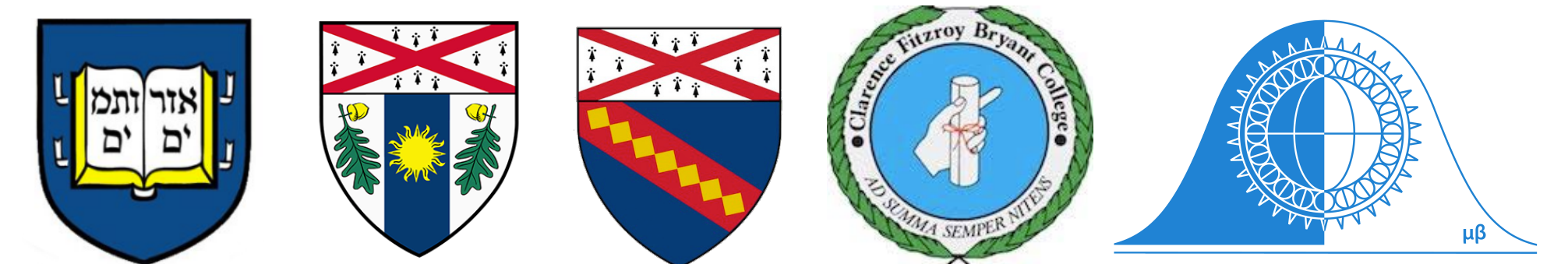


# Adaptive Capacity to Climate Change in an Eastern Caribbean Country

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## KEY POINTS:

- CATEGORY-SPECIFIC ADAPTIVE CAPACITY (SCORES)**
  - provide value for comparison between respondents
  - offer opportunity to tailor resilience building
  - Might have critical relevance for human health
- CARIBBEAN NATIONS ARE UNIQUELY AT RISK IN BEING**
  - disproportionately made to bear health and safety burdens of intensifying climate change impacts, despite being responsible for less than 1% of global GHG emissions
  - insufficiently resourced in knowledge or action given hard-to-overcome precarious circumstances

## Introduction

Evidence of association between climate change impacts and human health continues to emerge worldwide<sup>1,2,3,4</sup>. Small island nations of the Eastern Caribbean (EC), despite contributing less than 1% to global GHG emissions, are perhaps most uniquely vulnerable to climate change and associated effects<sup>2,3,4,5,6</sup>, such as drought-induced afflictions and storm-driven ailments. Adaptation or adaptive capacity refers to resilience-building behavioral, informational and circumstantial measures that aim to reduce health and safety risks potentially associated with climate change impacts. This study aimed to identify adaptation activities individually and collectively among EC residents of St. Kitts-Nevis (SKN), evaluating links to health outcomes and deriving adaptive capacity scores conducive to assessment.

## Materials and Methods

**Cross-sectional Survey:** A 30 to 45 minute questionnaire was administered to 228 residents of SKN, ages 15 to 75 between 2015 and 2017. Questions sought to catalog, using various Likert and dichotomous scales, demographics (e.g. sex, age, race, and occupation), lifestyle factors (e.g. income), uptake of adaptation measures as they relate to health (e.g. increased fluid intake, reduced layers of clothing during hot days). The questionnaire also captured health outcomes which included self-reported presence or absence of specific diseases (e.g. chikungunya, zika, asthma, dehydration, diabetes) that may or may not be induced or exacerbated by climate change impacts.

**Data Analysis: Adaptive Capacity Score (ACS):** Survey responses were converted to scores, each point on the various Likert and dichotomous scales uniquely assigned a positive, negative or zero value according to their contribution to adaptive capacity or vulnerability of the respondent. Scores were categorized as behavioral, knowledge-based or circumstantial. Factors that would significantly influence adaptive capacity were then determined using (a) Student t-tests and (b) ANOVA F-tests. **Health Outcomes:** Health status and safety profiles were evaluated categorically against (a) climate change perceptions as well as (b) the use of adaptive measures using (i) bivariate chi-square testing and (ii) logistic regression per a statistical stepwise model selection process. Significance was set at a 0.05 alpha level for all analyses.

