La dieta mediterránea en el la persona con diabetes

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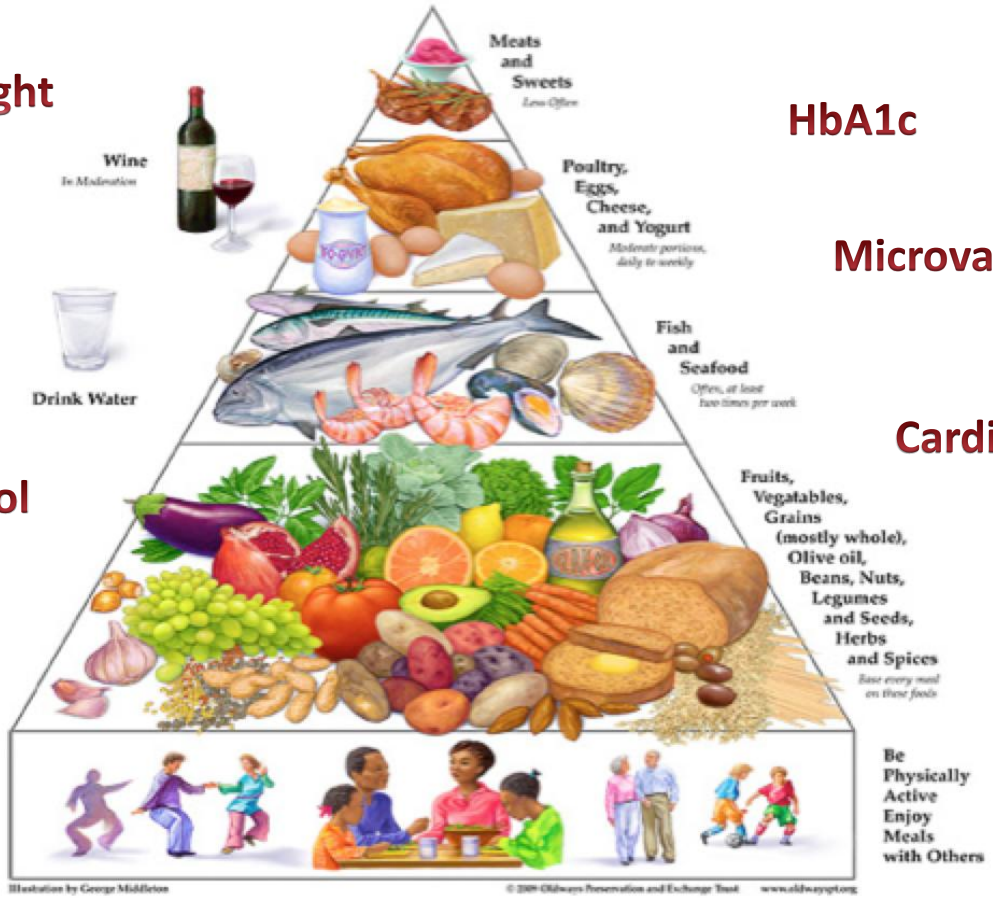
Diet (Mediterranean dietary pattern) therapy in type 2 diabetes

Weight

HbA1c

Visceral adiposity

Microvascular disease



Cardiovascular risk factors

Glucose control medication

Atherogenic dyslipidemia

Adherence and quality of life

Cardiovascular disease

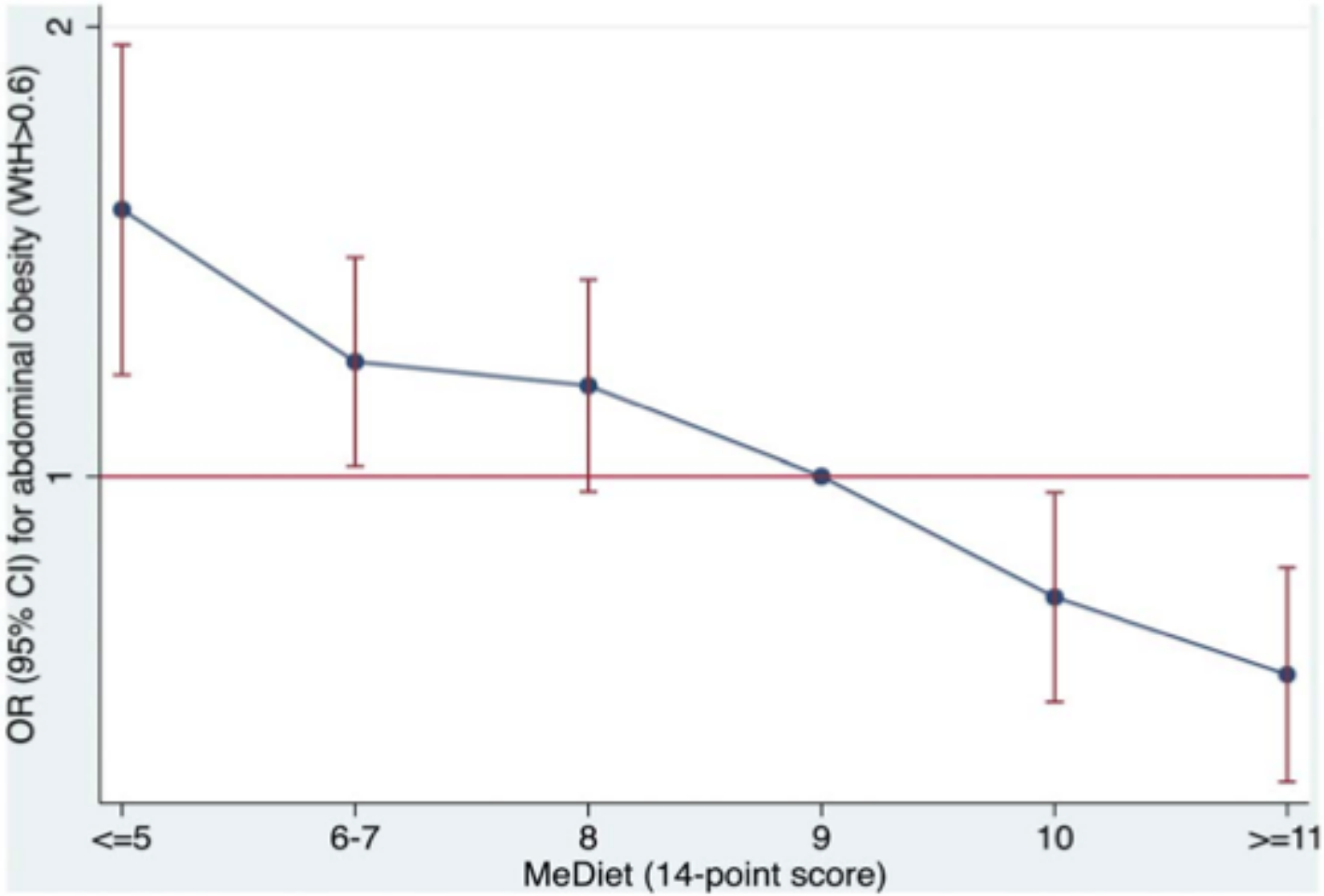
GUIDELINES

Did the PREDIMED Trial Test a Mediterranean Diet?

Lawrence J. Appel, M.D., M.P.H., and Linda Van Horn, Ph.D., R.D.

Still, there are many unanswered questions. Will the benefits of extra-virgin olive oil and mixed nuts accrue to persons consuming other diets? Does high consumption of extra-virgin olive oil and mixed nuts lead to weight gain? Can the benefits of extra-virgin olive oil and mixed nuts occur at lower doses?

¿Long-term effect on weight of a high-fat diet?

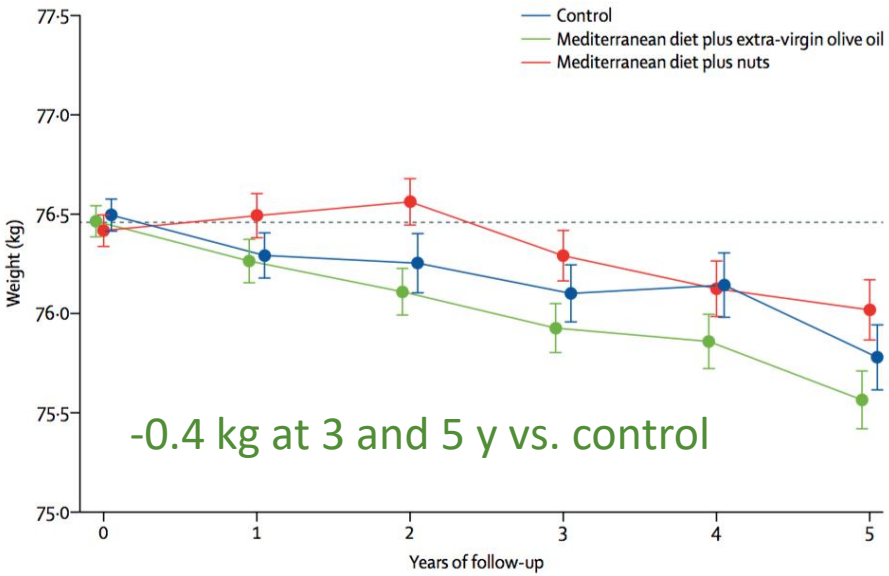


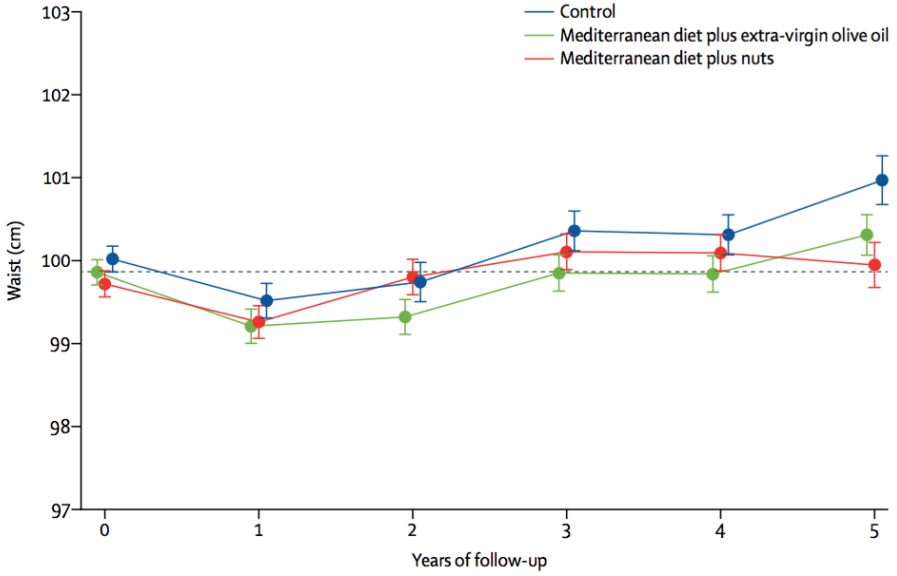
Martínez-González MA, PlosOne 2012

¿Long-term effect on weight of a high-fat diet in diabetic individuals?

PREDIMED

> 90% participants were overweight/obese





No differences (Nuts) or lower (EVOO) weight gain in MedDiet compared with control diet

Less gain (both) in central adiposity

MedDiet pattern in T2DM: no need of restricting healthy fats for weight maintenance!

Estruch R, Lancet Diabetes Endocrinol 2016

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Beneficial effect of weight loss in diabetes?

