Trends in Hypertension Control and Management Disparities in U.S. Adults: A NHANES Analysis from 1999-2020

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Introduction: Background

Background

- Hypertension is a leading risk factor for cardiovascular diseases, affecting public health worldwide and prominently in the U.S.

Problem

- Following an initial improvement in blood pressure control among U.S. adults with hypertension from 1999-2000 to 2007-2008, there was a stagnation and subsequent decrease post-2013 (Muntner P, et al., 2020).

Introduction

Motivation

- This study aims to explore the reasons behind recent declines in hypertension control.

Study Objective

- Examining the trends, awareness, and medication use in stage 2 hypertension among U.S. adults in 1999-2020.
- Assessing the impact of demographic factors and comorbid conditions on hypertension control.
- This study used 1999-2020 National Health and Nutrition Examination Survey (NHANES) data.

Statistical Analysis

1. Weighting and multiple year adjustment
2. Multiple Imputation to address missing data
3. Logistic Regression Models accounts for complex survey design (Heeringa, S., West, B.T. and Berglund, P.A., 2017):

The model can be expressed as:

$$log(\frac{\pi}{1-\pi}) = X\beta = \beta_0 + \beta_1 X_1 + ... + \beta_n X_n$$

- Variance is estimated using the linearization method
- Using Rubin's multiple imputation combining rule to combine both between and within imputation variance (Rubin, 2018)

Results

- Gap in high blood pressure treatment!
  - **Prevalence**: 19% of the population have stage 2 hypertension.
  - **Awareness**: Only 63% of those with stage 2 hypertension are aware of their condition.
  - **Treatment**: Among those aware, 77% are receiving medication
- Less than half ($0.63 \times 0.77 \approx 49\%$) of those with stage 2 hypertension are being medicated.

Results

Table 1: Participant Characteristics and Comorbidity Status of Uncontrolled Stage 2 Hypertension, Awareness, and Medication Use in US Adults, 1999-2020

Characteristic	Stage 2 Hypertension N = 56,017 [1]	Awareness N = 10,923[2]	Medication Use N = 6,891[3]
Age	64 (52, 74)	65 (54, 75)	68 (59, 77)
Race/Ethnicity			
Non-Hispanic White	4,627 (42%)	2,841 (41%)	2,223 (42%)
Hispanic/Asian/Other	3,221 (29%)	1,909 (28%)	1,406 (27%)
Non-Hispanic Black	3,075 (28%)	2,141 (31%)	1,664 (31%)
Gender			
Male	5,510 (50%)	3,249 (47%)	2,338 (44%)
Female	5,413 (50%)	3,642 (53%)	2,955 (56%)
BMI			
<25	2,584 (24%)	1,423 (21%)	1,067 (21%)
25 to 30	3,604 (34%)	2,202 (33%)	1,700 (33%)
30+	4,408 (42%)	3,057 (46%)	2,359 (46%)
Unknown	327	209	167
Diabetes	2,410 (22%)	1,867 (27%)	1,661 (31%)
Chronic Kidney Disease	3,653 (33%)	2,702 (39%)	2,272 (43%)
History of CVD	1,920 (18%)	1,588 (23%)	1,395 (26%)

[1] Stage 2 Hypertension Prevalence: Among the 56,017 participants, 10,923 (19%) have stage 2 hypertension.

[2] Awareness Among Those with Stage 2 Hypertension: 6,891 (63%) of them are aware of their condition.

[3] Medication Usage Among Aware Participants: 5,293 (77%) of them are taking medication.

