Interventions of eHealth technologies integrated with non-physician health workers for improving management of hypertension: Systematic review and meta-analysis

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Supplementary Table S1: Search Strategy

1	community health workers.mp. or exp health auxiliary/
2	community health nursing/ or nurse/
3	((Community adj3 health adj3 worker*) or CHW* or extension worker* or health extension worker* or outreach worker or outreach worker* or village health worker* or community health-care worker* or allied health worker* or lay health worker or lay health worker* or lay health-care worker* or (lay adj3 health adj3 volunteer*) or (lay adj3 healthcare adj3 volunteer*) or Primary health care worker* or primary healthcare worker* or primary health-care worker* or community worker* or community health care worker* or community healthcare worker* or bare foot health care worker* or barefoot doctor* or community health practitioner* or community health volunteer or community health volunteer* or health volunteer or (health adj3 volunteer*) or (community adj3 health adj3 volunteer*) or Female Community Health Volunteer* or FCHV or Accredited Social Health Activist* or ASHA or aganwadi* or agents communitaria de saude or agents communitaria de salud or embajadoras or colaborador voluntary schema or colaborador voluntary* or family welfare assistant* or Consejera or lay volunteer* or "care worker*" or health promotor* or community health provider* or emergency medical technician* or home health aides or trained personnel or "community resource person*" or health promotor* or frontline health worker* or promotora* or volunteer health worker* or "community health agent*" or community health surveyor* or community health assistant* or community health promoter*OR village health volunteer or close-to-community provider*vOR community-based practitioner*vOR lady Health worker* or Community Practitioner* or promotoras de salud or Animatrice or Barangay health worker or Barangay health workers or Basic health worker or Basic health workers or Brigadista or Colaborador voluntario* or Community

	health agent* or rural health auxiliaries or rural health auxiliary or Community health representative* or Female multipurpose health worker* or Kader or Monitora or Mother coordinator or Outreach educator* or Health Surveillance Assistant* or Nutrition Counselor* or Peer Educator* or Shasthya Shebika or Socorrista or Animator* or Community Case Management Worker* or Community Health Extension Worker* or Village health helper* or Village drug-kit manager* or Accompagnateur or Care Group Volunteer* or Community Case Management Worker or Community Case Management Worker* or auxiliary nurse-midwives or Auxiliary Nurse-midwife or Family Health Worker* or Care Group Volunteer* or Health Surveillance Assistant* or Family Planning Agent* or Family Welfare Assistant* or Family Welfare Assistant* or Maternal Child Health Worker* or Mobile Clinic Team* or Nutrition Agent* or Community HealthCare Provider*).mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword heading word, floating subheading word, candidate term word]
4	((licensed practical nurse* adj5 community) or nursing assistant* or community nurse or community nurse* or (community adj5 nurse) or community health nurse* or (community adj5 heath adj5 nurse*) or (community health adj5 nurse) or primary health care nurse* or (primary health care adj5 nurse) or (pharmacy technician* adj3 community) or health auxiliary or ANM or auxiliary nurse midwi* or midwi* or auxiliary midwives or community pharmacist or (community adj3 pharmacist*) or community drug distributor* or (non-physician health worker* adj5 community) or (non-physician adj5 community) or (non-physician adj5 community) or (health care workforce adj5 community) or (health workforce adj5 community) or (health care worker* adj5 community) or (extended scope practice adj5 community) or (healthcare provider* adj3 community)).mp.
5	exp Hypertension/di, ep, pc [Diagnosis, Epidemiology, Prevention & Control]

6	(Hypertension or hypertens$ or blood pressure or bloodpressure or BP or raised blood pressure or high blood pressure or pre hypertens* or pre-hypertens* or raised blood pressure).mp.
7	exp non communicable disease/di, dm, ep, pc [Diagnosis, Disease Management, Epidemiology, Prevention]
8	(Noncommunicable diseases or chronic disease or non-communicable disease or noncommunicable disease or NCD).mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword heading word, floating subheading word, candidate term word]
9	(mobile Health or digital health or telemedicine or telehealth or technology enabled or eHealth or mHealth or SMS or messaging).mp. [mp=title, abstract, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword heading word, floating subheading word, candidate term word]
10	1 or 2 or 3 or 4
11	5 or 6 or 7 or 8
12	9 and 10 and 11

Supplementary Table S2: Characteristics of the included studies

S. N	Author and reference	Published year	Country	Sample size		Age (years)	Population/disease condition	Duration of follow-up	Type of Intervention	Type of eHealth technology	Type of non-physician
				Intervention	Control						
1	Cho et al, 2020	2020	South Korea	43	41	30-59	At least 2 metabolic abnormalities:waist circumference (male: ≥90 cm; female: ≥80 cm), blood pressure (systolic: ≥135 mmHg; diastolic: ≥85 mmHg), triglyceride ≥150 mg/dL, high-density lipoprotein (HDL) cholesterol (male: <40 mg/dL; female: <50 mg/dL), and fasting	6 months	App-based self-logging and personalized coaching from professional dieticians and exercise coordinators group	Mobile application	Certified exercise regimen coordinators and clinical dieticians

S. N	Author and reference	Published year	Country	Sample size		Age (years)	Population/disease condition	Duration of follow-up	Type of Intervention	Type of eHealth technology	Type of non-physician
				Intervention	Control						
							glucose level ≥100 mg/dL				
2	Green et al, 2014	2014	USA	51	50	30-69	BMI>26, elevated BP, and 10%-25% 10-year Framingham CVD risk	6 months	Home BP monitor, scale, and dietitian team care. Follow-up occurred via secure messaging to report BP, weight, and fruit and vegetable intake and receive ongoing feedback.	Web-based	Dieticians
3	Ma et al, 2022	2022	China	105	105	26-73	those with uncontrolled blood pressure, who were taking antihypertensive medications,	3 months	Six individual weekly education and consultation sessions provided by a nurse in the first 6 weeks and a researcher-developed smartphone application	Mobile application	Nurses
4	Margolis, et al 2022	2022	USA	1423	1648	18-85	adult patients with moderately severe	12 months	Telehealth care using best practices and adding home BP	Telemonitoring	Clinical pharmacist

