Clinical correlations with unmet social needs in critically ill children with asthma

Scott E. Call, MD,[a]* Lisa Goto, MD,[a]* Gwynne Latimer, MD,[a,b] Eduardo A. Trujillo Rivera, PhD,[a,c,d,e] Amanda Jepson, MSW,[a] Mercedes Tate, MSW,[a] Shayla E. Stringfield, BS,[f] Gayle Gilmore, MSSA, LICSW,[a] Kitman Wai, MD, MS,[a,e] Shamily Jadhav,[e] Paola Jaminet,[a] Rachel H. F. Margolis, PhD, LICSW,[f,e] Shilpa J. Patel, MD, MPH,[g,e] and Terry Dean, MD, PhD[a,e] *Washington, DC, and New York, NY*

Background: Social drivers of health have been implicated as playing a major role in determining pediatric asthma outcomes. However, the impact of self-reported, family-level unmet social needs on asthma outcomes in critically ill pediatric patients is unknown.

Objective: Our aim was to determine whether the presence of unmet social needs at the time of intensive care unit (ICU) admission are associated with ICU-related and postadmission outcomes.

Methods: This was a 12-month (February 2022-January 2023) prospective cohort study at a single, urban pediatric health care system. Families of patients admitted to the pediatric ICU for asthma were screened for unmet social needs in multiple domains. Regression analyses were performed to correlate unmet needs with the following clinical outcomes: duration of bilevel positive airway pressure use; lengths of ICU and hospital stay; and rates of 6-month outpatient follow-up, ED visitation, and hospital readmission.

Results: Of 164 screened families, 57% reported at least 1 unmet social need. Unmet needs were significantly associated with longer hospitalizations (ie, a 3% increase per year of age (odds ratio =1.03 [95% CI = 1.00-1.07]) and a higher likelihood of returning for emergency care (adds ratio =2.6 [95% CI = 1.1-6.2]), even after accounting for race, insurance payer, and medical comorbidities. Additionally, patients provided with resources reported fewer needs when rescreened at outpatient follow-up (median = −1 need [*P* = .001]).

Conclusion: Families of critically ill pediatric patients with asthma reported a high rate of unmet social needs. Furthermore, those with needs were vulnerable to longer stays and repeat asthma exacerbations requiring emergency care. Identification of these families presents an opportunity to target a high-risk population with durable medical and social interventions. (J Allergy Clin Immunol Global 2025;4:100466.)

Key words: *Asthma, social drivers of health, pediatrics, unmet social needs*

Asthma is the most common chronic disease in children and a major cause of pediatric hospitalizations and intensive care unit (ICU) admissions.[1] There is increasing evidence[2] that social drivers of health (SDOHs) (eg, environmental factors,[3-5] socioeconomic status,[6] housing,[7] education,[8] race[1,5]) are linked to asthma outcomes, similar to those seen in other chronic diseases.[9-11] These data are supported by recent studies in which census tract–derived, neighborhood-level indices of SDOHs were associated with rates of asthma-related hospital[12] and intensive care[13] admissions, as well as with the results of a meta-analysis in which social risk interventions were effective in ameliorating asthma-related morbidities.[14] Indeed, data at the level of individual families confirm that those endorsing unmet social needs in the outpatient setting were at higher risk for worse asthma.[15] Although screening for unmet needs and social drivers of health is highly emphasized in outpatient pediatric settings,[16] screening hospitalized patients remains underinvestigated,[17,18] with few studies addressing children with critical illness,[19,20] a patient population that may be particularly vulnerable in terms of both asthma severity and SDOHs.[21,22] Therefore, whether the presence of unmet needs at the family-level following ICU admission is predictive of admission outcomes or metrics relating to postadmission outpatient care (including outpatient follow-up or return for emergency or inpatient care) is unknown.

Here, we present data obtained following implementation of a screening process to identify and address the unmet social needs of critically ill pediatric patients who have been admitted for status asthmaticus. We characterize the unmet needs of this severely ill patient population and determine their associations with admission and postadmission outcomes. We also evaluate performance metrics related to the screening process and present follow-up social needs data from post-ICU outpatient encounters.

METHODS

Data collection

We implemented a social needs screening process and a prospective cohort study to assess social needs, screening metrics, and clinical outcomes in the 47-bed pediatric ICU (PICU) of our academic quaternary care pediatric hospital from February 1, 2022, through January 31, 2023. The research protocol was approved by the Children's National Hospital institutional review

From [a]the Department of Critical Care Medicine, [c]the Division of Biostatistics and Study Methodology, [d]the Sheikh Zayed Institute for Pediatric Surgical Innovation, and [g]the Division of Emergent Medicine, Children's National Hospital, Washington, DC; [f]the Center for Translational Research, Children's National Research Institute, Children's National Hospital, Washington, DC; [e]the George Washington University School of Medicine and Health Sciences, Washington, DC; and [b]the Hassenfeld Children's Hospital at NYU Langone, New York.

*These authors contributed equally to this work.

Received for publication August 21, 2024; revised January 14, 2025; accepted for publication January 19, 2025.

Available online March 31, 2025.

Corresponding author: Terry Dean, MD, PhD, 111 Michigan Ave NW, M7706, Washington, DC 20010. E-mail: tdean@childrensnational.org.

