

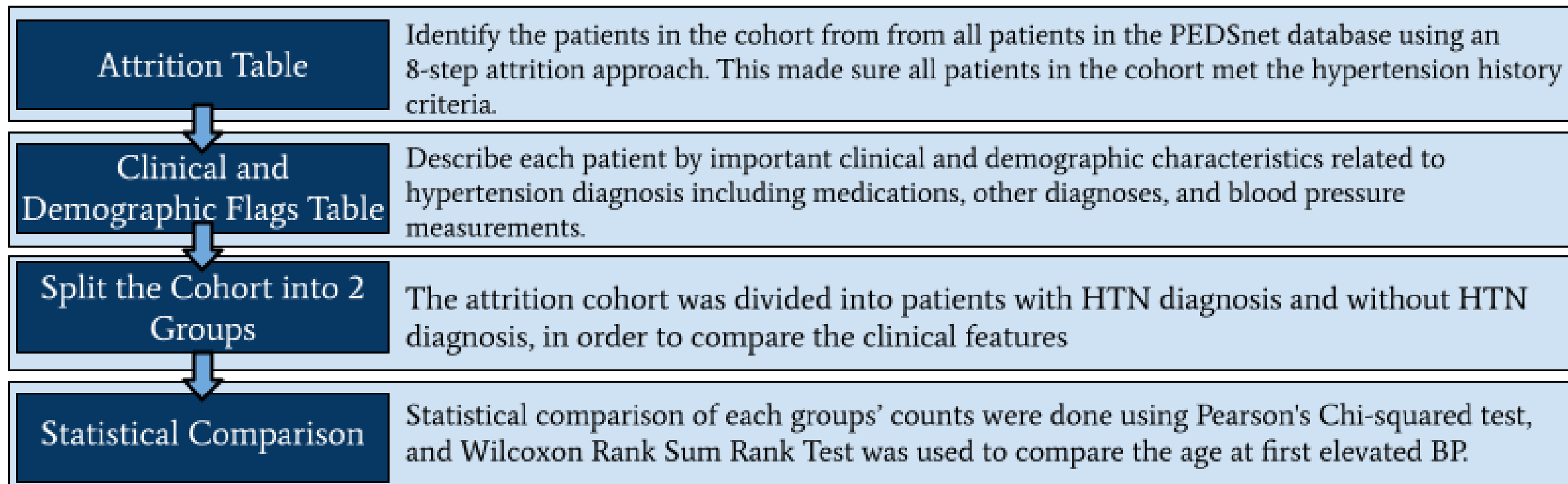
Background

- Pediatric hypertension (HTN) has rapidly increased in prevalence over the last few decades and now affects up to 4.5% of children in the US and worldwide.
- HTN diagnosis guidelines are hard to follow, as interpreting blood pressure (BP) readings requires the child's sex, height and age to classify them as normal, elevated, or hypertensive (stage 1/2), instead of flat cut-offs
 - Pediatric HTN often goes unrecognized, and thus undiagnosed and untreated.
- This is a major issue as almost 10% of adult HTN could be prevented if childhood HTN was recognized and treated.
- A potential solution is a risk score model which can identify patients at risk of developing HTN using multiple pieces of clinical data to assess the likelihood of having a given condition.
- As preparatory work, we sought to describe certain clinical and demographic factors that differentiate patients who are and are not diagnosed with HTN.

Objective

To determine the clinical and demographic characteristics of pediatric patients with elevated BP readings to understand the factors most important to receiving a diagnosis of HTN.