## Results

Almost 60% of respondents perceived hotter days while 1 in 4 reported increased vector-borne disease rates in their community. Most residents (65%) occupied homes sited close to higher risk areas: coastline, ghauts or base of a steep incline. Average knowledge, circumstance, behavior and total ACS were 57.97% ( $\sigma=27.48$ ), 11.71% ( $\sigma=17.33$ ), 44.5% ( $\sigma=24.97$ ) and 32% ( $\sigma=16.03$ ) respectively (Figure 1). Age ( $p<0.0001$ ), education level ( $p<0.001$ ) and occupation ( $p<0.001$ ) impacted some scores (Tables 1a and 1b). Odds risk of various diseases and deficits such as dehydration, vector-borne disease and mental health were significantly associated with a variety of adaptive capacity items and determinants (Figure 2a) in unadjusted (bivariate analysis) albeit less so after a selection of key factors were included in an adjusted multivariate model (Figure 2b). Behaviors and circumstances emerge as common elevators of risk for illness or deficit. In particular, proximity to low-lying zones was associated with higher risk of poor mental health (OR: 1.91; 95% CI: 1.05, 3.47;  $p=0.035$ ). Reduced time outdoors was linked to elevated risk of zika infection (OR: 3.42; 95% CI: 1.36, 8.62;  $p=0.009$ ).

## Discussion and Conclusion

Category-specific adaptive capacity scores have value in that they provide not only a means of comparison but an opportunity to initiate targeted resilience building for health. Findings reflect low capacity in SKN per deficiencies in disaster preparedness, post-crisis management, and other adaptation strategies. However, capacity is especially constrained by circumstance (situations and systems). This has profound implications for environmental (and climate) justice, specifically that Caribbean nations that disproportionately bear health and safety burdens of intensifying climate change impacts, despite being responsible for less than 1% of global GHG emissions that drive climate change, are not sufficiently resourced in knowledge or opportunities to act as individuals to overcome precarious circumstances. Further research is warranted with regard to vulnerabilities and utility of this assessment tool in pursuit of environmental justice.

Figure 1. Adaptive Capacity Score (%) per Questionnaire Responses Across Various Categories: (a) knowledge, (b) behavior, (c) circumstance and (d) total.

