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The Impact of Health Insurance Coverage on Short-Term and Long-Term Readmissions to the Emergency Department for Pediatric Patients with Asthma: A Retrospective Regression Analysis

Micheline Plantada
Medical University of South Carolina

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BY

Micheline Plantada

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By

Micheline M. Plantada

Chairperson: Jami Jones, PhD, MHA
Committee: Kit Simpson, DrPH, MPH
Larry Leaming, RRT, DHA, LFACHE

Abstract

Inadequate health insurance coverage may hinder the management of asthma in children in recurrent emergency department (ED) visits in comparison to children with health care insurance. Children with asthma who do not have health insurance are at risk of not having access to primary care physicians. They may live in poorer communities, where they are more likely to encounter higher concentrations of asthma-inducing agents or factors contributing to increased healthcare utilization, resulting in increased expenditures and reduced patient outcomes.

Keywords: Pediatric asthma; emergency department; race/ethnicity; health insurance.

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CHAPTER I INTRODUCTION

1.1 Background and Need

Pediatric asthma has become the most dominant chronic and increasingly frequent condition in the United States (Ruffner et al., 2018). Asthma-related mortality in the pediatric and young adult population is infrequent. It is avoidable when following the national guidelines for asthma treatment, maintenance, and education, especially for persons with an increased risk of death attributed to asthma. In the United States, the death rate related to asthma showed an increase in 2020 in comparison to both 2019 and 2021. According to the Centers for Disease Control and Prevention (CDC), the noted rise in deaths could potentially be attributed to the rise in mortality rates stemming from the continued COVID-19 outbreak (CDC, 2021). Jafarnejad & Khoshnezhad Ebrahimi (2020), also stated that a total of 1.8 million pediatric patients with uncontrolled asthma were presented to the emergency room with asthma exacerbations. This further emphasizes the need to ensure children receive access to care, timely treatment, and the resources needed to prevent frequent emergency department visits due to uncontrolled asthma.

2021 data from the CDC showed there were more than 4.6 million children affected by asthma under the age of 18. As of 2021, the CDC states that for children ages five through 14 years old, the asthma prevalence was less for females compared to males. Data collected by the CDC in 2018 also showed there were 136,000 hospitalizations, 200 pediatric fatalities, and $37 billion dollars in healthcare expenses that were attributed to pediatric asthma solely in the United States (Ruffner et al., 2018).

Children are more susceptible to airway emergencies due to their smaller respiratory airways. Having smaller respiratory airways can be a strong factor in children being more likely to develop chronic inflammatory diseases like asthma (Jafarnejad & Khoshnezhad Ebrahimi,

2020). An asthmatic episode or exacerbation can occur due to triggers such as external and internal allergens, and viral respiratory infections (Castillo et al., 2017). According to Bhaumik et al. (2019), we can determine that in the U. S. more than 9% pediatric asthma sufferers are below the age of 18. Blacks and Hispanics have a higher rate of asthma compared to other minorities of children with asthma.

The symptoms of asthma exacerbation can result from the reactions of allergens such as tobacco smoke, strong odors, pollen, dust, and mold. These allergens have the ability to cause inflammation in the lower airways, increase the production of secretions, and enhance the airway response in individuals with asthma (Castillo et al., 2017). Asthma, a long-term condition affecting the lower respiratory tract, inflammation of the airways, bronchoconstriction, and bronchial hyperresponsiveness. If chronic and severe, airway edema and increased mucous secretion can lead to airway remodeling and permanent constriction. If left untreated, an acute, severe asthma exacerbation that is not responsive to repeated inhaled beta-agonist delivery may be fatal (Lee et al., 2020).

Successful asthma management involves educating patients on monitoring their asthma symptoms, the factors and elements that trigger an asthma episode, and how to control or avoid them. Educating patients to monitor their lung function and any comorbid conditions is important. Reinforcement to adhere to their medication treatment plan is essential to reducing asthma exacerbations (Castillo et al., 2017).

Lack of access to healthcare due to socioeconomic factors and being uninsured are significant factors in recurrent emergency department readmissions due to asthma (George et al., 2023). Adherence to physician follow-up visits can be difficult for asthmatic patients due to the number of missed days from school, or access to care. However, not having access to an asthma

care plan due to lack of insurance, access to care, or neglecting medical advice, and not adhering to a daily complex preventative asthma prescription drug therapy regimen, may place asthmatic patients at risk for morbidity and death due to asthma-related illness (Ruffiner et al., 2018). Inadequately controlled asthma in children leads to increased school absenteeism, hospitalizations, asthma exacerbations, and more frequent hospital visits, increasing healthcare costs (Hsu et al., 2016). Poorly controlled asthma is also a contributing factor to poor outcomes in childhood obesity, physical inactivity, stress, concentration, attention, learning disabilities, and depression (Pedersen, 2016).

Need

The study will evaluate the hypothesis that uninsured patients are more likely to revisit the emergency department within 30 days after their initial visit for asthma exacerbations compared to insured patients. The significance of this study lies in its ability to provide data and determine the necessity and advantages of ensuring children with asthma have access to treatment management, follow-up care, and education on the triggers and environmental factors that contribute to asthma exacerbations requiring recurrent ED visits. Children with asthma use more healthcare resources and cost more to treat than those without asthma, placing a heavy financial burden on the U.S. healthcare system (Perry et al., 2018).

