

# *Reducing Pediatric Hospitalizations due to Chronic Illness:* *Case Studies of Type 1 Diabetes and Asthma*



# Agenda

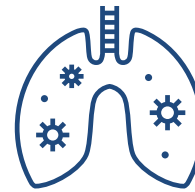
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Chronic Disease



Type 1 Diabetes  
Case Study



Asthma Case  
Study



Conclusion/Recap

# *Chronic Disease*



# What is a Chronic Condition?

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- According to the CDC, chronic disease is a condition that causes a patient to require ongoing medical attention, typically lasting for at least a year or sometimes even longer
- Chronic diseases prevalent among the public:



- Given their prolonged duration, the management for chronic conditions can be very costly for all stakeholders
- As of July 2022, “[Chronic Diseases] are the leading drivers of the nation’s \$4.1 trillion in annual health care cost” according to the CDC

# *About Chronic Disease*

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*“Six in ten adults in the US have a chronic disease, and four in ten adults have two or more.”*

- Center for Disease Control (CDC)

# Relevance of Chronic Pediatric Patients

- According to a study done by Bucholz et al., despite the decrease in the number of pediatric admissions 2010-2016, researchers noticed a drastic increase in the number of readmissions, especially in cases involving chronic conditions
- Chronic conditions prevalent among pediatric patients:

*Table 1. Estimated Prevalence of Selected Chronic Health Conditions Among U.S. Youth Ages 0 - 18 years\**

Chronic health condition	Estimated percentage of U.S. students affected*
Seizure disorders <sup>53-55</sup>	0.7%
Asthma <sup>55-58</sup>	7.3%–9.5% of all children 18% of children living in poverty
Diabetes <sup>55,59</sup>	0.3% (includes type 1 and type 2 diabetes)
Poor oral health <sup>60</sup>	15.6% (untreated dental caries [cavities])
Food allergies <sup>61</sup>	4.0%

*\*Estimates reflect populations from various studies—specific age groups may vary*

# *Relevance of Chronic Conditions*

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- Patients with a chronic disease who are uninsured are less likely to receive the care that they need compared to patients with health insurance<sup>1</sup>
- Having insurance would enable access to a primary care provider & improved treatment protocol
- Children with chronic conditions from low-income families used more inpatient care than children from families with better financial means<sup>2</sup>
- More frequent and longer lengths of stay are factors that influence hospitalization costs of patients with chronic disease<sup>3</sup>
- Direct costs come from frequent hospital visits and consistent prescription drug use, indirect costs stem from lost education and job opportunities<sup>4</sup>



# Insurance & Income

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## Among low-income individuals:

- More likely to be hospitalized for chronic conditions (ex: diabetes, hypertension)
- Put off seeking medical care when they need it
- Children with no insurance also have a higher chance of not receiving routine vaccinations



## Individuals with no insurance are:

- Those with cooccurring conditions spend more on inpatient and emergency services than individuals with higher incomes
- Their annual healthcare costs are also much higher than those of higher income individuals (\$9,472 vs. \$7,457)<sup>1</sup>



# *Impact on Children with Chronic Conditions*

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- Extended stays in hospital may affect the quality of life of children with chronic conditions
- Chronically ill children have a higher chance of developing emotional or behavioral symptoms compared to healthy children (Knapp et al)
- They may also be traumatized by their medical treatments (Stuber et al)
- Children hospitalized due to a chronic condition suffered poor academic performance (Hu et al)
- Improving effectiveness of care in hospitals could reduce this impact so these children can lead better lives



## *Our Project Focus*

*We will be presenting cases on two chronic diseases:  
Type 1 Diabetes & Asthma*

# *Type 1 Diabetes*



# Executive Summary

## *Context of the Case Assumption*

- A pharmaceutical company is seeking to enhance its marketing strategies for insulin-related products specifically aimed at managing Type 1 diabetes in pediatric patients
- To develop these strategies, the company has tasked our team with analyzing the 2019 Healthcare Cost and Utilization Project (HCUP) Kids' Inpatient Database (KID)

## *Goals for Analysis:*

- Identify demographic disparities in Type 1 diabetes among pediatric patients.
- Create marketing recommendations for pharmaceutical companies to effectively engage customers with product and service offerings tailored to the needs of Type 1 diabetes care.

## *Focused Areas for Analysis:*

- Demographics: Age, gender, race/ethnicity, hospital region.
- Clinical Insights: Severity and length of stay (LOS).
- Trends & Disparities: Key data trends and disparities identified among clusters

## *Outcomes for Analysis:*

- Marketing campaign recommendations for pharmaceutical companies based on demographic-specific insights

# Primary Customers, Touchpoints & Challenges



**Hospital**



**Home-Care**

Characteristics	Channels/Touchpoints	Challenges
<ul style="list-style-type: none"> <li>• B2B</li> <li>• Compliance with regulations</li> <li>• Cost efficiency and quality care.</li> <li>• Customization and flexibility</li> <li>• Evidence-based medicine</li> <li>• Risk-shared model</li> <li>• Continued education and support</li> </ul>	<ul style="list-style-type: none"> <li>• Medical conferences and trade show</li> <li>• Healthcare professional networks</li> <li>• Account-Based Marketing (ABM)</li> <li>• Hospital Procurement Platforms</li> </ul>	<ul style="list-style-type: none"> <li>• Navigating group purchasing organizations</li> <li>• Marketing Message Alignment for stakeholders within the hospital customers.</li> <li>• Value demonstration</li> </ul>
<ul style="list-style-type: none"> <li>• B2C</li> <li>• Patient quality of life and medication compliance.</li> <li>• Insurance coverage</li> <li>• Efficacy and reliability</li> <li>• Brand loyalty and trust</li> <li>• Healthcare provider recommendations</li> </ul>	<ul style="list-style-type: none"> <li>• Direct-to-patient services</li> <li>• Online parenting and health forums</li> <li>• Social media platforms</li> <li>• Educational webinar and events</li> <li>• Mobile health apps</li> <li>• Partnerships with pediatricians and diabetes clinics</li> </ul>	<ul style="list-style-type: none"> <li>• Personalization and patient engagement for marketing campaigns</li> <li>• Reaching the right audience and building trust</li> <li>• Service integration with the involvement of other stakeholders such as insurance companies or healthcare providers</li> <li>• Benefits and ethical implication trade-off</li> </ul>

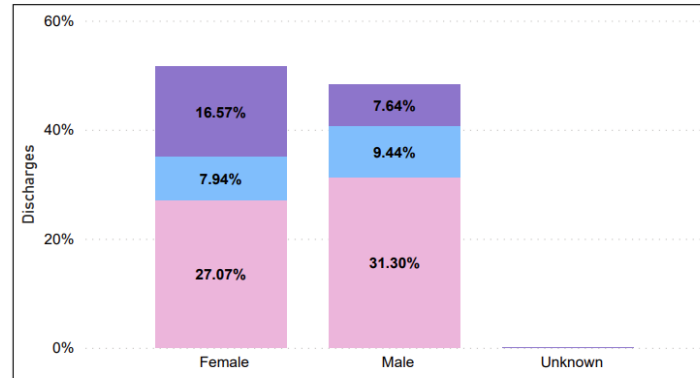
# *Exploring Patterns & Visualizations*



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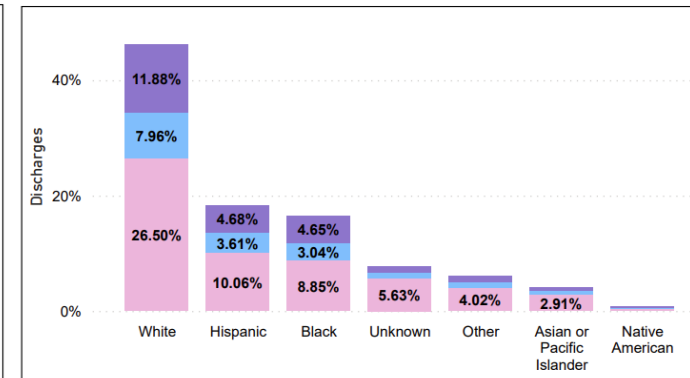
# About HCUP 2019 Data

