

# Hypertension Prevalence & Risk Factors In Tennessee vs. National Estimates: A Cross-Sectional Ecological Analysis

Muhammad Talha Khan, OMS-II, Shekher Mohan, Ph.D.  
Baptist Health Sciences University, College of Osteopathic Medicine, Memphis, TN

## Background

- Hypertension remains one of the most prevalent and preventable risk factors for cardiovascular disease in the United States, contributing significantly to morbidity, mortality, and healthcare costs.
- Despite advances in screening, diagnosis, and treatment, substantial disparities persist across geographic regions, racial and ethnic populations, and socioeconomic groups.
- A growing body of literature highlights the role of modifiable and structural determinants—such as obesity, health behaviors, and access to healthcare—in shaping both the prevalence and control of hypertension. However, the magnitude, direction, and consistency of these associations vary across populations, underscoring the need for more nuanced, population-level analyses.
- To address these gaps, this study integrates nationally representative data from the National Health and Nutrition Examination Survey (NHANES) with state-level data from Tennessee to provide a more comprehensive assessment of hypertension trends. *This dual-level approach allows for comparison between national patterns and localized population health dynamics.*

## Aim and Hypothesis

### Goal



Is to identify population-level trends that can inform targeted public health strategies and guide resource allocation decisions

### Hypothesis



Individuals with higher exposure to adverse health behaviors and limited healthcare access will demonstrate higher hypertension prevalence and lower rates of control

## References

- National Center for Health Statistics. National Health Interview Survey Data Query System (NHIS). Centers for Disease Control and Prevention. Available from: <https://www.cdc.gov/NHISDataQueryTool/>
- Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System (BRFSS): Tennessee Core Survey Data, 2019, 2021, and 2023. Available from: <https://www.cdc.gov/brfss>
- Centers for Disease Control and Prevention. Hypertension Prevalence and Control Among Adults: United States, 2019–2023. National Center for Health Statistics
- National Center for Health Statistics. National Health Interview Survey (NHIS), 2019–2023. Centers for Disease Control and Prevention. Available from: <https://www.cdc.gov/nchs/nhis>

## Methods



Cross-sectional study using publicly available data from the National Health and Nutrition Examination Survey (NHANES) (2019–2023) and Tennessee Behavioral Risk Factor Surveillance System (BRFSS) datasets (2019, 2021, 2023)



Hypertension defined as a diagnosis by a healthcare professional



Hypertension prevalence examined across demographic subgroups, including gender, race, geographic residence, and age categories

