openheart

Adherence to the European Society of Cardiology hypertension guidelines over 12 years of follow-up in the Irish population

Caoimhe McGarvey ,[1,2] Siobhan Scarlett,[1] Robert Briggs,[1,2] Cathal McCrory,[1] John William McEvoy,[3] Rose Anne Kenny,[1,2] Donal J Sexton[1,4]

► Additional supplemental material is published online only. To view, please visit the journal online (https://doi.org/10.1136/openhrt-2025-003744).

To cite: McGarvey C, Scarlett S, Briggs R, *et al*. Adherence to the European Society of Cardiology hypertension guidelines over 12 years of follow-up in the Irish population. *Open Heart* 2025;**12**:e003744. doi:10.1136/openhrt-2025-003744

Received 19 September 2025
Accepted 21 October 2025

[1]The Irish Longitudinal Study on Ageing, Trinity College, Dublin, Ireland
[2]Mercer's Institute for Successful Ageing (MISA), St James's Hospital, Dublin, Ireland
[3]National Institute for Prevention and Cardiovascular Health, University of Galway School of Medicine, Galway, Ireland
[4]Renal Unit, St James's Hospital, Dublin, Ireland

Correspondence to
Dr Caoimhe McGarvey; camcgarv@tcd.ie

ABSTRACT

Background Hypertension is a significant risk factor for cardiovascular disease, dementia and chronic kidney disease (CKD). Older adults bear the brunt of these conditions, and managing hypertension can be especially challenging in this cohort. In this study, we apply the European Society of Cardiology (ESC) hypertension guidelines to adults ≥50 years participating in a nationally-representative longitudinal study on ageing, providing crucial context for guideline implementation among older adults.

Methods Data from waves 1 (2009–2010), 3 (2014–2015) and 6 (2021–2023) of The Irish Longitudinal Study on Ageing were analysed. Hypertension (blood pressure (BP) ≥140/90 mm Hg) prevalence, awareness, treatment, control (on-treatment BP <130/80 mm Hg) and adherence to ESC recommendations were assessed. Subgroup analyses included people aged ≥85 years, adults with frailty, with CKD and with home BP measurements. Data were analysed using Stata V.15.1 applying inverse probability weighting.

Results From wave 3 (n=5329), weighted hypertension prevalence was 64.0% (62.4–65.6%). Of these, 55.5% were aware and 70.3% were on antihypertensive treatment. 32.2% on treatment had controlled BP, 20.9% were on dual therapy and 55.2% were taking one ESC-recommended agent. 87.8%, 77.1% and 76.7% of those with hypertension at waves 1, 3 and 6 were undiagnosed, untreated or uncontrolled. Hypertension prevalence was 91.1% (84.7–95.0%) in people ≥85 years and 75.9% (69.3–81.5%) in moderate–severe frailty.

Conclusions In a nationally-representative sample of older Irish adults, there is a high prevalence of hypertension, with low awareness, control and adherence to ESC guidelines.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Hypertension is common and is a major risk factor for cardiovascular disease; however, effective management can be challenging.

WHAT THIS STUDY ADDS

⇒ This study demonstrates that hypertension remains prevalent among adults aged 50 years and older in the Irish population across 12 years of follow-up. It shows that a significant proportion of those with hypertension are either undiagnosed, untreated or uncontrolled.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The findings of this study advocate for the comprehensive reform of the diagnosis, management and control of hypertension in this population.

INTRODUCTION

Hypertension is an important risk factor for cardiovascular disease (CVD), the leading cause of mortality worldwide.[1] In September 2023, the WHO published its inaugural global report on hypertension, revealing that the number of individuals with hypertension doubled from 650 million in 1990 to 1.3 billion in 2019.[2] The report emphasises that, although hypertension can be effectively prevented and treated, it remains a major cause of premature death, accounting for an estimated 10.8 million avoidable deaths annually.[2] In addition to its contribution to CVD and stroke, undertreatment of hypertension also likely plays a causal role in the development of cognitive dysfunction and dementia.[3]

In August 2024, the European Society of Cardiology (ESC) released updated evidence-based guidelines for the management of elevated blood pressure (BP) and hypertension.[4] These guidelines aimed to build on previous guidelines published in 2007, 2013 and 2018 and incorporated new recommendations based on current evidence, particularly in the area of elevated BP not meeting the threshold for a diagnosis of hypertension.[4–7] The guidelines included specific subgroups such as people aged ≥85 years, those with moderate-to-severe frailty and people with chronic kidney disease (CKD) as

well as an increased emphasis on home BP measurements (HBPMs).[4]

The ESC has defined hypertension as an office systolic BP (SBP) value ≥140 mm Hg and/or diastolic BP (DBP) values ≥90 mm Hg and in the 2024 guidelines, they define elevated BP as an SBP value of 120–139 or a DBP value of 70–89. In this study, we apply the ESC hypertension guidelines released in 2007, 2013, 2018 and 2024 to adults aged ≥50 years participating in a nationally-representative longitudinal study on ageing; thereby providing crucial context for guideline implementation among older adults.

METHODS

Study setting and participants

This study is longitudinal in design using data from the 1st, 3rd and 6th waves of The Irish Longitudinal Study on Ageing (TILDA). TILDA is a population-based prospective cohort study, representative of community-dwelling older adults, living in Ireland.[8] The sample was recruited in geographical clusters, based on a national directory of residential addresses in Ireland, using the RANSAM (random sampling) system.[9] Each member of the population in Ireland aged 50 years and older had an equal probability of being invited to participate. Participants were invited to complete a computer-assisted personal interview (CAPI), a self-complete postal questionnaire and a health centre or home-based health assessment (HA).[10]

Data collection in wave 1 was carried out from 2009 to 2011 and included 8673 participants. Wave 3 data collection took place from 2014 to 2015 and included 6684 participants, and data collection in wave 6 took place from 2021 to 2023 and included 4337 participants. In the TILDA study, participants were generally carried forward from one wave to the next. However, they had the option to opt out of specific data collection components or entire waves and could rejoin in subsequent waves if they wished. All participants with BP readings available were included in the final analyses at each wave. Exclusions for each wave are demonstrated in online supplemental figure 1. All experimental procedures adhered to the Declaration of Helsinki and HAs were carried out by trained healthcare professionals.

Blood pressure and related measurements

BP was measured by a nurse as part of the HA, either in a health centre or in the participant's own home. Measurements were taken according to a standard protocol at an ambient temperature of 20–25°C. A digital automated oscillometric BP monitor (Omron M10-IT, Omron, Kyoto, Japan) with an arm cuff (22–42 cm) was used to measure BP in one arm, at heart height, while the respondent was seated comfortably in an upright position. BP was recorded twice while seated with a timed interval of 1 min between readings. The mean systolic and diastolic readings were obtained from these two measurements.[11]

Hypertension was defined as a mean SBP value ≥140 mm Hg and/or mean DBP value ≥90 mm Hg or currently taking any antihypertensive medication. Antihypertensive medication use was recorded during the CAPI and was classified according to the WHO Anatomical Therapeutic Chemical (ATC) classification system. Antihypertensive medication was defined as medications categorised as C02, C03, C07, C08 and C09 using the ATC classification system. Awareness of hypertension was defined as self-reporting a doctor-delivered diagnosis of high BP or hypertension in the CAPI. Treatment of hypertension was initially defined as being on any antihypertensive treatment as identified in the CAPI and was then further explored in terms of the use of dual therapies and the use of specific recommended drug classes as set out in the ESC guidelines. In line with the changes in hypertension treatment targets over the 12-year period of data collection in this study, control of hypertension was recorded using BP targets of both <140/90 and <130/80 on antihypertensive medication.