1.2 Problem Statement

Asthmatic children are more likely to visit the Emergency department for an asthma exacerbation than adults. Uninsured children between the ages of two to seventeen years old diagnosed with asthma have emergency department readmissions for asthma exacerbation and an increased mortality risk compared to insured children in the same age range (CDC, 2021).

This study aims to analyze the potential impact of health insurance status on the

frequency of asthma exacerbation readmissions from short–term 7-day readmission post-ER visit to long–term 30-day readmissions post-initial ER visit for pediatric asthmatic patients, with the goal of improving healthcare outcomes and identifying possible areas for intervention.

1.3 Research Question

Is the availability or lack of health insurance coverage a determinant factor in the likelihood of Short-Term (7-day) or Long-Term (30-day) readmission to the emergency department (ED) for pediatric patients who recently visited the ED following Asthma symptoms?

1.4 Hypothesis

Hypothesis 1:

Uninsured patients are more likely to have a repeat visit to the emergency department within seven days of their initial emergency department visit for an asthma exacerbation.

Rationale:

When visiting the emergency department for an asthma exacerbation, patients are usually treated with a bronchodilator either by nebulizer or metered dose inhaler (Lizzo & Cortes, 2023). When patients are discharged from the ED, patients are provided with a prescription for filling the bronchodilator medication in an outpatient pharmacy. Economic barriers prevent many uninsured patients from accessing their medicine, resulting in repeat emergency room admissions (Ruffiner et al., 2018).

Hypothesis 2:

Patients with Medicaid or without healthcare insurance (compared to private healthcare insurance) are more likely to have a repeat ED visit between eight and 30 days of the initial ED visit.

Rationale:

Not having regular access to a primary care physician can increase the probability of recurring visits to the emergency department for asthma. Children with regular access to primary care physicians had reduced asthma related ED visits (Cooper et al., 2022). Uninsured patients and patients covered by Medicaid are more likely to have socioeconomic barriers to accessing primary care and may use the ED as their primary care resource (Garney et al., 2021).

CHAPTER II LITERATURE REVIEW

A literature review was conducted on pediatric emergency room asthma exacerbation visits of uninsured versus insured children from underrepresented communities. Study designs observed in the publications included retrospective studies, prospective reviews, systematic reviews, and literature reviews. The Medical University of South Carolina database was used to access PUBMED, MEDLINE, and Cochrane publications.

The literature review found similarities in Jafarnejad et al., (2020), which stated that 1.8 million pediatric patients with uncontrolled asthma were presented to the emergency room with asthma exacerbations. However, Perry et al., (2018) conducted an in-depth literature review in an online database search covering 95% of hospitals in the United States. This research included multiple pieces of literature identifying pediatric patients presenting to the emergency department based on specific ICD-9 code 493 asthma diagnosis, private healthcare insurance, public healthcare insurance such as Medicaid, or non-insured patients. It also included the socioeconomic status and medication adherence of children with asthma. Notably, the ICD-9 code 493 for asthma changed to J45.0 – J45.998 ICD-10CM (National Center for Environmental Health, 2019).

Perry et al., (2018) focused on the economic burden caused by emergency room visits by children with asthma enrolled in Medicaid than that of asthmatic children enrolled in private healthcare insurance. In 2010, the cost to Medicaid from emergency room visits in the United States was estimated at 272 million dollars. This study showed that emergency room visit costs in a mixed healthcare insurance population were estimated between $152.00 to $172.00 per patient each year. Asthmatic children in the United States Healthcare System consequently pose a significantly higher healthcare utilization and cost than non-asthmatic children, making them a

greater cost risk. (Perry et al., 2018).

At the time of this study, Perry et al., (2018) disclosed a conflict of interest of one of the authors, a current employee of Omron Healthcare Europe. They did disclose that the author was compensated for participation in this literature review. Limitations noted in the Perry et al., (2018) study were that it mainly focused on reporting asthmatic children enrolled in Medicaid, with only one study reporting on those enrolled in private healthcare insurance. This provides an imbalance in socioeconomic status compared to other studies where children with asthma enrolled in Medicaid are more likely to visit the emergency room than non-asthmatic children, as stated in a study by Alcala et al., (2017). In this study, Alcala et al. (2017), presented observed data on the determining factors of asthma morbidity. Specifically, they examine the impact of childhood poverty, which is concentrated in specific neighborhoods, on health outcomes at the individual level, considering variations in healthcare insurance coverage.

Previous research studies have shown a link between poverty, negative health effects, and inequalities in health outcomes, which are connected to variations in access to public and private healthcare insurance coverage. Alcala et al. (2017) suggest that the combination of concentrated poverty and an individual's insurance coverage amplifies health disparities. The effects of poverty on individuals differ depending on whether they live in neighborhoods with high poverty levels or more affluent areas. This also ties in with not having the affordability to obtain asthma control medication, adherence to asthma treatment, and visiting a physician.