1. Diabetes prevention
2. Diabetes remission (bariatric surgery)

Life-Style weight loss interventions in overweight/obese T2DM

- RCT ≥ 12 months, 70% completion rate, 2000 on
- Strategy: life-style intervention compared to usual care or another diet
- HbA1c available at 12 months

Franz, MJ, J Acad Nutr Diet. 2015;115:1447-1463

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Life-Style weight loss interventions in overweight/obese T2DM

<5% weight loss@1 year: others

ε5% weight loss@1 year : MedDiet & LookAhead

	< 5% Weigth-loss	ε5% weight loss@1 year: MedDiet	ε5% weight loss@1 year: Look-Ahead
HbA1c (%)	-0,2	-1,25	-0,63
TC (mg/dl)	-4,4	-15,1	- -
LDLc (mg/dl)	-0,7	- -	-4-44
TG (mg/dl)	-1,2	-39	-29,3
HDL (mg/dl)	+1,2	+3,9	+3,37
SBP/DBP (mmHg)	-2,2/-3,5	-2,3/-4	-9,9/-3,1
p-value	all NS	all p<0.01	all p<0.01

Franz, MJ, J Acad Nutr Diet. 2015;115:1447-1463

Mediterranean diet for weight loss?

DIRECT Trial

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 JULY 17, 2008 VOL. 359 NO. 3

n=322 (36 T2DM)

Weight Loss with a Low-Carbohydrate, Mediterranean, or Low-Fat Diet

Iris Shai, R.D., Ph.D., Dan Schwarzfuchs, M.D., Yaakov Henkin, M.D., Danit R. Shahar, R.D., Ph.D., Shula Witkow, R.D., M.P.H., Ilana Greenberg, R.D., M.P.H., Rachel Golan, R.D., M.P.H., Drora Fraser, Ph.D., Arkady Bolotin, Ph.D., Hilel Vardi, M.Sc., Osnat Tangi-Rozental, B.A., Rachel Zuk-Ramot, R.N., Benjamin Sarusi, M.Sc., Dov Brickner, M.D., Ziva Schwartz, M.D., Einat Sheiner, M.D., Rachel Marko, M.Sc., Esther Katorza, M.Sc., Joachim Thiery, M.D., Georg Martin Fiedler, M.D., Matthias Blüher, M.D., Michael Stumvoll, M.D., and Meir J. Stampfer, M.D., Dr.P.H., for the Dietary Intervention Randomized Controlled Trial (DIRECT) Group

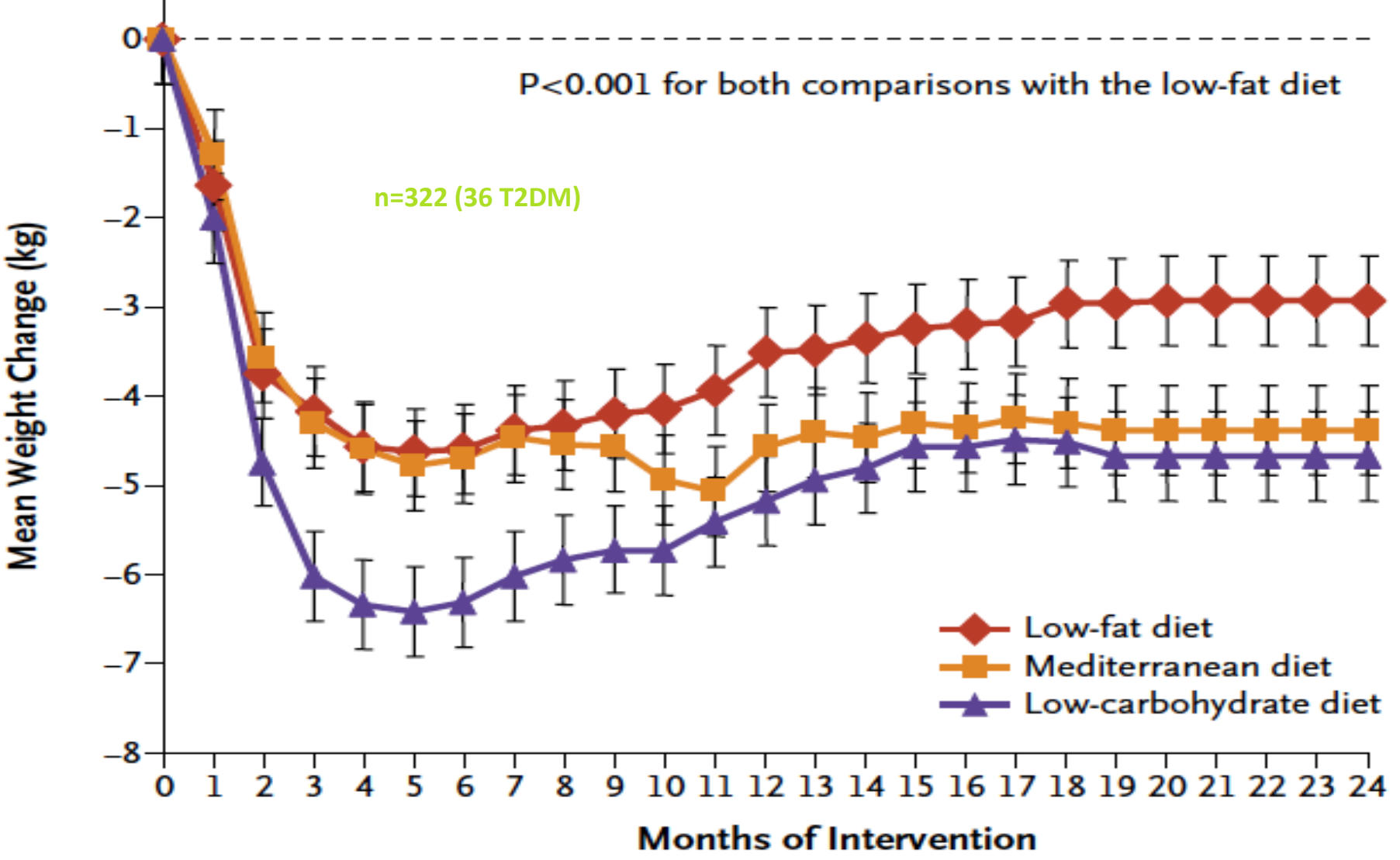
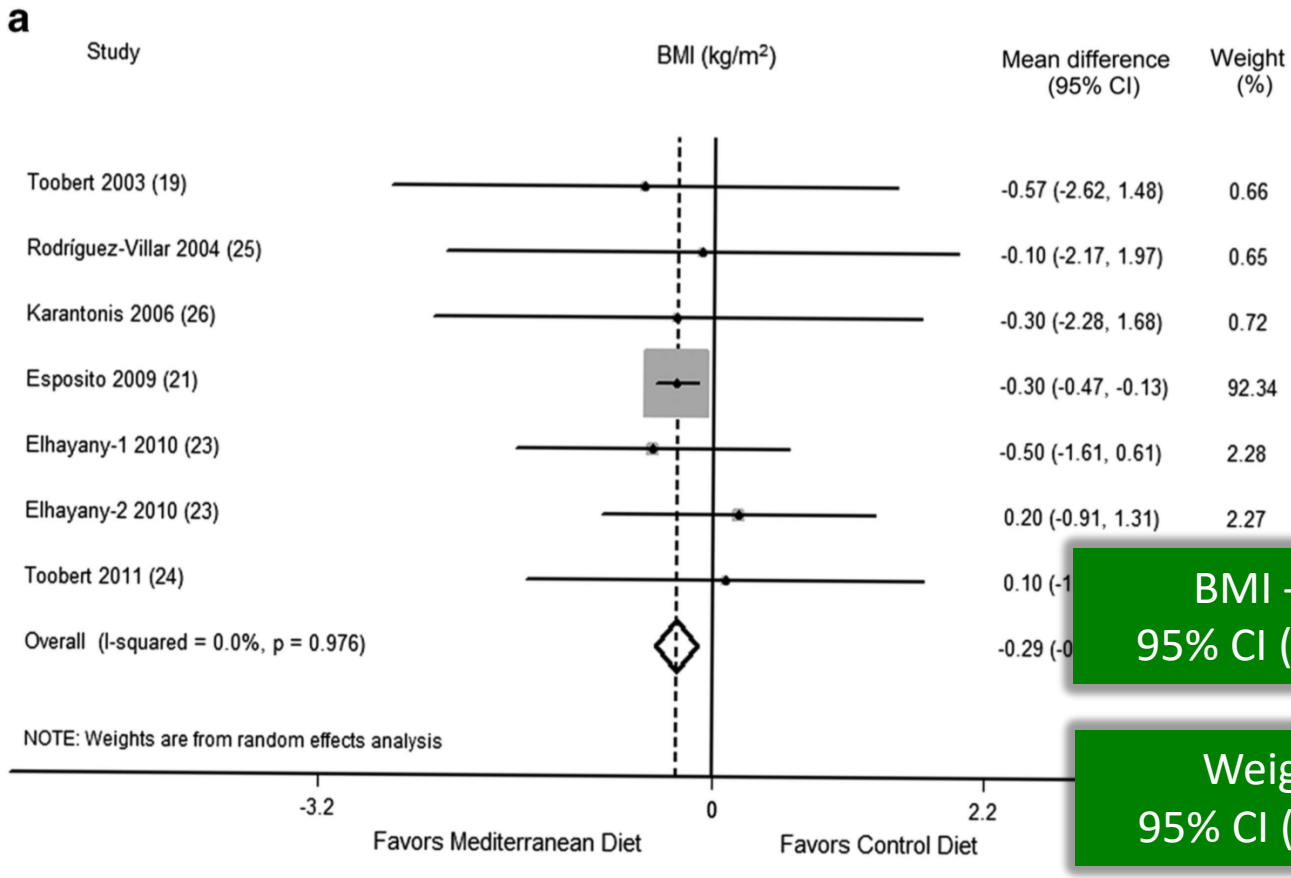


Figure 2. Weight Changes during 2 Years According to Diet Group.

Vertical bars indicate standard errors. To statistically evaluate the changes in weight measurements over time, generalized estimating equations were used, with the low-fat group as the reference group. The explanatory variables were age, sex, time point, and diet group.

