

EFFECT OF PAST AND CONCURRENT BLOOD PRESSURE OVER 120/70 ON WHITE MATTER HYPERINTENSITIES: AN ANALYSIS OF THE UK BIOBANK COHORT.

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Background

- White matter hyperintensities (WMHs) are associated with increased risk of stroke and dementia.
- They are strongly linked with age, hypertension, and cerebrovascular dysfunction.
- The temporal relationships between these factors and WMHs are poorly understood.

Aims

The aim of this study was to determine the associations between WMHs and concurrent and past systolic (SBP) and diastolic (DBP) blood pressure; in particular, to investigate whether:

- current SBP or DBP has a stronger association with WMHs
- past SBP or DBP has a stronger association with WMHs
- associations between SBP, DBP and WMHs vary across different ages

Methods

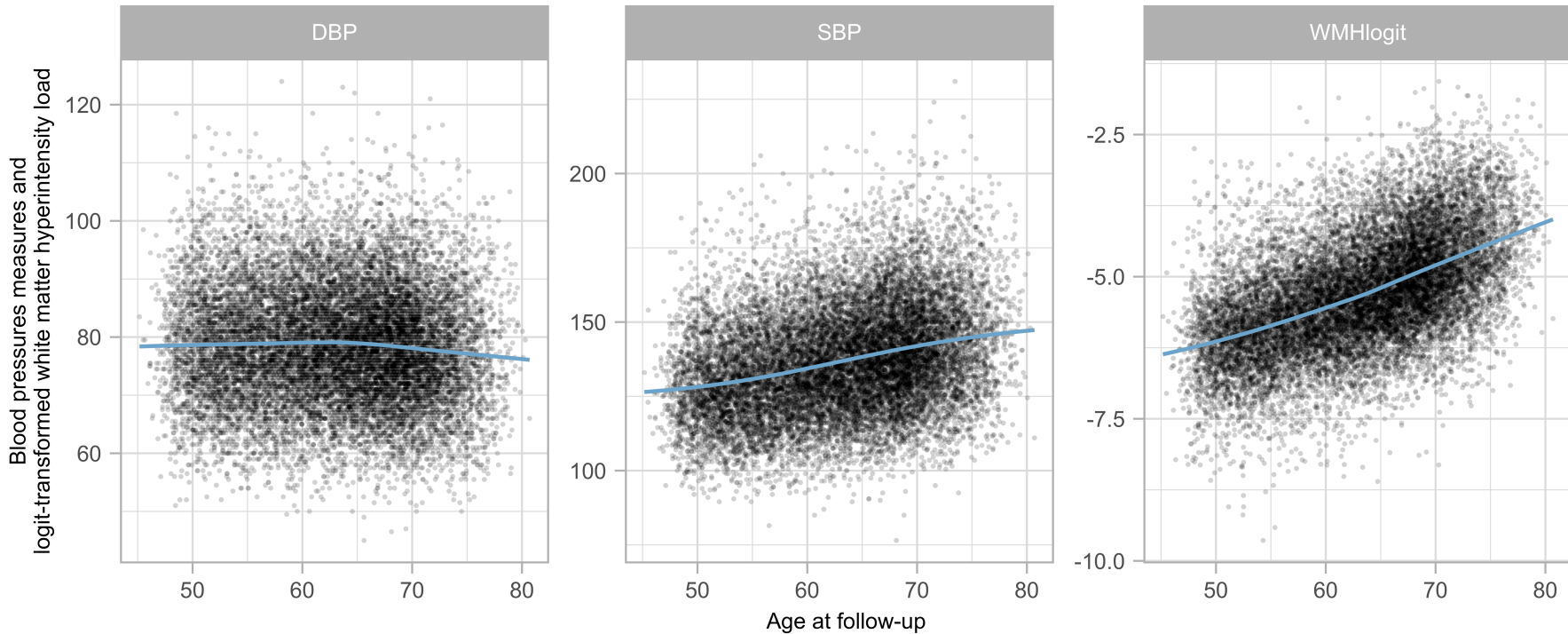
- UK Biobank is a prospective community-based cohort of >500,000, 40-69 year-old community-based people.
- 20,200 of whom had an MRI scan 4-12 years after baseline.
- WMHs were automatically segmented based on T1-weighted and T2-weighted FLAIR images using FSL tools (<https://fsl.fmrib.ox.ac.uk/fsl/fslwiki/>).