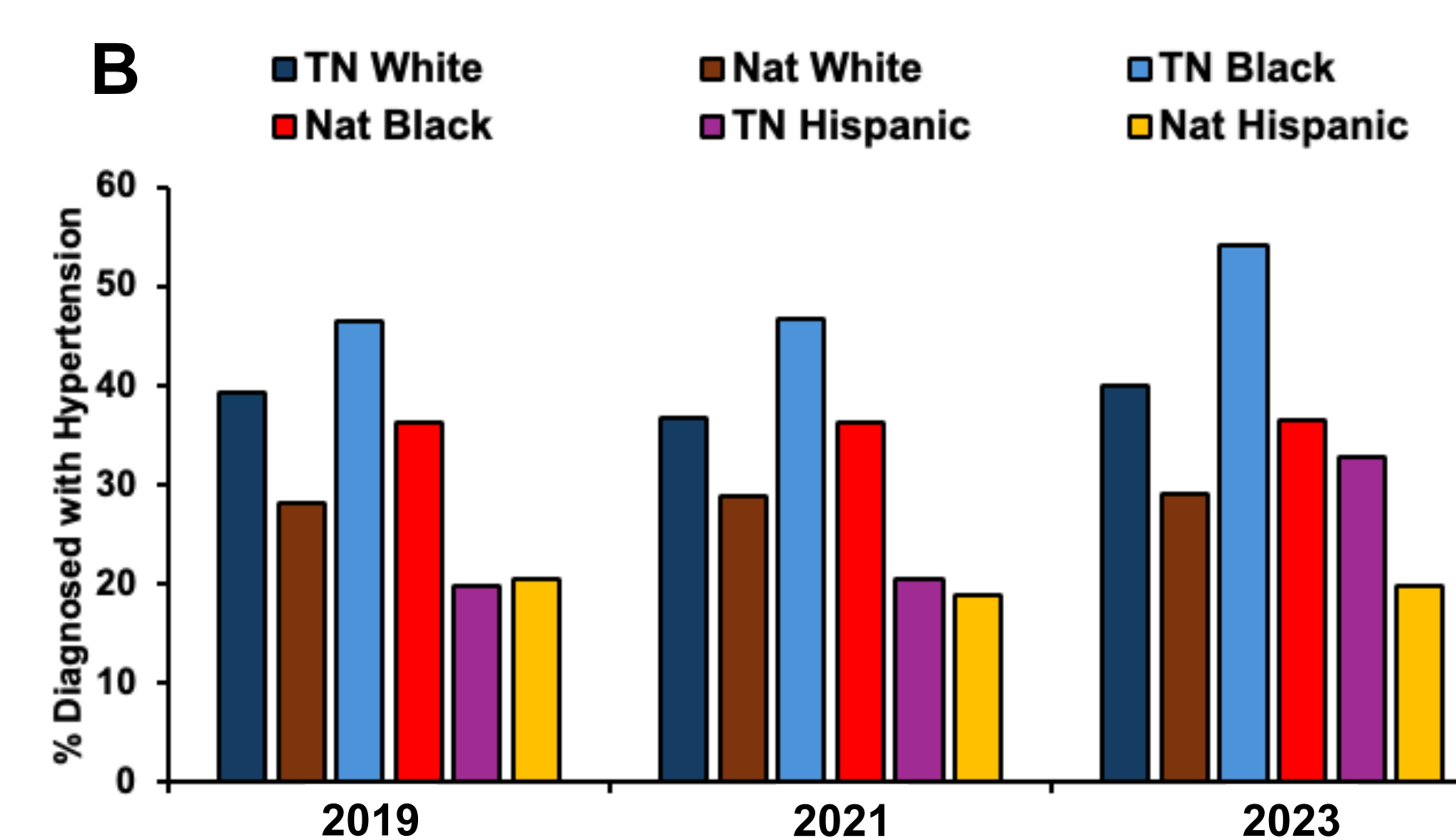
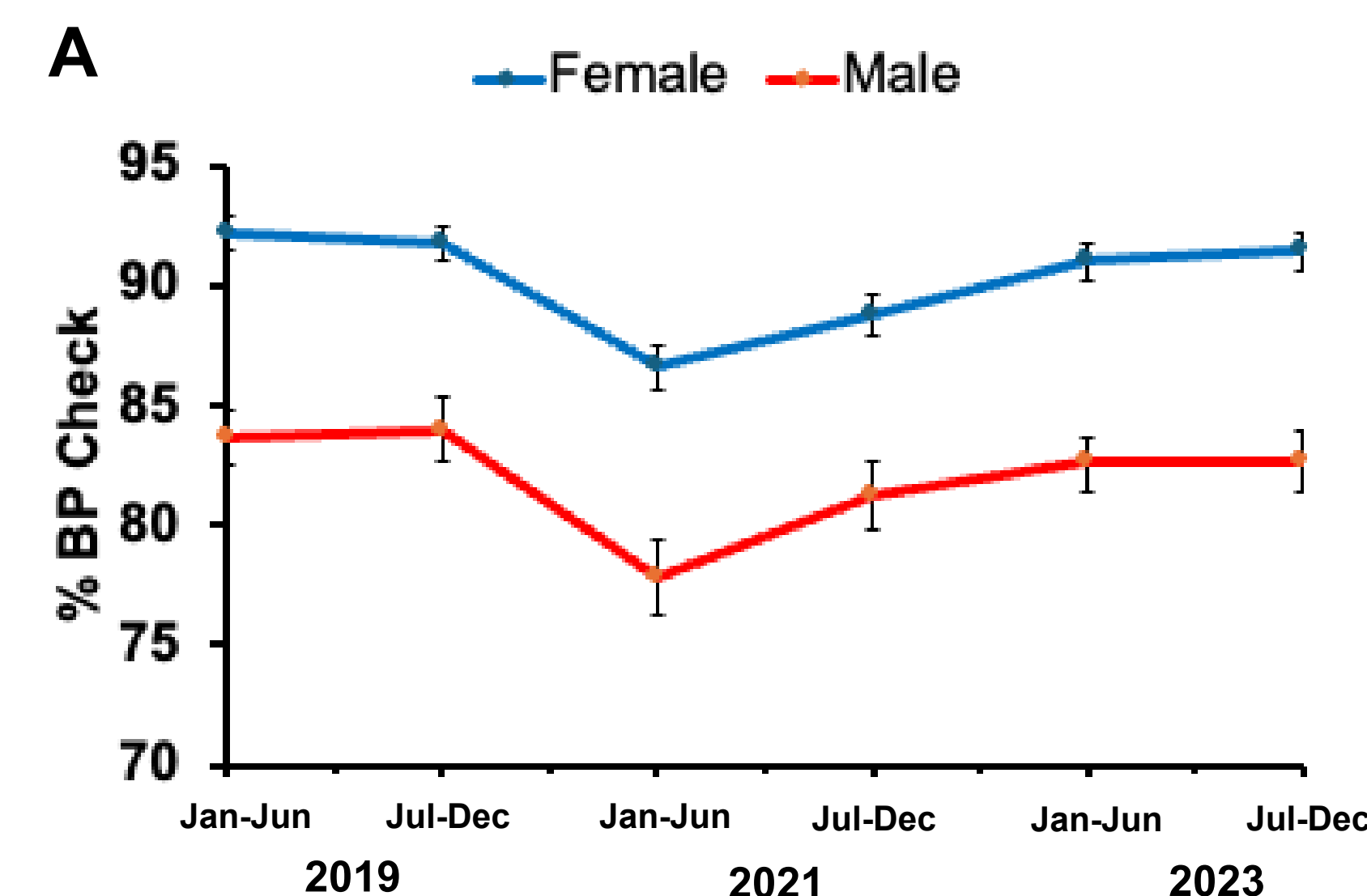