S. N	Author and reference	Published year	Country	Sample size		Age (years)	Population/disease condition	Duration of follow-up	Type of Intervention	Type of eHealth technology	Type of non-physician
				Intervention	Control						
							hypertension (BP≥150/95 mm Hg):		telemonitoring coordinated by a clinical pharmacist		
5	Ogren et al, 2018	2018	Sweden	320	340	Mean age for intervention =69.9 Mean age for control=69.3	Patients with stroke or TIA	36 months	Telephone-based follow-up and counselling by nurses	Telephone-based counselling	Nurse
6	Persell et al , 2018	2018	USA	278	254	18+	Systolic blood pressure of at least 135 mmHg	12 months	Electronic health record–based medication management tools	Electronic health	Nurse

S. N	Author and reference	Published year	Country	Sample size		Age (years)	Population/disease condition	Duration of follow-up	Type of Intervention	Type of eHealth technology	Type of non-physician
				Intervention	Control						
							or diastolic blood pressure of at least 85 mmHg or 130 mmHg or 80 mmHg for those with diabetes		(medication review sheets at visit check-in, lay medicationnurse-led medication management support (EHR plus education group), information sheets printed after visits and	record tools	
7	Sarfo et al , 2018	2018	Ghana	30	30	18+	Confirmed stroke of <1 month and uncontrolled hypertension (SBP ≥ 140 mmHg)	9 months	Patients in the IG received a Blue-toothed UA-767Plus BT Blue-toothed BP device and smartphone with an App for monitoring BP measurements and medication intake under nurse guidance for three month	Mobile application	Nurse

S. N	Author and reference	Published year	Country	Sample size		Age (years)	Population/disease condition	Duration of follow-up	Type of Intervention	Type of eHealth technology	Type of non-physician
				Intervention	Control						
8	Wong et al, 2022	2022	Hong Kong	74	76	60 +	Chronic pain, hypertension, or diabetes.	3 months	An mHealth smartphone app and a nurse case management model in partnership with a health-social care team composed of social workers and general practitioners	Mobile application	Nurse
9	Alsaqer et al, 2022	2022	Jordan	37	37	55+	Diagnosed with hypertension	3 months	Participants were instructed to download and use the 4-free apps to facilitate the self-monitoring and detect BP and behavior changes and public health nursing intervention	Mobile application	Nurse
10	He et al, 2017	2017	Argentina	743	689		Uncontrolled hypertension	18 months	Community health worker-led home intervention (health coaching, home BP monitoring, and BP audit and feedback), a	SMS text messages	Community health workers

S. N	Author and reference	Published year	Country	Sample size		Age (years)	Population/disease condition	Duration of follow-up	Type of Intervention	Type of eHealth technology	Type of non-physician
				Intervention	Control						
									physician intervention, and a text-messaging intervention teractive physician educational programs		
11	Jahan et al , 2020	2020	Bangladesh	209	211	> 35	Hypertension	5 months	In-person health education along with a health education booklet and SMS text messaging to develop awareness and knowledge, and motivate behavior changes	SMS text messages	Community health workers
12	Tain et al, 2015	2015	China and India	1095	991	≥40	Self-reported history of (1) coronary heart disease, (2) stroke, (3) diabetes mellitus, and/or (4) measured	12 months	Two therapeutic lifestyle modifications (smoking cessation and salt reduction) and the appropriate prescription of two	Electronic decision support system	Community health workers

S. N	Author and reference	Published year	Country	Sample size		Age (years)	Population/disease condition	Duration of follow-up	Type of Intervention	Type of eHealth technology	Type of non-physician
				Intervention	Control						
							systolic blood pressure (SBP) ≥160 mm Hg		medications (blood pressure–lowering agents and aspirin.The management program was delivered by trained community health workers in the intervention group on a monthly basis with the assistance of electronic decision support system in the form of an Android-based app installed on smartphones		
13	Vuaghan et al, 2021	2021	USA	44	45	> 18	Type 2 diabetes.	12 months	(1) CHW-participant telehealth communication via mobile health (mHealth) for 12 months, (2) CHW-led monthly group visits for	Telehealth support	Community health workers

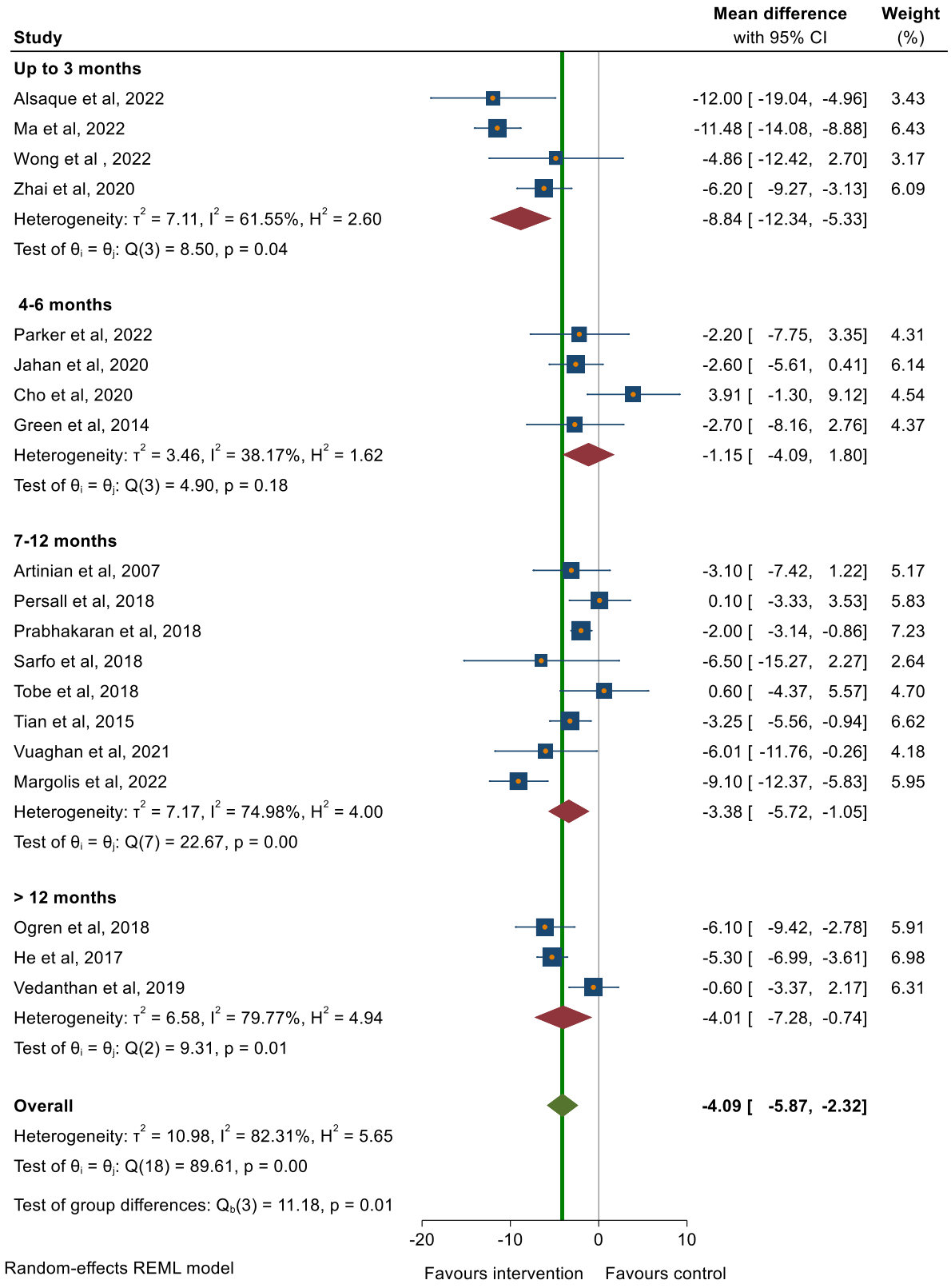
S. N	Author and reference	Published year	Country	Sample size		Age (years)	Population/disease condition	Duration of follow-up	Type of Intervention	Type of eHealth technology	Type of non-physician
				Intervention	Control						
									6 months, and (3) weekly CHW-physician diabetes training and support via telehealth (video conferencing).		
14	Zhai et al, 2020	2020	China	192	192	>18	diagnosed with hypertension	3 months	The first component comprised personal consultations by trained pharmacy students. The second component was SMS text messages sent at 3-day intervals	SMS text messages	Pharmacist
15	Tobe et al, 2018	2018	Canada	64	58	>18	Those with hypertension	12 months	The active SMS which included information on the management of hypertension as well as advice to follow-up with the participant's health care provider if the	SMS text messages	Community health workers

