The Role of Bariatric Surgery in Hypertension Control: A Systematic Review and Meta-Analysis with Extended Benefits on Metabolic Factors

Supplemental Material

Table of Contents

Search Strategy

Pubmed
(May 2, 2024)

	Query	Results (No.)
#1	"Hypertension"[Mesh] OR “Blood Pressure, High” OR “Blood Pressures, High” OR “High Blood Pressure” OR “High Blood Pressures” OR “Elevated Blood Pressure*” OR “HTN” OR “Elevated BP” OR “Raised blood pressure*” OR “High BP” OR “Hypertensive disease” OR “Hypertensive” OR “Increased blood pressure”	
#2	"Bariatric Surgery"[Mesh] OR “Surgeries, Bariatric” OR “Surgery, Bariatric” OR “Metabolic Surgery” OR “Metabolic Surgeries” OR “Surgeries, Metabolic” OR “Surgery, Metabolic” OR “Bariatric Surgical Procedures” OR “Bariatric Surgical Procedure” OR “Procedure, Bariatric Surgical” OR “Procedures, Bariatric Surgical” OR “Surgical Procedure, Bariatric” OR “Surgical Procedures, Bariatric” OR “Bariatric Surgeries” OR “Stomach Stapling” OR “Stapling, Stomach” OR “Weight loss surgery” OR “Obesity surgery” OR “Gastric surgery” OR “Surgical treatment for obesity” OR “Bariatric procedure*” OR “Weight reduction surgery” OR “Obesity treatment surgery” OR “Bariatric metabolic surgery” OR “Weight reduction procedure*” OR “Gastric sleeve surgery” OR “sleeve gastrectomy” OR “gastric sleeve” OR “gastric band*” OR “Bariatric metabolic procedure*” OR “Weight management surgery” OR “laparoscopic adjustable gastric banding” OR “Obesity reduction surgery” OR “LAGB” OR “VSG”	
	"Gastric Bypass"[Mesh] OR “Bypass, Gastric” OR “Greenville Gastric Bypass” OR “Gastric Bypass, Greenville” OR “Gastrojejunostomy” OR “Gastrojejunostomies” OR “Roux-en-Y Gastric Bypass” OR “Bypass, Roux-en-Y Gastric” OR “Gastric Bypass, Roux-en-Y” OR “Roux en Y Gastric Bypass” OR “Gastroileal Bypass” OR “Bypass, Gastroileal” OR “RYGB”	
	"Gastroplasty"[Mesh] OR “Gastroplasties” OR “Collis Gastroplasty” OR “Gastroplasty, Collis” OR “Vertical-Band* Gastroplasty” OR “Gastroplasties, Vertical-Band*” OR “Gastroplasty, Vertical-Band*” OR “Vertical Band* Gastroplasty” OR “Vertical-Band* Gastroplasties”	
	“Duodenal Switch” OR “Stomach Intestinal Pylorus Sparing” OR “Biliopancreatic diversion”OR “Biliopancreatic bypass” OR “Biliopancreatic diversionary surgery” OR “BPD surgery” OR “BPD procedure”	
#3	“Blood pressure control*” OR “Control of Blood pressure” OR “Blood pressure management” OR “Blood pressure maintenance” OR “ Blood pressure regulat*” OR “Blood pressure reduc*” OR “Blood pressure modulation” OR “Blood pressure adjustment” OR “Blood pressure normaliz*” OR “Blood pressure lowering” OR “Blood pressure stabiliz*” OR “BP control*” OR “BP management” OR “BP regulation” OR “BP reduction” OR “BP maintenance” OR “BP modulation” OR “BP lowering” OR “Prevention of Hypertension” OR “Control of Hypertension” OR “Hypertension treatment” OR	

		“Hypertension management” OR “Hypertension care” OR “Hypertension therap*” OR “Hypertension control*” OR “Hypertension prevention” OR “HTN control” OR “HTN management” OR “HTN therap*” OR “HTN treatment” OR “HTN prevention”	
		"Major Adverse Cardiac Events" OR "Cardiac Events" OR "Cardiac Event" OR "Event, Cardiac" OR "Adverse Cardiac Event" OR "Adverse Cardiac Events" OR "Cardiac Event, Adverse" OR "Cardiac Events, Adverse" OR "Myocardial Infarction" OR "Infarction, Myocardial" OR "Infarctions, Myocardial" OR "Myocardial Infarctions" OR "Cardiovascular Stroke" OR "Cardiovascular Strokes" OR "Stroke, Cardiovascular" OR "Strokes, Cardiovascular" OR "Myocardial Infarct" OR "Infarct, Myocardial" OR "Infarcts, Myocardial" OR "Myocardial Infarcts" OR "Heart Attack" OR "Heart Attacks" OR "Arrhythmia, Cardiac" OR "Cardiac Dysrhythmia" OR "Dysrhythmia, Cardiac" OR "Cardiac Arrhythmia" OR "Cardiac Arrhythmias" OR "Arrhythmia" OR "Arrythmia" OR "Heart Failure" OR “Cardiac Failure” OR “Heart Decompensation” OR “Decompensation, Heart” OR “Heart Failure, Right-Sided” OR “Heart Failure, Right Sided” OR “Right-Sided Heart Failure” OR “Right Sided Heart Failure” OR “Myocardial Failure” OR “Congestive Heart Failure” OR “Heart Failure, Congestive” OR “Heart Failure, Left-Sided” OR “Heart Failure, Left Sided” OR “Left-Sided Heart Failure” OR “Left Sided Heart Failure” OR "Coronary Artery Disease" OR "Artery Disease, Coronary" OR "Artery Diseases, Coronary" OR "Coronary Artery Diseases" OR "Left Main Coronary Artery Disease" OR "Left Main Disease" OR "Left Main Diseases" OR "Left Main Coronary Disease" OR "Coronary Arteriosclerosis" OR "Arterioscleroses, Coronary" OR "Coronary Arterioscleroses" OR "Atherosclerosis, Coronary" OR "Atheroscleroses, Coronary" OR "Coronary Atheroscleroses" OR "Coronary Atherosclerosis" OR "Arteriosclerosis, Coronary" OR "Hypertrophy, Left Ventricular" OR "Left Ventricular Hypertrophy" OR "Hypertrophies, Left Ventricular" OR "Left Ventricular Hypertrophies" OR "Ventricular Hypertrophies, Left" OR "Ventricular Hypertrophy, Left" OR “Stroke" OR ”Strokes” OR “Cerebrovascular Accident” OR “Cerebrovascular Accidents” OR “CVA” OR “CVAs” OR “Cerebrovascular Apoplexy” OR “Apoplexy, Cerebrovascular” OR “Vascular Accident, Brain” OR “Brain Vascular Accident” OR “Brain Vascular Accidents” OR “Vascular Accidents, Brain” OR “Cerebrovascular Stroke” OR “Cerebrovascular Strokes” OR “Stroke, Cerebrovascular” OR “Strokes, Cerebrovascular” OR “Apoplexy” OR “Cerebral Stroke” OR “Cerebral Strokes” OR “Stroke, Cerebral” OR “Strokes, Cerebral” OR “Stroke, Acute” OR “Acute Stroke” OR “Acute Strokes” OR “Strokes, Acute” OR “Cerebrovascular Accident, Acute” OR “Acute Cerebrovascular Accident” OR “Acute Cerebrovascular Accidents” OR “Cerebrovascular Accidents, Acute” OR “Peripheral Arterial Disease" OR “Arterial Disease, Peripheral” OR “Arterial Diseases, Peripheral” OR “Disease, Peripheral Arterial” OR “Diseases, Peripheral Arterial” OR “Peripheral Arterial Diseases” OR “Peripheral Artery Disease” OR “Artery Disease, Peripheral” OR “Artery Diseases, Peripheral” OR “Disease, Peripheral Artery” OR “Diseases, Peripheral Artery” OR “Peripheral Artery Diseases” OR “Heart Arrest” OR “Arrest, Heart”	

	OR “Cardiac Arrest” OR “Arrest, Cardiac” OR “Asystole” OR “Asystoles” OR “Cardiopulmonary Arrest” OR “Arrest, Cardiopulmonary” OR “Cardiomyopathies" OR “Cardiomyopathy” OR “Myocardiopathies” OR “Myocardiopathy” OR “Myocardial Diseases” OR “Myocardial Disease” OR “Disease, Myocardial” OR “Diseases, Myocardial” OR “Cardiomyopathies, Secondary” OR “Cardiomyopathy, Secondary” OR “Secondary Cardiomyopathies” OR “Secondary Cardiomyopathy” OR “Secondary Myocardial Diseases” OR “Myocardial Diseases, Secondary” OR “Disease, Secondary Myocardial” OR “Diseases, Secondary Myocardial” OR “Myocardial Disease, Secondary” OR “Secondary Myocardial Disease” OR “Cardiomyopathies, Primary” OR “Cardiomyopathy, Primary” OR “Primary Cardiomyopathies” OR “Primary Cardiomyopathy” OR “Primary Myocardial Diseases” OR “Myocardial Diseases, Primary” OR “Primary Myocardial Disease” OR “Disease, Primary Myocardial” OR “Diseases, Primary Myocardial” OR “Myocardial Disease, Primary” OR “Myocardial Ischemia" OR “Ischemia, Myocardial” OR “Ischemias, Myocardial” OR “Myocardial Ischemias” OR “Ischemic Heart Disease” OR “Heart Disease, Ischemic” OR “Disease, Ischemic Heart” OR “Diseases, Ischemic Heart” OR “Heart Diseases, Ischemic” OR “Ischemic Heart Diseases” OR “Aneurysm" OR “Aneurysms” OR “Fusiform Aneurysm” OR “Aneurysm, Fusiform” OR “Aneurysms, Fusiform” OR “Fusiform Aneurysms” OR “Saccular Aneurysm”	
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Total	#1 AND #2 AND #3	991

Scopus

(May 2, 2024)

	Query	Results (No.)
#1	TITLE-ABS-KEY ("Hypertension" OR "Blood Pressure, High"	

	OR "Blood Pressures, High" OR "High Blood Pressure" OR "High Blood Pressures" OR "Elevated Blood Pressure*" OR "HTN" OR "Elevated BP" OR "Raised blood pressure*" OR "High BP" OR "Hypertensive disease" OR "Hypertensive" OR "Increased blood pressure")	
#2	(TITLE-ABS-KEY ("Bariatric Surgery" OR "Surgeries, Bariatric" OR "Surgery, Bariatric" OR "Metabolic Surgery" OR "Metabolic Surgeries" OR "Surgeries, Metabolic" OR "Surgery, Metabolic" OR "Bariatric Surgical Procedures" OR "Bariatric Surgical Procedure" OR "Procedure, Bariatric Surgical" OR "Procedures, Bariatric Surgical" OR "Surgical Procedure, Bariatric" OR "Surgical Procedures, Bariatric" OR "Bariatric Surgeries" OR "Stomach Stapling" OR "Stapling, Stomach" OR "Weight loss surgery" OR "Obesity surgery" OR "Gastric surgery" OR "Surgical treatment for obesity" OR "Bariatric procedure*" OR "Weight reduction surgery" OR "Obesity treatment surgery" OR "Bariatric metabolic surgery" OR "Weight reduction procedure*" OR "Gastric sleeve surgery" OR "sleeve gastrectomy" OR "gastric sleeve" OR "gastric band*" OR "Bariatric metabolic procedure*" OR "Weight management surgery" OR "laparoscopic adjustable gastric banding" OR "Obesity reduction surgery" OR "LAGB" OR "VSG")) OR TITLE-ABS-KEY ("Gastroplasty" OR "Gastroplasties" OR "Collis Gastroplasty" OR "Gastroplasty, Collis" OR "Vertical-Band* Gastroplasty" OR "Gastroplasties, Vertical-Band*" OR "Gastroplasty, Vertical-Band*" OR "Vertical Band* Gastroplasty" OR "Vertical-Band* Gastroplasties")	
#3	((TITLE-ABS-KEY ("blood pressure recording") OR ("blood pressure range") OR ("blood pressure regulation") OR ("blood pressure reduction") OR ("blood-pressure reduction") OR ("normal blood pressure") OR ("blood pressure decrease") OR ("blood pressure drop") OR (blood AND pressure AND management) OR ("blood pressure maintenance") OR ("blood pressure modulation") OR ("blood pressure adjustment") OR ("blood pressure lowering") OR ("bp reduction") OR ("bp maintenance") OR ("bp modulation") OR ("bp lowering") OR ("prevention of hypertension") OR ("control of hypertension") OR ("hypertension control") OR ("hypertension management") OR ("hypertension care")))	
Total	#1 AND #2 AND #3	1507

Embase

(May 2, 2024)

	Query	Results (No.)
#1	(Hypertens*:ti,ab OR 'Blood Pressure':ti,ab OR ('Blood Pressure*' AND	

	High:ti,ab) OR ('Blood Pressure*':ti,ab AND Elevated:ti,ab) OR (Event:ti,ab AND Cardiac:ti,ab) OR HTN:ti,ab OR 'High BP':ti,ab)	
#2	('Bariatric Surger*':ti,ab OR 'Metabolic Surger*':ti,ab OR (Bypass:ti,ab AND Gastric:ti,ab) OR 'Gastrojejunostom*:ti,ab' OR 'Stomach Stapling':ti,ab OR 'Weight loss surger*':ti,ab OR 'Obesity surger*':ti,ab OR 'gastric sleeve':ti,ab OR 'laparoscopic adjustable gastric banding':ti,ab OR 'Obesity reduction surgery':ti,ab OR LAGB:ti,ab OR VSG:ti,ab OR (Bypass:ti,ab AND 'Roux-en-Y':ti,ab) OR 'Gastroileal Bypass':ti,ab OR Gastroplast*:ti,ab)	
#3	('Blood pressure control':ti,ab OR 'Blood pressure control*':ti,ab OR 'Control of Blood pressure':ti,ab OR 'Blood pressure management':ti,ab OR 'Blood pressure maintenance':ti,ab OR 'Blood pressure regulat*':ti,ab OR 'Blood pressure reduc*':ti,ab OR 'Blood pressure modulation':ti,ab OR 'Blood pressure adjustment':ti,ab OR 'Blood pressure normalize*':ti,ab OR 'Blood pressure lowering':ti,ab OR 'Blood pressure stabiliz*':ti,ab OR 'BP control*':ti,ab OR 'BP management':ti,ab OR 'BP regulation':ti,ab OR 'BP reduction':ti,ab OR 'BP maintenance':ti,ab OR 'BP modulation':ti,ab OR 'BP lowering':ti,ab OR 'Prevention of Hypertension':ti,ab OR 'Control of Hypertension':ti,ab OR 'Hypertension treatment':ti,ab OR 'Hypertension management':ti,ab OR 'Hypertension care':ti,ab OR 'Hypertension therap*':ti,ab OR 'Hypertension control*':ti,ab OR 'Hypertension prevention':ti,ab OR 'HTN control':ti,ab OR 'HTN management':ti,ab OR 'HTN therap*':ti,ab OR 'HTN treatment':ti,ab OR 'HTN prevention':ti,ab OR 'Cardiac Event*':ti,ab OR 'Myocardial Infarct*':ti,ab OR (Myocardial:ti,ab AND Infarct*:ti,ab) OR 'Cardiovascular Stroke*':ti,ab OR (Cardiovascular:ti,ab AND Stroke*:ti,ab) OR 'Heart Attack*':ti,ab OR Arrythmia*:ti,ab OR 'Heart Failure':ti,ab OR Dysrhythm*:ti,ab OR ('Artery Disease*':ti,ab AND Coronary:ti,ab) OR 'Left Main Disease*':ti,ab OR (Arterioscleros*:ti,ab AND Coronary:ti,ab) OR (Hypertroph*:ti,ab AND 'Left Ventricular':ti,ab) OR ('Cardiac Death':ti,ab AND Sudden:ti,ab) OR (Sudden:ti,ab AND 'Cardiac Arrest':ti,ab) OR 'Sudden Death':ti,ab OR Mortalit*:ti,ab OR 'Death Rate*':ti,ab OR 'Case Fatality Rate*':ti,ab)	
Total	#1 AND #2 AND #3	1839

Cochrane

(May 2, 2024)

	Query	Results (No.)
#1	("high blood pressure"):ti,ab,kw OR ("blood pressure elevation"):ti,ab,kw OR ("blood pressure increase"):ti,ab,kw OR ("HTN"):ti,ab,kw OR ("hypertensive cardiovascular disease"):ti,ab,kw OR (Elevated Blood Pressure):ti,ab,kw OR (Elevated BP):ti,ab,kw OR (Increased blood pressure):ti,ab,kw OR (Raised blood pressure):ti,ab,kw OR (High BP):ti,ab,kw OR ("hypertensive"):ti,ab,kw OR (hypertensive disease):ti,ab,kw OR MeSH descriptor: [Hypertension] explode all trees	
#2	(bariatric surgeries):ti,ab,kw OR (Metabolic Surgery):ti,ab,kw OR (Metabolic Surgeries):ti,ab,kw OR (Bariatric Surgical Procedure):ti,ab,kw OR (Stomach Stapling):ti,ab,kw OR ("weight loss surgery"):ti,ab,kw OR ("weight-loss surgery"):ti,ab,kw OR ("weight loss surgeries"):ti,ab,kw OR (obesity surgery):ti,ab,kw OR (Gastric surgery):ti,ab,kw OR (Surgical treatment for obesity):ti,ab,kw OR	

	(Weight reduction surgery):ti,ab,kw OR (Obesity treatment surgery):ti,ab,kw OR (Bariatric metabolic surgery):ti,ab,kw OR (Weight reduction procedure):ti,ab,kw OR (Bariatric procedure):ti,ab,kw OR (Gastric sleeve surgery):ti,ab,kw OR (sleeve gastrectomy):ti,ab,kw OR (gastric sleeve):ti,ab,kw OR (gastric band):ti,ab,kw OR (Bariatric metabolic procedure):ti,ab,kw OR (Weight management surgery):ti,ab,kw OR (laparoscopic adjustable gastric banding):ti,ab,kw OR (Obesity reduction surgery):ti,ab,kw OR (LAGB):ti,ab,kw OR (VSG):ti,ab,kw OR ("Greenville gastric bypass"):ti,ab,kw OR ("gastric bypass"):ti,ab,kw OR ("gastric bypass surgery"):ti,ab,kw OR ("gastrojejunostomy"):ti,ab,kw OR ("gastrojejunostomies"):ti,ab,kw OR ("Roux-en-Y gastric bypass"):ti,ab,kw OR (Gastroileal Bypass):ti,ab,kw OR ("RYGB"):ti,ab,kw OR ("gastroplasty"):ti,ab,kw OR ("gastroplasties"):ti,ab,kw OR ("Collis gastroplasty"):ti,ab,kw OR ("vertical banded gastroplasty"):ti,ab,kw OR ("vertical banded gastroplasties"):ti,ab,kw OR (Jejunoileal Bypass):ti,ab,kw OR ("jejuno-ileal bypass"):ti,ab,kw OR ("ileojejunal bypass"):ti,ab,kw OR ("ileo-jejunal bypass"):ti,ab,kw OR ("intestinal bypass"):ti,ab,kw OR ("lipectomies"):ti,ab,kw OR (Aspiration Lipectomy):ti,ab,kw OR (Aspiration Lipectomies):ti,ab,kw OR (Aspiration Lipolysis):ti,ab,kw OR (Suction Lipectomy):ti,ab,kw OR (Suction Lipectomies):ti,ab,kw OR (Suction Lipolysis):ti,ab,kw OR ("liposuction"):ti,ab,kw OR ("lipoplasty"):ti,ab,kw OR ("lipoplasties"):ti,ab,kw OR (Lipoabdominoplasties):ti,ab,kw OR (Duodenal Switch):ti,ab,kw OR (Stomach Intestinal Pylorus Sparing):ti,ab,kw OR ("biliopancreatic diversion"):ti,ab,kw OR (Biliopancreatic bypass):ti,ab,kw OR (Biliopancreatic diversionary surgery):ti,ab,kw OR (BPD surgery):ti,ab,kw OR (BPD procedure):ti,ab,kw	
#3	("blood pressure control"):ti,ab,kw OR ("blood pressure measurement"):ti,ab,kw OR ("BP level"):ti,ab,kw OR ("BP value"):ti,ab,kw OR ("blood pressure change"):ti,ab,kw OR ("blood pressure index"):ti,ab,kw OR ("blood pressure profile"):ti,ab,kw OR ("blood pressure recording"):ti,ab,kw OR ("blood pressure range"):ti,ab,kw OR ("blood pressure regulation"):ti,ab,kw OR ("blood pressure reduction"):ti,ab,kw OR ("blood-pressure reduction"):ti,ab,kw OR ("normal blood pressure"):ti,ab,kw OR ("blood pressure decrease"):ti,ab,kw OR ("blood pressure drop"):ti,ab,kw OR (Blood pressure management):ti,ab,kw OR (Blood pressure maintenance):ti,ab,kw OR (Blood pressure modulation):ti,ab,kw OR (Blood pressure adjustment):ti,ab,kw OR (Blood pressure lowering):ti,ab,kw OR (BP reduction):ti,ab,kw OR (BP maintenance):ti,ab,kw OR (BP modulation):ti,ab,kw OR (BP lowering):ti,ab,kw OR (Prevention of Hypertension):ti,ab,kw OR (Control of Hypertension):ti,ab,kw OR (Hypertension control):ti,ab,kw OR (Hypertension management):ti,ab,kw OR (Hypertension care):ti,ab,kw OR (Hypertension treatment):ti,ab,kw OR (Hypertension prevention):ti,ab,kw OR (HTN control):ti,ab,kw OR (HTN management):ti,ab,kw OR (HTN treatment):ti,ab,kw OR (HTN prevention):ti,ab,kw OR ("major adverse cardiac event"):ti,ab,kw OR ("cardiac event rate"):ti,ab,kw OR ("MACE"):ti,ab,kw OR ("myocardial infarction"):ti,ab,kw OR ("cardiovascular collapse"):ti,ab,kw OR ("heart attack"):ti,ab,kw OR ("myocardial ischemia"):ti,ab,kw OR ("cardiac arrhythmia"):ti,ab,kw OR ("arrythmia"):ti,ab,kw OR ("dysrhythmia"):ti,ab,kw OR ("heart failure"):ti,ab,kw OR ("coronary	

	artery disease"):ti,ab,kw OR ("coronary arteriosclerosis"):ti,ab,kw OR ("coronary arterioscleroses"):ti,ab,kw OR ("left ventricular hypertrophy"):ti,ab,kw OR ("left ventricular hypertrophies"):ti,ab,kw OR (Left Main coronary disease):ti,ab,kw OR (Cardiovascular Stroke):ti,ab,kw OR (cardiovascular event):ti,ab,kw OR (myocardial infarct):ti,ab,kw OR ("sudden cardiac death"):ti,ab,kw OR ("sudden cardiac arrest"):ti,ab,kw OR ("sudden death"):ti,ab,kw OR ("death"):ti,ab,kw OR ("mortality"):ti,ab,kw OR (cardiac death):ti,ab,kw OR (all cause death):ti,ab,kw OR (all-cause death):ti,ab,kw OR ("mortality rate"):ti,ab,kw OR ("death rate"):ti,ab,kw OR ("mortalities"):ti,ab,kw OR ("fatality rate"):ti,ab,kw OR ("fatalities"):ti,ab,kw OR ("fatality"):ti,ab,kw OR ("case fatality rate"):ti,ab,kw	
Total	#1 AND #2 AND #3	2850

Total Results

Data Base	Results (No.)
PubMed	991
Embase	1839
Scopus	1507
The Cochrane library	2853
Total	**7187**

Quality Assessment

Supplemental Figure 1. Risk of bias in randomized trials according to the Cochrane risk-of-bias tool for randomized trials (RoB-2).