Covariates

Demographic covariates included age, sex and highest educational attainment. Baseline cardiovascular risk factors and history, including current smoking status, problematic alcohol consumption, diabetes status, established CVD and level of physical activity were recorded. Problematic alcohol consumption was defined as a score of >2 on the CAGE (Cutdown, Annoyed, Guilt, Eye-opener) questionnaire.[12] The presence of diabetes or CVD (angina, myocardial infarction, stroke, transient ischaemic attack, atrial fibrillation or heart murmur) was based on the self-report of a doctor's diagnosis of the condition. In terms of physical activity, this was self-assessed using the International Physical Activity Questionnaire (IPAQ) short form.[13] The IPAQ scoring system categorises physical activity as low, moderate or vigorous/high intensity. Polypharmacy was defined as the regular use of five or more medications.[14] Multimorbidity is defined as two or more coexisting conditions in an individual.[15] Multimorbidity in this study was defined as the self-report of a doctor-delivered diagnosis of two or more chronic conditions including diabetes, arthritis, cancer, liver disease, kidney disease or heart failure. Self-reported kidney disease was not recorded at wave 1.

Several clinical measurements collected during the HA were also included in the analysis. These covariates included CKD status (calculated using estimated glomerular filtration rate (eGFR)), eGFR, serum total, high-density lipoprotein (HDL) and low-density lipoprotein (LDL) cholesterol, pulse wave velocity between the carotid and femoral arteries (cf-PWV), body mass index (BMI), Mini-Mental State Examination and Clinical Frailty Scale (CFS) score.

A venous blood sample was taken from consenting participants. Cystatin C and creatinine were measured simultaneously from frozen plasma using particle-enhanced and enzymatic immunoturbidimetric

assays, as described previously.[16] eGFR was estimated with the 2021 Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation using a combination of the creatinine and cystatin C measurements. CKD was defined as CKD-EPI eGFR <60 mL/min. Cystatin C and creatinine were not measured at wave 6, therefore eGFR is not available at this wave for analysis. Serum total, HDL and LDL cholesterol were measured from each sample before freezing with an automated enzymatic method. Cf-PWV was measured by Pulse Volume Recording (Vicorder) and the average of two measurements between the carotid and femoral arteries was used. Height and weight were measured by the study health practitioner, BMI was calculated as weight in kg/height in m2 and was included as a participant characteristic.

These measurements were used to assess the degree of cardiovascular risk in the population. Cardiovascular risk was assessed based on the presence of CKD identified by eGFR, diabetes status, the presence of established CVD, markers of hypertension-mediated organ damage (HMOD) including arterial stiffness measured by cf-PWV and total cholesterol. These variables also enabled the application of the Systematic Coronary Risk Estimation 2 (SCORE2) and SCORE2-Older Persons algorithms, which are estimated based on sex, age, diabetes status, smoking history, SBP, total cholesterol and HDL cholesterol, to the population in line with the ESC guidelines.[17 18] The CFS was retrospectively operationalised in TILDA at waves 1 and 3 using the CFS decision tree and six specific domains as described previously.[19 20] This facilitated the frailty subgroup analysis in this study.

Subgroup analysis

Subgroup analyses were explored using wave 3 data in alignment with specified groups highlighted in the guidelines. These included those aged 85 years and older, people with moderate-to-severe frailty and those with CKD. Frailty was assessed using the CFS as recommended by the ESC guidelines. The ESC guidelines outline the role of HBPM as a method of out-of-office BP measurement.[4] For this reason, a further subgroup analysis was carried out on 1072 participants who had their HA including their BP readings completed in their own homes.

Statistical analysis

Participant characteristics are presented as unweighted sample number (n), weighted percentage and 95% CI or mean and SD for each wave of data collection. Descriptive statistics were used to calculate prevalence, awareness, treatment and control of hypertension. Inverse probability weighting was applied to account for the complex survey design used in TILDA. The population weights were calculated based on age, sex and educational attainment of the population in Ireland and aim to adjust for selection bias and non-response bias to the HA component of the survey. Further detail on the weights applied is available elsewhere.[21] Data analysis was conducted using Stata V.15.1.

Patient and public involvement

TILDA has a patient and public involvement working group that contributed to the wave 6 data collection but they were not directly involved in this study.

RESULTS

5879 participants at wave 1, 5329 participants at wave 3 and 3202 participants at wave 6 were included in the final analysis. The mean (±SD) age of study participants at wave 1 was 63.1 (±9.4) years, increasing to 66.4 (±9.1) years and 70.6 (±7.6) years at waves 3 and 6. In wave 1, 54.2% of participants were female compared with 55% and 57% at waves 3 and 6, respectively. Overall, the mean SBP and DBP values for each consecutive wave were: 135.6 (±19.8), 134.3 (±19.4) and 139.1 (±19.4) and 82.4 (±11.3), 80.8 (±10.7) and 74.9 (±11.2). Table 1 displays the survey weighted characteristics of the sample at each wave.

Based on the ESC guidelines, the weighted prevalence of hypertension at wave 1 was 63.0% (95% CI 61.5% to 64.4%) increasing to 64% (95% CI 62.4% to 65.6%) and 71.3% (95% CI 68.6% to 73.9%) at waves 3 and 6. Hypertension prevalence was higher in men than in women (wave 1: 68.0% vs 58.3%, p<0.001, wave 3: 68.5% vs 59.9%, p<0.0001, wave 6: 75.3% vs 67.8%, p<0.0071) and higher in the oldest age group compared with the youngest (wave 1: 91.8% vs 51.0%, p<0.001, wave 3: 88.0% vs 48.5%, p<0.0001, wave 6: 84.3% vs 57.0%, p<0.0001).

In terms of BP classification, table 2 demonstrates the breakdown by BP categories, suggested by the 2024 ESC guidelines. Table 3 displays the degree of cardiovascular risk in this population and table 4 demonstrates the degree of cardiovascular risk in the hypertensive population. Of those with hypertension, 53.5% (423 620), 55.5% (421 812) and 56.3% (408 138) at waves 1, 3 and 6 were aware of their diagnosis of hypertension.

59.9% (473 954), 70.3% (534 216) and 71.4% (517 932) at waves 1, 3 and 6, respectively, were taking an antihypertensive medication as classified by the WHO ATC classification system. Among those taking antihypertension medications, 27.9% at wave 1, 32.2% at wave 3 and 32.8% at wave 6 achieved BP control below 130/80. In terms of adherence to the treatment recommendations in the ESC guidelines, 18.6% (147 513), 21% (159 227) and 14.4% (104 240) of the hypertensive population were prescribed a recommended dual therapy at waves 1, 3 and 6. Of those on treatment, 49.5% (392 019) at wave 1, 55.2% (419 761) at wave 3 and 56.9% (412 245) at wave 6 were taking at least one of the guideline-recommended antihypertension agents. This data is demonstrated in figure 1. 21.8% of those with hypertension at wave 1