Methods

- WMH load was calculated by logit-transformed the volume of WMHs normalised by the total white matter volume.
- Associations between concurrent and past SBP and DBP values and were analysed using linear models adjusted for age, sex and cardiovascular risk factors (smoking and diabetes), ASI, antihypertensive medication, source of BP measure, assessment centre, and longitudinally, for time since baseline.
- Analyses were repeated after stratifying by age and BP values, and for hypertensive status.

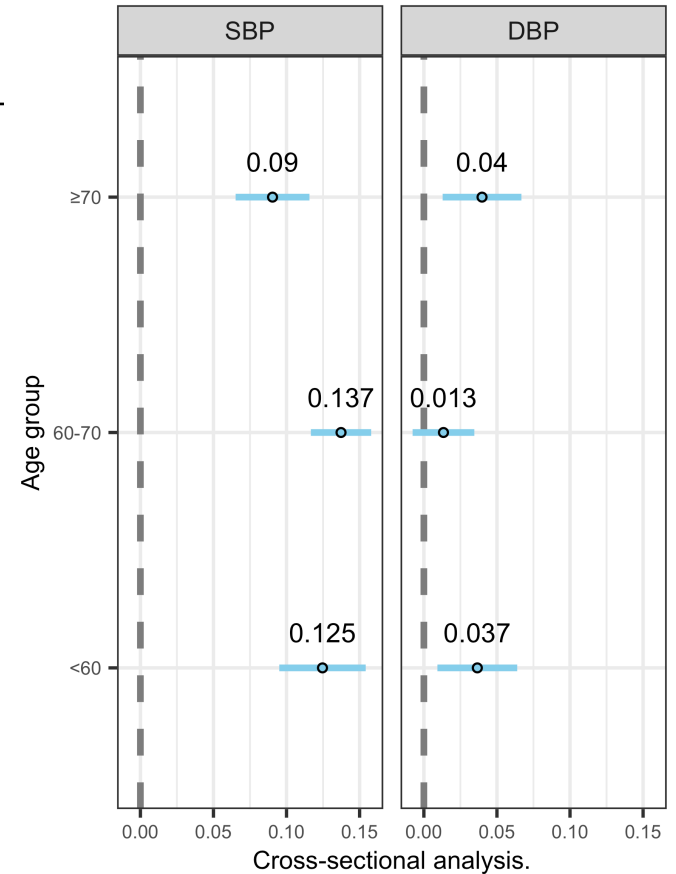
Results

SBP and logit-WMH load increase with age



Results: cross-sectional

Variable	Unadjusted (95%CI)	Age- and sex- adjusted (95%CI)	Fully-adjusted (95%CI)
SBP	0.273 (0.262 to 0.284)	0.126 (0.116 to 0.136)	0.076 (0.062 to 0.090)
DBP	0.083 (0.071 to 0.094)	0.117 (0.107 to 0.127)	0.064 (0.050 to 0.078)