2772-8293

https://doi.org/10.1016/j.jacig.2025.100466

Abbreviations used

BiPAP: Bilevel positive airway pressure
ED: Emergency department
EMR: Electronic medical level
FSA: Family service associate
ICU: Intensive unit
IMPACT DC: Improving Pediatric Asthma Care in the District of Columbia
IQR: Interquartile range
OR: Odds ratio
PAS: Pediatric Asthma Score
PASS: Pediatric Asthma Severity Score
PICU: Pediatric intensive care unit
PRAM: Pediatric Respiratory Assessment Measure
SDOH: Social driver of health

board (Pro00016356, "Social Needs and Asthma"; approved August 16, 2021). A multidisciplinary team comprising family service associates (FSAs), an FSA supervisor, a social work manager, and critical care physicians implemented a process for identifying and screening families of ICU patients with asthma by using the Plan-Do-Study-Act (PDSA) model, with two 6-month cycles during the study period. FSAs reviewed the daily census to identify ICU patients admitted with asthma exacerbations and verified their eligibility by examining their electronic medical record (EMR). During the initial 6-month cycle (ie, the "pilot" phase), screening eligibility was limited to pediatric patients (aged 2-18 years) requiring noninvasive bilevel positive airway pressure (BiPAP) support for more than 24 hours, invasive mechanical ventilation for any duration, or use of medical therapies beyond our typical first-line agents of nebulized bronchodilators and steroids (ie, terbutaline infusion or aminophylline). These criteria were utilized to capture the more "severely ill" patients in lieu of traditional asthma severity indices (eg, Pediatric Asthma Severity Score, Pediatric Asthma Score, Pediatric Respiratory Assessment Measure) owing to ease of identification by social work team members without formal medical training.[23-25] After a review of our screening metrics, including percentage of patients screened and time investment for screening, eligibility for the second 6-month cycle was expanded to include all pediatric patients with asthma exacerbations.

Screenings were preferentially performed at bedside, but some were also conducted over the phone if family members were not present. Interpretative services assisted with interviews as necessary. Screening questions were adapted from a social needs questionnaire (see Fig E1 in the Online Repository at www.jaci-global.org) developed by Improving Pediatric Asthma Care in the District of Columbia (IMPACT DC), a dedicated outpatient asthma program at Children's National Hospital[26]; the questions assessed several domains, including (1) housing stability, (2) food access, (3) employment, (4) material goods, (5) transportation (6), child care, (7) public benefits, and (8) modifiable asthma triggers. Families with self-identified needs received immediate assistance from FSAs, who provided need-specific, location-based community services via e-mail or paper printouts per family preference. FSAs also provided information about government assistance programs and drafted letters to property owners addressing specific housing concerns when appropriate. No additional incentives were provided to families for participating in the screening protocol. *A priori*, families with 3 or more unmet social needs were referred for formal social work consultation based on emerging data connecting poor clinical outcomes to increased needs.[27,28] FSAs summarized and documented screening results in the EMR and in secure digital repositories (eg, REDCap,[29] Onedrive). Demographic information, clinical outcomes, and laboratory test results were retrieved from the EMR through *post hoc* chart review. FSAs also recorded data from unscreened patients (eg, those who did not meet eligibility criteria, those who were admitted or discharged over the weekends).

All patients were referred to a subspeciality asthma clinic (IMPACT DC, Pulmonology, or Allergy and Immunology). Patients who received follow-up care at IMPACT DC repeated the social needs questionnaire at their appointment; changes in self-reported needs between the index admission and subsequent follow-up appointments were recorded.

Statistical analyses

The primary admission outcomes included duration of BiPAP use, ICU length of stay, and hospital length of stay. The primary postadmission outcomes, evaluated at the 6-month mark following the index ICU admission, included rates of follow-up rates, emergency department (ED) visitation rates, and readmission rates. Patients requiring BiPAP or mechanical ventilation at home were excluded from outcome analyses but included in the analysis of process metrics. We used the Mann-Whitney test to evaluate differences in admission outcomes between patients without any self-reported unmet needs and those with at least 1 unmet need, and we used the chi-square test to detect differences in postadmission outcomes.

Regression analyses were conducted to consider the following predictors: unmet social need, age, race, insurance payer, and comorbidities and/or obesity. Age was included in all models. Of note, absolute eosinophil count was not included in the analysis, as it was not routinely gathered in all patients and requires repeated measurements owing to intraindividual variability.[30] Total IgE level was not included given the very few patients for whom data were available. Of the remaining predictors, only those that approached ($P < .1$) or met ($P < .05$) statistical significance to predict the outcome in question were included in the analyses. For each of the outcomes, we considered all multiple linear regression models by including all combinations of linear predictors and 2-way interactions. For the admission outcomes, we used γ-response. Additionally, for BiPAP duration, we also considered 2-part, zero-inflated models. Briefly, a zero-inflated model considers first the risk of need for BiPAP support and then, conditioning on need for BiPAP, the number of hours receiving BiPAP support. For both, the risk of need for BiPAP and the number of hours receiving BiPAP support can be explained with different covariates. Residual plots were studied for the admission outcomes models as goodness of fit tests, and Hosmer Lemeshow testing was applied to the postadmission outcome models.

Descriptive statistics summarizing patient characteristics and process metrics (eg, screening time) are detailed throughout. Simple linear regression was used to evaluate the duration of screenings as a function of increasing social needs. Kruskal-Wallis testing was used to evaluate differences in clinical outcomes between those with zero, 1 or 2, and more than 2