S. N	Author and reference	Published year	Country	Sample size		Age (years)	Population/disease condition	Duration of follow-up	Type of Intervention	Type of eHealth technology	Type of non-physician
				Intervention	Control						
									measured BP was above target. Individual BP measure-ments were taken by community health workers using an automated BP device with Bluetooth transmission capability..		
16	Vedanthan et al, 2019	2019	Kenya	469	491	Mean age; Intervention =58.6 Mean age;	Those with hypertension	15 months	Community health workers with tailored behavioral communication, using smartphone technology	mHealth tool	Community health workers

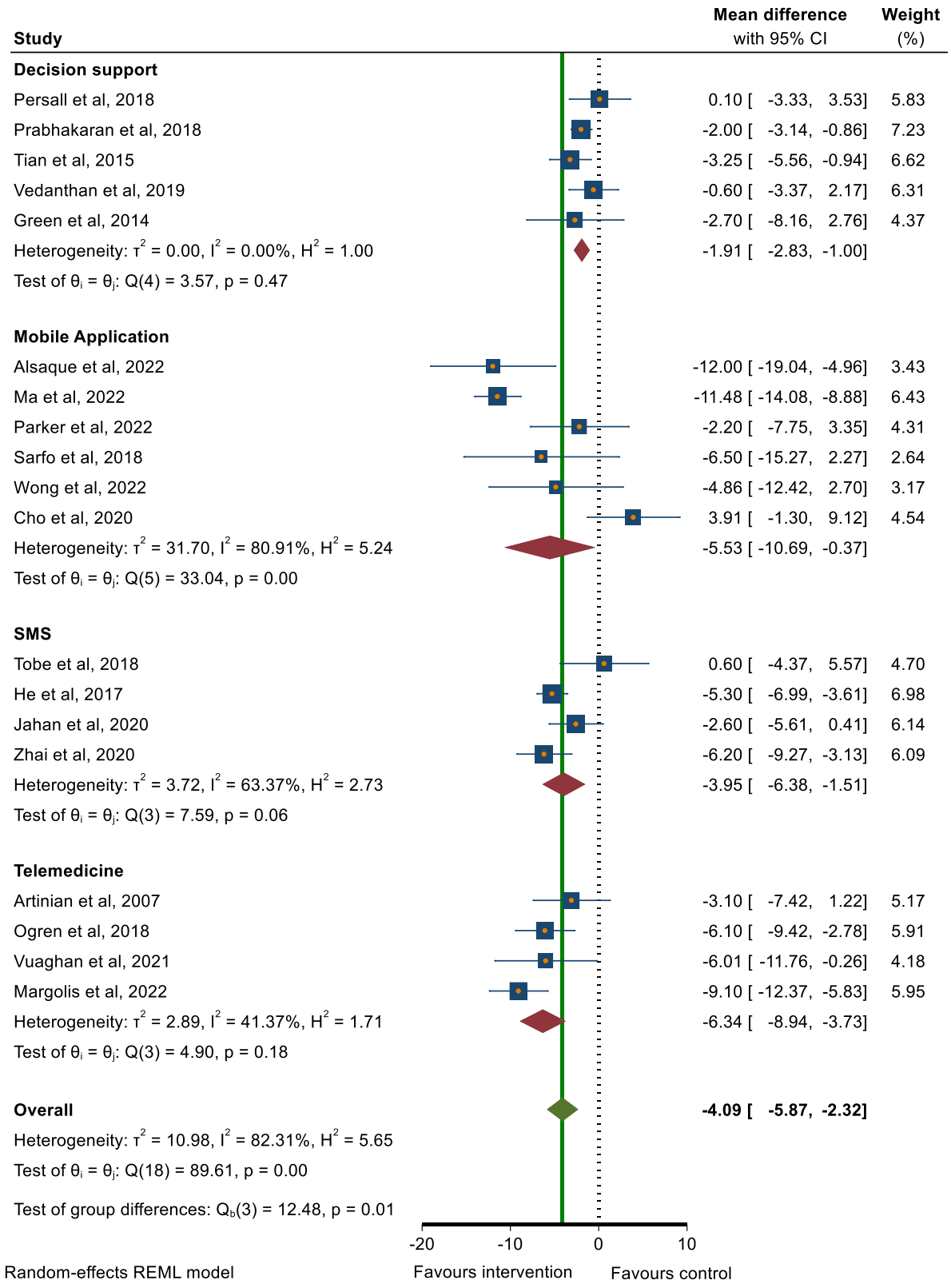
S. N	Author and reference	Published year	Country	Sample size		Age (years)	Population/disease condition	Duration of follow-up	Type of Intervention	Type of eHealth technology	Type of non-physician
				Intervention	Control						
						control=61.3					
18	Prabhakaran et al, 2018	2018	India	1856	1842	≥30 years	Hypertension and diabetes mellitus	12 months	CD nurse used a tablet computer installed with the mWellcare system to collect data on patient history, blood pressure, blood glucose, depression, tobacco and alcohol use, and current medications for a decision support recommendations.	Electronic decision support system	Nurse
19	Artinian et al, 2007	2007	USA	194	193	≥18 years	Hypertension	12 months	Telemonitoring participants were also asked to telephonically send their BP readings to the intervention nurse and their care providers	Telemonitoring	Nurse

