

# A Healthful Plant-based Dietary Pattern is Favorably Associated with Lipid Profile in Adults with Heterozygous Familial Hypercholesterolemia

Clémence Desjardins<sup>1,2</sup>, Valérie Guay<sup>1,2</sup>, Maryka Rancourt-Bouchard<sup>1,2</sup>, Jacob Lessard-Lord<sup>1,2</sup>, Patrick Couture<sup>1,3,4</sup>, Anne Gangloff<sup>3,4</sup>, Marie-Annick Clavel<sup>5</sup>, Jonatan Blais<sup>3,4</sup>, Jean-Philippe Drouin-Chartier<sup>1,2</sup>.

(1) NUTRISS (Nutrition, Health and Society) Research Center, Institute on Nutrition and Functional Foods, Laval University, 2440 Hochelaga Boulevard, Quebec City, Canada; (2) Faculty of Pharmacy, Laval University, 1050 Medicine Avenue, Quebec City, Canada; (3) Faculty of Medicine, Laval University, 1050 Medicine Avenue, Quebec City, Canada; (4) CHU de Québec Research Center, Laval University, 2705 Laurier Boulevard, Quebec City, Canada; (5) Quebec Heart and Lung Institute Research Center, 2725 Chemin Ste-Foy, Quebec City, Canada.





## BACKGROUND & AIM

- Heterozygous familial hypercholesterolemia (HeFH) is a genetic disorder that disrupts the normal clearance of apolipoprotein B (apoB)-containing low-density lipoproteins (LDLs) from the plasma, resulting in a marked hypercholesterolemia across the lifespan [1]. This condition affects 34 million individuals worldwide, making it the most prevalent genetic disorder causing premature atherosclerotic cardiovascular diseases (CVDs) [2].
- In HeFH, CVD prevention relies on LDL-cholesterol (LDL-C)-lowering medication use, in addition to healthy lifestyle habits, with diet being a cornerstone [3].
- While diets rich in minimally processed plant foods are associated with a lower CVD risk in the general population [4], this association has never been studied in adults with HeFH [5].
- This is a major issue to address as the drug-centered approach to CVD prevention has led to a devaluation of the importance of diet and is now documented as a barrier to healthy eating among adults with HeFH [6].

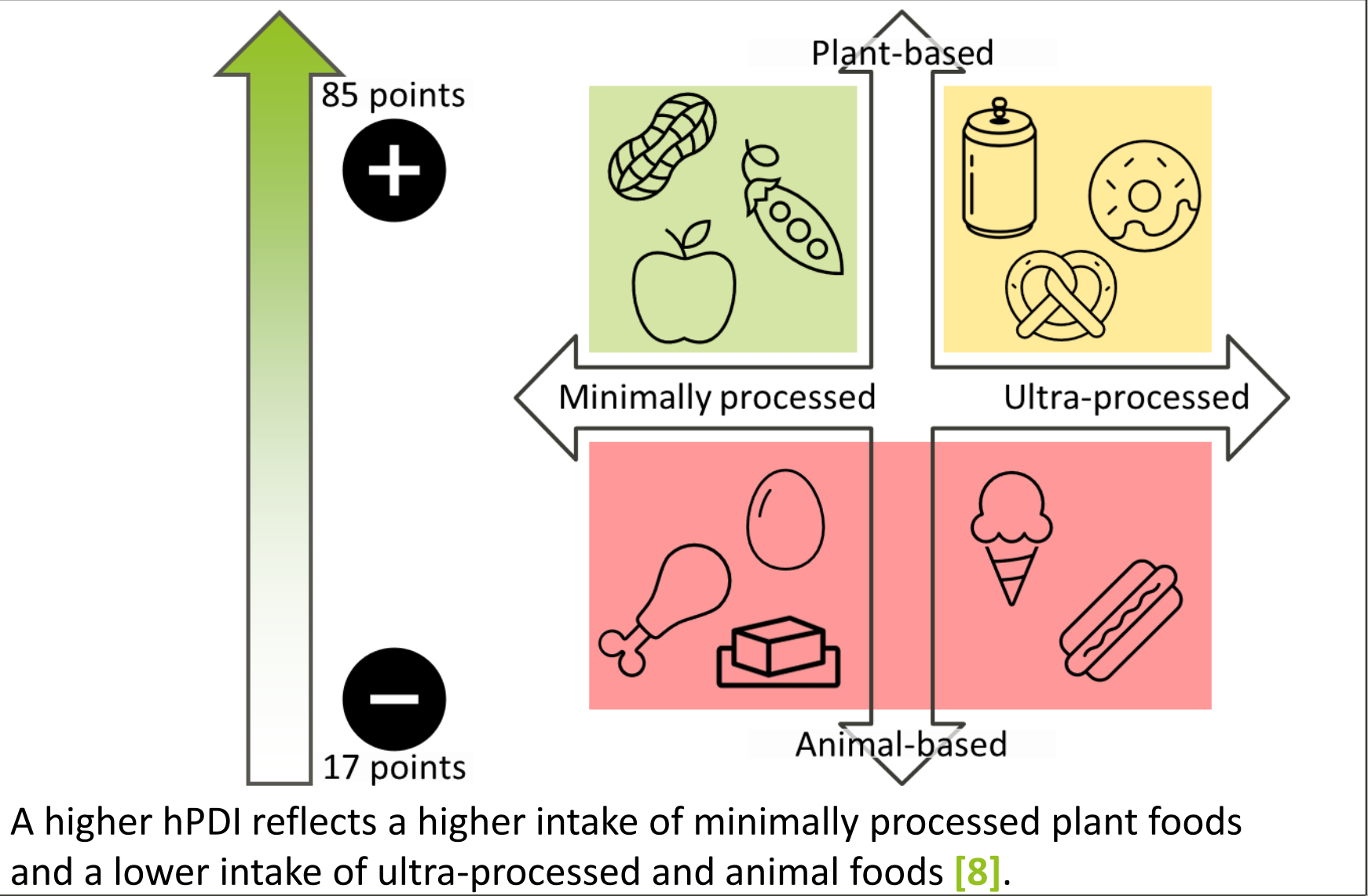
We aimed to assess the association between a **dietary pattern high in minimally processed plant foods** and **lipid profile** in adults with HeFH.