Effect of MedDiet on body weight in T2DM: > 4 weeks intervention

- ✧ RCTs (7 parallel or 2 cross-over),
- ✧ MedDiet (4 wks-4years) vs. control diet
- ✧ 520 on MedDiet vs. 500 on control diet



BMI -0.29 kg/m²
95% CI (-0.46 to -0.12)

Weight -0.29 kg
95% CI (-0.55 to -0.04)

Huo, European Journal of Clinical Nutrition (2015) 69, 1200–1208

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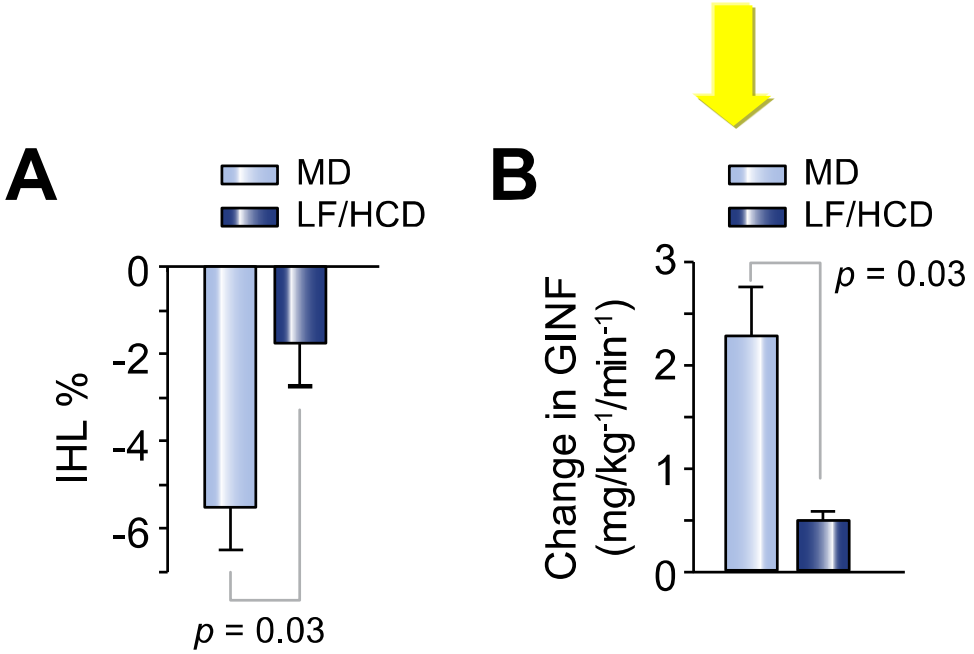
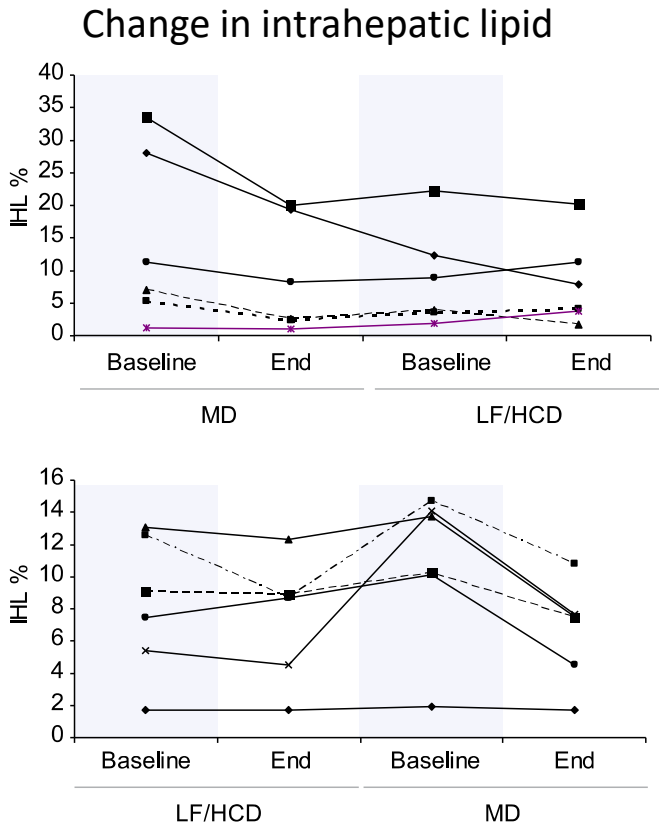
Mediterranean diet: visceral adipose tissue

Design + Intervention	n & population	Time	Results
* RCT, cross-over MedDiet vs. LF-HC MedDiet food, LF-HC standards	12, Australia, NAFLD+Met syndorme	42 d	**-39% vs. -7% IHL MD vs. LF-HC** **-HOMA ↓ and GINF ↑ with MD**



Magnetic resonance spectroscopy

3-h hyperinsulinaemic–euglycaemic clamp



* Ryan 2013 Journal of Hepatology

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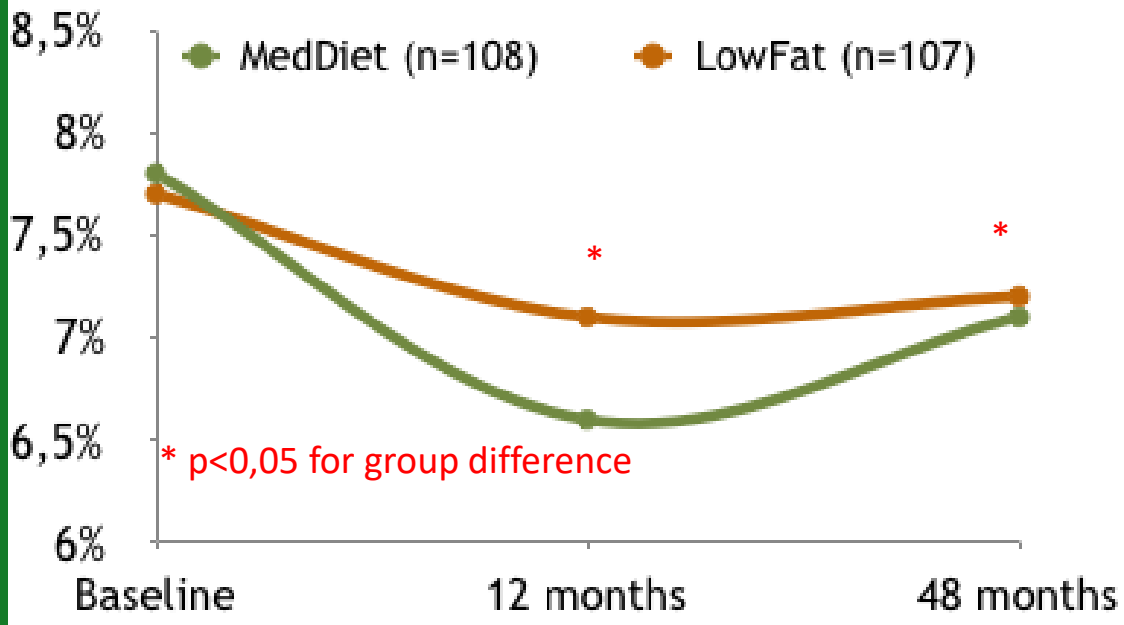
Effect of MedDiet on HbA1c in T2DM: long term RCT



- ♀/♂, 52 y , BMI 30 kg/m^2
- HbA1c 7,7%
- Newly T2DM, treatment naive
- **AHA diet (n=107) 1500/1800 low fat low cab <30% fat (<10% SAT)**
- **MedDiet (n=108) 1500 ♀/1800 ♂ kcal, 50% complex CH, > 30% Fat-olive oil**
- Energy intake -550 kcal/day
- PA intervention both groups

Esposito K Ann Intern Med. 2009;151:306-314

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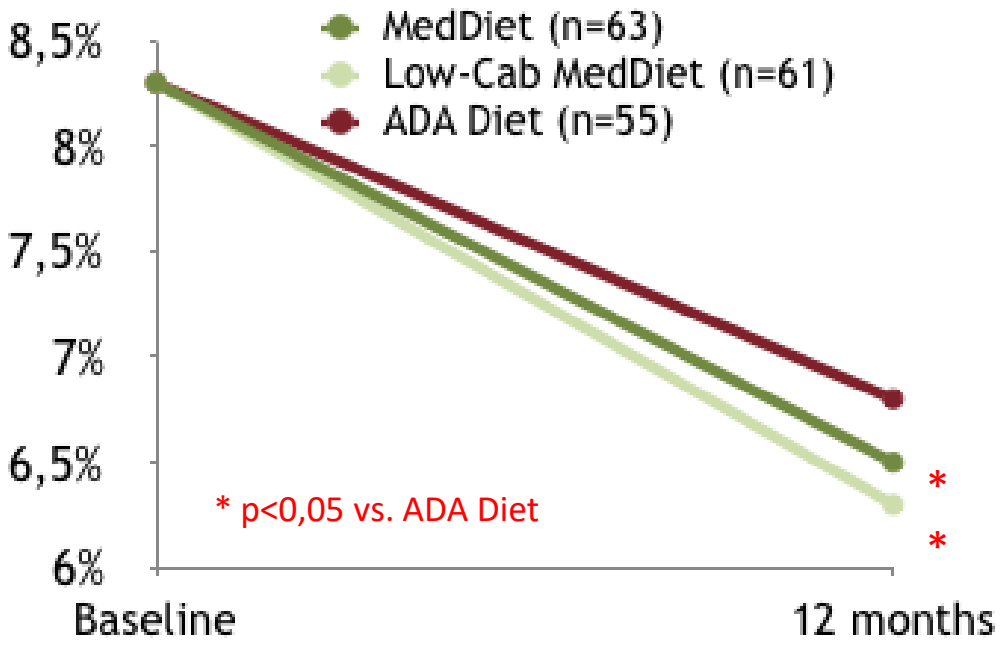
Effect of MedDiet on HbA1c in T2DM: long term RCT



- ♀/♂, 56 y , BMI 31 kg/m^2
- Baseline HbA1c 8,3%
- T2DM evolution 5-6 year
- **ADA diet (n=85) 50-55% mixed CH, 30% Fat**
- **MedDiet tradicional (n=89) 50-55% LGI CH, 30% Fat**
- **MedDiet lowCab (n=85) 35% LGI CH, 45% Fat (50% MUFA)**
- Average intake 2220 kcal/day
- No PA intervention

Elhayany A *Diabetes, Obesity and Metabolism* 12: 204-209, 2010

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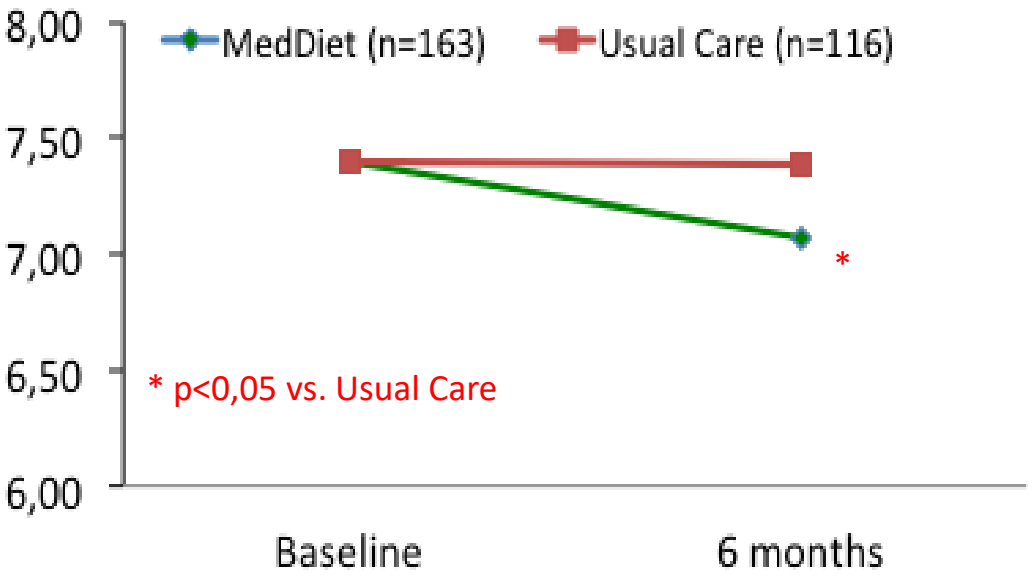
Effect of MedDiet on HbA1c in T2DM: long term RCT



- ♀menopausal, BMI 35 kg/m^2
- Baseline HbA1c 7,4%
- Treatment forT2DM 5 y
- T2DM duration 8,5 y
- **Usual Care (n=116)**
- **MedDiet (n=163)**
- PA, stress management, smoking, and social support intervention

