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Liposomal-Associated Phospholipase A_2 Is More Effective in Predicting Cardiac Risk in Law Enforcement Than Framingham Risk Score and Coronary Artery Calcium Score Calculation

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Objective: To clarify the methods for identifying officers at high risk for cardiac events. **Methods:** This retrospective review included 3330 patient charts. Classic cardiovascular risk factors, coronary artery calcium (CAC) scores, and endothelial inflammatory biomarker levels were compared between civilians and law enforcement officers (LEOs). The Framingham Risk Score (FRS) was compared with risk assessment using inflammatory biomarkers. **Results:** The FRS failed to identify more than 90% of LEOs at high risk of cardiovascular events. Similarly, the use of the CAC score was ineffective. Inflammatory biomarker analysis measuring the lipoprotein-associated phospholipase A_2 activity was the most reliable method for identifying LEOs at high risk of cardiovascular events. **Conclusions:** The use of the standard FRS and CAC scores is less effective than that of inflammatory biomarkers in identifying LEOs at high risk of cardiovascular events;

Keywords: cardiovascular disease, coronary artery calcium score, coronary disease, Framingham risk score, inflammation, law enforcement officer, liposomal associated phospholipase A2

LEARNING OUTCOMES

Completing this educational activity would enable the following:

- Understanding the techniques most effective in predicting cardiovascular disease among law enforcement officers.
- Understanding the mechanism that accounts for the increased prevalence of cardiovascular disease among law enforcement officers.
- Assessing standard cardiovascular disease risk assessment techniques and comparing these techniques with novel advanced inflammatory biomarker analyses.

INTRODUCTION AND OBJECTIVES

The current literature suggests that a top cause of morbidity and mortality in law enforcement officers (LEOs) is cardiovascular disease (CVD). Although death from heart attack is consistently ranked the second or third most common cause of death by tracking organizations, such as the Officer Down Memorial Page or National Law Enforcement Officer Memorial Fund, these rankings do not include heart attack deaths that occur after the individual officer finishes the duty shift.[1] Extrapolating these numbers for a 24-hour day would rank heart attack first as a cause of death among individuals in uniform. Furthermore, only approximately 3% of heart attacks are fatal, meaning that the collected and published data do not recognize thousands of heart attacks that cause significant morbidities in officers rather than death.[2]

In addition to taking a toll on human life, heart attack treatment is one of the leading medical expenses incurred by police agencies. According to the Commission on Accreditation for Law Enforcement Agencies, the cost to taxpayers of in-service heart attacks ranges from $450k to $750k per incident.[3]

Previously published data suggest that the average age of a US police officer and a civilian with an acute myocardial infarction (MI) is 46 and 65 years, respectively. Moreover, a civilian aged between 55 and 59 years has only a 1.5% chance of dying from cardiovascular (CV) causes, whereas LEOs in the same age range have a chance of more than 56%. More frequent heart attacks at younger ages contribute to the statistics of police officers having a life expectancy lower by 22 years than that of their civilian counterparts.[4] However, these findings are disputed. For example, the California State Employees' Retirement System Experience Study compared the life expectancies of male police officers with those of male workers and retirees not in the public safety field and found that individuals aged 50, 55, 60, or 65 years had similar life expectancies, regardless of whether they were police officers or other workers.[5] An Illinois study on state police life expectancy yielded similar findings.[6] However this study did not consider officers' retirement ages, which may have occurred earlier than that of the population used to construct the actuarial tables. Furthermore, the California study only covered 10 years, making the conclusion less certain. Nevertheless, there is sufficient previously published data indicating the possibility that the risk of heart disease is higher in officers than in their civilian counterparts.[7]

Law enforcement lay press and trade publications have suggested that police officers are 25 times more likely to die from a CV event than be killed by the violent action of a suspect. The data regarding this significant statement have not been sufficiently and scientifically evaluated nor have they been reproduced. However, this is anecdotal evidence that the risk of CV morbidity and mortality is a concern for police departments nationwide. Nonetheless, a current review of the published literature supports the concept that police officers worldwide have an increased prevalence of coronary disease and metabolic syndrome (hypertension, dyslipidemia, hyperglycemia, hypertriglyceridemia, and obesity).[7–11]

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Authors' contributions: J.S. designed study, collected data, and wrote the original and updated manuscript. J.C. provided data analytics. P.R. provided technical help with the preparation of the manuscript.
This study adheres to the STROBE guidelines for observational cohort analysis
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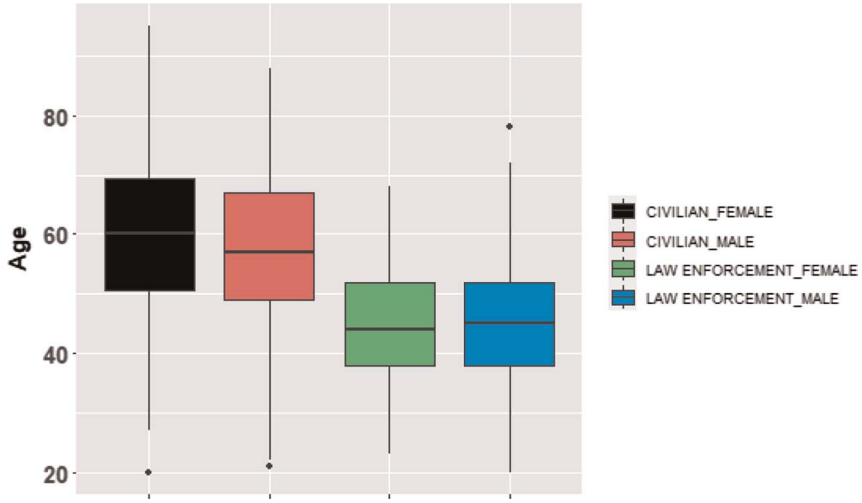

FIGURE 1. Job group (civilians vs LEOs) by age and sex.

