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Prevalence of American heart association's¨Life's Essential 8¨in a cohort of Latino women

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HIGHLIGHTS

- The new Life's Essential Eight (LE8) score arose in 2022 to promote ideal cardiovascular health (CVH).
- LE8 was assessed in a Chilean women (35 to 70 yo) cohort to measure the prevalence of ideal CVH. The mean LE8 score was 62.7 points, 11.5 % (1 in 9 women) had an ideal high CVH (≥80 points).
- The best-accomplished metrics were blood glucose, physical activity, and the worst diet and nicotine exposure.
- Adjusted regression analysis showed that a high education level significantly and independently improved the mean LE8 score, driven by positive improvements in lipids, blood pressure, body mass index, diet, and physical activity.
- These findings provide the first assessment of LE8 score in Latino women living outside the US and underline that social determinants of health, such as education level, are pivotal to achieving health wellness.

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ABSTRACT

The ideal cardiovascular health (CVH) construct has recently been updated to¨Life's Essential 8(LE8).
Objective: to determine LE8′s prevalence and its association with sociodemographic and socioeconomic determinants in a Latino women cohort in Santiago de Chile.
Methods: Cross-sectional study on 619 women between 35 and 70 years old, representing 1.359.509 women (after expansion factors). LE8 was assessed through a survey on demographic and CV risk factors, as well as anthropometric, blood pressure, and biochemical measurements. The overall LE8 score was estimated for all participants, ranging from 0 to 100 (≥80 points, high CVH and < 50 points, low CVH). Besides, the score for each metric was determined. A descriptive analysis was performed with sample weights for the overall sample, and stratified by age, education, family income level and civil status. A regression analysis was performed adjusted by age group, family income and education level to determine the association of sociodemographic variables with LE8 score.
Results: The mean overall LE8 score was 62.7 points. Only 11.5 % had a high LE8, while 18.2 % had a low score. The best-accomplished metrics were blood glucose and physical activity (PA); the worst were diet and nicotine exposure. The adjusted regression analysis showed significantly higher scores for younger age (+3.2 points for <45yo, $p < 0.05$) and higher education level (+5 points, $p < 0.01$ and +12 points, $p = 0.000{,}1$ for high school and tertiary education, respectively). Higher LE8 scores in women with high education level were significantly driven by improvements in 5 metrics (lipids, blood pressure, body mass index, diet and PA).

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Conclusion: Nearly 1 out of 9 women from Santiago had an ideal LE8 score. Years of education are crucial determinants in the fight to get an ideal CVH.

1. Introduction

The American Heart Association (AHA) has updated the construct of Ideal Cardiovascular Health (CVH) previously defined by¨Life's Simple 7¨ (LS7) [1]. They have incorporated a new metric, sleep health, and modified tobacco consumption, diet, lipid and diabetes metrics. Thus, AHA improved the ideal diet concept, proposing a new method for assessing diet quality for both the population and the individual level. Regarding tobacco consumption, inhaled nicotine delivery systems and second-hand smoking exposure have been incorporated. Besides, non-HDL cholesterol has been proposed as a substitute for total cholesterol. Thus, Life's Essential 8 (LE8) could represent a more comprehensive and holistic way to analyze ideal CVH[2].

LS7 has allowed us to learn about cardiovascular risk factors in diverse populations and has enabled us to realize that the ideal CVH is difficult to achieve worldwide. Likewise, it has demonstrated a strong association with CV outcomes [3,4]. However, with this updated CVH score, AHA aims to improve its metrics quantification to achieve¨a more sensitive approach¨. LE8 writing group has requested US physicians to use this new tool, but it also calls for the LE8 score to be a novel target to improve CVH worldwide.

Recently, data from European and Asian populations have reported LE8 prevalence with this new approach, along with Shetty et al. in the US in young adults [5–7]. In 2015, our group studied a cohort of representative women from Santiago de Chile to measure CVH based on LS7 metrics. The prevalence of Ideal CVH, as defined by the presence of 5 out of 7 ideal metrics, was only 14 % [8]. The prevalence of cardiovascular risk factors in Chilean women has consistently increased over the last 20 years, reaching 14 % in diabetes, 27.7 % in hypertension, 36, 5 % in smoking, and overweight /obesity almost 75 % in 2016. This information is worrisome, which is one reason why measuring how many women are in good CVH is essential. Nevertheless, to our knowledge, no data exists on LE8 prevalence in Latin America.

The main aim of the present study was to determine the prevalence of LE8 in our Latino women's cohort. As a secondary objective, we investigated the association of LE8 with age, education level, family income level, and marital status.

2. Methods

2.1. Study design

This cross-sectional study was performed in a cohort of women from Santiago de Chile, Metropolitan Region, ESCI (the Spanish acronym for "Study of ideal cardiovascular health in women"). This study was carried out in Santiago between May and August 2015. The methodology has been fully described previously[9]. Briefly, baseline data were collected during two home visits. In the first visit, a survey interviewer completed a face-to-face questionnaire. At the second visit, a nurse obtained anthropometric and blood pressure (BP) measurements and blood and urine samples. For this study, the reported data considered 619 participants, with complete data from both home visits. They came from a representative sample of women between 35 and 70 years old in urban Santiago, selected by a stratified and multistage probability design. Therefore, the prevalence of all the CV risk-associated-LE8 conditions was corrected by expansion factors to represent the female population of this age range in Santiago.

The Santiago East Metropolitan Region Ethics Committee approved the study, and all participants signed the informed consent before study inclusion.

2.2. Sample

The sample design was probabilistic, multistage, and geographically stratified. The cohort was stratified by three age groups (35–44, 45–54, and 55–70 years old) and three socioeconomic levels based on the total per capita income of the household residents using data from the Chilean National Socioeconomic Characterization (CASEN) Survey[10]. Only one female was randomly selected from each eligible household. Pregnant women were excluded, as were those with a history of myocardial infarction, stroke, and renal failure on dialysis. The¨Centro de Estudios y Encuestas Longitunidales¨of the Pontificia Universidad Católica de Chile conducted the fieldwork

2.3. Data collection and biochemical variables determination

We used the Global Physical Activity Questionnaire (GPAQ) to assess physical activity (PA) [11]. We applied a diet questionnaire based on the previous LS7, supported by nutritional sheets and serving-size instruments. Also, the survey included questions about alcohol consumption and dairy products.