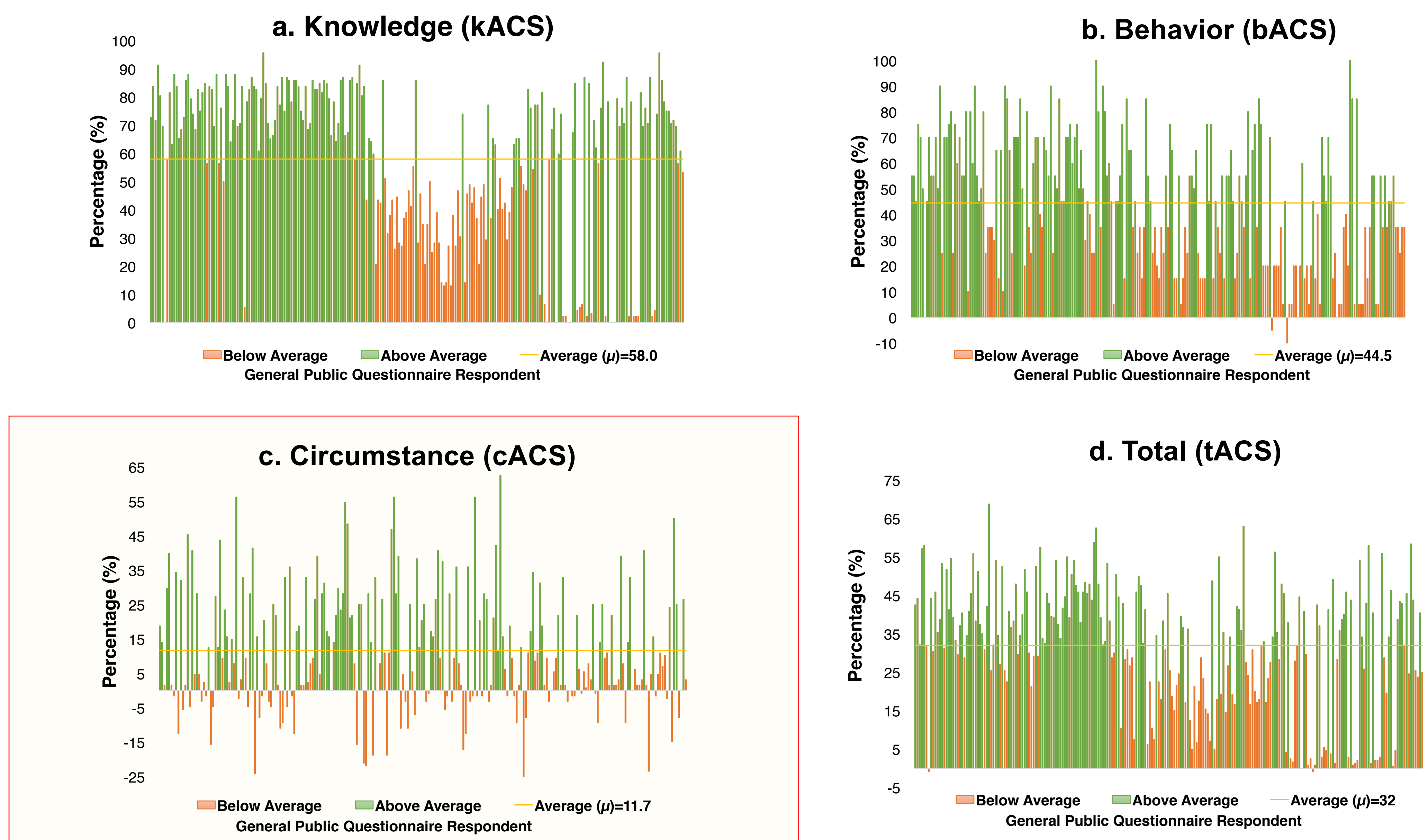


Table 1a Unadjusted Factors Associated with Personal Adaptive Capacity Score per General Survey Responses

Key Factors (Unadjusted)	n	(%)	Total			Knowledge			Behavior			Circumstance			
			Coeff	t	p	Coeff	t	p	Coeff	t	p	Coeff	t	p	
Age Group															
18 and over	158	(70.7)	10.37	3.82	0.000	10.68	6.29	<.0001	0.32	0.87	0.386	-0.63	-0.39	0.696	
Highest Education															
Masters or Higher	25	(10.9)	10.45	2.39	0.018	12.68	4.66	<.0001	1.15	1.98	0.049	-3.38	-1.30	0.195	
Associate/A-Level	64	(27.9)	10.88	3.34	0.001	10.05	4.95	<.0001	-0.09	-0.22	0.829	0.93	0.48	0.633	
Bachelors	46	(20.1)	10.85	3.04	0.003	11.02	4.96	<.0001	0.32	0.66	0.507	-0.49	-0.23	0.819	
Secondary	20	(8.7)	9.75	2.05	0.042	10.52	3.55	0.001				-0.78	-0.27	0.784	
Occupation															
Student/Intern	104	(45.4)	-11.12	4.53	<.0001	-10.49	6.84	<.0001	-0.80	2.43	0.016	0.16	-0.11	0.913	
Teacher or Tutor	16	(7.0)	-7.92	1.59	0.113	-0.38	0.12	0.908	-0.15	0.23	0.815	-7.39	2.60	0.010	
Legislator/Director/Officer/Manager	20	(8.7)	7.14	-1.59	0.113	7.55	-2.58	0.011	1.26	-2.17	0.031	-1.66	0.64	0.523	
Clerk or Office Administrator	21	(9.2)	15.17	-3.53	0.001	9.76	-3.45	0.001	0.52	-0.91	0.362	4.89	-1.94	0.054	