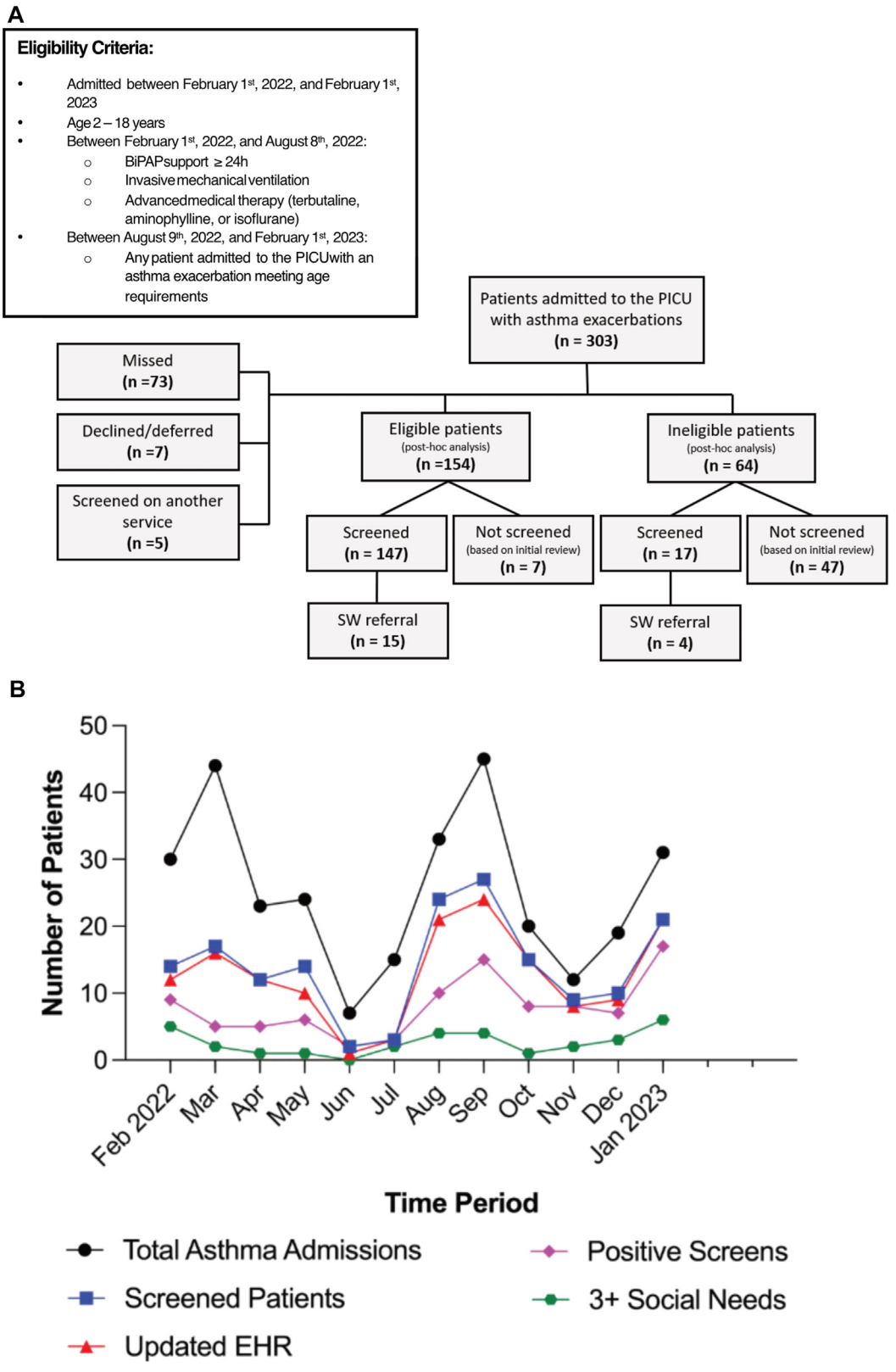

FIG 1. Patient evaluation and screening process. **A,** Flowchart of yields for patients screened in the PICU from February 1, 2022, through January 31, 2023. **B,** Run graph depicting number of patients admitted to the PICU with asthma exacerbations (*black*), as well as the number of families screened for self-identified unmet needs (*blue*). Also depicted are the number of patients with adequate electronic health record (HER) documentation (*red*), positive screens (*magenta*), and ≥ 3 social needs. *SW,* Social worker.

TABLE I. Demographic characteristics of the screened patients

Characteristic	Patients with social needs (n = 96)	Patients without social needs (n = 73)
Age (y)		
Range	0.08-20	0.67-16
Mean	6.93	5.94
Median	6	6
Race/ethnicity, no. (%)		
Black	72 (75%)	45 (61.64%)
Hispanic	18 (18.75%)	8 (10.96%)
White	3 (3.13%)	12 (16.44%)
Other	3 (3.13%)	8 (10.96%)
Comorbidity (listed if incidence > 1%), no. (%)		
Obesity*	23 (23.96%)	15 (20.55%)
Pulmonary or airway disease	13 (13.54%)	10 (13.70%)
Other	20 (20.83%)	11 (15.07%)
Type of insurance, no. (%)		
Public (Medicaid)	89 (92.71%)	51 (69.86%)
Other	7 (7.87%)	22 (43.14%)

*Defined as a body mass index higher than 95% for age or a diagnosis of obesity in the EMR problem list.

TABLE II. Results of laboratory analyses of data from screened patients

Variable	Patients with social needs (n = 96)	Patients without social needs (n = 73)
CBC data and results		
Patients with CBC data	68 (70.83% of cohort)	41 (56.16% of cohort)
Patients with AEC > 150 cells/μL	40 (58.82% of those tested)	17 (41.46% of those tested)
Total IgE level, no. (%)		
Patients with IgE level testing	14 (14.58% of cohort)	5 (6.85% of cohort)
Patients with IgE level < 76 IU/mL	1 (7.14% of those tested)	0
Patients with IgE level of 76-700 IU/mL	6 (42.86% of those tested)	4 (80% of those tested)
Patients with IgE level > 700 IU/mL	7 (50% of those tested)	1 (20% of those tested)

AEC, Absolute eosinophil count; *CBC*, complete blood count.

needs, whereas the Kolmogorov-Smirnov test was used to assess differences in the distribution of clinical outcomes. The chi-square test was used to compare postadmission outcomes for unscreened patients (ie, patients who failed to meet eligibility requirements in the pilot phase or patients who were missed owing to resource limitations). The Wilcoxon matched pairs signed rank test was used to determine whether there were changes in unmet needs between the PICU and follow-up IMPACT DC screenings.

Data were analyzed with GraphPad Prism (Dotmatics, Boston, Mass) and R, version 4.3.1 (2023-06-16 ucrt, Beagle Scouts, Vienna, Austria).

RESULTS

In total, individuals from the families of 169 of the 303 critically ill children admitted the PICU for status asthmaticus underwent screening for unmet social needs (Fig 1). Among the unscreened caregivers, 54 failed to meet rolling eligibility requirements at the time of initial FSA review, 73 were missed because of screening process limitations (eg, ICU course occurred primarily outside normal business hours), and 7 declined or deferred screening. Several "ineligible" patients underwent screening, including those who failed to meet the severity threshold set for the pilot period and those who were outside the specified age range. However, all screened patients remained part of the data set. We established 3 pools of patients for comparative analysis: (1) screened patients with at least 1 self-identified unmet social need (n = 96 [57%]), (2) screened patients without needs (n = 73 [43%]), and (3) unscreened patients (n = 76).