Distribution by Age Group and Gender



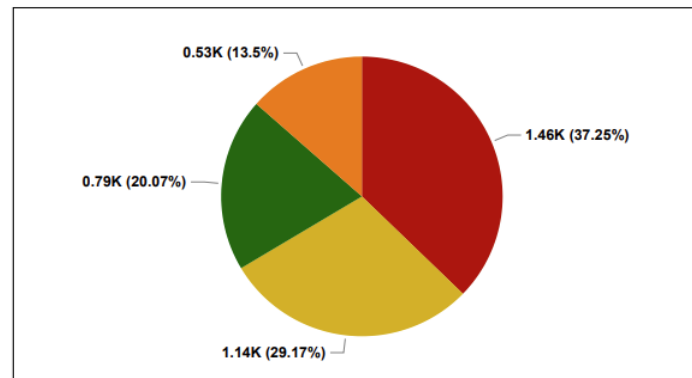
Age Group: Infant Children Adolescents

Distribution by Age Group and Race



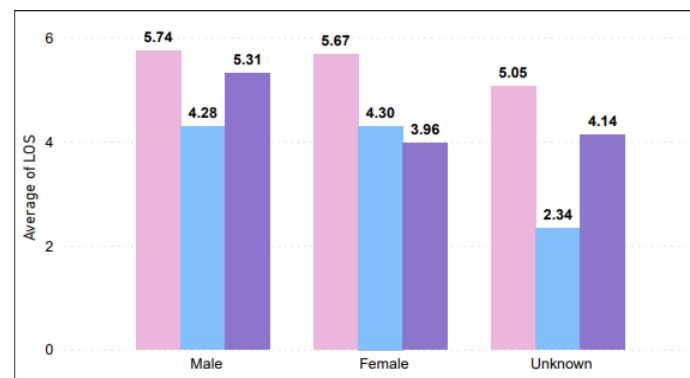
Age Group: Infant Children Adolescents

Distribution by Hospital Region



Hospital Region: Midwest or North Central Northeast South West

Distribution by Age Group and Length of Stay



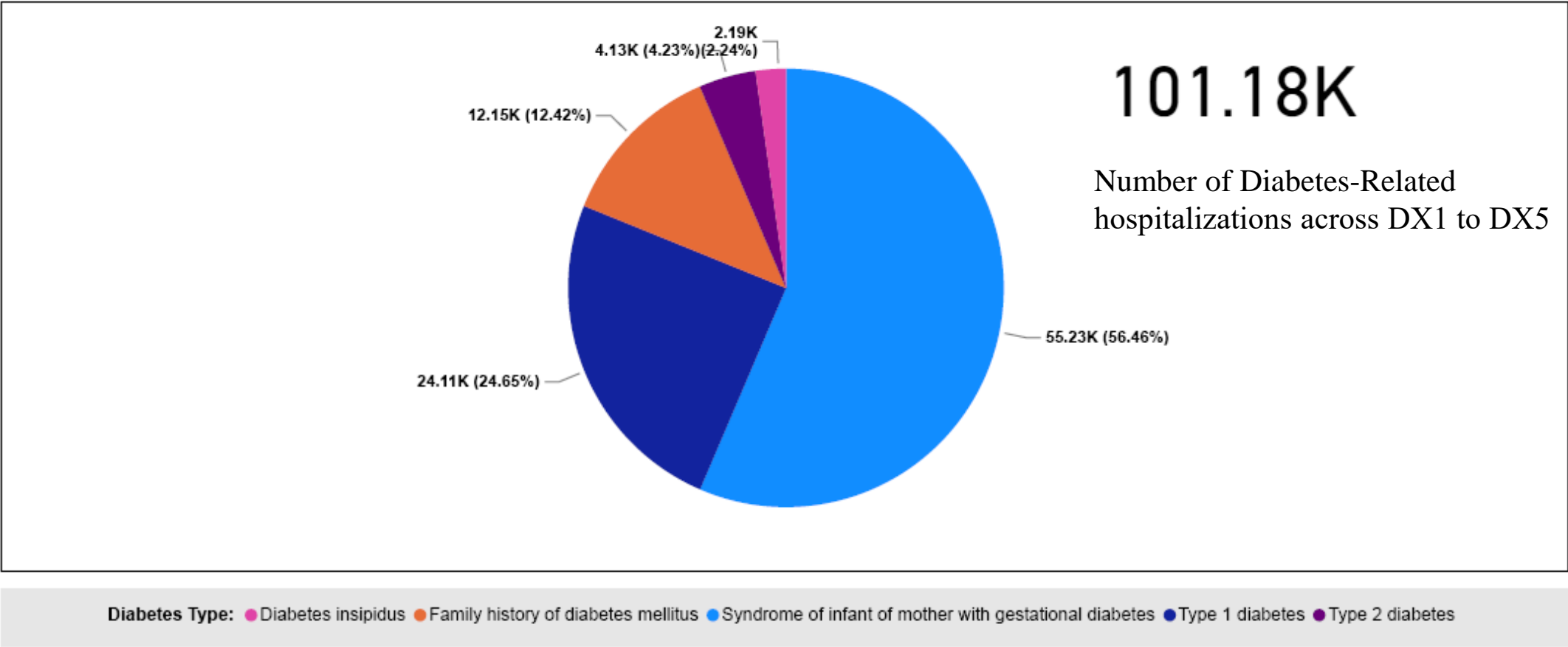
Age Group: Infant Children Adolescents

**3.08 million**  
Total Hospitalizations

**3,998**  
Total Hospitals

# Cases of Diabetes in KIDs Inpatient - 2019

Distribution of Diabetes in KID's Inpatient





# *Analysis*

# Hypothesis Questions

**1. A disparity in gender concerning the severity of the diagnosis of type 1 diabetes.**

$H_0$  : *There is no significant disparity in gender concerning severity of diagnosis of type 1 diabetes.*

$H_1$  : *There is significant disparity in gender concerning severity of diagnosis of type 1 diabetes.*

**2. Factors such as the regions of hospitals and ethnicity are found to have a correlation with type 1 diabetes within the group.**

$H_0$  : *There is no significant associate in ethnicity and hospitals regions of type 1 diabetes within the group.*

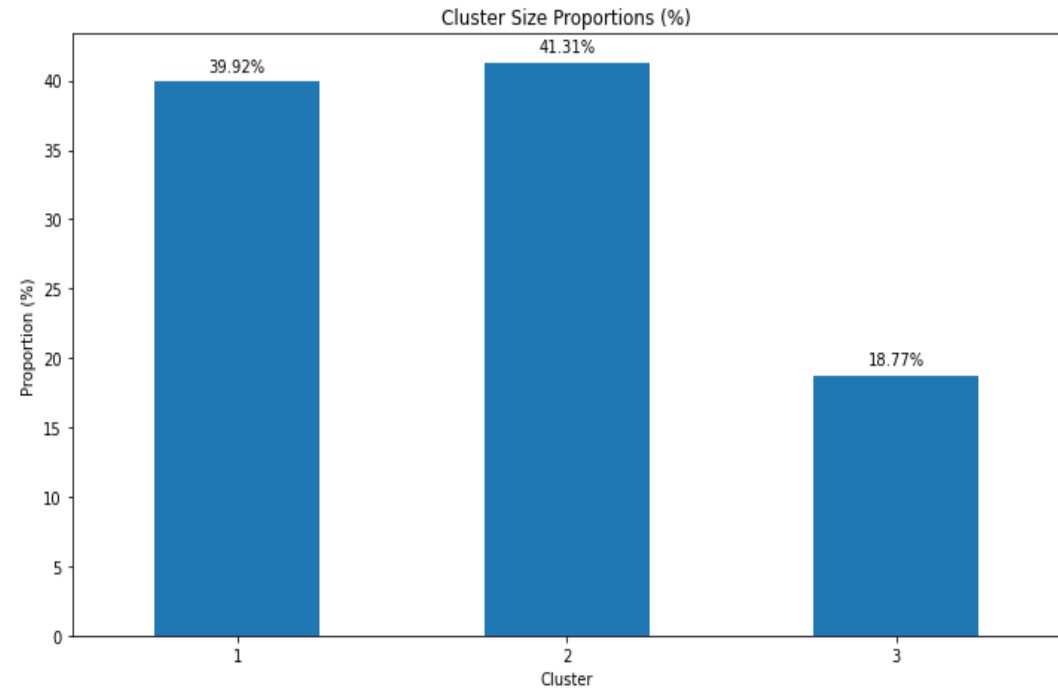
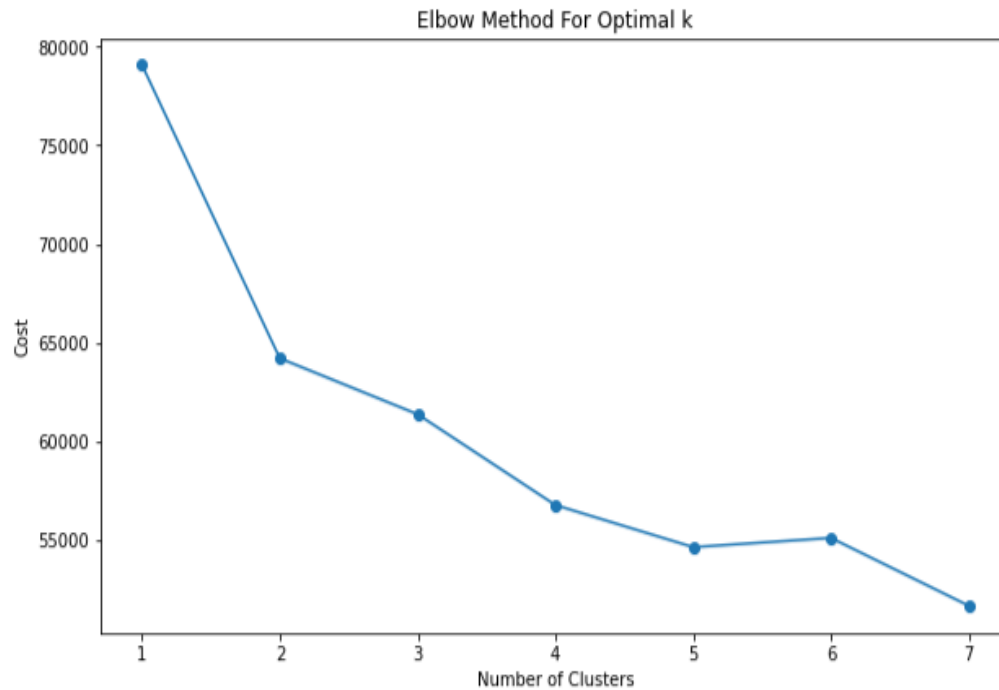
$H_1$  : *There is significant associate in ethnicity and hospitals regions of type 1 diabetes within the group.*

