



## Risk factors for nonaccidental burns in children

Dalya M. Ferguson<sup>a,b,c</sup>, Tayler D. Parker<sup>a</sup>, Vanessa E. Marino<sup>a</sup>, Elisa I. Garcia<sup>a,b,c</sup>, Seyed A. Arshad<sup>a,b,c</sup>, Pranali S. Kamat<sup>a</sup>, Caroline M. Anding<sup>a</sup>, KuoJen Tsao<sup>a,b,c</sup>, Rebecca G. Girardet<sup>c,d</sup>, Mary T. Austin<sup>a,b,c,\*</sup>

<sup>a</sup> Department of Pediatric Surgery, McGovern Medical School at the University of Texas Health Science Center at Houston, 6431 Fannin St, MSB 5.256, Houston, TX 77030

<sup>b</sup> Center for Surgical Trials and Evidence-based Practice (C-STEP), McGovern Medical School at the University of Texas Health Science Center at Houston, 6431 Fannin St, MSB 5.256, Houston, TX 77030

<sup>c</sup> Children's Memorial Hermann Hospital, 6411 Fannin St, Houston, TX 77030

<sup>d</sup> Department of Pediatrics, Division of Child Safety and Integrated Health, McGovern Medical School at the University of Texas Health Science Center at Houston, 6431 Fannin St, MSB 5.256, Houston, TX 77030

### ARTICLE INFO

#### Article history:

Received 13 April 2020

Received in revised form 22 May 2020

Accepted 29 May 2020

Available online 5 June 2020

### ABSTRACT

**Background:** The relative influences of baseline risk factors for pediatric nonaccidental burns have not been well described. We evaluated baseline characteristics of pediatric nonaccidental burn patients and their primary caretakers.

**Methods:** A single-center retrospective cohort study was conducted of pediatric (age < 17) burn patients from July 1, 2013, to June 30, 2018. The primary outcome was nonaccidental burn, defined as burn secondary to abuse or neglect as determined by the inpatient child protection team or Child Protective Services. Univariate and multivariate analyses were performed.

**Results:** Of 489 burn patients, 47 (9.6%) suffered nonaccidental burns. Nonaccidental burn patients more frequently had a history of Child Protective Services involvement (48.9% vs 9.7%,  $P < .001$ ), as did their primary caretakers (59.6% vs 10.9%,  $P < .001$ ). Non-Hispanic black children had higher rates of Child Protective Services referral (50.7% vs 26.7%,  $P < .001$ ) and nonaccidental burn diagnosis (18.9% vs 5.6%,  $P < .001$ ) than children of other races/ethnicities. On multivariate analysis, caretaker involvement with CPS (odds ratio 7.53, 95% confidence interval 3.38–16.77) and non-Hispanic black race/ethnicity (odds ratio 3.28, 95% confidence interval 1.29–8.36) were associated with nonaccidental burn.

**Conclusion:** Caretaker history of Child Protective Services involvement and non-Hispanic black race/ethnicity were associated with increased odds of pediatric nonaccidental burn. Prospective research is necessary to determine whether these represent true risk factors for nonaccidental burn or are the result of other confounders, such as socioeconomic status.

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### INTRODUCTION

Burns are a frequent cause of injury and death in children, with an estimated 100,000 pediatric burns occurring annually in the United States [1]. Younger children are disproportionately affected, with the majority of burns occurring in children less than 5 years old [1,2]. Although many pediatric burns are accidental, child abuse and neglect may manifest as burn injuries [3].

Nonaccidental burns (NABs) have been associated with a number of socioeconomic factors. Children of nonwhite race, with parents who did not complete high school, or with a lower household income all have

higher reported rates of NABs [4]. However, previous studies have only evaluated individual factors without simultaneously taking all important patient and caregiver characteristics into account.

A better understanding of the interplay between predictors of NABs would aid in the development of interventions to prevent recurrent injury secondary to abuse or neglect and would better inform public policy. Therefore, we aimed to identify patient and caretaker characteristics associated with pediatric burns that occurred secondary to abuse or neglect and to evaluate the relative influences of identified risk factors.