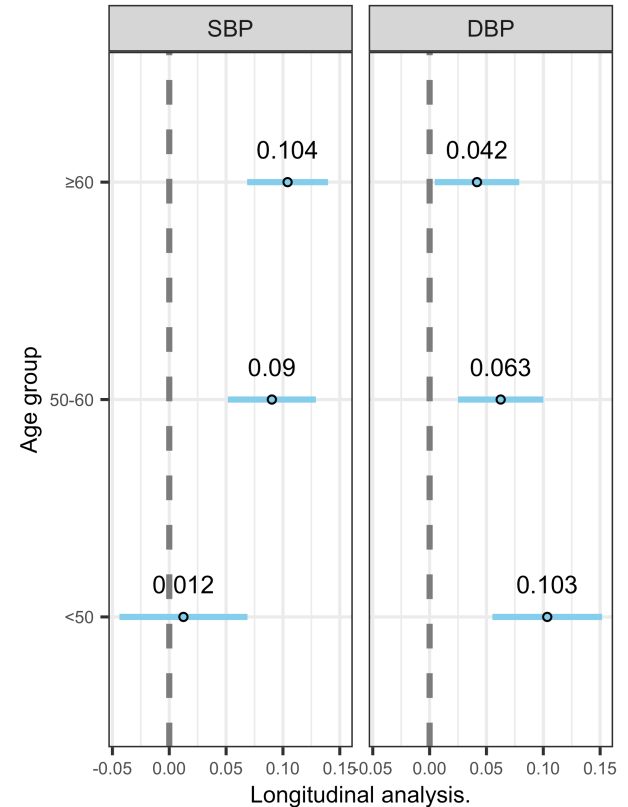


Age group	WMH increase per 10 mmHg concurrent SBP	WMH increase per 5 mmHg concurrent DBP
< 60	1.069	1.017
60 - 69	1.076	1.0063
≥ 70	1.049	1.019