The socioeconomic level was assessed by asking about the household income in Chilean pesos. Considering the mean observed US dollar (USD) in June 2015, this amount was converted to USD and divided into quartiles. Therefore, the family income was classified as low (< 457 USD), middle-low (457–913 USD), middle USD 914-$1260, and middle-high / high (> USD 1260).

Employment status (full or part-time) and civil (married or living together, divorced or separated, widowed or single) were also registered. Finally, education level was categorized by asking for the years of formal education and the highest qualification received into three categories: low (primary school or less; 0–8 years), middle (complete or incomplete secondary education; 9–12 years), and high (complete or incomplete university or technical studies; > 12 years).

Blood pressure (BP) was measured with monitor Omron HEM7200, using the average of three measurements. Venous blood samples were obtained after at least 8 and 24 h of fasting and alcohol withdrawal, respectively. Using Cobas from Roche 8000 modular analyzer series (Hitachi), lipid levels and glycemia were determined. Twenty-four-hour salt consumption was determined by the Tanaka et al. formula using a morning isolated urine sample [12].

2.4. Quantification of Life's Essential 8

LE8 CVH score includes blood glucose, BP, non-HDL cholesterol, BMI, diet, PA, sleep health, and nicotine exposure. This composite score is calculated as the mean of each factor's score, which ranges from 0 to 100 points. An overall score from 80 to 100 points is considered a high CVH; instead, 50 to 79 and 0 to 49 points reveal a moderate and low CVH, respectively. Table 1 summarizes how the scores were calculated in the present study. PA, BMI, BP, and non-HDL cholesterol assessment kept the same punctuation as recommended by Lloyd-Jones et al. [2]..

We made adaptations in 4 parameters, as described below, to accomplish the new LE8 CVH definition:

- Diet scoring: It was calculated based on population quartiles. We divided each food group or nutrient into quintiles, giving 1 to 5 points to each one as proposed by Lloyd-Jones (Supplemental Table 1). ESCI study did not collect data on red and processed meats, legumes, and nuts consumption. Therefore, we included the following food groups: fruits and vegetables, fish, whole grains, low-

Table 1
Quantification of Life's Essential 8 Cardiovascular Health Score.

Metric	Lifes Essential 8 score [2]		Adapted Lifes Essential 8	
	Measurement (cut-off)	Score	Measurement (cut-off)	Score
DASH Diet Score (population based)	Percentile		Percentile (∗)	
	≥95th %tile	100	≥95th %tile	100
	75th-94th %tile	80	75th-94th %tile	80
	50th-74th %tile	50	50th-74th %tile	50
	25th-49th %tile	25	25th-49th %tile	25
	1–24th %tile	0	1–24th %tile	0
Physical activity	Minutes of moderate or intense activity		Minutes of moderate or intense activity	
	>=150 min	100	No adaptation	
	120–149 min	90		
	90–119 min	80		
	60–89 min	60		
	30–59 min	40		
	1–29 min	20		
	0 min	0		
Nicotine Exposure	Tobacco use or inhaled NDS use; or second-hand smoking exposure in home		Tobacco use or second-hand smoking exposure in home	
	Never Smoker	100	Never Smoker	100
	Former smoker >=5 y	75	N/A	
	Former smoker 1–5 y	50	Former smoker >=1 y	50
	Former smoker <1 y or vaping	25	Former smoker <1 y	25
	Smoker	0	Smoker	0
	Second-hand smoking (unless score is 0)	−20	Second-hand smoking (unless score is 0)	−20
Sleep health	Sleep (hours)		Sleep score based on sleep disturbances' severity and frequency	
	7 a < 9	100	0	100
	9 a < 10	90	1	80
	6 a < 7	70	2 - 3	50
	5 *a* < 6 *o* >=10	40	4 - 5	25
	4 a < 5	20	6 - 7	0
	<4	0		
BMI	kg/m^2		kg/m^2	
	<25	100	No adaptation	
	25–29.9	70		
	30–34.9	30		
	35–39.9	15		
	>=40	0		
Non-HDL cholesterol	mg /dL		mg /dL	
	<130	100	No adaptation	
	130–159	60		
	180–189	40		
	190–219	20		
	>=220	0		
	Subtract 20 points if treated			
Fasting glucose and Diabetes	FBG(mg/dL) and HbA1c		FBG(mg/dL)	
	No diabetes and FBG <100 (or HbA1c <5.7)	100	No diabetes & FBG <100	100
	No diabetes and FBG 100–125 (or HbA1c 5.7–6.4)	60	No diabetes & FBG 100–125	60
	Diabetes and HbA1c <7	40	Diabetes & FBG <126	40
	Diabetes and HbA1c 7–7.9	30	Diabetes & FBG 126–180	30
	Diabetes and HbA1c 8–8.9	20	Diabetes & FBG 181–210	20
	Diabetes and HbA1c 9–9.9	10	Diabetes & FBG 211–240	10
	Diabetes and HbA1c>=10	0	Diabetes & FBG ≥240	0
Blood Pressure	mmHg		mmHg	
	<120/<80	100	No Adaptation	
	120–129/<80	75		
	130–139/80–89	50		
	140–159 o 90–99	25		
	>=160 *o* >=100	0		
	Subtract 20 points if treated			

BMI, body mass index; DASH, Dietary Approaches to Stop Hypertension; FBG, fasting blood glucose; NDS, nicotine delivery system.
(∗): Score based on quintiles for sodium, fruit and vegetables, dairy products, sugar sweetened beverages, fish, whole grains).