The median age of the screened patients was 6 years (range 1 month-20 years) of age (Table I). Most patients were members of a racial or ethnic minority, with 69.2% of screened patients (n = 117) identified as Black in the EMR. A majority used public insurance (eg, Medicaid) (n = 140 [82.9%]). Comorbidities were common, with high rates of obesity (n = 38 [22.5%]) and coexisting pulmonary or airway disease (n = 23 [13.6%]).

Interestingly, according to the EMRs of the screened patients, 109 (64.5% of the screened cohort) were noted to have undergone laboratory testing with a peripheral complete blood count at some time preceding, during, or following their hospitalization (Table II). Of these patients, 52.3% were noted to have absolute eosinophil acount (AEC) greater than 150 cells/μL.[30] Additionally, although only a minority of patients (11.2%) also underwent total IgE level testing, 94.7% were noted to have an IgE level higher than 76 IU/mL, inclusive of the 42.1% noted to have an IgE level higher than 700 IU/mL[31] (Table II).

On average, patients with no needs required a mean of 30.5 minutes plus or minus an SD of 7.4 minutes for screening, whereas those with 1 or 2 needs required a mean of 36.9 plus or

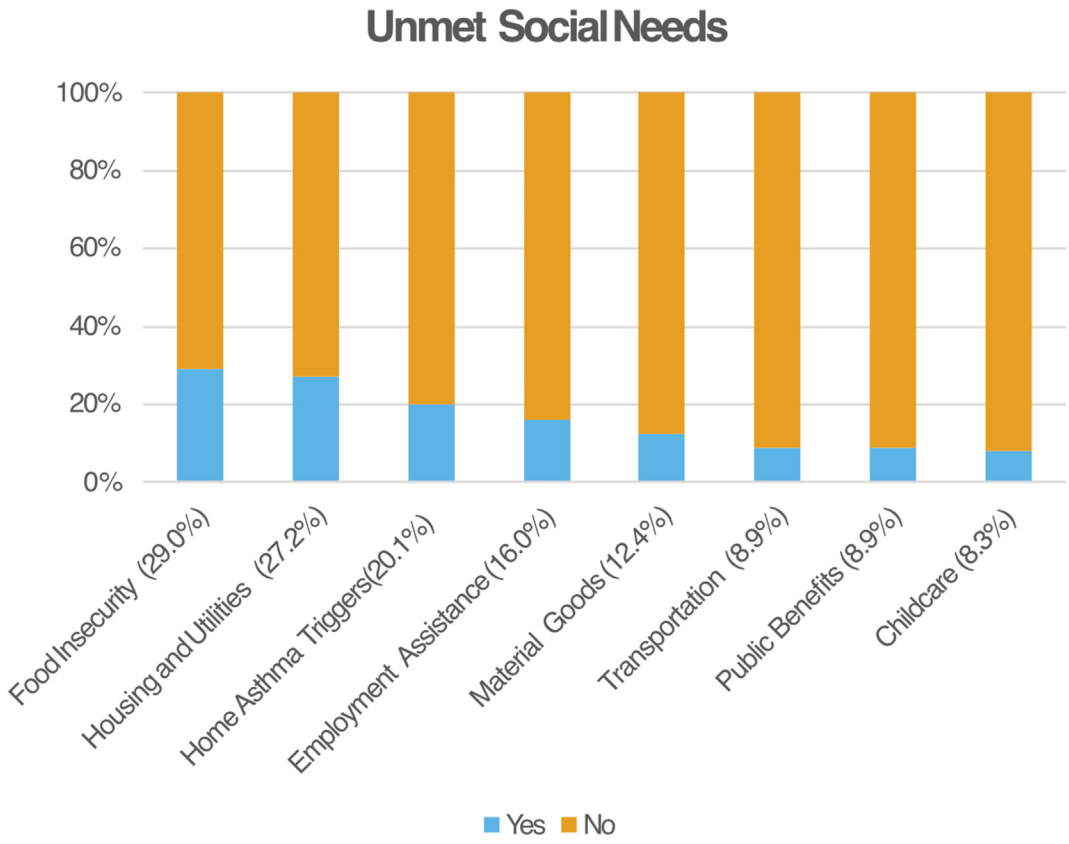

FIG 2. Unmet social needs in critically ill asthmatic patients. Bar graph depicting the percentage of screened patients with identified social needs.

TABLE III. Summary of regression analyses

Variable, median (IQR)	6-mo readmission	6-mo ED visitation rate	6-mo follow-up	Hospital length of stay (d)	ICU length of stay (d)	Duration of BiPAP use (h)
Social need	2.0 (0.8-5.4)	2.5 (1.2-5.3)†	0.8 (0.4-1.6)	0.9 (0.7-1.2)	1.2 (0.9-1.4)	1.1 (0.9-1.4)
Age (y)	0.9 (0.8-1.0)*	0.9 (0.9-1.0)	1.0 (0.9-1.0)	1.0 (1.0-1.0)	1.0 (1.0-1.0)	1.0 (1.0-1.0)
Commercial insurance	4.9 (1.6-15.7)‡	2.8 (1.0-8.4)*			0.8 (0.5-1.0)*	
Other insurance	3.8 (1.3-11.1)‡					
Black race		2.6 (1.1-6.2)†		1.2 (1.0-1.4)*		
Pulmonary comorbidity			3.3 (1.2-10.1)†			
Social need:age				1.03 (1.00-1.07)†		
Obesity						1.3 (1.0-1.8)*

*$05 \leq P < 01$ (criterion for inclusion in the model).
†$P < .05$.
‡$P < .01$.

minus 8.9 minutes and those with at least 3 needs required a mean of 49.8 plus or minus 18.8 minutes. Increasing unmet needs were associated with longer screening duration ($R^2 = 0.339$ [$P < 0001$]; see Fig E2 in the Online Repository at www.jaci-global.org). In all, 31 families disclosed 3 or more unmet social needs, with 19 receiving social work referrals (61%). For families reporting at least 1 unmet need on the questionnaire (see Fig E1), the following were most prevalent (Fig 2): (1) food insecurity (n = 49 [29.0%]), (2) housing and/or utility assistance (n = 47 [27.8%]), and (3) household asthma triggers (eg, pests, dust, mold, unresponsive landlord; n = 34 [21.1%]).