### METHODS

**Study Design.** A retrospective cohort study of pediatric burn patients was conducted at Children's Memorial Hermann Hospital (CMHH), a 234-bed quaternary care children's hospital in Houston, Texas. As the only pediatric burn center in the greater Houston area, CMHH serves an estimated 1.7 million children [5]. CMHH utilizes a child protection team, run by the

\* Corresponding author at: Mary T. Austin, MD, MS, 6431 Fannin St, MSB 5.604, Houston, TX 77030. Tel.: +1 713 500 7300; fax: +1 713 500 7296.

URL's: [mary.t.austin@uth.tmc.edu](mailto:mary.t.austin@uth.tmc.edu) (M.T. Austin).

@HealthScoutBlog (D.M. Ferguson) @SARshiaArshad (S.A. Arshad) @KuoJenTsao (K. Tsao).

University of Texas Health Science Center at Houston, Department of Pediatrics, Division of Child Safety and Integrated Health, to evaluate children with suspected maltreatment findings and to provide integrated medical and psychosocial services after discharge when indicated [6]. This study was approved by the Institutional Review Boards at The University of Texas Health Science Center at Houston and Memorial Hermann Hospital with waiver of informed consent (HSC-MS-18-1020).

**Patient Population.** Children <17 years of age who were admitted with a burn diagnosis from July 1, 2013, through June 30, 2018, were included in the analysis. Patients who sustained isolated mucosal burns secondary to caustic ingestions were excluded. Characteristics of patients and their primary caretakers and clinical data were abstracted from the electronic medical record. The primary caretaker was identified in the social work note, and only 1 primary caretaker was analyzed per patient. If the patient was not evaluated by social work, notes written by the admitting service were reviewed to determine whether a primary caretaker was identified. Patient race/ethnicity was determined using the social work note, when available, or hospital registration data. Race/ethnicity recorded during hospital registration is frequently not self-reported and was therefore considered less reliable than the social work note.

Patient insurance status at hospital discharge was collected from the medical record. *Public insurance* was defined as health insurance funded or subsidized by a government body. Among this population, Medicaid and the Children's Health Insurance Program provide free or low-cost insurance coverage, respectively, to children living in poverty [7]. Program eligibility is determined based on household income; children must also be Texas residents and U.S. citizens or legal permanent residents in order to qualify in Texas. *Private insurance* refers to insurance coverage that is either sponsored by the parent's employer or individually purchased by the parent. *Uninsured or self-pay status* implies that the child's parent does not have insurance coverage but the household income is too high for the child to qualify for public insurance.

**Outcomes.** In this study, we focused on factors that predict NAB injury rather than factors that help identify NABs after they occur. The primary outcome was *NAB*, defined as a burn determined by the inpatient child protection team to have occurred secondary to abuse or neglect. If the child protection team did not make a definitive determination of abuse or neglect, child placement at discharge was used to classify burns as accidental or nonaccidental. If Child Protective Services (CPS) mandated a temporary change in placement or determined that the patient could not spend unsupervised time with the individual suspected to be responsible for a burn, the burn was classified as nonaccidental. If the patient was allowed to remain in the custody of or continue to spend unsupervised time with the individual suspected to be responsible for a burn, the burn was classified as accidental.

Secondary outcomes included referral to CPS, referral to the child protection team, and placement at discharge. *CPS referral* was defined as involvement of CPS as a result of the burn injury, regardless of whether the referral occurred before or after transfer to CMHH. Patient or caretaker history of involvement with CPS was generally self-reported to the social worker, as was caretaker drug or alcohol abuse. *History of involvement with CPS* was defined as inclusion in a previous CPS case, unrelated to the current admission. Caretaker drug or alcohol abuse could either be past or current at the time of patient admission. Patient placement at discharge (e.g., placement in foster care) was determined by reviewing social work notes.

**Statistical Analysis.** Data were summarized using frequency distributions for categorical variables and means with standard deviations or medians with interquartile ranges for continuous variables. Accidental burn and NAB patients were compared using Student's *t* test or Wilcoxon rank-sum test for continuous variables and Pearson  $\chi^2$  or Fisher's exact tests for categorical variables. Missing data were not

considered to be missing at random because patients who sustained accidental burns were missing significantly more data than those who sustained NABs. Missing data were managed by including a "missing" category in categorical variables, and the number of patients missing data for continuous outcomes was listed in table footnotes.