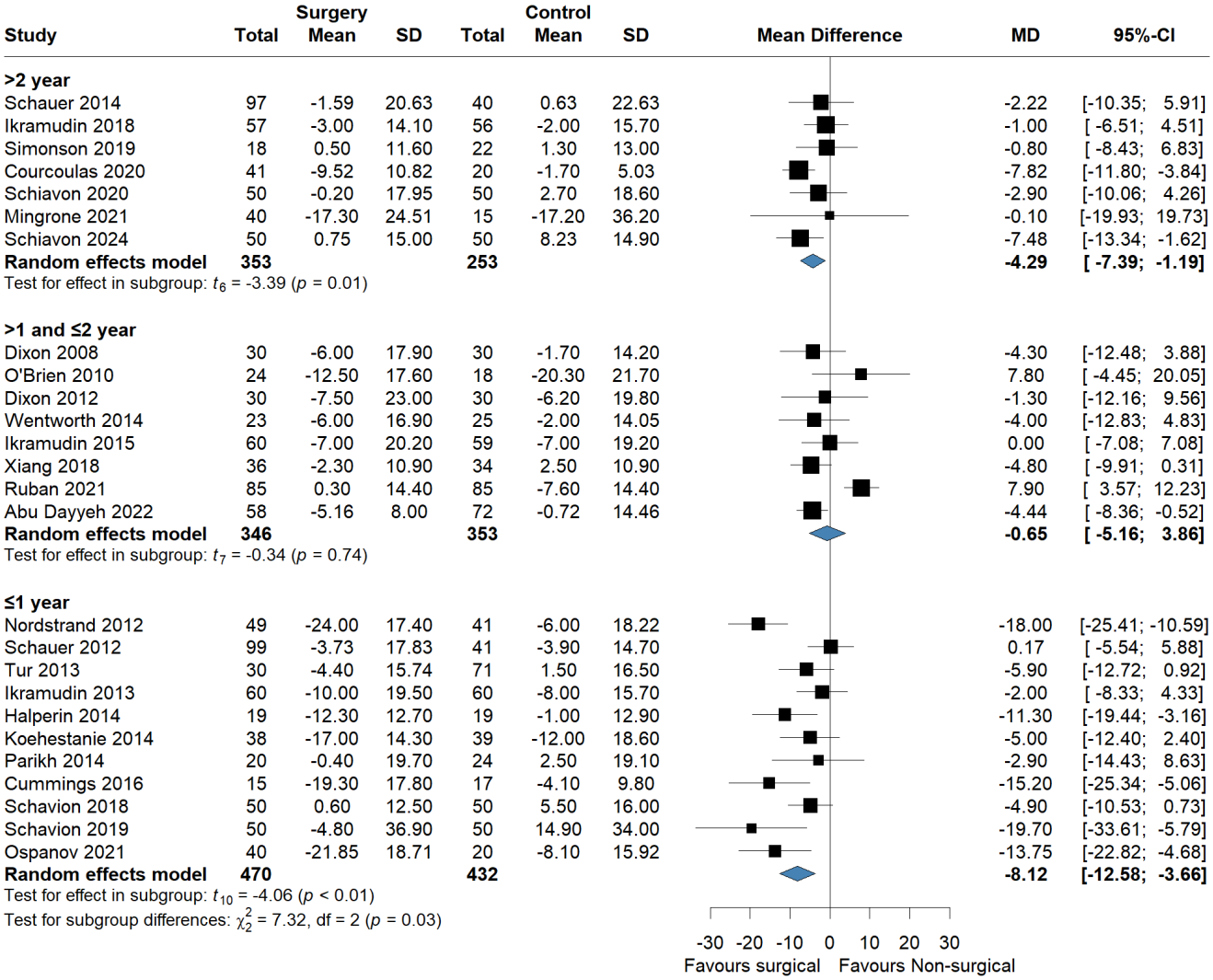
Supplemental Results

Supplemental Table 1. Results of the meta-analysis comparing the efficacy of surgical versus non-surgical interventions across various variables.

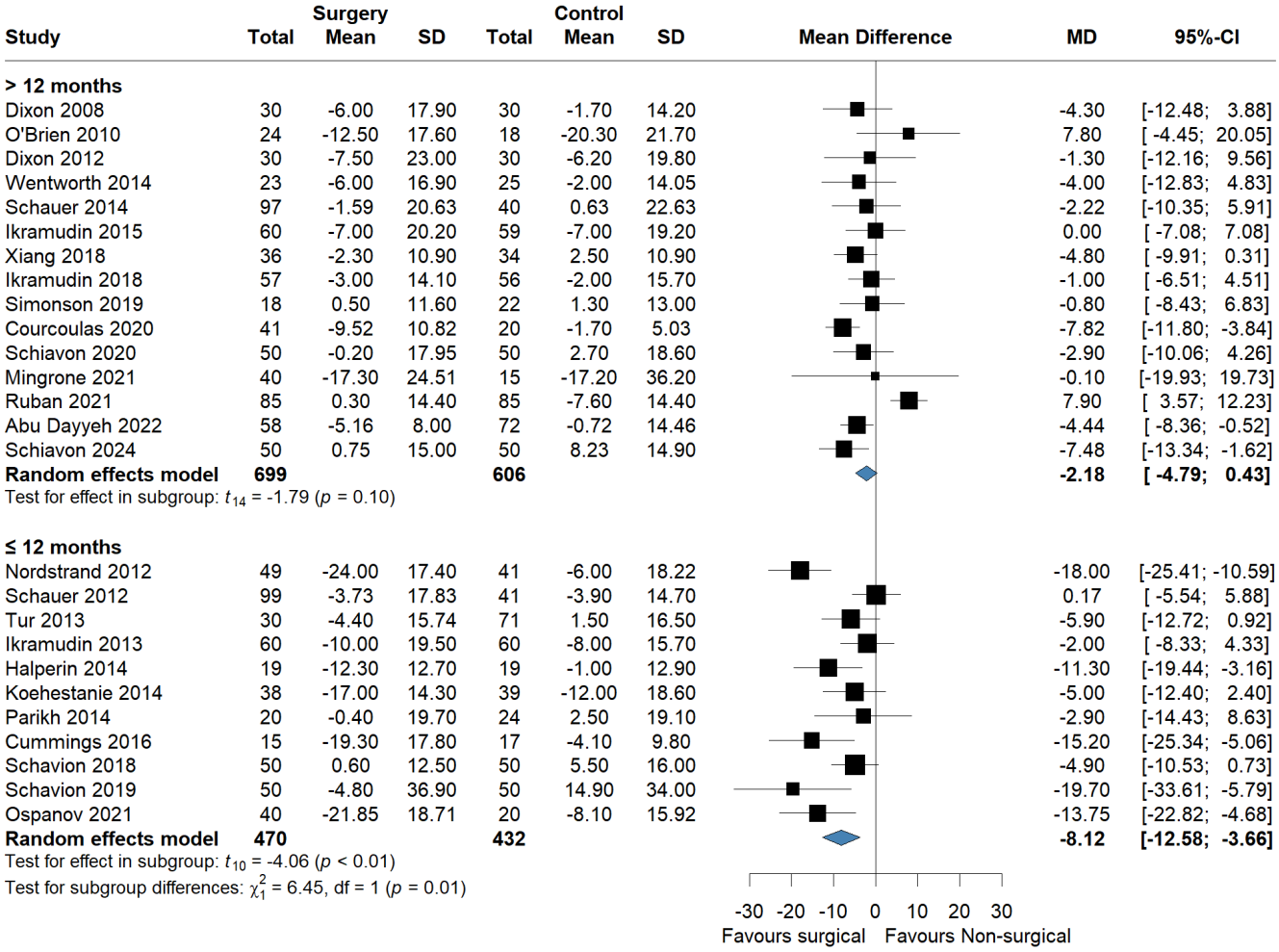
Variable	Group	Number of studies	Mean difference	95% CI (Lower limit)	95% CI (Upper limit)	P value[1]	Heterogeneity (I^2)	P value[2]	Risk of publication bias (p value[3])
Systolic Blood Pressures (mmHg)	Overall	26	-4.506	-6.999	-2.013	.001	66.7%	<.001	.29
	≤1 year	11	-8.123	-12.581	-3.665	.01	63.3%	<.001	NA
	>1 and ≤ 2 year	8	-0.6496	-5.1575	3.858	.74	71.2%	<.001	NA
	>2 year	7	-4.291	-7.390	-1.191	<.01	11.4%	.34	NA
Diastolic Blood Pressures (mmHg)	overall	25	-3.040	-4.765	-1.314	.001	73.4%	<.001	.70
	≤1 year	10	-5.185	-9.107	-1.263	.02	82%	<.001	NA
	>1 and ≤ 2 year	8	-0.942	-3.567	1.681	.42	55.5%	.03	NA
	>2 year	7	-2.427	-3.912	-0.941	<.01	0.0%	.51	NA
Fasting Blood Sugar (mg/dl)	overall	21	-30.444	-41.288	-19.601	<.001	81.2%	<.001	.001
	≤1 year	7	-34.970	-55.257	-14.684	<.01	87.4%	<.001	NA
	>1 and ≤ 2 year	7	-30.122	-67.263	7.0177	.09	79.9%	<.001	NA
	>2 year	7	-29.645	-45.344	-13.946	<.01	78.4%	<.001	NA
Hemoglobin A1c (%)	overall	24	-1.108	-1.414	-0.802	<.001	89.4%	<.001	.002
	≤1 year	10	-1.069	-1.443	-0.695	<.01	86.7%	<.01	NA
	>1 and ≤ 2 year	7	-1.198	-2.412	0.014	.05	86.3%	<.01	NA
	>2 year	7	-1.168	-1.711	-0.625	<.01	94.3%	<.01	NA
LDL-cholesterol (mg/dl)	overall	21	-7.744	-16.783	1.293	.089	91.8%	<.001	.13
	≤1 year	8	-12.753	-35.334	9.828	.22	92.3%	<.01	NA
	>1 and ≤ 2 year	6	-0.707	-6.1340	4.718	.75	0.0%	.7	NA
	>2 year	7	-6.211	-23.251	10.829	.41	90.8%	<.01	NA
HDL-cholesterol (mg/dl)	overall	25	7.387	5.056	9.719	<.001	73.1%	<.01	.41

	≤1 year	9	6.030	2.835	9.224	<.01	61.6%	<.01	NA
	>1 and ≤ 2 year	9	6.297	2.834	9.761	<.01	67.1%	<.01	NA
	>2 year	7	10.942	3.334	18.550	.01	81.8%	<.01	NA
Total Cholesterol (mg/dl)	overall	20	-8.6353	-19.847	2.576	.12	90.8%	<.01	.28
	≤1 year	8	-16.749	-41.245	7.747	.15	91.7%	<.01	NA
	>1 and ≤ 2 year	8	0.104	-11.123	11.332	.98	47.8%	.06	NA
	>2 year	4	2.725	-12.875	18.326	.62	44.1%	.15	NA
Triglyceride (mg/dl)	overall	25	-39.746	-54.458	-25.034	<.001	74.5%	<.01	.98
	≤1 year	10	-40.032	-75.694	-4.370	.03	81.5%	<.01	NA
	>1 and ≤ 2 year	8	-35.551	-59.215	-11.887	<.01	54.7%	.03	NA
	>2 year	7	-39.719	-60.838	-18.600	<.01	73.1%	<.01	NA
[1] p value of MD between surgical and non-surgical treatments of variables based on the random effect model									
[2] p value of heterogeneity based on Cochran's Q									
[3] p value of Risk of publication bias assessment by Egger method									

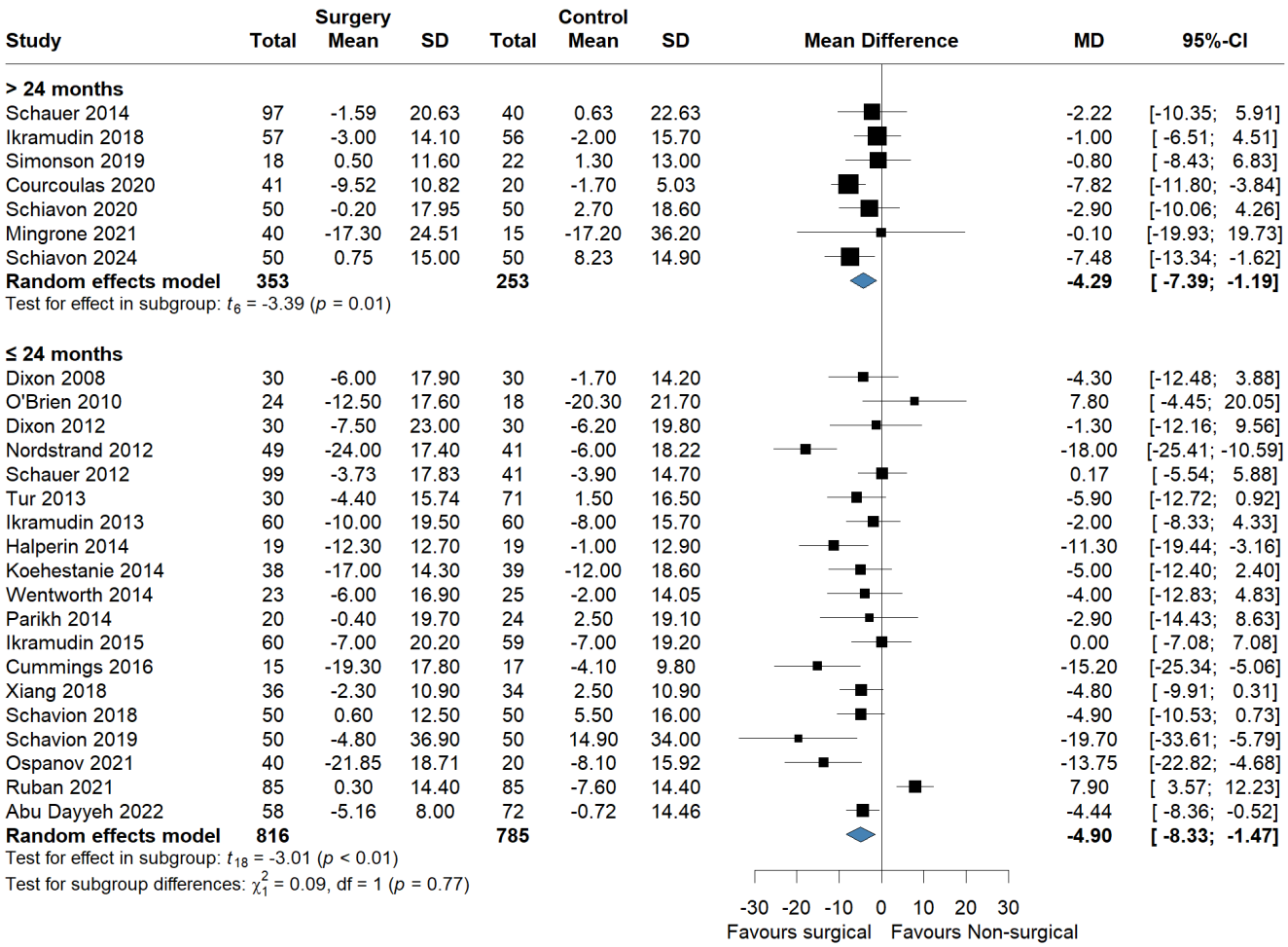
Supplemental Figure 2.1. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by follow-up duration, focusing on systolic blood pressure.



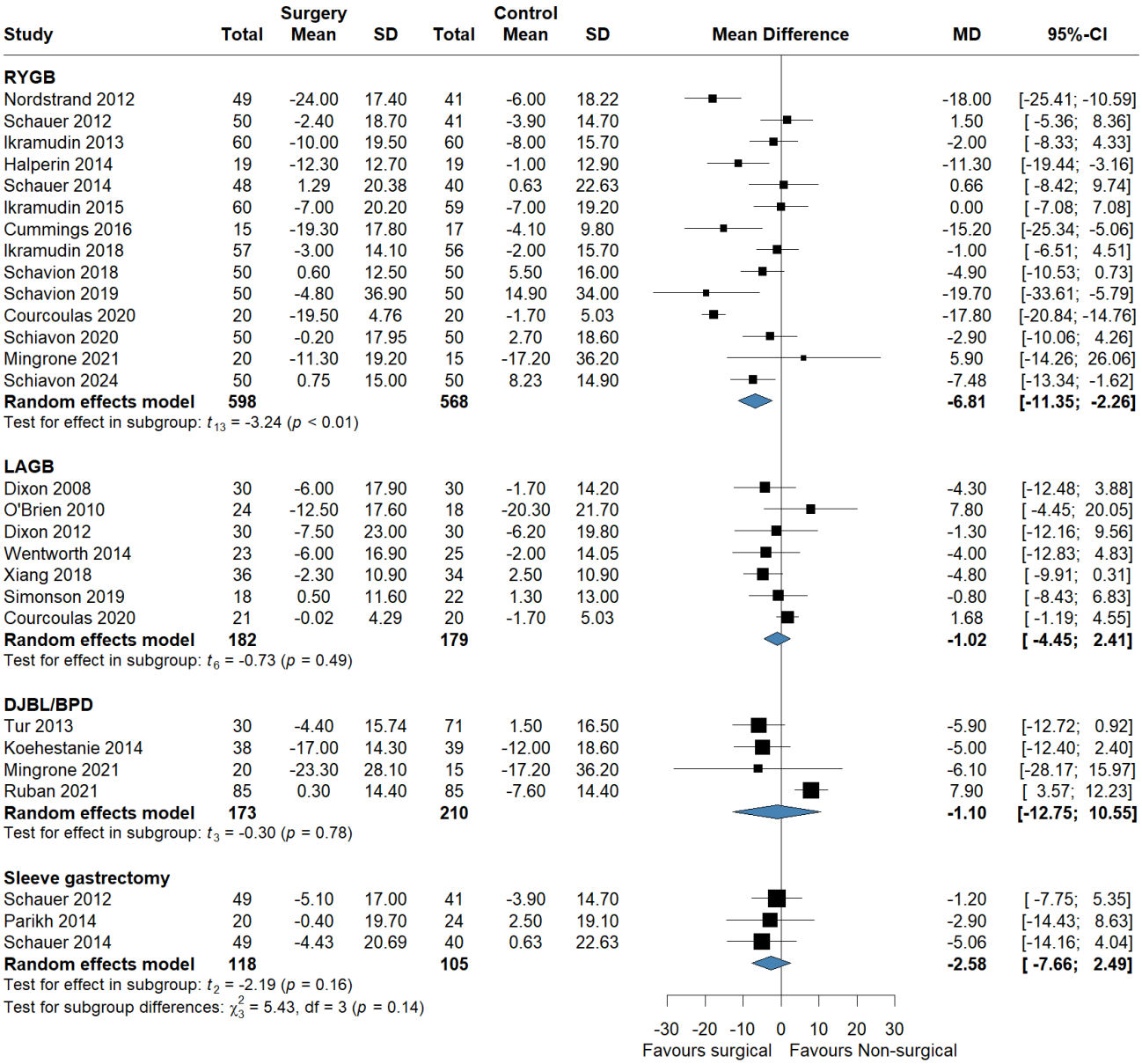
Supplemental Figure 2.2. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by follow-up duration, focusing on systolic blood pressure.



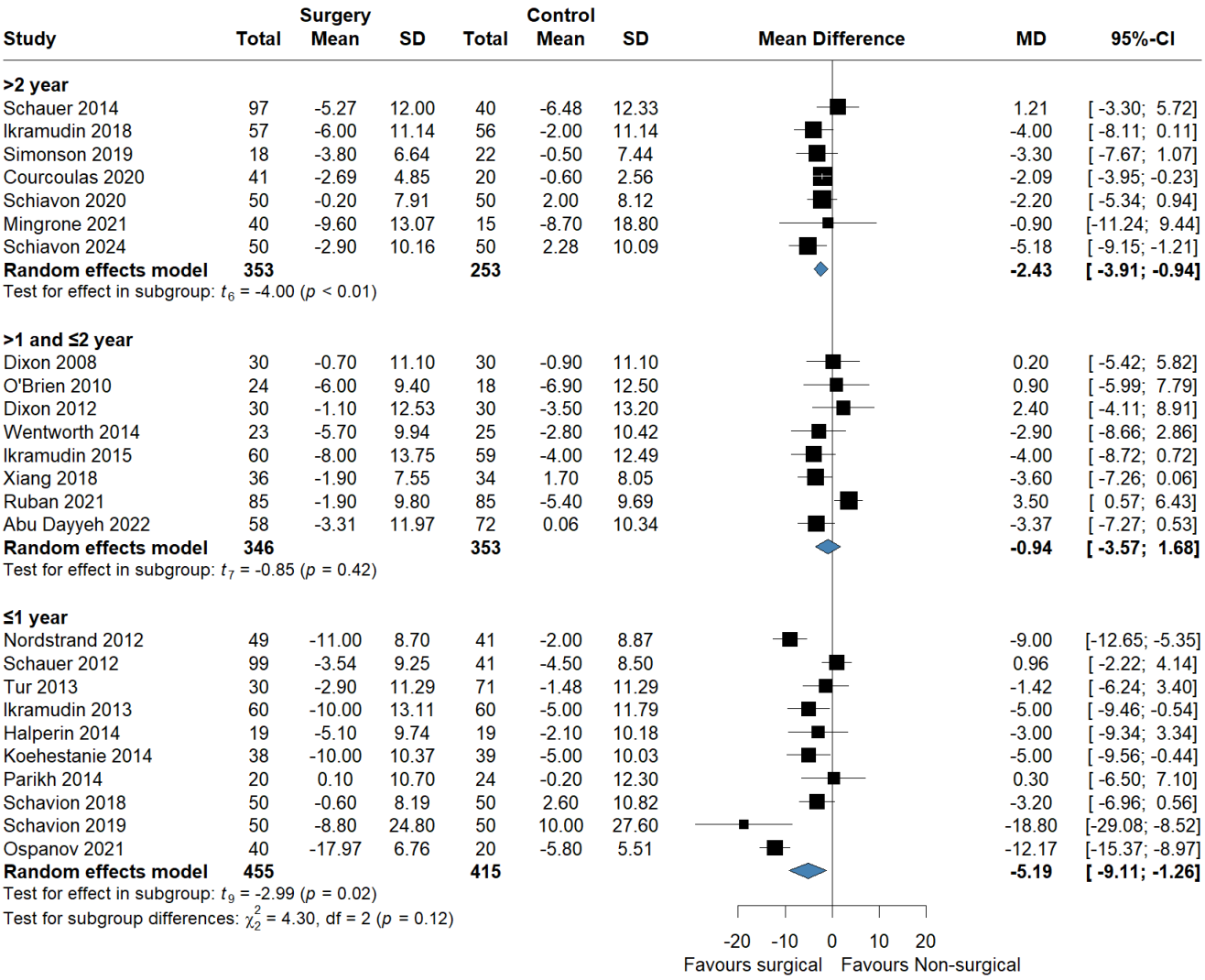
Supplemental Figure 2.3. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by follow-up duration, focusing on systolic blood pressure.



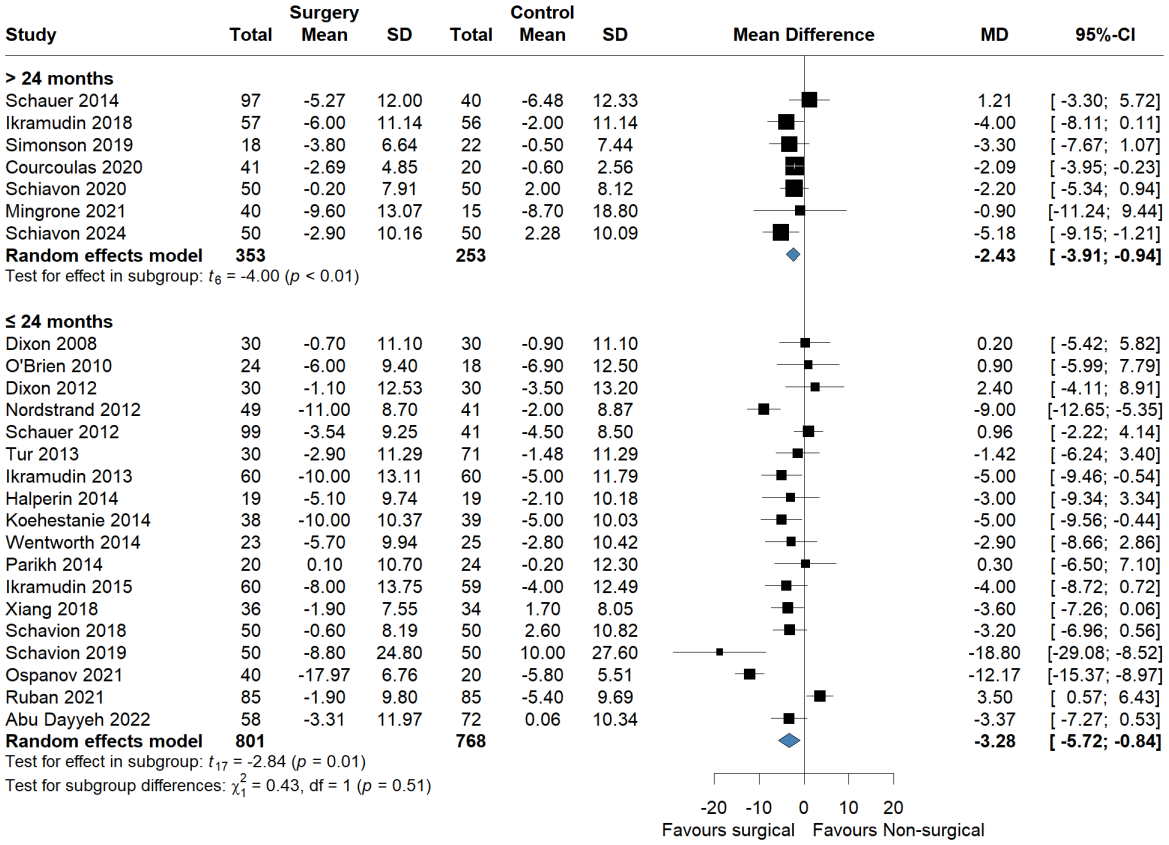
Supplemental Figure 3. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by type of surgery, focusing on systolic blood pressure.

