

## Racial and Ethnic Disparities in Bystander Treatment and Outcomes for Witnessed Out-of-Hospital Cardiac Arrest in Connecticut

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### BACKGROUND

- Bystander cardiopulmonary resuscitation (CPR) positively impacts outcomes following witnessed outside-of-hospital cardiac arrest (OHCA).<sup>1</sup>
- Blacks and Hispanics are less likely than Whites to receive bystander CPR following witnessed OHCA in the United States.<sup>2</sup>
- State-level variation in racial and ethnic disparities for witnessed OHCA treatment and outcomes are not understood.
- We hypothesized that Black and Hispanic adults would have similar treatment and outcomes to White adults following witnessed OHCA in Connecticut.

### METHODS

- Retrospective analysis of witnessed OHCA in the Connecticut Cardiac Arrest Registry to Enhance Survival (CARES) Database: 1/1/2013 - 12/31/2021.
- OHCA treatment and outcomes were compared for Minorities (Black or Hispanic) versus Whites.
- Outcomes: survival to discharge and good neurological outcome
- Categorical variables are presented as proportions. Chi-square test compared treatment and outcomes for White and Minority cohorts. Standardized difference compared CPR provider identity and census tract demographics for Whites vs. Minorities. Effect sizes are reported as adjusted odds ratios.
- Logistic regression determined the association between race/ethnicity, location of arrest, socioeconomic level of arrest neighborhood, race/ethnic composition of arrest neighborhood, bystander CPR, and OHCA outcomes.
- Favorable neurological outcome was defined by a discharge Cerebral Performance category score of 1 or 2.
- Significance was  $p < .05$  and standardized difference  $> 10$ .
- Analyses were performed with SPS v26.0 (IBM Armonk, NY).

**Table 1. Resuscitation Provider and Neighborhood Demographics for OHCA in Minorities vs. Whites in Connecticut (CARES 2013 - 2021)**

Parameter	Minority (n=924)	White (n=1885)	Standardized Difference
<b>Arrest Year, n (%)</b>			3.9
2013	25 (2.7)	87 (4.6)	
2014	73 (7.9)	139 (7.4)	
2015	77 (8.3)	152 (8.1)	
2016	70 (8.5)	143 (7.6)	
2017	64 (6.9)	113 (6.0)	
2018	84 (9.1)	145 (7.7)	
2019	89 (9.6)	127 (6.7)	
2020	218 (23.6)	451 (23.9)	
2021	215 (23.3)	528 (28.0)	
<b>Age</b>			40.8
Average $\pm$ SD (Years)	62.7 $\pm$ 16.4	69.4 $\pm$ 16.1	
Median(IQR)	60 (52-75)	71 (60-82)	
<b>Gender, n (%)</b>			15.6
Female	406 (43.9)	685 (36.3)	
Male	518 (56.1)	1200 (63.7)	
<b>Race/Ethnicity n (%)</b>			NA
Black	644 (69.7)	0 (0.0)	
Hispanic	580 (30.2)	0 (0)	
White	0 (0.0)	1885 (100.0)	
<b>CPR Provider, n (%)</b>			3.5
Bystander	44 (4.8)	153 (8.1)	
EMS	301 (32.6)	531 (28.2)	
Family Member	95 (10.3)	266 (14.1)	
First Responder	387 (41.9)	725 (38.5)	
Healthcare Provider On-Site	97 (10.5)	205 (10.9)	
Not Applicable	0 (0.0)	5 (0.3)	
<b>Location of Arrest, n (%)</b>			1.3
Home	649 (70.2)	1322 (70.1)	
Healthcare Facility	121 (13.1)	269 (14.3)	
Public	154 (16.7)	294 (15.6)	
<b>Median Income, n (%)</b>			90.3
<\$40,000	306 (33.3)	120 (6.5)	
\$40,000 - \$80,000	448 (46.7)	713 (38.5)	
>\$80,000	166 (18.0)	1020 (55.0)	
<b>Race /Ethnicity, n (%)</b>			98.2
>50% Black/Hispanic	176 (19.0)	39 (2.1)	
<50%, >20% Black/Hispanic	647 (70.0)	857 (45.5)	
<20% Black/Hispanic	101 (10.9)	989 (52.5)	