Alcala et al. (2017), encountered various obstacles, such as the inability to identify exact dates or establish a direct connection between matching individual patients and the frequency of repeat emergency room visits by pediatric asthma exacerbations. The research findings also brought attention to the possibility of bias that may arise because of the challenges in accurately

measuring the proportion of privately insured patients versus those insured through Medicaid, considering their immigration status. The research conducted by Pate et al. (2019) revealed that children diagnosed with asthma and enrolled in public health insurance programs, such as Medicaid or not having health insurance coverage, encountered more significant financial barriers when accessing medical services from physicians or specialists.

A correlation was also found between increased asthma morbidity and children living in impoverished metropolitan environments. A cross-sectional analysis was conducted by Sullivan et al. (2019) on a sample size of 15,052 children between the ages of one to 17 years old. These participants were selected from the 2000-2014 Medical Expenditure Panel Survey (MEPS) dataset. The analysis focused on indicators denoting inadequate management of asthma, such as the use of over three canisters of short-acting beta agonist (SABA), also known as a "bronchodilator" or a "rescue inhaler" over three months, the occurrence of an asthma attack, as well as a visit to the emergency room (ER) or admission to an inpatient facility (IP) throughout one year.

The study found that children with asthma who lived in economically impoverished urban areas had a reduced probability of using their prescribed asthma controller medications (odds ratio [OR] 0.77), attaining a controller-to-total ratio of 0.7 or higher (OR 0.75), and reporting an asthma attack (OR 0.75). However, children with asthma were more likely to seek emergency room or inpatient hospital care (OR 1.3) than their peers living in non-impoverished areas. Sullivan et al., (2019), Alcala et al., (2017), and Gil et al., (2022), had similarities with children with asthma living in low-income or impoverished areas and not having private healthcare insurance as being a contributing factor not only to the likelihood of decreased or non-adherence to asthma control medication treatment but also to an increased use of emergency

room visits for asthma exacerbations. The healthcare financial burden of asthma is mostly driven by outpatient visits and medication consumption. The study performed by Sullivan et al. (2019), determined that the standard errors showed the highest level of significance when it came to inpatient and medication expenditures.

Pate et al., (2019), suggest previous studies show that children receiving public health insurance come from low-income families. The Child Asthma Call Back Survey (ACBS) 2012 - 2014, included a sample size of 3,788 asthmatic children from the age of 18 years old and under who were diagnosed with asthma. An adult respondent was required for the Child Asthma Call-back Survey. There was no cost difference between Black children with private or public insurance. The study showed that compared to white children (2.9% [2.1, 4.0]) ($p = 0.03$), insured black asthmatic children experienced a cost barrier when visiting a doctor (10.6% [5.6, 18.3]) when adjusting for demographic factors (sex, age, and race). Being uninsured and not having health insurance coverage for an entire year was associated with cost barriers. Visiting a doctor (adjusted prevalence ratio aPR = 8.07 [4.78, 13.61] and aPR = 6.58 [3.78, 11.45]) and affording medication (aPR = 8.35 [5.23, 13.34] and aPR = 4.93 [2.96, 8.19]), compared with children who had coverage for one entire year. Public healthcare insurance was associated with a cost barrier to visiting a doctor (aPR = 4.43 [2.57, 7.62]), compared with private healthcare insurance (Pate et al., 2019).

Pate et al. (2019) demonstrated a notable disparity in socioeconomic barriers to healthcare access between black children and white children. Keet et al., (2015) conducted a study that discovered a significant correlation between healthcare insurance coverage, particularly Medicaid, and a decline in recent primary care physician visits among black children with asthma. This was coupled with a considerable rise in emergency room visits due to asthma

exacerbations, which was not observed in white children with asthma. The present study establishes a correlation between the socioeconomic status of families with children affected by asthma and the risk of hospitalization for asthma exacerbation. Specifically, the findings suggest that children from low-income urban households who lack access to asthma control medication are more likely to require emergency room care for asthma-related complications.

According to Tolbert et al., (2023), in 2022 the percentage of uninsured children who could not afford to have the necessary care was 8.6%, while the percentage of children with private health insurance was less than 1%. It was also noted that a substantial number of children without health insurance (24.5%) did not have a doctor's appointment the previous year compared to 4.3% and 5.7% for children with public and private health insurance. The 2022 Kaiser Family Foundation (KFF) survey analysis chart in Figure 1, demonstrates the barriers to health care for uninsured and insured children from age 0 to 17 years old which were encountered in one year.

We know that many children who have asthma and come from low-income families, living in underrepresented communities, and without healthcare insurance or those who are relying on public insurance often encounter difficulties in accessing primary care physician services. They also encounter difficulty affording the necessary asthma control medication. As a result, they may find it challenging to follow medication treatment plans, placing them at a higher risk of experiencing asthma exacerbations. Episodes of asthma exacerbation can lead to increased emergency room visits. It can also pose an increased burden on the healthcare system. The study's limited scope of only 26 states prevents generalization to all US children with asthma. Additionally, Pate et al., (2019) did not explore the reasons for differential insurance coverage among children.