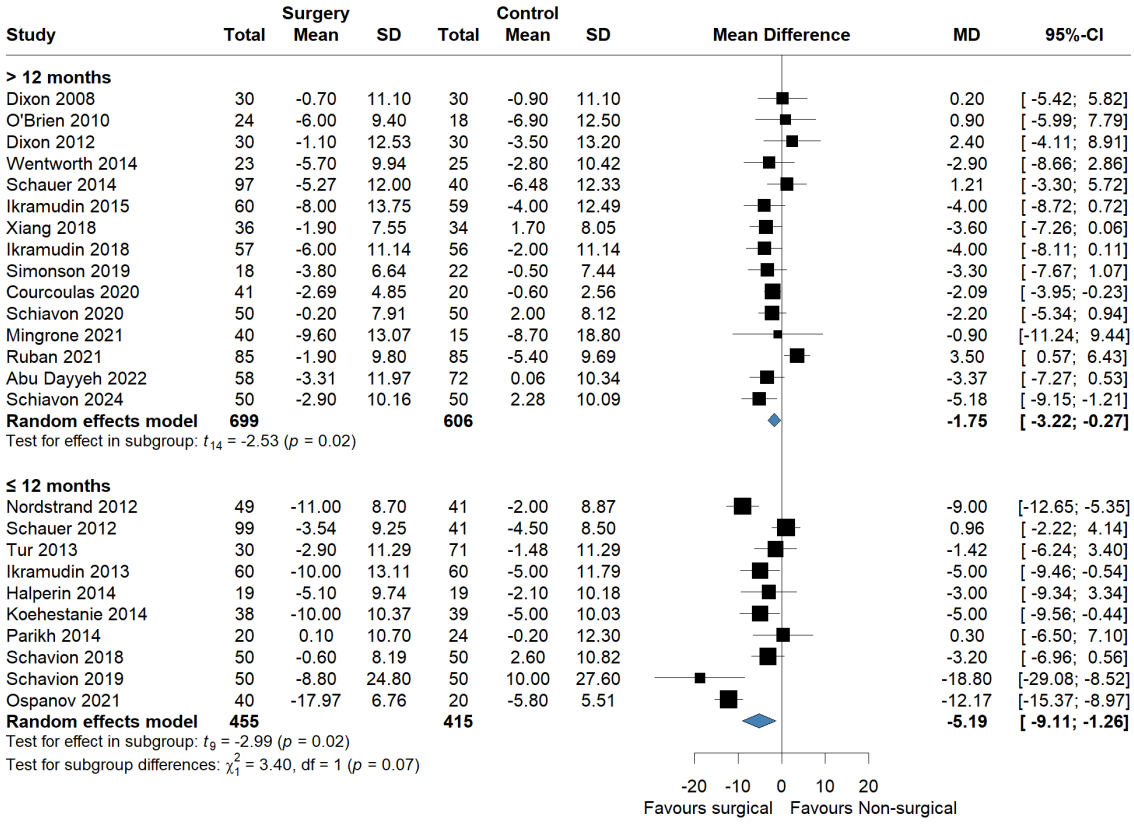


Supplemental Figure 4.1. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by follow-up duration, focusing on diastolic blood pressure.

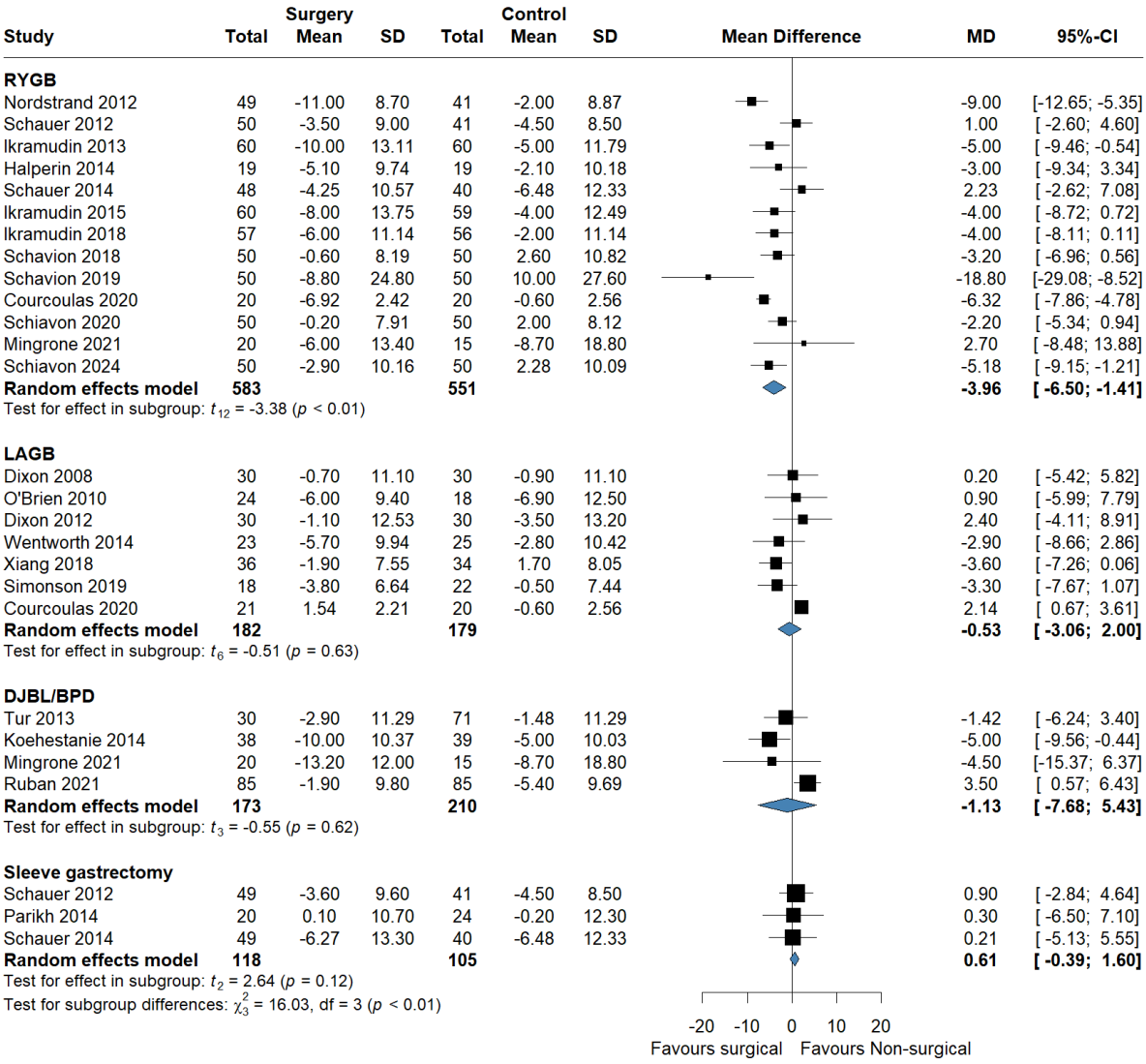


Supplemental Figure 4.2. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by follow-up duration, focusing on diastolic blood pressure.

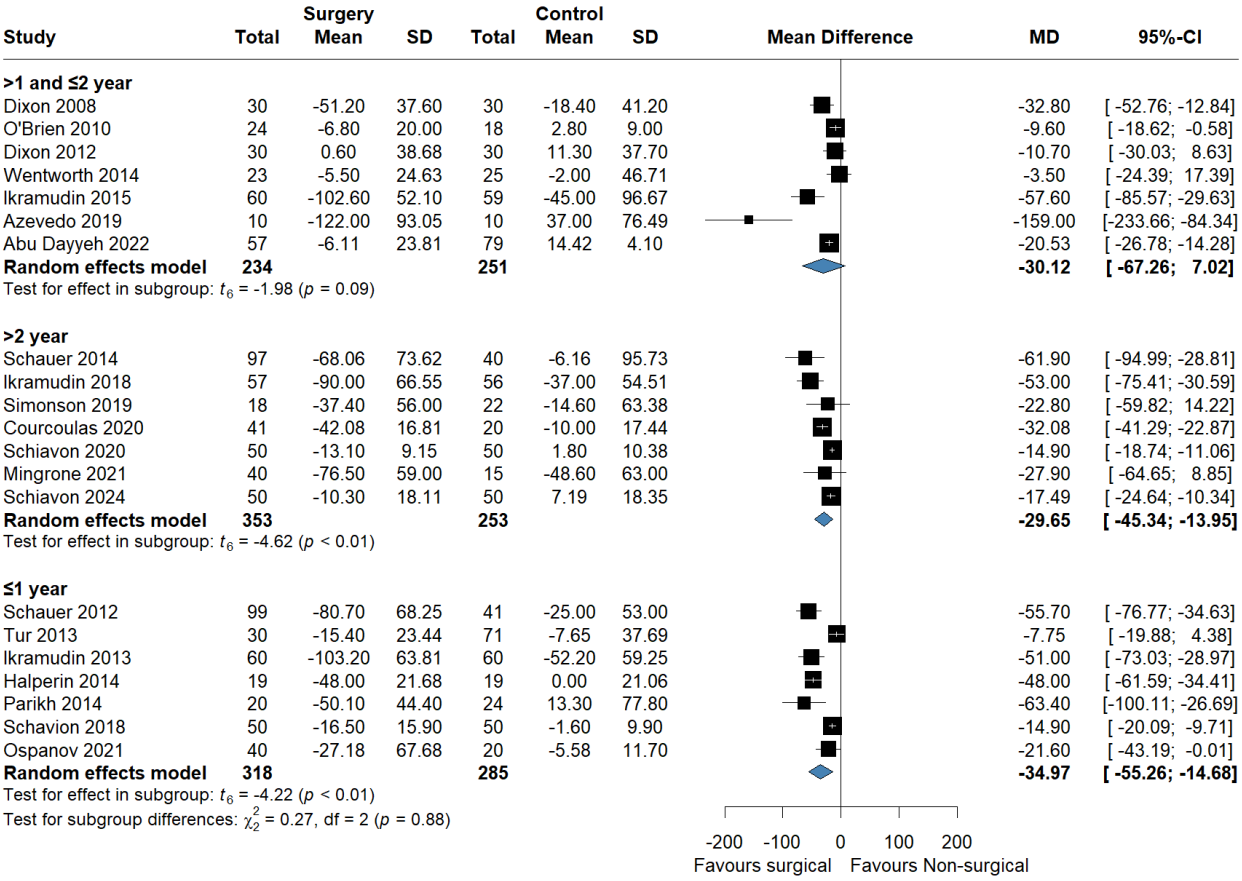




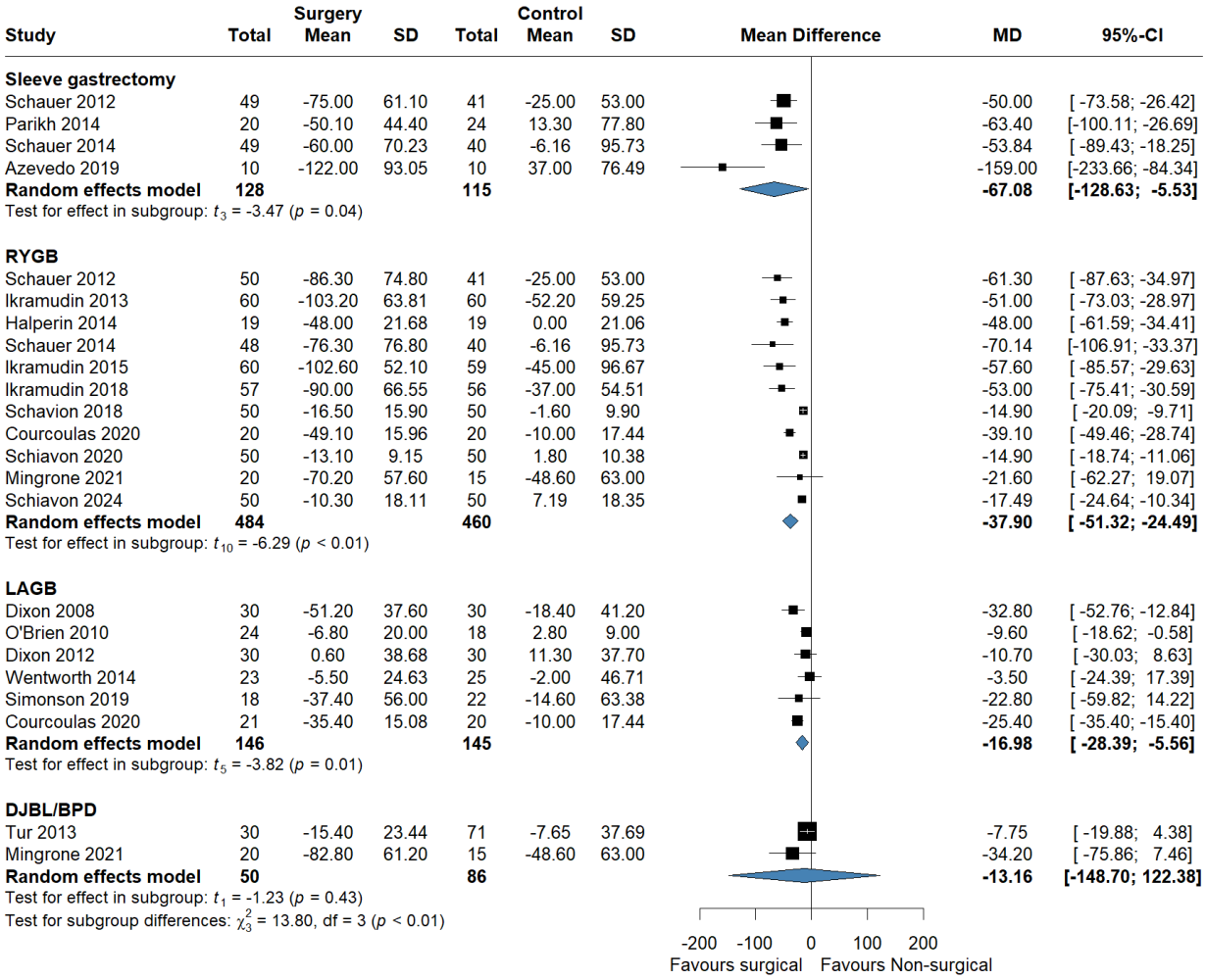
Supplemental Figure 5. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by type of surgery, focusing on diastolic blood pressure.



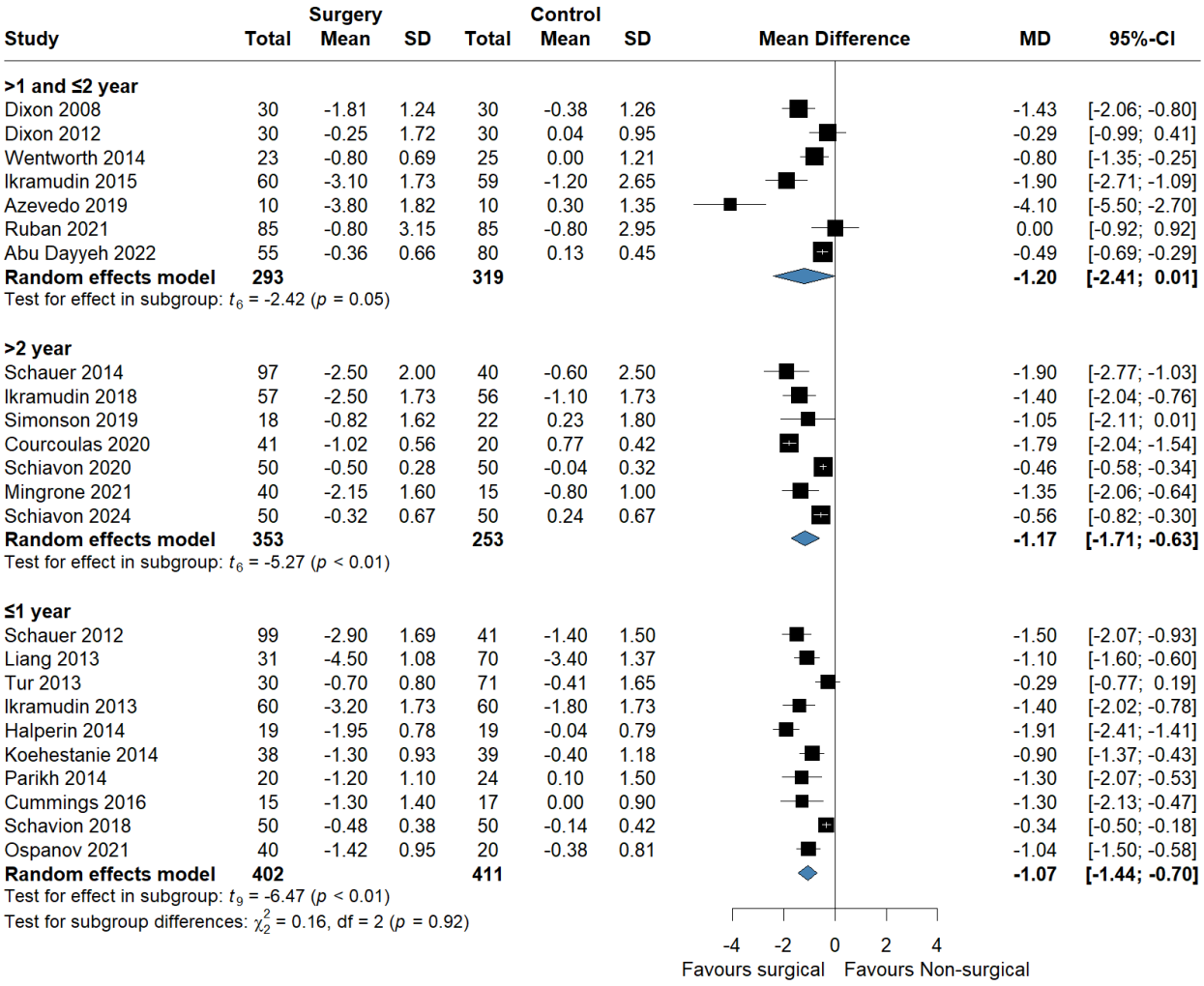
Supplemental Figure 6. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by follow-up duration, focusing on fasting blood sugar.



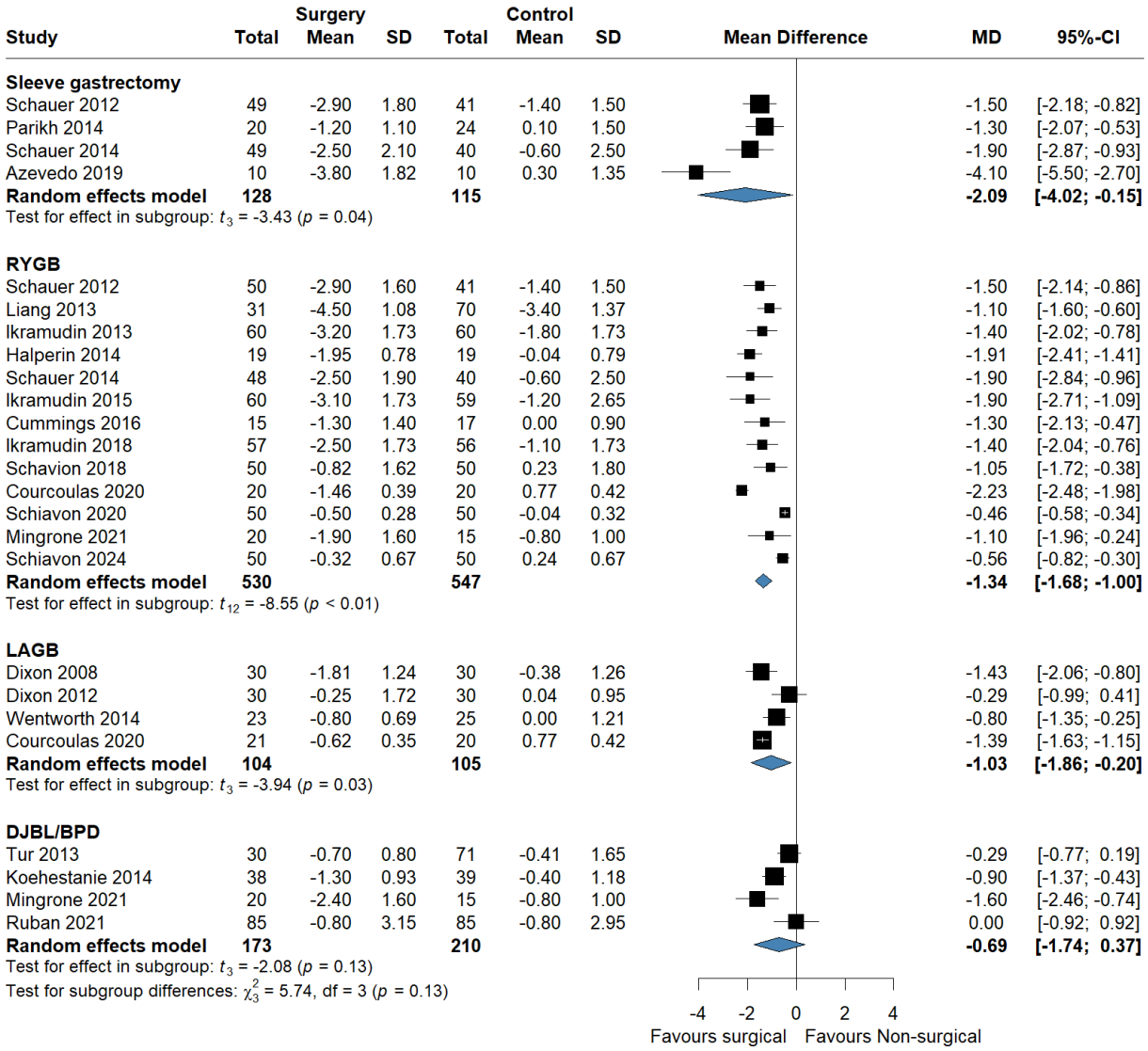
Supplemental Figure 7. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by type of surgery, focusing on fasting blood sugar.



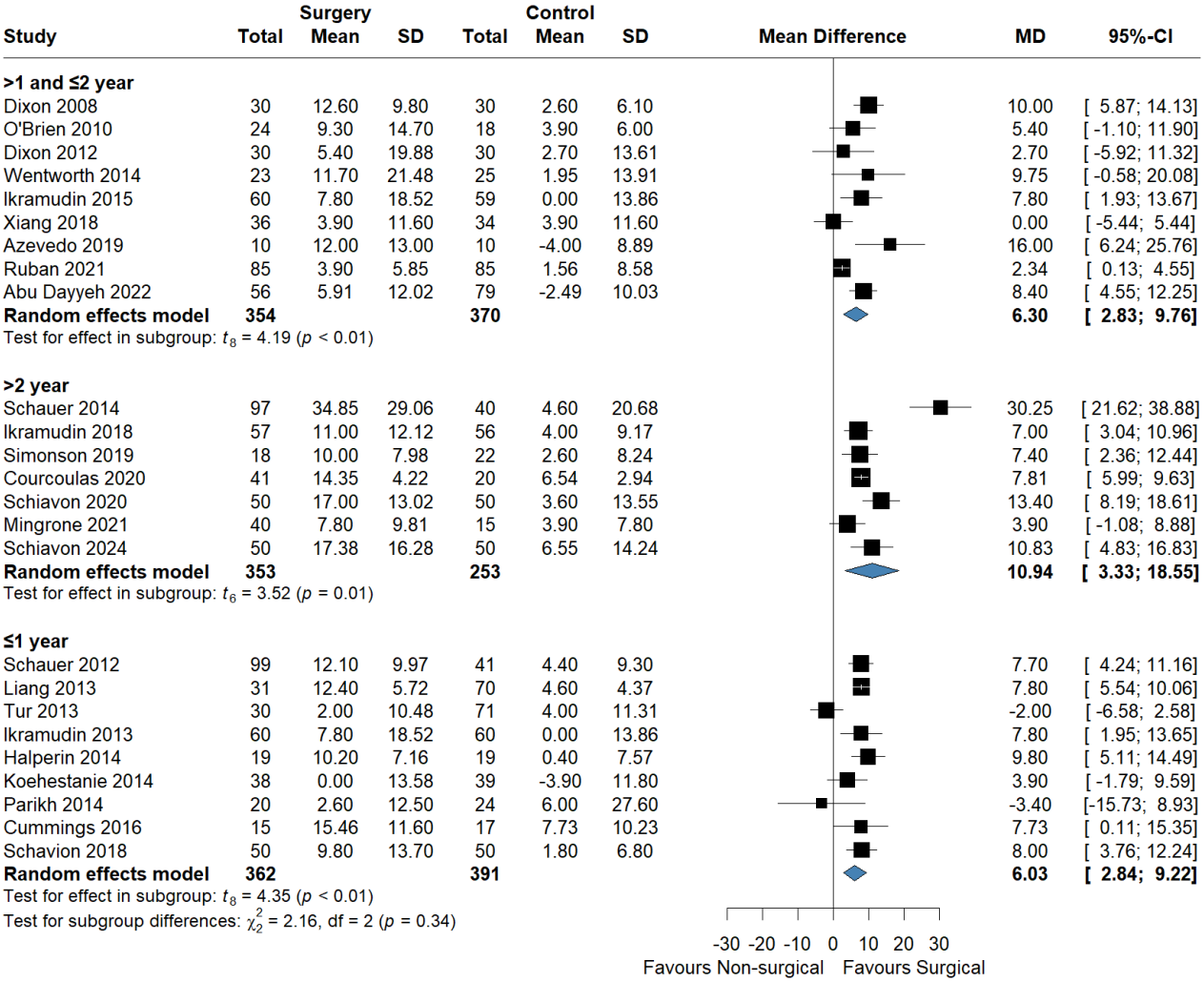
Supplemental Figure 8. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by follow-up duration, focusing on HbA1c.