Table 2
Sociodemographic characteristics and biochemical parameters of the study population.

	Total sample (*n* = 619=, % (n) or mean (SD)	**Weighted sample to 1.359.509 %, n [x 1000] or mean (SE)**
Age, y, mean (SE)	51.2 (9.1)	51.3 (0.6)
Age strata		
35–44 y	25 % (155/619)	27 % (366.8)
45–59 y	53.3 % (330/619)	50.7 % (689)
≥60 y	21.7 % (134/619)	22.3 % (303.7)
Educational level		
Low (≤8 years)	28.2 % (175/619)	24.8 % (335.3)
Middle (9–12 years)	54.0 % (334/619)	52.2 % (709.6)
High (>12 years)	17.8 % (110/619)	23.1 % (314.6)
Family income level (in USD)		
Low (USD <$457), %	32.8 % (203/619)	29.2 % (397.2)
Mid-Low (USD 457-$913), %	36.2 % (224/619)	32.1 % (436.4)
Middle (USD 914-$1260), %	11.0 % (68/619)	11.3 % (154.1)
Mid-High /High (USD> $1260), %	9.2 % (57/619)	16.6 % (225.4)
Civil status		
Married or cohabitating, %	67.9 % (420/619)	67.3 % (915.5)
Divorced or separated, %	15.8 % (98/619)	15.1 % (204.9)
Widowed, %	4.8 % (30/619)	6.1 % (83.1)
Single, %	11.5 % (71/619)	11.5 % (156.1)
Employment		
Employed full or part-time %	55.3 % (341/619)	54.0 % (734.1)
Not employed, %	40.9 % (253/619)	42.7 % (580.5)
Retired, %	3.7 % (23/619)	3.2 % (43.5)
Missing, %	0.2 % (1/619)	0.2 % (2.7)
Laboratory parameters		
Total Cholesterol, mg/dL	195 (39)	195 (2.1)
No-HDL Cholesterol, mg/dL	144 (38)	143 (1.9)
Blood glucose, mg/dL	98 (43)	98 (2.4)
SBP, mmHg	128 (21)	128 (1.1)
DBP, mmHg	76 (10)	76 (0.5)
Anthropometric and behavioral data		
BMI, kg/m^2	29.5 (5.6)	29.2 (0.3)
Smokers, %	38.3 % (237/619)	34.1 % (460.2)
Physical activity, total, min/wk	770 (1052)	923 (80)
Recreational physical activity, min/wk	49 (221)	54[10]
F&V intake, p/day	2.3 (1.5)	2.3 (0.1)
Whole grains intake, p/day	0.4 (0.7)	0.4 (0.1)
Dairy intake, p/day	0.9 (0.9)	1.0 (0.1)
SSB, glasses/wk	1.3 (2.1)	1.3 (0.1)
Alcohol intake ≤1 drink/day, %	81.4 % (504/619)	82.2 % (1117.5)
Fish intake ≥1/wk, %	56.1 % (347/619)	55.9 % (760)
Mean 24-hour sodium excretion, mg/d	3.6 (0.8)	3.6 (0.04)

BMI, body mass index; DBP, Diastolic blood pressure; FBG, fasting blood glucose; F&V, fruits and vegetables; SBP, Systolic blood pressure; SSB, sugar-sweetened beverages ; USD, US dollar.

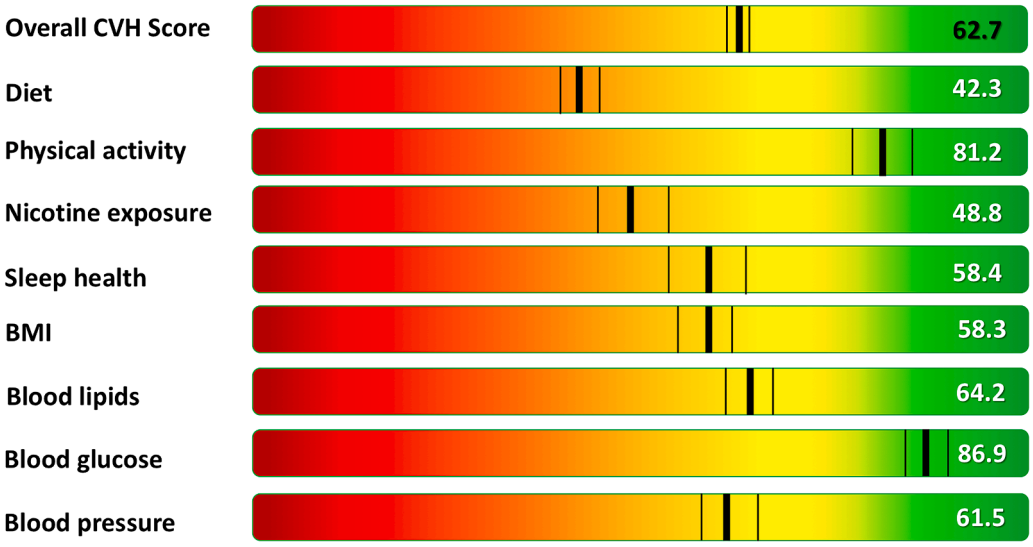


Fig. 1. Lifés Essential 8 cardiovascular health score overall and for individual metrics. Mean (thick black bars) and 95 % CI (thin bars).

fat dairy, alcohol, sugar-sweetened beverages, and an estimated 24-hour sodium intake.

- Fasting glucose levels and diabetes: The ESCI study did not measure HbA1c levels. We used a graded equivalence using fasting blood glucose in women with diabetes according to the estimated glucose laboratory data [13].
- Nicotine exposure: Vaping was not included in the ESCI survey. Nevertheless, we did have data on second-hand smoking exposure. ESCI survey only included data on those who had quit tobacco for ≥1 year or <1 year. Thus, information on ex-smokers who had quit for longer than 5 years was not available, so those were scored as they would have quit for ≥1 year (Table 1).
- Sleep health: we included two questions about sleep quality. The first was about sleep disturbances severity (scored from 0 to 4), and the second was about the frequency of difficulties in falling asleep (scored from 0 to 3). (Supplemental Table 2). The ESCI survey did not ask about sleeping hours.