S. N	Author and reference	Published year	Country	Sample size		Age (years)	Population/disease condition	Duration of follow-up	Type of Intervention	Type of eHealth technology	Type of non-physician
				Intervention	Control						
20	Parker et al, 2022	2022	Australia	95	64	40–74	BMI ≥28	6 months	A practice nurse-led preventive health check, a mobile application and telephone coaching. A lifestyle app (mysnapp) designed to help patients and consumers to manage their health and health coaching via the “Get Healthy” telephone coaching	Mobile application	Nurse

Supplementary Figure S1: Reduction in systolic blood pressure by duration of intervention



Supplementary Figure S2: Reduction in systolic blood pressure reduction by type of eHealth technologies



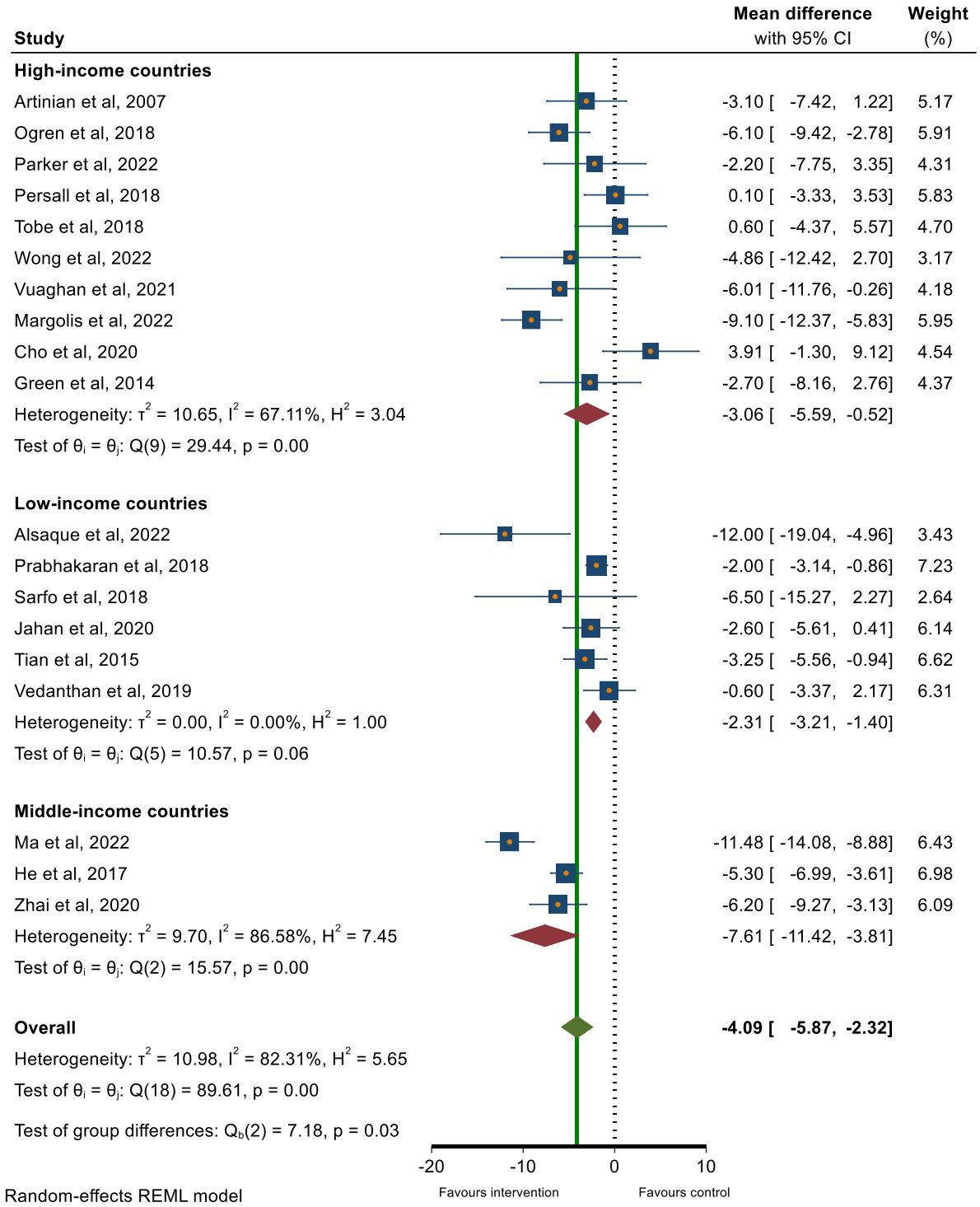
Decision support is defined as those tools and apps that support clinial decision and used by non-physician health workers such as lectronic health record tools, smartphone for community health workers or electronic decision support system

Mobile application are the smart-phone based application used by articipants for self-monitorng