**3. Is there a relation between length of a patient's stay associate in the hospital and severity of diabetes diagnoses among different age groups.**

$H_0$  : *There is no association between the length of a patient's stay in the hospital and the severity of their diabetes diagnosis among different age groups.*

$H_1$  : *There is association between the length of a patient's stay in the hospital and the severity of their diabetes diagnosis among different age groups.*

# Clustering Model

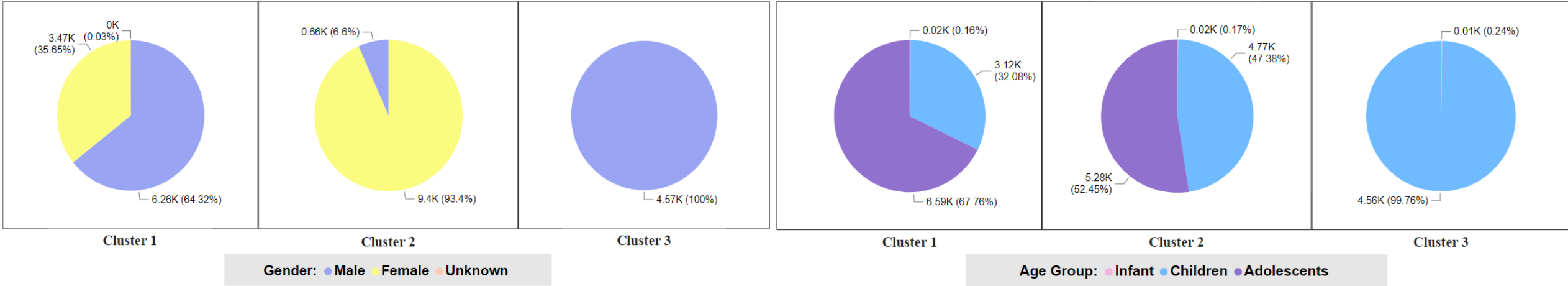


- Identified  $k = 3$  as the optimal number of clusters using the elbow method
- 7 features for efficient k-Mode clustering, enhancing computational efficiency
- Implemented k-Mode, an algorithm optimized for categorical data, utilizing a dissimilarity metric instead of Euclidean distance
- Adopted mode-based centroid updating for iterative optimization in k-Mode
- The cluster proportions suggest effective clustering with meaningful differentiation