2.5. Statistical analysis

We performed descriptive analysis for the overall sample and stratified by age (35–44 years, 45–59 years and ≥60 years), education (low, middle and high), family income level (low, middle-low, middle, and middle-high/ high), and civil status (married or cohabiting, divorced or widowed and single).

For the statistical analysis, we used Stata 17.0 using the SVY: command to adjust for survey design (strata, cluster, and weights). Sample weights and designs were incorporated in calculating prevalence estimates and standard errors (expanded sample). For prevalence estimates, non-overlapping 95 % CIs indicate statistical significance ($p < 0.05$). We also performed a regression analysis adjusted by age group, family income, and education level to determine the association with overall LE8 score. We repeated the same regression analysis for each of the 8 components of the CVH score.

3. Results

We studied 619 women from urban Santiago, representing 1.359.509 females between 35 and 70 years old. The mean age of the population was 51 ± 4 years old. Table 2 shows the study population's sociodemographic and clinical characteristics. Most women presented with a middle education level; >50 % worked full or part-time, and over 65 % were married or living together.

3.1. Life' 's Essential eight findings

The mean overall LE8 score was 62.7 (moderate score); 11.5 % of women had a high LE8 score (≥80 points) and 18.2 % had a low LE8 score (<50 points). Fig. 1 shows the mean overall LE8 score and individual LE8 metrics (plus 95 %CI). Mean scores were highest for glycemia and PA metrics and lowest for diet and nicotine exposure.

The analysis of the mean overall LE8 score for each metric (plus 95 % CI) according to income level, age range, education level, and marital status is shown in Fig. 2. Young women had a higher score than the oldest ones (66.3 ± 1.3 vs. 61.1 ± 1.3, $p = 0.004$), whereas women with low education level had significantly lower LE8 score compared to those with middle (57 ± 1.3 vs. 62.6 ± 0.8, $p < 0.0001$) and high education level (69.2 ± 1.5, $p < 0.0001$). Single women (54.5 ± 1.9) and divorced/ widowed women (59.6 ± 1.4) had a lower score than married/ living together (63.4 ± 0.8, $p = 0.046$ and $p = 0.02$, respectively). Women with middle-high/high-income levels had higher LE8 scores than those with lower income level (64.7 ± 1.7 vs. 59.7 ± 1.1; $p < 0.05$).

Table 3 shows the crude and adjusted regression analysis by household income, age range, education level, and civil status for the total and the individual risk-health metric scores. Table 4 shows the same for behavioral metrics. The adjusted regression analysis showed statistically significantly higher total LE8 scores for women <45 yo (+3.2, $p < 0.05$) and those with a higher education level (+5 points, $p < 0.01$ and +12 points, $p = 0.001$, for middle and high educational level, respectively). Regarding individual metrics, healthy diet, and nicotine exposure scores were statistically significantly higher in women ≥ 60 yo. By contrast, cholesterol, blood glucose, and BP were statistically significantly lower in older women. Moreover, cholesterol, BP, BMI, diet, and PA showed a significantly higher LE8 score in women with a high educational level.

4. Discussion

The present study is the first to report ideal CVH prevalence using the new LE8 proposal in a Latin American women population living outside the US. In these women's cohort from Santiago de Chile, LE8 mean overall score was ~ 63 points, classified as moderate CVH. This score is far from the ideal proposed by AHA of ≥80 points. Only 11.5 % ranked as a high CVH score. The best LE8 accomplished metrics were blood glucose and PA, while the worst were nicotine exposure and a healthy diet. LE8's overall score was significantly better in younger women. Remarkably, having a high education level significantly and independently increased the LE8 CVH score based on improved diet, PA, BMI,