Multivariate logistic regression was performed to evaluate baseline patient and caretaker characteristics associated with NABs. Covariates were chosen based on previous literature: patient age, sex, race/ethnicity, insurance status, patient history of fracture, caretaker history of CPS involvement, and caretaker drug or alcohol abuse (current or past). Stata version 15 was used for all analyses (StataCorp, College Station, TX).

## RESULTS

**Patient Characteristics and Social Circumstances.** A total of 490 pediatric burn patients were identified, and 1 patient was excluded because of an isolated burn of the oral mucosa secondary to caustic ingestion. Of 489 included patients, 126 (25.8%) were evaluated by the inpatient child protection team and 166 (33.9%) were referred to CPS. (More patients were referred to CPS than to the child protection team because some CPS referrals were initiated at other facilities prior to transferring the patient to CMHH.) Ultimately, 47 (9.6%) patients were determined to have NABs (Table 1). Nonaccidental and accidental burn patients were similar by sex and history of medical problems or developmental delay, but NAB patients were younger and more likely to be non-Hispanic black, be publicly insured, have a history of fracture, and have a history of CPS involvement.

When reviewing patient data by race/ethnicity, non-Hispanic black children were more frequently referred to CPS (50.7%) compared with children of Hispanic (30.9%), non-Hispanic white (27.0%), or other or unknown race/ethnicity (19.8%,  $P < .001$ ). Non-Hispanic black children were also more likely to receive a determination of abuse or neglect (18.9% of all non-Hispanic black children) compared with children of Hispanic (5.0%), non-Hispanic white (8.1%), or other or unknown race/ethnicity (3.3%,  $P < .001$ ).

Publicly insured and uninsured children were referred to CPS at similar rates (37.9% and 37.0%, respectively), whereas children with private insurance were only referred to CPS 20.3% of the time ( $P = .002$ ). Patients with public insurance were more likely to receive a determination of abuse or neglect (12.2%) versus uninsured patients (10.9%) or those with private insurance (2.5%,  $P = .009$ ).

**Table 1**  
Demographics of children who sustained nonaccidental and accidental burns

	Nonaccidental burn n = 47	Accidental burn n = 442	P value
Patient age in years, median (IQR)	2.2 (1.3–4.4)	3.0 (1.3–7.3)	.04
Male sex, n (%)	26 (55.3%)	261 (59.0%)	.61
Race/ethnicity, n (%)			
Hispanic	7 (14.9%)	132 (29.9%)	
Non-Hispanic white	9 (19.1%)	102 (23.1%)	<.001
Non-Hispanic black	28 (59.6%)	120 (27.1%)	
Other/unknown	3 (6.4%)	88 (19.9%)	
Insurance status, n (%)			
Public	39 (83.0%)	280 (63.3%)	
Private	3 (6.4%)	115 (26.0%)	.009
Uninsured/self-pay	5 (10.6%)	41 (9.3%)	
Other/unknown	0 (0.0%)	6 (1.4%)	
Patient medical illness/developmental delay, n (%)	3 (6.4%)	42 (9.5%)	.60
Missing	0 (0.0%)	17 (3.8%)	
Patient history of fracture, n (%)	3 (6.4%)	7 (1.6%)	
Missing	0 (0.0%)	34 (7.7%)	.01
Patient involved in previous CPS case, n (%)	23 (48.9%)	43 (9.7%)	<.001
Missing	2 (4.3%)	53 (12.0%)	

IQR, interquartile range; CPS, child protective services.

Most patients lived with their biological parent(s) prior to admission, and the primary caretaker was most often the biological mother (Table 2). Primary caretakers of children with NABs had a more frequent history of involvement with CPS (59.6% vs 10.9%), including previous removal of another child (31.9% vs 2.5%), and current or past drug or alcohol abuse (15.5% vs 3.4%,  $P < .001$  for all comparisons). Based on available data, caretakers of NAB patients were also younger and more likely to be female, divorced or separated from their partner, and employed at least part time; however, as noted in Table 2, a significant number of accidental burn patients were missing these data points.