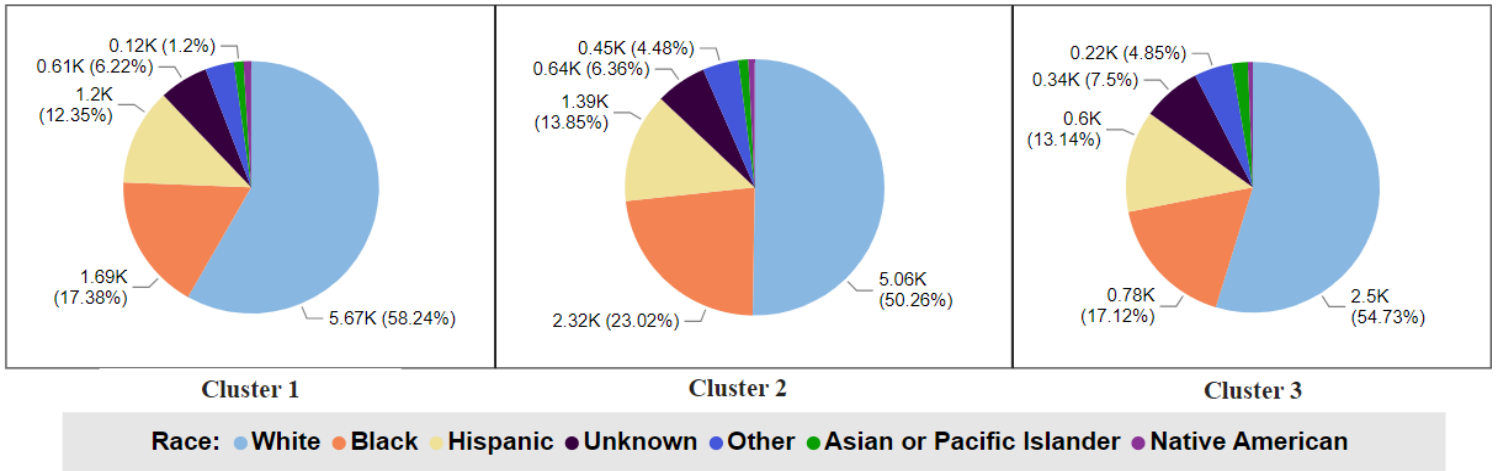
# Cluster Profiles

Distribution of Gender

Distribution of Age

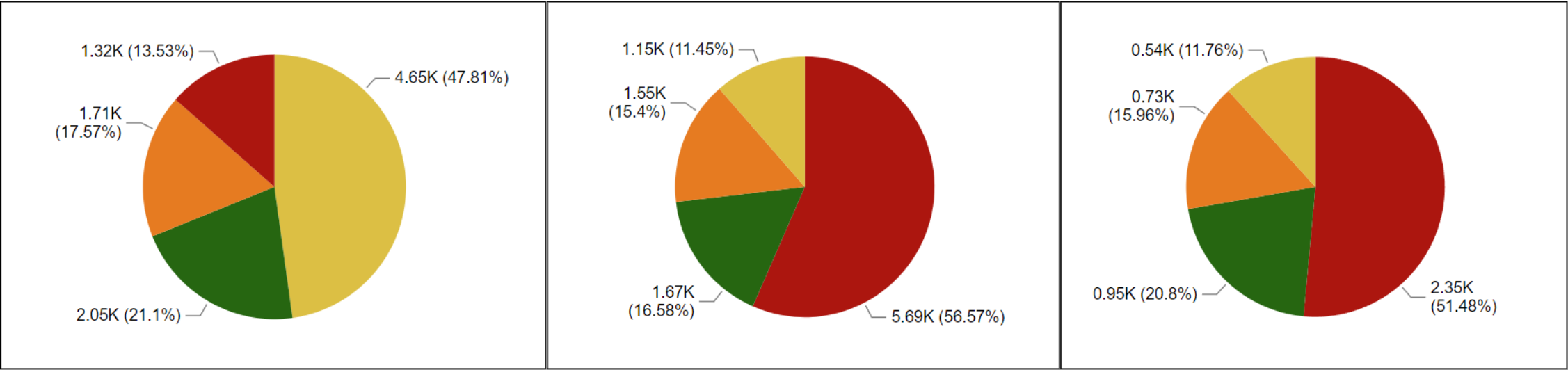


Distribution of Race



# Cluster Profiles

Distribution of Discharges by Hospital Region



Cluster 1

Cluster 2

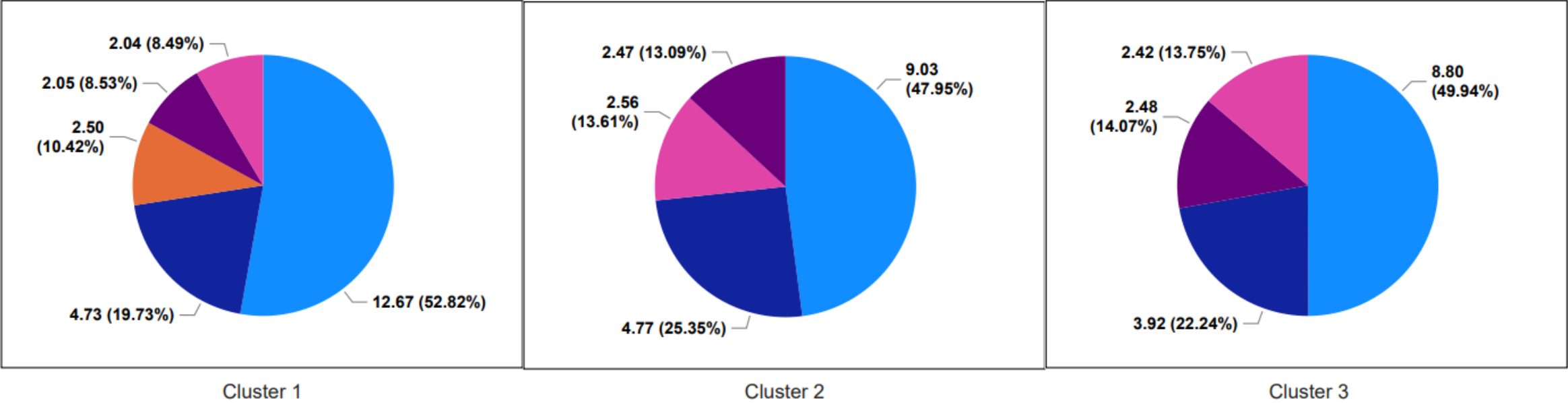
Cluster 3

Hospital Region ● Midwest or North Central ● West ● Northeast ● South



# Cluster Profiles

Average Length of Stay based on Severity



Severity: ● Extreme loss of function ● Major loss of function ● No class specified ● Minor loss of function (includes cases with no comorbidity or co... ● Moderate loss of function

## *Insights & Recommendations*



# *Model & Conclusion Highlights for Type 1 Diabetes*

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**E1010 - Type 1 diabetes mellitus with ketoacidosis without coma**

**E1065 - Type 1 diabetes mellitus with diabetic hyperglycemia**

- 1.** Females are more likely to be diagnosed with extreme and major loss of function
- 2.** Higher rates for White and Black individuals with variations in diagnosis include higher likelihood of E1065 for Asian and Pacific Islander patients and E1010 for Black and Hispanic and White patients
- 3.** Southern region show higher cases, specifically for Black and Hispanic patients
- 4.** Patients with moderate severity have a longer length of stay (1-7 days). Adolescents and children have a shorter length of stay than infants
- 5.** Adolescents and Children have moderate severity



# Recommendations for Hospitals



**Hospital**

<i>Channels</i>	<i>Touchpoints</i>	<i>Strategies</i>	<i>Recommendations</i>
<b>Account-Based Sales</b>	<b>Account-Based Marketing</b>	<ul style="list-style-type: none"> <li>Identify key hospitals in the South who are likely to benefit from product/service offerings, and prioritize building long-term relationships</li> </ul>	<ul style="list-style-type: none"> <li>Develop personalized marketing campaigns for key hospital accounts</li> <li>Use the data from our analysis to understand the specific needs of hospitals in each regions, tailoring messaging to address unique challenges in patient care and operations (severity and LOS) that are mentioned in the analysis</li> </ul>
<b>Target Hospital Segments</b>	<b>Hospital Procurement Platforms</b>	<ul style="list-style-type: none"> <li>Adjust marketing strategies to extend outreach to the South, and to Black and Hispanic individuals diagnosed with Type 1 diabetes</li> </ul>	<ul style="list-style-type: none"> <li>Establish a strong presence on these platforms with clear, concise information about products, including pricing, benefits, and user testimonials</li> <li>Offer virtual consultations and demos for procurement officers to experience the products firsthand</li> </ul>
<b>Stakeholder Engagement including Physicians, Pharmacy Directors, etc.</b>	<b>Medical Conferences and Trade Show</b>	<ul style="list-style-type: none"> <li>Focusing on insulin, establish value-based agreements with insurance companies and hospitals situated in the South</li> </ul>	<ul style="list-style-type: none"> <li>Design interactive exhibits that showcase product efficacy and cost-efficiency with demonstrations</li> <li>Provide comprehensive data packets and case studies that highlight successful hospital implementations</li> </ul>
	<b>Healthcare Professional Networks</b>		<ul style="list-style-type: none"> <li>Utilize these networks to share thought leadership content and peer-reviewed research</li> <li>Offer exclusive insights into product development and invite feedback through roundtable discussions to build credibility and trust within the professional community</li> </ul>

*Our analysis highlighted the variations in length of stay (LOS) and severity among patients under 19 across different demographics. This data can guide pharmaceutical companies in tailoring their communication to hospitals, particularly in regions with high Type 1 diabetes rates.*

# Recommendations for Home-Care



## Home-Care

Channels/Touchpoints	Recommendations
<b>Direct-to-Patient Services</b>	<ul style="list-style-type: none"> <li>Customize home care packages with educational resources that address the unique challenges faced by females with severe Type 1 diabetes</li> </ul>
<b>Online Parenting &amp; Health Forums</b>	<ul style="list-style-type: none"> <li>Facilitate discussions on online platforms that focus on the experiences and management strategies relevant to Hispanic, White and Black families with E1010 and Asian and Pacific Islander with E1065</li> <li>Providing insights tailored to these ethnic groups' specific diagnostic patterns</li> </ul>
<b>Social Media Platforms</b>	<ul style="list-style-type: none"> <li>Cater advertisements and content to platforms popular among parents and highlight personalized remote monitoring tools and the convenience of its direct-to-patient services</li> <li>Target to Southern region with language preferences of Hispanic communities</li> </ul>
<b>Educational Webinars &amp; Virtual Events</b>	<ul style="list-style-type: none"> <li>Host educational webinars aimed at parents of adolescents and children, focusing on transitioning to self-care and the importance of managing diabetes effectively during the shorter hospital stay</li> </ul>
<b>Mobile Health Applications</b>	<ul style="list-style-type: none"> <li>Develop or partner with mobile application offering tailored monitoring for Type 1 diabetes patients</li> <li>Ensure that language and cultural considerations are considered for the highlighted demographic groups in analysis</li> </ul>
<b>Partnerships with Pediatricians &amp; Diabetes Clinics and Insurance Companies</b>	<ul style="list-style-type: none"> <li>Partner with pediatricians who can directly refer products to regions with a high prevalence of families and patients with Type 1 diabetes</li> <li>Partner with insurance companies to offer the discounts or gift cards campaigns for patients with insurance</li> <li>Gift cards or discount tailored for clinics and hospital with prescription from those healthcare providers</li> </ul>

# *Cost-Benefit Evaluation*

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## **Assume that:**

- One of top 3 market leaders decides to spend 1% of its revenue on running marketing campaigns for 2024. Given the company's revenue is proportionate to the market size for 2023 (USD \$11.14 B):
- With 30% of the market, the company would receive approximately USD \$3.7 B in revenue from insulin production. Therefore, investing 1% on marketing would cost USD \$37 M.
- Assuming the marketing campaign increases their market share by 1% from improved visibility and patient education, and the market size is USD \$11.14B, a 1% increase would generate an additional USD \$111.4 M in revenue.
- **Return on Marketing Investment (ROMI)** =  $(111.4 - 37) / 37 * 100\% = 200\%$
- Contrary to common, meticulous marketing strategies based on the businesses' requirements and vision, our marketing strategies are cost-effective and easy to implement

# *Asthma*

# Motivation

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- There is no cure for asthma, but it can be managed and controlled. The best way to manage asthma is to avoid triggers, take medications to prevent symptoms, and prepare to treat asthma episodes if they occur.
- About 27 million people in USA, roughly 1 in 12, have asthma, and over 4.5 million of them are under 18 years old.
- The total annual cost of asthma care to the US economy is \$82 billion.
- The total annual cost of pediatric asthma care to the US economy is \$27 billion.
- The USA allocates nearly 18% of its overall GDP to healthcare, which amounts to more than \$4.3 trillion on average and equates to approximately \$12,000 per person.
- According to statistics, about 530,000 Americans go bankrupt every year due to medical bills.