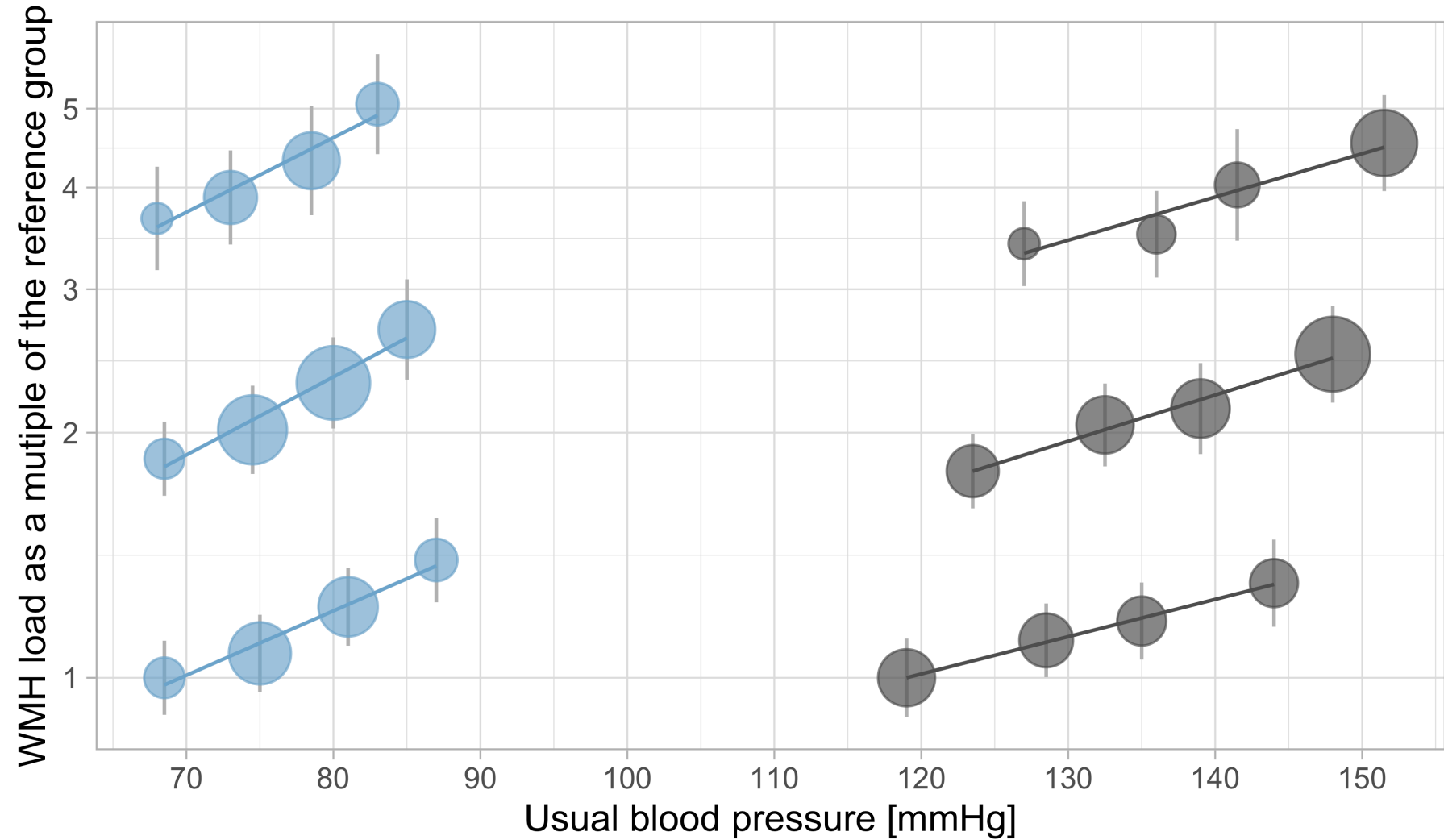
Results: longitudinal

Variable	Unadjusted (95%CI)	Age- and sex-adjusted (95%CI)	Fully-adjusted (95%CI)
SBP	0.257 (0.240 to 0.274)	0.115 (0.100 to 0.131)	0.045 (0.022 to 0.069)