Toobert DJ *Diabetes Care* 2003 26:2288–2293

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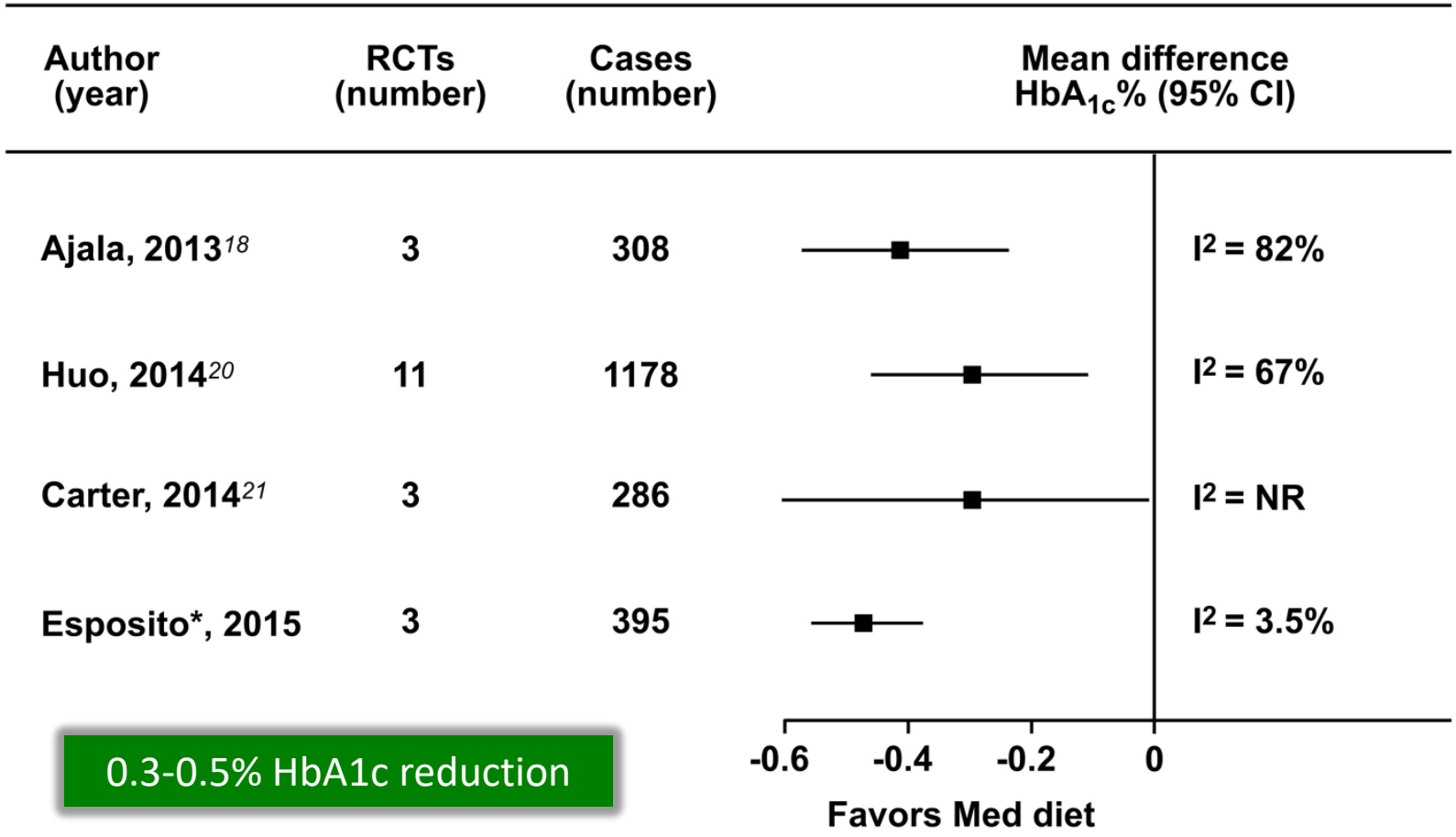
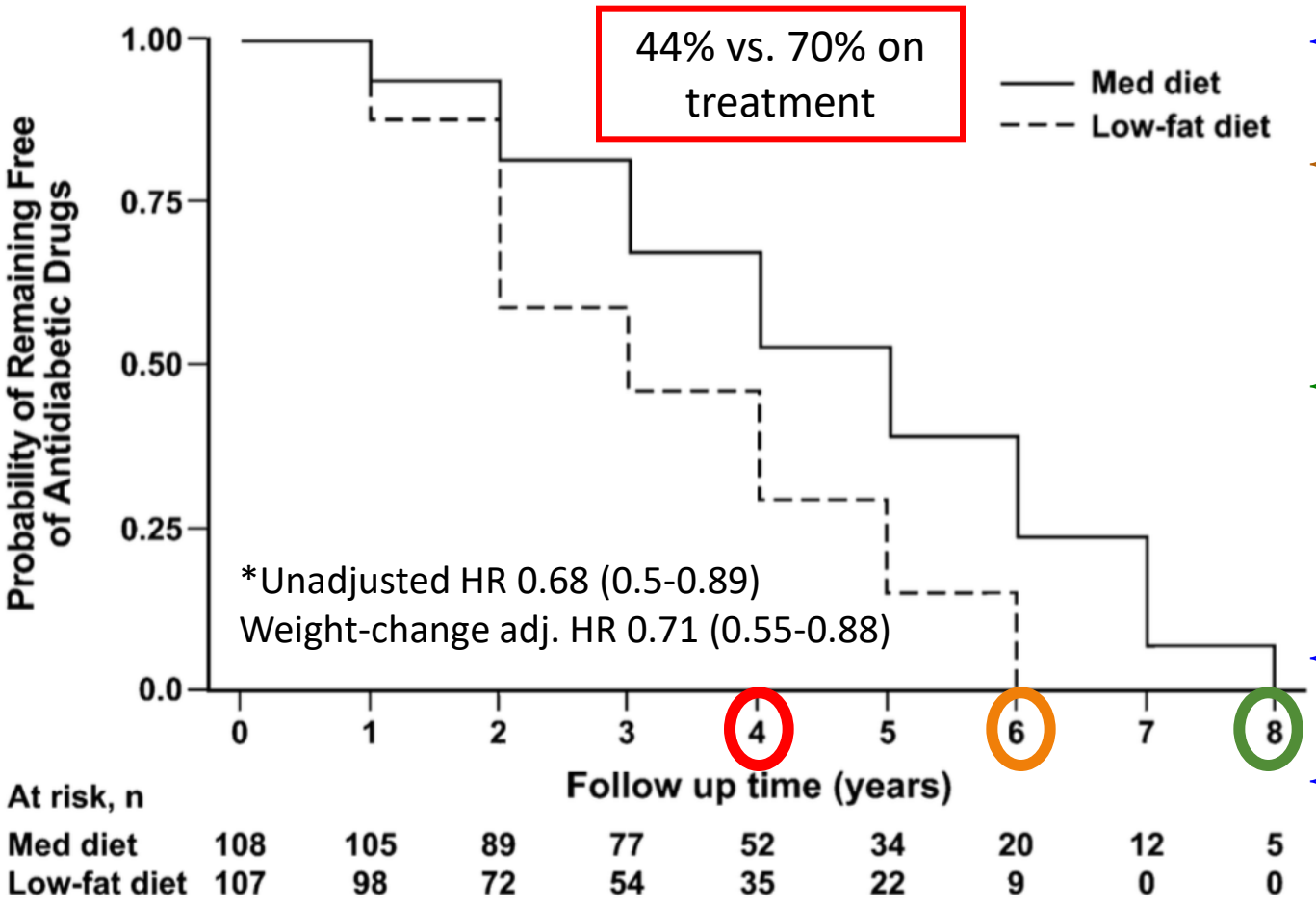
Effect of MedDiet on HbA1c in T2DM



0.3-0.5% HbA1c reduction

Esposito K, et al. BMJ Open 2015

Effect of MedDiet: need for diabetes medication

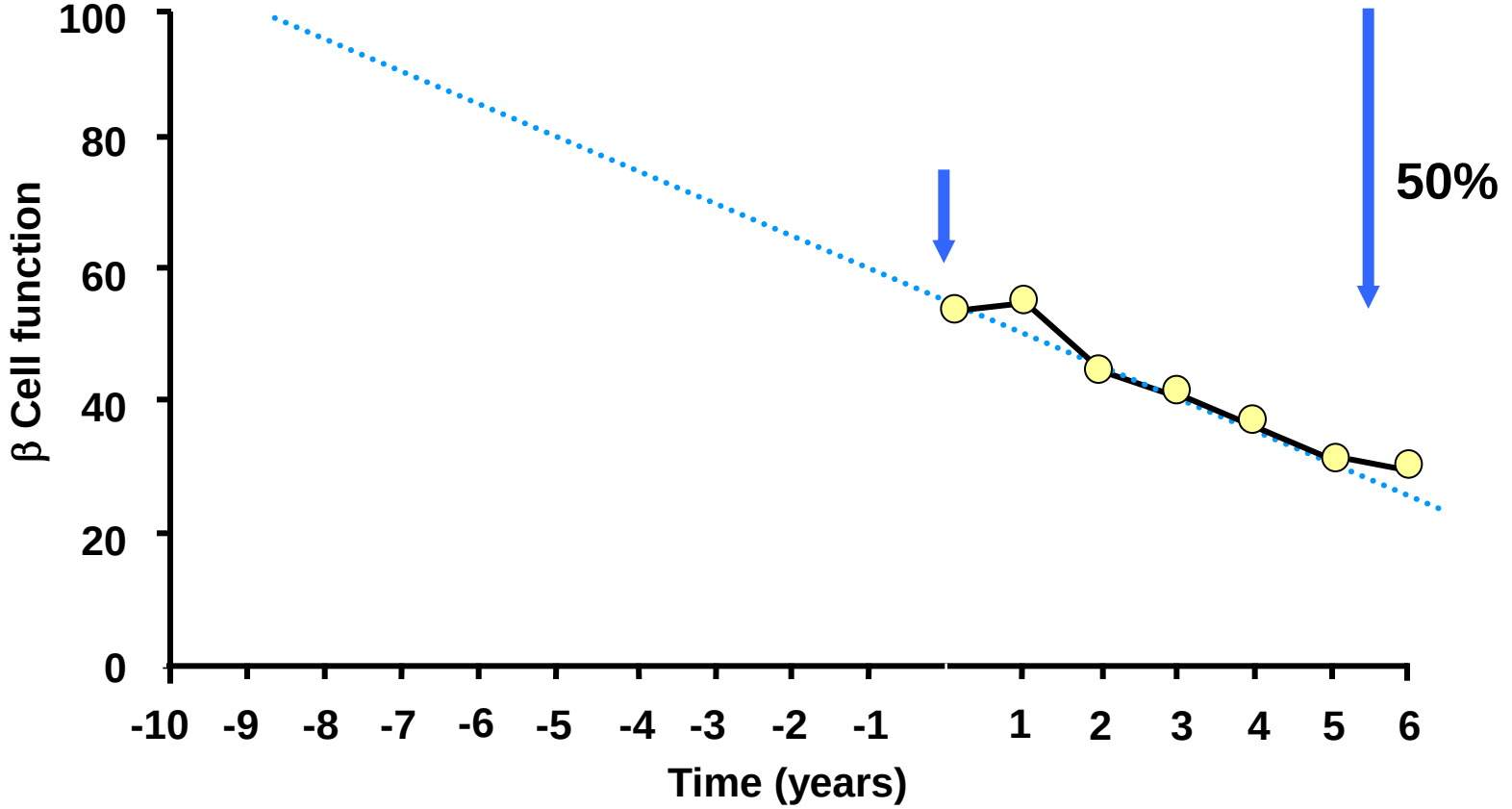


- ♀/♂, 52 y , BMI 30 kg/m^2, HbA1c 7,7%,
- **AHA diet (n=107) 1500/1800 low fat low cab <30% fat (<10% SAT)**
- **MedDiet (n=108) 1500 ♀/1800 ♂ kcal, 50% complex CH, > 30% Fat-olive oil**
- Energy intake -550 kcal/day
- PA intervention both groups