Methods



Results

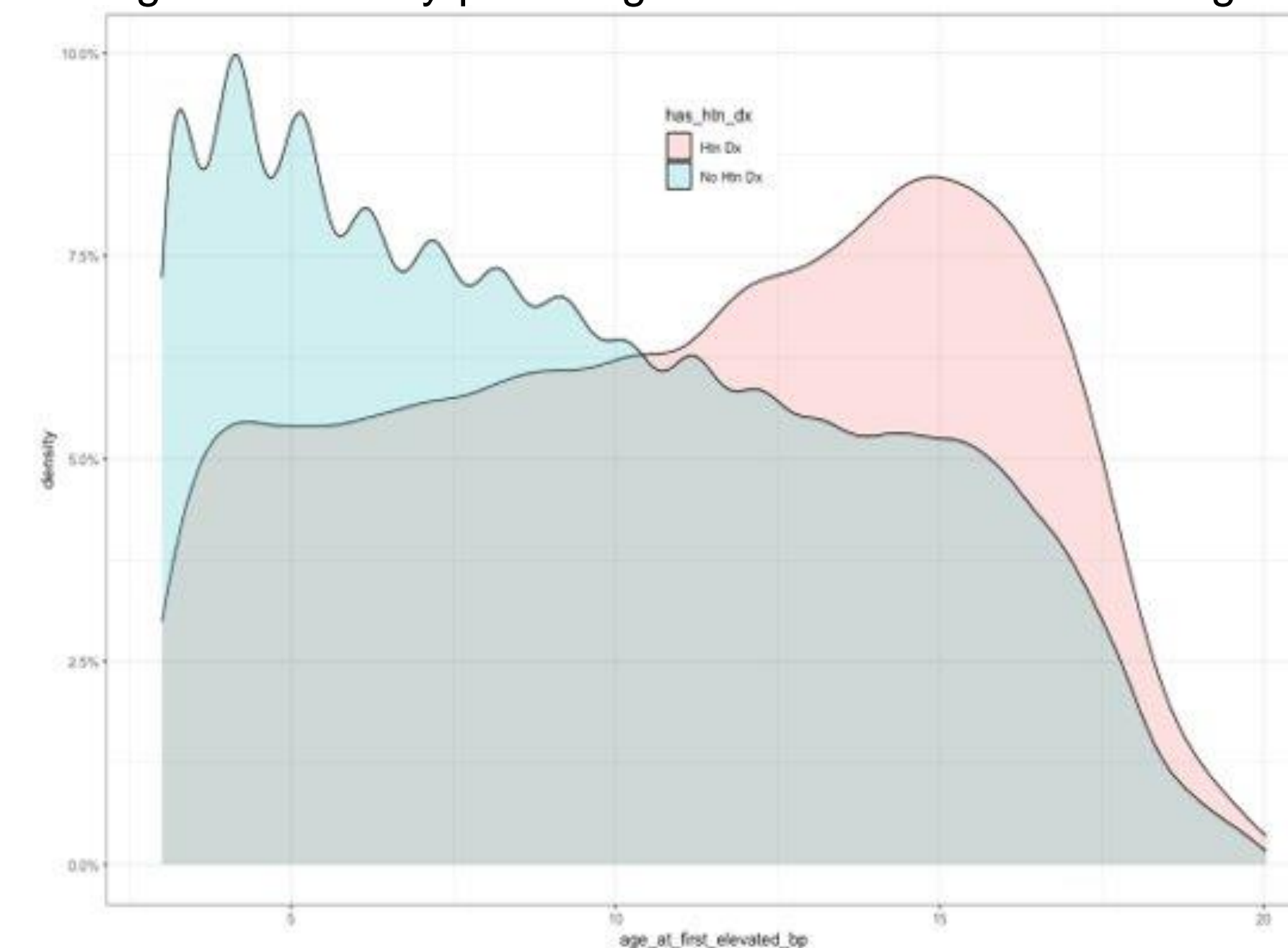
Table 1. Attrition table showing how cohort of 605,737 patients was constructed.