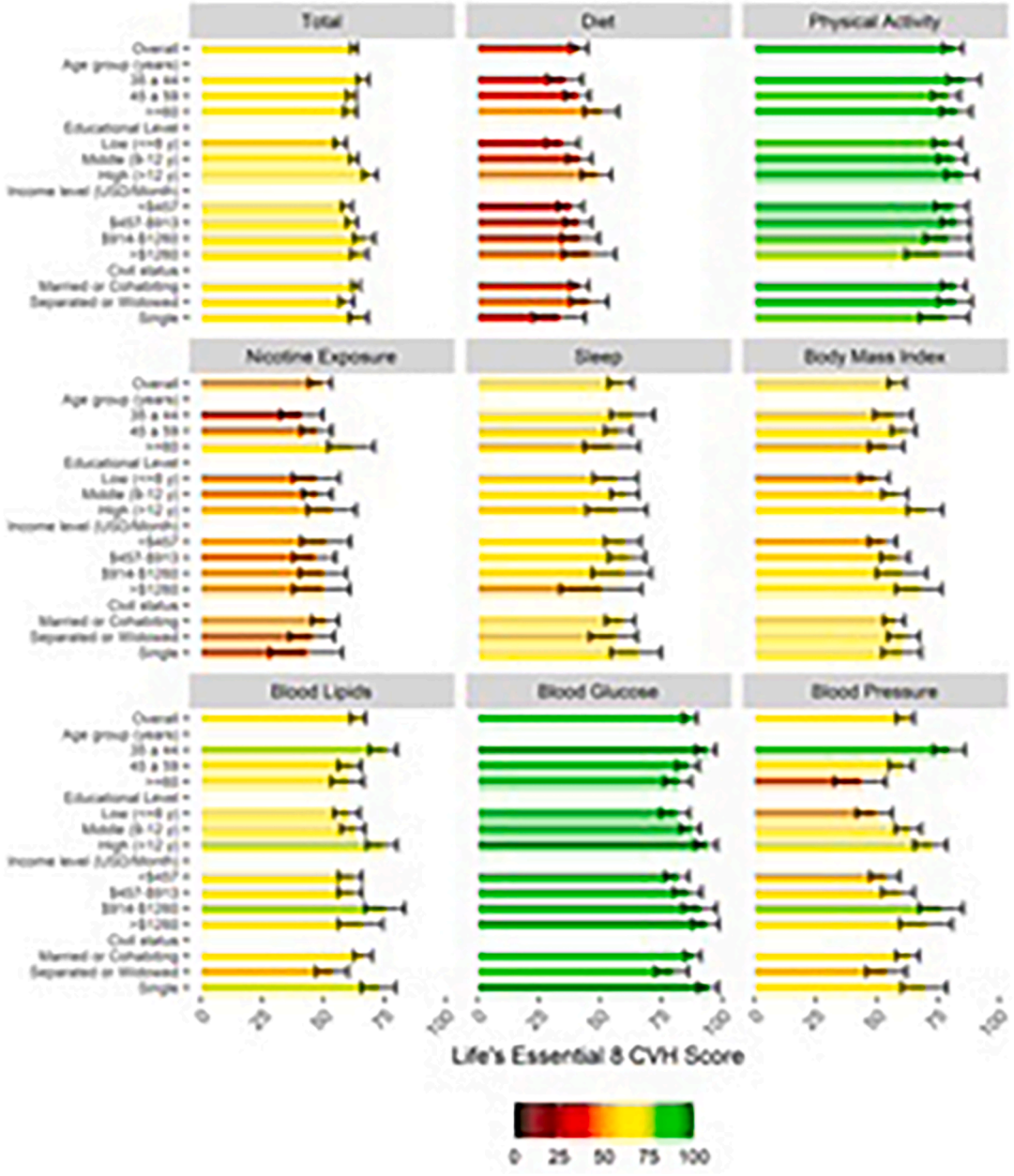


Fig. 2. Mean Life's Essential 8 score and individual health metric scores by age range, education level, family income, and civil status. (For prevalence estimates, non-overlapping 95 % CIs indicate statistical significance).

lipids, and BP metrics (Central Illustration).

The LE8 total score in Chilean women was suboptimal but quite similar to the numbers reported by Lloyd Jones et al. in adult US women (~67 points) and Xing et al. in a mixed cohort of young women and men in China [14,6]. However, when we focused on the mean score of each of the 8 metrics, there were substantial discrepancies between these populations. Thus, the mean PA score reported in US women was 49, contrasting with the higher score of 81 observed in our population. Our results are concordant with recently published data comparing eight Latin American countries, which showed that Chilean women presented the lowest sedentary behavior and the highest PA (measured through accelerometer recordings) compared to all the others [15]. Furthermore, 55 % of our participants had employment outside their homes as well as the fact that Santiago is the city with the highest rate of public transportation and active mode (walking or biking)[16], which may have influenced the higher PA status in our cohort.

By contrast, Chilean women reported more significant exposure to nicotine, poorer sleep health, and a higher prevalence of hypertension than the 2013–2018 NHANES female population. Nicotine exposure score in our population is discouraging, but it is not surprising. Chilean women are among the most smokers in the region of the Americas, with an estimated prevalence of daily smoking in 2012 of 26 % compared to 14 % in US women[17]. The current LE8 definition for this behavior is stricter than the previous one, as it considers the time since smoking has been quit and also other sources of exposure to nicotine. Our participants had poor smoking CVH with this recent definition. Instead, with the previous LS7, 61 % of these women presented an ideal non-smoking status (defined as never smoked or quit smoking >12 months). The new definition of tobacco assessment represents a better concept of nicotine burden, as it analyzes the time free of exposure to nicotine and other types of exposures. Therefore, this new definition is more demanding and challenging to achieve.

In our study, diet was the least accomplished metric. This result concurs with the data published in other countries [6,18]. Achieving an

Table 3
Table Lifés 8 Essential CVH total score and health factor scores regression models.