Similar to the other studies, Gil et al. (2022) conducted a systematic review to assess the effectiveness of community interventions targeted at Black and Hispanic children with asthma who live in low-income populations. The interventions were designed to address the structural and social determinants of asthma inequities that disproportionately affect these populations, to improve healthcare outcomes, and to reduce emergency room visits significantly. The systematic review analyzed 26 community intervention publications classified into four categories: eight care coordination publications, eight policy and environmental change publications, six home-based interventions publications, and four community-based health services publications.

The selected studies showed that community interventions significantly reduced childhood asthma-related emergency department visits and hospitalizations by improving caregiver self-efficacy, reducing home environmental triggers, and increasing access to healthcare. Both areas showed promising results in reducing emergency healthcare utilization. Specifically, seven studies on care coordination and five studies on policy and environmental changes were significantly associated with reduced emergency room visits and hospitalizations The review provides valuable insights into the strategies that may effectively treat asthma on a community level. Poor environmental conditions have been extensively studied to correlate with an increased likelihood of emergency room visits and hospitalizations for childhood asthma, particularly in communities that have historically received less investment (Gil et al., 2022).

Children from underrepresented minorities, urban areas, and low-income families are especially susceptible to increased asthma exacerbations in part due to the home environment. Unfortunately, the burden of air pollution and substandard housing falls disproportionately on racial and ethnic minorities, among other social and environmental determinants of health. This had similarities with several other studies focusing on asthma and an increase in emergency

room visits, with living in low-income areas as one of the contributing factors. Therefore, interventions that address the entire community are necessary (Gil et al., 2022), (Alcala et al, 2019), (Sullivan et al., 2019).

This study highlights the importance of community-based interventions for reducing emergency room visits for asthma. Evidence supports the efficacy of care coordination, policy, and environmental changes. Interventions addressing health's social and environmental determinants must be prioritized, especially in historically overlooked communities and among underrepresented minorities, urban areas, and low-income families (Gil et al., 2022).

The findings indicate that policy and environmental changes substantially reduced hospitalizations and emergency room visits for children with asthma. A decrease of 65.5% in hospitalizations and 27.7% in emergency room visits ($P < .02$) was reported. These results suggest that implementing effective policy and environmental changes can significantly improve the health outcomes for children with asthma, thereby decreasing emergency room visits for asthma exacerbations. The findings have significant implications for policymakers, healthcare providers, and other stakeholders in managing childhood asthma. Under the Home-Based Interventions in Communities studies, six were performed primarily in Black and Hispanic low-income communities (Gil et al., 2022).

Community health educators, such as nurses or other health educators able to identify and educate on asthma triggers, home supplies, pest control, tobacco smoke, dust mites, and mold treatment, were employed for the studies. These are all asthma triggers that can be managed and kept under control. One study showed a significant decrease of 68% in hospitalizations, a 53% reduction in emergency room visits, and a 48% decrease in unscheduled visits to a healthcare provider for asthma. The present study has certain limitations that should be acknowledged. Its

generalizability to countries with minimal racial and socioeconomic inequities or universal healthcare systems may be limited. Secondly, there was a severe risk of bias, as numerous intervention studies were single-arm studies that lacked proper comparison groups. The study's limitations should be considered when interpreting the outcomes. (Gil et al., 2022).

Similarities were found in much of the literature reviewed. Similarities included socioeconomic barriers, environmental barriers, access to physician visits, medication access, or adherence to asthma control medication treatment based on whether children were uninsured, insured, or the type of health care insurance. The methods of obtaining data were not consistent. Several of the data were self-reported, provided from questionnaires, or adult-provided responses by proxies such as patient caretakers, the parents, and in some cases, the child. The public health insurance Medicaid was the most common healthcare insurance the children in the study had.

During the review, it was evident that having public insurance was not necessarily a deterrent to an asthmatic child visiting an emergency room for asthma. Most families on public health insurance were families living in low-income areas where the environment in their homes was a contributing factor to triggering an asthmatic episode. The review also showed Blacks and Hispanic children were more likely to visit the emergency room for an asthma exacerbation compared to white, non-Hispanic children with asthma. Further research needs to be conducted in a consistent pattern to establish the main factors impeding asthmatic children with public healthcare insurance from accessing asthma control medication, access to a physician, and education on asthma care management. Proper asthma care management and access to asthma control medication and physician visits will help decrease the time between emergency room visits for asthma exacerbations.

Chapter III Methodology

3.1 Research Design/Methods

This study design is a quantitative, retrospective study utilizing archival billing data for ED visits. The independent variables are health insurance status, and the dependent variables are the readmission to the ED within 7 days, or the readmission to the ED between 8 and 30 days after the initial ED event for asthma. The population of interest is asthmatic children that receive care in the emergency room for asthma exacerbations. The goal of the study was to determine if there is a difference in emergency room readmission rates between insured and uninsured asthmatic children. We used archival billing data from the 2017 and 2018 Healthcare Cost and Utilization Project (HCUP) state filer for Florida.

3.2 Study Aims

This study investigates if the frequency of emergency department readmission of seven days, or from eight to thirty days for pediatric patients presenting with asthma exacerbation is influenced by health care insurance or uninsured status.

