in the current quarter compared to the previous year: weeks and hours/week worked, earnings, and unemployment benefits.

Post-traumatic stress reactivity (PTSR): residents were interviewed using a 17-question checklist to capture intensity of symptoms of post-traumatic stress in the past month. Responses were scaled ranging from 0 ("Not at all") to 4 ("Very frequently"). Examples of stress-related symptoms include "repeated memories of the hurricane," "reliving the experience," and "avoiding thinking about the hurricane."

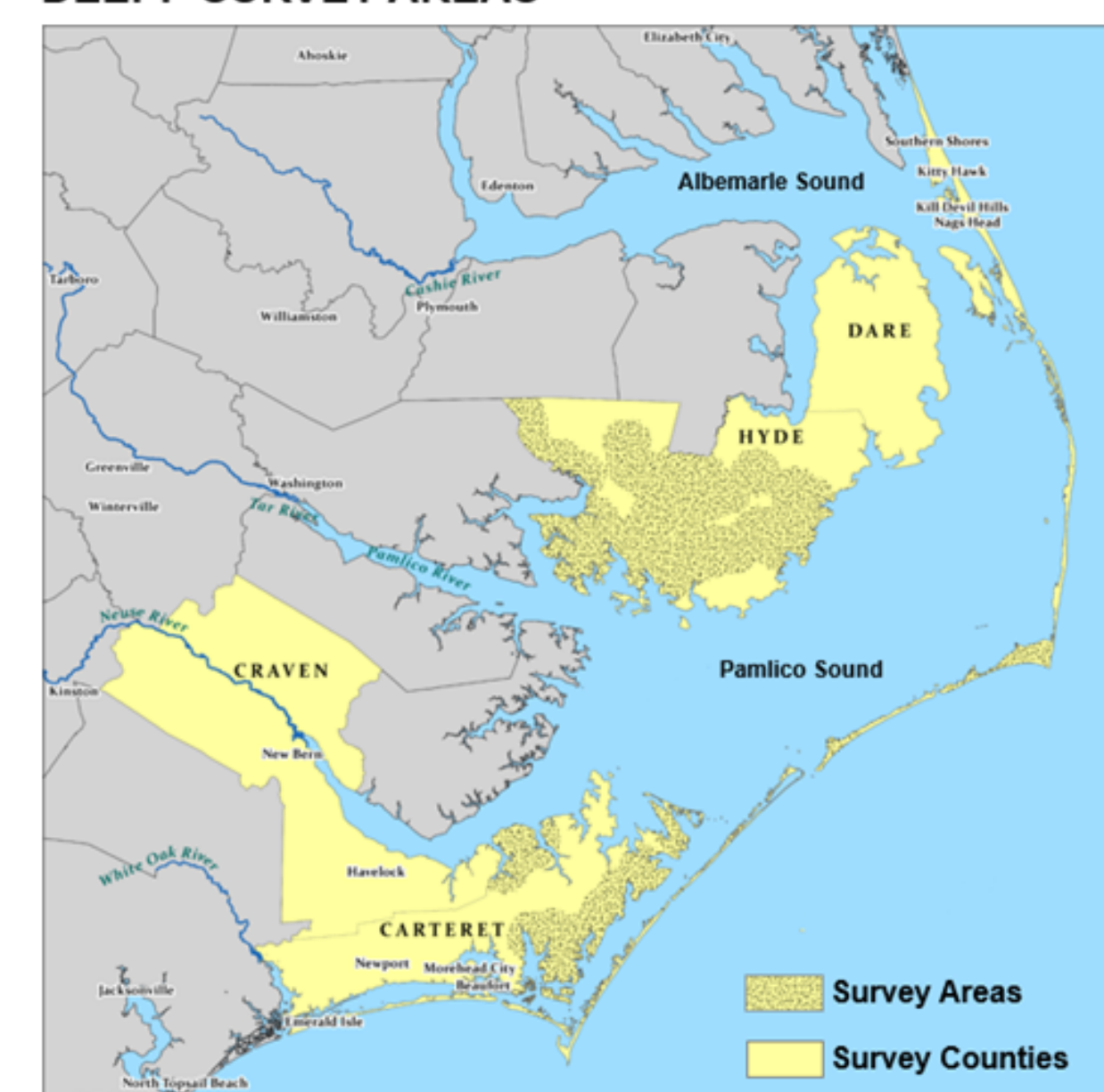
To account for overdispersion in PTSR data, we used a quasi-Poisson model that included variables for change in earnings in the quarter post-Dorian, COVID-19 impacts, traumatic exposures, flooding on property and housing damage, demographic characteristics, and a control for timing of interview post-Dorian.