DBP	0.150 (0.133 to 0.167)	0.120 (0.105 to 0.136)	0.087 (0.064 to 0.109)

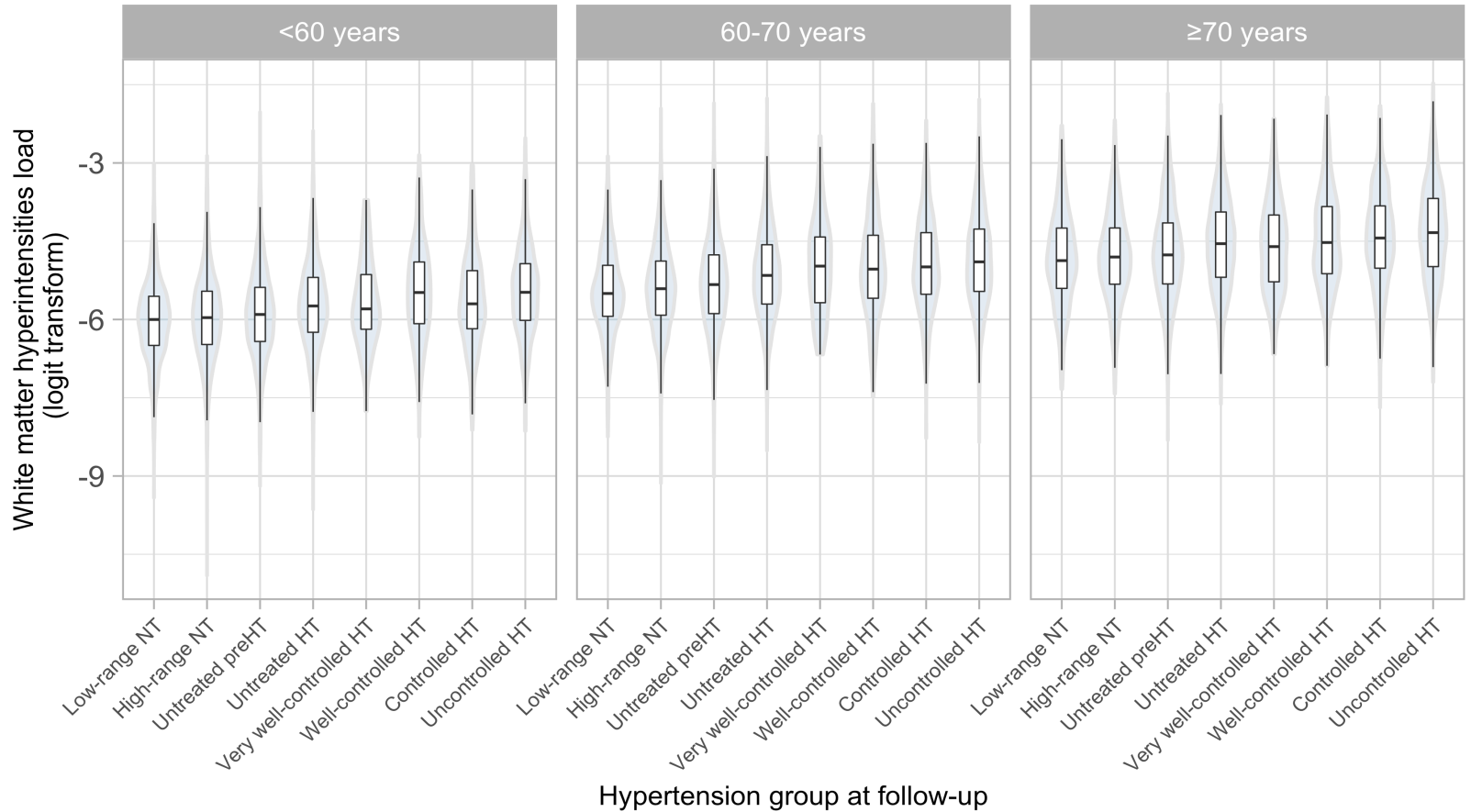
Age group	WMH increase per 10 mmHg concurrent SBP	WMH increase per 5 mmHg concurrent DBP
< 50	1.007	1.054
50 - 60	1.052	1.032
≥ 60	1.061	1.021