## METHODS

- Cross-sectional study
  - Recruitment at the local lipid clinic
  - n=252 adults with genetically-diagnosed HeFH
- Data collection was carried out in 2 stages** (~ 1 week apart)

1 Web-based questionnaires	2 In-person visit
 <ul style="list-style-type: none"><li>Personal and socio-economic characteristics</li><li>Food frequency questionnaire [7]</li></ul>	 <ul style="list-style-type: none"><li>Pill containers / pharmacy receipts → LDL-C-lowering medication</li><li>Fasting blood sample → Lipid profile</li><li>Anthropometric measurements</li></ul>

## Healthful Plant-based Diet Index (hPDI)



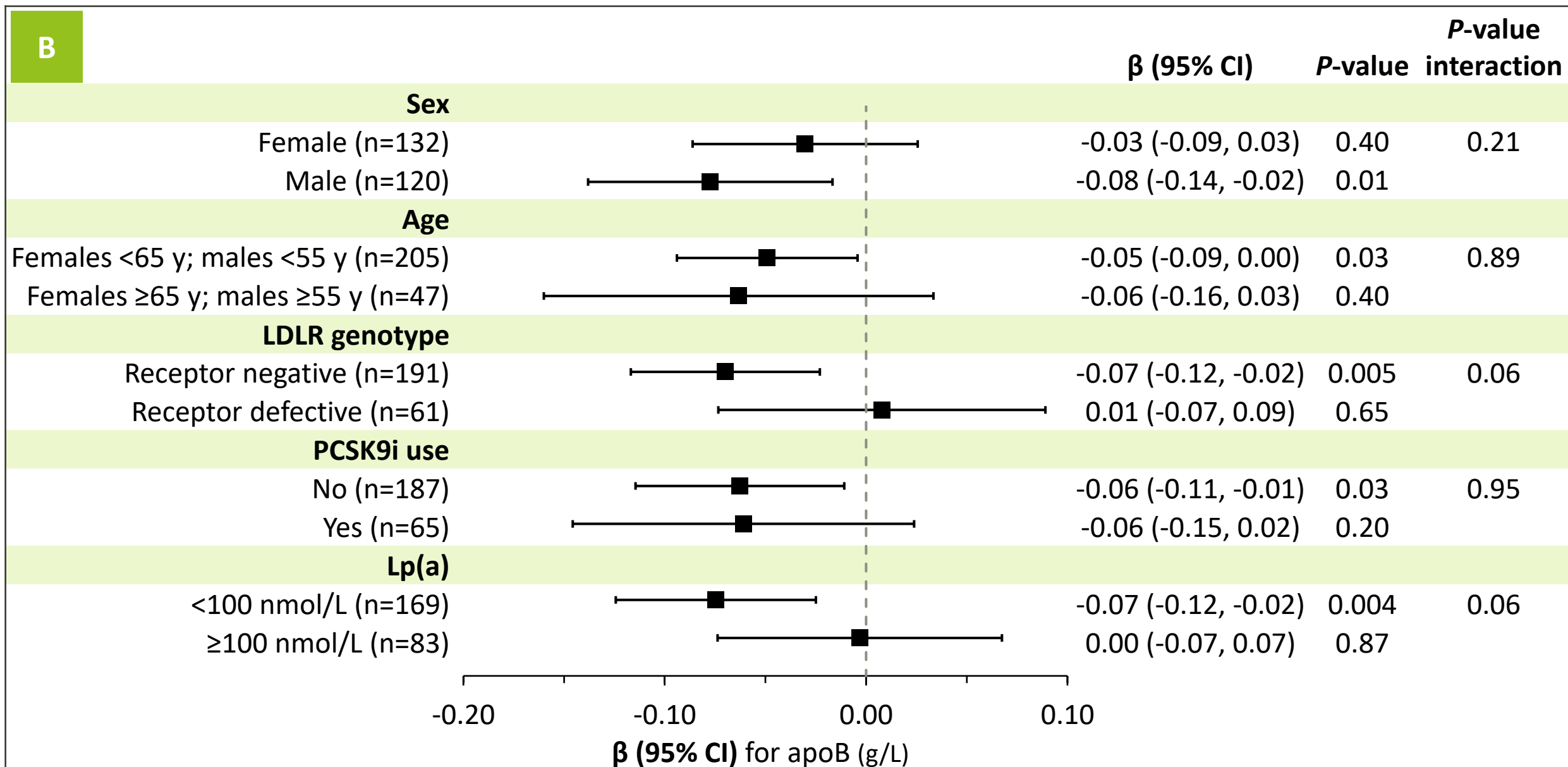
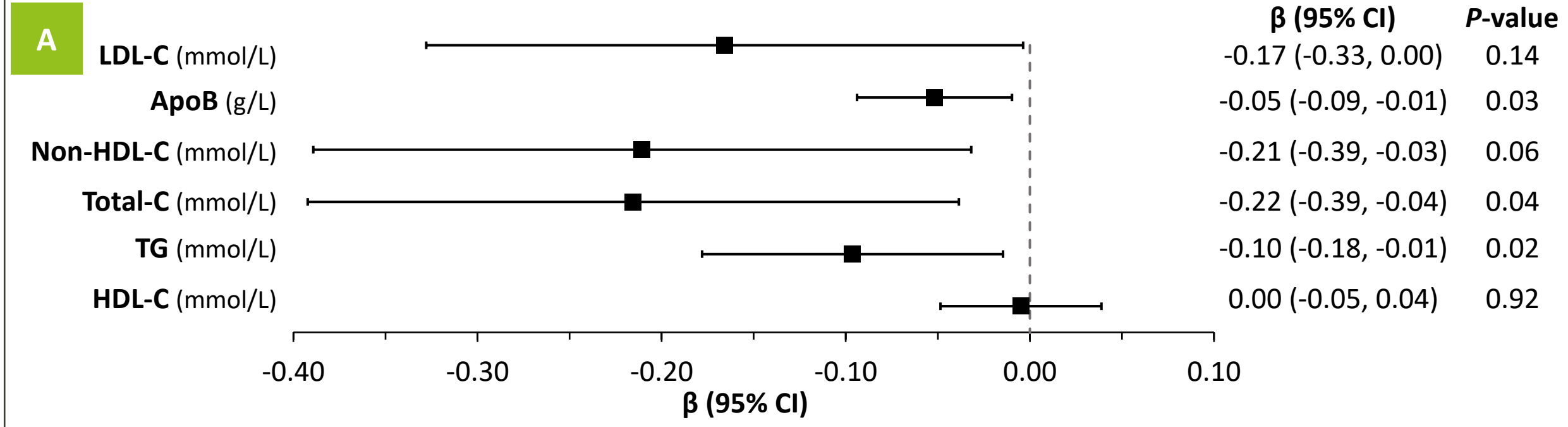
A higher hPDI reflects a higher intake of minimally processed plant foods and a lower intake of ultra-processed and animal foods [8].