3.3 Sample Population

The target population for this study is pediatric patients presenting to the emergency room with asthma related symptoms or diagnosed with asthma, from two to seventeen years of age. Pediatric patients with recurrent department room visits presenting with asthma exacerbation were evaluated. Socioeconomic status, gender, and insurance status were identified.

3.4 Data Set Description

The data used in this study will be categorized based on the demographics of age, gender, Race/Ethnicity, type of insurance, median household income quartile per zip code, admission day, and the asthma diagnosis. The diagnosis will be taken from the Current Procedural Technology (CPT) and the ICD-10-CM Codes J45 – asthma. The data collected will be as a whole and in intervals of Short-Term (7 days) and Long-Term (30 days) post-initial emergency room visits due to asthma. The HCUP data will determine the recurrent emergency room visits for asthma exacerbation. The HCUP is a complete repository of healthcare data accessible to the public. The HCUP provides data on State and Federal patient healthcare encounters. It provides complete, detailed data on the number of hospital inpatient days and stays, emergency room visits, and other reported services such as ambulatory surgery. The HCUP data is invaluable to researchers, insurers, and others to understand patient outcomes and care delivery throughout time (AHRQ, 2022). Use of this data for research is restricted by a Data Use Agreement (DUA). This study falls within the DUA.

3.5 Variables - Independent and Dependent

The selection criteria will include patients aged from 2 to 17 years of age. The outcomes of interest (dependent variables) will require linking ED visits and constructing two outcomes: 1) a new (one or more) ED visits for asthma within 7-days of the Index Visit; and 2) a visit to the ED for asthma between 8 and 30-days. The independent variables include health insurance status, whether insured, uninsured, or with private insurance, admission day of the week, and presence of asthma only vs. asthma with additional diagnosis. The analyses will use multivariable modeling to control for imbalance of the effects of age, sex, race, and socioeconomic status on readmission rates.

3.6 Protection of Human Subjects:

This research study is exempt from the Institutional Review Board approval due to secondary data usage.

CHAPTER IV REUSLTS

4.1 Data Analysis

In total 31,496 pediatric asthma patients visited the emergency department in Florida between 2017 and 2018 at 7 and 30 days. The average age of patients is 8.8 (± 4.4); (2, 17) years. The data revealed the number of pediatric males with asthma 18595 (59%) compared to pediatric females with asthma 12,9101 (41%). The average total emergency department cost for asthma readmissions were $2,934.07 (SD±$2,361.58), and ranged ($133, $44,927). The amount of time in hours spent in the emergency room for an asthma related readmission was 3.2 (SD±5.5), with the duration of hours in the ED (0, 174), see (Table 1).

Table 1: Descriptive Statistics for Asthma Patients Aged 2 – 17 Admitted to the ED in Florida 2017 and 2018.

Variable	**Mean (± Standard Deviation)**	**Minimum**	**Maximum**
Age (yrs.)	8.78 (±4.37)	2	17
ED Hours	3.23 (±5.49)	0	174
Total Charges ($)	2934.07 (±2361.58)	133	44927
Sample Size	n = 31496		

M = mean; *SD* = Standard deviation; Age in years; *ED* = emergency department in hours. Total charges in USD.

Males had higher readmission rates than females at 7-days (OR: 1.143; 95% CI: 1.026-1.274, p = 0.0123) while females showed a higher rate of readmission at 30 days (OR: 1.123, 95% CI:1.034-1.218, p = 0.006). Black children compared to white children were readmitted to

the ED significantly less frequently at 7 days (OR: 0.75, 95% CI: 0.666-0.854, p = 0.0019) but not at 30 days (OR: 0.932, 95% CI 0.854 to 1.017), (Table 2). Readmission rates for Medicaid-covered children were at both 7 days 4,507 (14%) and 30 days (91.3%), and uninsured children readmitted within the same timeframes (97.5%) for 7-days, and 30 days (97.5%) readmissions. Socioeconomic status indicated by median household income quartiles at 30-day readmission rates (OR: 0.939, 95% CI: 0.900-0.979, p = 0.0031), (Table 2).

Table 2: Descriptives Statistics of Variables for Asthma Patients Admitted to the ED in Florida 2017 - 2018

Variable	Level	Frequency	(%)	p-value
Gender	Female	12901	40.96%	<0.001
	Male	18595	59.04%	
Race	Black	14520	46.10%	<0.001
	White	13209	41.94%	
	Other	3767	11.96%	
Admission Day (Weekend)	Weekday	22632	71.86%	<0.001
	Weekend	8864	28.14%	
Median Household Income	Quartile 1	13536	43.54%	<0.001
	Quartile 2	8861	28.50%	
	Quartile 3	5737	18.45%	
	Quartile 4	2954	9.50%	
Insurance Status	Medicaid	25532	81.06%	<0.001
	Private	3765	11.95%	
	None	1457	4.63%	
	Other	742	2.36%	
Uninsured	No	30039	95.37%	<0.001
	Yes	1457	4.63%	

Table 3: 30 – Day Readmission

Variable	Odds Ratio	95% CI (Lower –Upper)	Chi-Square	p-value
Age	1.006	(0.959 – 0.977)	0.8251	<0.0001
Female	1.143	(1.034 – 1.218)	5.8973	0.0056*
Race (Black)	0.747	(0.854 – 1.017)	9.6285	0.4886
Race (Other)	0.823	(0.810 – 1.058)	0.3222	0.5177
Median Income	0.939	(0.900 – 0.979)	1.0107	0.0031*