	Total Score		Cholesterol		Glucose		Blood pressure		Body mass index	
	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted
Age (y) (mean; SE)										
35–44	Reference (66.3; 1.2)		Reference (74.5; 2.9)		Reference (93.2; 2.2)		Reference (79.7; 3.3)		Reference (56.8; 3.7)	
45–59	−4.7** (−7.9; −1.5)	−3.2* (−5.9; −0.5)	−13.8*** (−21.8; −5.9)	−11.6** (−19.7; −3.6)	−7.5* (−13.9; −1.1)	−6.0 (−12.2; 0.3)	−19.7*** (−28.3; −11.1)	−17.7*** (−26.0; −9.4)	4.2 (−6.1; 14.5)	7.1 (−2.7; 16.8)
60+	−5.1** (−8.7; −1.7)	−3.2* (−6.4; −0.1)	−14.7*** (−23.6; −5.9)	−12.4** (−21.0; −3.8)	−11.4*** (−18.8; −4.1)	−9.3* (−16.9; −1.8)	−36.5*** (−48.9; −24.0)	−33.4*** (−45.5; −21.4)	−2.9 (−13.5; 7.7)	0.9 (−9.0; 10.7)
Educational level (mean; SE)										
Low (<8 y) (mean; SE)	Reference (57.0; 1.3)		Reference (59.6; 2.8)		Reference (80.8; 3.1)		Reference (49.1; 3.8)		Reference (49.2; 3.1)	
Middle (9–12 y)	5.6*** (2.5; 8.6)	5.0 ** (1.8; 8.3)	2.4 (−4.7; 9.5)	1.2 (−6.0; 8.5)	6.2 (−0.4; 12.7)	4.5 (−1.9; 10.9)	13.8** (4.6; 23.0)	10.0* (0.7; 19.3)	8.4 (−0.1; 16.9)	7.2 (−1.2; 15.5)
High (>12 y)	12.2*** (8.2; 16.3)	12*** (6.7; 17.3)	14.4*** (6.3; 22.5)	12.8* (3.1; 22.5)	12.6*** (5.0; 20.3)	8.3 (−1.0; 17.5)	22.9*** (12.5; 33.4)	13.1* (0.5; 25.6)	20.5*** (10.6; 30.5)	19.2*** (8.9; 29.6)
Income level (mean; SE)										
Low (mean; SE)	Reference (59.7; 1.1)	Reference (61.0; 2.5)	Reference (81.5; 2.5)	Reference (53.3; 3.1)	Reference (52.4; 2.9)					
Middle-Low	2.1 (−1.3; 5.5)	1.3 (−1.9; 4.5)	−0.1 (−6.8; 6.7)	−5.3 (−7.2; 6.1)	4.3 (−3.5; 12.2)	3.5 (−4.2; 11.2)	5.4 (−3.8; 14.7)	3.1 (−4.9; 11.2)	5.1 (−2.4; 12.7)	4.0 (−3.2; 11.3)
Middle	7.1** (2.1; 12.1)	3.7 (−1.6; 8.9)	14.1*** (5.3; 22.9)	10.1 (0.0–20.2)	9.3* (0.5; 18.1)	6.3 (−2.7; 15.3)	23.1*** (12.6; 33.5)	16.5** (6.8; 21.1)	7.8 (−4.5; 20.1)	3.3 (−8.5; 15.3)
Middle-High/ High	5.0* (1.1; 9.0)	−0.9 (−5.5; 3.6)	4.2 (−6.0; 14.4)	−4.1 (−14.6; 6.4)	11.7*** (3.8;19.6)	6.9 (−3.0; 16.9)	16.8** (4.5; 29.0)	7.7 (−8.4; 23.8)	14.8** (4.2; 25.4)	6.3 (−3.6; 16.2)
Civil Status (mean; SE)										
Married or cohabiting	Reference (63.4; 0.8)		Reference (66.2; 2.0)		Reference (88.0; 1.7)		Reference (62.6; 0.8)		Reference (57.2; 2.2)	
Divorced or widowed	−3.9 (−7.2; −0.5)	−2.7 (−6.0; 0.6)	−12.6*** (−20.5; −4.8)	−10.1** (−17.6; −27)	−8.5* (−16.1; −1.0)	−5.7 (−13.3; 1.9)	−8.7 (−18.5; 1.1)	−1.7 (−11.1; 7.6)	3.8 (−3.1; 10.8)	6.4 (−0.6; 13.3)
Single	1.0 (−3.0; 5.1)	0.7 (−3.6; 5.0)	6.4 (−1.5; 14.4)	5.2 (−2.9; 13.3)	6.2* (0.8; 11.5)	7.5* (1.4; 13.6)	6.8 (−3.6; 17.2)	8.8 (−1.1; 18.7)	3.1 (−5.7; 11.9)	4.4 (−3.8; 12.5)

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

ideal diet is complicated due to the increasing marketing of unhealthy diet products, the costs of healthy foods, cultural beliefs, and the prevalent adverse social determinants of health [19,20]. Unfortunately, the behavior of a healthy diet is hard to achieve, even though this new definition is more inclusive and wide-ranging than the previous one. In the LS7 score, the ideal AHA diet was reached having 4 out of 5 metrics. However, the new definition is friendlier, incorporating more healthy food alternatives and different eating patterns, including the Mediterranean and the DASH diets. These two diets have been demonstrated to reduce cardiovascular events and improve CV risk factors [21,22].

>12 years of education (high education level) significantly improved the ideal CVH in Chilean women based on the current CVH score. Similarly, a recent analysis with a US representative sample showed a better LE8 overall score in more educated women (college graduates or above) regardless of race[23]. Therefore, the education women achieves makes a difference in overall CV health. In Chile, data from our last National Health Survey (2016) showed that people with lower levels of education were more likely to be physically inactive and had more traditional CV risk factors[24,25]. Likewise, Bauman et al. demonstrated a close association between a higher education level and PA compared to those with lower education level in a mixed population from Australia and some Asian countries [26]. In our cohort, women with >12 years of education consumed significantly more fruits and vegetables, whole grains, and less salt than those under 8 years (supplemental Table 3, expanded sample). This behavior has been described in other countries. Biesbroek et al., in a cohort from The Netherlands, observed that higher education is associated with greater intake of healthy nutrients (fruits, raw vegetables, fish, and high-fiber cereals) [27]. In the UK, Azizi Fard et al. reported similar results [28].

