

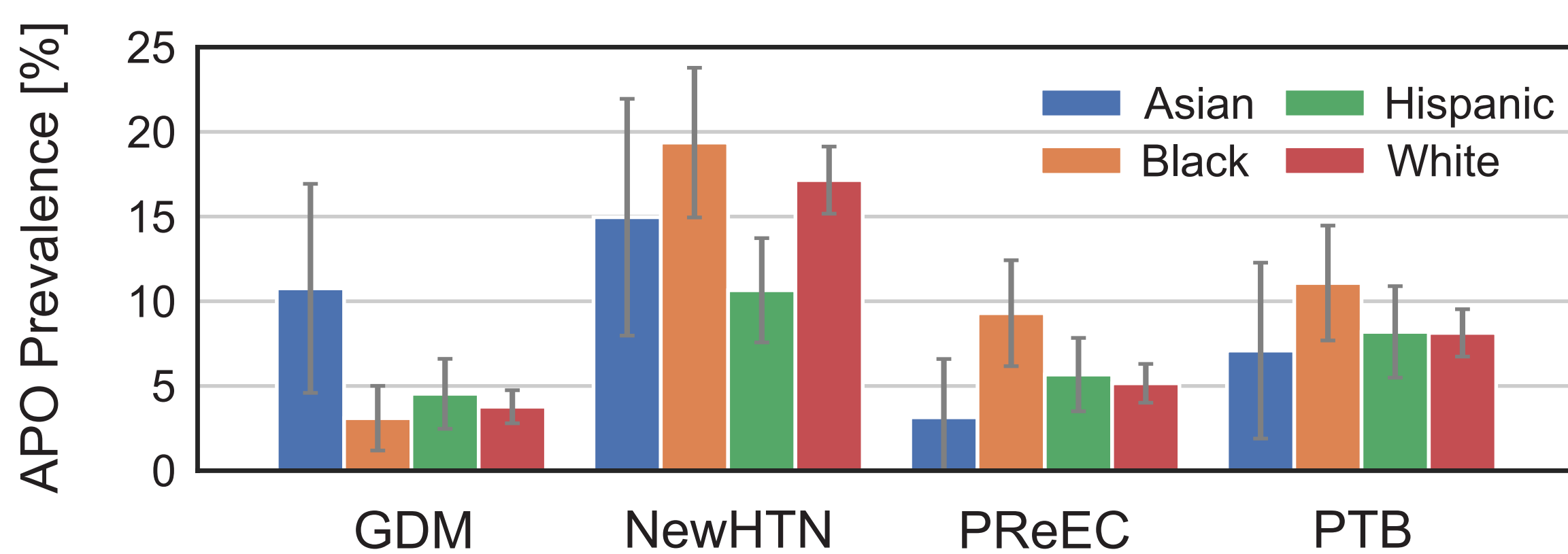
Health Disparities are Heterogenous among High-Risk Subgroups and Context-Dependent Policies May Be More Effective At Reducing Disparities

Introduction

Adverse pregnancy outcomes (APOs) such as:

- **Gestational Diabetes Mellitus (GDM)**
- **Preeclampsia (PReEc)**
- **Preterm birth (PTB)**
- **New hypertension (NewHTN)**

are known to disproportionally affect racial/ethnic groups but the extent to which the disparities are present in high-risk subgroups have not been studied.



Method

We transformed the nuMOM2b cohort (n=8903) clinical data into transactional data and applied **association rules** to identify high-risk subgroups for each APO

Table 1. Examples of statistically significant association rules for the nuMoM2b cohort.