Hurricane Dorian Sep 6, 2019



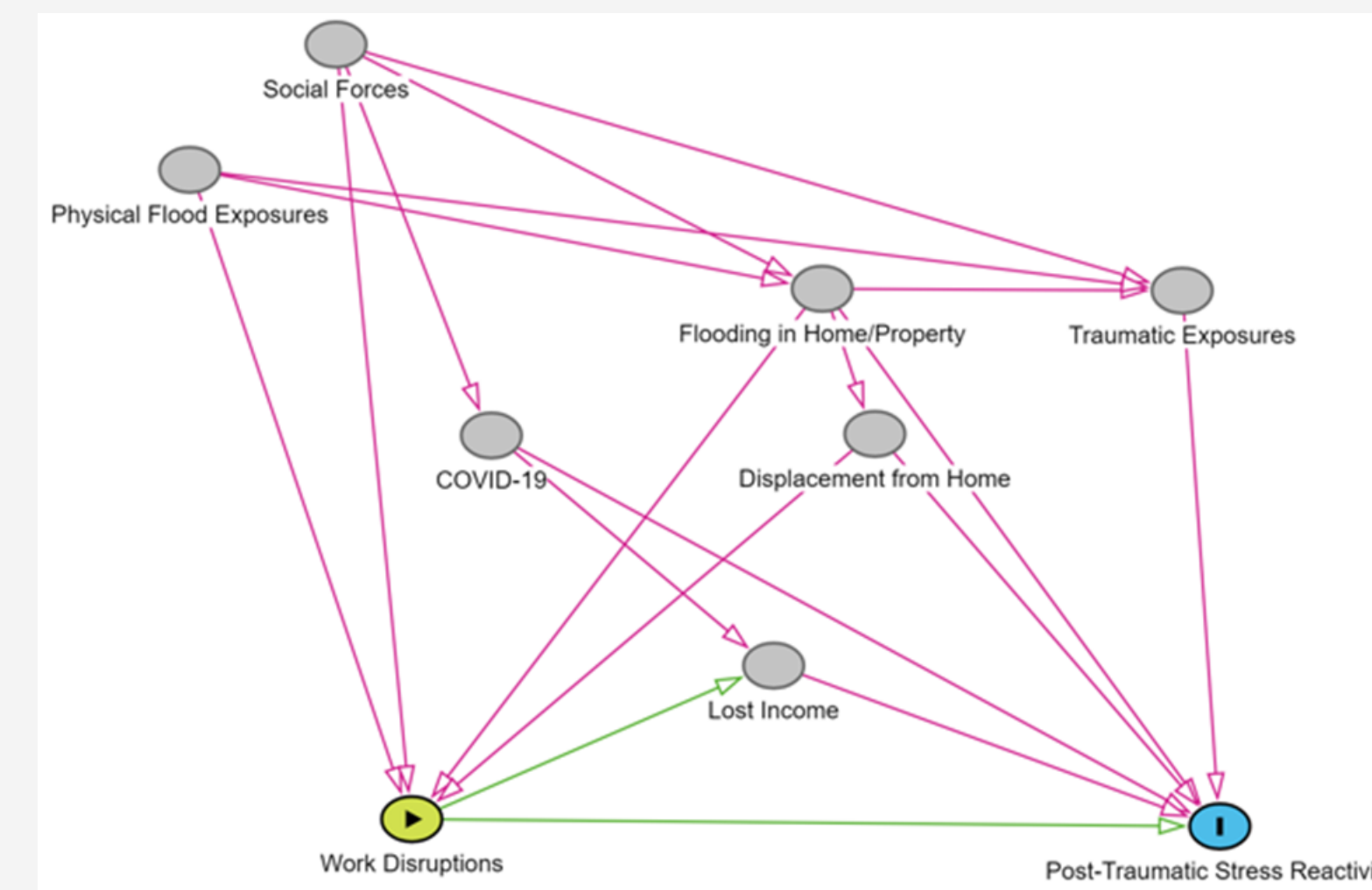
Maximum Water Height Above Mean Sea Level
 Source: CERA - Coastal Emergency Risks Assessment