Table 1 Participant characteristics ≥50 years at each wave

Participant characteristic	n Wave 1 (n=5879)	Weighted % or mean Wave 1	95% CI Wave 1	n Wave 3 (n=5329)	Weighted % or mean Wave 3	95% CI Wave 3	n Wave 6 (n=3202)	Weighted % or mean Wave 6	95% CI Wave 6
Age									
50–64	3498	58.1	56.3 to 60.0	2492	45.3	43.4 to 47.3	794	26.4	23.9 to 29.0
65–79	2007	32.1	30.4 to 33.8	2281	41.1	39.3 to 42.9	1971	58.1	54.8 to 61.3
80+	348	9.8	8.7 to 11.1	549	13.6	12.2 to 15.1	437	15.5	12.9 to 18.7
Sex									
Male	2692	48.2	46.9 to 49.5	2394	48.0	46.6 to 49.4	1375	47.2	44.4 to 50.1
Female	3187	51.8	50.5 to 53.1	2935	52.0	50.6 to 53.4	1823	52.8	49.9 to 55.6
Education									
Primary	1528	31.5	29.8 to 33.2	1266	29.5	27.7 to 31.4	482	23.8	20.9 to 26.9
Secondary	2410	46.1	44.6 to 47.7	2082	44.9	43.1 to 46.7	1220	48.6	45.5 to 51.7
Tertiary	1939	22.4	21.0 to 23.8	1980	25.6	24.0 to 27.3	1496	27.7	25.2 to 30.3
BMI, mean		28.6	28.5 to 28.8		28.6	28.4 to 28.8		28.5	28.1 to 28.9
Smoking status									
Never	2641	42.6	41.1 to 44.1	2426	43.1	41.3 to 44.8	1541	46.5	43.4 to 49.7
Past	2303	38.1	36.5 to 39.7	2278	42.5	40.9 to 44.2	1411	43.5	40.5 to 46.6
Current	935	19.3	18.0 to 20.7	624	14.4	13.1 to 15.8	245	9.9	8.0 to 12.2
Problematic alcohol consumption (CAGE ≥2)	672	13.0	12.0 to 14.1	574	12.4	11.2 to 13.6	85	2.6	1.9 to 3.6
Diabetes history	419	8.1	7.4 to 8.9	459	9.2	8.2 to 10.2	321	11.5	9.7 to 13.6
Cardiovascular disease	1709	32.8	31.2 to 34.6	1152	22.1	20.7 to 23.6	399	12.9	11.0 to 15.1
Chronic kidney disease by self-report				30	0.5	0.3 to 0.8	25	1.1	0.6 to 2.1
Chronic kidney disease by eGFR	487	11.4	10.3 to 12.5	554	13.4	12.0 to 15.0			
eGFR, mean		83.5	82.8 to 84.2		82.3	81.4 to 83.1			
Total cholesterol Mean (±SE)		5.09	5.06 to 5.13		4.80	4.77 to 4.84		4.62	4.56 to 4.68
HDL, mean (±SE)		1.53	1.51 to 1.54		1.47	1.45 to 1.49		1.50	1.47 to 1.53
LDL, mean (±SE)		2.90	2.87 to 2.93		2.59	2.55 to 2.62		2.42	2.36 to 2.47
Pulse wave velocity, mean (±SE)		10.53	10.46 to 10.61		10.54	10.46 to 10.62			
Physical activity low intensity	1758	32.2	30.5 to 33.8	1940	39.8	37.9 to 41.8	861	31.4	28.3 to 34.7
Moderate intensity	2045	34.5	32.9 to 36.1	1806	34.9	33.1 to 36.7	1417	43.3	40.1 to 46.5
High intensity	2027	33.3	31.5 to 35.3	1326	25.3	23.4 to 27.2	905	25.3	22.6 to 28.2
MMSE, mean		28.0	27.92 to 28.10		28.49	28.41 to 28.58		28.28	28.14 to 28.42

Continued

Table 1 Continued

Participant characteristic	n Wave 1 (n=5879)	Weighted % or mean Wave 1	95% CI Wave 1	n Wave 3 (n=5329)	Weighted % or mean Wave 3	95% CI Wave 3	n Wave 6 (n=3202)	Weighted % or mean Wave 6	95% CI Wave 6
SCORE2 CVS Risk Score (%),* mean <70 years old		6.1	6.0 to 6.3		7.8	7.6 to 8.0		8.0	7.8 to 8.3
SCORE2-OP CVS Risk Score (%),* mean >69 years old		18.5	17.8 to 19.2		20.8	19.9 to 21.7		17.8	16.7 to 18.8
CFS frailty group									
(1) CFS 1–3	4249	69.7	65.9 to 73.6	3892	74.8	70.5 to 79.4	.	.	.
(2) CFS 4–6	1521	28.6	26.1 to 31.4	1033	23.3	20.6 to 26.2	.	.	.
(3) CFS 7–9	80	1.7	1.3 to 2.3	71	1.9	1.5 to 2.5	.	.	.
Polypharmacy (five or more non-hypertensive medications)	735	13.3	12.2 to 14.4	900	18.0	16.7 to 19.4	1123	27.6	24.8 to 30.5
Multimorbidity (two or more chronic diseases)	402	7.6	6.8 to 8.4	403	8.6	7.6 to 9.7	300	12.0	10.0 to 14.4

Table 1 displays participant characteristics for each wave of data analysis and expresses the results as both unweighted sample number and weighted percentage.
*10-year risk of cardiovascular disease.
†CVS - Cardiovascular
BMI, body mass index; CAGE, Cutdown, Annoyed, Guilt, Eye-opener; CFS, Clinical Frailty Scale; eGFR, estimated glomerular filtration rate; HDL, high-density lipoprotein; LDL, low-density lipoprotein; MMSE, Mini-Mental State Examination; SCORE2, Systematic Coronary Risk Estimation 2; SCORE2-OP, Systematic Coronary Risk Estimation 2-Older Persons.

and 25.2% at both waves 3 and 6 were prescribed a beta blocker.

Unmet need

Based on wave 6 data, collected between 2021 and 2023, 61.7% or 446663 people with hypertension in Ireland were not appropriately managed according to the 2018 guidelines, whether they had undiagnosed hypertension, were diagnosed but not on treatment or were on treatment but were not controlled to a target BP of <140/90. This figure was 74.6% in wave 1 and 62.3% at wave 3, as demonstrated in figure 2. Using the lower BP target of <130/80, as advised by the 2024 ESC guidelines, 87.8%, 77.1% and 76.7% of those with hypertension at waves 1, 3 and 6, respectively, were not appropriately managed. Figure 2 demonstrates a detailed breakdown of the unmet need in hypertension management in Ireland at three time points over the last 12 years.

Subgroup analysis

Older people and frailty

The ESC guidelines identify people aged ≥85 years and people with moderate-to-severe frailty at any age as a subgroup needing specific attention. As advised by the ESC guidelines, frailty was assessed by the CFS in this study. Based on wave 3 data collection, the prevalence of hypertension in those aged 85 years and older was 91.1% (95% CI 84.7% to 95.0%) or 66349 in terms of population. Of those aged 85 years or older with hypertension, 79.8% (95% CI 70.5% to 86.6%) or 52914 people were on a form of antihypertensive treatment, 53.9% (95% CI 44.4% to 63.2%) or 35790 were prescribed an ESC-recommended antihypertensive agent and 18.6% (95% CI 12.4% to 27.1%) or 12365 were taking a recommended dual therapy.

Hypertension prevalence in those with moderate-to-severe frailty, defined as a CFS of 6 or more, was 75.9% (95% CI 69.3% to 81.5%) or 66191 people. Of those with frailty and hypertension, 85.8% (95% CI 79.6% to 90.3%) or 56768 people were on a form of antihypertensive treatment, 61.2% (95% CI 53.0% to 68.8%) or 40514 people were prescribed an ESC-recommended antihypertensive agent and 19.6% (95% CI 13.6% to 27.4%) or 12973 people were taking a recommended dual therapy. Figure 3 demonstrates a comparison of the total population, those aged 85 years or more and those with moderate-to-severe frailty in terms of hypertension management.