*p <0.05, CI = Confidence Interval, Sample Size 31,496

Table 4: Insurance Status 7-Day Readmission

Variable	Odds Ratio	95% CI (Lower – Upper)	p-value
Uninsured	1.078	(0.905 – 1.282)	0.3924
Medicaid_Uninsured	1.346	(1.167 – 1.552)	<0.0001*
Private	0.910	(0.787 – 1.053)	0.2113
No insurance	1.040	(0.864 – 1.251)	0.6781
Other	1.059	(0.883 – 1.272)	0.5407

Note: *p <0.05, CI = Confidence Interval, Sample Size = 31,496

Table 5: Insurance Status 30-Day Readmission

Variable	Odds Ratio	95% CI (Lower – Upper)	p-value
Uninsured	1.164	(0.977 – 1.387)	0.0882
Medicaid_Uninsured	1.334	(1.154 – 1.542)	<0.0001*
Private	0.926	(0.800 – 1.072)	0.3125
No insurance	1.073	(0.889 – 1.293)	0.4679
Other	0.956	(0.795 – 1.149)	0.6512

*p <0.05, CI = Confidence Interval, Sample Size = 31,496

CHAPTER V DISCUSSION

5.1 Discussion of Results

This comprehensive analysis of 31,496 pediatric asthma patients in Florida in 2017 and 2018, revealed significant demographic, socioeconomic, and healthcare utilization patterns impacting ED readmission rates within seven and thirty days of initial discharge. The age of patients ranged from 2 to 17 years, with an average age of 8.8 years (SD ± 4.4), highlighting the pediatric nature of the study population. The data also showed that healthcare utilization, as measured by total charges and ED hours, varied extensively among the group. The average total charges for an ED visit for asthma were $2,934.07 (SD ± $2,361.58), ranging from a low of $133 to $44,927 as the highest charges, which demonstrate significant variability in the cost of care. Patients spent an average of 3.2 hours in the ED (SD±5.5), with stays ranging from less than an hour to 174 hours, emphasizing the severity and treatment needs of asthma-related ED visits (Table 1).

Hypothesis 1: Uninsured patients are more likely to have a repeat visit to the emergency room within seven days of their initial emergency department visit for an asthma exacerbation.

The findings do not support the hypothesis. There was no significant difference in readmission rates to the ED for uninsured patients (Uninsured) ($p = 0.3924$). The odds of 7-day readmission for uninsured patients were comparable to patients with private insurance. The logistic regression analysis for 7-day readmission shows a statistically significant association for Medicaid patients with an odds ratio 1.346 (95% CI: 1.167 – 1.552), showing a higher likelihood of readmission within 7-days compared to privately insured patients (Figure 1).

Age showed no statistically significant effect on 7-day readmissions (OR:1.006; 95% CI: 0.993-1.018; p-value: 0.3637), however, it was a significant factor for 30-day readmissions

where each additional year of age reduced the likelihood of readmission (OR: 0.968; 95% CI: 0.959-0.977, $p < .0001$). Gender disparities identified. Females showed a lower likelihood to be readmitted at 7 days (OR: 1.143; 95% CI: 1.026-1.274, $p = 0.0152$). Being female ($p= 0.0056$) and in the lower median income quartile ($p = 0.0031$) are significantly associated with higher odds of 30-day readmission to the ED. Race/ethnicity analysis showed that Black children were significantly less likely to be readmitted within 7-days than White children (OR: 0.747; 95% CI: 0.666 - 0.839, $p = 0.0019$) this showed there was no significant racial differences noticed in 30-day readmission odds (Table 3).

Disparities were seen based on health insurance status. Insurance coverage significantly influenced readmission rates, with Medicaid-covered children showing high readmission rates at both 7 days (85.69%) and 30 days (91.28%), while almost all uninsured children were readmitted within the same timeframes (97.53% for 7-day, 97.47% for 30-day readmissions). Socioeconomic status, as indicated by median household income quartiles, was a significant predictor of 30-day readmission rates (OR: 0.939, 95% CI: 0.900-0.979, $p = 0.0031$), with the higher income quartiles associated with lower risks of readmission. It shows that the environment where children with asthma live in has a significant difference in their 30-day readmission to the ED. These findings underscore the importance of demographic characteristics, insurance status, and socioeconomic factors in the risk of ED readmission among pediatric asthma patients, highlighting the need for targeted interventions to address the disparities.

Hypothesis 2: Patients with Medicaid or without healthcare insurance (compared to private healthcare insurance) are more likely to have a repeat ED visit between eight and 30 days of the initial ED visit.

The findings support the hypothesis. The logistic regression analysis for 30-day

readmission showed patients with Medicaid had a statistically significant association with higher odds of 30 day readmission with an odds ratio of 1.334 (95% CI: 1.54 – 1.542) and a p-value <0.0001 indicating an increased likelihood of 30 day readmission to the ED compared to privately insured patients. In contrast, uninsured patients, although not statistically significant (p = 0.0882) did trend to higher readmission rates at 30 days.