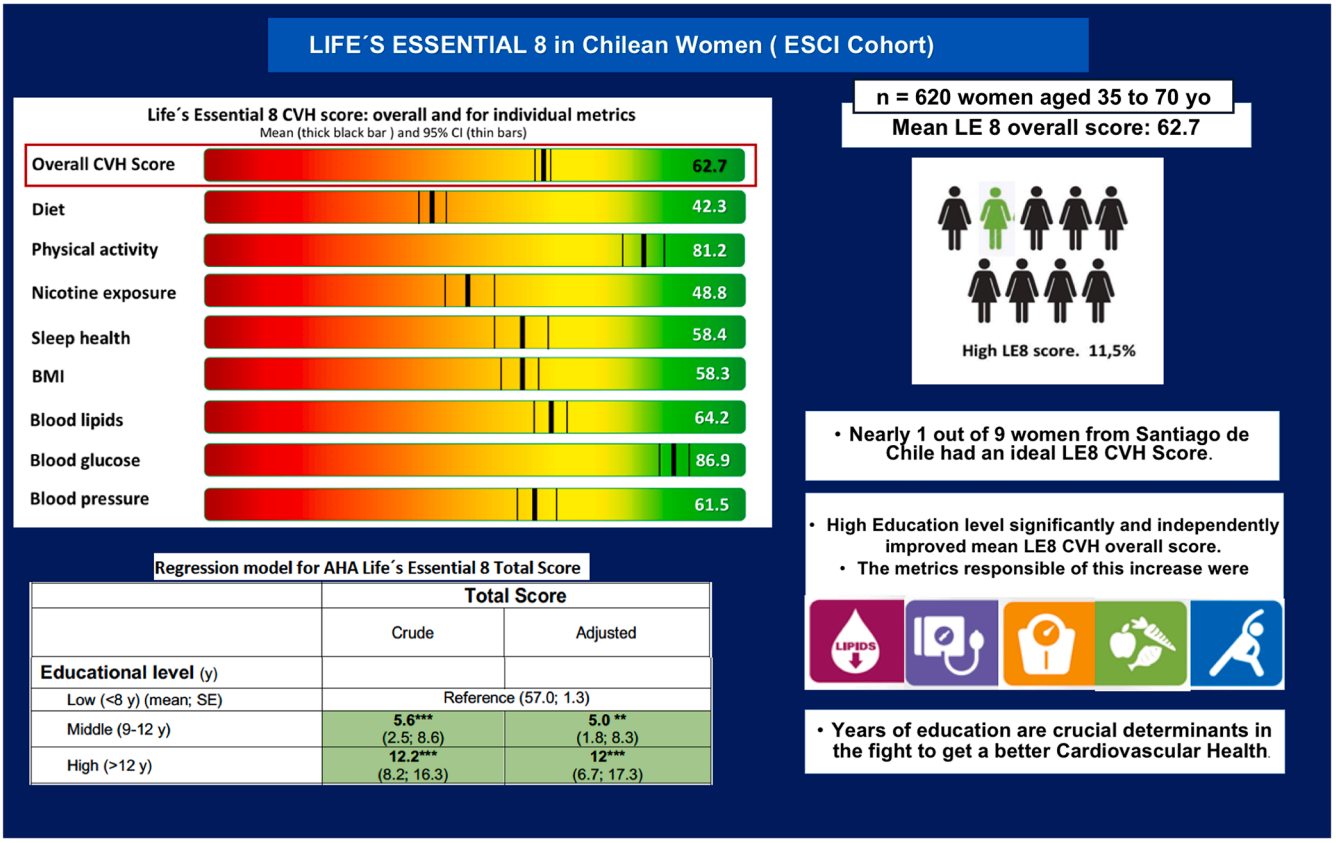
We have to read the above results as an opportunity to improve primordial CVH. Education is the most influential factor in achieving the ideal CVH. Perhaps we must intervene sooner in younger populations and ideally children, as it has been promoted by Valentin Fuster in Sesame Street's initiative [29]. Also, it would be essential to include dietitians in counseling kids, adolescents and parents in healthy food choices, teaching them to read food label information, and reinforcing these aspects in those with overweight, obesity and/or other metabolic disorders. These interventions should be cost-effective and include all the ministries involved in this big health issue for girls and boys.

Regarding women, perhaps we should direct our strategies to educate them in places they usually meet, such as hairdressing salons, gyms (pilates, yoga), and universities. Other strategies already implemented are taxes on unhealthy foods, peer-supporting programs, and education through text- -messaging. However, our experience,and those of others through text-messaging have not been successful [30,31].

Table 4
Lifés 8 Essential CVH behavioral scores regression models.

	Diet		Physical activity		Sleep		Tobacco	
	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted
Age (y)(mean; SE)								
35–44	Reference (35.6; 3.7)		Reference (85.6; 3.3)		Reference (63.3; 4.5)		Reference (41.1; 4.5)	
45–59	5.0	7.2	−7.2	−6.4	−5.8	−6.5	6.1	7.5
	(−4.3; 14.4)	(−2.0; 16.3)	(−15.9; 1.4)	(−14.7; 2.0)	(15.3; 3.7)	(−16.2; 3.3)	(−5.4; 17.6)	(−4.6; 19.5)
60+	14.8**	17.6***	−3.1	−2.2	−8.5	−9.1	20.4**	21.8**
	(4.9; 24.7)	(7.9; 27.3)	(−12.5; 6.4)	(−11.7; 7.2)	(−22.4; 5.4)	(−22; 4.2)	(8.3; 32.2)	(8.8; 34.7)
Educational level (mean; SE)								
Low	Reference (34.5; 3.5)		Reference (78.9; 2.8)		Reference (56.4; 4.7)		Reference (57.1; 4.7)	
Middle	7.1	7.6	1.9	2.9	3.9	4.5	0.4	2.3
	(−1.5; 15.7)	(−0.7; 15.8)	(−5.6; 9.5)	(−4.7; 10.5)	(−6.8; 14.6)	(−6.8; 15.8)	(−10.8; 11.6)	(−8.0; 12.6)
High	14.1**	16.5**	5.9	11.2*	0.5	4.4	6.2	10.8
	(5.1; 23.1)	(4.8; 28.1)	(−2.4; 14.1)	(0.7; 21.7)	(−14.6; 15.7)	(−9.6; 18.4)	(−6.2; 18.7)	(−5.4; 27.1)
Income level (mean; SE)								
Low	Reference (38.0; 2.6)		Reference (80.6; 3.3)		Reference (59.4; 3.7)		Reference (51.1; 5.1)	
Middle-Low	3.1	2.6	1.8	1.5 (−6.5; 9.4)	1.7	0.9	−4.6	−4.3
	(−4.5; 10.7)	(−4.8; 10.0)	(−5.9; 9.6)		(−8.8; 12.2)	(−10.1; 11.9)	(−19.0; 9.6)	(−17.1; 8.5)
Middle	3.9	1.1	−1.6	−4.6	−0.4	−2.6	−1.2	−2.0
	(−4.9; 12.7)	(−8.2; 10.4)	(−13.3; 10.1)	(−17.1; 7.9)	(−14.6; 13.9)	(−17.8; 12.6)	(−15.4; 13.1)	(−17.0; 13.0)
Middle-High/High	7.8	2.2	−5.3	−11.2	−9.0	−11.6	−1.7	−4.8
	(−3.9; 19.4)	(−11.0; 15.5)	(−20.2; 9.6)	(−27.2; 4.6)	(−27.0; 9.1)	(−29.8; 6.5)	(−16.5; 13.0)	(−23.1; 13.5)
Civil Status (mean; SE)								
Married or cohabiting	Reference (41.6; 1.9)		Reference (81.6; 2.5)		Reference (58.4; 3.1)		Reference (50.9; 2.8)	
Divorced or widowed	3.9	3.2	0.4	−0.3	−2.8	−3.6	−5.5	−9.2
	(−4.4; 12.2)	(−5.2; 11.5)	(−7.6; 8.4)	(−8.3; 7.8)	(−13.8; 8.1)	(−14.5; 7.2)	(−15.7; 4.6)	(−19.7; 1.3)
Single	−8.4	−8.6	−4.0	−6.0	6.3	4.9	−7.8	−10.4
	(−19.6; 2.8)	(−19.4; 2.3)	(−15.2; 7.1)	(−17.5; 5.6)	(−5.4; 18.1)	(−6.4; 16.2)	(−23.9; 8.2)	(−28.7; 7.9)