Chronic kidney disease

Another patient group highlighted by the ESC guidelines is those with CKD. This group was assessed at wave 3 in this study due to the availability of kidney biomarkers. In those with CKD, the overall prevalence of hypertension (population on antihypertensive medication or with BP ≥140/90) was 88.1% (95% CI 84.2% to 91.2%). 32.4% (95% CI 27.6% to 37.8%) of those with CKD had elevated BP while 49.2% (95% CI 43.4% to 55.1%) had

Table 2 BP categories

BP category	Weighted prevalence wave 1, % (CI)	Population count wave 1	Weighted prevalence wave 3, % (CI)	Population count wave 3	Weighted prevalence wave 6, % (CI)	Population count wave 6
Non-elevated BP	18.1 (17.0 to 19.3)	227 645	20.0 (18.7 to 21.4)	237 271	15.3 (13.3 to 17.6)	155 916
Elevated BP	37.3 (36.0 to 38.7)	469 409	39.9 (38.3 to 41.6)	474 038	40.7 (37.8 to 43.6)	413 437
Hypertension*	44.6 (43.1 to 46.0)	560 360	40.1 (38.4 to 41.8)	475 698	44.0 (40.9 to 47.1)	446 663
Total	100	1 257 415	100	1 187 007	100	1 016 016

Table 2 displays weighted percentages and counts of individuals per BP category across waves. The elevated BP category was added in the 2024 ESC guidelines. Waves 1, 3 and 6 used the 2007, 2013 and 2018 ESC guidelines, respectively, all defining hypertension as office SBP ≥140 mm Hg and/or DBP ≥90 mm Hg.
*Excludes those with hypertension controlled on treatment.
BP, blood pressure; DBP, diastolic blood pressure; ESC, European Society of Cardiology; SBP, systolic blood pressure.

hypertension, not accounting for antihypertensive use. 88.9% (95% CI 84.0% to 92.4%) of those with hypertension in CKD were on at least one antihypertensive medication. 49.6% (95% CI 40.1% to 60.5%) of those on treatment were controlled to a BP target of 140/90 in line with the guidelines at the time of data collection.

In terms of adherence to ESC recommendations, of those with hypertension and CKD Stage I–III, 25.6% (95% CI 20.4% to 31.5%) were taking a recommended combination therapy and 67.1% (95% CI 59.8% to 73.7%) were taking a medication from one of the recommended drug classes. For those with CKD Stage IV or higher, 24.6% (95% CI 17.0% to 34.2%) were taking a recommended combination therapy and 74.1% (95% CI 64.1% to 82.0%) were taking a medication from one of the recommended drug classes.

Home blood pressure measurement

At wave 3, the mean age of the home assessment (HO) group was 72.1 (±10.3) compared with 65.0 (±8.2) in the health centre assessment (HC) group. The prevalence of hypertension was higher in the HO group compared with the HC group (81.1% vs 59.5%, p=0.0000). Awareness of hypertension was similar between both groups: 58.1% for HO and 54.6% for HC (p value=0.18).

Table 3 Cardiovascular risk in the elevated BP category

Cardiovascular risk factor	Weighted prevalence wave 1 (CI)	Population count wave 1	Weighted prevalence wave 3 (CI)	Population count wave 3	Weighted prevalence wave 6 (CI)	Population count wave 6
Established clinical cardiovascular disease	30.7 (28.3 to 33.1)	143 912	22.1 (19.9 to 24.3)	104 528	12.9 (10.0 to 16.5)	53 356
Moderate-to-severe chronic kidney disease (eGFR <60 mL/min/1.73 m2)	8.9 (7.5 to 10.6)	38 095	11.0 (9.2 to 13.0)	46 338	1.6 (0.7 to 3.8)*	6638*
Other forms of hypertension-mediated organ damage (cf-PWV >10 m/s)	39.3 (37.0 to 41.8)	184 694	40.5 (37.9 to 43.1)	191 805		
Diabetes mellitus	7.5 (6.4 to 8.9)	35 416	10.1 (8.5 to 11.8)	47 702	11.4 (8.9 to 14.5)	47 277
Familial hypercholesterolaemia (probable=total cholesterol >7.5 mmol/L)	1.5 (1.0 to 2.3)	7225	0.6 (0.3 to 1.2)	3005	0.5 (0.1 to 1.8)	2048
Total number with at least one high CVS risk condition	64.6 (62.2 to 66.9)	303 068	59.9 (57.2 to 62.4)	283 719		
Total number with at least one high CVS risk condition excluding high PWV	38.0 (35.6 to 40.4)	178 165	34.4 (32 to 37)	163 223	24.4 (20.4 to 28.9)	100 987
SCORE2 ≥10%	4.6 (3.8 to 5.7)	21 734	7.6 (6.2 to 9.2)	36 031	6.9 (5.1 to 9.2)	28 400
SCORE2-OP ≥10%	16.5 (14.8 to 18.5)	77 855	23.0 (20.7 to 25.5)	109 036	30.7 (26.3 to 35.4)	126 840

Table 3 demonstrates the breakdown of cardiovascular risk by risk factor and by SCORE2 or SCORE2-OP algorithm in those with elevated BP.
*Kidney disease only identified by self-reported kidney disease at wave 6 as creatinine and cystatin C not available.
†CVS - Cardiovascular
BP, blood pressure; cf-PWV, pulse wave velocity between the carotid and femoral arteries; eGFR, estimated glomerular filtration rate; SCORE2, Systematic Coronary Risk Estimation 2; SCORE2-OP, Systematic Coronary Risk Estimation 2-Older Persons.

Table 4 Cardiovascular risk in the hypertension category

Cardiovascular risk factor	Weighted prevalence wave 1 (CI)	Population count wave 1	Weighted prevalence wave 3 (CI)	Population count wave 3	Weighted prevalence wave 6 (CI)	Population count wave 6
Established clinical cardiovascular disease	35.7 (33.4 to 38.2)	200 312	22.8 (20.7 to 25.1)	108 410	11.2 (8.8 to 14.2)	50 121
Moderate-to-severe chronic kidney disease (eGFR <60 mL/min/1.73 m2)	13.6 (11.8 to 15.5)	68 205	16.4 (13.8 to 19.4)	70 249	0.8 (0.3 to 1.9)	3378
Other forms of hypertension-mediated organ damage (cf-PWV >10 m/s)	51.5 (49.0 to 54.0)	288 669	48.8 (46 to 51.7)	232 285		
Diabetes mellitus	8.9 (7.7 to 10.3)	49 957	8.9 (7.5 to 10.6)	42 383	10.9 (8.4 to 14.0)	48 494
Familial hypercholesterolaemia (probable=total cholesterol >7.5 mmol/L)	1.7 (1.2 to 2.3)	11 127	0.9 (0.5 to 1.5)	4355	0.2 (0.07 to 0.8)	1064
Total number with at least one high CVS risk condition	80.8 (79.0 to 82.4)	452 559	70.3 (67.8 to 72.8)	334 574		
Total number with at least one high CVS risk condition excluding high PWV	45.5 (43.2 to 47.8)	254 975	37.8 (35.1 to 40.5)	179 695	21.4 (18.0 to 25.3)	95 683
SCORE2 ≥10%	14.6 (13.0 to 16.2)	81 659	16.9 (15.0 to 19.1)	80 472	17.3 (13.8 to 21.5)	77 316
SCORE2-OP ≥10%	37.5 (35.3 to 39.8)	210 394	37.4 (34.4 to 40.5)	177 758	41.5 (37.0 to 46.2)	185 486

Table 4 demonstrates the breakdown of cardiovascular risk by risk factor and by SCORE2 or SCORE2-OP algorithm in those with hypertension.
*CVS - Cardiovascular
cf-PWV, pulse wave velocity between the carotid and femoral arteries; eGFR, estimated glomerular filtration rate; SCORE2, Systematic Coronary Risk Estimation 2; SCORE2-OP, Systematic Coronary Risk Estimation 2-Older Persons.

In terms of treatment, the HO group were more likely to be taking some form of antihypertensive medication (76.8% vs 67.9%, p=0.0001). The rates of adherence to the guidelines in terms of dual therapy and the use of recommended drug classes were similar between the two groups: dual therapy: HO 21.7% vs HC 19.4% (p=0.30) and recommended drug classes: HO 57.5% vs HC 54.4% (p=0.23). Of those on treatment, 34.2% of those in the HC group were controlled to a BP <130/80 compared with 27.5% in the HO group (p=0.019). Online supplemental figure 2 demonstrates a comparison of those with home versus health centre-based BP measurements in terms of hypertension management.