5.2 Limitations:

The dataset is limited to data from 2017 and 2018. The ED readmission rate for children with asthma could be influenced by policy changes in healthcare, access to care or changes and advancements in asthma treatment after this study period, in particular with changes in policy that occurred after COVID-19. Geographical limitations are also present. This study focuses on the state of Florida. The study limits the generalizability of the findings to regions that have different demographic profiles, healthcare systems, and environmental factors. The absence of patient-level data on lifestyle, environmental exposures, and adherence to asthma treatment plans can have several potential implications for asthma management:

- Identification of individual factors: The data does not provide information on particular lifestyle choices such as smoking, exercise, or diet which can have a significant effect on the frequency and severity of asthma symptoms.
- Inability to identify environmental triggers: It is crucial to identify environmental triggers that can exacerbate asthma symptoms requiring an ED visit. Patient-level data on environmental exposures such as allergens and air pollution can be helpful in the development of strategies to reduce exposure to triggers and controlling asthma successfully.
- Treatment adherence limitation: Adherence to asthma treatment such as medication usage, and following the asthma recommended guidelines, plays a vital role in controlling

asthma symptoms. Without the patient-level data, individualized treatment plans based on the patients' characteristics and needs are not optimized and may risk generalized treatment plans that may not address each individual patient. The absence of detailed patient-level data on lifestyle, environmental exposures, and treatment adherence hampers the understanding of asthma management, limits personalized approaches to care, and reduces the precision of research findings in this field.

5.3 Future Research:

Future research should focus on longitudinal studies to track the changes over time. This is especially considering the impacts of recent healthcare policies and advancements in asthma care management. Expanding the study to other regions would enhance the generalizability of the findings. Incorporating detailed patient-level data on environment and lifestyle factors could provide deeper insights into effective asthma management strategies. It is important to understand that conducting the study during a more recent time (2020 – 2023) could reveal different outcomes due to several factors:

- COVID-19 Pandemic: COVID – 19 significantly impacted healthcare access and delivery, which could influence readmission rates and patient management strategies.
- Certain variants of COVID-19 such as Delta decreased the number of asthmatic pediatric patients hospitalized (Foster et. Al., 2023).
- There were contrasting reports from several hospitals on the number of pediatric asthma ED admissions especially in the early months of COVID -19. Arsenault et al., (2021) found that a Bronx, New York ED reported a 7% to 2% decrease in pediatric asthmatic visits during the beginning months of COVID-19 compared to the previous year. Decreases in pediatric asthma admissions were also noted in Boston in the beginning months of the COVID-19

(Arsenault et al., 2021). Figure 2. from the Florida Department of Health shows the number of children admitted to the ED in Florida from 2005 to 2022. There is a substantial drop in ED admissions for asthma in 2020.

Changes in Healthcare Policy which increased access to care via telehealth services, reduced some barriers to effective asthma management which can contribute to lower ED readmission rates. Most importantly for this study from the literature reviewed, other than the type of treatment adherence was the post emergency room patient follow-up. The post emergency department patient follow-up via telephone appeared to be significant in decreasing readmissions (Ruffner et al., 2018). Also substantial was the significance in compliance with medication adherence in commercially insured patients compared to uninsured patients (George et al., 2023).

5.4 Conclusion:

This study shows the effect demographics, socioeconomic standing, and insurance coverage status affect the healthcare needs of children with asthma. Initiatives aimed to reduce gender, race/ethnicity, and insurance status readmission discrepancies are needed. A multidisciplinary strategy is needed to address the complex interactions that affect pediatric asthma readmission rates. Strategies may include increasing asthma prevention, illness management, and education for low-income families and tackling systemic healthcare barriers that disproportionately affect Medicaid-covered and uninsured populations. There needs to be emphasis for evidence-based asthma management strategies that are tailored to the patient's needs, exacerbation risk factors, and barriers to care. Community health initiatives, school-based asthma education programs, and improved primary care specialist collaboration at the time of ED discharge, could improve asthma management, especially for the high-risk population highlighted in this study.