Adjusted models by age group, education, and income level. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. Education level was categorized by asking for the years of formal education, and the highest qualification received into three categories: low (primary school or less; 0–8 years), middle (complete or incomplete secondary education; 9–12 years), and high (complete or incomplete university or technical studies; > 12 years).



Central Illustration. Lifés Essential 8 in a Chilean women cohort: ESCI study (Spanish acronym for "Study of ideal cardiovascular health in women").

4.1. Caveats and strengths

This paper has limitations. First, as the survey was done only in women, we did not have a concurrent population of men for comparison. Second, the ESCI survey was designed to assess LS7 metrics. As explained in "Methods", we adapted some metrics to comply with LE8 definitions. Third, this was a cross-sectional study; therefore, we can only determine associations, not causality. Finally, data on PA, sleep health, and diet were obtained by self-reporting, so we cannot exclude recall bias or social desirability.

Also, this study has strengths. First, it is a representative sample of women selected by a stratified and multistage probability design. Second, data collection was carried out using standardized measurements. Third, to our knowledge, this is the first report on LE8 in women living in Latin America.

In conclusion, this representative Latino women cohort presented a moderated LE8 score, far from ideal CVH cutoffs. Education arises as an important mean to improve CVH factors and behaviors in Chilean women. These results should be read and discussed by public ministries in order to carry out jointly innovative ways to improve CVH.

CRediT authorship contribution statement

Paola Varleta: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Mónica Acevedo:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Giovanna Valentino:** Writing – original draft, Methodology, Formal analysis. **Carolina Casas-Cordero:** Supervision, Methodology, Formal analysis. **Amalia Berríos:** Project administration. **Rosario López-Infante:** Writing – review & editing, Visualization.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Paola Varleta reports financial support was provided by Teva Pharmaceutical Industries Ltd. PAOLA VARLETA reports a relationship with Abbott Laboratories that includes: speaking and lecture fees. PAOLA VARLETA reports a relationship with AstraZeneca Pharmaceuticals LP that includes: speaking and lecture fees. PAOLA VARLETA reports a relationship with Axon Pharma that includes: consulting or advisory and speaking and lecture fees. PAOLA VARLETA reports a relationship with Bayer AG that includes: speaking and lecture fees. PAOLA VARLETA reports a relationship with Boehringer Ingelheim Pharmaceuticals Inc that includes: speaking and lecture fees and travel reimbursement. PAOLA VARLETA reports a relationship with Eurofarma Laboratories that includes: speaking and lecture fees. PAOLA VARLETA reports a relationship with Grupo Ferrer Internacional SA that includes: speaking and lecture fees. PAOLA VARLETA reports a relationship with GlaxoSmithKline Inc that includes: consulting or advisory. PAOLA VARLETA reports a relationship with Janssen Pharmaceuticals Inc that includes: consulting or advisory. PAOLA VARLETA reports a relationship with Organon & Co. Inc. that includes: speaking and lecture fees. PAOLA VARLETA reports a relationship with Novartis that includes: speaking and lecture fees and travel reimbursement. PAOLA VARLETA reports a relationship with Novo Nordisk Pharmaceuticals SA that includes: speaking and lecture fees. PAOLA VARLETA reports a relationship with Tecnofarma that includes: speaking and lecture fees and travel reimbursement. PAOLA VARLETA reports a relationship with Teva Pharmaceutical Industries Ltd that includes: speaking and lecture fees. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

MONICA ACEVEDO reports financial support was provided by Teva Pharmaceutical Industries Ltd. MONICA ACEVEDO reports a relationship with Abbott Laboratories that includes: speaking and lecture fees. MONICA ACEVEDO reports a relationship with AstraZeneca that includes: consulting or advisory and speaking and lecture fees. MONICA ACEVEDO reports a relationship with Axon PHARMA that includes: consulting or advisory and speaking and lecture fees. MONICA ACEVEDO reports a relationship with Bayer AG that includes: consulting or advisory and speaking and lecture fees. MONICA ACEVEDO reports a relationship with Boehringer Ingelheim Pharmaceuticals Inc that includes: speaking and lecture fees. MONICA ACEVEDO reports a relationship with Grupo Ferrer Internacional SA that includes: speaking and lecture fees. MONICA ACEVEDO reports a relationship with Eurofarma Laboratories that includes: speaking and lecture fees. MONICA ACEVEDO reports a relationship with Novartis that includes: speaking and lecture fees. MONICA ACEVEDO reports a relationship with Novo Nordisk Pharmaceuticals SA that includes: consulting or advisory and speaking and lecture fees. MONICA ACEVEDO reports a relationship with Tecnofarma SA that includes: speaking and lecture fees. MONICA ACEVEDO reports a relationship with Teva Pharmaceutical Industries Ltd that includes: speaking and lecture fees. EDITORIAL BOARD OF THE AMERICAN JOURNAL OF PREVENTIVE CARDIOLOGY (MONICA ACEVEDO, MD) If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ajpc.2025.100988.

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