Among the screened patients, those from families with unmet needs demonstrated nonsignificant trends toward longer durations of BiPAP use (median = 29 hours [interquartile range (IQR) = 8.75-39.75 hours] vs 27 hours [IQR = 15.00-39.75 hours], respectively), ICU length of stay (2.14 days [IQR = 1.37-3.64 days] vs 1.86 days [IQR = 1.32-2.94 days], respectively), and duration of hospitalization (4.11 days [IQR = 3.10-5.31 days] vs 3.43 days [IQR = 2.60-5.09 days], respectively). However, patients with at least 3 unmet social needs experienced admission-related outcomes similar to those of patients with 1 or 2 needs and those without needs (see Fig E3 in the Online Repository at www.jaci-global.org). The details of each regression analysis for the admission outcomes are depicted in Table III, Fig 3, and Fig E4 (available in the Online Repository at www.jaci-global.org).

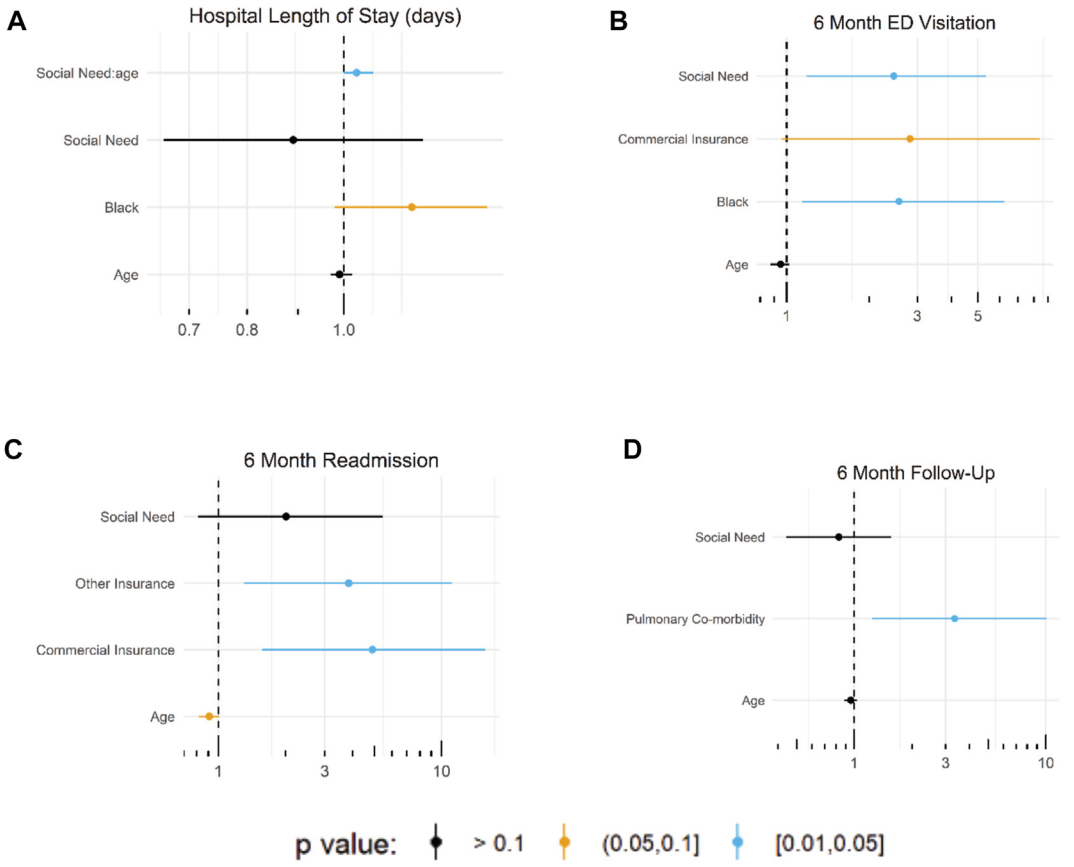

FIG 3. Associations between outcomes and variables included in the regression analysis. Plots depict ORs for age, social needs, and variables included in the regression analyses for outcomes: hospital length of stay (**A**), 6-month ED visit (**B**), 6-month readmission (**C**), and 6-month outpatient follow-up (**D**). All variables predictive of outcome with regression analysis are labeled in blue ($P < .05$), whereas those labeled in orange approached statistical significance ($.05 \leq P < .01$).

First, no significant associations were observed between unmet social needs and BiPAP use or duration of BiPAP use. Specifically, in the zero-inflated model for BiPAP use, patient age in the absence of social needs was the only significantly associated predictor, such that for every 1-year increase in age, the odds ratio (OR) for BiPAP use was 1/0.6 = 1.7 (95% CI = 1.2-3.0); other associations with age and social needs did not reach statistical significance. For duration of BiPAP use (see Fig E4, *A*) and ICU length of stay (see Fig E4, *B*), obesity and commercial insurance were the only variables meeting the criteria for inclusion in the regression analysis, respectively. For regression analysis of hospital length of stay (Fig 3, *A*), race met the *P* value criteria for inclusion, and there was a significant association between the interaction of age, social needs, and hospital length of stay (OR = 1.03 [95% CI = 1.00-1.07]) among patients with social needs, with every 1-year increase in age being associated with a 3% increase in hospital length of stay.