**Predictors of NABs.** On unadjusted logistic regression, a number of factors were associated with increased odds of sustaining NABs: younger age, non-Hispanic black race/ethnicity, public insurance, lack of insurance, caretaker history of CPS involvement, and caretaker drug or alcohol abuse (Table 3). After adjusting for age, sex, race/ethnicity, insurance status, history of fracture, caretaker history of CPS involvement, and caretaker drug or alcohol use, non-Hispanic black race/ethnicity (adjusted odds ratio [OR] 3.28, 95% confidence interval [CI]

**Table 2**  
Social circumstances and caretaker characteristics of children who sustained nonaccidental and accidental burns

	Nonaccidental burn n = 47	Accidental burn n = 442	P value
Total number of children at home, median (IQR)*	2 (2–4)	2 (1–3)	.97
Patient living arrangement, n (%)			
Living with biological parent(s)	41 (87.2%)	394 (89.1%)	
Living with both parents separately (shared custody)	3 (6.4%)	18 (4.1%)	
Living with nonparent relative(s)	1 (2.1%)	4 (0.9%)	
CPS-mandated placement with nonparent relative(s)	1 (2.1%)	3 (0.7%)	.21
CPS-mandated facility (e.g., foster home, group home)	1 (2.1%)	1 (0.2%)	
Living with custodial parent(s) (e.g., adoptive parent)	0 (0.0%)	2 (0.5%)	
Other	0 (0.0%)	2 (0.5%)	
Missing	0 (0.0%)	18 (4.1%)	
Primary caretaker, n (%)			
Biological mother	36 (76.6%)	354 (80.1%)	
Biological father	6 (12.8%)	55 (12.4%)	
Adoptive mother	0 (0.0%)	2 (0.5%)	.16
Adoptive father	0 (0.0%)	1 (0.2%)	
Other	4 (8.5%)	9 (2.0%)	
Missing	1 (2.1%)	21 (4.8%)	
Caretaker age in years, median (IQR)†	27 (24–34)	32 (27–38)	.04
Caretaker female sex, n (%)	40 (85.1%)	344 (77.8%)	1.00
Missing	2 (4.3%)	51 (11.5%)	
Caretaker marital status, n (%)			
Married	15 (31.9%)	160 (36.2%)	
Single, never married	9 (19.1%)	85 (19.2%)	
Divorced	5 (10.6%)	9 (2.0%)	
Separated	5 (10.6%)	12 (2.7%)	.002
Living common-law	3 (6.4%)	5 (1.1%)	
Widowed	0 (0.0%)	4 (0.9%)	
Missing	10 (21.3%)	167 (37.8%)	
Caretaker employed, n (%)	19 (40.4%)	102 (23.1%)	.002
Missing	8 (17.0%)	188 (42.5%)	
Caretaker involved in previous CPS case, n (%)	28 (59.6%)	48 (10.9%)	<.001
Missing	3 (6.4%)	62 (14.0%)	
Caretaker history of child removal by CPS, n (%)	15 (31.9%)	11 (2.5%)	<.001
Missing	4 (8.5%)	65 (14.7%)	
Caretaker current or past drug or alcohol use/abuse, n (%)	12 (25.5%)	15 (3.4%)	<.001
Missing	4 (8.5%)	75 (17.0%)	

IQR, interquartile range; CPS, child protective services.

\* Refers to the total number of children living at home, including the burn patient; data are missing for 70 children (3 nonaccidental burns and 67 accidental burns).

† Data are missing for 204 children (14 nonaccidental burns and 190 accidental burns).