Attrition Step	Description	Number of Patients
1	All patients	9,107,649
2	At least 1 Outpatient Visit Between The Ages of 3-21 After 2011	5,436,542
3	At Least 2 Outpatient Visits At Least 3 Months Apart	3,405,213
4	Have 2 BP Measurements (7 Days Apart From Each Other)	1,846,244
5	Have 3 BP Measurements (Each At Least 7 Days Apart From Each Other)	1,522,102
6	Did Not Have A Htn Diagnosis Prior To The Age of 3	1,513,543
7	Did Not Have Elevated BP Prior To The Age of 3	1,448,232
8	At least 1 Elevated BP After the Age of 3	605,737

Table 2. Characteristics of overall cohort and sub-groups with and without diagnoses of HTN

	Htn Dx (N=33,689)	No Htn Dx (N=572,048)	Overall (N=605,737)	p-value
Sex				0.105
Female	16,013 (47.5%)	274,514 (48.0%)	290,527 (48.0%)	
Male	17,676 (52.5%)	297,534 (52.0%)	315,210 (52.0%)	
Race				<0.0001
Asian/Pacific Islander	1,299 (3.9%)	21,021 (3.7%)	22,320 (3.7%)	
Black	4,582 (13.6%)	110,225 (19.3%)	114,807 (19.0%)	
Hispanic	5,366 (15.9%)	84,187 (14.7%)	89,553 (14.8%)	
Other	1,751 (5.2%)	28,711 (5.0%)	30,462 (5.0%)	
Unknown	940 (2.8%)	25,304 (4.4%)	26,244 (4.3%)	
White	19,748 (58.6%)	302,590 (52.9%)	322,338 (53.2%)	
Missing	<11 (0.0%)	<11 (0.0%)	13 (0.0%)	
Age at First Elevated Blood Pressure (years)				<0.0001
Mean (SD)	11.15 (4.36)	9.45 (4.37)	9.54 (4.39)	
Median [Q1-Q3]	11.58 [7.49 - 14.84]	8.96 [5.57 - 12.99]	9.08 [5.65 - 13.13]	
Total length of follow-up (years) from first to last visit				
Mean (SD)	10.98 (6.14)	10.89 (5.38)	10.89 (5.42)	
Median [Q1-Q3]	10.99 [6.21 - 14.91]	10.97 [7.06 - 14.26]	10.97 [7.02 - 14.29]	
Has Type 1 Diabetes				<0.0001
Yes	1,210 (3.6%)	17,586 (3.1%)	18,796 (3.1%)	
No	32,479 (96.4%)	554,462 (96.9%)	586,941 (96.9%)	
Has Type 2 Diabetes				<0.0001
Yes	446 (1.3%)	3,756 (0.7%)	4,202 (0.7%)	
No	33,243 (98.7%)	568,292 (99.3%)	601,535 (99.3%)	
Total number of Steroid Prescriptions				
Mean (SD)	1.81 (5.36)	0.74 (2.60)	0.80 (2.84)	
Median [Q1-Q3]	0.00 [0.00 - 1.00]	0.00 [0.00 - 0.00]	0.00 [0.00 - 0.00]	
Avg BMI Z-score across all measurements				
Mean (SD)	0.78 (1.19)	0.71 (1.11)	0.72 (1.11)	
Median [Q1-Q3]	0.84 [-0.03 - 1.72]	0.74 [-0.03 - 1.55]	0.75 [-0.03 - 1.56]	

Figure 1. Density plot of age at first elevated BP reading.



Discussion

- The overall cohort with at least one elevated BP was 605,737, and 5.5% had a diagnosis of HTN.
- Notable differences between the 2 sub-groups:
 - The race distribution was significantly different, with Black patients under-represented in the HTN group.
 - Black patients are historically at higher risk for HTN, so this was unexpected.
 - Diabetes (Type 1 and 2) was significantly more likely in the HTN group.
 - Age at first elevated BP was also significantly higher in the HTN diagnosis group.
- Limitations:
 - Relied on EHR data and chart review was not done to confirm results.
 - No cohort of confirmed HTN patients was available for comparison.

Next Steps

- Explore additional variables such as steroid use, number of hypertensive BPs before HTN diagnosis, differences in use of other classes of medications
- Use linear regression or machine learning approaches to help develop a potential risk score for development of HTN.

Acknowledgements

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