DISCUSSION

This study demonstrates a high prevalence of hypertension (71%) in community-dwelling adults over 50 years old in Ireland. This corresponds to an estimated hypertension burden of over 700 000 people at each wave in this population group. For context, at the time of wave 6 data collection, Ireland's population of community-dwelling adults over 50 years old was estimated to be 1.1 million people based on 2022 census data.[22] This study also highlights poor adherence to the 2007, 2011, 2018 and 2024 ESC hypertension guidelines.[4–7]

Hypertension prevalence was higher in men than in women. According to the most recent data, 76.7% of those with hypertension were not appropriately managed. This means that they were either diagnosed with hypertension but not on treatment, on treatment for hypertension but not controlled to a BP target of 130/80 or that they had undiagnosed hypertension. Applying a BP target of 140/90, 61.7% of those with hypertension were not appropriately managed.

At wave 6, 56.3% of participants were aware of their diagnosis of hypertension and 71.4% were on some form of antihypertensive medication. However, only 14.4% of the hypertensive population were prescribed a recommended dual therapy and 56.9% were taking at least one of the ESC guidelines recommended antihypertensive agents. Given that data collection for waves 1 and 3 took place in 2009–2010 and 2014–2015, respectively, it is worth noting that although the 2007 and 2013 European hypertension guidelines stated that monotherapy only achieves BP control in a limited number of people, they only recommended the prescription of dual therapy at the initiation of treatment in the case of high baseline BP or high cardiovascular risk and favoured the addition of further agents after a period of failed monotherapy in other groups.[5 6]

The 2018 guidelines, published prior to wave 6 data collection, and the most recent 2024 ESC guidelines recommend starting with dual therapy in most patients. The first-line treatment advised is a combination of angiotensin-converting enzyme inhibitor (ACEi) or angiotensin receptor blocker (ARB) and calcium channel blocker (CCB) or thiazide diuretic or thiazide-like diuretic.[4 7] As per the 2018 and 2024 guidelines, beta

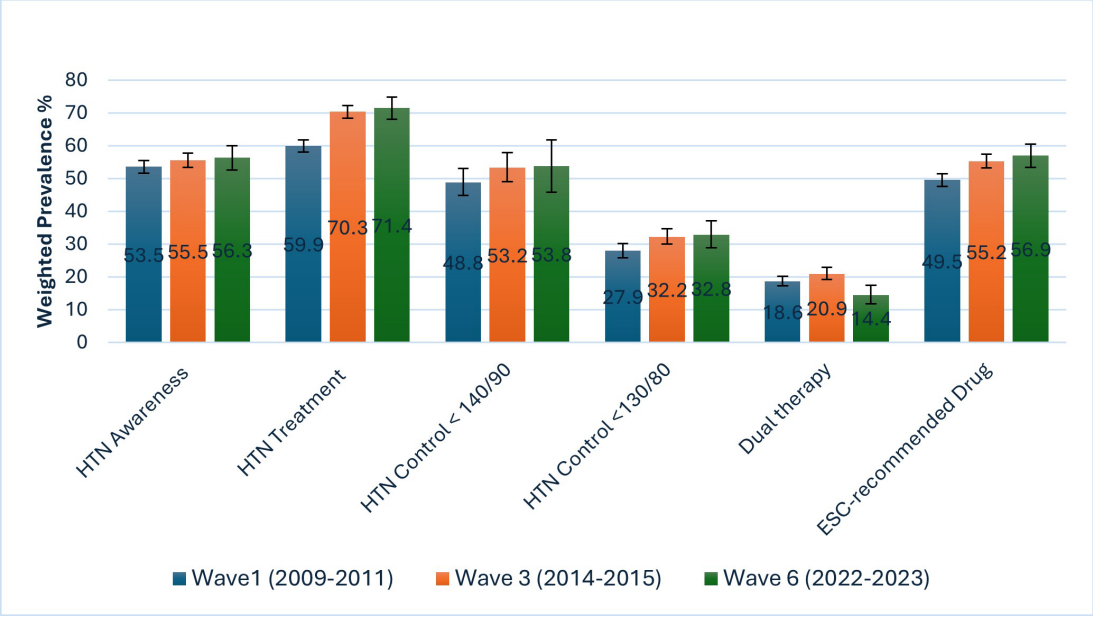

Figure 1 HTN management in Ireland. This bar chart depicts various aspects of HTN management over three time points: wave 1 (2009–2011), wave 3 (2014–2015) and wave 6 (2022–2023). The chart includes six groups; (1) HTN awareness: the proportion of individuals who are aware of their diagnosis of HTN. (2) HTN treatment: the proportion of individuals with HTN receiving any form of antihypertensive treatment. (3) HTN control <140/90: the proportion of individuals on treatment whose BP is below 140/90. (4) HTN control <130/80: the proportion of individuals on treatment whose BP is below 130/80. (5) Dual therapy: the proportion of individuals prescribed a dual antihypertensive therapy recommended by the 2024 ESC HTN guidelines. (6) ESC-recommended drug: the proportion of individuals prescribed any antihypertensive agent recommended by the guidelines. The blue bars represent the data from wave 1, the orange bars represent the data from wave 3 and the green bars represent data from wave 6. Weighted prevalence for each group, expressed as a percentage is displayed on the y-axis and error bars represent the 95% CIs for each category. BP, blood pressure; ESC, European Society of Cardiology; HTN, hypertension.

blockers can be used at any stage of combination therapy and are most appropriate in those with indications such as heart failure, angina, postmyocardial infarction and atrial fibrillation.[4 7] 25.2% of the population at waves 3 and 6 were prescribed a beta blocker.

Among those on treatment for hypertension at wave 6, 32.8% achieved BP control to <130/80, while a further 21% reached a target BP of <140/90. All ESC guidelines over the period of data collection except the 2013 guidelines suggest a BP target of <130/80 if tolerated in suitable patients while the 2024 guidelines advise this lower target in most patients.[4–7] Of those with hypertension at wave 3, 85.5% had high cardiovascular risk.

The 2024 ESC guidelines place increased emphasis on the category of elevated BP, not meeting the criteria for hypertension.[4] In this study, those with elevated BP ranged from 37.3% to 40.7% of the population, amounting to approximately 450 000 people aged 50 years and older at each wave as shown in table 2. Most of this group at wave 3, 71.0% or 346 209 people had evidence of high cardiovascular risk. As advised by the guidelines, those with established CVD, moderate-to-severe CKD, diabetes, probable familial hypercholesterolaemia or evidence of hypertension mediated organ damage, for example, pulse wave velocity >10 m/s have a high cardiovascular risk and may benefit from antihypertensive treatment to similar targets as for those with documented hypertension.[4]

In terms of the subgroup analyses, the prevalence of hypertension in those over 85 years was 91.1% (95% CI 84.7% to 95.0%), while in those with moderate-to-severe frailty, prevalence was 75.9% (95% CI 69.3% to 81.5%). As demonstrated in figure 3, people aged ≥85 years and those with moderate-to-severe frailty were less likely to have undiagnosed hypertension. Interestingly, those with higher frailty scores were more likely to be taking antihypertensive medications, including those recommended by the ESC guidelines, and had similar rates of BP control <130/80 mm Hg when compared with the overall population. As demonstrated in figure 3, this contrasted with those aged ≥85 years who had lower rates of antihypertensive use when compared with those with frailty, perhaps reflecting a tendency to deprescribe in older age rather than in frailty.