**Table 3**  
Predictors of NABs in children

	Unadjusted OR	Unadjusted 95% CI	Adjusted OR	Adjusted 95% CI
Patient age in years	0.87	0.79–0.97	0.90	0.80–1.00
Patient sex				
Male			Reference	
Female	1.16	0.64–2.13	1.16	0.57–2.34
Patient race/ethnicity				
Hispanic			Reference	
Non-Hispanic white	1.66	0.60–4.62	1.35	0.43–4.27
Non-Hispanic black	4.40	1.85–10.44	3.28	1.29–8.36
Other/unknown	0.64	0.16–2.55	0.92	0.21–3.95
Patient insurance status*				
Private			Reference	
Public	5.34	1.62–17.62	2.23	0.62–8.00
Uninsured/self-pay	4.67	1.07–20.44	1.97	0.38–10.05
Patient history of fracture*	3.91	0.97–15.65	2.43	0.43–13.64
Caretaker involved in previous CPS case	12.10	6.10–24.01	7.53	3.38–16.77
Missing	1.00	0.28–3.55	2.58	0.21–31.28
Caretaker drug or alcohol abuse	9.08	3.91–21.11	1.63	0.57–4.63
Missing	0.61	0.21–1.77	0.70	0.08–6.16

IQR, interquartile range; CPS, child protective services; OR, odds ratio.

\* No patients with missing insurance status or fracture history sustained NABs; therefore, the “missing” categories were automatically dropped from the logistic regression model.

1.29–8.36) and caretaker history of CPS involvement (adjusted OR 7.53, 95% CI 3.38–16.77) remained associated with NABs.

**Outcomes in NABs.** Burn characteristics and patient outcomes are presented in Table 4. Of the 47 children who sustained NABs, 44 (93.6%) lived with at least 1 biological parent prior to admission. Of those, 10 (22.7%) remained in parental custody at the time of discharge, 16 (36.4%) were placed in a relative's custody, 9 (20.5%) were placed in foster care, 3 (6.8%) were discharged to a rehabilitation facility, 3 (6.8%) were placed with a nonrelative friend, 2 (4.5%) were kept in CPS custody, and 1 (2.3%) was discharged home with the same parent but under a friend's supervision. Of the 10 patients who remained in parental custody, 2 were placed in the custody of a different biological parent. Of the 3 patients who were not in parental custody before admission, 2 were moved to new foster homes and 1 was placed in the custody of a different relative.

**DISCUSSION**

We found that, of the 489 children who sustained burns, 33.9% were referred to CPS and 9.6% of burns were ultimately determined to be related to abuse or neglect. Patients who suffered NABs tended to be younger, non-Hispanic black, and publicly insured and more frequently had a history of fracture or CPS involvement. Caretakers of NAB patients similarly had a more frequent history of CPS involvement and were more likely to suffer from drug or alcohol abuse. Notably, non-Hispanic black children were more likely to be both referred to CPS and to receive a final determination of abuse or neglect compared to children of other races/ethnicities. Similarly, children with public or no insurance were more likely to be referred to CPS, and children with public insurance were more likely to sustain NABs. On adjusted analysis, caretaker history of CPS involvement and non-Hispanic black race/ethnicity were independently associated with increased odds of NAB.

The observed 9.6% rate of NABs in our population falls within the previously reported range. The variety of case definitions that have been used likely accounts for the wide range of reported NAB rates. Hodgman et al. narrowly categorized NABs as burns secondary to intentional injury inflicted by another person and therefore reported a low rate of 5.3% [8]. Campos et al. broadly defined NABs as a burn with



**Table 4**  
Burn characteristics and clinical outcomes in children who sustained nonaccidental and accidental burns

	Nonaccidental burn n = 47	Accidental burn n = 442	P value
First aid given prior to seeking professional treatment, n (%)	20 (42.6%)	103 (23.3%)	.007
Missing	1 (2.1%)	10 (2.3%)	
Burn etiology, n (%)			.03
Scald	34 (72.3%)	281 (63.6%)	
Contact	2 (4.3%)	62 (14.0%)	
Flame	6 (12.8%)	73 (16.5%)	
Friction	0 (0.0%)	12 (2.7%)	
Chemical	2 (4.3%)	1 (0.2%)	
Electrical	1 (2.1%)	4 (0.9%)	
Other (e.g., firework explosion)	0 (0.0%)	8 (1.8%)	
Missing	2 (4.3%)	1 (0.2%)	
Maximal burn depth, n (%)			
First degree (superficial)	1 (2.1%)	2 (0.5%)	
Second degree (superficial partial thickness)	33 (70.2%)	311 (70.4%)	
Third degree (deep partial or full thickness)	12 (25.5%)	127 (28.7%)	
Fourth degree (extending into fascia or muscle)	1 (2.1%)	2 (0.5%)	.96
Percent TBSA, median (IQR)	4 (3–8)	5 (2–9)	
Referral to child protection team, n (%)	43 (91.5%)	83 (18.8%)	<.001
Referral to CPS, n (%)	47 (100.0%)	119 (26.9%)	<.001
LOS in days, median (IQR)	7 (3–13)	3 (2–5)	<.001
Patient discharge disposition, n (%)			<.001
Parent's home	8 (17.0%)	415 (93.9%)	
Nonparent relative's home	17 (36.2%)	11 (2.5%)	
Foster home	11 (23.4%)	0 (0.0%)	
Other*	11 (23.4%)	16 (3.6%)	