*Similar results for HbA1c > 7% as primary outcome: HR 0.66 (0.52-0.90)

Esposito Diabetes Care 2015

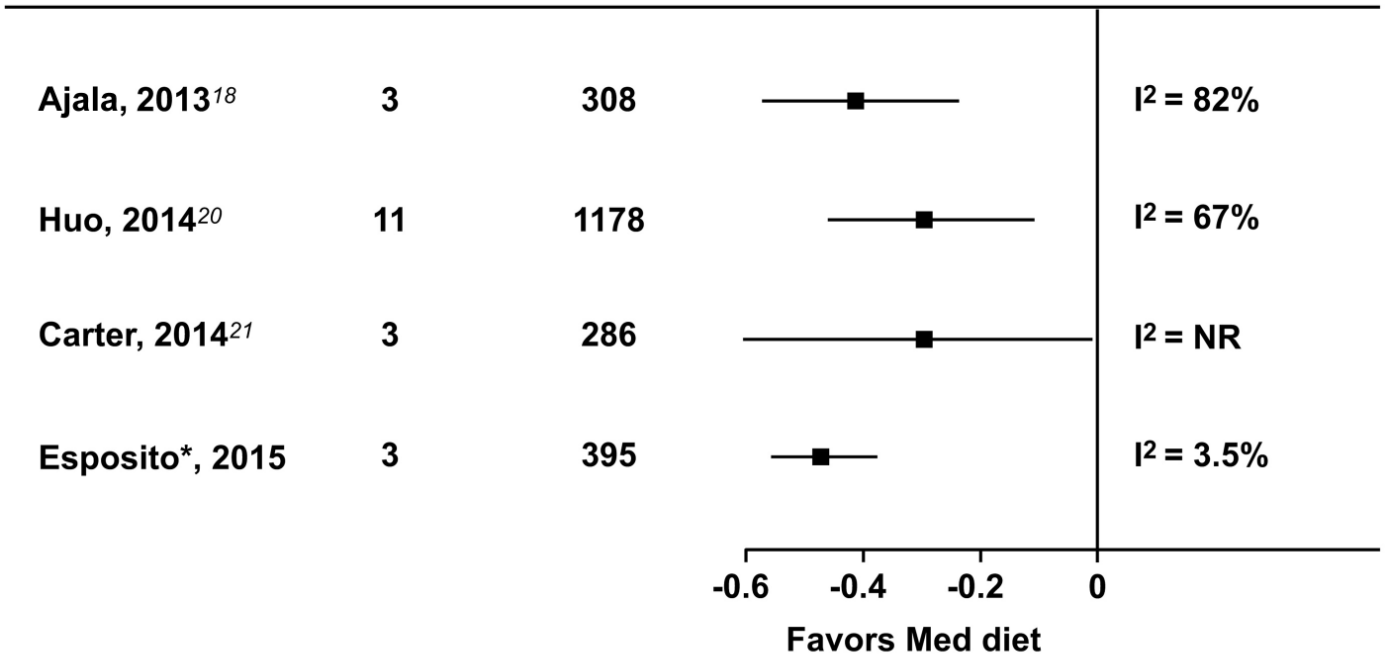
CLÍNIC BARCELONA Hospital Universitari



Holman RR. *Diabetes Res Clin Prac* 1998; 40 (Suppl.):S21–S25.

Effect of MedDiet on total cholesterol in T2DM

- Systematic review of meta-analyses RCTs of MedDiet and T2DM or prediabetes
- 'de novo' meta-analyses on the same topic



Total cholesterol -5,4 mg/dl
95% CI (-3,5 to -7,3)

Esposito K, et al. BMJ Open 2015

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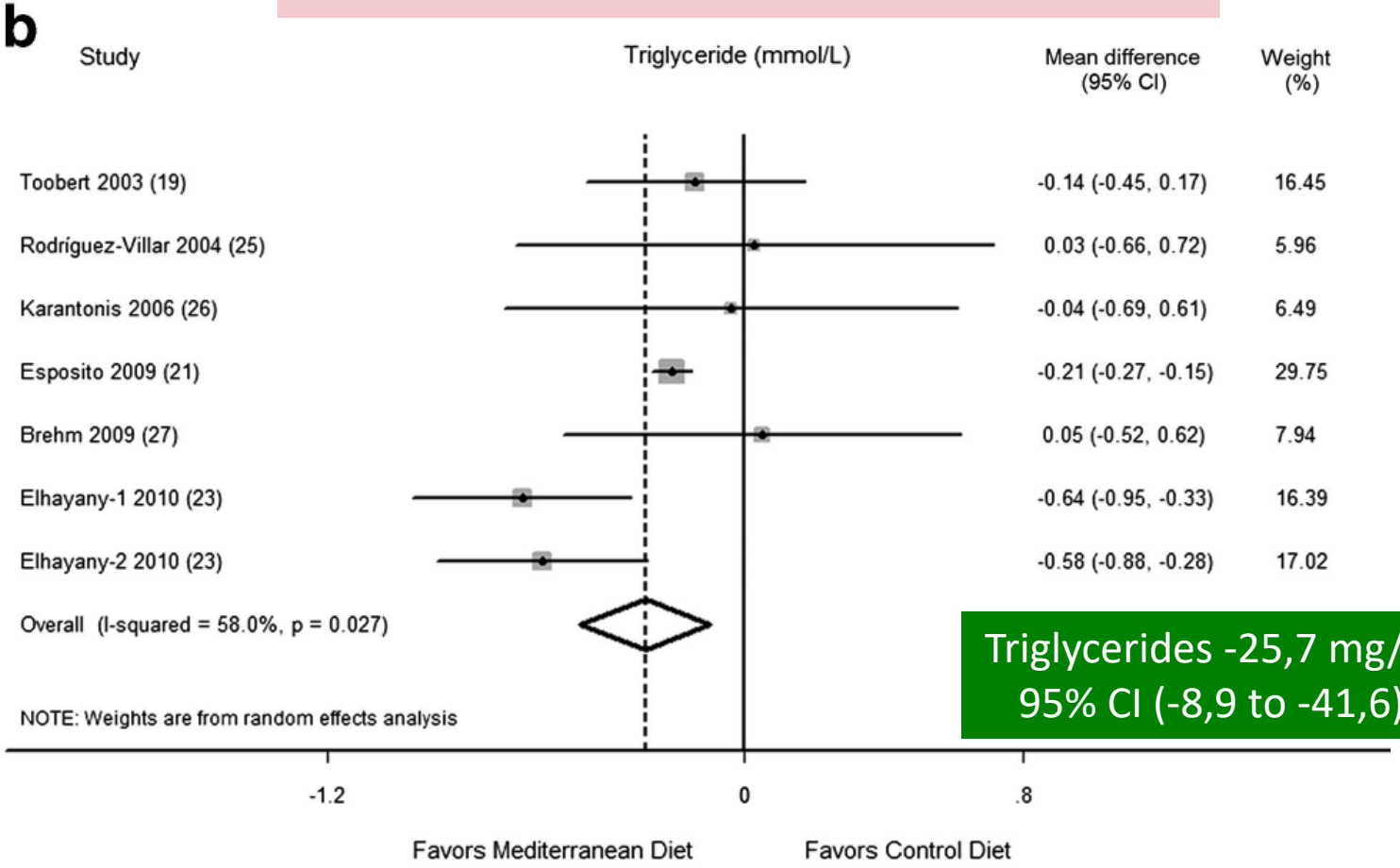
Effect of MedDiet on triglycerides in T2DM

- ✧ RCTs (7 parallel or 2 cross-over),
- ✧ MedDiet (4 wks-4years) vs. control diet
- ✧ 1178 individuals



Triglycerides -25,7 mg/dl
95% CI (-8,9 to -41,6)

Huo, European Journal of Clinical Nutrition (2015) 69, 1200–1208

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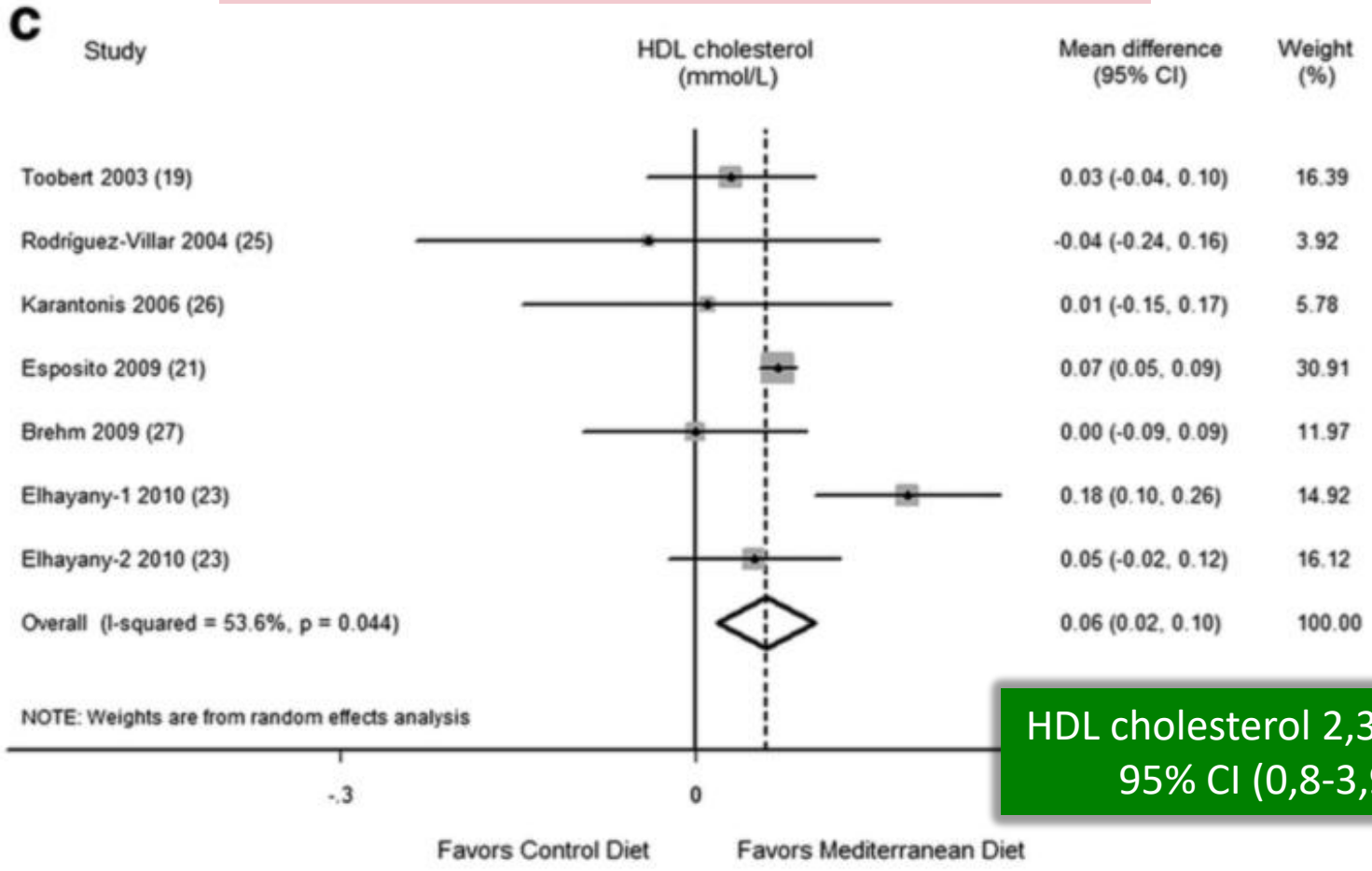
Effect of MedDiet on HDLc in T2DM