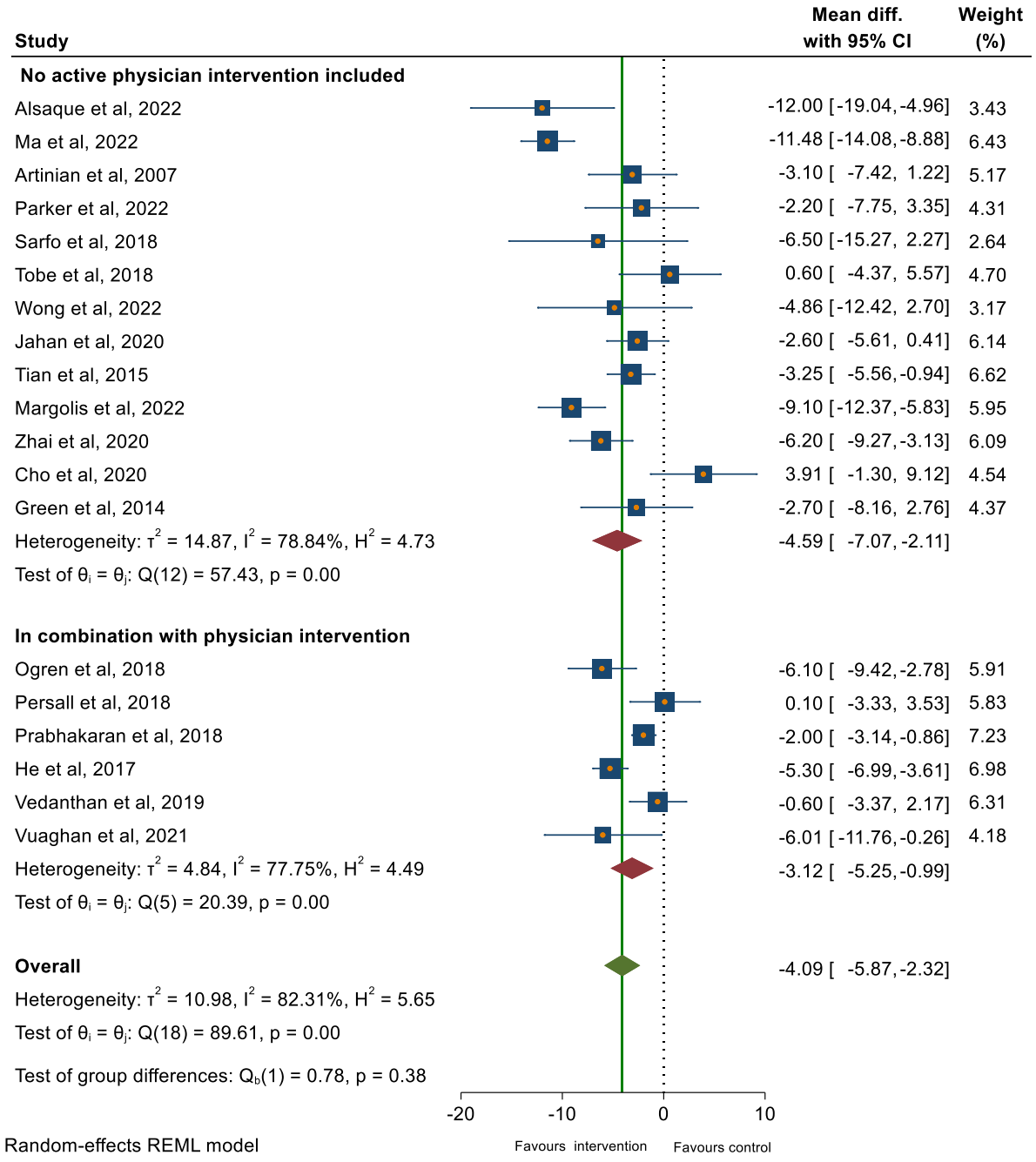
SMS, short text message service

Telemedicine is defined as telephone based coaching, video-conferncing and phone based follow-ups other than text messaging

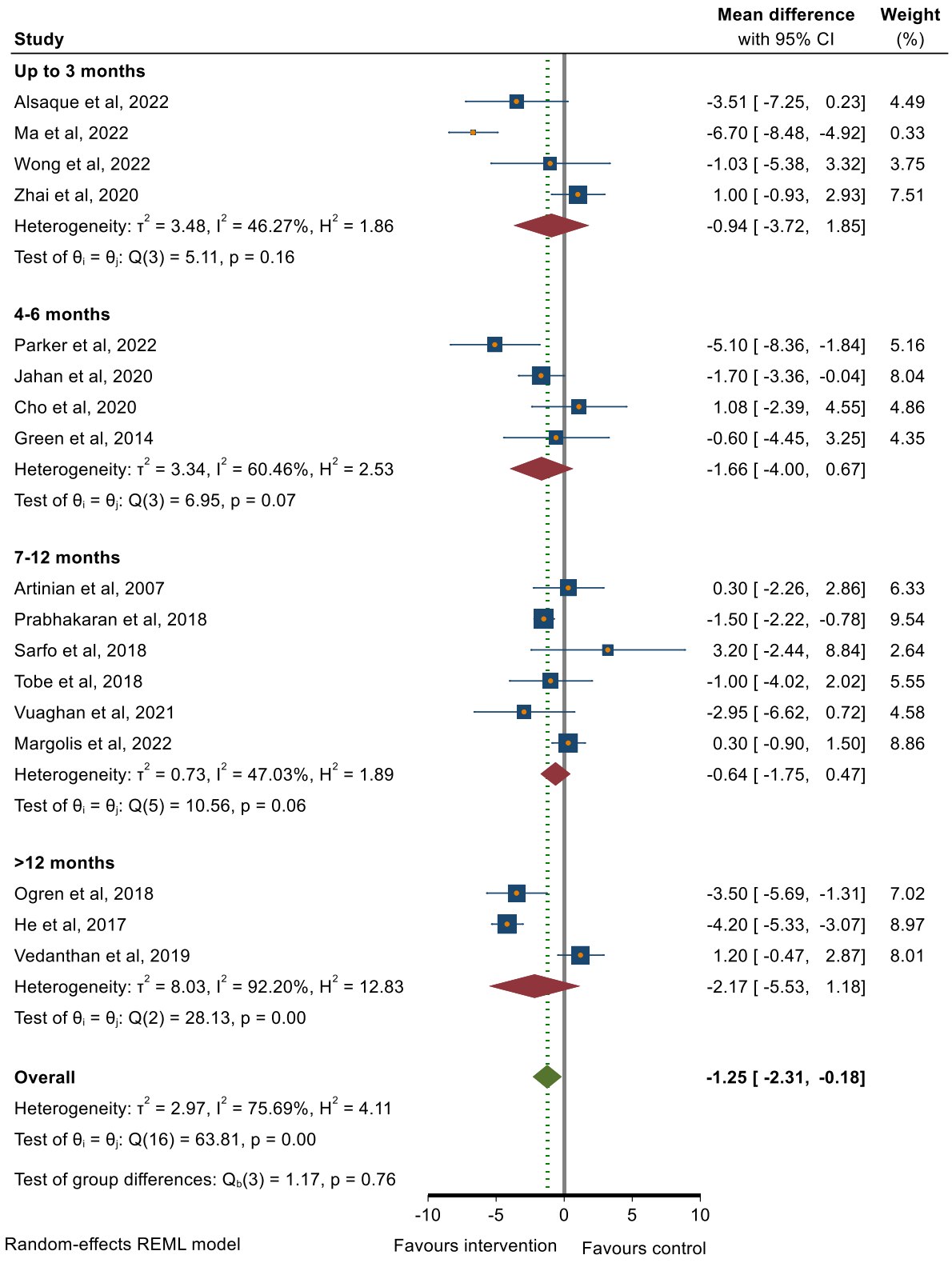
Supplementary Figure S3: Reduction in systolic blood pressure reduction by type of country income