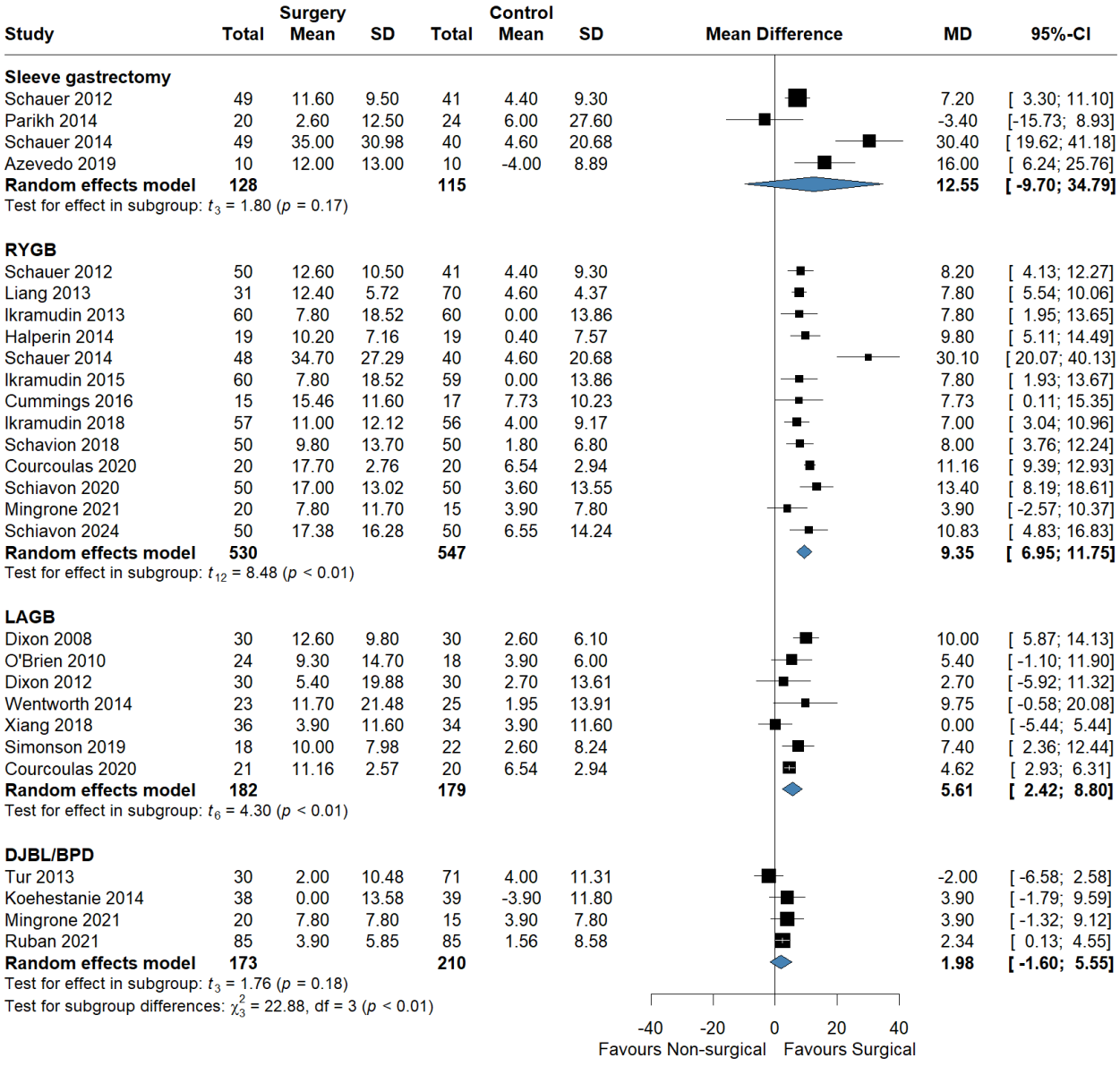
Supplemental Figure 9. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by type of surgery, focusing on HbA1c.



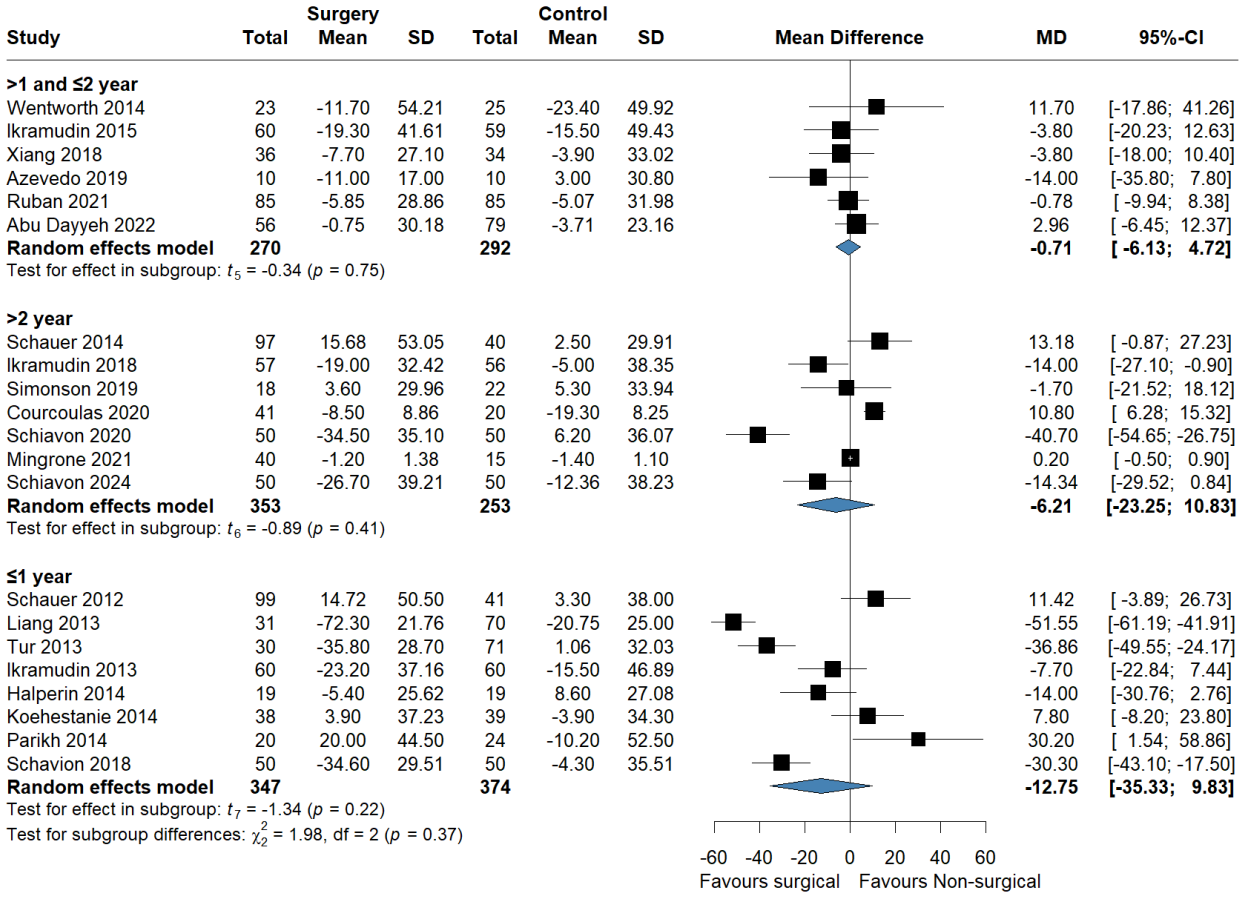
Supplemental Figure 10. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by follow-up duration, focusing on HDL.



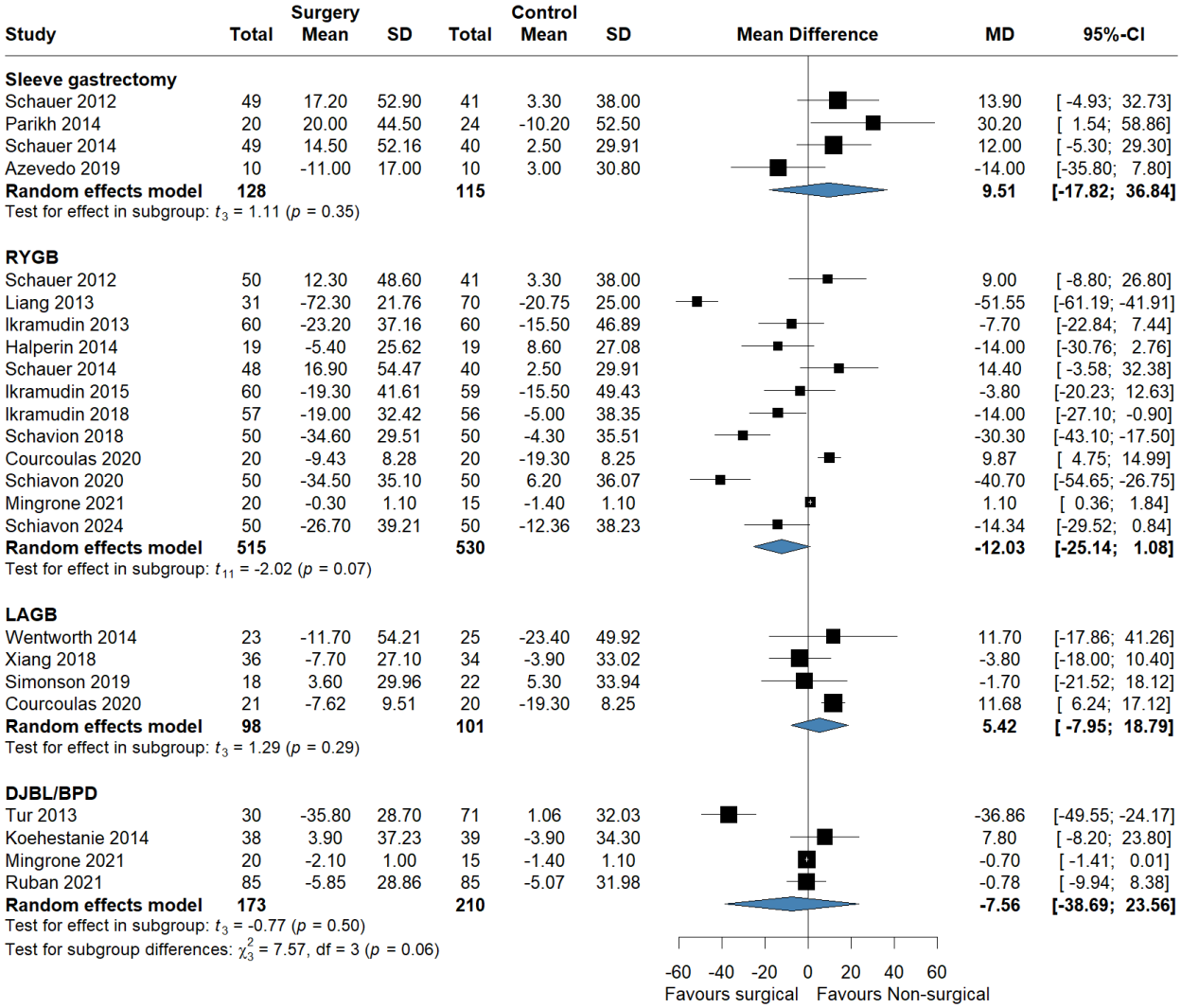
Supplemental Figure 11. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by type of surgery, focusing on HDL.



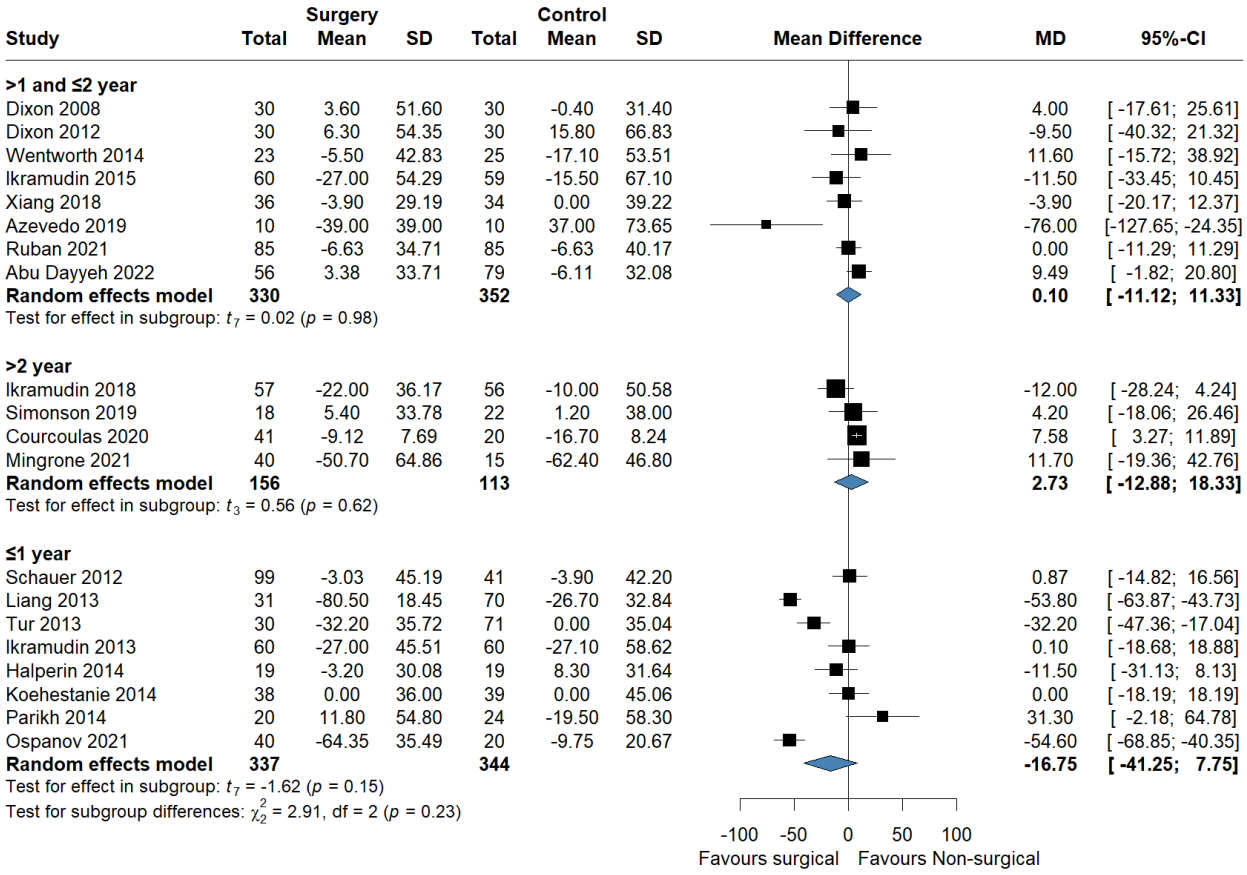
Supplemental Figure 12. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by follow-up duration, focusing on LDL.



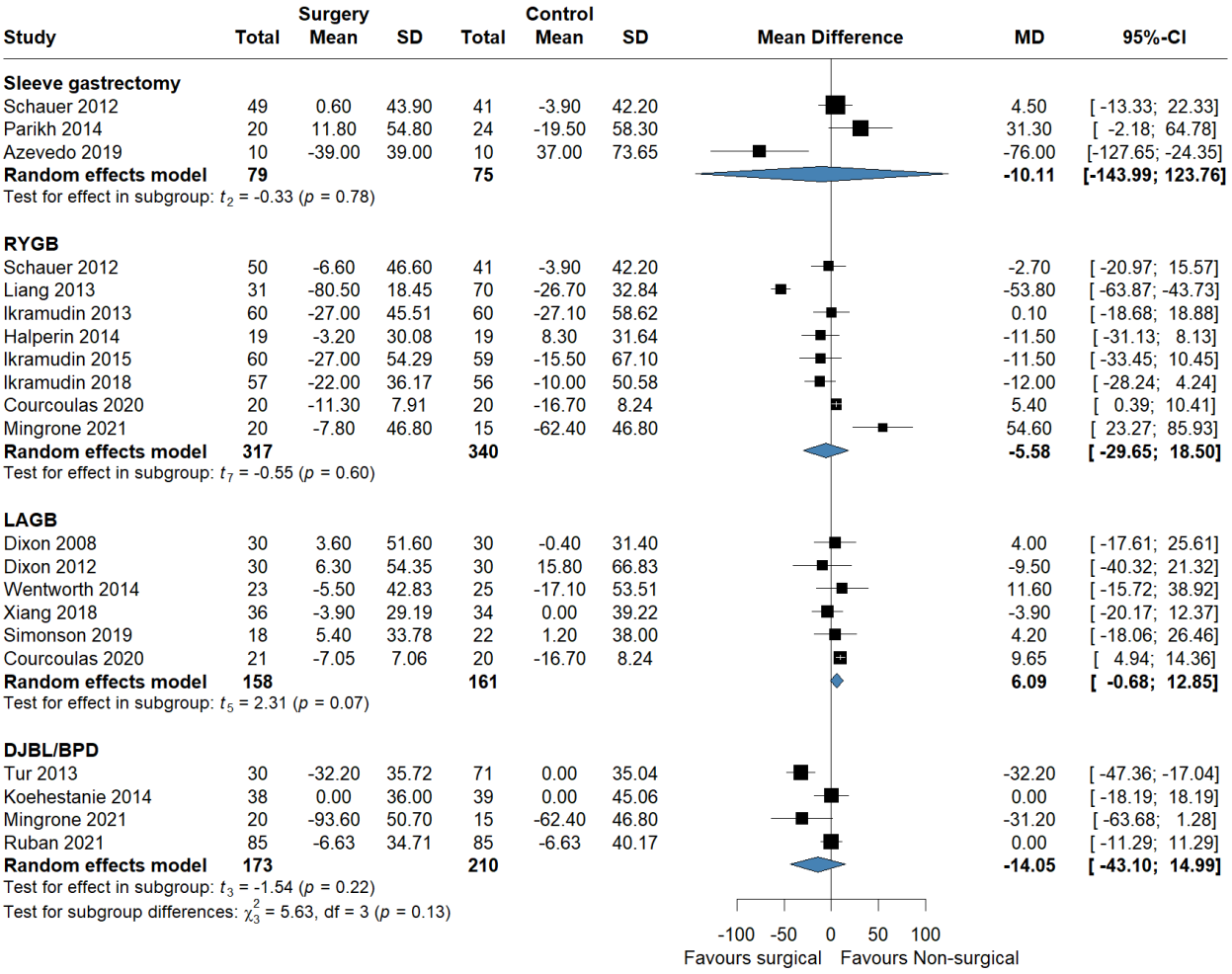
Supplemental Figure 13. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by type of surgery, focusing on LDL.



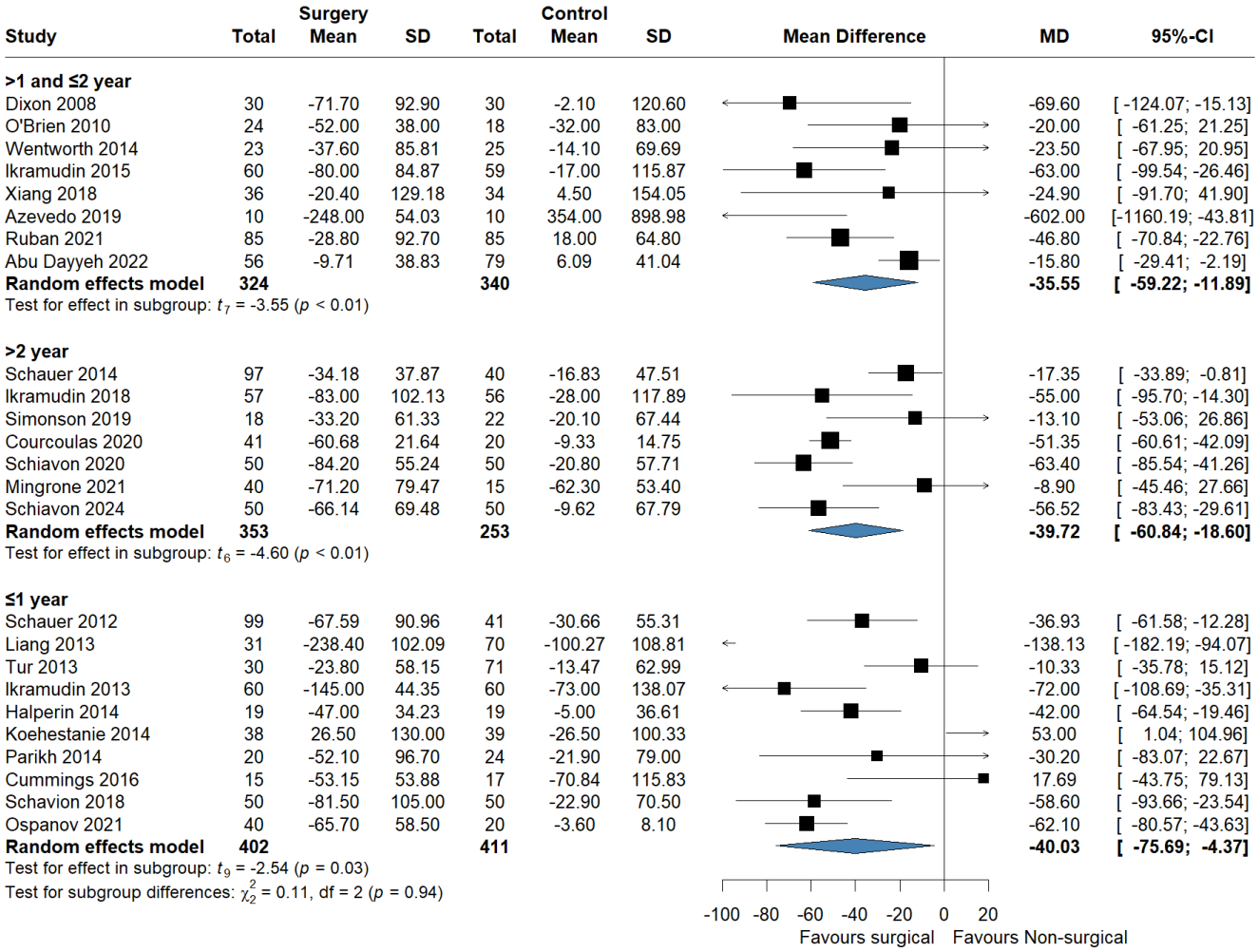
Supplemental Figure 14. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by follow-up duration, focusing on total cholesterol.



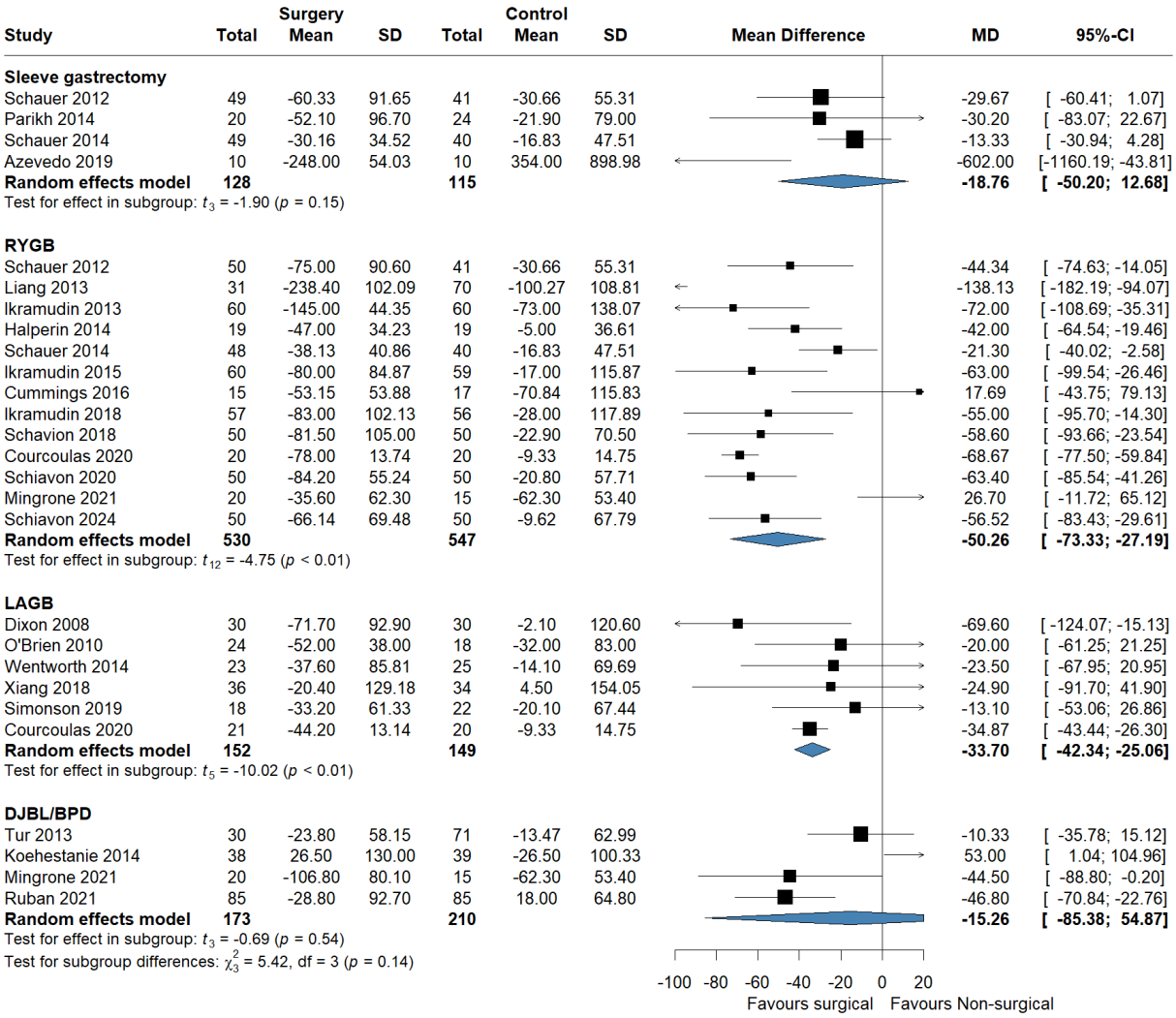
Supplemental Figure 15. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by type of surgery, focusing on total cholesterol.