DEEPP SURVEY AREAS



RESULTS

Conceptual Model

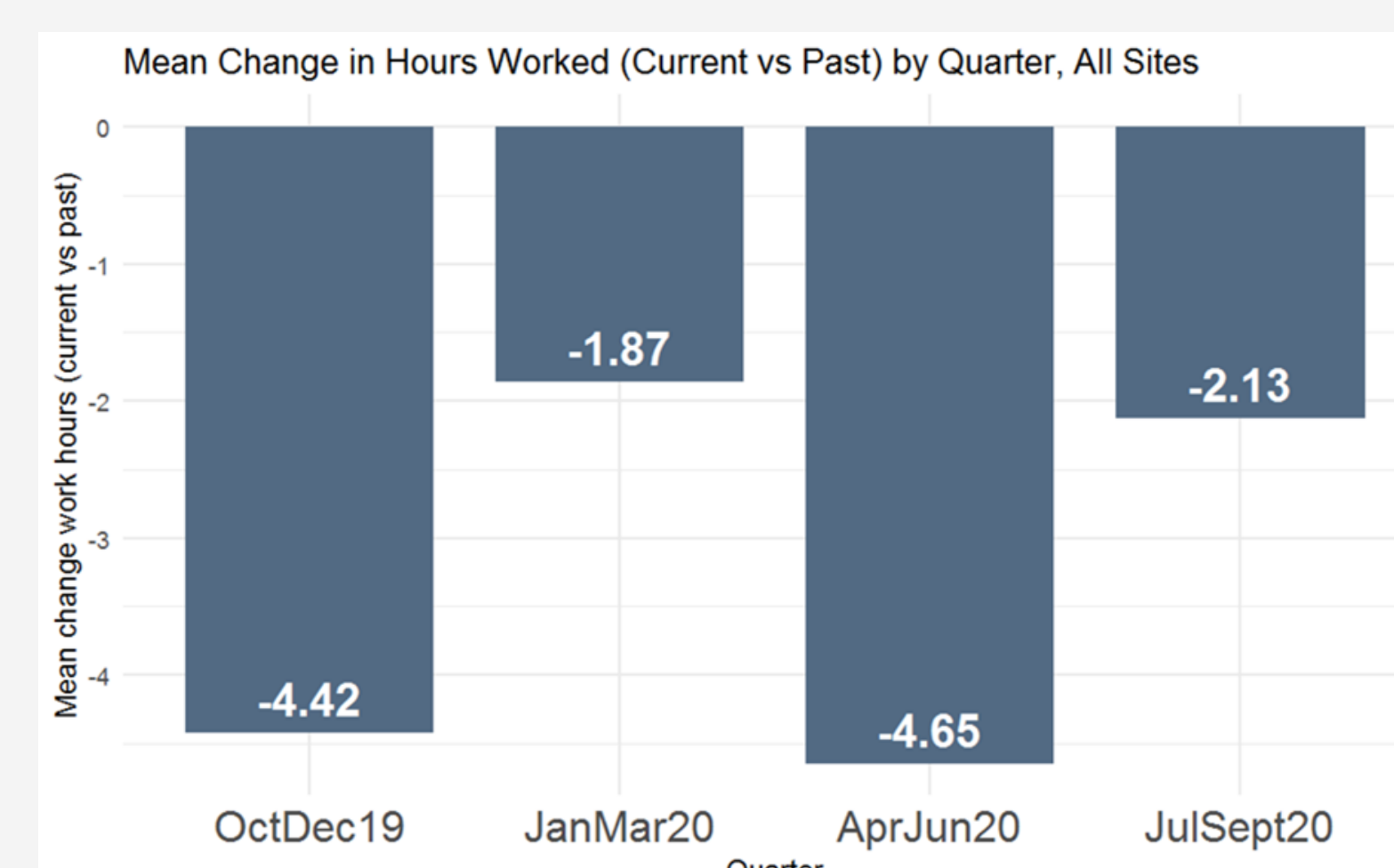


Descriptive statistics: work in last year, work by quarter, labor market transitions, qualitative change in earnings by quarter, by survey site