LOS, length of stay; TBSA, total body surface area; IQR, interquartile range; CPS, child protective services.

\* Three patients were discharged to rehabilitation facilities, 3 in the custody of a non-relative friend, 2 in the custody of a different parent, 2 in CPS custody, and 1 was discharged home with the same parent under a friend's supervision.

concurrent CPS involvement and, therefore, reported a much higher rate of 22.5% [9]. As expected, our rate falls in between these estimates because burns secondary to neglect were included in our definition of NAB.

We found that patient or caretaker history of CPS involvement was strongly associated with NABs, which is consistent with multiple prior studies. Chester et al. evaluated characteristics of the parents of children with neglect-related burns versus those with accidental burns and reported that 82.9% of patients with NABs had a prior case entered in the national child protection register in the United Kingdom [3]. Along these same lines, the Classification and Regression Tree trial analysis showed that prior CPS involvement accounted for 53% of all recurrent cases of abuse and was the best overall predictor for recurrent abuse [10].

Our finding that non-Hispanic black children had a higher rate of CPS referral is concordant with previous literature. Lane et al. retrospectively reviewed children admitted for skull or long bone fractures and found that minority children between 1 and 3 years old were significantly more likely to be referred to CPS compared with their non-Hispanic white counterparts (adjusted OR 4.32, 95% CI 1.63–11.43,  $P = .003$ ) [11]. The burn literature mirrors this finding: Campos et al. reported that nonwhite race/ethnicity was associated with increased odds of CPS referral in pediatric burns [9].

Although previous studies corroborate our observation of increased screening among non-Hispanic black children, our finding of a corresponding higher rate of NABs conflicts with some prior literature. Campos et al. reported that, although non-Hispanic black children were twice as likely to trigger CPS involvement, they were not more likely to be involved in substantiated cases of abuse or neglect [9]. The disparity observed by Campos et al. suggests a reporting bias rather than a true difference between groups.

Ards et al. addressed reporting bias using national data on pediatric abuse and neglect and found that socioeconomic status (SES) was likely an important confounder [12]. They demonstrated that observed racial disparities were reversed when patients were subgrouped by welfare status. Specifically, reporting rates were higher among non-Hispanic white welfare recipients than non-Hispanic black welfare recipients. A 2012 trial by Laskey et al. specifically examined the influence of race and SES on physicians' likelihood to diagnose abuse and found similar results [13]. Physicians were presented with identical clinical scenarios (an 18-month-old with an oblique femur fracture after an unwitnessed fall) in which only the patient's race and SES differed. Laskey et al. reported that race did not influence the rate of abuse diagnosis, but patients of lower SES were more likely to be diagnosed with abuse. These findings suggest that the racial disparity we detect may be secondary to confounding by SES.

Using the present data set, we were unable to directly assess the influence of SES, but insurance status was used as a surrogate marker of SES. Our observations that children with public insurance (i.e., Medicaid) or no insurance were more frequently referred to CPS and that children with public insurance had a higher incidence of NAB corroborate the influence of SES. Pawlik et al. similarly reported that children with NABs were more likely to have public insurance [14]. On our multivariate analysis, the correlations between public insurance or no insurance and NAB persisted but became imprecise (95% CIs crossing 1). We suspect this relationship would be stronger if a more direct marker of SES were used.