Results

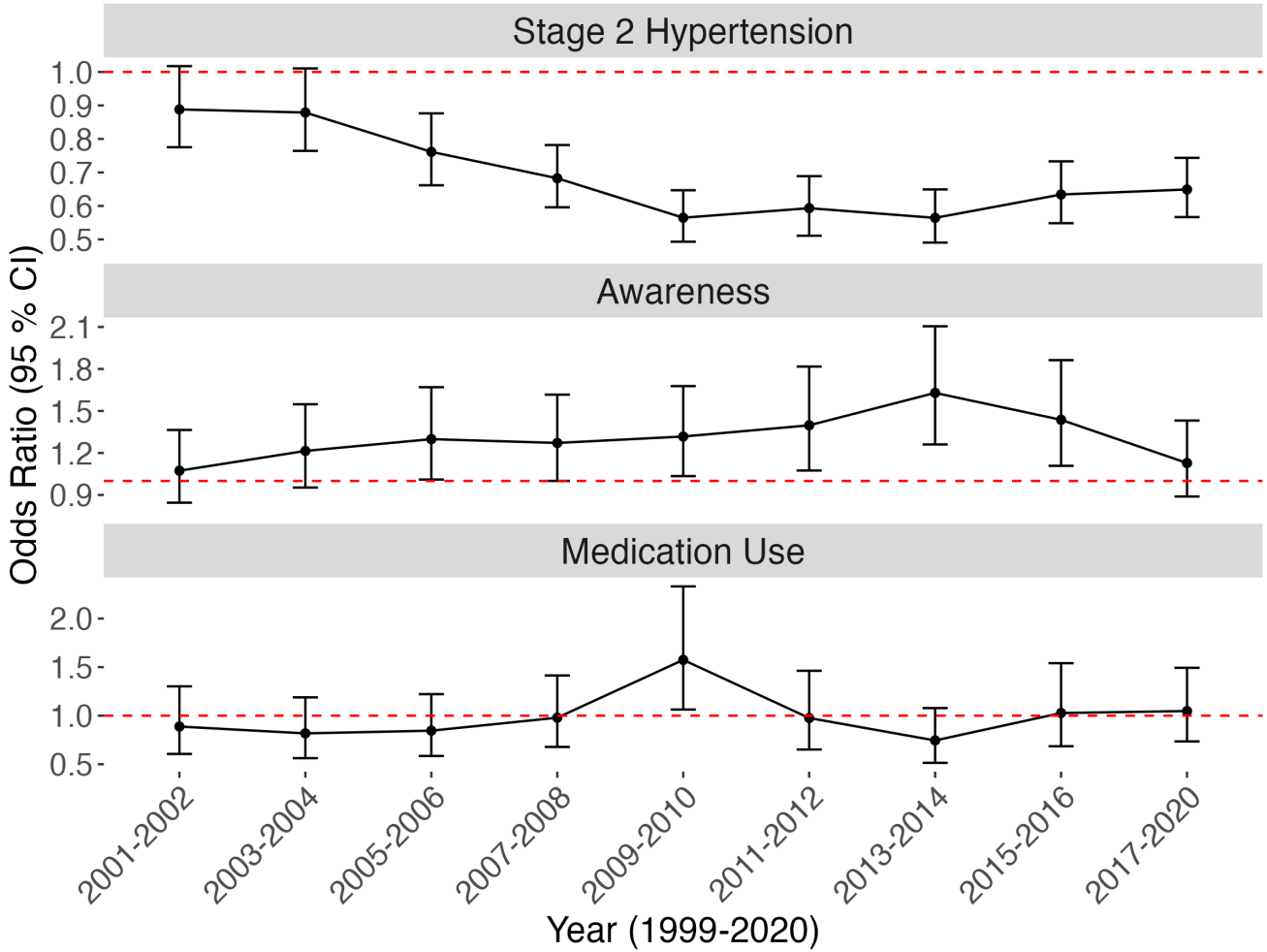

Figure 1: Odds Ratios and 95% CI of Uncontrolled Stage 2 Hypertension, Awareness, and Self-reported Antihypertensive Medication Use in US Adults by Year

Results

Table 2: Odds Ratios and 95% CI of Uncontrolled Stage 2 Hypertension, Awareness, and Medication Use in US Adults, 1999-2020

Characteristic	Model 1: Stage 2 Hypertension N = 56,017	Model 2: Awareness N = 10,923	Model 3: Medication Use N = 6,891
Age	1.06 (1.06, 1.06)	1.02 (1.01, 1.02)	1.06 (1.05, 1.07)
Race/Ethnicity			
Non-Hispanic White	Ref	Ref	Ref
Hispanic/Asian/Other	1.23 (1.14, 1.33)	0.98 (0.86, 1.13)	0.93 (0.76, 1.15)
Non-Hispanic Black	2.09 (1.94, 2.24)	1.49 (1.32, 1.70)	1.38 (1.15, 1.66)
Gender			
Male	Ref	Ref	Ref
Female	0.83 (0.78, 0.89)	1.24 (1.10, 1.40)	1.39 (1.17, 1.65)
BMI			
< 25	Ref	Ref	Ref
25 to 30	1.16 (1.06, 1.26)	1.41 (1.21, 1.64)	1.26 (1.00, 1.65)
30+	1.57 (1.44, 1.70)	2.26 (1.93, 2.64)	1.62 (1.28, 2.03)
Diabetes	1.02 (0.93, 1.12)	1.68 (1.42, 1.98)	2.10 (1.63, 2.70)
Chronic Kidney Disease	1.72 (1.59, 1.87)	1.56 (1.36, 1.77)	1.10 (0.91, 1.34)
History of CVD	0.84 (0.76, 0.92)	2.79 (2.33, 3.36)	1.61 (1.26, 2.05)

SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure.

Stage 2 Hypertension: SBP $\geq$ 140 mm Hg or DBP $\geq$ 90 mm Hg.

Discussion

Findings

- A gap in high blood pressure treatment
- Overall increase in awareness since 1999, but a notable decline in recent years.
- Level of medication use has not shown significant improvement.
- Women and people with existing health issues tend to pay more attention to blood pressure management.

Limitations

- Potential inaccuracies in self-reported data and the exclusion of certain variables that might influence the outcomes.

References

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Thank you!

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