- ✧ RCTs (7 parallel or 2 cross-over)
- ✧ MedDiet (4 wks-4years) vs. control diet
- ✧ 1178 individuals



HDL cholesterol 2,3 mg/dl
95% CI (0,8-3,9)

Huo, European Journal of Clinical Nutrition (2015) 69, 1200–1208

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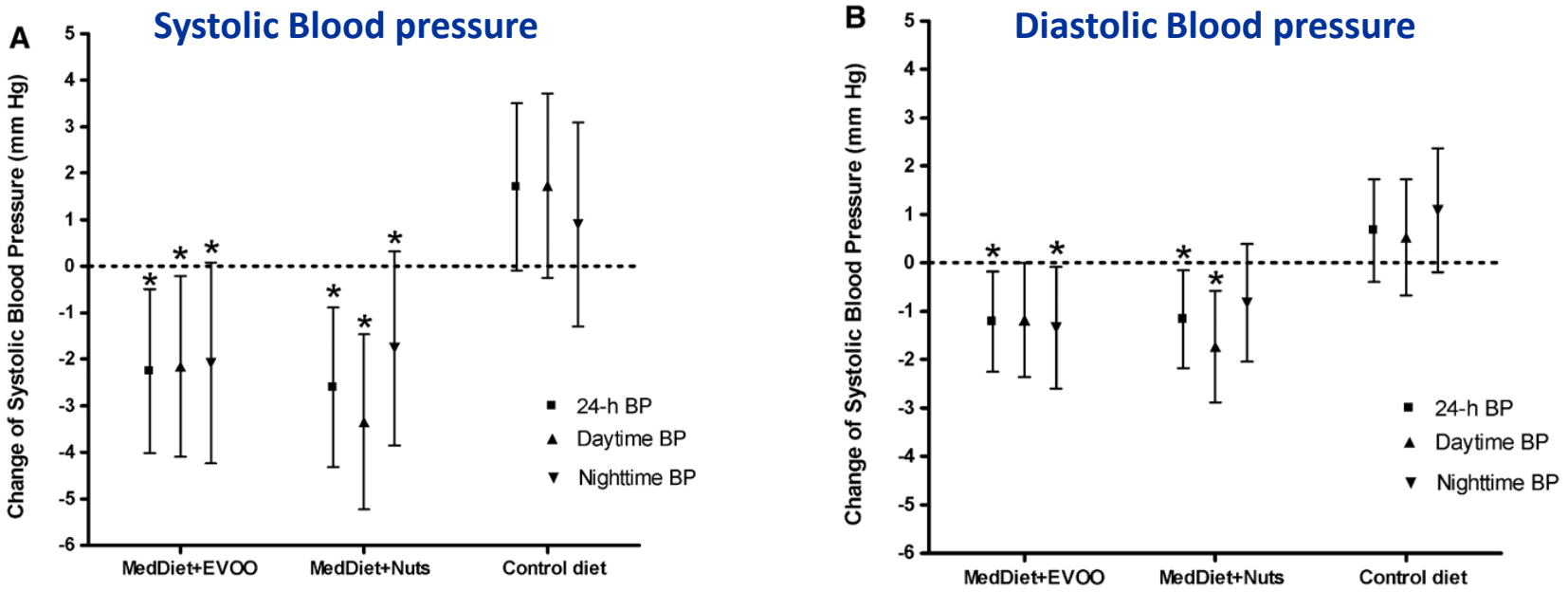
Effect of MedDiet on blood pressure in T2DM

24h-ABP Measurement



Sig. interaction T2DM (n=85)/control (n=151), indicating greater BP reduction in T2DM

- ✧ MedDiet (4 wks-4years) vs. control diet
- ✧ 1178 individuals
- ✧ RCTs (7 parallel or 2 cross-over)

SBP (−1.45mmHg; CI, − 1.97 to − 0.94)
DBP (−1.41 mmHg; CI, −1.84 to −0.97)

Domenech M, Hypertension 2014 & Huo EJCN 2015

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Microvascular complications: effect of MedDiet

Outcomes	MedDiet-EVOO	MedDiet-Nuts	Control group
Diabetic retinopathy, n	1282	1142	1190
Cases, n/person-years of follow-up	22/7830	20/6622	32/6856
Multivariable-adjusted model 1†	0.56 (0.32–0.97)	0.63 (0.35–1.11)	1 (Ref.)
Multivariable-adjusted model 1†	0.60 (0.37–0.96)		1 (Ref.)
Diabetic nephropathy, n	740	672	717
Cases, n/person-years of follow-up	64/4419	51/3985	53/4180
Multivariable-adjusted model 1†	1.15 (0.79–1.67)	1.06 (0.72–1.58)	1 (Ref.)
Multivariable-adjusted model 1†	1.11 (0.79–1.55)		1 (Ref.)

Cox regression models with outcome of diabetic retinopathy and diabetic nephropathy and exposure to MedDiet intervention group vs. control group. †Model adjusted for age, sex, BMI, waist, smoking, physical activity, education, hypertension, dyslipidemia, family history of premature CHD, and baseline adherence to the MedDiet. **Baseline HbA1c or HbA1c changes not availables**

Díaz-López Diabetes Care Volume 38, 2015

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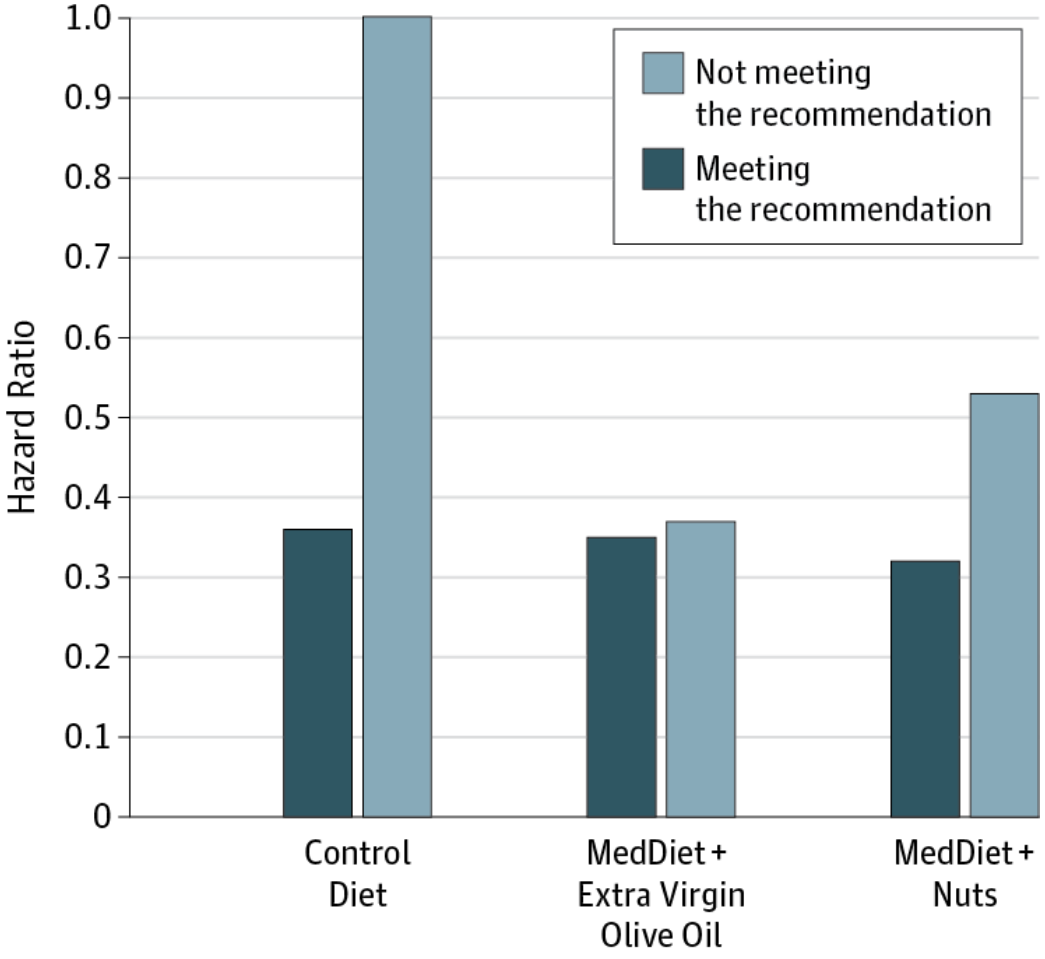
Diabetic retinopathy (DR): effect of MedDiet

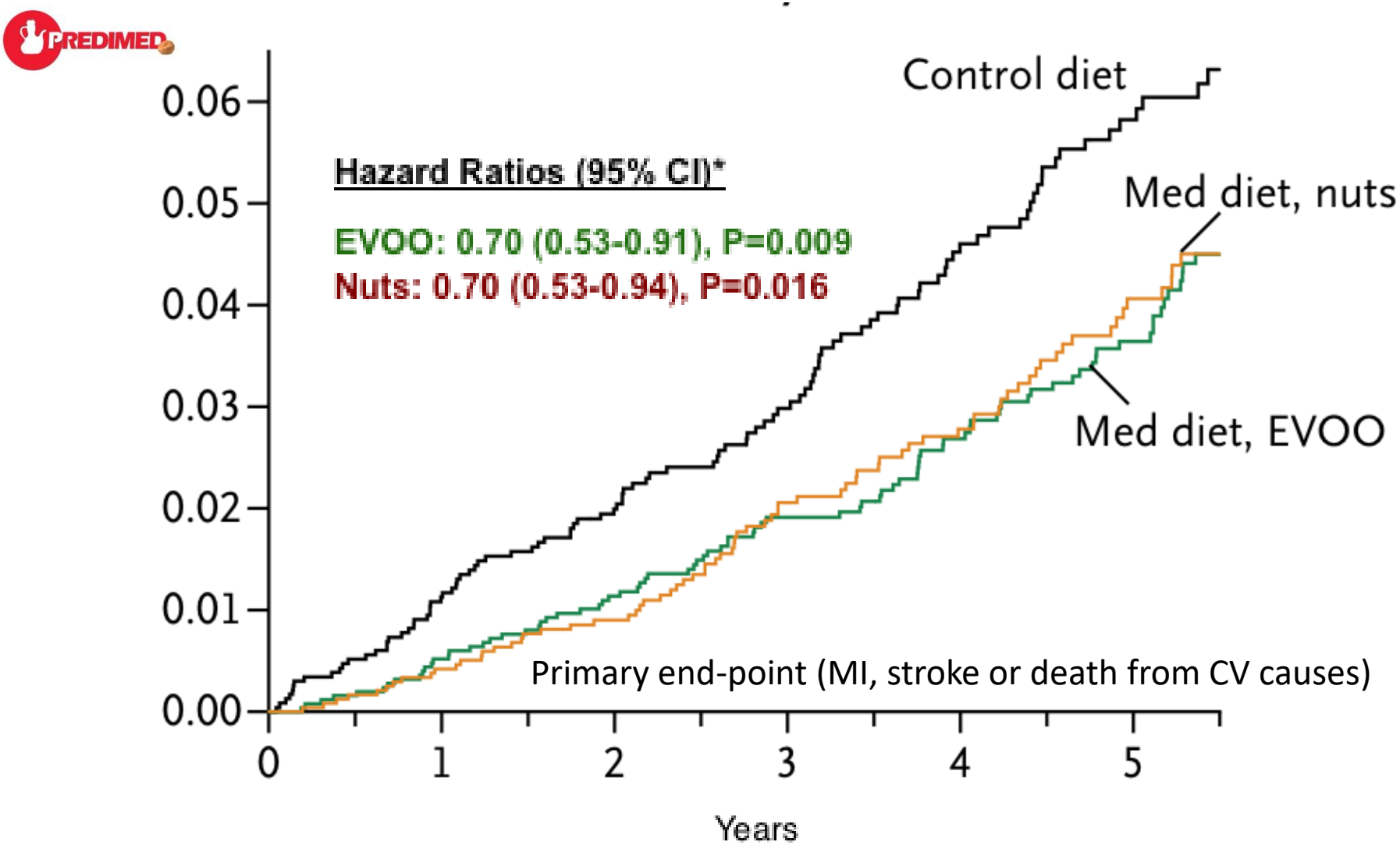
- Adjusted risk of DR among participants meeting LCω3PUFA (≥ 500 mg/d, ≥ 2 w servings of oily fish) recommendation: **0.52 (0.31-0.88), p =0.001**