For 6-month postadmission outcomes, patients with unmet needs showed significantly increased rates of return to the ED (40.4% vs 22.2%; $X^2 = 6.16$ [$P = .013$]) but similar rates of specialty service follow-up (44.68% vs 48.61%; $X^2 = 0.25$ [$P = .615$]) and hospital readmission (20.21% vs 13.89%; $X^2 = 1.13$ [$P = .288$]). In the regression analyses of 6-month ED return rates, race and commercial insurance both met the criteria for inclusion, and unmet needs remained significantly associated with the outcome (OR = 2.6 [95% CI = 1.1-6.2]) (Fig 3, *D*). For 6-month hospital readmission rates (Fig 3, *E*) and outpatient follow-up (Fig 3, *F*), insurance payer and pulmonary comorbidities met the criteria for inclusion in analyses, respectively, but the presence of social needs was not associated with differences in either outcome. There was no difference between screened and unscreened patients in terms of 6-month postadmission outcomes: ED visits (32.5% vs 45.1%; $X^2 = 3.38$ [$P = .066$]), specialty service follow-up (46.4% vs 46.5%; $X^2 = 0.00017$ [$P = .99$]), and hospital readmission (17.5% vs 19.7%; $X^2 = 0.17$ [$P = .68$]).

Of those patients screened in the PICU, 50 were subsequently seen and rescreened at IMPACT DC using the same questionnaire; 53.7% demonstrated a reduction in the number of self-reported needs, whereas 41.5% reported no change and 4.9% reported additional needs (see Fig E5 in the Online Repository at www.jaci-global.org), resulting in an overall decrease in reported unmet needs (median change at follow-up = –1 need [$P = .0011$]).

DISCUSSION

There is increasing evidence that the families of critically ill pediatric patients are socially vulnerable.[21,32] Indeed, the majority (57%) of families studied here reported at least 1 self-reported

unmet social need that would have gone unrecognized without dedicated social needs screening. The most frequently reported needs included food, housing, and help with household asthma triggers, which is consistent with the results of previous studies[3-5]; however, they were reported at higher rates than in the general population.[33-35] This suggests that the needs at the level of individual families are critical to obtain, in terms of both providing family-specific resources and individualizing asthma-directed care. Of note, family-level needs may be more sensitive to the SDOH-related influence on pediatric asthma outcomes than are geo-tagged, neighborhood-level indices alone.[36]

Although we hypothesized that unmet needs would predict worse ICU-related outcomes, no differences in duration of BiPAP use or ICU length of stay were detected. However, an interaction between social needs and age was found to be associated with duration of hospitalization, suggesting that older patients (eg, adolescents) with unmet social needs require longer hospital stays. Although this interaction requires further investigation, we suspect that SDOHs may contribute to treatment adherence in these patients, which has been shown to affect asthma outcomes.[37] We also found that the presence of unmet needs was associated with a higher 6-month rate of return to the ED (which is consistent with the findings of previous studies[38]) and a trend toward a higher rate of hospital readmission. In effect, these data suggest that the presence of needs serves as a biomarker for future asthma morbidity. We posit that providing these families with medical and/or social interventions at the time of their ICU admission may prevent follow-up ED visits, reduce downstream hospitalizations, and shorten hospital stays, which could help alleviate the socioeconomic and cumulative childhood trauma associated with asthma.[14,38-40] To address this specifically, follow-up studies should look beyond the ICU and focus on the efficacy of social interventions (ie, providing resources) in terms of post-ICU metrics at the level of individual families. Our data are optimistic in suggesting that screening and provision of resources reduces unmet needs at post-ICU follow-up; however, we recognize that they are highly susceptible to attrition bias. Therefore, these findings must be corroborated with data from families who did not return to outpatient care. This would also be an opportunity to more directly assess barriers to resources that are likely specific to each family (eg, based on their unique circumstances) and each community resource (eg, based on ease of access).

Our protocol prioritized in-person interviews for social needs screenings. For families with a high burden of unmet needs (eg, ≥3), personnel needed approximately 50 minutes to conduct the screening and provide families with appropriate resources and explanations. Alternatively, our staff also required 30 minutes to screen families without needs, which is a considerable investment of time without clear benefit to the family. Anonymous electronic screening will reduce staff time for these patients while affording health care systems the flexibility needed to honor patient and caregiver preferences for screening[41]; however, it risks omitting families uninterested in completing an electronic screener. More work is needed to substantiate the risks and benefits of electronic screening beyond those in the limited literature published to date.[42]

We recognize several study limitations. From a technical standpoint, our center could not support screenings outside business hours, which might have preferentially excluded patients with shorter ICU admissions (eg, <1 day) and biased the sample toward sicker patients. We expect that automated electronic screenings will address these limitations in the future. It is also important to recognize that our screening process specifically captured self-reported needs. Although validated screening tools may more accurately identify social risk factors, exceedingly few validated screeners exist for social domains outside food insecurity and interpersonal violence.[43,44] A benefit, however, is that identifying self-reported needs may select families more amenable to receiving and accessing resources provided by medical professionals. In short, additional studies are needed to determine the correlation between self-identified needs assessments, validated social risk screening tools, and census-driven composite scores to inform universal approaches to screening, as recent studies indicate overwhelming caregiver approval of inpatient screening and longitudinal support.[45,46]

An additional limitation stems from our inability to fully characterize disease heterogeneity within our cohort using asthma phenotypes and endotypes.[47,48] We summarized the available peripheral eosinophil counts and IgE levels in our patients, which suggests that half of our cohort has type 2–high, eosinophilic asthma. However, these levels were not routinely obtained in all patients and were missing from the data on more than one-third of our cohort. Furthermore, among individuals with testing, levels were not consistently repeated and details about concomitant steroid use at the time of testing were lacking, both of which could lead to inaccuracy in classification.[30,49] As these prohibited meaningful inclusion in our statistical analysis, we cannot comment on whether certain phenotypes or endotypes are more strongly associated with unmet social needs. As the heterogeneity of asthma subtypes is now so critical as to warrant specific treatment strategies,[50] it will also be important to understand the interaction of social circumstance with underlying asthma biology. Similarly, data about concomitant or previous viral infections were lacking for most patients. The correlation between respiratory viruses (eg, respiratory syncytial virus, rhinovirus) in early childhood and the later development of asthma is well known,[51] and understanding the influence of social drivers on both exposure risk and subsequent development of asthma warrants further investigation.[52]

Given the various correlations between social and biologic characteristics of asthma, we expect that the next wave of scholarly inquiry will focus on whether resolving unmet social needs improves asthma outcomes. As such, we anticipate that future studies will need to integrate granular data at multiple points of contact: inpatient, outpatient, and within the community.