Antecedent	Consequent	Confidence	LR ⁺ [95% CI]	Adjusted p-value
{Age = 35-39}	{GDM = 1}	9.6% (51/531)	2.5 [1.9, 3.2]	4.7×10^{-7}
{Age = 35-39}	{NewHTN = 1}	21.1% (112/531)	1.4 [1.1, 1.7]	1.1×10^{-2}
{Age < 18}	{PTB = 1}	14.3% (70/489)	1.8 [1.4, 2.3]	1.7×10^{-4}
{BMI ≥ 35}	{GDM = 1}	8.8% (78/882)	2.3 [1.8, 2.8]	5.8×10^{-9}
{BMI ≥ 35}	{PTB = 1}	11.9% (105/882)	2.2 [1.8, 2.7]	7.2×10^{-4}
{BMI ≥ 35}	{NewHTN = 1}	25.3% (223/882)	1.8 [1.5, 2.0]	1.1×10^{-10}
{Diet = poor}	{PReEc = 1}	7.9% (146/1853)	1.4 [1.2, 1.6]	3.0×10^{-4}
{Exercise = inactive, High BP = 1}	{PTB = 1}	21.4% (19/89)	2.9 [1.8, 4.8]	5.7×10^{-3}
{Diet = poor, High BP = 1}	{PReEc = 1}	22.2% (16/72)	4.7 [2.7, 8.1]	1.2×10^{-3}
{Age = 35-39, BMI = 30-35}	{NewHTN = 1}	33.3% (22/66)	2.6 [1.6, 4.3]	3.6×10^{-3}

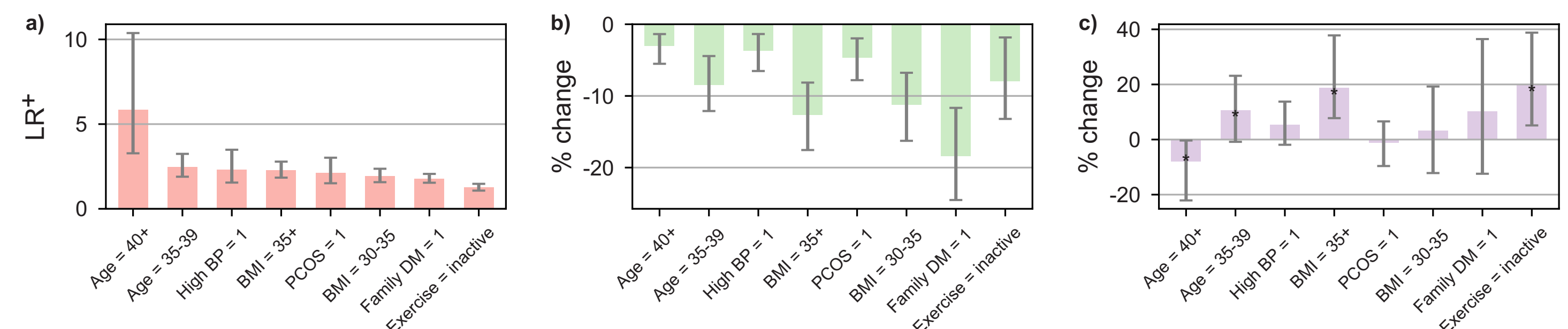
We quantified racial/ethnic disparity in each subgroup using **Gini coefficients** and evaluated for each APO:

1. The subgroups with the highest statistically significant **positive likelihood ratios (LR+)**
2. The relative change in APO prevalence if the high-risk subgroups are omitted from the cohort
3. The relative change in Gini coefficient if the high-risk subgroups are omitted from the cohort