The prevalence of hypertension in those with CKD was 88.1%. In CKD, the ESC guidelines recommend the use of combination therapy to control BP. This should consist of either ACEi or ARB with a CCB or a thiazide/thiazide-like diuretic if eGFR levels are ≥45 mL/min/1.73 m2 (CKD Stage IIIa). In patients with an eGFR below 30 mL/min/1.73 m2, thiazide/thiazide-like diuretics should generally be replaced by loop diuretics. The transition from treatment with a thiazide/thiazide-like to a loop diuretic should be individualised in patients with eGFR values between 30 and 45 mL/min/ 1.73 m2.[4 6 7]

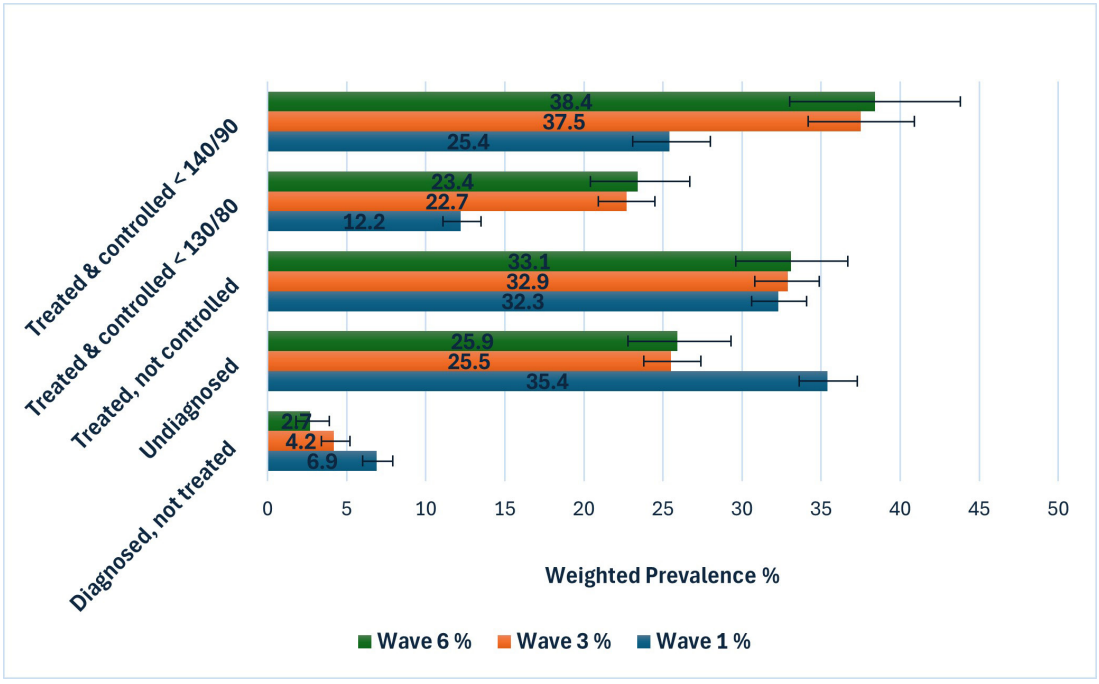

Figure 2 Unmet need in hypertension management in Ireland. This bar chart illustrates the distribution of the Irish population aged 50 years and older across five hypertension management groups. Data was collected at three time points: wave 1 (2009–2011), wave 3 (2014–2015) and wave 6 (2022–2023). The five groups are: (1) Diagnosed, not treated: individuals with a diagnosis of hypertension but not prescribed any antihypertensive treatment. (2) Undiagnosed: individuals with hypertension who have not been diagnosed. (3) Treated, not controlled: individuals receiving treatment for hypertension but without achieving adequate BP control. (4) Treated and controlled to BP <140/90: individuals receiving treatment and achieving adequate BP control (BP <140/90). (5) Treated and controlled to BP <130/80: individuals receiving treatment and achieving adequate BP control (BP <130/80). The blue bars represent the data from wave 1, the orange bars represent the data from wave 3 and the green bars represent data from wave 6. Weighted prevalence for each group, expressed as a percentage, is displayed on the x-axis and error bars represent the 95% CIs for each category. BP, blood pressure.

Similarly to the frailty subgroup, those with later stages of CKD were more likely to be prescribed these recommended agents. These findings may indicate that those with significant comorbidities and consequently more healthcare contacts or specialist input are more likely to be adequately managed in terms of hypertension.

The subgroup of those with HBPMs also demonstrated a higher prevalence of hypertension (81.1%). The idea proposed previously that home BP might lead to less defined hypertension or less need for treatment does not appear to be the case in this cohort.[23] When compared with those who had a health centre-based assessment, the HO group were less likely to have undiagnosed hypertension (18.5% vs 28.1%, p<0.0001) but more likely to be on treatment with suboptimal control (55.6% vs 44.7%, p<0.0001).

The ESC guidelines state that HBPM can be considered in addition to office BP measurements (OBPM) and ambulatory BP measurements (ABPM).[4] However, HO in this study may have been biased toward patients with more comorbidities and did not follow the ESC guideline recommendations of monitoring home BP for 7 days with duplicate morning and evening measurements. The importance of the results of this subgroup in the care of older people in the community is an awareness that HBPM may lead to higher hypertension prevalence.

A previous TILDA study, published by Murphy *et al* in 2016, found hypertension prevalence to be 63.7%, with similarly low levels of hypertension awareness, treatment and control.[11] Our study adds to this cross-sectional study by examining hypertension prevalence over 12 years of follow-up, by assessing adherence to the most recent European hypertension guidelines and by performing subgroup analyses for those aged 85 years and older and for those with frailty, CKD and HBPMs.

Similarly, hypertension prevalence in adults over 45 years old was 62% when estimated by Barron *et al* using data from SLÁN (Survey of Lifestyle, Attitudes and Nutrition) in 2007.[24] The 2023 WHO hypertension profile for Ireland states that hypertension prevalence, based on 2019 STEPwise approach to noncommunicable disease risk factor surveillance data, was 32%.[25] This profile reports that 50% of those with hypertension are diagnosed, 41% are treated and 24% are controlled; however, this was based on an age range of 30–79 years as opposed to 50 years and over in TILDA. A 2009 study on hypertension in Ireland found that less than half of those with elevated BP on a one-off reading were on treatment and less than half of those on treatment had BP controlled.[26]

This is not a uniquely Irish problem. Studies from other European countries, such as Germany and Belgium, have likewise reported low levels of hypertension control.[27 28]