Pearson correlation analysis of cigarette smoking prevalence and hypertension prevalence across subgroups

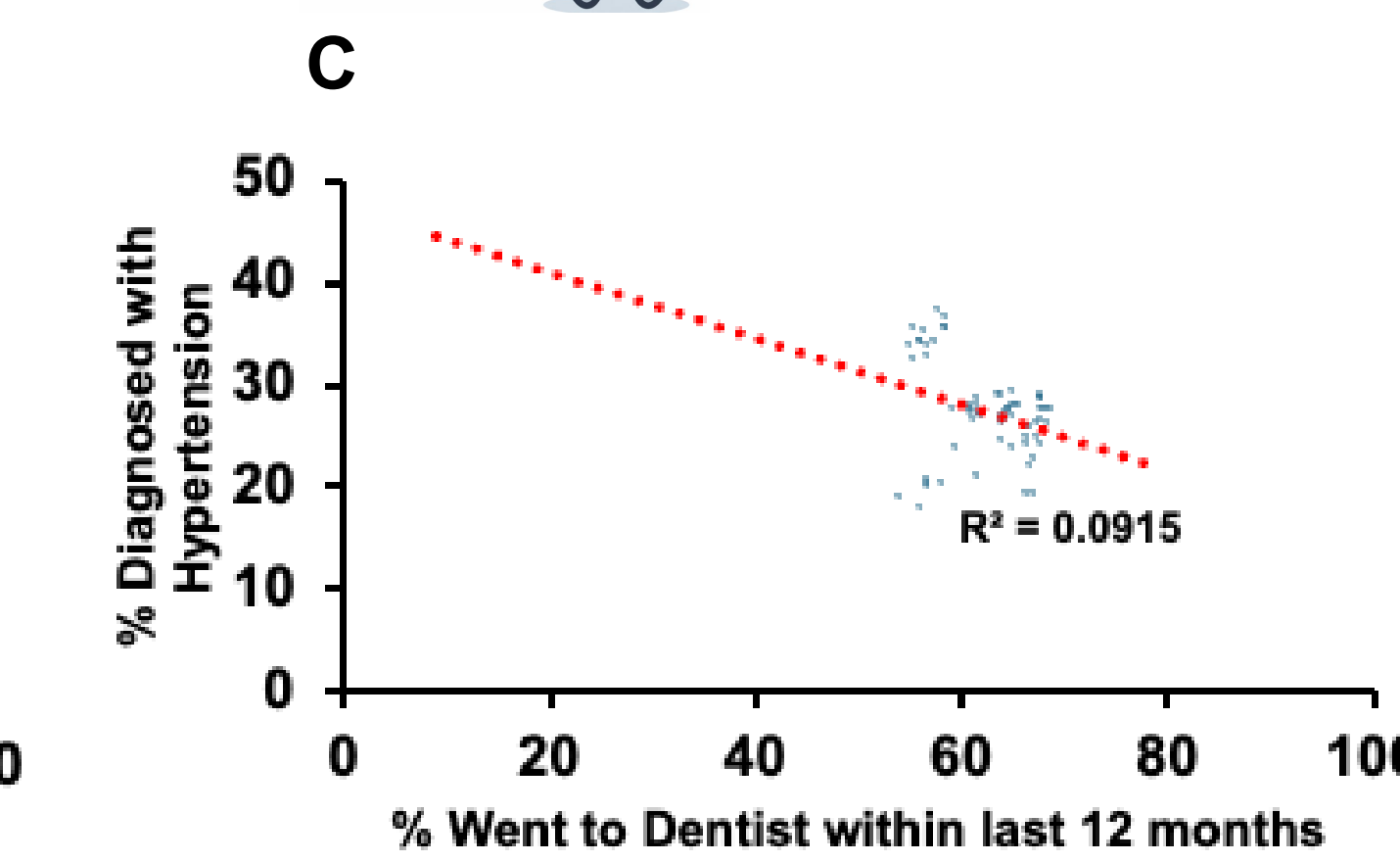
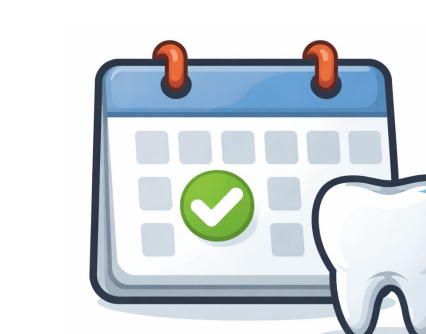