DISCLOSURE STATEMENT

Supported by the Children's National Hospital Department of Critical Care Medicine and the National Institutes of Health (grant 1K08NS131529 [to T.D.] and 1K01MD018636 [to R.M.]).

Disclosure of potential conflict of interest: The authors declare that they have no relevant conflicts of interest.

We would like to acknowledge Michael J. Bell and the Children's National Division of Critical Care Medicine for supporting the mission of the social drivers of health work group, including funding the screening process and data analyses included in this study.

REFERENCES

1. Zahran HS, Bailey CM, Damon SA, Garbe PL, Breysse PN. Vital signs: asthma in children - United States, 2001-2016. MMWR Morb Mortal Wkly Rep 2018;67:149-55.
2. Grant T, Croce E, Matsui EC. Asthma and the social determinants of health. Ann Allergy Asthma Immunol 2022;128:5-11.
3. Sharpe R, Thornton CR, Osborne NJ. Modifiable factors governing indoor fungal diversity and risk of asthma. Clin Exp Allergy 2014;44:631-41.
4. O'Connor GT, Walter M, Mitchell H, Kattan M, Morgan WJ, Gruchalla RS, et al. Airborne fungi in the homes of children with asthma in low-income urban communities: the Inner-City Asthma Study. J Allergy Clin Immunol 2004;114:599-606.
5. Hughes HK, Matsui EC, Tschudy MM, Pollack CE, Keet CA. Pediatric asthma health disparities: race, hardship, housing, and asthma in a national survey. Acad Pediatr 2017;17:127-34.
6. Castro M, Schechtman KB, Halstead J, Bloomberg G. Risk factors for asthma morbidity and mortality in a large metropolitan city. J Asthma 2001;38:625-35.
7. Northridge J, Ramirez OF, Stingone JA, Claudio L. The role of housing type and housing quality in urban children with asthma. J Urban Health 2010;87:211-24.
8. Holt EW, Theall KP, Rabito FA. Individual, housing, and neighborhood correlates of asthma among young urban children. J Urban Health 2013;90:116-29.
9. Cockerham WC, Hamby BW, Oates GR. The social determinants of chronic disease. Am J Prev Med 2017;52:S5-12.
10. Seligman HK, Laraia BA, Kushel MB. Food insecurity is associated with chronic disease among low-income NHANES participants. J Nutr 2010;140:304-10.
11. Prather AA, Gottlieb LM, Giuse NB, Koonce TY, Kusnoor SV, Stead WW, et al. National Academy of Medicine social and behavioral measures: associations with self-reported health. Am J Prev Med 2017;53:449-56.
12. Tyris J, Gourishankar A, Ward MC, Kachroo N, Teach SJ, Parikh K. Social determinants of health and at-risk rates for pediatric asthma morbidity. Pediatrics 2022;150:e2021055570.
13. Akande MY, Ramgopal S, Graham RJ, Goodman DM, Heneghan JA. Child opportunity index and emergent PICU readmissions: a retrospective, cross-sectional study of 43 U.S. hospitals. Pediatr Crit Care Med 2023;24:e213-23.
14. Tyris J, Keller S, Parikh K. Social risk interventions and health care utilization for pediatric asthma: a systematic review and meta-analysis. JAMA Pediatr 2022;176:e215103.
15. Telzak A, Fiori KP, Chambers EC, Haughton J, Levano S, Reznik M. Unmet social needs and pediatric asthma severity in an urban primary care setting. Acad Pediatr 2023;23:1361-7.
16. Hagan JF, Shaw JS, Duncan PM (eds). *Bright futures: guidelines for health supervision of infants, children and adolescents*, 4th ed, Elk Grove Village (IL): American Academy of Pediatrics, 2017.
17. Islam F, Fiori KP, Rinke ML, Acholonu R, Luke MJ, Cabrera KI, et al. Implementing inpatient social needs screening in an urban tertiary care children's hospital. Hosp Pediatr 2024;14:480-9.
18. Lopez MA, Yu X, Hetrick R, Raman S, Lee J, Hall J, et al. Social needs screening in hospitalized pediatric patients: a randomized controlled trial. Hosp Pediatr 2023;13:95-114.
19. Sokol R, Austin A, Chandler C, Byrum E, Bousquette J, Lancaster C, et al. Screening children for social determinants of health: a systematic review. Pediatrics 2019;144:e20191622.
20. Cooper S, Rahme E, Tse SM, Grad R, Dorais M, Li P. Are primary care and continuity of care associated with asthma-related acute outcomes amongst children? A retrospective population-based study. BMC Prim Care 2022;23:5.
21. Najjar N, Opolka C, Fitzpatrick AM, Grunwell JR. Geospatial analysis of social determinants of health identifies neighborhood hot spots associated with pediatric intensive care use for acute respiratory failure requiring mechanical ventilation. Pediatr Crit Care Med 2022;23:606-17.
22. Akande M, Paquette ET, Magee P, Perry-Eaddy MA, Fink EL, Slain KN. Screening for social determinants of health in the pediatric intensive care unit: recommendations for clinicians. Crit Care Clin 2023;39:341-55.
23. Gouin S, Robidas I, Gravel J, Guimont C, Chalut D, Amre D. Prospective evaluation of two clinical scores for acute asthma in children 18 months to 7 years of age. Acad Emerg Med 2010;17:598-603.
24. Maue DK, Krupp N, Rowan CM. Pediatric asthma severity score is associated with critical care interventions. World J Clin Pediatr 2017;6:34-9.
25. National Asthma E, Prevention P. Expert Panel Report 3 (EPR-3): Guidelines for the diagnosis and management of asthma-summary report 2007. J Allergy Clin Immunol 2007;120(suppl 5):S94-138.