We also found that primary caretakers of NAB patients were more likely to have a history of drug or alcohol abuse, which is congruent with previous literature. Chester et al. reported that parental drug abuse was associated with burns secondary to neglect [3]. Additionally, we observed that caretakers of NAB patients were younger and more frequently divorced or separated. Although a significant number of patients in our data set were missing these data, prior studies demonstrated similar trends. Wibbenmeyer et al. reported that children with NABs were more likely to live in a single-parent household and to have younger parents [14]. They also showed that the primary caregivers of NAB patients were more frequently unemployed.

Limitations exist in this study. First, patients were not universally screened for abuse by the social worker, child protection team, or CPS; therefore, cases of abuse or neglect could have been missed. This limitation is concerning, as the socioeconomic patterns observed in NABs could reflect physician and health care worker biases rather than actual differences between groups. However, as previously discussed, there is also evidence to suggest that differential CPS referral patterns are complex and may be confounded by patient SES. Second, as previously discussed, household income was not available, so insurance status was used as a surrogate marker for SES. Third, the child protection team was not consulted on all burn patients, and therefore, some cases of abuse or neglect could have been missed. Although it is possible for the child protection team to misclassify cases, it is less likely, as these teams are the de facto "gold standard" for identifying cases of child maltreatment. Fourth, because universal screening for abuse with standardized questions was not performed, certain caretaker characteristics were missing for a substantial number of patients, limiting the value of these comparisons. Finally, we did not have access to CPS' final determination of abuse or neglect in cases where patients were discharged during an ongoing investigation, which could have altered the observed proportion of NABs.

We have taken the first steps toward analyzing the relationships between observed risk factors for NAB. As previously stated, a number of these characteristics are interrelated. Race/ethnicity appears to interact with SES in both CPS referral patterns and determination of abuse. Medicaid utilization has also been specifically cited as a risk factor for CPS involvement [9]. Poverty has been linked to a higher proportion of unmarried and teenaged parents, and single-parent households have been associated with abuse [15]. The relationships between income,

race/ethnicity, and other socioeconomic factors are highly complex and largely beyond the scope of this article. Nevertheless, this study takes an important step toward examining the complex interactions between risk factors for abuse and neglect in children.

Our study highlights several important gaps in the current body of evidence. First, prospective research is necessary to better evaluate whether the characteristics identified in our study are associated with NABs as a result of confounding by either SES or physician bias. Second, the direct relationship between SES and NABs has not been well investigated. Surrogate traits that are more easily obtained, such as insurance status or median household income by zip code, are used most often but do not provide robust data. Existing data also point to a potential interaction between poverty and race, which warrants exploration in this population. Third, the finding that a large proportion of children with NABs and/or their caretakers have previously interacted with CPS suggests the opportunity for prevention. Further research is needed to determine what types of programs or policies would most effectively prevent repeat occurrences, particularly in cases of burns secondary to neglect, in which a lack of resources and/or knowledge is implied.

## Conclusion

In conclusion, caretaker history of CPS involvement and non-Hispanic black race/ethnicity were associated with increased odds of pediatric NABs. Prospective research is necessary to validate these findings and determine whether these associations are the result of confounding by other factors, such as patient SES or physician bias. These data, if validated prospectively, may be used to develop programs aimed at primary and secondary prevention of NABs and to better inform policy-makers and public agencies.

## Author Contributions

**Dalya M. Ferguson:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing - original draft, Writing - review & editing. **Taylor D. Parker:** Investigation, Writing - original draft. **Vanessa E. Marino:** Investigation, Writing - original draft. **Elisa I. Garcia:** Investigation, Writing - review & editing. **Seyed A. Arshad:** Writing - review & editing. **Pranali S. Kamat:** Investigation. **Caroline M. Anding:** Investigation. **Kuojen Tsao:** Writing - review & editing. **Rebecca G. Girardet:** Resources, Validation, Writing - review & editing. **Mary T. Austin:** Conceptualization, Methodology, Supervision, Writing - review & editing.

## Conflicts of Interest

None of the authors have any conflicts of interest to disclose.

## Funding Sources

None of the authors have any financial support to disclose.

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