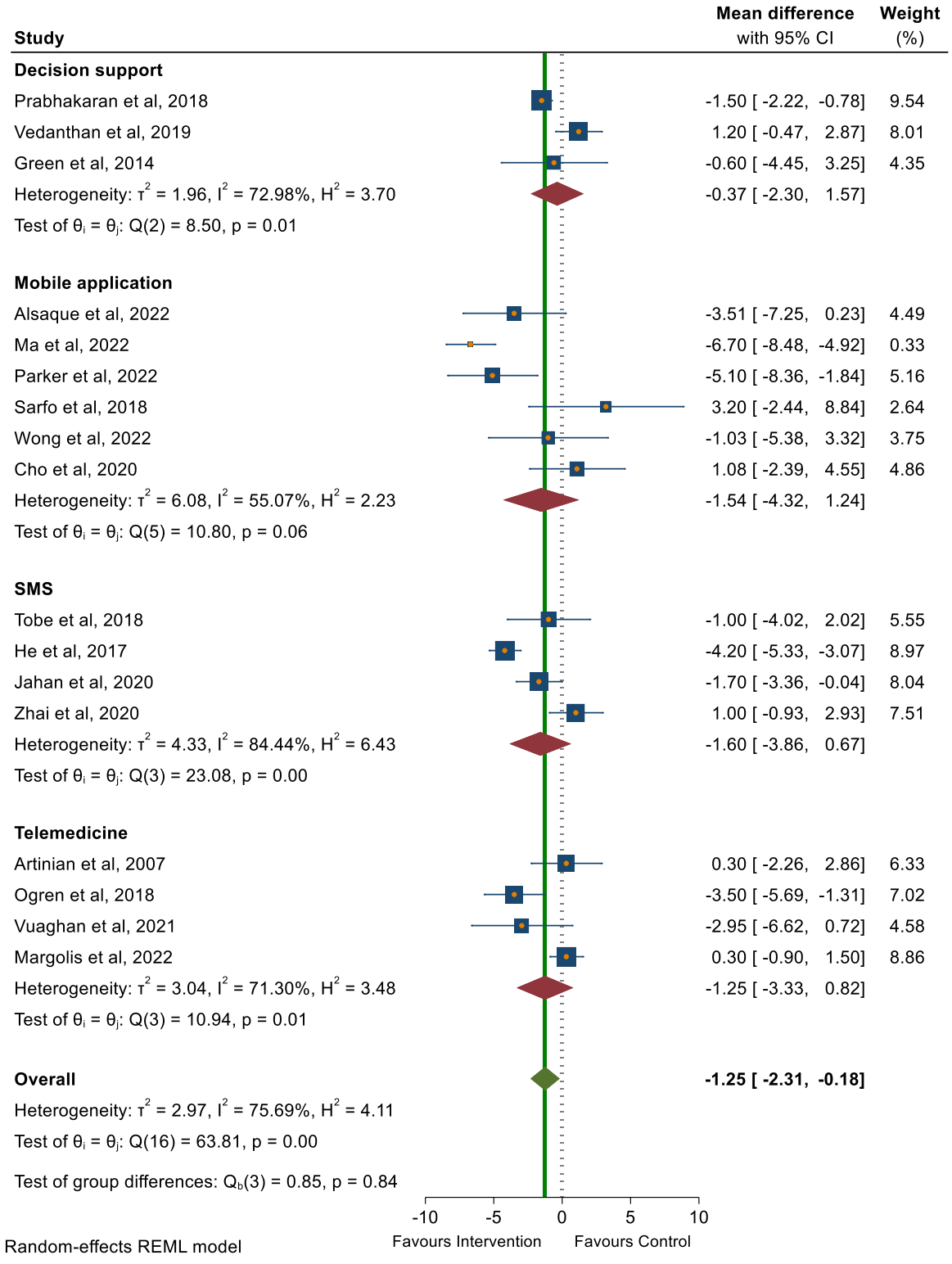
Supplementary Figure S4: Reduction in systolic blood pressure reduction by involvement of physician intervention



Supplementary Figure S5: Reduction in diastolic blood pressure reduction by duration of intervention



Supplementary Figure S6: Reduction in diastolic blood pressure reduction by type of eHealth technologies