Supplemental Figure 16. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by follow-up duration, focusing on triglyceride.



Supplemental Figure 17. Forest plot illustrating the subgroup analysis of surgical versus non-surgical methods by type of surgery, focusing on triglyceride.



Sensitivity Analysis

Supplemental Table 2. Sensitivity analysis using a fixed-effect model, including only studies with more than 50 cases per arm.

Variable	Group	Number of studies	Mean difference	95% CI (Lower limit)	95% CI (Upper limit)	P value[1,2]	Heterogeneity (I^2)	P value[3]
Systolic Blood pressures (mmHg)	Fixed	26	-3.921	-5.219	-2.624	<.001	66.7%	<.001
	Low risk of bias	17	-4.716	-6.677	-2.755	<.001	18.3%	0.23
	More 50 per arm	10	-2.939	-7.199	1.3211	.15	73.5%	<.001
Diastolic Blood pressures (mmHg)	Fixed	25	-2.912	-3.709	-2.114	<.001	73.4%	<.001
	Low risk of bias	15	-2.907	-4.033	-1.782	<.001	0.0%	0.46
	More 50 per arm	10	-3.208	-6.214	-0.202	.039	70.1%	<.001
Fasting Blood Sugar (mg/dl)	Fixed	21	-19.254	-21.451	-17.056	<.001	81.2%	<.001
	Low risk of bias	15	-32.622	-46.414	-18.830	<.001	82.5%	<.001
	More 50 per arm	8	-26.2411	-42.1181	-10.3641	0.005	78.4%	<.001
Hemoglobin A1c	Fixed	24	-0.702	-0.770	-0.633	<.001	89.4%	<.001
	Low risk of bias	18	-1.248	-1.626	-0.869	<.001	91.5%	<.001
	More 50 per arm	8	-0.765	-1.269	-0.261	.008	78.8%	<.001
LDL-cholesterol	Fixed	21	-0.145	-0.823	0.532	.67	91.8%	<.001

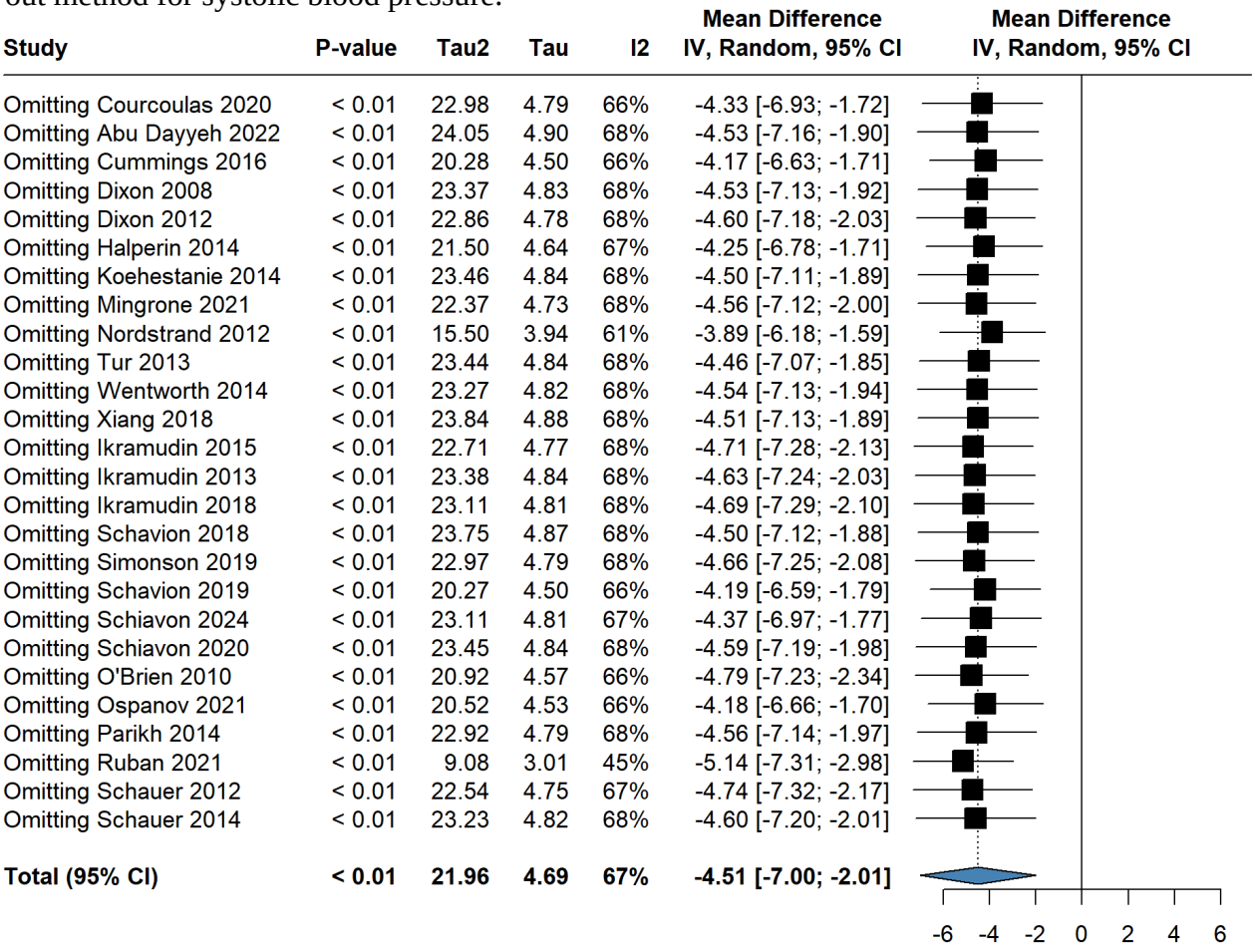
	Low risk of bias	15	-9.493	-20.830	1.844	.09	93.1%	<.001
	More 50 per arm	10	-8.364	-20.632	3.903	.15	84.2%	<.001
HDL-cholesterol	Fixed	25	6.835	6.014	7.655	<.001	73.1%	<.001
	Low risk of bias	18	7.756	6.506	9.006	<.001	29.5%	.11
	More 50 per arm	10	9.6806	4.8016	14.5597	<.01	83.1%	<.001
Total Cholesterol	Fixed	20	-4.461	-7.352	-1.570	.002	90.8%	<.001
	Low risk of bias	15	-5.302	-18.256	7.652	.39	90.1%	<.001
	More 50 per arm	6	-0.207	-8.726	8.312	.95	14.6%	.32
Triglyceride	Fixed	25	-40.722	-45.636	-35.809	<.001	74.5%	<.001
	Low risk of bias	17	-46.000	-65.058	-26.943	<.001	73.1%	<.001
	More 50 per arm	10	-45.012	-59.722	-30.302	<.001	70.5%	<.001

[1] p value of MD between surgical and non-surgical treatments of variables based on the fixed effect model

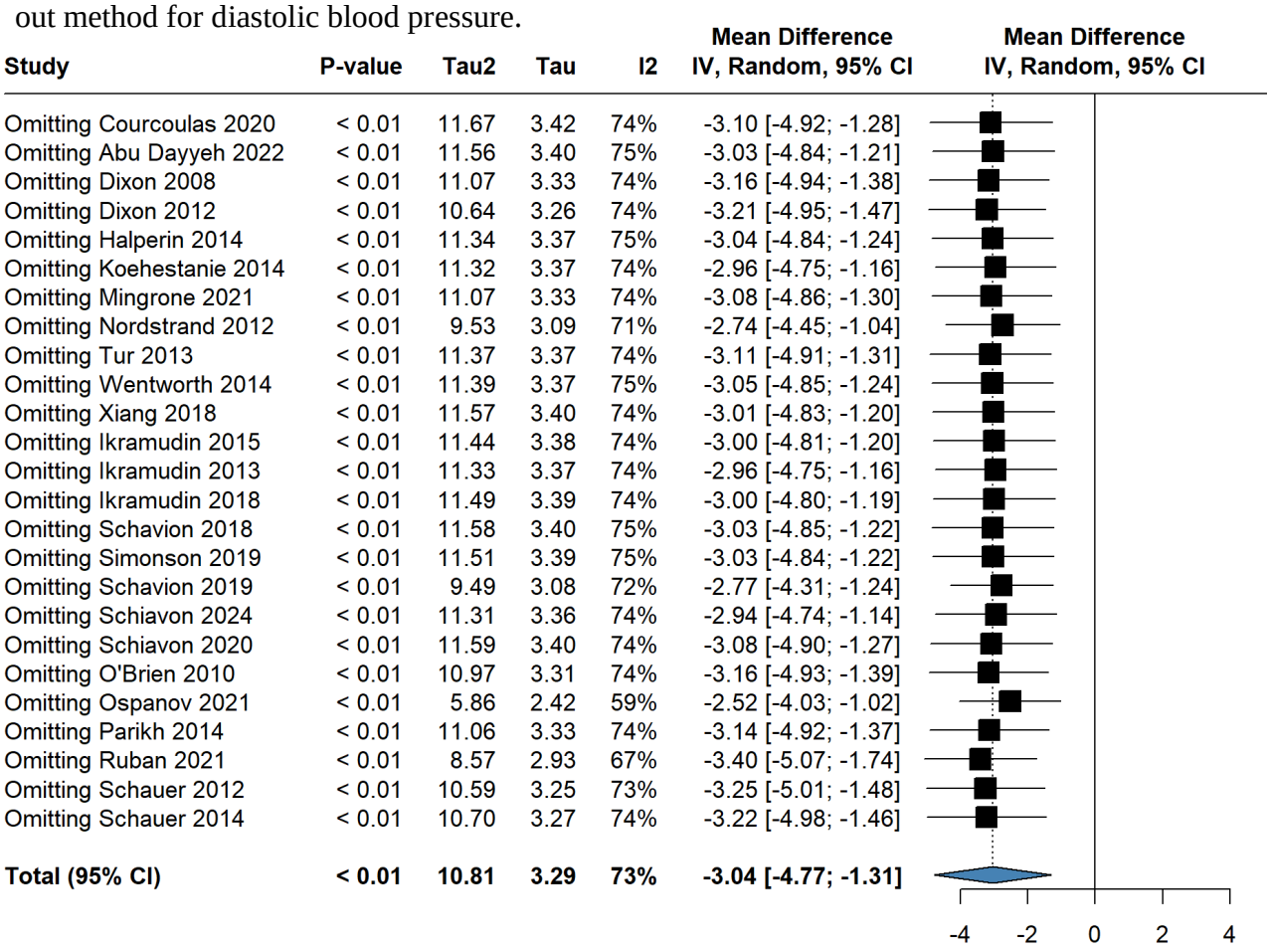
[2] p value of MD between surgical and non-surgical treatments of variables based on the random effect model

[3] p value of heterogeneity based on Cochran's Q

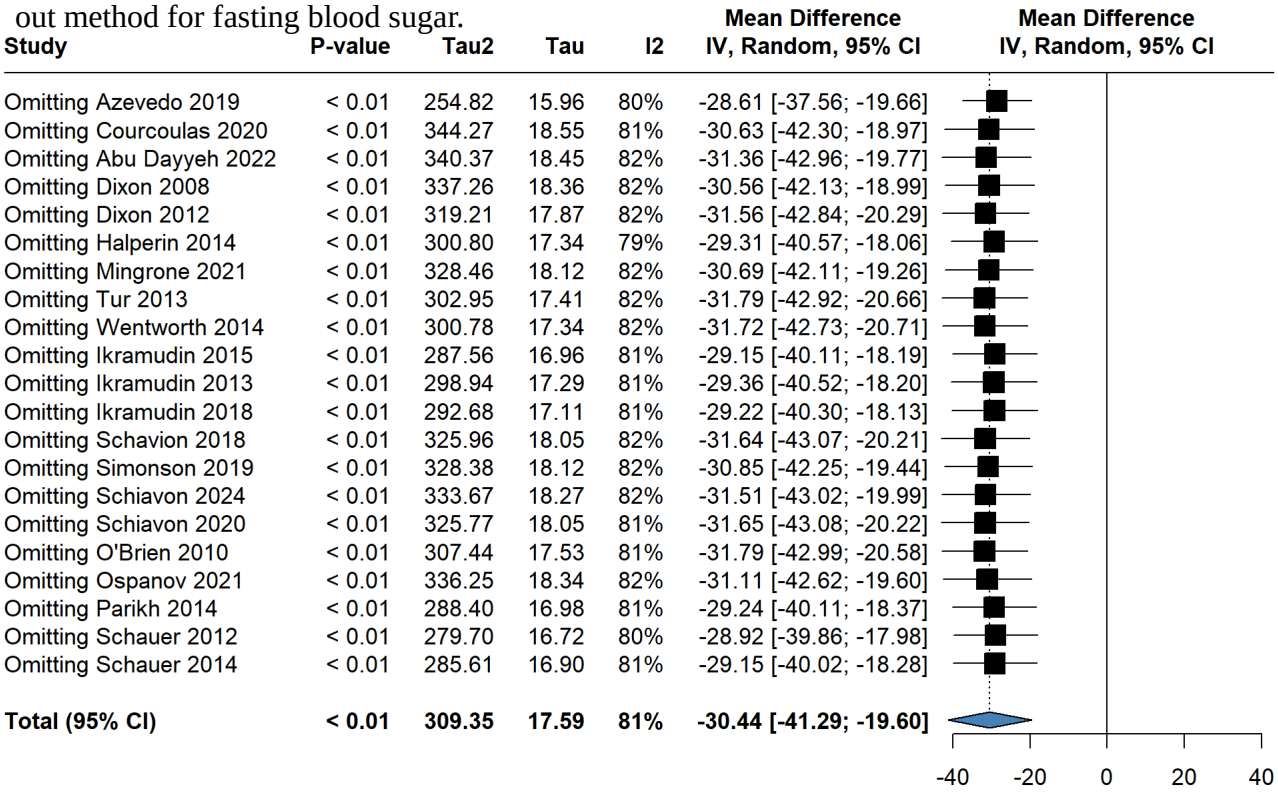
Supplemental Figure 18. Forest plot illustrating the sensitivity analysis using the leave-one-out method for systolic blood pressure.



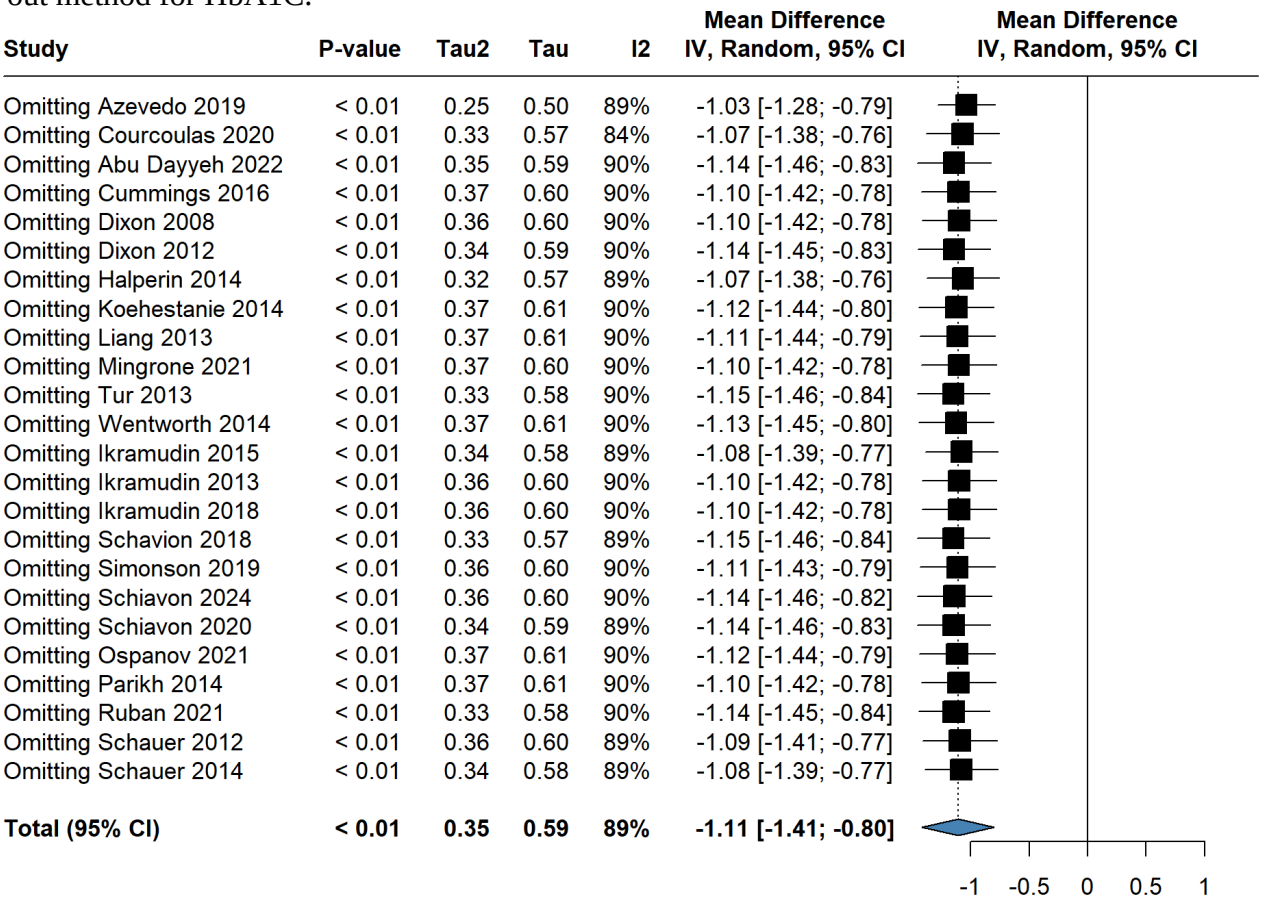
Supplemental Figure 19. Forest plot illustrating the sensitivity analysis using the leave-one-out method for diastolic blood pressure.



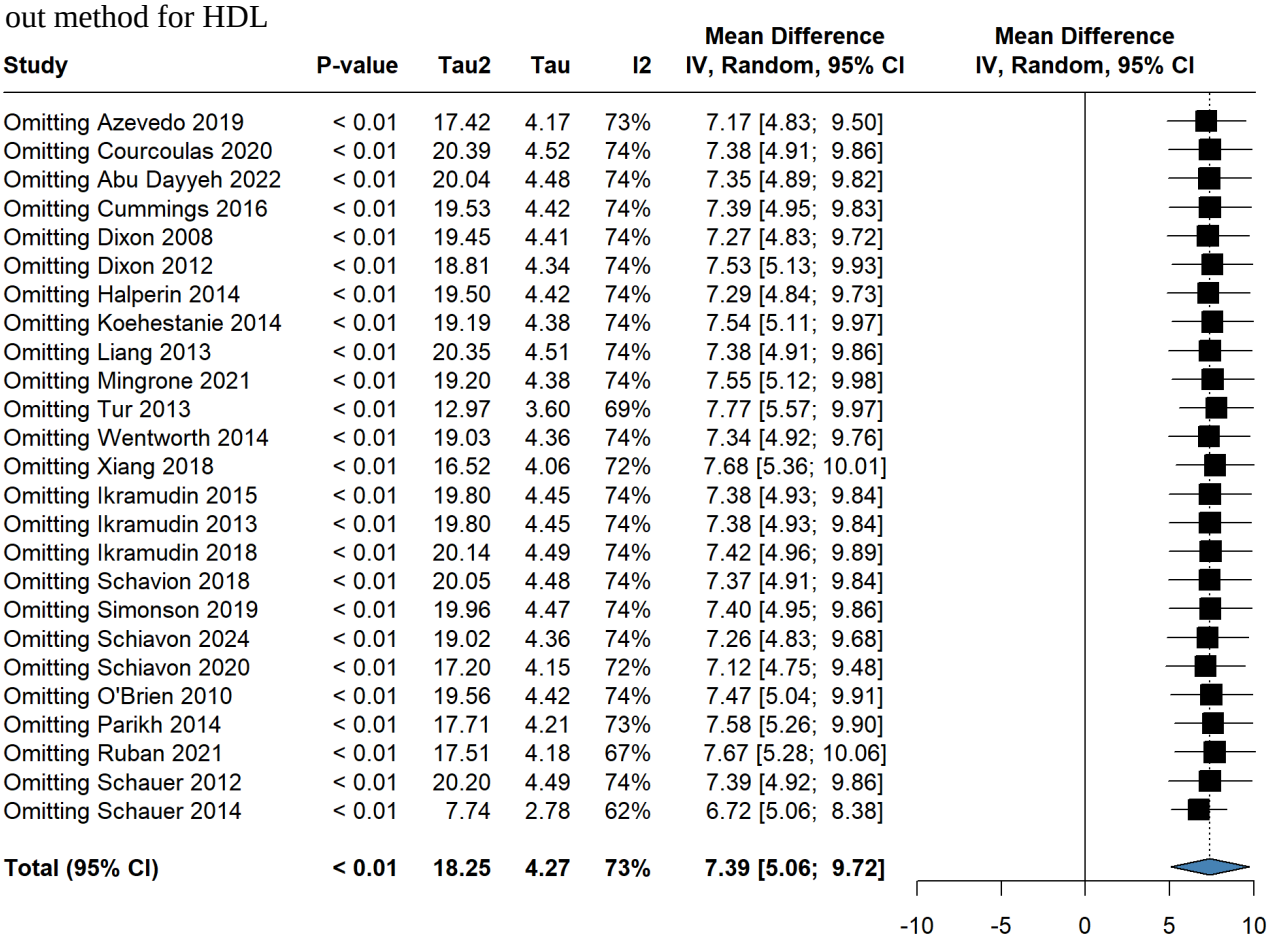
Supplemental Figure 20. Forest plot illustrating the sensitivity analysis using the leave-one-out method for fasting blood sugar.



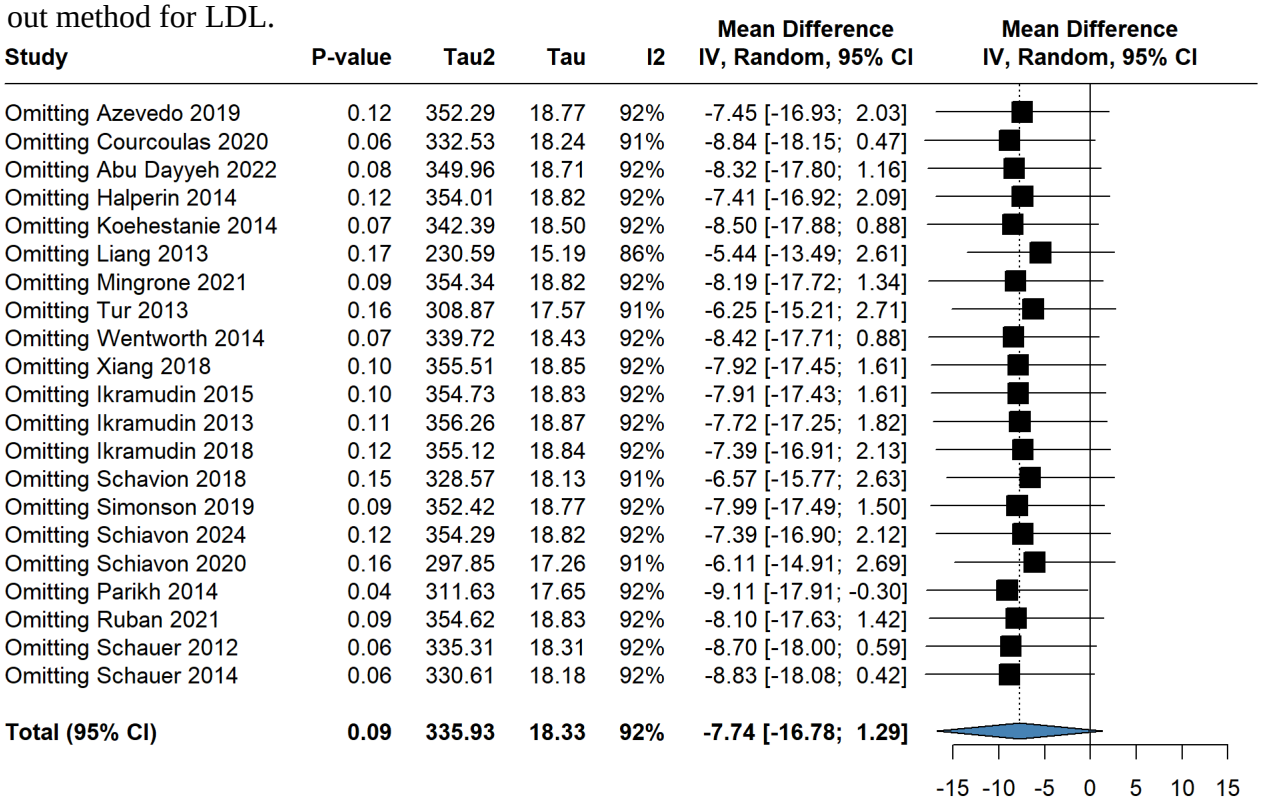
Supplemental Figure 21. Forest plot illustrating the sensitivity analysis using the leave-one-out method for HbA1C.