26. Teach SJ, Crain EF, Quint DM, Hylan ML, Joseph JG. Improved asthma outcomes in a high-morbidity pediatric population: results of an emergency department-based randomized clinical trial. Arch Pediatr Adolesc Med 2006;160:535-41.
27. Rucker AC, Watson A, Badolato G, Boyle M, Hendrix C, Jarvis L, et al. Predictors of elevated social risk in pediatric emergency department patients and families. Pediatr Emerg Care 2022;38:e910-7.
28. Cole MB, Nguyen KH. Unmet social needs among low-income adults in the United States: Associations with health care access and quality. Health Serv Res 2020;55(suppl 2):873-82.
29. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)–a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform 2009;42:377-81.
30. Corren J, Du E, Gubbi A, Vanlandingham R. Variability in blood eosinophil counts in patients with eosinophilic asthma. J Allergy Clin Immunol Pract 2021;9:1224-31.e9.
31. Louis R, Pilette C, Michel O, Michils A, Brusselle G, Poskin A, et al. Variability in total serum IgE over 1 year in severe asthmatics. Allergy Asthma Clin Immunol 2019;15:20.
32. Grunwell JR, Opolka C, Mason C, Fitzpatrick AM. Geospatial analysis of social determinants of health identifies neighborhood hot spots associated with pediatric intensive care use for life-threatening asthma. J Allergy Clin Immunol Pract 2022;10:981-91.e1.
33. Kim EJ, Abrahams S, Uwemedimo O, Conigliaro J. Prevalence of social determinants of health and associations of social needs among United States adults, 2011-2014. J Gen Intern Med 2020;35:1608-9.
34. Solari CD, Lo L, A R, Bond L. Housing insecurity in the District of Columbia: results from a representative survey. Available at: https://www.urban.org/research/publication/housing-insecurity-district-columbia. Accessed May 24, 2024.
35. Martincheck K, Gupta P, M K, D G. As Inflation squeezed family budgets, food insecurity increased between 2021 and 2022: findings from the Well-Being and Basic Needs Survey. Available at: https://www.urban.org/research/publication/inflation-squeezed-family-budgets-food-insecurity-increased-between-2021-and-2022. Accessed May 24, 2025.
36. Tyris J, Putnick DL, Bell EM, McAdam J, Lin TC, Parikh K, et al. Child Opportunity Index mobility, recurrent wheezing, and asthma in early childhood: a population-based prospective cohort study. J Pediatr 2024;272:114121.
37. Kaplan A, Price D. Treatment adherence in adolescents with asthma. J Asthma Allergy 2020;13:39-49.
38. Mayes KD, Cash RE, Schiavoni KH, Vogeli C, Thorndike AN, Camargo CA Jr, et al. Social risk, social need, and use of the emergency department. JAMA Netw Open 2024;7:e2352365.
39. Pinquart M. Posttraumatic stress symptoms and disorders in children and adolescents with chronic physical illnesses: a meta-analysis. J Child Adolesc Trauma 2020;13:1-10.
40. Allgire E, McAlees JW, Lewkowich IP, Sah R. Asthma and posttraumatic stress disorder (PTSD): Emerging links, potential models and mechanisms. Brain Behav Immun 2021;97:275-85.
41. Gayle T, Law A, Stokes S, Page A, Neal W, Bhansali P. Parent preferences on screening for social determinants of health in hospitalized children. Hosp Pediatr 2023;13:623-35.
42. Gottlieb L, Hessler D, Long D, Amaya A, Adler N. A randomized trial on screening for social determinants of health: the iScreen study. Pediatrics 2014;134:e1611-8.
43. Moen M, Storr C, German D, Friedmann E, Johantgen M. A review of tools to screen for social determinants of health in the United States: a practice brief. Popul Health Manag 2020;23:422-9.
44. Karran EL, A GC, Barker T, M AB, Chiarotto A, Dewidar O, et al. The 'what' and 'how' of screening for social needs in healthcare settings: a scoping review. PeerJ 2023;11:e15263.
45. Luke MJ, Fernandes DM, Leon Rodriguez F, Acholonu RG, Fiori K. Caregiver perspectives on social needs screening and interventions in an urban children's hospital. Hosp Pediatr 2023;13:670-81.
46. Leary JC, Rijhwani L, Bettez NM, Harrington Y, LeClair AM, Garg A, et al. Parent perspectives on screening for social needs during pediatric hospitalizations. Hosp Pediatr 2022;12:681-90.
47. Fainardi V, Esposito S, Chetta A, Pisi G. Asthma phenotypes and endotypes in childhood. Minerva Med 2022;113:94-105.
48. Roberto G, Barberi S, Marseglia GL, Licari A. What's new in pediatric asthma and rhinitis phenotypes and endotypes? Curr Opin Allergy Clin Immunol 2024;24:73-8.
49. Prazma CM, Bel EH, Price RG, Bradford ES, Albers FC, Yancey SW. Oral corticosteroid dose changes and impact on peripheral blood eosinophil counts in patients with severe eosinophilic asthma: a post hoc analysis. Respir Res 2019;20:83.
50. Jackson DJ, Wechsler ME, Jackson DJ, Bernstein D, Korn S, Pfeffer PE, et al. Twice-yearly depemokimab in severe asthma with an eosinophilic phenotype. N Engl J Med 2024;391:2337-49.
51. Jackson DJ, Lemanske RF Jr. The role of respiratory virus infections in childhood asthma inception. Immunol Allergy Clin North Am 2010;30:513-22, vi.
52. Espaillat AE, Hernandez ML, Burbank AJ. Social determinants of health and asthma. Curr Opin Allergy Clin Immunol 2023;23:144-50.