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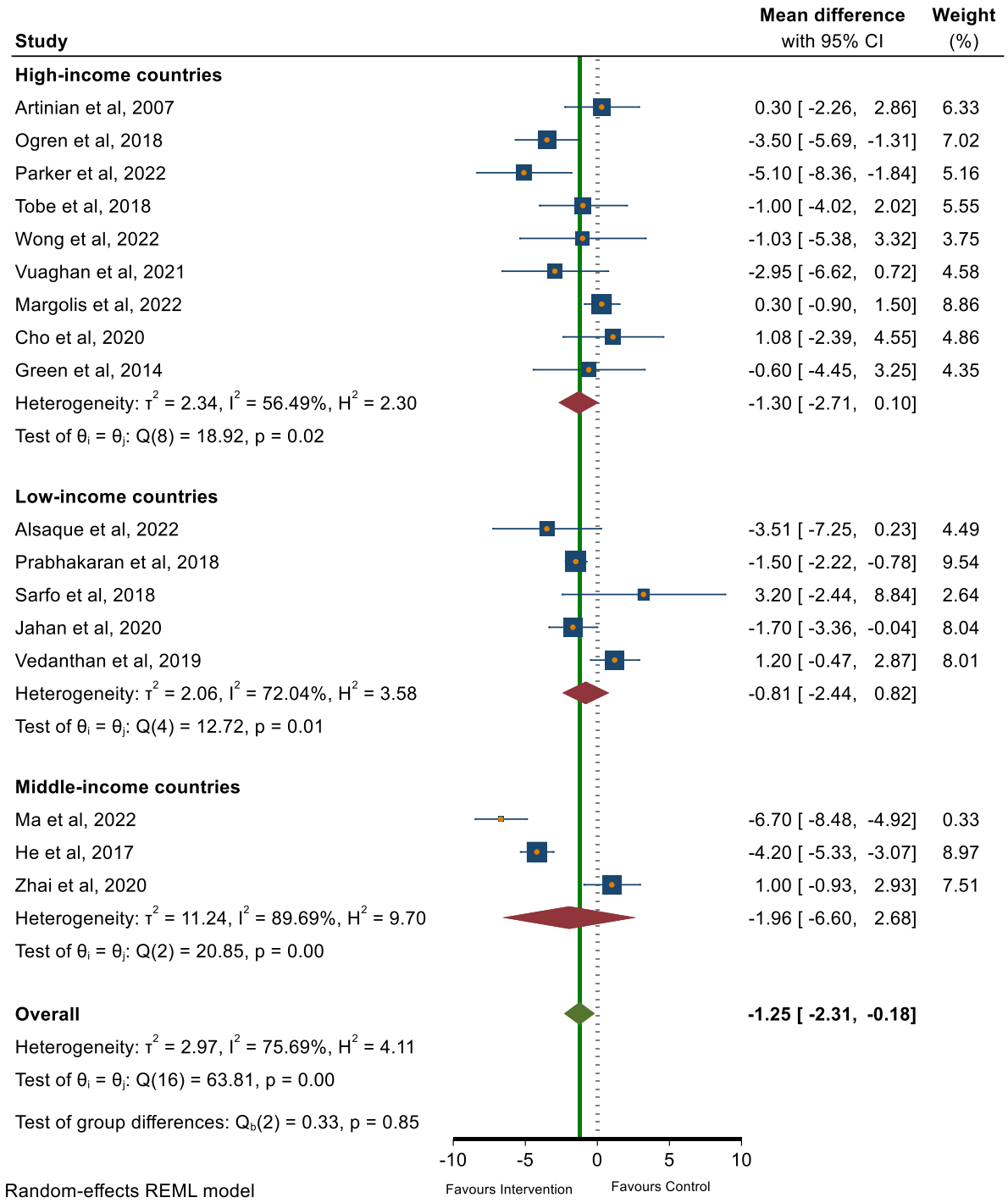
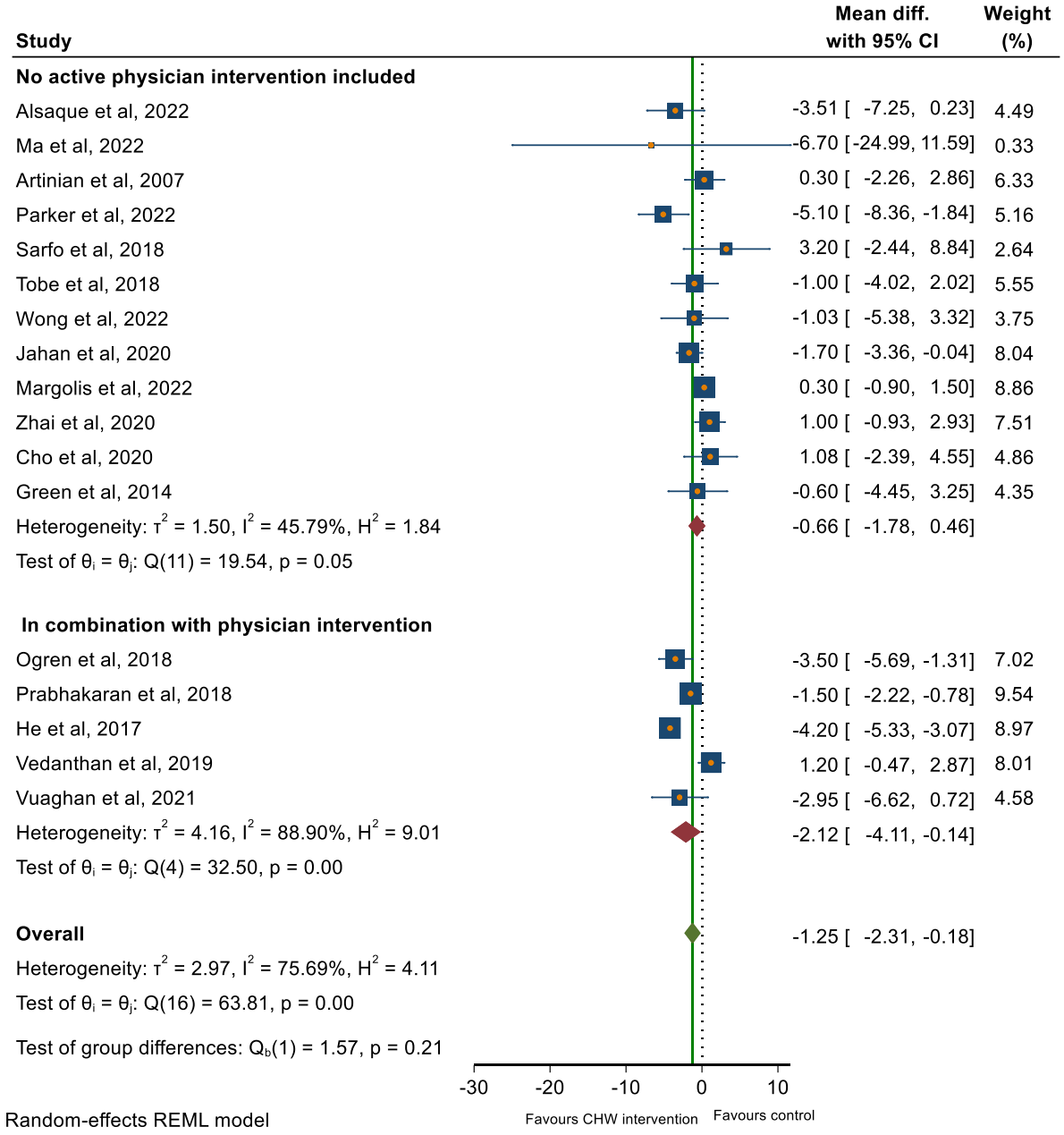
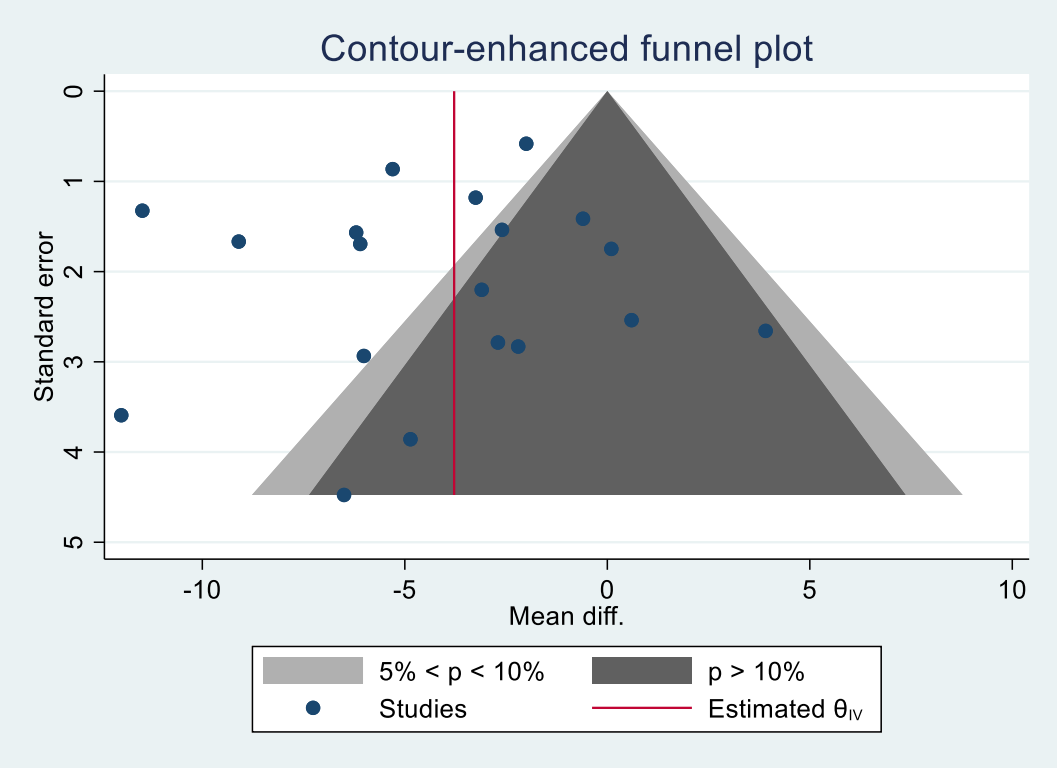
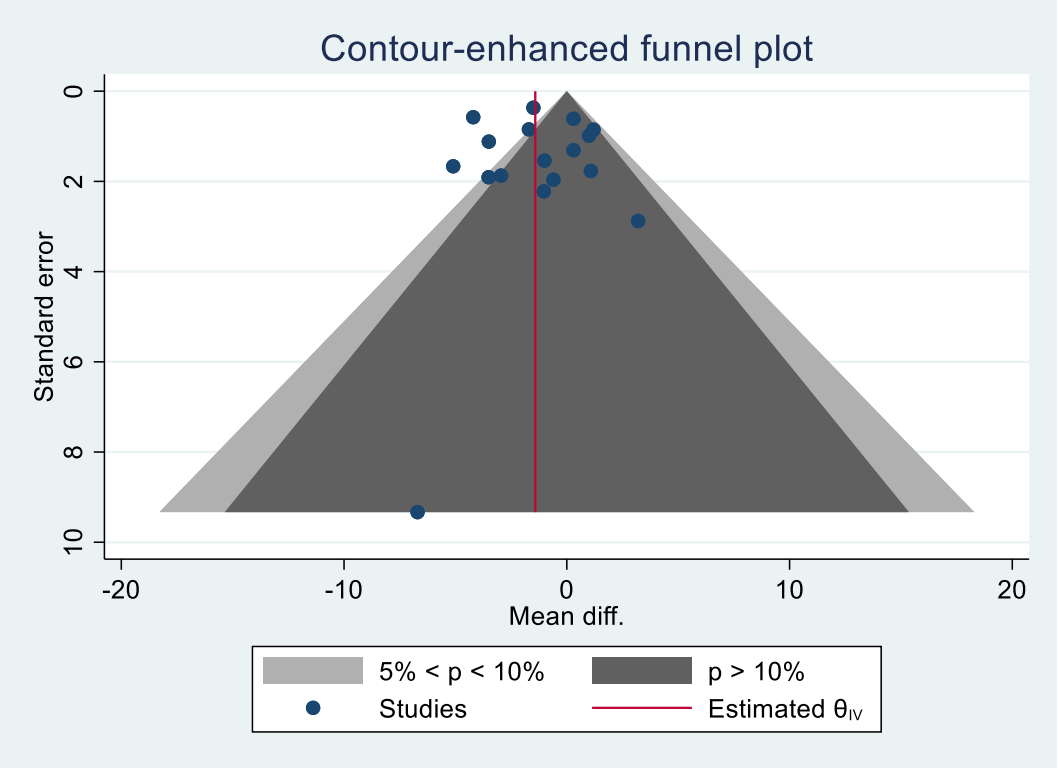
Supplementary Figure S7: Reduction in diastolic blood pressure reduction by country income



Supplementary Figure S8: Reduction in diastolic blood pressure reduction by engagement of physician intervention



Supplementary Figure S9A: Contoured enhanced plot for publication bias for systolic blood pressure



Supplementary Figure S9B: Contoured enhanced plot for publication bias for diastolic blood pressure