Results: usual BP

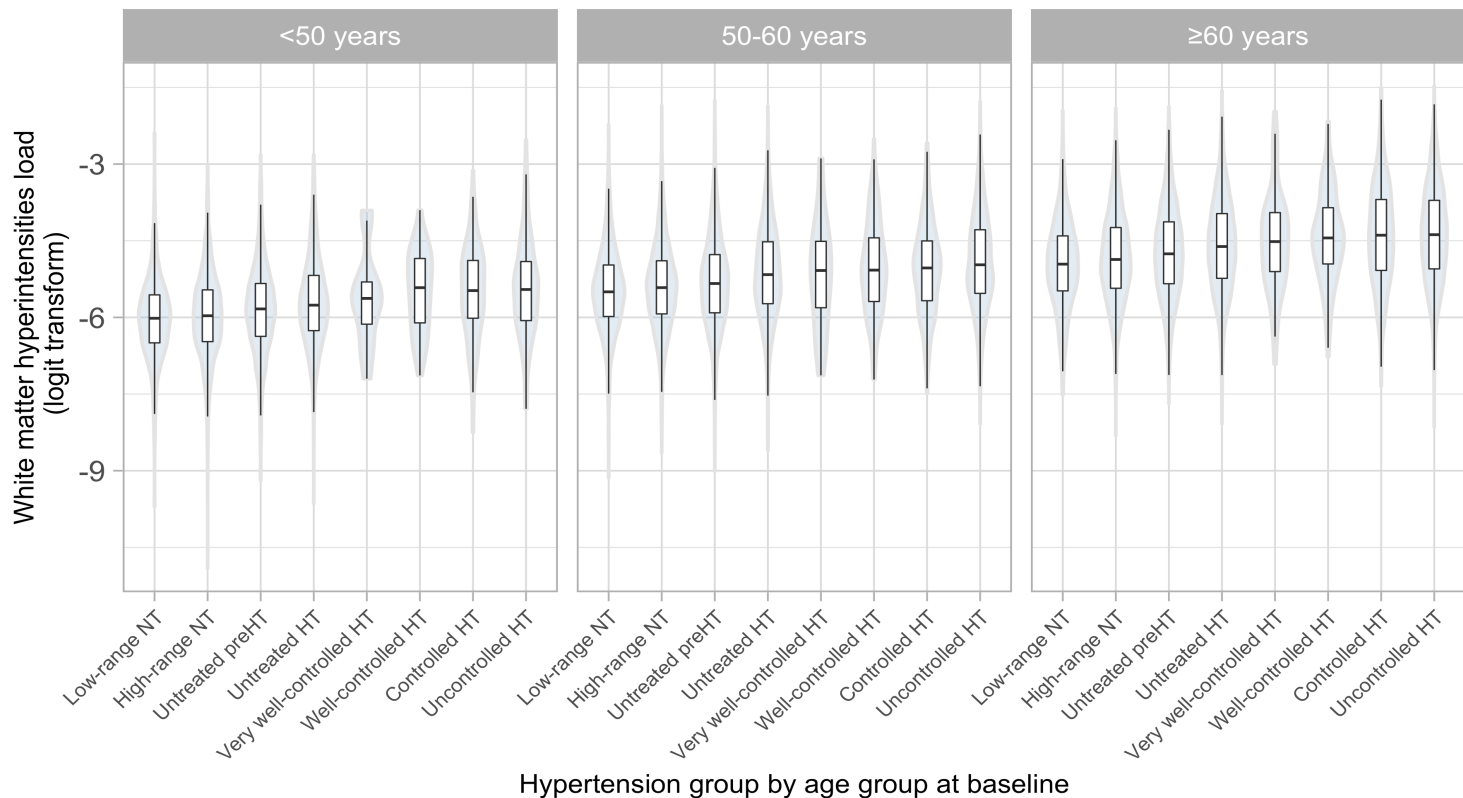


Results



Results

Group at follow-up	BP [mmHg]	AntiHT	Increase in WMH load (95% CIs)	N
High NT	SBP: 120-130 or DBP: 70-80	No	1.079 (1.032 to 1.127)	5463
Untreated pre-HT	SBP: 130-140 or DBP: 80-90	No	1.180 (1.130 to 1.232)	6053
Untreated HT	SBP \geq 140 or DBP \geq 90	No	1.398 (1.341 to 1.457)	9226
Very well-controlled HT	SBP < 120 or DBP < 70	Yes	1.545 (1.374 to 1.738)	285
Well-controlled HT	SBP 120-130 or DBP 70-80	Yes	1.603 (1.495 to 1.719)	949
Controlled HT	SBP: 130-140 or 80-90	Yes	1.604 (1.516 to 1.697)	1879
Uncontrolled HT	\geq 140 or DBP \geq 90	Yes	1.774 (1.693 to 1.858)	5156



Hypertension group by age group at baseline

Group at baseline	BP [mmHg]	AntiHT	Increase in WMH load (95% CIs)	N
High NT	SBP: 120-130 or DBP: 70-80	No	1.089 (1.018 to 1.166)	7384
Untreated pre-HT	SBP: 130-140 or DBP: 80-90	No	1.213 (1.135 to 1.298)	8133
Untreated HT	SBP ≥ 140 or DBP ≥ 90	No	1.415 (1.323 to 1.513)	9780
Very well-controlled HT	SBP < 120 or DBP: < 70	Yes	1.417 (1.078 to 1.863)	122
Well-controlled HT	SBP 120-130 or DBP 70-80	Yes	1.720 (1.496 to 1.978)	491
Controlled HT	SBP: 130-140 or 80-90	Yes	1.782 (1.606 to 1.976)	1185
Uncontrolled HT	≥ 140 or DBP ≥ 90	Yes	1.791 (1.654 to 1.941)	2959

Conclusions

- Elevated DBP in midlife is associated with more extensive brain damage years later.
- WMHs were strongly associated with elevated SBP and DBP, even if BP was below the pre-hypertensive range.
- Concurrent SBP was more strongly associated with WMHs, across all ages,
- Past past DBP more strongly predicted future WMHs than past SBP, particularly in mid-life (people in their 40s).
- Long-term prevention of WMH may require intensive control of even mildly-elevated mid-life BP.

Acknowledgements