Variable	Value	site				
		Carteret	Craven	Dare/Hatteras	Mainland Hyde	Ocracoke
Worked in last 12 months	No	52.5%	50.0%	51.2%	49.2%	23.5%
	Yes	47.5%	50.0%	48.8%	50.8%	76.5%
No hrs worked Oct-Dec 2019	Total	263	154	43	65	162
	No hrs	92.0%	81.8%	81.0%	93.5%	57.7%
worked Jan-Mar 2020	Yes	8.0%	18.2%	19.0%	6.5%	42.3%
	Total	125	77	21	31	123
No work transition Oct-Dec 2019	No work	8.1%	9.3%	15.8%	7.1%	6.7%
	Out	0.0%	9.3%	5.3%	0.0%	37.0%
Work transition Jan-Mar 2020	In	0.8%	5.3%	5.3%	0.0%	0.8%
	Worked both	91.1%	76.0%	73.7%	92.9%	55.5%
Total	Worked both	123	75	19	28	119
	No work	7.3%	10.5%	10.5%	10.7%	20.2%
Work transition Oct-Dec 2019	Out	3.3%	13.2%	5.3%	0.0%	13.4%
	In	2.4%	2.6%	5.3%	0.0%	4.2%
Total	Worked both	87.0%	73.7%	78.9%	89.3%	62.2%
	Total	123	76	19	28	119
Qual change earnings Oct-Dec 2019	Earnings up	21.1%	25.7%	11.1%	7.1%	2.5%
	No change	70.7%	56.8%	83.3%	92.9%	40.7%
Total	Earnings down	8.1%	17.6%	5.6%	0.0%	56.8%
	Total	123	74	18	28	118
Qual change earnings Jan-Mar 2020	Earnings up	24.4%	20.8%	11.1%	14.3%	11.0%
	No change	60.2%	56.9%	88.9%	85.7%	63.6%
Total	Earnings down	15.4%	22.2%	0.0%	0.0%	25.4%
	Total	123	72	18	28	118

Mean absolute change in hours worked between the current quarter and same quarter in the previous year, all survey sites

Dorian: Sept 2019; COVID-19 shutdown: March 20, 2020



Work type by survey site

Type of work	site				
	Carteret	Craven	Dare/Hatteras	Mainland Hyde	Ocracoke
Private Sector	39.6%	61.2%	34.8%	25.0%	46.5%
Government	29.7%	23.9%	17.4%	28.6%	22.8%
Business owner	26.1%	14.9%	34.8%	39.3%	25.7%
Other/Missing	4.5%	0.0%	13.0%	7.1%	5.0%
Total	111	67	23	28	101

Associations between Post-Traumatic Stress Reactivity (PTSR) and work disruptions, traumatic exposures, physical forces, and social forces

Variable	RR ¹	95% CI ¹	p-value
Qual change earnings Oct-Dec 2019			
Earnings up	—	—	
No change	2.03	0.93, 5.14	0.1
Earnings down	1.5	0.62, 4.09	0.4
Econ/health COVID concerns			
No	—	—	
Yes	1.92	1.22, 3.08	0.006
Lost work income COVID shutdowns			
No	—	—	
Yes	1.69	1.07, 2.67	0.026
Traumatic exposures	1.12	1.03, 1.23	0.009
Non-hurr property flooding	1.51	1.01, 2.26	0.047
Flooding disrupts work commute	1.28	0.84, 1.93	0.2
House unliveable post-Dorian			
No	—	—	
Yes	1.89	1.01, 3.56	0.049
Male			
No	—	—	
Yes	0.57	0.36, 0.89	0.015
Age			
15-24	—	—	
25-39	1	0.43, 2.67	>0.9
40-54	0.62	0.27, 1.64	0.3
55-69	0.64	0.28, 1.68	0.3
70+	0.76	0.28, 2.21	0.6
Hispanic ethnicity			
No	—	—	
Yes	0.29	0.08, 0.77	0.027
Education			
1-6 yrs	—	—	
7-11 yrs	0.15	0.02, 1.04	0.045
12 yrs	0.16	0.03, 1.02	0.037
Some college	0.2	0.04, 1.26	0.063
College	0.22	0.04, 1.44	0.088
Post college	0.18	0.03, 1.12	0.046

¹ RR = Rate Ratio, CI = Confidence Interval

CONCLUSIONS

Hurricane Dorian-related disruptions to work were most prevalent in Ocracoke.

For Ocracoke respondents, in the quarter following Dorian (Oct-Dec 2019):

- 42.3% said they did not work any hours.
- 37.0% who had been working at this time in the previous year transitioned out of the labor market.
- 56.8% had decreased earnings compared to the previous year.

Across all sites, respondents reported a mean decrease in hours worked for each current quarter compared to the same quarter in the previous year.

- 4.42 fewer hours/week post-Dorian.
- 4.65 fewer hours/week post-COVID-19 shutdowns.

We observed a 50% increase in PTSR (rate ratio (RR) = 1.5, 95% CI: 0.62, 4.09) in respondents whose earnings decreased in the quarter after Hurricane Dorian.

Economic/health concerns and lost work income from COVID-19, traumatic exposures, non-hurricane property flooding, and housing damage/displacement were all associated with increases in PTSR.

Our findings highlight the negative impact of hurricane and flood-related disruptions to work on psychosocial health. These results may be attenuated due to reduced exposure to Hurricane Dorian in respondents surveyed outside of Ocracoke.

Next Steps:

- Incorporate Hurricane Florence (September 2018) flooding and work disruption data.
- Explore different health outcomes and measures of well-being.

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