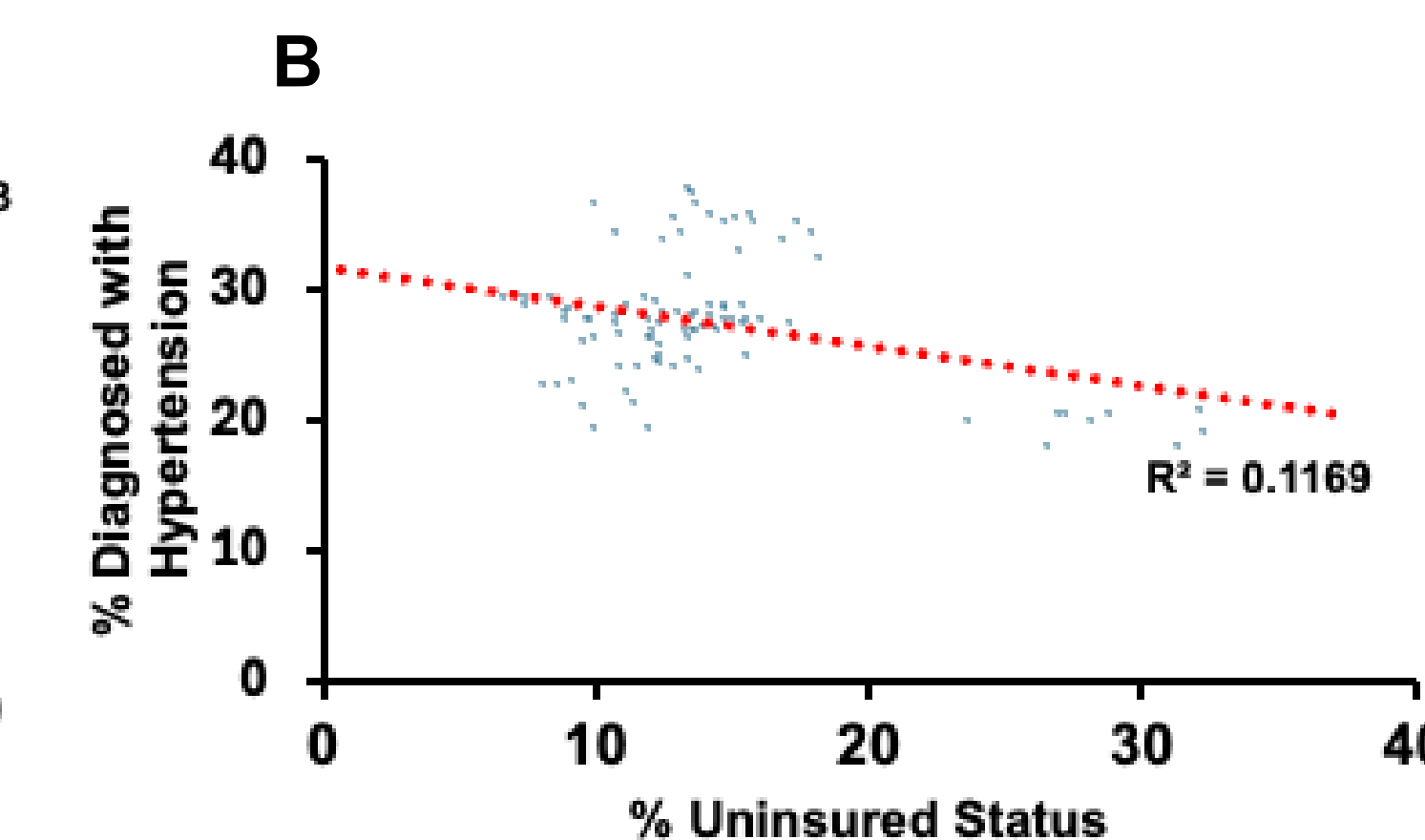
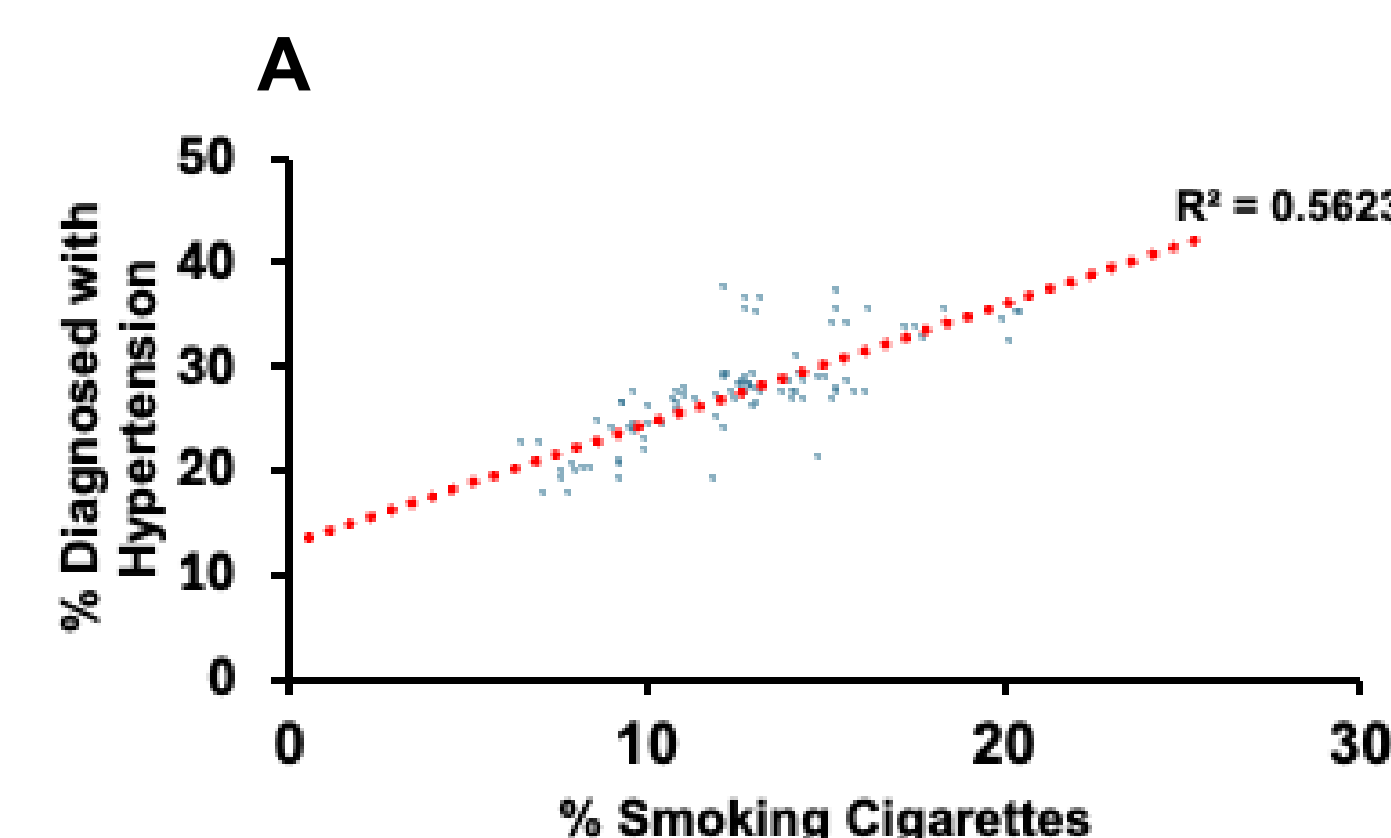