# Executive Summary

**Aim:** To understand the disparities in Asthma prevalence among pediatric patients in the US based on different demographic factors.

**Focus:** Minimize hospital admissions among pediatric asthma patients by effectively controlling and managing elements influencing asthmatic conditions or attacks.

## Findings

Black individuals face higher hospitalization rates, and the Midwest and Northeast regions, housing 37% of patients, contribute significantly to pediatric cases (47%). Females are diagnosed more between ages 16-20, while males dominate between ages 1-7.

Socioeconomics matter: 37% of patients earn \$1-\$48,000, with 60% of patients paying through Medicaid. Asthma often coexists with other conditions—patients with mental and behavioral disorders, infectious and endocrine diseases stay in hospitals twice as long.

## Recommendations

**Comprehensive Asthma Strategy:**  
Pharmaceutical companies can enhance sales by strategically directing marketing efforts to the northeast and mid-west regions, with a focus on black race groups and low-income demographics. Collaborating with government programs like Medicaid to produce and promote asthma medications and monitoring device like peak flow meters creates a powerful avenue for large-scale sales optimization.

**Preventive Healthcare Transformation:**  
Encourage regular asthma check-ups, especially in the Northeast and Midwest regions with a higher prevalence of Black race groups, aiming for early detection.

## Stakeholders

- Pharmaceutical Company 
- Government 
- Patients 

## HCUP Asthma Overview

- 190,000 Patients 
- Average Daily Cost of Hospitalizations - \$ 12000 
- Average Prevention Cost per Annum \$5000 



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Source: HCUP 2019 KIDs Inpatient

# Primary Customers, Touchpoints, & Challenges



**Government**



**Home-Care**

Characteristics	Channels/Touchpoints	Challenges
<ul style="list-style-type: none"> <li>• Compliance with regulations</li> <li>• Cost efficiency and quality care.</li> <li>• Evidence-based medicine</li> <li>• Continued education and support</li> <li>• Medicaid for low-income families</li> </ul>	<ul style="list-style-type: none"> <li>• Vendor Pools</li> <li>• Approved Pricing</li> <li>• Procurement Platforms</li> <li>• Lobbyists</li> <li>• Medicaid</li> </ul>	<ul style="list-style-type: none"> <li>• Navigating group purchasing organizations</li> <li>• Managing low-cost/large volume purchases</li> </ul>
<ul style="list-style-type: none"> <li>• B2C</li> <li>• Patient quality of life and medication compliance</li> <li>• Insurance coverage</li> <li>• Efficacy and reliability</li> <li>• Brand loyalty and trust</li> <li>• Healthcare provider recommendations</li> </ul>	<ul style="list-style-type: none"> <li>• Direct-to-patient services</li> <li>• Online parenting and health forums</li> <li>• Social media platforms</li> <li>• Educational webinar and events</li> <li>• Mobile health apps</li> <li>• Partnerships with pediatricians</li> </ul>	<ul style="list-style-type: none"> <li>• Personalization and patient engagement for marketing campaigns</li> <li>• Reaching the right audience and building trust</li> <li>• Service integration with the involvement of other stakeholders such as insurance companies or healthcare providers</li> <li>• Benefits and ethical implication trade-off</li> </ul>

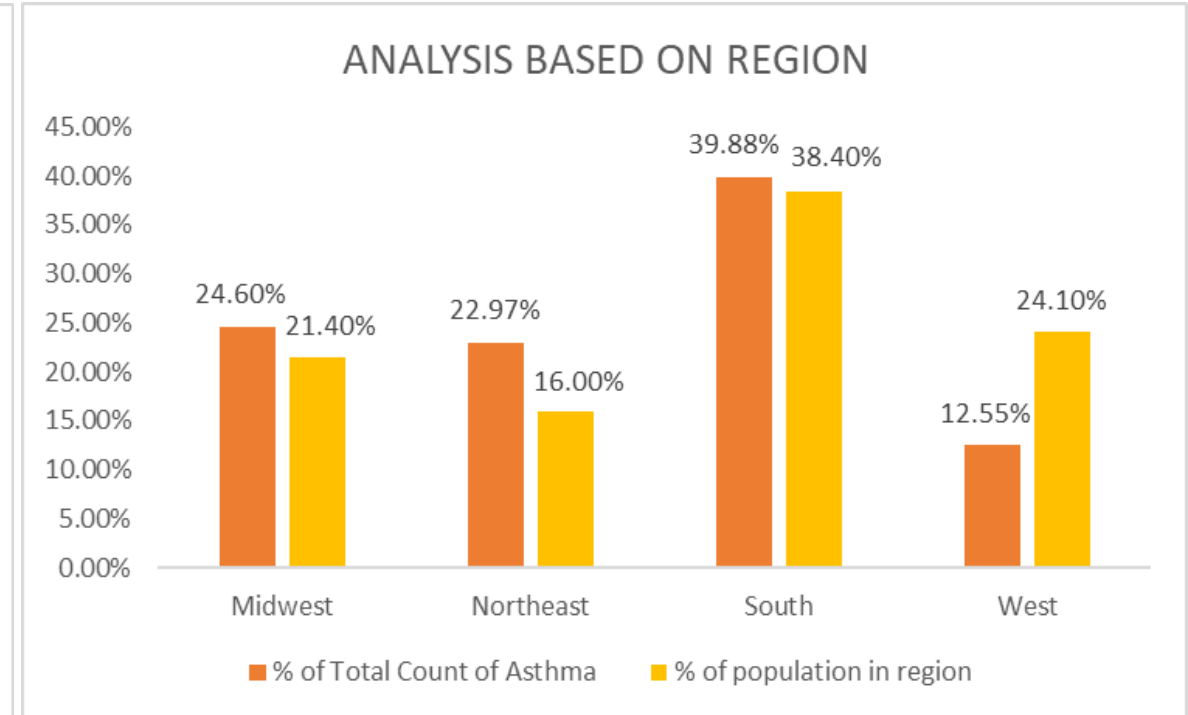
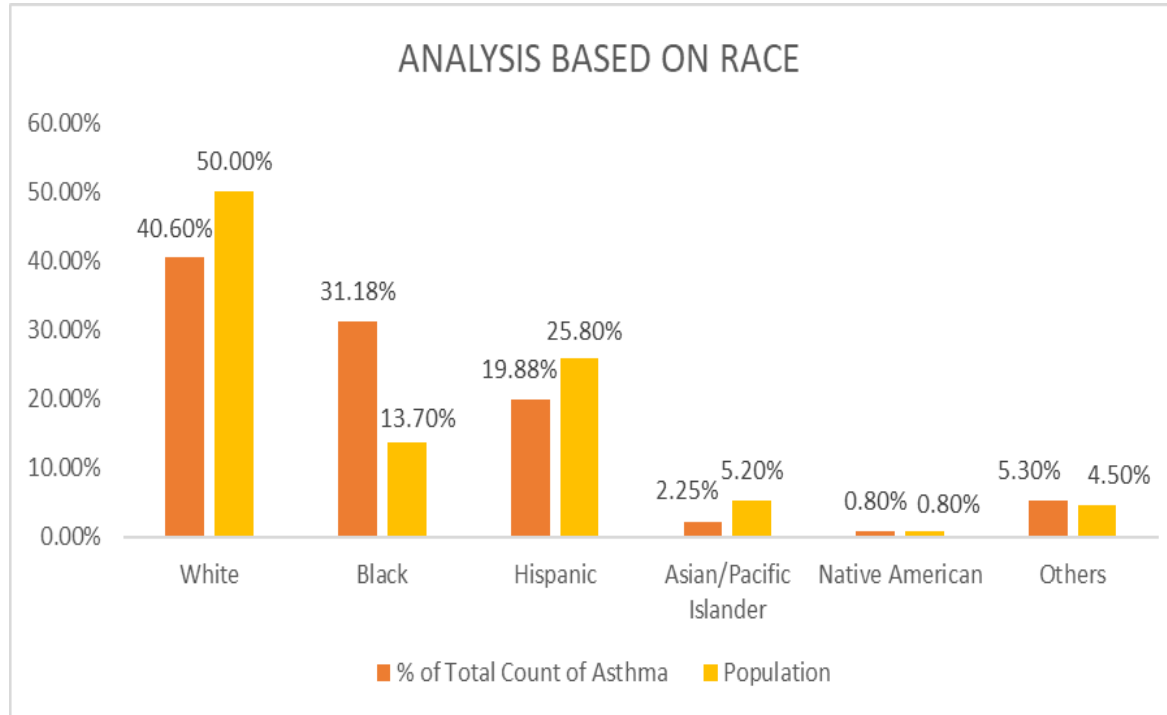
# *Analysis*