- Higher effect for hypertensive patients, longer T2DM duration, and insulin users



Sala-Vila A, JAMA Ophthal 2016

Macrovascular complications: effect of MedDiet



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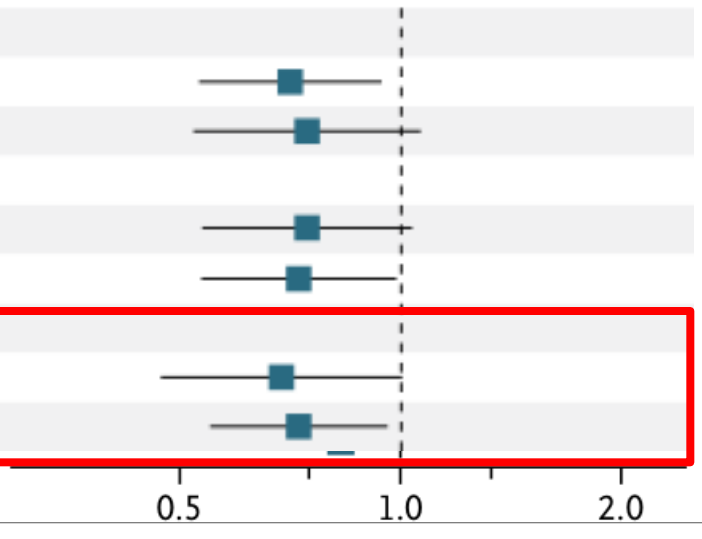
ORIGINAL ARTICLE

Primary Prevention of Cardiovascular Disease with a Mediterranean Diet

Subgroup	Combined Med Diets	Control Diet
	no. of participants with primary end-point event/total no. of participants	
Sex		
Male	107/2178	64/987
Female	72/2819	45/1463
Age		
<70 yr	86/3272	47/1504
≥70 yr	93/1725	62/946
Diabetes		
No	58/2572	40/1261
Yes	121/2425	69/1189



2016 ADA Standards of Medical Care in Diabetes

Topic		Evidence
Patterns and macronutrient	Carbohydrate intake from **whole grains, vegetables, fruits, legumes, and dairy products**, with an emphasis on foods **higher in fiber** and lower in glycemic load, should be advised over other sources, especially those containing sugars.	**B**
Dietary Fat	**Mediterranean-style diet (rich in MUFA**) an effective ***alternative*** to a diet low in total fat but relatively high in carbohydrates (ref 63 (PREDIMED),66, 67 (DIRECT), 68)	**B**
	Eating foods rich in long-chain omega-3 fatty acids, such as **fatty fish** (EPA and DHA) and **nuts and seeds** (ALA), is recommended to prevent or treat CVD B; evidence does not support a beneficial role for omega-3 dietary supplements. A	**B, A**
Alcohol	Adults with diabetes who drink **alcohol** should do so in **moderation** (1 drink for ♀, 2 drinks for ♂).	**C**

"Mediterranean diet is based on consuming proximity products mostly associated with the latitude (weather conditions) where the mediterranean sea is located rather than its proximity to this sea"

http://www.paralelo40.es/

Mediterranean adherence in Spain

di@bet.es

N=5076 (2899/2177 F/M)	Scores*, according to frequency of consumption (times/week) number of subjects (n) and percentage (%))					
	0	1	2	3	4	5
***Frequency n (%)**						
Vegetables	≤ 1 month 353 (7)	2-6 1684 (33)	7 2111 (42)	14 795 (16)	21 119 (2)	>21 14 (0)
Legumes and nuts	≤ 1 month 127 (3)	2-3 month 130 (3)	1 1088 (21)	2-3 2331 (46)	4-6 638 (12)	≥7 762 (15)
Nonrefined cereals	≤ 1 month 3571 (70)	2-6 360 (7)	7 617 (12)	14 345 (7)	21 162 (3)	>21 21 (1)
Fish	≤ 1 month 96 (2)	2-3 month 52 (1)	1 596 (12)	2-3 2266 (45)	4-6 1369 (27)	≥7 697 (13)
Fruit	≤ 1 month 483 (10)	2-3 469 (9)	4-6 334 (7)	7 1304 (26)	14 1487 (29)	>14 999 (19)
Potatoes	≤ 2-3 month 294 (6)	1 676 (13)	2-3 2201 (43)	4-6 1386 (27)	7 489 (10)	>14 30 (1)
*Wine males	≤ 2-3/month or > 21/w 1118 (51)	21 33 (2)	1-3 420 (19)	4-6 72 (3)	14 221 (10)	7 313 (14)
*Wine females	≤ 2-3/month or > 14/w 2182 (75)	1 208 (7)	2-3 198 (7)	4-6 53 (2)	14 62 (2)	7 196 (7)
Dairy products	>28 week 195 (4)	28 455 (9)	21 1167 (23)	14 1749 (34)	7 1071 (21)	≤ 4-6 439 (9)
Meat and meat products	>14 week 75 (2)	14 612 (12)	7 1936 (38)	4-6 1316 (26)	2-3 965 (19)	≤1 172 (3)

*Panagiotakos' score ATTICA Study

Ortega E, Ann Nutr Metab. 2013;62(4):339-46

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¿Effect of globalization (global dietary trends) on MedDiet adherence in Spain?

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	Lowest 5-23 (n=1854)	Middle 23-26 (n=1574)	Highest 26-38 (n=1648)	p-value	*Age-adj. p value
Age (years)	**45.6 ± 17.3**	**50.7 ± 16.6**	**55.5 ± 15.5**	**<0.0001**	--
Female sex	1065 (57)	945 (60)	889 (54)	0.002	0.36
BMI (kg/m2)	28.1 ± 5.6	28.1 ± 5.1	28.1 ± 4.8	0.203	<0.0001
Obesity (BMI > 30 kg/m^2) †	554 (30)	486 (31)	504 (31)	0.782	<0.0001
Waist (cm)	93.5 ± 14.5	93.9 ± 14.3	94.8 ± 13.7	0.002	<0.0001
Education (University)	239 (13)	249 (16)	307 (19)	<0.001	<0.001
Current Smoker	581 (31)	425 (27)	312 (19)	<0.001	<0.001
Physical exercise (once a week)	570 (31)	579 (37)	777 (47)	<0.001	<0.001

Ortega E, Ann Nutr Metab 2013;62(4):339-46

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Is Mediterranean diet recommended to diabetic patients?

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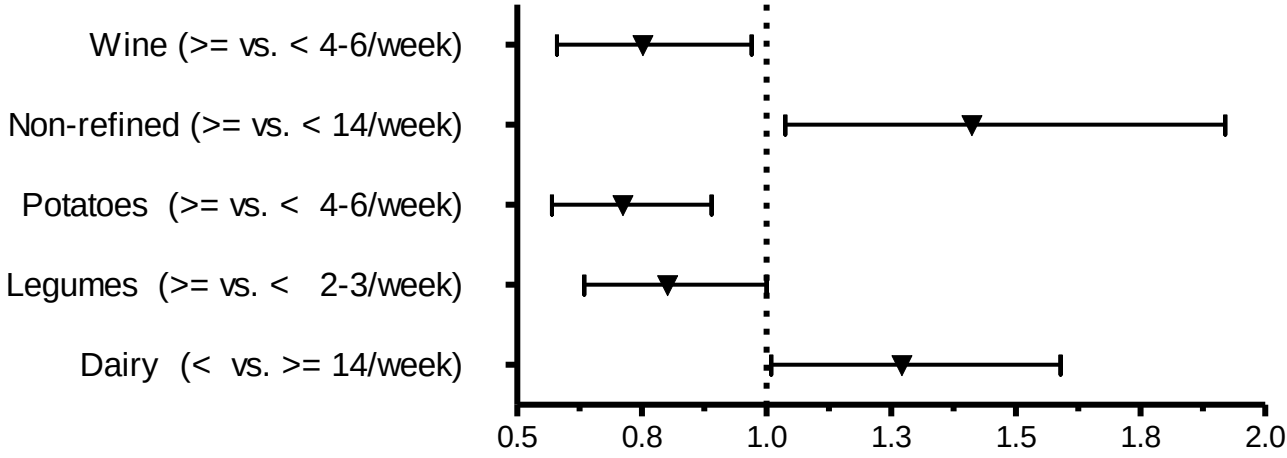
Kwon diabetes (n=478) vs. NORMAL (n=3772)	MedScore (0-50) 5 point increment		
	OR	95% CI	p value
Age-adjusted model	0.97	0.87-1.07	0.517
Age-and-sex- adjusted model	0.95	0.86-1.06	0.386
Multiple adjusted model	1.00	0.89-1.14	0.888

Association between adherence to MedDiet and diabetes (compared to NORMAL)

Figure.
Probability of food-group recommended consumption in diabetic individuals.
No difference for other food group components of the Mediterranean Score



Ortega E, Ann Nutr Metab. 2013;62(4):339-46

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Mediterranean diet adherence in individuals with prediabetic and unknown diabetes

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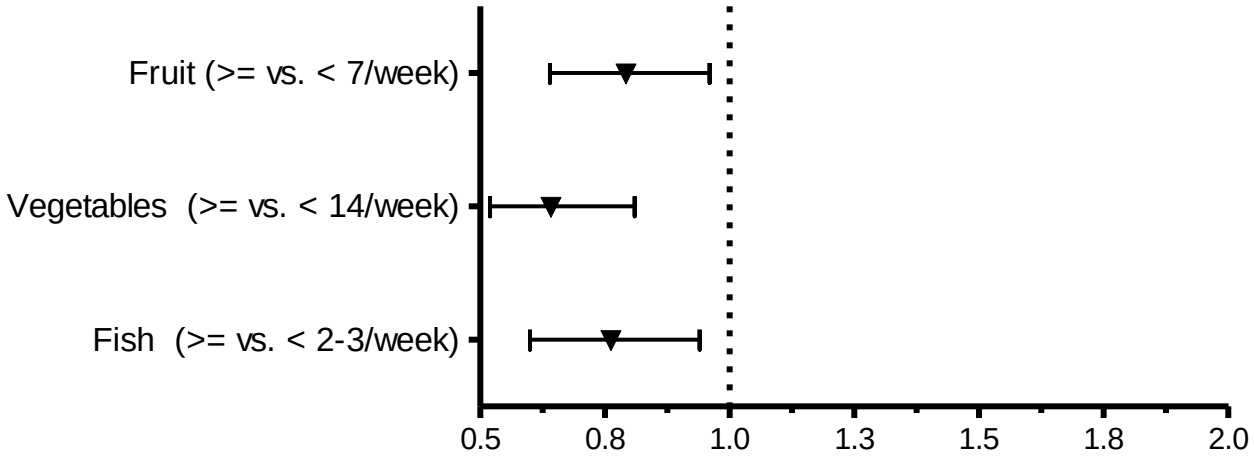
PREDM/UKDM (n=826) vs. NORMAL (n=3772)	MedScore (0-50) 5 point increment		
	OR	95% CI	p value
Age-adjusted model	0.88	0.81-0.96	0.003
Age-and-sex- adjusted model	0.87	0.80-0.95	0.002
Multiple adjusted model	0.89	0.82-0.98	0.018