Supplemental Figure 22. Forest plot illustrating the sensitivity analysis using the leave-one-out method for HDL

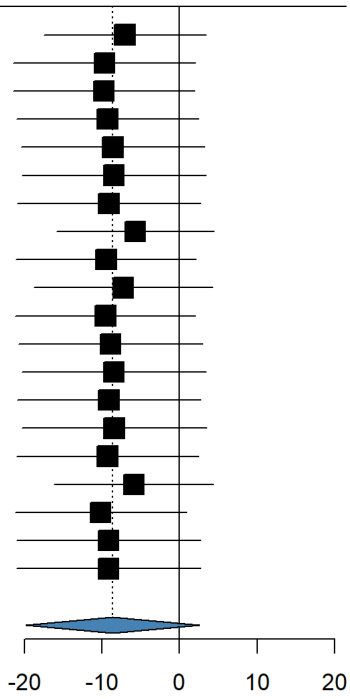


Supplemental Figure 23. Forest plot illustrating the sensitivity analysis using the leave-one-out method for LDL.

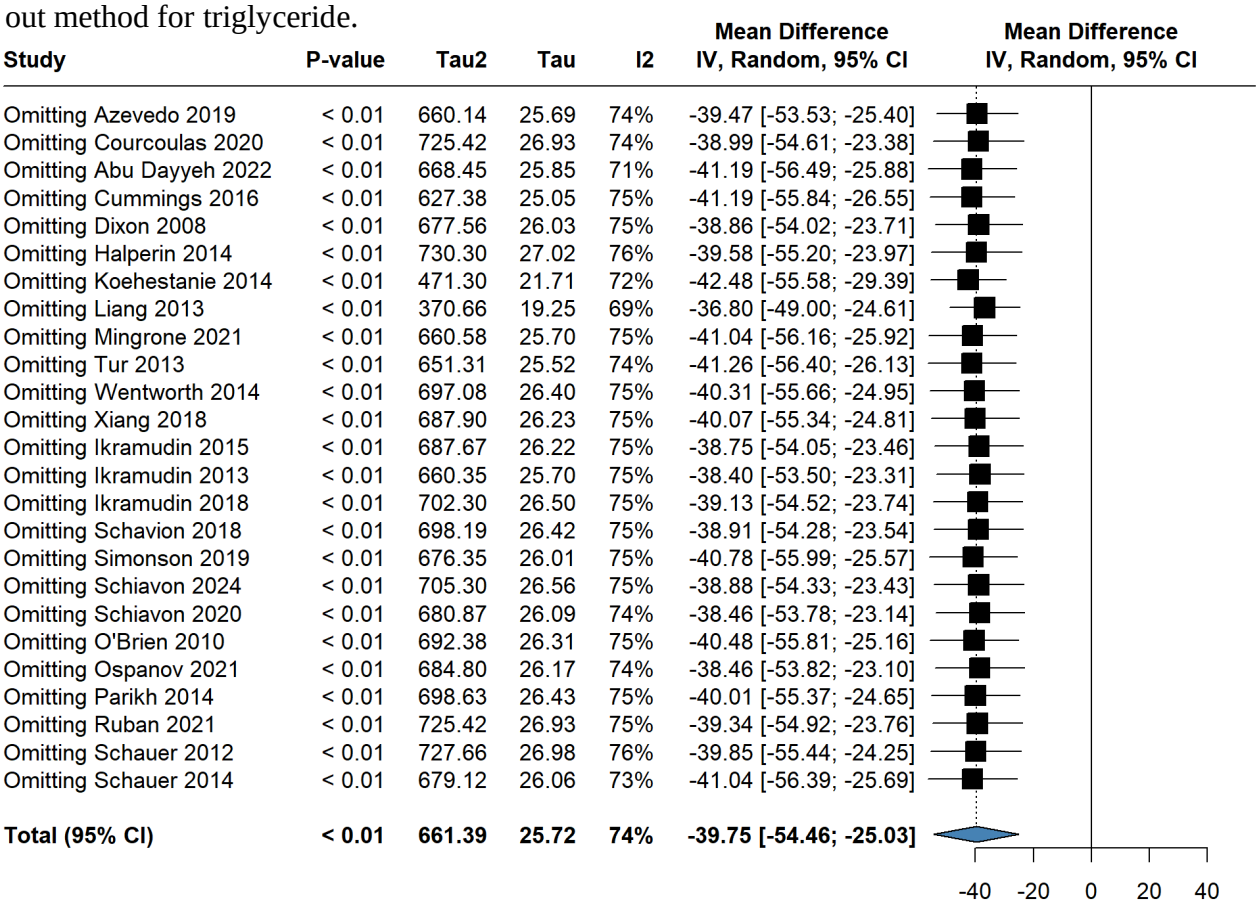


Supplemental Figure 24. Forest plot illustrating the sensitivity analysis using the leave-one-out method for total cholesterol.

Study	P-value	Tau2	Tau	I2	Mean Difference IV, Random, 95% CI
Omitting Azevedo 2019	0.17	396.32	19.91	91%	-7.05 [-17.49; 3.39]
Omitting Courcoulas 2020	0.10	445.41	21.10	88%	-9.70 [-21.46; 2.06]
Omitting Abu Dayyeh 2022	0.10	440.93	21.00	91%	-9.75 [-21.45; 1.94]
Omitting Dixon 2008	0.12	453.21	21.29	91%	-9.28 [-21.07; 2.50]
Omitting Dixon 2012	0.14	457.04	21.38	91%	-8.59 [-20.42; 3.23]
Omitting Halperin 2014	0.15	463.02	21.52	91%	-8.47 [-20.36; 3.42]
Omitting Koehestanie 2014	0.12	459.35	21.43	91%	-9.11 [-20.96; 2.75]
Omitting Liang 2013	0.25	290.83	17.05	83%	-5.72 [-15.91; 4.46]
Omitting Mingrone 2021	0.10	441.73	21.02	91%	-9.48 [-21.10; 2.14]
Omitting Tur 2013	0.20	426.81	20.66	91%	-7.26 [-18.79; 4.27]
Omitting Wentworth 2014	0.10	441.07	21.00	91%	-9.55 [-21.18; 2.07]
Omitting Xiang 2018	0.13	463.67	21.53	91%	-8.90 [-20.80; 3.01]
Omitting Ikramudin 2015	0.15	461.75	21.49	91%	-8.48 [-20.36; 3.40]
Omitting Ikramudin 2013	0.12	459.02	21.42	91%	-9.11 [-20.96; 2.75]
Omitting Ikramudin 2018	0.15	464.58	21.55	91%	-8.43 [-20.34; 3.48]
Omitting Simonson 2019	0.12	452.80	21.28	91%	-9.28 [-21.06; 2.50]
Omitting Ospanov 2021	0.24	311.49	17.65	89%	-5.91 [-16.19; 4.36]
Omitting Parikh 2014	0.07	406.26	20.16	91%	-10.18 [-21.26; 0.89]
Omitting Ruban 2021	0.12	461.53	21.48	91%	-9.16 [-21.05; 2.73]
Omitting Schauer 2012	0.12	459.10	21.43	91%	-9.18 [-21.04; 2.68]
Total (95% CI)	**0.12**	**432.92**	**20.81**	**91%**	**-8.64 [-19.85; 2.58]**



Supplemental Figure 25. Forest plot illustrating the sensitivity analysis using the leave-one-out method for triglyceride.



Meta-Regression

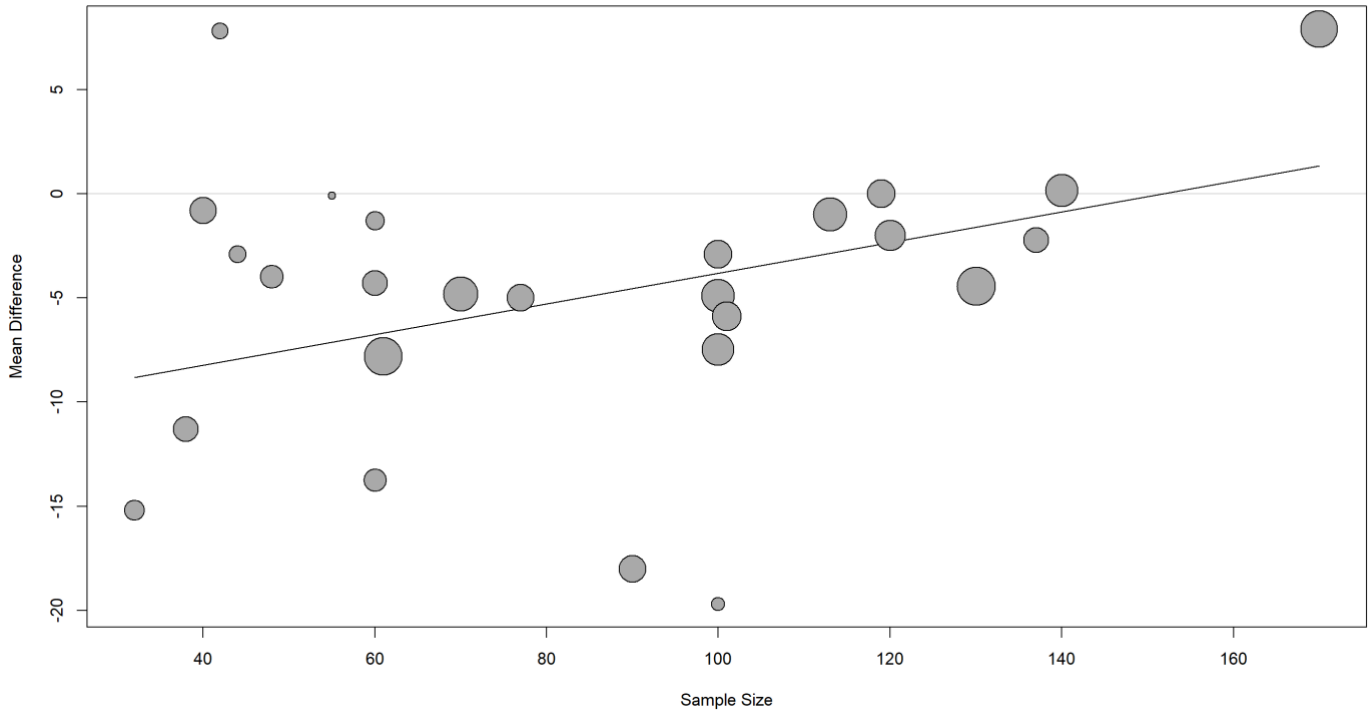
Supplemental Table 3. The findings of meta-regression analyses

Main Variable	Predictor variable	Amount of heterogeneity accounted for	Residual heterogeneity (I^2)	Test of moderator (P value)
Systolic Blood pressures	Year of publication	0.0%	66.72%	.87
	Follow-up duration	0.0%	66.03%	.4
	Sample size	47.54%	49.05%	.01
	Age	0.0%	67.3%	.52
	BMI	4.02%	64.56%	.32
Diastolic Blood pressures	Year of publication	0.0%	71.60%	.23
	Follow-up duration	0.0%	71.00%	.48
	Sample size	9.4%	68.88%	.29
	Age	0.0%	72.93%	.82
	BMI	0.0%	72.68%	.88
Fasting Blood Sugar	Year of publication	0.0%	91.32%	.67
	Follow-up duration	0.0%	91.11%	.90
	Sample size	0.0%	91.12%	.65

	Age	14.24%	89.52%	.18
	BMI	17.73%	89.36%	.08
Hemoglobin A1c	Year of publication	1.73%	90.91%	.38
	Follow-up duration	0.0%	91.04%	.61
	Sample size	11.65%	89.96%	.09
	Age	7.56%	89.68%	.37
	BMI	7.79%	90.65%	.13
LDL-cholesterol	Year of publication	0.0%	94.07%	.97
	Follow-up duration	0.0%	90.92%	.59
	Sample size	0.0%	93.7%	.76
	Age	3.05%	91.71%	.19
	BMI	0.0%	91.24%	.42
HDL-cholesterol	Year of publication	0.0%	80.44%	.90
	Follow-up duration	0.0%	80.24%	.76
	Sample size	0.0%	80.12%	.74
	Age	0.0%	81.00%	.79
	BMI	20.64%	75.24%	.1

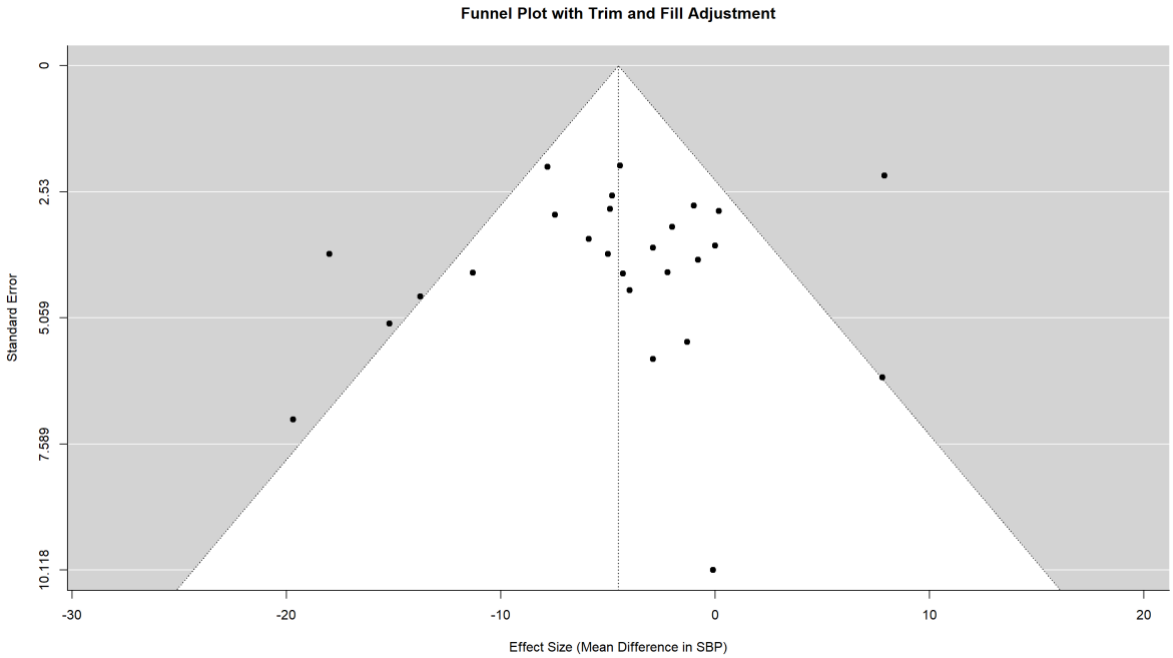
Total Cholesterol	Year of publication	0.0%	88.87%	.97
	Follow-up duration	3.56%	85.98%	.29
	Sample size	0.0%	88.47%	.81
	Age	0.0%	89.27%	.87
	BMI	0.0%	89.38%	.62
Triglyceride	Year of publication	0.0%	80.11%	.89
	Follow-up duration	0.0%	78.9%	.78
	Sample size	0.0%	79.44%	.44
	Age	0.0%	80.57%	.70
	BMI	12.31%	76.95%	.13

Supplemental Figure 26. Bubble plot of the meta-regression analysis evaluating sample size as a covariate in the final mean difference of systolic blood pressure.

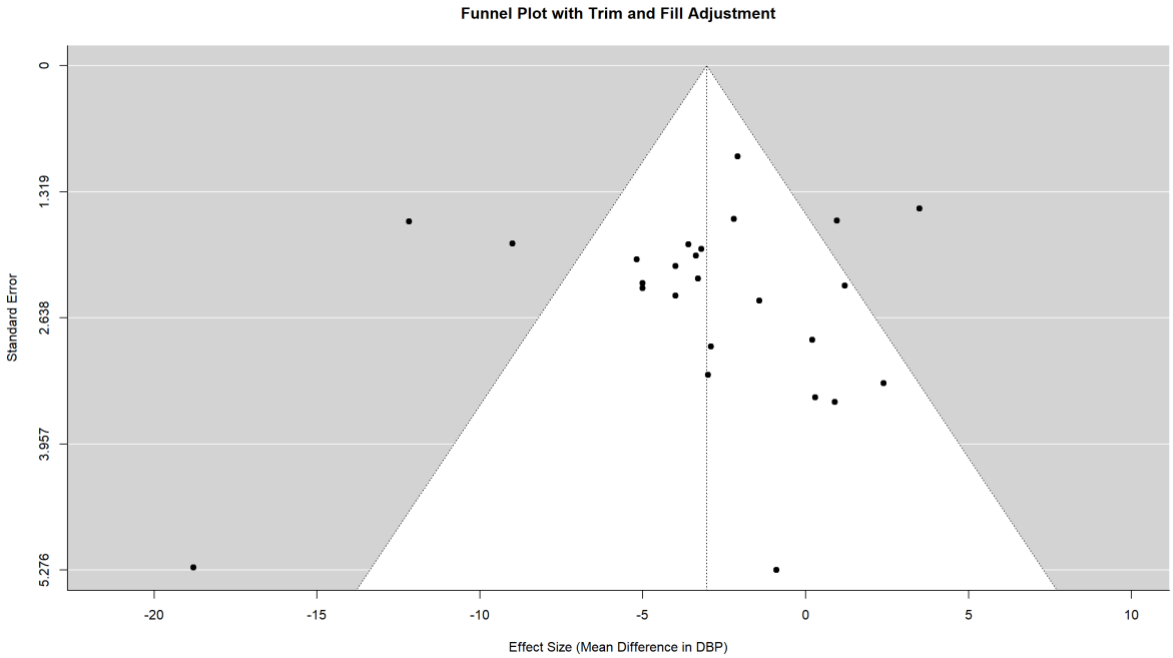


Publication Bias

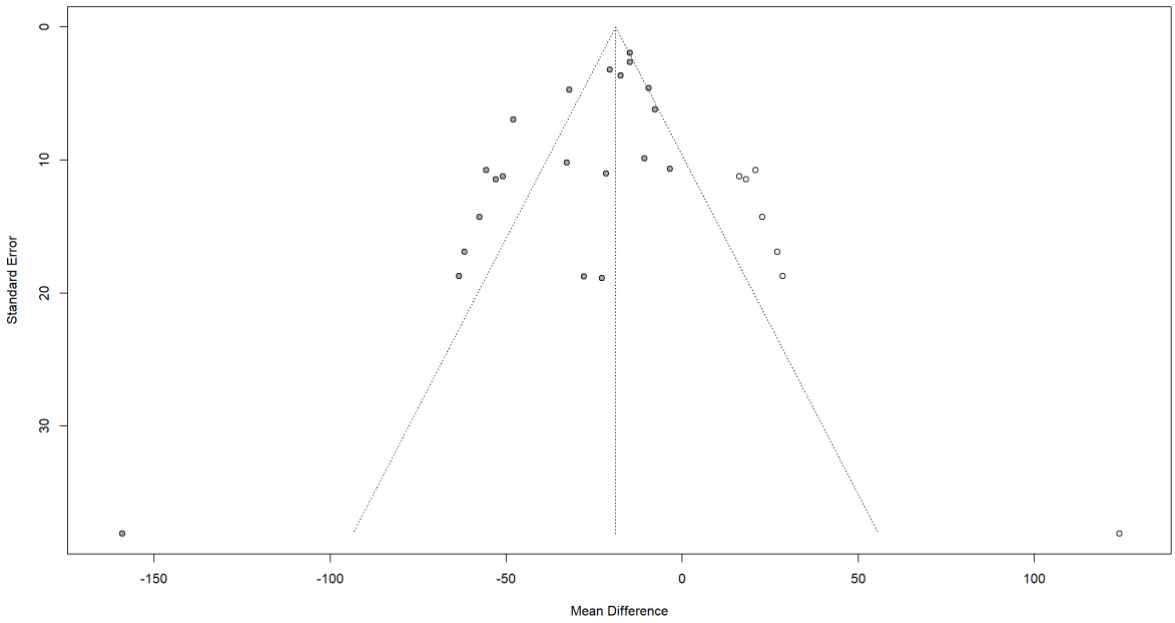
Supplemental Figure 27. Funnel plot for systolic blood pressure.



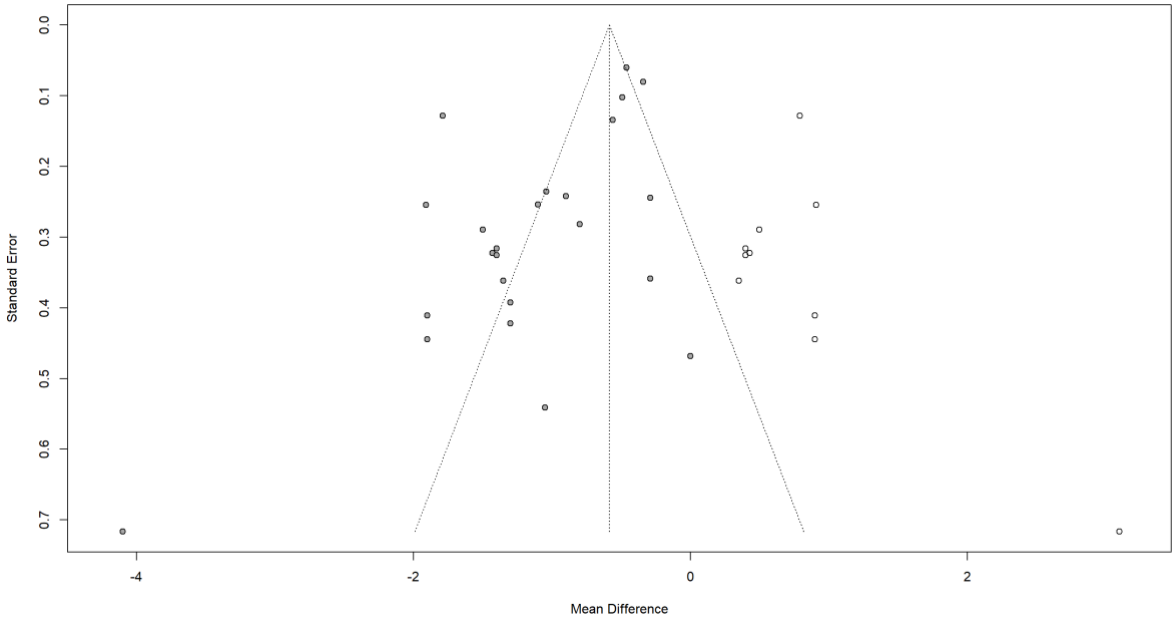
Supplemental Figure 28. Funnel plot for diastolic blood pressure.



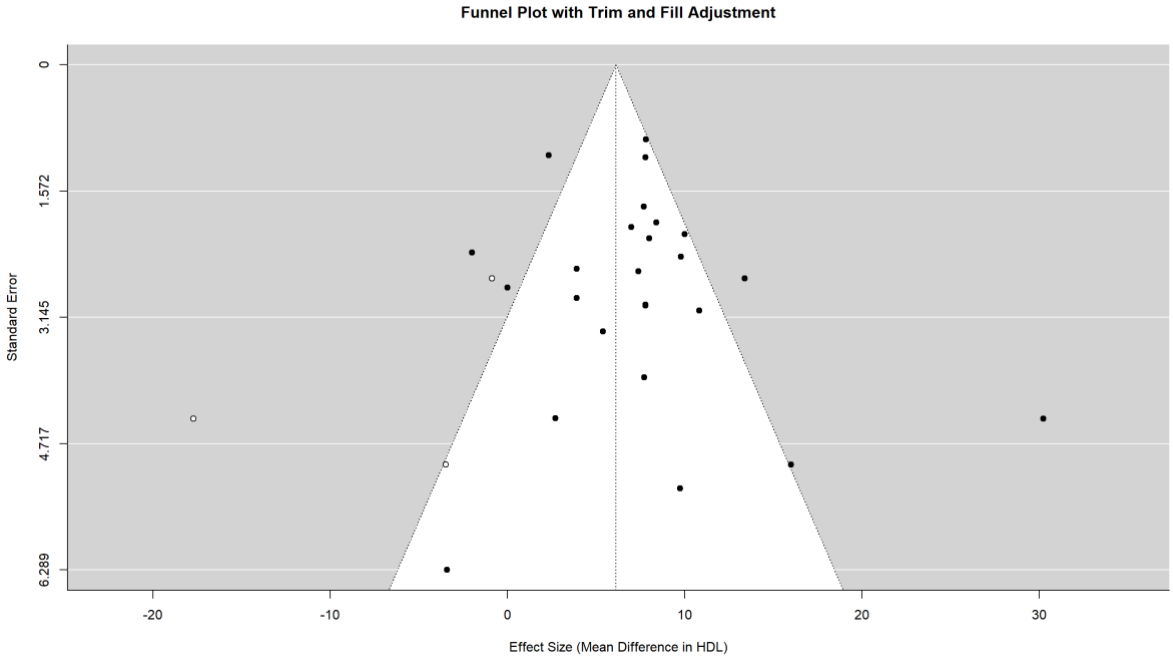
Supplemental Figure 29. Funnel plot for fasting blood sugar.