# Analysis Based on Race & Region

Exploration

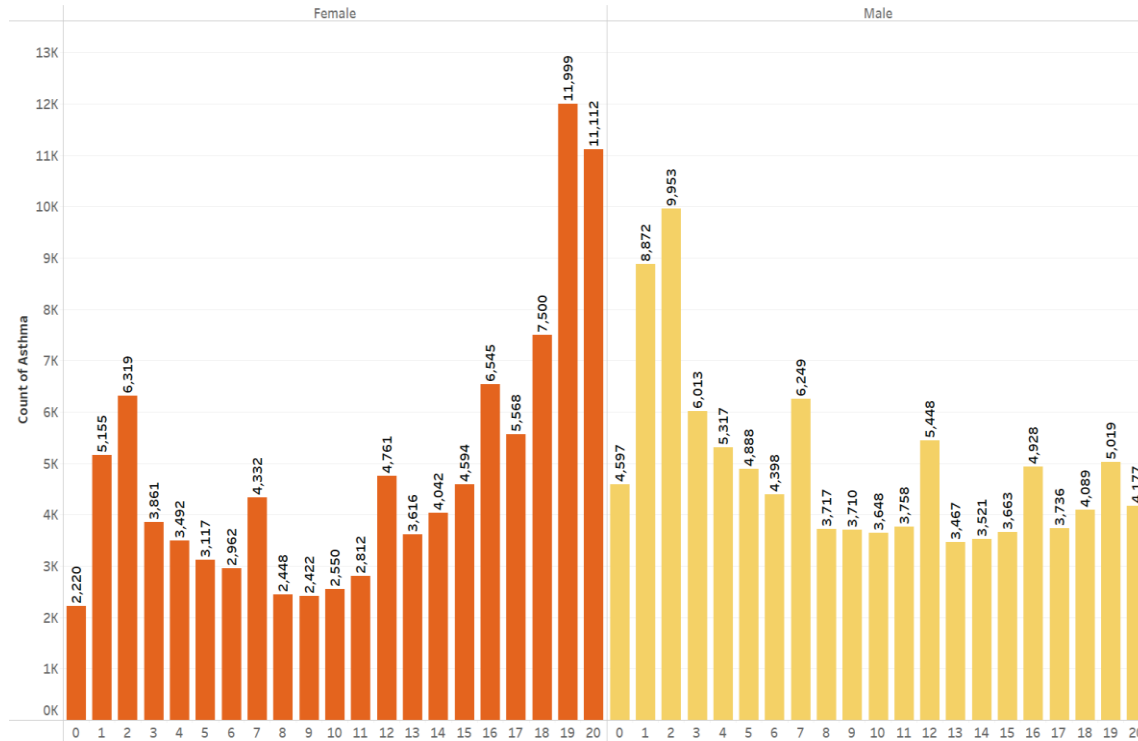


- Blacks are more prone to being hospitalized due to asthma compared to other racial groups
- Midwest and Northeast regions make up around 37% of the US population aged 0-18 years, But these regions contribute 47% of the total asthmatic patients

# Analysis Based on Gender and Income Range

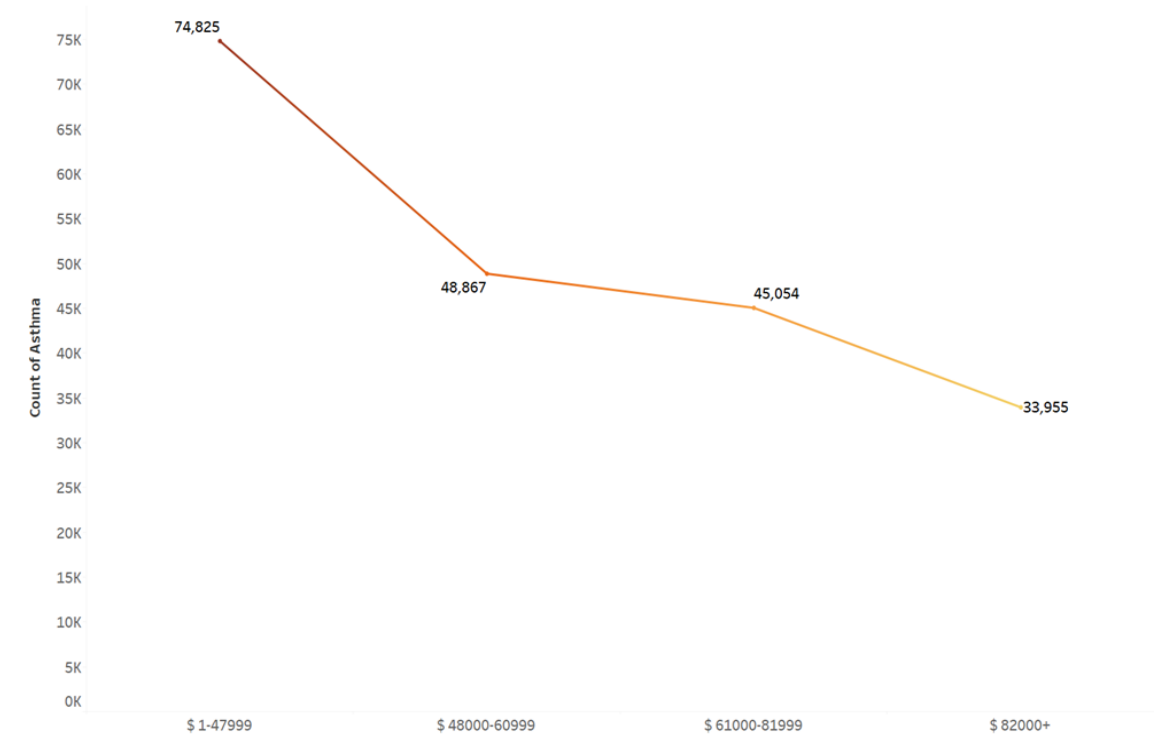
## Exploration

Asthma by Age and Gender



- Females are more prone to being diagnosed with asthma between the ages of 16-20, while males are more prone to being diagnosed with asthma between the ages of 1-7