**Table 2. Regression Model for Survival to Discharge Following Witnessed OHCA in Connecticut (CARES 2013-2021)**

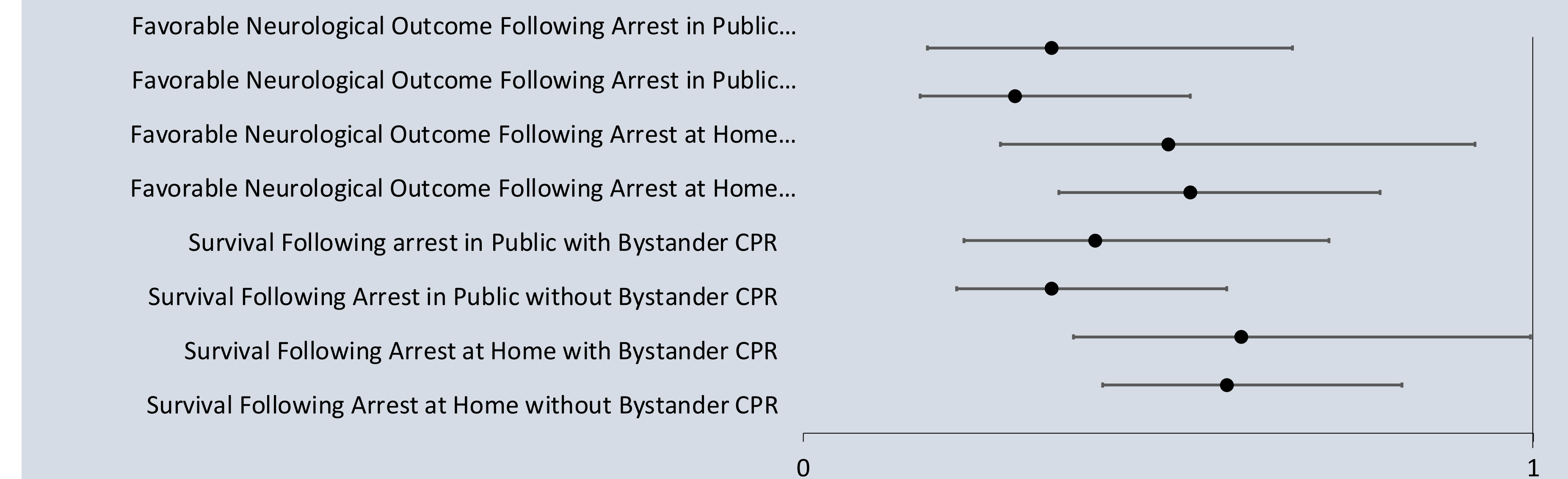
Predictor Variable	Odds Ratio	Lower 95% C.I.	Upper 95% C.I.	P Value
Minority				
Race/Ethnicity	.614	.385	.978	<b>.040</b>
Age (Years)	.970	.958	.982	<b>.000</b>
AED with Defibrillation Prior to EMS	2.963	1.912	4.592	<b>.000</b>
Gender	1.338	.866	2.066	.190
Public vs. Home				
Location of Arrest	2.860	1.857	4.406	<b>.000</b>
Resuscitative Drugs Administered	.173	.103	.289	<b>.000</b>
EMS Response Time	1.001	.995	1.007	.820
Sustained ROSC	32.364	18.052	58.020	<b>.000</b>
Average Household Size	1.011	.607	1.682	.968
Bystander CPR	1.514	1.016	2.255	<b>.041</b>

**Abbreviations:** C.I. (Confidence Interval); AED (Automatic External Defibrillator); EMS(Emergency Medical Services); ROSC (Return of Spontaneous Circulation); CPR (Cardiopulmonary Resuscitation)