## RESULTS

**Table 1.** Participants’ characteristics, according to quartiles of the hPDI.

Characteristics	Quartiles of the hPDI			
	Q1 (n=62)	Q2 (n=64)	Q3 (n=61)	Q4 (n=65)
Age, years	40.6 ± 12.4	47.7 ± 14.1	45.5 ± 14.9	49.1 ± 13.8
Sex, n (%)				
Female	31 (50)	35 (55)	31 (51)	35 (54)
Male	31 (50)	29 (45)	30 (49)	30 (46)
LDLR genotype, n (%)				
Receptor negative	45 (73)	49 (77)	46 (75)	51 (78)
Receptor defective	17 (27)	15 (23)	15 (25)	14 (22)
LDL-C-lowering medication, n (%)				
No medication	4 (6.5)	1 (1.6)	2 (3.3)	1 (1.5)
Statin and/or ezetimibe	45 (73)	41 (64)	46 (75)	47 (72)
PCSK9i ± oral therapy	13 (21)	22 (34)	13 (21)	17 (26)
Prevalent hypertension, n (%)	17 (27)	19 (30)	10 (16)	15 (23)
Prevalent type 2 diabetes, n (%)	1 (1.6)	2 (3.1)	2 (3.3)	2 (3.1)
Prevalent CVD, n (%)	1 (1.6)	9 (14)	3 (4.9)	5 (7.7)
Ever smoking, n (%)	18 (29)	22 (34)	14 (23)	22 (34)
Body mass index, kg/m <sup>2</sup>	28.6 ± 5.0	27.5 ± 4.7	27.2 ± 5.1	26.1 ± 4.8
Diet composition				
hPDI, /85 points	39.9 ± 3.6	47.5 ± 1.8	52.7 ± 1.5	61.1 ± 4.5
Energy, kcal/day	2,406 ± 664	2,145 ± 721	1,956 ± 717	1,922 ± 614
Total fat, % of energy	34.2 ± 5.1	34.2 ± 6.1	35.4 ± 7.3	34.5 ± 7.1
Saturated fat, % of energy	12.6 ± 2.9	11.5 ± 2.5	11.2 ± 2.7	9.5 ± 2.4
Monounsaturated fat, % of energy	13.2 ± 2.0	13.9 ± 2.9	14.8 ± 4.2	14.9 ± 3.8
Polyunsaturated fat, % of energy	5.8 ± 1.3	6.1 ± 1.3	6.6 ± 1.3	7.5 ± 2.2
Trans fat, g/day	4.5 ± 1.5	3.5 ± 1.6	2.9 ± 1.4	2.1 ± 0.9
Dietary cholesterol, mg/day	299 ± 100	266 ± 104	233 ± 117	171 ± 78
Dietary fiber, g/day	21.0 ± 7.7	22.8 ± 10.3	23.1 ± 9.2	30.6 ± 13.3
Alcohol, g/day	11.5 ± 15.3	12.2 ± 15.0	10.0 ± 11.1	10.1 ± 9.5

Continuous variables are presented as unadjusted means ± standard deviation. Categorical variables are presented as count (percent).



**Figure 1.** Association between the hPDI and plasma lipids. **A.** Difference in LDL-C, total-C, HDL-C, TG, non-HDL-C, and apoB for with each 10% increment in the hPDI. **B.** Difference in apoB for each 10% increment in the hPDI, after stratification for participants’ characteristics. Models adjusted for sex, LDLR genotype, age, LDL-C-lowering medication, prevalent hypertension and diabetes, smoking status, energy and alcohol intake, body mass index. *P*-values were calculated from models performed on log-transformed data.

## CONCLUSIONS

- In this cross-sectional study conducted within a cohort of 252 adults with HeFH, a diet rich in minimally processed plant foods was favorably associated with lipid profile. Such dietary patterns tend to contain, among other things, higher amounts of fiber and unsaturated fats, with lower amounts of saturated fat and dietary cholesterol [4], contributing to their lipid-lowering potential.
- The inverse relationship between the hPDI and apoB levels appeared more pronounced among participants with a negative LDLR genotype, and among those with Lp(a) levels <100 nmol/L.
- Overall, this study supports the clinical importance of emphasizing healthful, plant-rich dietary patterns in the management of HeFH. Given the current lack of conclusive data on HeFH’s dietary management, these findings may support strategies aimed at enhancing adherence to heart-healthy eating patterns among individuals with this condition. Moreover, subgroup analyses point towards the potential health-improving effects of precision nutrition approaches for HeFH management.

**References**

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[3] Brunham *et al.*, *CJC*, 2018. [7] Labonté *et al.*, *Eur J Clin Nutr*, 2012.  
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**Abbreviations**

ApoB, apolipoprotein B; CI, confidence interval; CVD, cardiovascular disease; HDL-C, high-density lipoprotein cholesterol; HeFH, heterozygous familial hypercholesterolemia; hPDI, healthful plant-based diet index; LDL-C, low-density lipoprotein cholesterol; LDLR, LDL-receptor; Lp(a), lipoprotein(a); PCSK9i, proprotein convertase subtilisin/kexin type 9 inhibitor; TG, triglycerides; Total-C, total cholesterol.