Table 1b. Adjusted Factors Associated with Personal Adaptive Capacity Score per General Survey Responses

Key Factors (Adjusted)	n	(%)	Total (R <sup>2</sup> =0.106)			Knowledge (R <sup>2</sup> =0.211)			Behavior (R <sup>2</sup> =0.049)			Circumstance (R <sup>2</sup> =0.037)		
			Coeff	t	p	Coeff	t	p	Coeff	t	p	Coeff	t	p
Occupation														
Student/Intern	104	(45.4)	-7.02	1.85	0.066	-5.98	2.49	0.014	-1.002	2.01	0.045			
Teacher or Tutor	16	(7.0)										-6.74	2.40	0.017
Clerk or Office Administrator	21	(9.2)	9.56	2.11	0.036	5.51	-1.94	0.054				3.64	-1.43	0.154

Figure 2a. Odds of Disease or Deficit per Adaptive Capacity Items (Unadjusted)

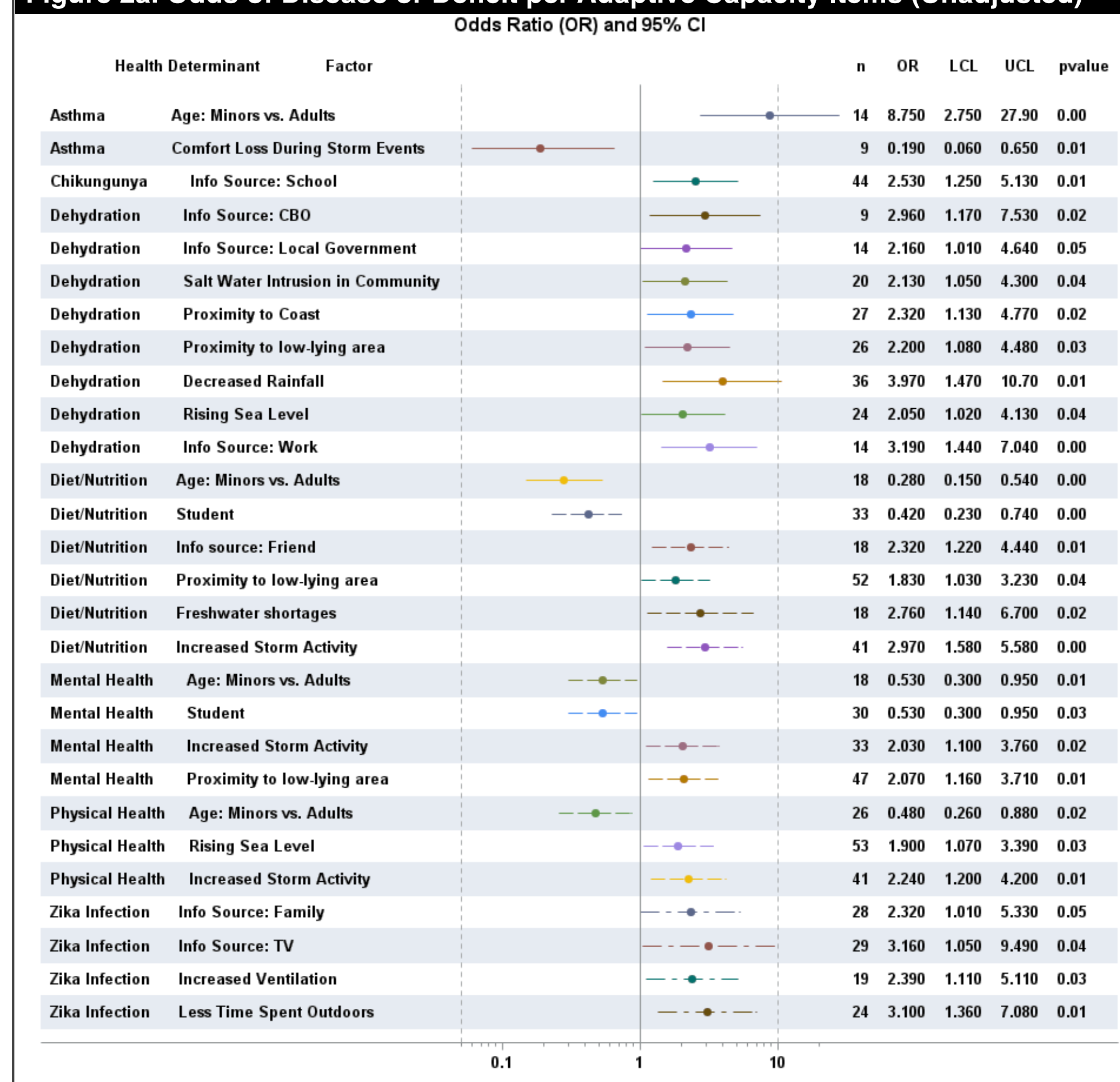
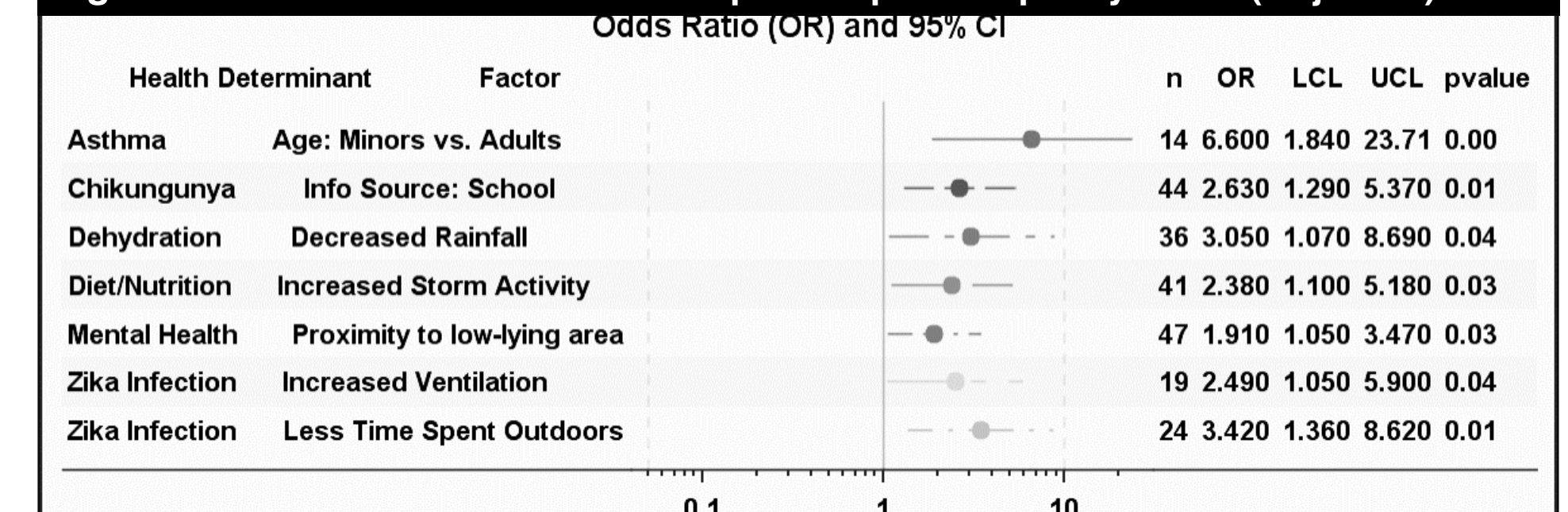


Figure 2b. Odds of Disease or Deficit per Adaptive Capacity Items (Adjusted)



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