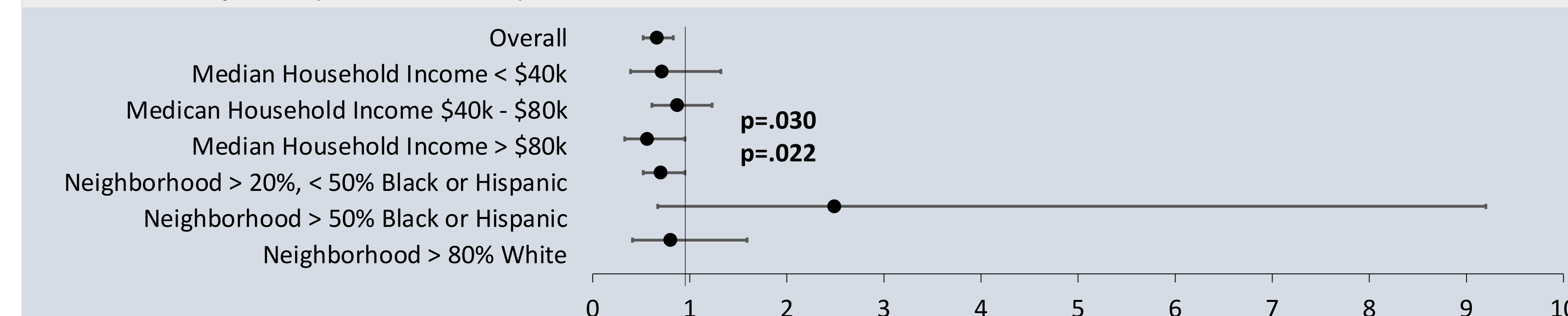
**Table 3: Pre-Hospital Treatment and Hospital Outcomes for Witnessed OHCA in Connecticut: Minorities vs. Whites (CARES 2013 - 2021)**

Treatment/Outcome	Minorities (n = 924)	Whites (n = 1885)	P value
Bystander CPR	236 (25.5)	624 (33.1)	<b>&lt;.001</b>
Layman AED	344 (37.2)	745 (39.5)	0.241
Initial Rhythm Shockable	183 (19.8)	543 (28.8)	<b>&lt;.001</b>
Successful Defibrillation	97 (10.5)	271 (14.4)	<b>.004</b>
Return of Spontaneous Circulation	324 (35.1)	740 (39.3)	<b>.031</b>
Survival to Discharge	95 (10.3)	278 (14.8)	<b>.001</b>
Discharge with Good Cerebral Function	62 (65.3)	223 (80.2)	<b>.003</b>

**Figure 1: Multivariable Regression for Minority vs. White Survival to Discharge and Post-Discharge Favorable Neurological Outcome in Connecticut (CARES 2013-2021)**



**Figure 2. Odds Ratios for Bystander CPR Administration to Minorities in Connecticut Based on Census Tract Socioeconomic Level and Race/Ethnic Composition(CARES 2013-2021)**



### DISCUSSION and CONCLUSION

- 2809 patients with witnessed OHCA in Connecticut CARES between 2013 and 2021 were analyzed.
- Bystander CPR and layman AED use predicted survival in all patients but bystander CPR did not eliminate racial and ethnic disparities for survival to discharge or good neurological outcome (Table 2 and Figure 1); Minorities were more likely to receive bystander CPR in communities that had majority minority composition and were less likely to receive bystander CPR in affluent communities or racially and ethnically integrated communities in Connecticut during the study period (Figure 2).
- These results support previous findings of the importance of bystander CPR to survival and favorable neurological outcome.<sup>2</sup>
- Racial/ethnic disparities in outcomes from witnessed OHCA in Connecticut may be addressed by policies and health system strategies that target education regarding AED use in all communities and more uniform administration of CPR for witnessed OHCA in communities defined by socioeconomic level and by racial/ethnic composition.

**1)** McNally B, Stokes A, Crouch A, Kellerman AL: CARES Surveillance Group. CARES: Cardiac Arrest Registry to Enhance Survival. Ann Emerg Med. 2009 Nov 54(5): 674-683.e.2.; **2)** Garcia RA, Spertus JA, Girotra S, Nallamothu BK et al. Racial and Ethnic Differences in Bystander CPR for Witnessed Cardiac Arrest. N Engl J Med 2022; 387: 1569-78. DOI: 10.1056/NEJMoa2200798