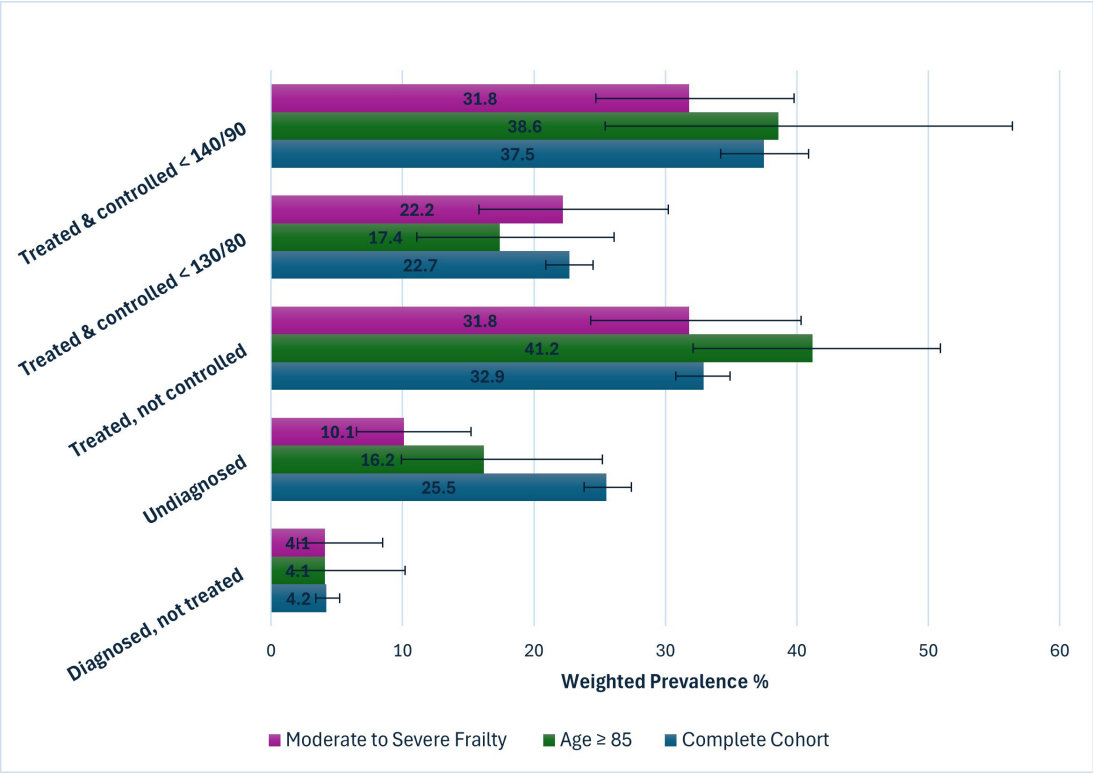

Figure 3 Hypertension management compared by older age and frailty. This bar chart illustrates the distribution of those aged 85 years and older and those with moderate-to-severe frailty and compares these groups to the Irish population aged 50 years and older across five hypertension management categories. Data was collected at wave 3 (2014–2015). The five groups are: (1) Diagnosed, not treated: individuals with a diagnosis of hypertension but not prescribed any antihypertensive treatment. (2) Undiagnosed: individuals with hypertension who have not been diagnosed. (3) Treated, not controlled: individuals receiving treatment for hypertension but without achieving adequate BP control. (4) Treated and controlled to BP <140/90: individuals receiving treatment and achieving adequate BP control (BP <140/90). (5) Treated and controlled to BP <130/80: individuals receiving treatment and achieving adequate BP control (BP <130/80). The purple bars represent those with moderate-to-severe frailty, defined as a Clinical Frailty Scale of 6 or more, the green bars represent those aged 85 years and older and the blue bars represent the full study cohort at wave 3 data collection. Weighted prevalence for each group, expressed as a percentage, is displayed on the x-axis and error bars represent the 95% CIs for each category. BP, blood pressure.

The CARLA (Cardiovascular Disease, Living, and Ageing in Halle) study in Germany, which examined a cohort with a mean age of 64.4 years, found a hypertension prevalence of 74.4%.[27] Notably, it reported higher levels of hypertension awareness compared with our findings, with awareness increasing over the follow-up period. A recent Belgian study observed comparable levels of undiagnosed hypertension to those in our cohort.[28] On a broader scale, an international study published in the Lancet in 2019 examined trends in hypertension among individuals aged 40 and older up to 2017.[29] While the study highlighted significant improvements in awareness, treatment and control during the 1990s and 2000s, it also noted a concerning plateau thereafter.[29] Drawing on data from sources such as the US National Health and Nutrition Examination Survey and the Health Survey for England, the study revealed substantial intercountry variability. Even in the best-performing nations, treatment rates peaked at 80%, with control rates remaining below 70%.[29]

This study applies the ESC hypertension guidelines to adults aged ≥50 years participating in a nationally-representative longitudinal study of ageing, thereby providing crucial context for guideline implementation among older adults. The strengths of this study include the involvement of a large, population-representative cohort of community-dwelling older adults. Comprehensive data collection, standardised HAs and ongoing follow-up with extensive longitudinal data further enhance the robustness of this study. In addition, TILDA can look at older age, frailty and CKD subgroups as well as home BP as specified in the ESC Guidelines.

This study has some limitations, some of the variables including established CVD and diabetes status are based on participants' self-report of a doctor-delivered diagnosis which could be subject to recall bias. In terms of hypertension measurement, it is well documented that BP readings can be inappropriately high or low in healthcare settings, termed either 'white coat hypertension' or 'masked hypertension'. This may cause over or underestimation of hypertension prevalence.[30 31] 'White-coat hypertension' refers to those who are not on treatment for hypertension and have an elevated OBPM with a normal ABPM and affects 15–30% of those with an elevated

OBPM.[30] 'Masked hypertension' is defined as those who are not on treatment for hypertension, who have normal OBPM and are hypertensive out of office and affects an estimated 32% of those with normal OBPM.[31] Regarding the assessment of the degree of cardiovascular risk, ECG and urinalysis data for left ventricular hypertrophy and albuminuria, respectively, were unavailable in the data set, so the extent of HMOD including CKD may have been underestimated.

HBPMs were only included for those participants who chose to have their HA conducted in their home, so this group may be subject to selection bias, likely toward individuals with a greater number of comorbidities. In terms of the attrition rate between waves, this can be explained by a combination of mortality, participants withdrawing from the study, participants opting in or out of the wave 1, 3 or 6 HA or opting out of wave 3 or 6 altogether.

Public awareness of hypertension, as well as the current levels of screening and management of individuals diagnosed with hypertension, needs critical attention. In Ireland, at present, primary care employs the Opportunity Case Finding programme to identify those with elevated BP and other cardiovascular risk factors. Individuals diagnosed with hypertension are then registered on the Annual Chronic Disease Management Prevention Programme for annual review.[32] However, this system is exclusive to medical card or general practitioner visit card holders and hypertension is not included in the Structured Chronic Disease Treatment Programme. The existing programme covers asthma, type 2 diabetes, chronic obstructive pulmonary disease and CVDs, which encompass heart failure, ischaemic heart disease, cerebrovascular disease (stroke or transient ischaemic attack) and atrial fibrillation.[32]

In addition, CKD is not yet included in this scheme even though it is a major risk factor for both hypertension and CVD.[32] Furthermore, adequate treatment of hypertension in CKD is necessary to avoid progressive loss of kidney function leading to end stage renal disease, requiring management with dialysis or kidney transplant.[33] Another challenge is the heterogeneous use of clinical guidelines in Ireland, while many practitioners favour the ESC guidelines, others continue to reference National Institute for Health and Care Excellence recommendations. There is currently no formal consensus on hypertension guideline use in either primary or secondary care in Ireland.

In conclusion, this study identifies a high prevalence of hypertension in community-dwelling adults over 50 in Ireland, alongside poor adherence to European hypertension guidelines. Furthermore, the results highlight a significant unmet need in terms of hypertension management in Ireland. The findings of this study advocate for a comprehensive reform in the identification and management of hypertension given the proven benefits of hypertension management including reduced CVD, CKD, cerebrovascular disease and dementia.[3 34 35] Aligning with the United Nations' Decade of Healthy Ageing, it is imperative to emphasise the appropriate management of this identifiable and treatable condition to prevent complications and extend healthy life expectancy going forward.[36]

Acknowledgements The authors thank the TILDA participants and members of the TILDA research team for their continued commitment, support and cooperation.

Contributors CMcG: formal analysis, methodology, writing—original draft, writing—review and editing, guarantor. SS: formal analysis, methodology. RB: writing—review and editing. CMcC: project administration, resources, writing—review and editing. JWM: writing—review and editing. RAK: project administration, resources, conceptualisation, writing—review and editing. DJS: conceptualisation, methodology, writing—review and editing.

Funding TILDA is funded by Department of Health in Ireland, The Atlantic Philanthropies, Irish Life and the Health Research Board (grant numbers TILDA-2-17-1, TILDA-2023-001). The funders did not have any involvement in study design, in the collection, analysis or interpretation of data or in the writing and submission of this paper for publication.