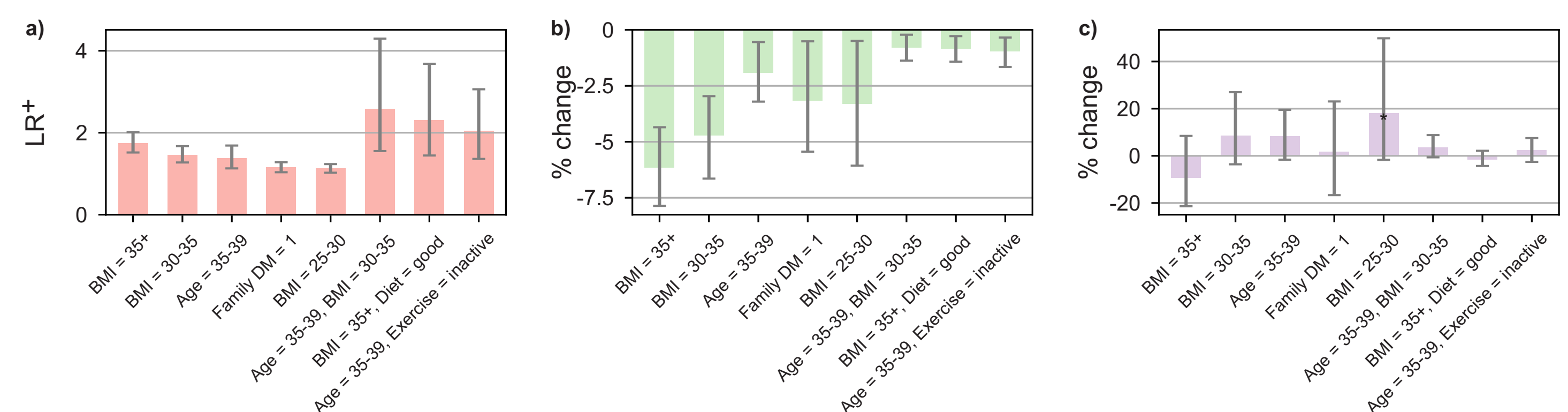
Results

Disparity is highly heterogeneous within and across APOs

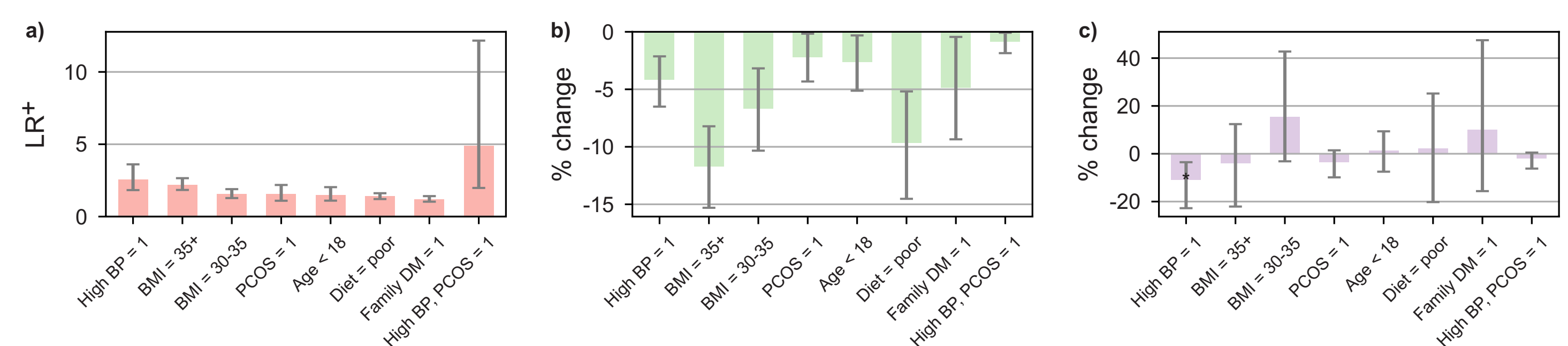
Gestational Diabetes Mellitus (GDM)