Descriptive statistics used to assess trends in hypertension prevalence over study years

## Data



**Fig. 1. A.** Gender differences (%) in getting blood pressure (BP) checked in 2019, '21 and 2023. **B.** Racial differences (%) in hypertension diagnosis between Tennessee (TN) and National levels across white, black and Hispanic populations



**Fig. 2.** Pearson's Correlations (via scatter plot) to diagnosis with hypertension (%). **A.** Smoking cigarettes ( $R^2 = 0.5623$ ). **B.** Medical Insurance [uninsured] Status ( $R^2 = 0.1169$ ); **C.** Dental Visits within the last 12 months ( $R^2 = 0.0915$ ).

## Results

- Hypertension prevalence remained consistently **higher** in Tennessee compared to national estimates throughout the study period
- National prevalence remained stable at approximately 27–28%, while Tennessee rates were notably higher, ranging from 37.5% to 40.7% (not plotted)
- Racial disparities** were evident at both national and state levels, with Black, non-Hispanic adults demonstrating the highest prevalence of hypertension
- In Tennessee, hypertension prevalence among Black adults reached 54.1% in 2023, substantially exceeding national estimates, while White populations showed moderate prevalence (**Fig. 1B**)
- An increase in hypertension prevalence was observed among **Hispanic** populations in Tennessee in 2023 (32.8%), suggesting emerging disparities (**Fig. 1B**)
- A strong positive correlation was identified between cigarette smoking and hypertension prevalence (56%), while weaker negative correlations were observed with uninsured status (11%) and dental visits within the last 12 months (9%) (**Fig. 2A-C**)

## Conclusions & Recommendations

- Hypertension prevalence was consistently higher in Tennessee compared to national estimates, with pronounced racial disparities; Black, non-Hispanic adults experienced the highest burden
- A strong positive association between cigarette smoking and hypertension prevalence highlights the significant role of modifiable behavioral risk factors in driving disease burden (**Fig. 2A**)
- In contrast, weaker associations were observed for uninsured status and recent dental visits, suggesting limited independent explanatory power of these variables in isolation. These weaker relationships likely reflect the multifactorial etiology of hypertension, limitations of cross-sectional self-reported data, and the indirect nature of insurance status and dental care as proxies for overall healthcare access and preventive behavior.
- Study limitations include reliance on self-reported hypertension diagnosis, cross-sectional design limiting causal inference, and potential variability due to differences in national versus state-level sampling
- Overall, these findings highlight smoking as the most influential of the evaluated correlates, while also reinforcing that hypertension is driven by a complex interplay of behavioral, structural, and biological factors.
- Recommendation:** Future efforts should prioritize longitudinal research and targeted public health interventions focused on smoking cessation, improving healthcare access, and addressing treatment gaps in high-risk populations, particularly younger adults and racial minorities