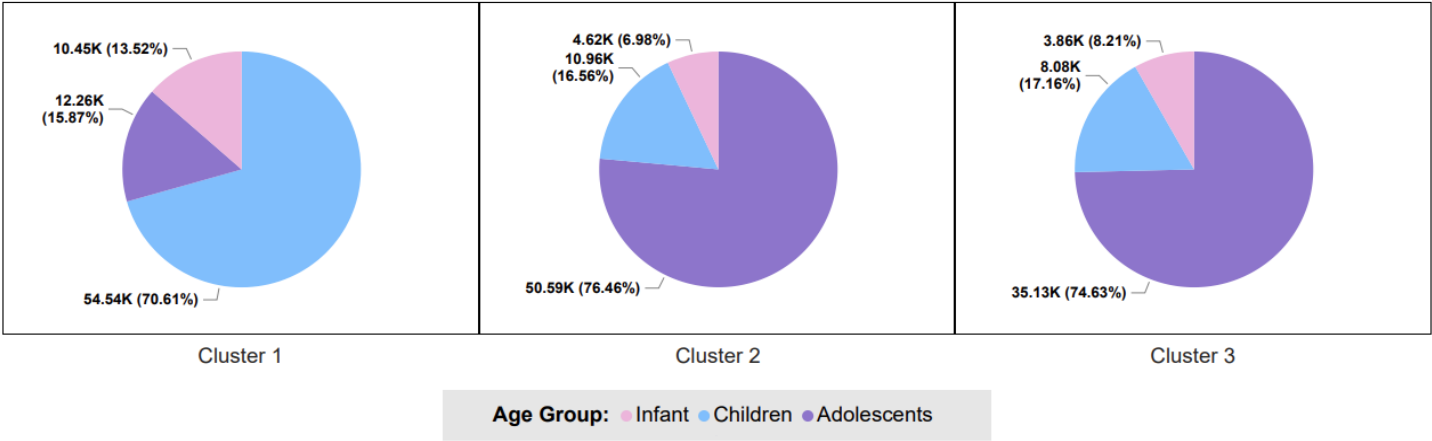
Asthma count by Income



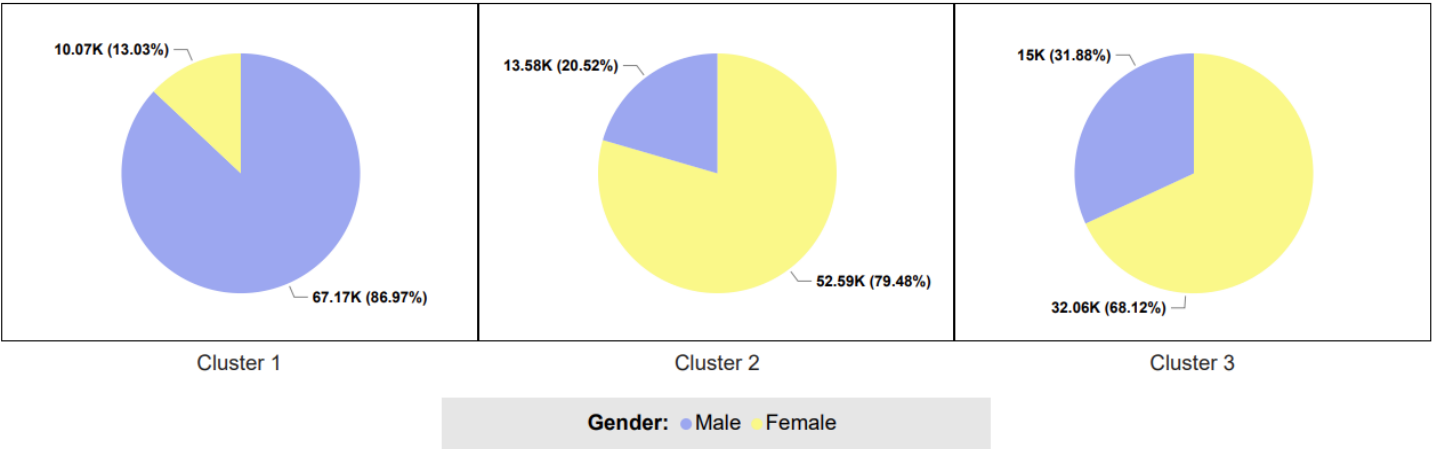
- Almost 37% of all asthmatic patients fall under the median income range of \$1-\$48,000