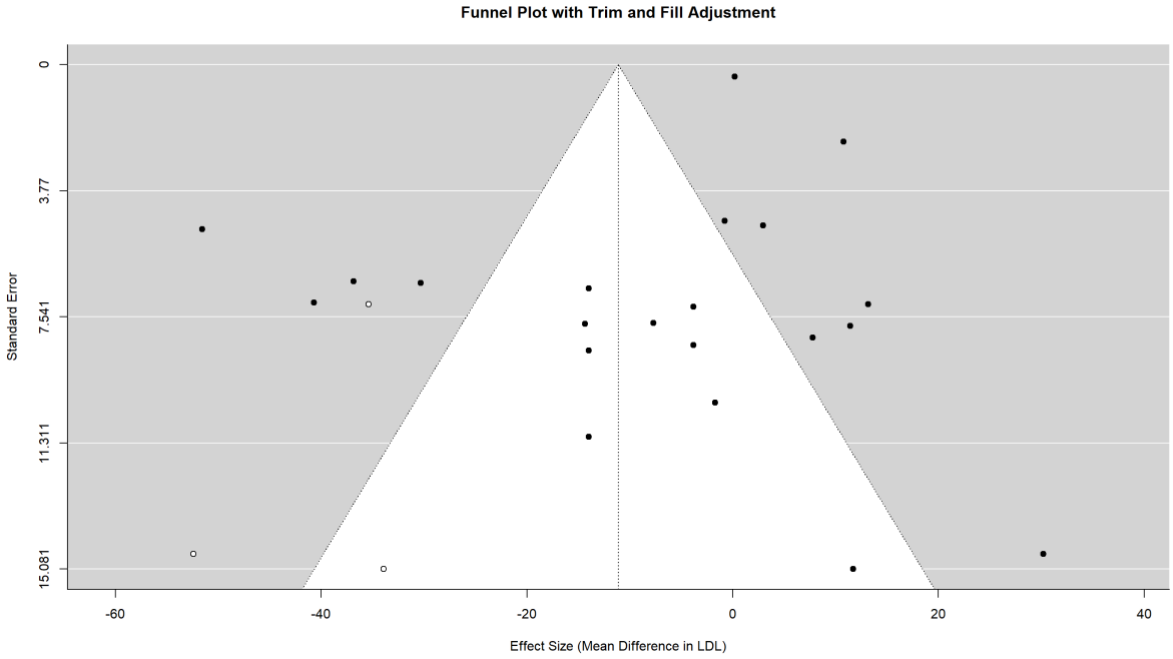
Supplemental Figure 30. Funnel plot for HbA1C.



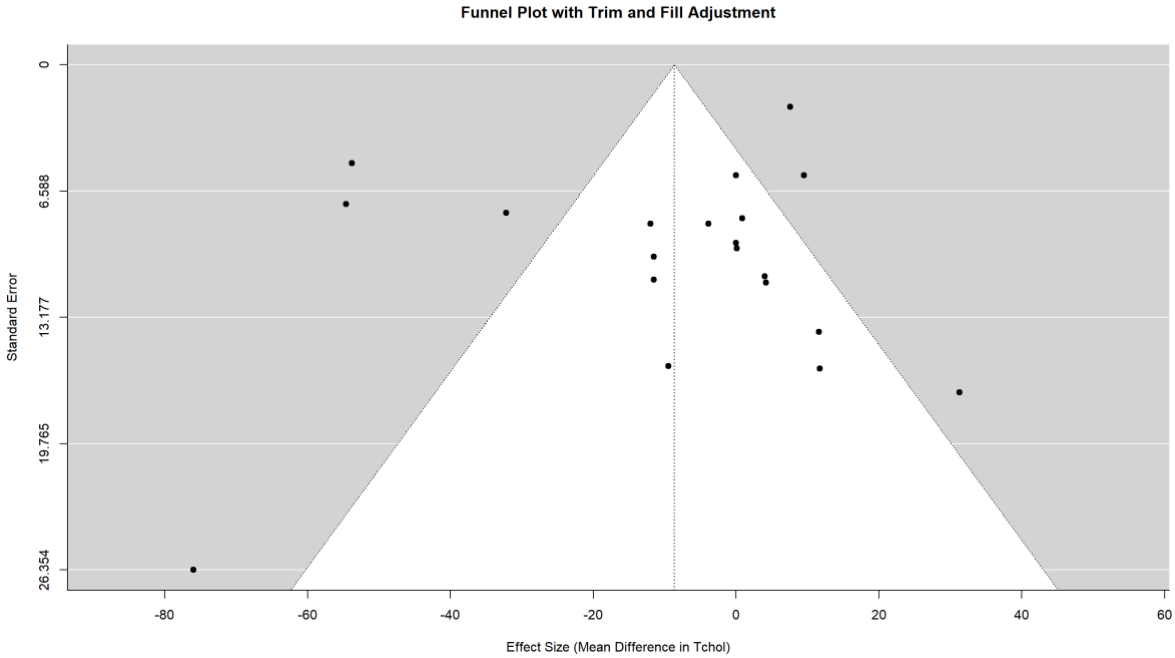
Supplemental Figure 31. Funnel plot for HDL.



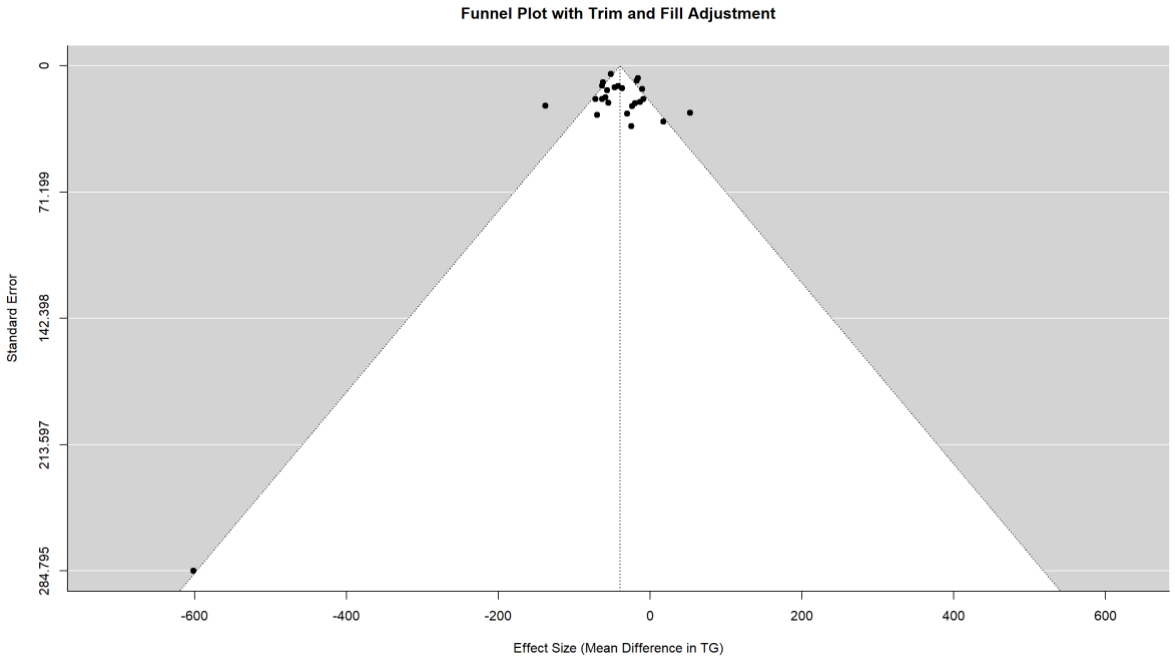
Supplemental Figure 32. Funnel plot for LDL.



Supplemental Figure 33. Funnel plot for Total cholesterol.



Supplemental Figure 34. Funnel plot for Triglycerides.



Summary of Findings

Supplemental Table 4. GRADE summary of findings table.

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	bariatric surgery	no bariatric surgery	Relative (95% CI)	Absolute (95% CI)		
Diastolic Blood Pressure												
25	randomised trials	not serious	not serious	not serious	not serious	none	1154	1021	-	MD **3.04 mmHg lower** (4.77 lower to 1.31 lower)	⨁⨁⨁⨁ High	IMPORTANT
Fasting Blood Sugar												
21	randomised trials	not serious	not serious	not serious	not serious	none	905	789	-	MD **30.44 mg/dL lower** (41.29 lower to 19.6 lower)	⨁⨁⨁⨁ High	IMPORTANT
Glycated Hemoglobin												
24	randomised trials	not serious	not serious	not serious	not serious	very strong association	1048	983	-	MD **1.11 % lower** (1.41 lower to 0.8 lower)	⨁⨁⨁⨁ High	CRITICAL
High-density lipoprotein												
25	randomised trials	not serious	not serious	not serious	not serious	none	1069	1014	-	MD **7.39 mg/dL higher** (5.06 higher to 9.72 higher)	⨁⨁⨁⨁ High	IMPORTANT
Low-density lipoprotein												
21	randomised trials	not serious	serious[a]	not serious	not serious	publication bias strongly suspected[b]	970	919	-	MD **7.74 mg/dL lower** (16.78 lower to 1.29 higher)	⨁⨁◯◯ Low	IMPORTANT
Systolic Blood Pressure												
26	randomised trials	not serious	not serious	not serious	not serious	none	1169	1038	-	MD **4.51 mmHg lower** (7 lower to 2.01 lower)	⨁⨁⨁⨁ High	IMPORTANT
Total Cholesterol												
20	randomised trials	not serious	not serious	not serious	not serious	publication bias strongly suspected[b]	823	809	-	MD **8.64 mg/dL lower** (19.85 lower to 2.58 higher)	⨁⨁⨁◯ Moderate	NOT IMPORTANT
Triglycerides												
25	randomised trials	not serious	not serious	not serious	not serious	strong association	1079	1004	-	MD **39.75 mg/dL lower** (54.56 lower to 25.03 lower)	⨁⨁⨁⨁ High	IMPORTANT

CI: confidence interval; **MD:** mean difference

Explanations

a. Some studies showed a significant increase, and others showed a significant decrease in LDL concentrations

b. Asymmetric funnel plot

Included and Excluded Studies

Supplemental Table 5. List of studies that underwent full-text review

Author (year)	Reason
Lee (2004)	Wrong study design
Czupryniak (2005)	Wrong study design
O'Brien (2006)	Included
Dixon (2008)	Included
Nct (2009)	Other reasons
De Paula (2010)	Doesn’t meet inclusion criteria
O'Brien (2010)	Included
Burguera (2011)	Abstract
Nordstr (2011)	Included
Dixon (2012)	Included
Schauer (2012)	Included
Demerdash (2013)	Other reasons
Ikramuddin (2013)	Included
Irct2013012712294N (2013)	Doesn’t meet inclusion criteria
Liang (20130	Included
Nct (20130	Doesn’t meet inclusion criteria
Pollock (2013)	Wrong study design
Tur (2013)	Included via citation searching
Ding (2014)	Abstract
Halperin (2014)	Included
Helmio (2014)	Abstract
Koehestanie (2014)	Included
Nct (2014)	Doesn’t meet inclusion criteria
Nct (2014)	Other reasons
Parikh (2014)	Included
Raffaelli (2014)	Wrong study design
Schauer (2014)	Included
Schiavon (2014)	Duplicate
Wentworth (2014)	Included via citation searching
Abu Dayyeh (2015)	Doesn’t meet inclusion criteria
Biter (2015)	Doesn’t meet inclusion criteria
De Barros (2015)	Doesn’t meet inclusion criteria

De Barros (2015)	Doesn’t meet inclusion criteria
De Barros (2015)	Doesn’t meet inclusion criteria
Grubnik (2015)	Abstract
Halperin (2015)	Abstract
Ikramuddin (2015)	Included
Irct2013123012294N (2015)	Doesn’t meet inclusion criteria
Luger (2015)	Abstract
Mahfouz (2015)	Other reasons
Tan (2015)	Abstract
Cummings (2016)	Included
Grubnik (2016)	Abstract
Grubnik (2016)	Doesn’t meet inclusion criteria
Irct201512229936N (2016)	Abstract
Kruschitz (2016)	Wrong study design
Maleckas (2016)	Abstract
Risstad (2016)	Doesn’t meet inclusion criteria
Vr (2016)	Doesn’t meet inclusion criteria
Bedi (2017)	Doesn’t meet inclusion criteria
Bh (2017)	Abstract
Bh (2017)	Doesn’t meet inclusion criteria
De Guzman (2017)	Abstract
Elkeleny (2017)	Abstract
Grubnik (2017)	Doesn’t meet inclusion criteria
Ottridge (2017)	Doesn’t meet inclusion criteria
Peterli (2017)	Doesn’t meet inclusion criteria
Porta (2017)	Wrong study design
Schiavon (2017)	Abstract
Schiavon (2017)	Duplicate
Seetharamaiah (2017)	Doesn’t meet inclusion criteria
Simonson (2017)	Abstract
Sullivan (2017)	Doesn’t meet inclusion criteria
Azevedo (2018)	Included

Ctri (2018)	Doesn’t meet inclusion criteria
Ikramuddin (2018)	Included
Nguyen (2018)	Doesn’t meet inclusion criteria
Ruiz-Tovar (2018)	Doesn’t meet inclusion criteria
Salminen (2018)	Doesn’t meet inclusion criteria
Schiavon (2018)	Duplicate
Schiavon (2018)	Included
Schroder (2018)	Not english
Xiang (2018)	Included via citation searching
Benaiges (2019)	Doesn’t meet inclusion criteria
Boerboom (2019)	Doesn’t meet inclusion criteria
Ctri (2019)	Doesn’t meet inclusion criteria
Nl (2019)	Doesn’t meet inclusion criteria
Peterli (2019)	Doesn’t meet inclusion criteria
Quiroz (2019)	Abstract
Robert (2019)	Doesn’t meet inclusion criteria
Robert (2019)	Doesn’t meet inclusion criteria
Salte (2019)	Abstract
Schiavon (2019)	Doesn’t meet inclusion criteria
Schiavon (2019)	Duplicate
Schiavon (2019)	Duplicate
Schiavon (2019)	Included
Simonson (2019)	Included
ChiCtr (2020)	Doesn’t meet inclusion criteria
Courcoulas (2020)	Included
Gentileschi (2020)	Doesn’t meet inclusion criteria
Naeem Mohamed (2020)	Doesn’t meet inclusion criteria
Nct (2020)	Doesn’t meet inclusion criteria
Nct (2020)	Other reasons

Reddy (2020)	Abstract
Schiavon (2020)	Included
Soliman (2020)	Doesn’t meet inclusion criteria
Ctri (2021)	Doesn’t meet inclusion criteria
Ctri (2021)	Doesn’t meet inclusion criteria
Kirwan (2021)	Abstract
Mingrone (2021)	Included
Mollan (2021)	Doesn’t meet inclusion criteria
Mollan (2021)	Duplicate
Moustafiz (2021)	Abstract
Nct (2021)	Doesn’t meet inclusion criteria
Ospanov (2021)	Duplicate
Ospanov (2021)	Included
Pajecki (2021)	Doesn’t meet inclusion criteria
Sabry (2021)	Doesn’t meet inclusion criteria
Wölnerhanssen (2021)	Doesn’t meet inclusion criteria
Zerrweck (2021)	Doesn’t meet inclusion criteria
Abu Dayyeh (2022)	Abstract
Abu Dayyeh (2022)	Included
Asgari (2022)	Not english
Ctri (2022)	Doesn’t meet inclusion criteria
Esk (2022)	Doesn’t meet inclusion criteria
Mollan (2022)	Doesn’t meet inclusion criteria
Nct (2022)	Doesn’t meet inclusion criteria
Pactr (2022)	Wrong study design
Ruban (2022)	Included
Salminen (2022)	Doesn’t meet inclusion criteria
Schiavon (2022)	Abstract
Tctr (2022)	Doesn’t meet inclusion criteria
Vadala di Prampero (2022)	Abstract

Vadala di Prampero (2022)	Abstract
Vadala Di Prampero (2022)	Doesn’t meet inclusion criteria
Acin (2023)	Abstract
Hart (2023)	Doesn’t meet inclusion criteria
Heinonen (2023)	Doesn’t meet inclusion criteria
Heinonen (2023)	Duplicate
Lal (2023)	Abstract
Oliveira (2023)	Doesn’t meet inclusion criteria
Salman (2023)	Doesn’t meet inclusion criteria
Salman (2023)	Doesn’t meet inclusion criteria
Hall (2024)	Doesn’t meet inclusion criteria
Schiavon (2024)	Duplicate
Schiavon (2024)	Included

Detailed Risk of Bias Assessments

Supplemental Table 6. Detailed ROB in each domain

Basic Info			Domain 1. Randomization process					Domain 2. Deviations from intended interventions									Domain 3. Missing outcome data						Domain 4. Measurement of the outcome							Domain 5. Selection of the reported result				
ID	Assessor	Reference	1.1	1.2	1.3	1.0 Algorithm result	1.0 Assessor's Judgement	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.0 Algorithm result	2.0 Assessor's Judgement	3.1	3.2	3.3	3.4	3.0 Algorithm result	3.0 Assessor's judgement	4.1	4.2	4.3	4.4	4.5	4.0 Algorithm result	4.0 Assessor's Judgement	5.1	5.2	5.3	5.0 Algorithm result	5.0 Assessor's Judgement
1	MMM	Ospanov O, et al (2021)	Y	Y	N	Low	Low	Y	Y	N	NA	NA	Y	NA	Low	Low	Y	NA	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	NI	N	N	Some concerns	Some concerns
2	MMM	Ruban A, et al (2022)	Y	Y	N	Low	Low	Y	Y	NA	Y	Y	Y		Some concerns	Some concerns	Y	NA	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	NI	N	N	Some concerns	Some concerns
3	MMM	Schauer PR, et al (2012)	Y	Y	N	Low	Low	Y	Y	NA	NA	Y	Y		Some concerns	Some concerns	Y	NA	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	NI	N	N	Some concerns	Some concerns
4	MMM	O'Brien PE, et al (2006)	Y	Y	N	Low	Low	Y	Y	NA	NA	Y	Y		Some concerns	Some concerns	Y	NA	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	Y	N	N	Low	Low
5	MMM	O'Brien PE, et al (2010)	Y	Y	N	Low	Low	Y	Y	N	NA	NA	Y	NA	Low	Low	Y	NA	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	NI	N	N	Some concerns	Some concerns
6	MMM	Parikh M, et al (2014)	Y	Y	N	Low	Low	Y	Y	NA	NA	N	NA		Low	Low	Y	NA	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	Y	N	N	Low	Low
7	MMM	Schauer PR, et al	Y	Y	N	Low	Low	Y	Y	NA	NA	PY	NI		High	High	Y	NA	NA	NA	Low	Low	N	N	Y	PN	NA	Low	Low	NI	N	N	Some concerns	Some concerns

		(2014)																																		
8	MAF	Abu Dayyeh BK, et al (2022)	Y	Y	N	Low	Low	Y	Y	N	NA	NA	Y	NA	Low	Low	Y	NA	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	Y	N	N	Low	Low
9	MAF	Courcoulas AP, et al (2020)	Y	PY	N	Low	Low	Y	Y	N	NA	NA	Y	NA	Low	Low	Y	NA	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	Y	N	N	Low	Low
10	MAF	Xiang AH, et al (2018)	Y	Y	N	Low	Low	Y	Y	N	NA	NA	Y	NA	Low	Low	Y	NA	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	Y	N	N	Low	Low
11	MAF	Azevedo FR, et al (2018)	Y	Y	PN	Low	Low	PY	PY	N	NA	NA	Y	NA	Low	Low	Y	NA	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	Y	N	N	Low	Low
12	MAF	Cummings DE, et al (2016)	Y	Y	N	Low	Low	Y	Y	N	NA	NA	Y	NA	Low	Low	Y	NA	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	Y	N	N	Low	Low
13	MAF	Dixon JB, et al (2008)	Y	Y	N	Low	Low	Y	Y	N	NA	NA	Y	NA	Low	Low	Y	NA	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	Y	N	N	Low	Low
14	MAF	Dixon JB, et al (2012)	PY	Y	N	Low	Low	Y	Y	N	NA	NA	Y	NA	Low	Low	Y	NA	NA	NA	Low	Low	N	PN	Y	N	NA	Low	Low	Y	N	N	Low	Low
15	MAF	Mingrone G, et al (2021)	Y	Y	N	Low	Low	Y	Y	N	NA	NA	Y	NA	Low	Low	Y	NA	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	Y	N	N	Low	Low
16	MAF	Halperin F, et al (2014)	Y	Y	PN	Low	Low	PY	PY	N	NA	NA	Y	NA	Low	Low	Y	NA	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	PY	N	N	Low	Low
17	PP	Simonson	Y	NI	N	Some conce	Low	Y	Y	Y	PN	NA	Y	NA	Some conce	Low	Y	NA	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	Y	PN	PN	Low	Low

		DC, et al (2019)				rns									rns																			
18	PP	Schiavon CA, et al (2019)	Y	NI	N	Some concerns	Low	Y	Y	N	NA	NA	Y	NA	Low	Low	PY	NA	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	Y	N	N	Low	Low
19	PP	Schiavon CA, et al (2024)	Y	NI	N	Some concerns	Low	Y	Y	N	NA	NA	Y	NA	Low	Low	Y	PN	PY	PN	Some concerns	Some concerns	N	N	Y	N	NA	Low	Low	Y	N	N	Low	Low
20	PP	Schiavon CA, et al (2020)	Y	NI	N	Some concerns	Low	Y	Y	N	NA	NA	Y	NA	Low	Low	N	PY	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	Y	N	N	Low	Low
21	PP	Schiavon CA, et al (2018)	Y	NI	N	Some concerns	Low	Y	Y	PN	NA	NA	Y	NA	Low	Low	PN	NA	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	Y	N	N	Low	Low
22	PP	Ikramuddin S, et al (2018)	Y	NI	N	Some concerns	Low	Y	Y	PY	PN	NA	Y	NA	Some concerns	Some concerns	Y	Y	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	Y	N	N	Low	Low
23	PP	Ikramuddin S, et al (2013)	Y	NI	N	Some concerns	Low	Y	PN	PN	NA	NA	Y	NA	Low	Low	PN	Y	NA	NA	Low	Low	N	N	PN	NA	NA	Low	Low	Y	N	N	Low	Low
24	PP	Ikramuddin S, et al (2015)	Y	NI	N	Some concerns	Low	Y	PY	N	NA	NA	Y	NA	Low	Low	PN	PY	NA	NA	Low	Low	N	N	Y	N	NA	Low	Low	PY	PN	N	Low	Low
25	MM	Koehestanie P, et al (2014)	Y	NI	N	Some concerns	Low	Y	Y	N	NA	NA	N	PN	Some concerns	Some concerns	PN	N	PN	NA	Low	Low	N	N	Y	PY	PN	Some concerns	Low	Y	NI	NI	Some concerns	Some concerns
26	MM	Liang Z, et al (2013)	Y	Y	N	Low	Low	Y	Y	Y	N	NA	Y	NA	Some concerns	Some concerns	NI	N	PN	NA	Low	Low	N	N	Y	N	NA	Low	Low	Y	NI	NI	Some concerns	Some concerns
27	MM	Nordstr, et al (2011)	N	N	PY	High	High	Y	Y	Y	PY	PN	PN	PN	High	High	NI	N	PN	NA	Low	Low	N	N	Y	N	NA	Low	Low	Y	NI	NI	Some concerns	Some concerns
2	MM	Tur JJ,	P	N	N	High	Some	Y	Y	N	N	N	N	P	Some	Low	N	N	P	N	Low	Low	N	N	Y	Y	P	Some	Low	Y	N	N	Some	Some

8		et al (2013)	N				concerns				A	A		N	concerns		I		N	A							N	concerns			I	I	concerns	concerns
29	MM	Wentworth JM, et al (2014)	Y	Y	N	Low	Low	Y	Y	N	NA	NA	N	N	Some concerns	Low	N	N	PN	NA	Low	Low	N	N	Y	PN	NA	Low	Low	Y	NI	NI	Some concerns	Some concerns

Signaling questions:

1.1 Was the allocation sequence random?

1.2 Was the allocation sequence concealed until participants were enrolled and assigned to interventions?

1.3 Did baseline differences between intervention groups suggest a problem with the randomization process?

2.1 Were participants aware of their assigned intervention during the trial?

2.2 Were carers and people delivering the interventions aware of participants' assigned intervention during the trial?

2.3 If Y/PY/NI to 2.1 or 2.2: Were there deviations from the intended intervention that arose because of the trial context?

2.4 If Y/PY to 2.3: Were these deviations likely to have affected the outcome?

2.5. If Y/PY/NI to 2.4: Were these deviations from intended intervention balanced between groups?

2.6 Was an appropriate analysis used to estimate the effect of assignment to intervention?

2.7 If N/PN/NI to 2.6: Was there potential for a substantial impact (on the result) of the failure to analyse participants in the group to which they were randomized?

3.1 Were data for this outcome available for all, or nearly all, participants randomized?

3.2 If N/PN/NI to 3.1: Is there evidence that the result was not biased by missing outcome data?

3.3 If N/PN to 3.2: Could missingness in the outcome depend on its true value?

3.4 If Y/PY/NI to 3.3: Is it likely that missingness in the outcome depended on its true value?

4.1 Was the method of measuring the outcome inappropriate?

4.2 Could measurement or ascertainment of the outcome have differed between intervention groups?

4.3 If N/PN/NI to 4.1 and 4.2: Were outcome assessors aware of the intervention received by study participants?

4.4 If Y/PY/NI to 4.3: Could assessment of the outcome have been influenced by knowledge of intervention received?

4.5 If Y/PY/NI to 4.4: Is it likely that assessment of the outcome was influenced by knowledge of intervention received?

5.1 Were the data that produced this result analysed in accordance with a pre-specified analysis plan that was finalized before unblinded outcome data were available for analysis?

Is the numerical result being assessed likely to have been selected, on the basis of the results, from...

5.2. ... multiple eligible outcome measurements (e.g. scales, definitions, time points) within the outcome domain?

5.3 ... multiple eligible analyses of the data?