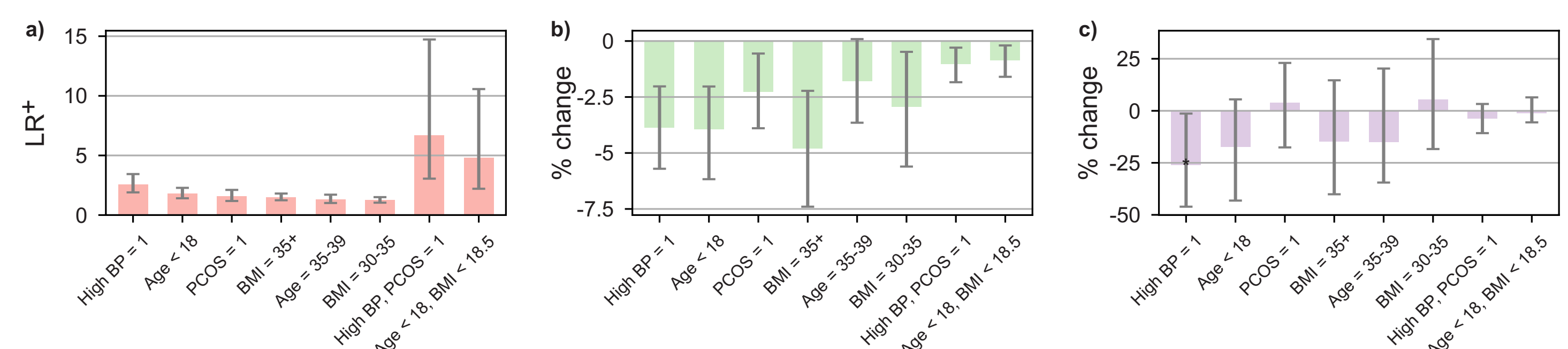
New Hypertension (NewHTN)



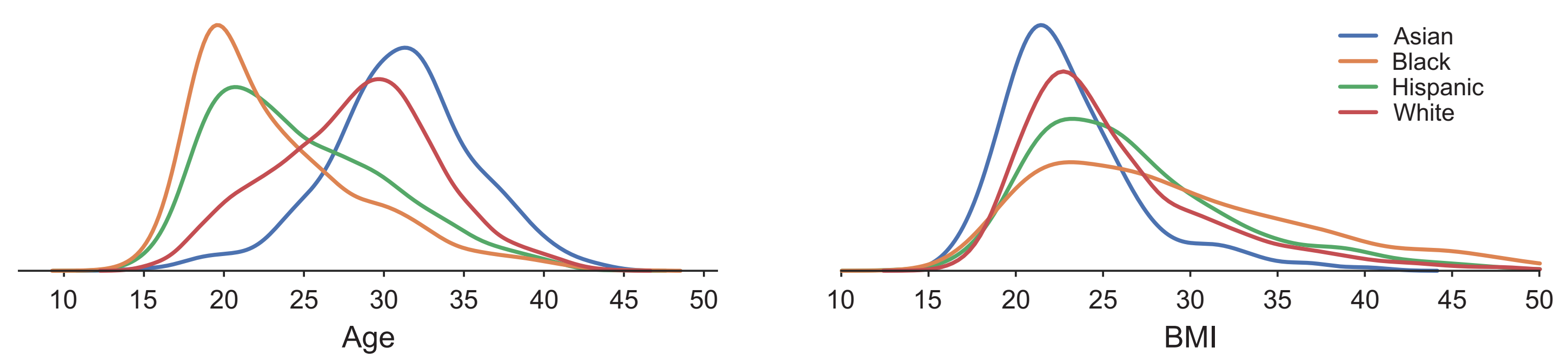
Preeclampsia (PReEc)



Preterm Birth (PTB)



Major APO risk-factors are associated with population structure



Discussion

- Association rules are easily interpretable which enable findings to be accessible to wide audiences including clinicians and policy makers
- Significant differences in age and BMI distributions appears to play an important role in shaping the APO disparity landscape
- While the study does not model clinical intervention, our findings can be used to inform planning of policy interventions such as influencing resource allocation in communities where disparities and health outcomes need to be addressed. For example:
 - High prevalence of GDM among Asian participants above the age of 40 can serve as evidence for prioritizing education on the potential impact of maternal age on the risk of GDM in clinics that serve mostly Asian communities
 - High prevalence of PReEc among Black participants with high blood pressure could serve as evidence for providing resources for blood pressure management in clinics that serve mostly Black communities

Using Association Rules to Understand the Risk of Adverse Pregnancy Outcomes in a Diverse Population

Hoyin Chu¹, Rashika Ramola¹, Shantanu Jain¹, David M. Haas², Sriaram Natarajan³, Predrag Radivojac¹

¹Northeastern University, ²Indiana University School of Medicine, ³University of Texas at Dallas

Email: chu.ho@northeastern.edu Url: hoyinchu.github.io/posters/ Twitter: @hoyin_chu

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