# Cluster Profiles - Asthma

Distribution of Age

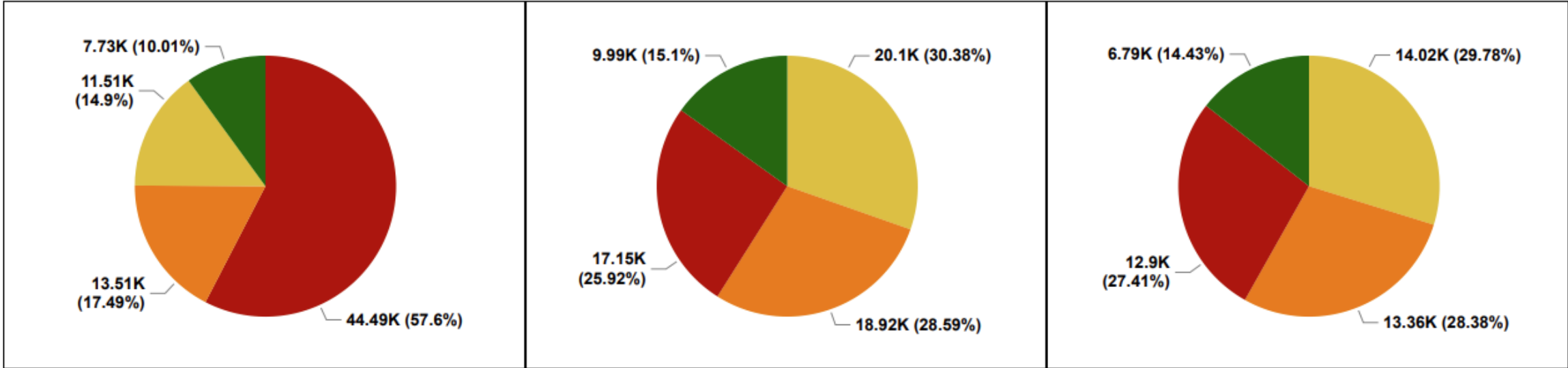


Distribution of Gender



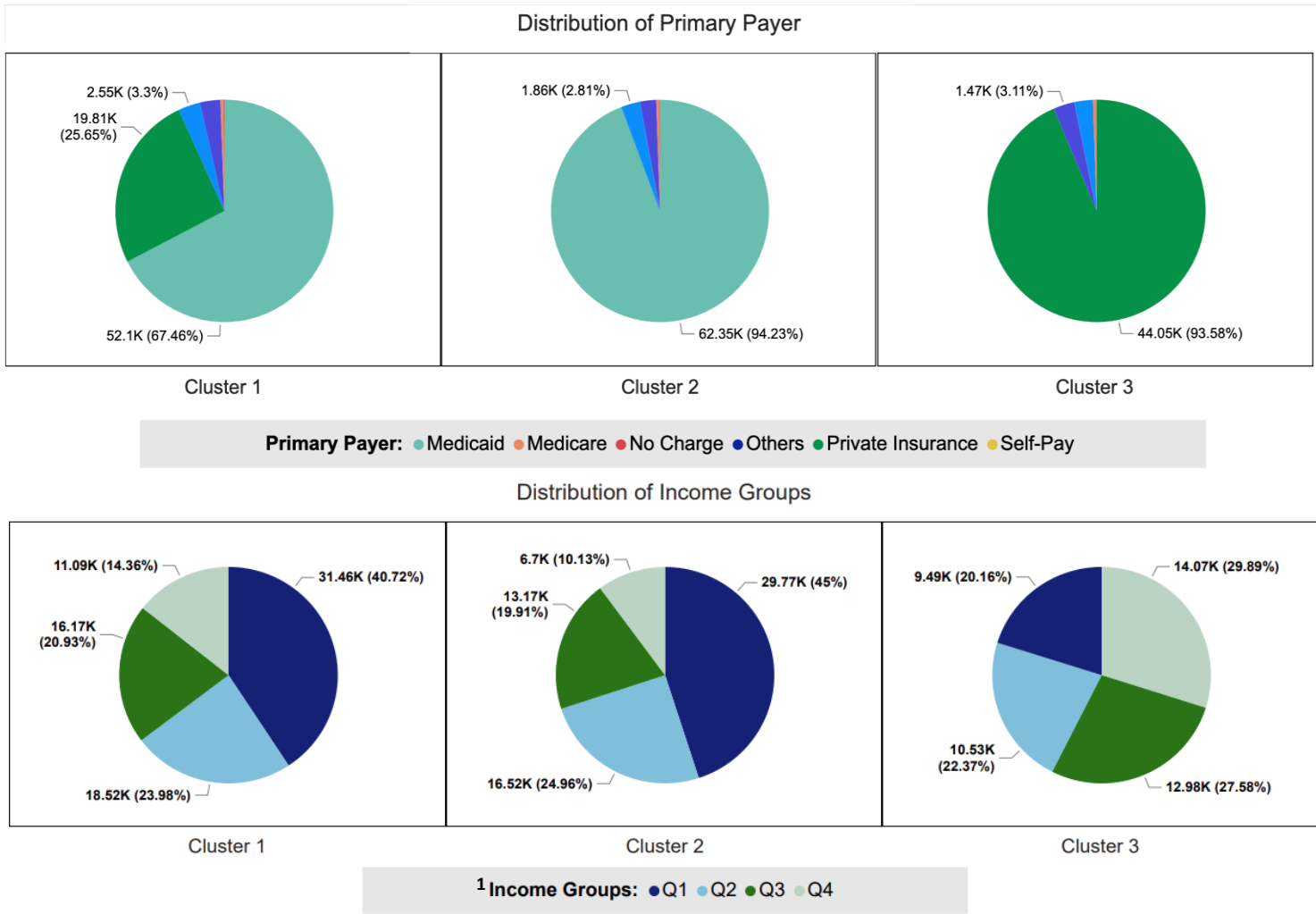
# Cluster Profiles - Asthma

Distribution of Discharges by Hospital Region



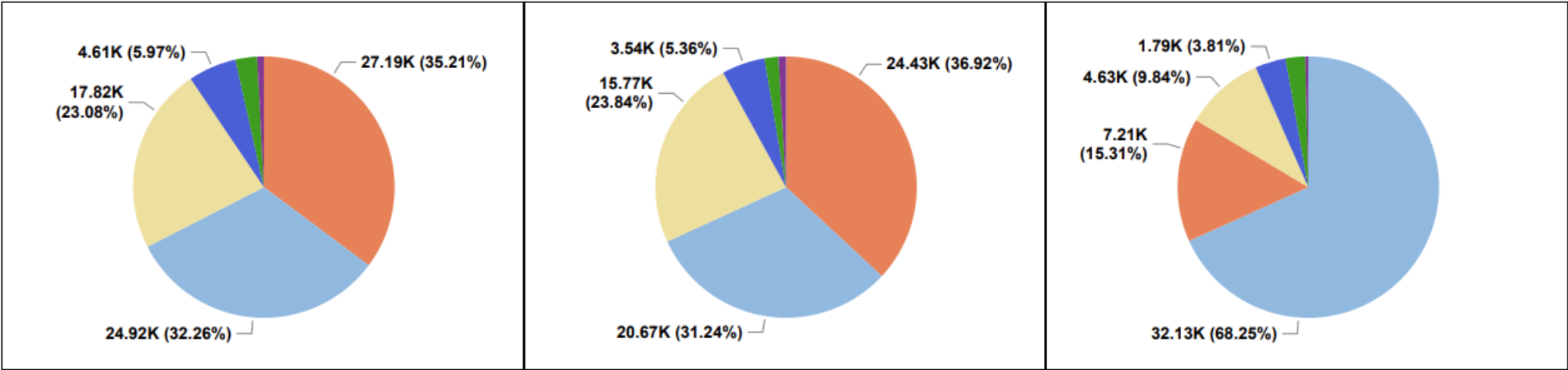
Hospital Region: ● Midwest or North Central ● Northeast ● South ● West

# Cluster Profiles - Asthma



# Cluster Profiles - Asthma

Distribution of Race



Cluster 1

Cluster 2

Cluster 3

**Race:** White Other Native American Hispanic Black Asian or Pacific Islander



# Hypothesis Testing Results

Dimension		Conclusion
<b>Comorbidity Hypothesis</b>	Asthma + Other Diseases	Individuals with asthma have a higher likelihood of getting diagnosed with other diseases compared to those without asthma.
<b>Age Hypothesis</b>	Asthma + Age	Asthma prevalence and impact vary significantly among different age groups, with youngest and oldest age brackets experiencing higher rates and more severe consequences.
<b>Race/Ethnicity Hypothesis</b>	Asthma + Race	Asthma rates and impacts vary significantly among different racial or ethnic groups in the United States, with Blacks having higher prevalence than others.
<b>Geographical Hypothesis</b>	Asthma + Region	Asthma rates and impacts vary significantly across different regions of the United States, with Midwest and Northeast having higher prevalence.
<b>Income Hypothesis</b>	Asthma + Income	There is a significant association between income level and the likelihood of being diagnosed with asthma with the lowest income level having higher prevalence.

## *Insights & Recommendations*





# Cost Distribution – Making a Case to the Government

Asthma Triggers Prevention & Management Cost	Prevention		Cost (in USD)
		Asthma Friendly Air Purifier	600 to 950
		Indoor Pest Control (Annually)	400 to 950
		Mold Removal	10 to 25 per sq.ft.
		HEPA-filter vacuum cleaner	256 to 400
	Monitoring	Peak Flow Meter	25 to 50
		Pediatric Pulse Oximeter	20 to 25
	Medical Care	Generic Inhalers	100 to 130
		Brand Name Inhaler	340
		Medical Prescriptions (Annually)	~1830 <sup>1</sup>
Cost to Taxpayers			

- The total annual cost of pediatric asthma care to the US economy is \$27 billion.
- Children with asthma miss over 14 million school days, and their care results in parents missing over 14 million workdays.
- Average Prevention Cost per Annum - \$5,000.
- The average cost per day for asthmatic patients is about \$12,000.

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- The average cost per day for asthmatic patients is about \$12,000.

# Recommendations for Government



## Government

Channels/ Touchpoints	Recommendations	Considerations
<b>Medicaid</b>	<ul style="list-style-type: none"> <li>Collaborate with government programs like Medicaid to produce asthma medications, thereby generating sales on a large scale.</li> </ul>	<ul style="list-style-type: none"> <li><b>Cost Reduction through Collaboration:</b> Collaborating with government programs like Medicaid can lead to cost reductions in research, development, and production. This, in turn, can increase profit margins and contribute to revenue growth.</li> <li><b>Increased Sales Through Government Support:</b> Access to government programs can expand the market by making medications more affordable for a larger population, thus increasing sales volume.</li> <li><b>Pricing Pressures:</b> Government programs may negotiate for lower prices, potentially impacting profit margins. Balancing affordability with sustainability is crucial</li> <li><b>Sustainability of Treatment Plans:</b> Affordability and accessibility contribute to the sustainability of asthma treatment plans. Patients are more likely to continue their prescribed medications, leading to long-term management and potentially reducing the need for emergency interventions</li> </ul>
<b>Vendor Pools</b>	<ul style="list-style-type: none"> <li>Medicaid program can negotiate drug prices with the pharmaceutical companies through various strategies, like volume purchasing of inhalers. States can leverage their purchasing power by negotiating discounts for large quantities of inhalers. In the past, the government has successfully implemented policies wherein the price of insulin was capped at \$35.</li> </ul>	<ul style="list-style-type: none"> <li><b>Volume Sales:</b> Negotiating drug prices through volume purchasing can lead to increased sales for pharmaceutical companies, compensating for reduced unit prices.</li> <li><b>Market Stability:</b> Stable, negotiated prices may encourage long-term partnerships between pharmaceutical companies and Medicaid, ensuring a consistent revenue stream.</li> <li><b>Profit Margins:</b> Pharmaceutical companies may face challenges in maintaining profit margins with reduced prices. This requires careful negotiation to ensure a fair balance.</li> <li><b>Consistent Medication Supply:</b> Negotiating prices and leveraging purchasing power can contribute to a stable and consistent supply of inhalers. This ensures that asthma patients have reliable access to the medications they need, reducing the risk of medication shortages.</li> </ul>

# Recommendations for Home-Care



Home-Care

Channels/Touchpoints	Recommendations
<b>Direct-to-Patient Services</b>	<ul style="list-style-type: none"> <li>Marketing inhalers and preventive methods can encourage asthma patients to adopt proactive measures to manage their condition. This can lead to better adherence to treatment plans, potentially reducing the frequency and severity of asthma attacks.</li> </ul>
<b>Online Parenting &amp; Health Forums</b>	<ul style="list-style-type: none"> <li>Facilitate discussions on online platforms that focus on the experiences and management strategies relevant to Black families with asthma</li> </ul>
<b>Social Media Platforms</b>	<ul style="list-style-type: none"> <li>Focus their marketing efforts in the northeast and mid-west regions, in order to tap into densely populated areas where asthma prevalence is higher</li> <li>Cater advertisements and content to black race group and low-income demographics, to promote inhalers and other preventive methods for managing asthma attacks.</li> </ul>
<b>Partnerships with Pediatricians &amp; Respiratory Clinics</b>	<ul style="list-style-type: none"> <li>We advise regular asthma checkups for individuals with mental and behavioral disorders, endocrine conditions, and infectious diseases, particularly in the northeast and mid-west regions where there is a higher prevalence of black race groups to get hospitalized by asthma attacks. This proactive approach aims to detect asthma in its early stages.</li> </ul>

# *Conclusion/Recap*



# *Conclusion/Recap*

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## **Accomplishments:**

- Identified significant disparities in Type 1 diabetes and Asthma prevalence among different demographic groups of pediatric patients
- Created marketing recommendations for pharmaceutical companies to effectively engage customers with product and service offerings tailored to the needs of Type 1 diabetes and Asthma care.
- Formulated recommendations for pharmaceutical companies to partner with government programs to increase access to Asthma medications for preventive care.
- Addressed outreach, access expansion and preventive care towards vulnerable youth populations through tailored treatment, localized engagement and data-driven resource allocation.

## **Client Impacts:**

- Increase sales and revenue for the pharmaceutical company.
- Streamlining and collaborations lead to lower operational cost.
- Strategic partnership with government agencies and the recurrent nature of preventive care provide a stable revenue source for the pharmaceutical company.
- Improve access to preventive care for chronic disease patients.

# Limitations

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- **Outdated Data:** The data only pertains to 2019, thus it may not reflect changes in how chronic disease affects different groups of people.



- **Potential Data Bias:** The analysis could be slanted since it does not fully represent all children with chronic disease, especially those not treated in hospitals.



- **Causality:** The analysis might reveal trends and associations, but they cannot prove one thing causes another.



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