Comprehensive Data Extraction of Included Studies

Supplemental Table 7. Detailed Data Extraction from included articles

Author	Data Extractor	Date of extraction	Type of surgery	Follow up months	Age	BMI	Surgery (n)	Control (n)	SBP int. change	SD int. change	SBP cont. change	SD cont. change
Dixon 2008	D.N.	May 2024	LAGB	24	46.6	37	30	30	-6	17.9	-1.7	14.2
O'Brien 2010	D.N.	May 2024	LAGB	24	16.5	42.3	24	18	-12.5	17.6	-20.3	21.7
Dixon 2012	D.N.	May 2024	LAGB	24	47.4	46.3	30	30	-7.5	23	-6.2	19.8
Nordstrand 2012	D.N.	May 2024	RYGB	12	44.4	45.5	49	41	-24	17.4	-6	18.22
Schauer 2012	D.N.	May 2024	RYGB/other	12	48	37.1	99	41	-3.73	17.83	-3.9	14.7
Tur 2013	D.N.	May 2024	other	12	44.1	49.2	30	71	-4.4	15.74	1.5	16.5
Ikramudin 2013	D.N.	May 2024	RYGB	12	49	34.9	60	60	-10	19.5	-8	15.7
Halperin 2014	D.N.	May 2024	RYGB	12	50.7	36	19	19	-12.3	12.7	-1	12.9
Koehestanie 2014	D.N.	May 2024	other	12	49.5	34.6	38	39	-17	14.3	-12	18.6
Wentworth 2014	D.N.	May 2024	LAGB	24	53	29	23	25	-6	16.9	-2	14.05
Parikh 2014	D.N.	May 2024	other	6	46.8	32.8	20	24	-0.4	19.7	2.5	19.1
Schauer 2014	F.O.	May	RYGB/other	36	48.	37	97	40	-1.59	20.63	0.63	22.63

		2024			3							
Ikramudin 2015	F.O.	May 2024	RYGB	24	49	34.9	60	59	-7	20.2	-7	19.2
Cummings 2016	F.O.	May 2024	RYGB	12	52	38.3	15	17	-19.3	17.8	-4.1	9.8
Xiang 2018	F.O.	May 2024	LAGB	24	47	35.7	36	34	-2.3	10.9	2.5	10.9
Ikramudin 2018	F.O.	May 2024	RYGB	60	49	34.9	57	56	-3	14.1	-2	15.7
Schavion 2018	F.O.	May 2024	RYGB	12	43	37.4	50	50	0.6	12.5	5.5	16
Simonson 2019	F.O.	May 2024	LAGB	36	51	36.4	18	22	0.5	11.6	1.3	13
Schavion 2019	F.O.	May 2024	RYGB	12	43.1	37.4	50	50	-4.8	36.9	14.9	34
Courcoulas 2020	F.O.	May 2024	LAGB/RYGB	60	47.7	35.7	41	20	-9.52	10.82	-1.7	5.03
Schiavon 2020	F.O.	May 2024	RYGB	36	43	37.4	50	50	-0.2	17.95	2.7	18.6
Mingrone 2021	F.O.	May 2024	RYGB/DJBL/ BPD	120	43.9	44.2	40	15	-17.3	24.51	-17.2	36.2
Ospanov 2021	F.O.	May 2024	other	12	48.7	39.88	40	20	-21.85	18.71	-8.1	15.92
Ruban 2021	F.O.	May 2024	other	24	51.6	36.8	85	85	0.3	14.4	-7.6	14.4
Abu Dayyeh 2022	F.O.	May 2024	other	13	47.3	35.5	58	72	-5.16	8	-0.72	14.46
Schiavon 2024	F.O.	May 2024	RYGB	60	43.6	37.35	50	50	0.75	15	8.23	14.9

Author	Data Extractor	Date of extraction	Type of surgery	Follow up months	Age	BMI	Surgery (n)	Control (n)	DBP int. change	SD int. change	DBP cont. change	SD cont. change
Dixon 2008	D.N.	May 2024	LAGB	24	46.6	37	30	30	-0.7	11.1	-0.9	11.1
O'Brien 2010	D.N.	May 2024	LAGB	24	16.5	42.3	24	18	-6	9.4	-6.9	12.5
Dixon 2012	D.N.	May 2024	LAGB	24	47.4	46.3	30	30	-1.1	12.53	-3.5	13.2
Nordstrand 2012	D.N.	May 2024	RYGB	12	44.4	45.5	49	41	-11	8.7	-2	8.87
Schauer 2012	D.N.	May 2024	RYGB/other	12	48	37.1	99	41	-3.54	9.25	-4.5	8.5
Tur 2013	D.N.	May 2024	other	12	44.1	49.2	30	71	-2.9	11.29	-1.48	11.29
Ikramudin 2013	D.N.	May 2024	RYGB	12	49	34.9	60	60	-10	13.11	-5	11.79
Halperin 2014	D.N.	May 2024	RYGB	12	50.7	36	19	19	-5.1	9.74	-2.1	10.18
Koehestanie 2014	D.N.	May 2024	other	12	49.5	34.6	38	39	-10	10.37	-5	10.03
Wentworth 2014	D.N.	May 2024	LAGB	24	53	29	23	25	-5.7	9.94	-2.8	10.42
Parikh 2014	D.N.	May 2024	other	6	46.8	32.8	20	24	0.1	10.7	-0.2	12.3
Schauer 2014	F.O.	May 2024	RYGB/other	36	48.3	37	97	40	-5.27	12	-6.48	12.33
Ikramudin 2015	F.O.	May 2024	RYGB	24	49	34.9	60	59	-8	13.75	-4	12.49
Xiang 2018	F.O.	May 2024	LAGB	24	47	35.7	36	34	-1.9	7.55	1.7	8.05

Ikramudin 2018	F.O.	May 2024	RYGB	60	49	34.9	57	56	-6	11.14	-2	11.14
Schavion 2018	F.O.	May 2024	RYGB	12	43	37.4	50	50	-0.6	8.19	2.6	10.82
Simonson 2019	F.O.	May 2024	LAGB	36	51	36.4	18	22	-3.8	6.64	-0.5	7.44
Schavion 2019	F.O.	May 2024	RYGB	12	43.1	37.4	50	50	-8.8	24.8	10	27.6
Courcoulas 2020	F.O.	May 2024	LAGB	60	47.7	35.7	41	20	-2.69	4.85	-0.6	2.56
Schiavon 2020	F.O.	May 2024	RYGB	36	43	37.4	50	50	-0.2	7.91	2	8.12
Mingrone 2021	F.O.	May 2024	DJBL/BPD/RYGB	120	43.9	44.2	40	15	-9.6	13.07	-8.7	18.8
Ospanov 2021	F.O.	May 2024	other	12	48.7	39.88	40	20	-17.97	6.76	-5.8	5.51
Ruban 2021	F.O.	May 2024	other	24	51.6	36.8	85	85	-1.9	9.8	-5.4	9.69
Abu Dayyeh 2022	F.O.	May 2024	other	13	47.3	35.5	58	72	-3.31	11.97	0.06	10.34
Schiavon 2024	F.O.	May 2024	RYGB	60	43.6	37.35	50	50	-2.9	10.16	2.28	10.09

Author	Data Extractor	Date of extraction	Type of surgery	Follow up months	Age	BMI	Surgery (n)	Control (n)	FBS int. change	SD int. change	FBS cont. change	SD cont. change
Dixon 2008	D.N.	May 2024	LAGB	24	46.6	37	30	30	-51.2	37.6	-18.4	41.2

O'Brien 2010	D.N.	May 2024	LAGB	24	16.5	42.3	24	18	-6.8	20	2.8	9
Dixon 2012	D.N.	May 2024	LAGB	24	47.4	46.3	30	30	0.6	38.68	11.3	37.7
Schauer 2012	D.N.	May 2024	RYGB/other	12	48	37.1	99	41	-80.7	68.25	-25	53
Tur 2013	D.N.	May 2024	other	12	44.1	49.2	30	71	-15.4	23.44	-7.65	37.69
Ikramudin 2013	D.N.	May 2024	RYGB	12	49	34.9	60	60	-103.2	63.81	-52.2	59.25
Halperin 2014	D.N.	May 2024	RYGB	12	50.7	36	19	19	-48	21.68	0	21.06
Wentworth 2014	D.N.	May 2024	LAGB	24	53	29	23	25	-5.5	24.63	-2	46.71
Parikh 2014	D.N.	May 2024	other	6	46.8	32.8	20	24	-50.1	44.4	13.3	77.8
Schauer 2014	D.N.	May 2024	RYGB/other	36	48.3	37	97	40	-68.06	73.62	-6.16	95.73
Ikramudin 2015	D.N.	May 2024	RYGB	24	49	34.9	60	59	-102.6	52.1	-45	96.67
Ikramudin 2018	F.O.	May 2024	RYGB	60	49	34.9	57	56	-90	66.55	-37	54.51
Schavion 2018	F.O.	May 2024	RYGB	12	43	37.4	50	50	-16.5	15.9	-1.6	9.9
Azevedo 2019	F.O.	May 2024	sleeve gastrectomy	24	45	33.4	10	10	-122	93.05	37	76.49
Simonson 2019	F.O.	May 2024	LAGB	36	51	36.4	18	22	-37.4	56	-14.6	63.38
Courcoulas 2020	F.O.	May 2024	LAGB/RYGB	60	47.7	35.7	41	20	-42.08	16.81	-10	17.44
Schiavon 2020	F.O.	May 2024	RYGB	36	43	37.4	50	50	-13.1	9.15	1.8	10.38

Mingrone 2021	F.O.	May 2024	RYGB/DJBL/BPD	120	43.9	44.2	40	15	-76.5	59	-48.6	63
Ospanov 2021	F.O.	May 2024	other	12	48.7	39.88	40	20	-27.18	67.68	-5.58	11.7
Abu Dayyeh 2022	F.O.	May 2024	other	13	47.3	35.5	57	79	-6.11	23.81	14.42	4.1
Schiavon 2024	F.O.	May 2024	RYGB	60	43.6	37.35	50	50	-10.3	18.11	7.19	18.35

Author	Data Extractor	Date of extraction	Type of surgery	Follow up months	Age	BMI	Surgery (n)	Control (n)	HBA1 int. change	SD int. change	HBA1 cont. change	SD cont. change
Dixon 2008	D.N.	May 2024	LAGB	24	46.6	37	30	30	-1.81	1.24	-0.38	1.26
Dixon 2012	D.N.	May 2024	LAGB	24	47.4	46.3	30	30	-0.25	1.72	0.04	0.95
Schauer 2012	D.N.	May 2024	RYGB/other	12	48	37.1	99	41	-2.9	1.69	-1.4	1.5
Liang 2013	D.N.	May 2024	RYGB	12	50.8	30.5	31	70	-4.5	1.08	-3.4	1.37
Tur 2013	D.N.	May 2024	other	12	44.1	49.2	30	71	-0.7	0.8	-0.41	1.65
Ikramudin 2013	D.N.	May 2024	RYGB	12	49	34.9	60	60	-3.2	1.73	-1.8	1.73
Halperin 2014	D.N.	May 2024	RYGB	12	50.7	36	19	19	-1.95	0.78	-0.04	0.79
Koehestanie 2014	D.N.	May 2024	other	12	49.5	34.6	38	39	-1.3	0.93	-0.4	1.18

Wentworth 2014	D.N.	May 2024	LAGB	24	53	29	23	25	-0.8	0.69	0	1.21
Parikh 2014	D.N.	May 2024	other	6	46.8	32.8	20	24	-1.2	1.1	0.1	1.5
Schauer 2014	D.N.	May 2024	RYGB/other	36	48.3	37	97	40	-2.5	2	-0.6	2.5
Ikramudin 2015	F.O.	May 2024	RYGB	24	49	34.9	60	59	-3.1	1.73	-1.2	2.65
Cummings 2016	F.O.	May 2024	RYGB	12	52	38.3	15	17	-1.3	1.4	0	0.9
Ikramudin 2018	F.O.	May 2024	RYGB	60	49	34.9	57	56	-2.5	1.73	-1.1	1.73
Schavion 2018	F.O.	May 2024	RYGB	12	43	37.4	50	50	-0.48	0.38	-0.14	0.42
Azevedo 2019	F.O.	May 2024	sleeve gastrectomy	24	45	33.4	10	10	-3.8	1.82	0.3	1.35
Simonson 2019	F.O.	May 2024	LAGB	36	51	36.4	18	22	-0.82	1.62	0.23	1.8
Courcoulas 2020	F.O.	May 2024	LAGB/RYGB	60	47.7	35.7	41	20	-1.02	0.56	0.77	0.42
Schiavon 2020	F.O.	May 2024	RYGB	36	43	37.4	50	50	-0.5	0.28	-0.04	0.32
Mingrone 2021	F.O.	May 2024	RYGB/DJBL/ BPD	120	43.9	44.2	40	15	-2.15	1.6	-0.8	1
Ospanov 2021	F.O.	May 2024	other	12	48.7	39.88	40	20	-1.42	0.95	-0.38	0.81
Ruban 2021	F.O.	May 2024	other	24	51.6	36.8	85	85	-0.8	3.15	-0.8	2.95
Abu Dayyeh 2022	F.O.	May 2024	other	13	47.3	35.5	55	80	-0.36	0.66	0.13	0.45
Schiavon 2024	F.O.	May 2024	RYGB	60	43.6	37.35	50	50	-0.32	0.67	0.24	0.67

Author	Data Extractor	Date of extraction	Type of surgery	Follow up months	Age	BMI	Surgery (n)	Control (n)	TG int. change	SD int. change	TG cont. change	SD cont. change
Dixon 2008	D.N.	May 2024	LAGB	24	46.6	37	30	30	-71.7	92.9	-2.1	120.6
O'Brien 2010	D.N.	May 2024	LAGB	24	16.5	42.3	24	18	-52	38	-32	83
Schauer 2012	D.N.	May 2024	RYGB/other	12	48	37.1	99	41	-67.59	90.96	-30.66	55.31
Liang 2013	D.N.	May 2024	RYGB	12	50.8	30.5	31	70	-238.4	102.09	-100.27	108.81
Tur 2013	D.N.	May 2024	other	12	44.1	49.2	30	71	-23.8	58.15	-13.47	62.99
Ikramudin 2013	D.N.	May 2024	RYGB	12	49	34.9	60	60	-145	44.35	-73	138.07
Halperin 2014	D.N.	May 2024	RYGB	12	50.7	36	19	19	-47	34.23	-5	36.61
Koehestanie 2014	D.N.	May 2024	other	12	49.5	34.6	38	39	26.5	130	-26.5	100.33
Wentworth 2014	D.N.	May 2024	LAGB	24	53	29	23	25	-37.6	85.81	-14.1	69.69
Parikh 2014	D.N.	May 2024	other	6	46.8	32.8	20	24	-52.1	96.7	-21.9	79
Schauer 2014	D.N.	May 2024	RYGB/other	36	48.3	37	97	40	-34.18	37.87	-16.83	47.51
Ikramudin 2015	F.O.	May 2024	RYGB	24	49	34.9	60	59	-80	84.87	-17	115.87
Cummings 2016	F.O.	May 2024	RYGB	12	52	38.3	15	17	-53.15	53.88	-70.84	115.83

Xiang 2018	F.O.	May 2024	LAGB	24	47	35.7	36	34	-20.4	129.18	4.5	154.05
Ikramudin 2018	F.O.	May 2024	RYGB	60	49	34.9	57	56	-83	102.13	-28	117.89
Schavion 2018	F.O.	May 2024	RYGB	12	43	37.4	50	50	-81.5	105	-22.9	70.5
Azevedo 2019	F.O.	May 2024	sleeve gastrectomy	24	45	33.4	10	10	-248	54.03	354	898.98
Simonson 2019	F.O.	May 2024	LAGB	36	51	36.4	18	22	-33.2	61.33	-20.1	67.44
Courcoulas 2020	F.O.	May 2024	LAGB/RYGB	60	47.7	35.7	41	20	-60.68	21.64	-9.33	14.75
Schiavon 2020	F.O.	May 2024	RYGB	36	43	37.4	50	50	-84.2	55.24	-20.8	57.71
Mingrone 2021	F.O.	May 2024	RYGB/DJBL/BPD	120	43.9	44.2	40	15	-71.2	79.47	-62.3	53.4
Ospanov 2021	F.O.	May 2024	other	12	48.7	39.88	40	20	-65.7	58.5	-3.6	8.1
Ruban 2021	F.O.	May 2024	other	24	51.6	36.8	85	85	-28.8	92.7	18	64.8
Abu Dayyeh 2022	F.O.	May 2024	other	13	47.3	35.5	56	79	-9.71	38.83	6.09	41.04
Schiavon 2024	F.O.	May 2024	RYGB	60	43.6	37.35	50	50	-66.14	69.48	-9.62	67.79

Author	Data Extractor	Date of extraction	Type of surgery	Follow up months	Age	BMI	Surgery (n)	Control (n)	Tchol int. change	SD int. change	Tchol cont. change	SD cont. change
Dixon 2008	D.N.	May 2024	LAGB	24	46.6	37	30	30	3.6	51.6	-0.4	31.4

Dixon 2012	D.N.	May 2024	LAGB	24	47.4	46.3	30	30	6.3	54.35	15.8	66.83
Schauer 2012	D.N.	May 2024	RYGB/other	12	48	37.1	99	41	-3.03	45.19	-3.9	42.2
Liang 2013	D.N.	May 2024	RYGB	12	50.8	30.5	31	70	-80.5	18.45	-26.7	32.84
Tur 2013	D.N.	May 2024	other	12	44.1	49.2	30	71	-32.2	35.72	0	35.04
Ikramudin 2013	D.N.	May 2024	RYGB	12	49	34.9	60	60	-27	45.51	-27.1	58.62
Halperin 2014	D.N.	May 2024	RYGB	12	50.7	36	19	19	-3.2	30.08	8.3	31.64
Koehestanie 2014	D.N.	May 2024	other	12	49.5	34.6	38	39	0	36	0	45.06
Wentworth 2014	F.O.	May 2024	LAGB	24	53	29	23	25	-5.5	42.83	-17.1	53.51
Parikh 2014	F.O.	May 2024	other	6	46.8	32.8	20	24	11.8	54.8	-19.5	58.3
Ikramudin 2015	F.O.	May 2024	RYGB	24	49	34.9	60	59	-27	54.29	-15.5	67.1
Xiang 2018	F.O.	May 2024	LAGB	24	47	35.7	36	34	-3.9	29.19	0	39.22
Ikramudin 2018	F.O.	May 2024	RYGB	60	49	34.9	57	56	-22	36.17	-10	50.58
Azevedo 2019	F.O.	May 2024	sleeve gastrectomy	24	45	33.4	10	10	-39	39	37	73.65
Simonson 2019	F.O.	May 2024	LAGB	36	51	36.4	18	22	5.4	33.78	1.2	38
Courcoulas 2020	F.O.	May 2024	LAGB/RYGB	60	47.7	35.7	41	20	-9.12	7.69	-16.7	8.24
Mingrone 2021	F.O.	May 2024	RYGB/DJBL/ BPD	120	43.9	44.2	40	15	-50.7	64.86	-62.4	46.8

Ospanov 2021	F.O.	May 2024	other	12	48.7	39.88	40	20	-64.35	35.49	-9.75	20.67
Ruban 2021	F.O.	May 2024	other	24	51.6	36.8	85	85	-6.63	34.71	-6.63	40.17
Abu Dayyeh 2022	F.O.	May 2024	other	13	47.3	35.5	56	79	3.38	33.71	-6.11	32.08

Author	Data Extractor	Date of extraction	Type of surgery	Follow up months	Age	BMI	Surgery (n)	Control (n)	HDL int. change	SD int. change	HDL cont. change	SD cont. change
Azevedo 2019	D.N.	May 2024	sleeve gastrectomy	24	45	33.4	10	10	12	13	-4	8.89
Courcoulas 2020	D.N.	May 2024	LAGB/RYGB	60	47.7	35.7	41	20	14.35	4.22	6.54	2.94
Abu Dayyeh 2022	D.N.	May 2024	other	13	47.3	35.5	56	79	5.91	12.02	-2.49	10.03
Cummings 2016	D.N.	May 2024	RYGB	12	52	38.3	15	17	15.46	11.6	7.73	10.23
Dixon 2008	D.N.	May 2024	LAGB	24	46.6	37	30	30	12.6	9.8	2.6	6.1
Dixon 2012	D.N.	May 2024	LAGB	24	47.4	46.3	30	30	5.4	19.88	2.7	13.61
Halperin 2014	D.N.	May 2024	RYGB	12	50.7	36	19	19	10.2	7.16	0.4	7.57
Koehestanie 2014	D.N.	May 2024	other	12	49.5	34.6	38	39	0	13.58	-3.9	11.8
Liang 2013	D.N.	May 2024	RYGB	12	50.8	30.5	31	70	12.4	5.72	4.6	4.37
Mingrone 2021	D.N.	May 2024	RYGB/DJBL/BPD	120	43.9	44.2	40	15	7.8	9.81	3.9	7.8

Tur 2013	D.N.	May 2024	other	12	44.1	49.2	30	71	2	10.48	4	11.31
Wentworth 2014	F.O.	May 2024	LAGB	24	53	29	23	25	11.7	21.48	1.95	13.91
Xiang 2018	F.O.	May 2024	LAGB	24	47	35.7	36	34	3.9	11.6	3.9	11.6
Ikramudin 2015	F.O.	May 2024	RYGB	24	49	34.9	60	59	7.8	18.52	0	13.86
Ikramudin 2013	F.O.	May 2024	RYGB	12	49	34.9	60	60	7.8	18.52	0	13.86
Ikramudin 2018	F.O.	May 2024	RYGB	60	49	34.9	57	56	11	12.12	4	9.17
Schavion 2018	F.O.	May 2024	RYGB	12	43	37.4	50	50	9.8	13.7	1.8	6.8
Simonson 2019	F.O.	May 2024	LAGB	36	51	36.4	18	22	10	7.98	2.6	8.24
Schiavon 2024	F.O.	May 2024	RYGB	60	43.6	37.35	50	50	17.38	16.28	6.55	14.24
Schiavon 2020	F.O.	May 2024	RYGB	36	43	37.4	50	50	17	13.02	3.6	13.55
O'Brien 2010	F.O.	May 2024	LAGB	24	16.5	42.3	24	18	9.3	14.7	3.9	6
Parikh 2014	F.O.	May 2024	other	6	46.8	32.8	20	24	2.6	12.5	6	27.6
Ruban 2021	F.O.	May 2024	other	24	51.6	36.8	85	85	3.9	5.85	1.56	8.58
Schauer 2012	F.O.	May 2024	RYGB/other	12	48	37.1	99	41	12.1	9.97	4.4	9.3
Schauer 2014	F.O.	May 2024	RYGB/other	36	48.3	37	97	40	34.85	29.06	4.6	20.68

Author	Data Extractor	Date of extraction	Type of surgery	Follow up months	Age	BMI	Surgery (n)	Control (n)	LDL int. change	SD int. change	LDL cont. change	SD cont. change
Schauer 2012	D.N.	May 2024	RYGB/other	12	48	37.1	99	41	14.72	50.5	3.3	38
Liang 2013	D.N.	May 2024	RYGB	12	50.8	30.5	31	70	-72.3	21.76	-20.75	25
Tur 2013	D.N.	May 2024	other	12	44.1	49.2	30	71	-35.8	28.7	1.06	32.03
Ikramudin 2013	D.N.	May 2024	RYGB	12	49	34.9	60	60	-23.2	37.16	-15.5	46.89
Halperin 2014	D.N.	May 2024	RYGB	12	50.7	36	19	19	-5.4	25.62	8.6	27.08
Koehestanie 2014	D.N.	May 2024	other	12	49.5	34.6	38	39	3.9	37.23	-3.9	34.3
Wentworth 2014	D.N.	May 2024	LAGB	24	53	29	23	25	-11.7	54.21	-23.4	49.92
Parikh 2014	D.N.	May 2024	other	6	46.8	32.8	20	24	20	44.5	-10.2	52.5
Schauer 2014	D.N.	May 2024	RYGB/other	36	48.3	37	97	40	15.68	53.05	2.5	29.91
Ikramudin 2015	D.N.	May 2024	RYGB	24	49	34.9	60	59	-19.3	41.61	-15.5	49.43
Xiang 2018	D.N.	May 2024	LAGB	24	47	35.7	36	34	-7.7	27.1	-3.9	33.02
Ikramudin 2018	F.O.	May 2024	RYGB	60	49	34.9	57	56	-19	32.42	-5	38.35
Schavion 2018	F.O.	May 2024	RYGB	12	43	37.4	50	50	-34.6	29.51	-4.3	35.51

Azevedo 2019	F.O.	May 2024	sleeve gastrectomy	24	45	33.4	10	10	-11	17	3	30.8
Simonson 2019	F.O.	May 2024	LAGB	36	51	36.4	18	22	3.6	29.96	5.3	33.94
Courcoulas 2020	F.O.	May 2024	LAGB/RYGB	60	47.7	35.7	41	20	-8.5	8.86	-19.3	8.25
Schiavon 2020	F.O.	May 2024	RYGB	36	43	37.4	50	50	-34.5	35.1	6.2	36.07
Mingrone 2021	F.O.	May 2024	RYGB/DJBL/ BPD	120	43.9	44.2	40	15	-1.2	1.38	-1.4	1.1
Ruban 2021	F.O.	May 2024	other	24	51.6	36.8	85	85	-5.85	28.86	-5.07	31.98
Abu Dayyeh 2022	F.O.	May 2024	other	13	47.3	35.5	56	79	-0.75	30.18	-3.71	23.16
Schiavon 2024	F.O.	May 2024	RYGB	60	43.6	37.35	50	50	-26.7	39.21	-12.36	38.23