Competing interests None declared.

Patient consent for publication Not applicable.

Ethics approval Ethical approval for the study was received from the Trinity College Research Ethics Committee, the reference number for wave 6 data collection is 190407. Earlier waves predate the reference number system; however, copies of the approval letters can be provided on request. All participants provided written informed consent.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. TILDA offers access to the datasets for research use through pseudonymised publicly accessible dataset files, and through an on-site and remotely accessible Hot Desk Facility. The publicly accessible dataset files are hosted by the Irish Social Science Data Archive (ISSDA) based in University College Dublin. Researchers wishing to access the data can find more information and application forms on https://tilda.tcd.ie/data/accessing-data/.

ORCID iD

Caoimhe McGarvey https://orcid.org/0000-0002-5928-4912

REFERENCES

1 Wu CY, Hu HY, Chou YJ, *et al*. High Blood Pressure and All-Cause and Cardiovascular Disease Mortalities in Community-Dwelling Older Adults. *Medicine (Baltimore)* 2015;94:e2160.
2 WHO. Global report on hypertension: the race against a silent killer. 2023.
3 Lennon MJ, Lam BCP, Lipnicki DM, *et al*. Use of Antihypertensives, Blood Pressure, and Estimated Risk of Dementia in Late Life: An Individual Participant Data Meta-Analysis. *JAMA Netw Open* 2023;6:e2333353.
4 McEvoy JW, McCarthy CP, Bruno RM, *et al*. 2024 ESC Guidelines for the management of elevated blood pressure and hypertension: Developed by the task force on the management of elevated blood pressure and hypertension of the European Society of Cardiology (ESC) and endorsed by the European Society of Endocrinology (ESE) and the European Stroke Organisation (ESO). *Eur Heart J* 2024.

5 Mancia G, De Backer G, Dominiczak A, *et al*. 2007 Guidelines for the management of arterial hypertension: The Task Force for the Management of Arterial Hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). *Eur Heart J* 2007;28:1462–536.
6 Members ATF, Mancia G, Fagard R, *et al*. 2013 ESH/ESC Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC). *Eur Heart J* 2013;34:2159–219.
7 Williams B, Mancia G, Spiering W, *et al*. 2018 ESC/ESH Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH). *Eur Heart J* 2018;39:3021–104.
8 Scarlett S, Monaghan A, McLoughlin S, *et al*. Cohort Profile Update: The Irish Longitudinal Study on Ageing (TILDA)-Waves 5 and 6. *Int J Epidemiol* 2025;54:dyaf158.
9 Whelan BJ. Ransam - random sample design for Ireland. *Economic and Social Research Institute* 1979;10:169–74.
10 Cronin H, O'Regan C, Finucane C, *et al*. Health and aging: development of the Irish Longitudinal Study on Ageing health assessment. *J Am Geriatr Soc* 2013;61 Suppl 2:S269–78.
11 Murphy CM, Kearney PM, Shelley EB, *et al*. Hypertension prevalence, awareness, treatment and control in the over 50s in Ireland: evidence from The Irish Longitudinal Study on Ageing. *J Public Health (Oxf)* 2016;38:450–8.
12 Ewing JA. Detecting alcoholism. The CAGE questionnaire. *JAMA* 1984;252:1905–7.
13 Craig CL, Marshall AL, Sjöström M, *et al*. International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc* 2003;35:1381–95.
14 Varghese D, Ishida C, Patel P, *et al*. Polypharmacy. In: *StatPearls*. Treasure Island (FL): StatPearls Publishing, 2025.
15 Skou ST, Mair FS, Fortin M, *et al*. Multimorbidity. *Nat Rev Dis Primers* 2022;8:48.
16 Canney M, O'Connell MDL, Sexton DJ, *et al*. Graded Association Between Kidney Function and Impaired Orthostatic Blood Pressure Stabilization in Older Adults. *J Am Heart Assoc* 2017;6:e005661.
17 Hageman S, Pennells L, Ojeda F, *et al*. SCORE2 risk prediction algorithms: new models to estimate 10-year risk of cardiovascular disease in Europe. *Eur Heart J* 2021;42:2439–54.
18 de Vries TI, Cooney MT, Selmer RM, *et al*. SCORE2-OP risk prediction algorithms: estimating incident cardiovascular event risk in older persons in four geographical risk regions. *Eur Heart J* 2021;42:2455–67.
19 O'Halloran AM, Hartley P, Moloney D, *et al*. Informing patterns of health and social care utilisation in Irish older people according to the Clinical Frailty Scale. *HRB Open Res* 2021;4:54.
20 Theou O, Pérez-Zepeda MU, van der Valk AM, *et al*. A classification tree to assist with routine scoring of the Clinical Frailty Scale. *Age Ageing* 2021;50:1406–11.
21 Whelan BJ, Savva GM. Design and methodology of the Irish Longitudinal Study on Ageing. *J Am Geriatr Soc* 2013;61 Suppl 2:S265–8.
22 Central Statistics Office. Census of population 2022 - Summary results. 2025. Available: https://www.cso.ie/en/releasesandpublications/ep/p-cpsr/censusofpopulation2022-summaryresults/populationchanges
23 George J, MacDonald T. Home Blood Pressure Monitoring. *Eur Cardiol* 2015;10:95–101.
24 Barron S, Balanda K, Hughes J, *et al*. National and subnational hypertension prevalence estimates for the Republic of Ireland: better outcome and risk factor data are needed to produce better prevalence estimates. *BMC Public Health* 2014;14:24.
25 World Health Organisation. Hypertension profile - Ireland. 2023. Available: https://www.who.int/publications/m/item/hypertension-irl-2023-country-profile
26 Zaharan NL, Mahmud A, Bennett K, *et al*. Hypertension in Ireland: public awareness and doctors choice of therapy. *Ir J Med Sci* 2009;178:413–7.
27 Lacruz ME, Kluttig A, Hartwig S, *et al*. Prevalence and Incidence of Hypertension in the General Adult Population: Results of the CARLA-Cohort Study. *Medicine (Baltimore)* 2015;94:e952.
28 De Bacquer D, Bayet S, Bondue A, *et al*. Prevalence, awareness and therapeutic control of hypertension in Belgium: an opportunistic screening of nearly 6,000 participants during the May Measurement Month campaigns 2017-23. *Blood Press* 2025;34:2501956.
29 Zhou B, Danaei G, Stevens GA, *et al*. Long-term and recent trends in hypertension awareness, treatment, and control in 12 high-income countries: an analysis of 123 nationally representative surveys. *Lancet* 2019;394:639–51.
30 Franklin SS, Thijs L, Hansen TW, *et al*. White-coat hypertension: new insights from recent studies. *Hypertension* 2013;62:982–7.
31 Thakkar HV, Pope A, Anpalahan M. Masked Hypertension: A Systematic Review. *Heart Lung Circ* 2020;29:102–11.
32 Health Service Executive. Chronic disease management programme. 2023. Available: https://www.hse.ie/eng/about/who/gmscontracts/2019agreement/chronic-disease-management-programme
33 Theodorakopoulou M, Ortiz A, Fernandez-Fernandez B, *et al*. Guidelines for the management of hypertension in CKD patients: where do we stand in 2024? *Clin Kidney J* 2024;17:36–50.
34 Ettehad D, Emdin CA, Kiran A, *et al*. Blood pressure lowering for prevention of cardiovascular disease and death: a systematic review and meta-analysis. *Lancet* 2016;387:957–67.
35 Burnier M, Damianaki A. Hypertension as Cardiovascular Risk Factor in Chronic Kidney Disease. *Circ Res* 2023;132:1050–63.
36 World Health Organisation. Decade of healthy ageing: baseline report. Report no.: ISBN: 9789240017900. 2021.