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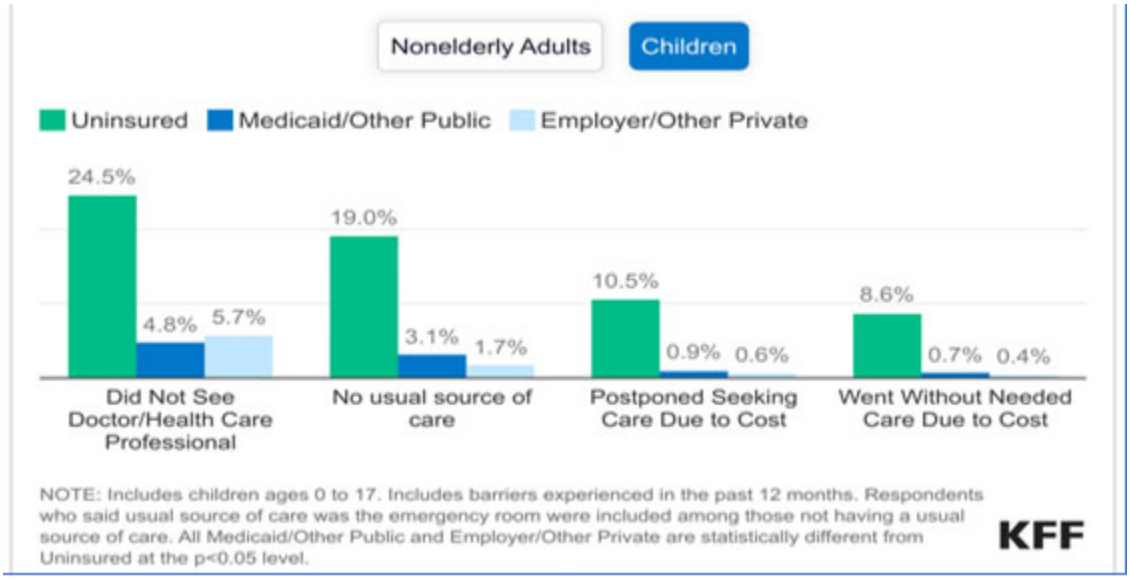
Figures

Figure 1: Barriers to Health Care among Children by Insurance Status, 2022



Source: KFF analysis of 2022 National Interview Survey

Figure 2: Chart from (Florida Department of Health, 2022).

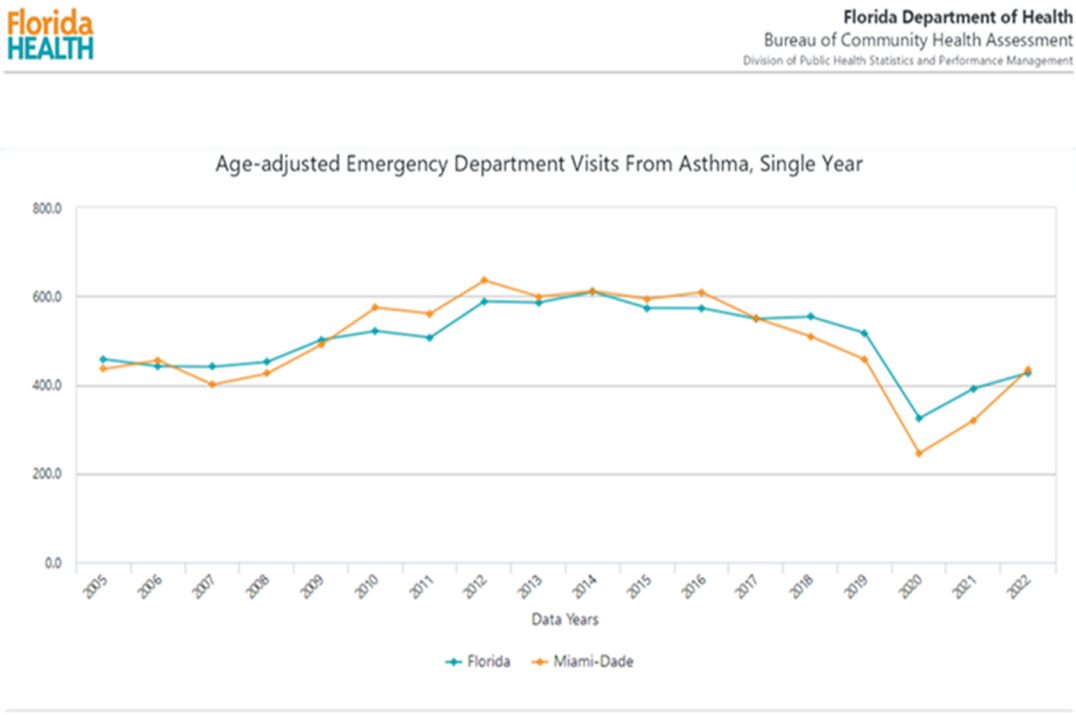


Figure 3: Florida Chart Age Adjusted Emergency Department Visits by Year

Florida HEALTH
Florida Department of Health
Bureau of Community Health Assessment
Division of Public Health Statistics and Performance Management

Age-adjusted Emergency Department Visits From Asthma, Rate Per 100,000 Population, Single Year

	Miami-Dade		Florida	
Data Year	Count	Rate	Count	Rate
2022	10,621	435.1	81,537	427.0
2021	8,258	320.6	73,883	392.1
2020	6,533	245.7	62,012	325.0
2019	11,711	457.1	95,839	516.9
2018	12,760	509.4	100,890	553.9
2017	13,493	550.2	98,246	549.2
2016	14,708	609.1	100,878	573.2
2015	14,197	594.0	100,480	573.5
2014	14,476	611.7	105,417	609.7
2013	14,044	599.2	100,010	586.0
2012	14,814	635.5	100,171	588.7
2011	12,899	561.0	85,904	507.0
2010	13,000	574.6	87,351	521.7
2009	11,735	490.9	85,831	501.9
2008	10,171	425.7	77,501	451.8
2007	9,463	400.6	74,939	440.9
2006	10,685	455.6	74,215	442.0
2005	10,209	436.0	75,935	457.9

Data Source: Florida Agency for Health Care Administration (AHCA)