Association between adherence to MedDiet and PREDM/UKDM compared to NORMAL

Figure.
Probability of food-group recommended consumption in prediabetic or unknown diabetic individuals.
No difference for other food group components of the Mediterranean Score



Ortega E, Ann Nutr Metab. 2013;62(4):339-46

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My conclusions

- Mediterranean diet (MedDiet) is available, useful, and a better option diet strategy for T2DM individuals in terms of weight loss/maintenance, HbA1c reduction, and control of CVRF
  - compared with other dietary patterns
  - short (>4 weeks)-long (>6 months) term follow-up
  - small number of participants in RCT
  - short term duration or newly diagnosed T2DM
  - low cab MedDiet could be the most useful approach
- In terms of diabetes associated chronic complications (in particular CVD) MedDiet is the gold standard and therefore should be the initial dietary pattern in T2DM

There is no one size fits all eating pattern for “all types” of type 2 diabetes…

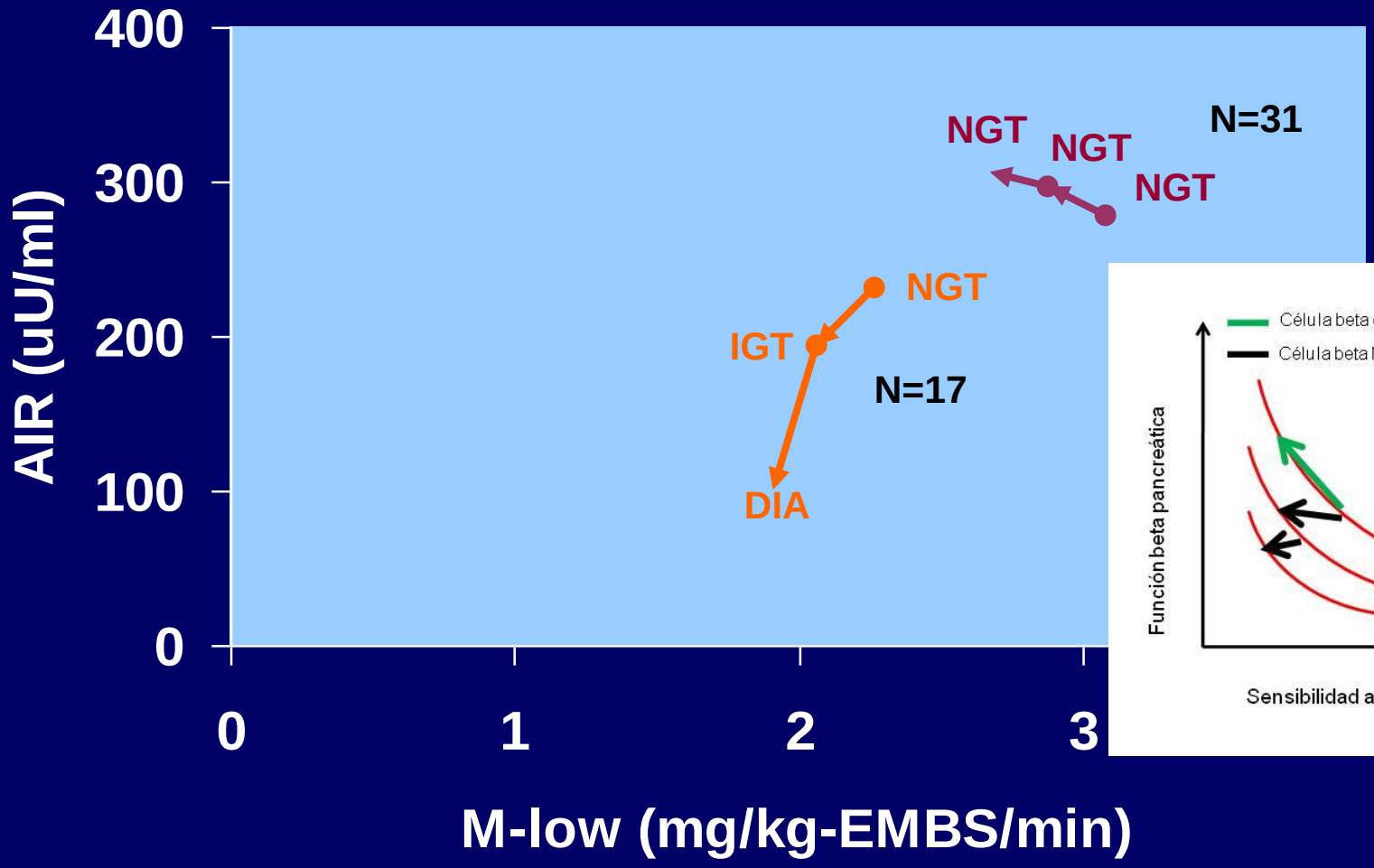
Liniers @porliniers

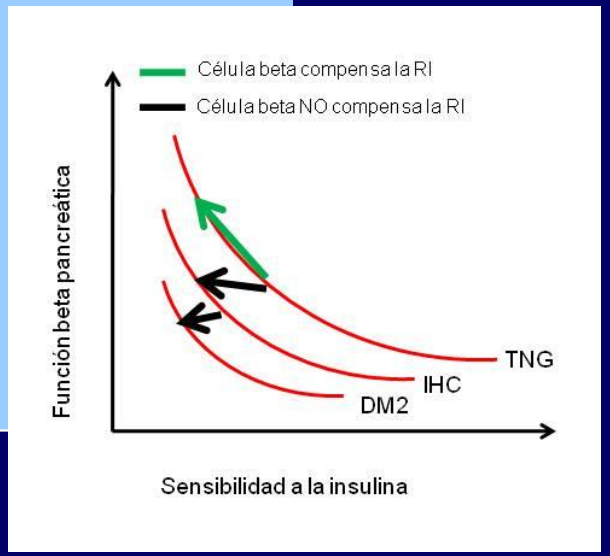
…but a Mediterranean dietary pattern approach should be the initial point to start with in most of them

Muchas gracias por vuestra atención

Longitudinal Study of the Transition from NGT to Type 2 Diabetes

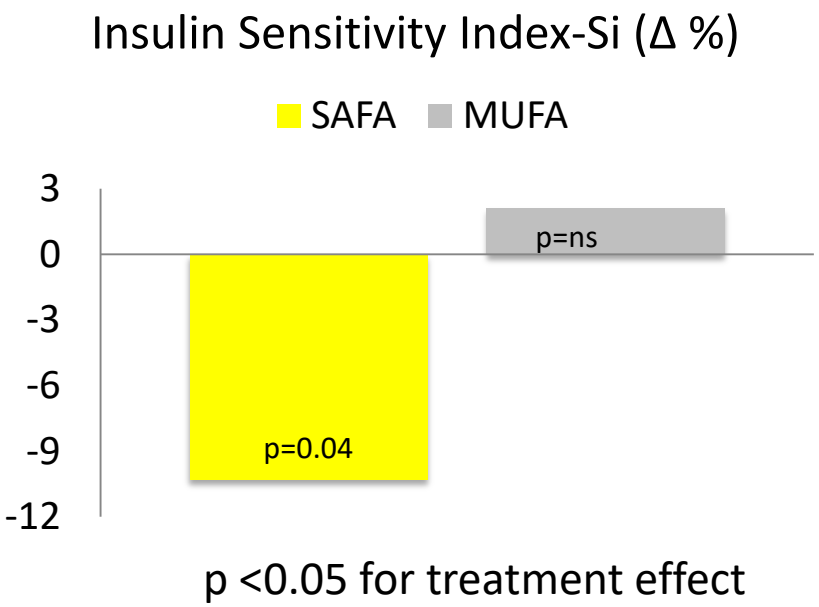
Early Insulin Response vs Insulin Action



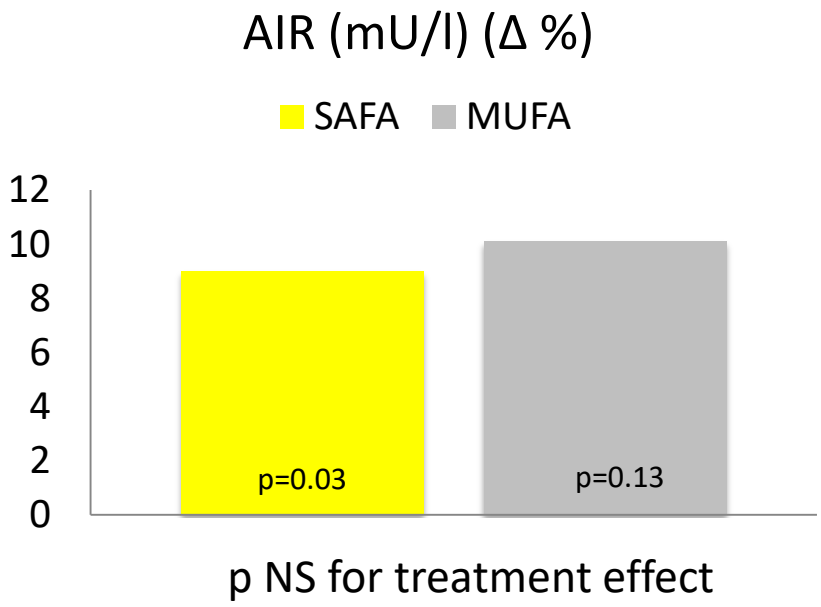


Adapted from Weyer et al, 1999

MedDiet increases insulin sensitivity



p <0.05 for treatment effect



p NS for treatment effect

Disposition Index (IVGTT)= Si x AIR
1.SAFA Δ DI = -2%
2.MUFA Δ DI = +12%

Vessby (KAMWU Study) 2001 Diabetologia

Pérez-Jimenez 2001 Diabetologia, Paniagua 2007 Diabetes Care, Ryan 2013 J Hepat

Bos 2010 NMCD, Jebb 2010 AJCN, Tierney 2011 IJO

Nutrient Composition of the Diet in the Treatment Group

ENERGY RESTRICTED MEDITERRANEAN DIET	
Nutrients	**Recommended Intake**
Calories	Reduction of ≈600 kcal/day (≈30% of energy) from usual intake
Total fat	**35-40%** of energy
Saturated fatty acids	8-10% of energy
Monounsaturated fatty acids	Up to 20% of energy
Polyunsaturated fatty acids	Up to 10% of energy
Cholesterol	< 300 mg/day
Protein	≈**20%** of energy
Carbohydrate	**40-45%** of energy (low glycemic index)
Dietary fiber	**30-35** g/day
Sodium chloride	≤100 mmol/day (≈2.4 g of sodium or ≈6 g of salt)
Calcium	1000-1500 mg/day
Alcohol	Up to 1 glass of wine for men and ½ for women