The cause of increased cardiac risk in policing remains elusive. Either the LEO population has an increased prevalence of known classic cardiac risk factors (including hypertension, high cholesterol, diabetes, age, smoking, and family history) or despite a relatively similar risk to that of civilians, MI in LEOs occurs more frequently because of other mechanisms. This increased risk may be due to additional occupation-specific risks, such as mental stress induced by shift work, hypervigilance, psychological/physical trauma, or repeated exposure to a hyperadrenergic state caused by the inherent nature of police work, such as pursuits, use of force, rendering emergency aid, or other acutely stressful incidences. Evidence has been published that reveals LEOs have more classic CV risk factors than their civilian counterparts.[12] However, this study was limited by its size (n = 310); therefore, a larger analysis examining these classic risk factors was conducted.

Because of the discrepancy in the rates of CV events in the law enforcement population, this study aimed to determine the most effective way to identify LEOs at an elevated risk of CV events. We compared standard population-based CV risk modeling using the Framingham Risk Score and novel inflammatory biomarker analysis using lipoprotein-associated phospholipase A_2 (Lp-PLA2). The FRS is a sex-specific algorithm for estimating an individual's 10-year CV risk. It was first developed based on data obtained from the Framingham Heart Study and considers age, sex, total cholesterol level, systolic blood pressure (SBP), treatment for hypertension, presence of diabetes, presence of peripheral vascular disease, and smoking status.[13] This information is used to determine individuals' 10-year risk of developing coronary heart disease (CHD) by categorizing them into low (<10%), intermediate (10%–20%), or high (>20%) risk tertiles.

Lipoprotein-associated phospholipase A_2 is an enzyme primarily synthesized by macrophages and foam cells within atherosclerotic plaques. Phospholipase A_2 is a ubiquitous enzyme that hydrolyzes the *sn*-2-acyl bond of phospholipids of the cell membrane and lipoproteins and yields free fatty acids and Lys-phospholipids, which are precursors of various proinflammatory lipid mediators, including leukotrienes, eicosanoids, prostaglandins, and platelet-activating factor.[14–16] Elevated Lp-PLA2 (measured as activity or concentration) levels have been associated with a severely increased risk of CHD and cerebral vascular disease because it is an indicator of rupture-prone plaque.[17–28] Data derived from Brilakis et al[28] demonstrated a large increase in CV events over 4 years, even with slight elevations in Lp-PLA2 serum concentration above the upper normal limits.

Furthermore, we analyzed the results of participants in our cohorts who underwent (C.A.C.) score calculation to determine whether this testing modality was effective in identifying LEOs at an increased risk for a CV event. Finally, we compared the prevalence of baseline classical CV risk factors in civilian and LEO populations to determine whether an increase in these well-known risk factors could elevate the cardiac events observed in the LEO population, as suggested by Joseph et al.[12]

METHODS

We conducted a deidentified, descriptive study using a retrospective review of medical records. Therefore, the comparative cohorts were not matched with control groups. The Strengthening the Reporting of Observational studies in Epidemiology (STROBE) checklist was adhered to and is attached herein (Supplemental Digital Content, http://links.lww.com/JOM/B483). The medical records of individuals who presented for their first clinical visit were reviewed to analyze their CV risk. The patients were seen at a private clinician's practice and/or as part of a cardiometabolic screening program on LEOs undertaken by Sigma Tactical Wellness™ (Austin, TX). Patients who were naive to lipid

TABLE 1. Overall Average Biometric Values for Comparing LEOs With Civilians

Average Metric Values Comparing LEOs With Civilians		
Metric	**LEO**	**Civilian**
n	2222	970
Age, yr	45	58.36
SBP, mm Hg	127.02	126.03
DBP, mm Hg	81.96	77.27
Insulin, uIU/ml	9.55	8.91
HbA1c, %	5.40	5.39
TC, mg/dL	210.75	171.73
LDL, mg/dL	136.3	93.54
HDL, mg/dL	47.56	56.16
Current smoker, +/−	0.5%	4.64%
Positive CAC, %	31.78%	28.66%
Framingham (untreated SBP), score	6.85	9.56
Framingham (treated SBP), score	8.1	11.18
Positive Lp-PLA2, %	92.84%	27.73%
Positive Lp-PLA2 (low-intermediate Framingham Risk Score), %	92.39%	24.43%
Positive Lp-PLA2 (low-intermediate Framingham Risk Score; treated SBP), %	92.17%	24.42%

CAC, coronary artery calcium; DPB, diastolic blood pressure; HbA1c, hemoglobin A1c; HDL, high-density lipoprotein; LDL, low-density lipoprotein; LEO, law enforcement officer; Lp-PLA2, lipoprotein-associated phospholipase A_2; SBP, systolic blood pressure; TC, total Cholesterol.

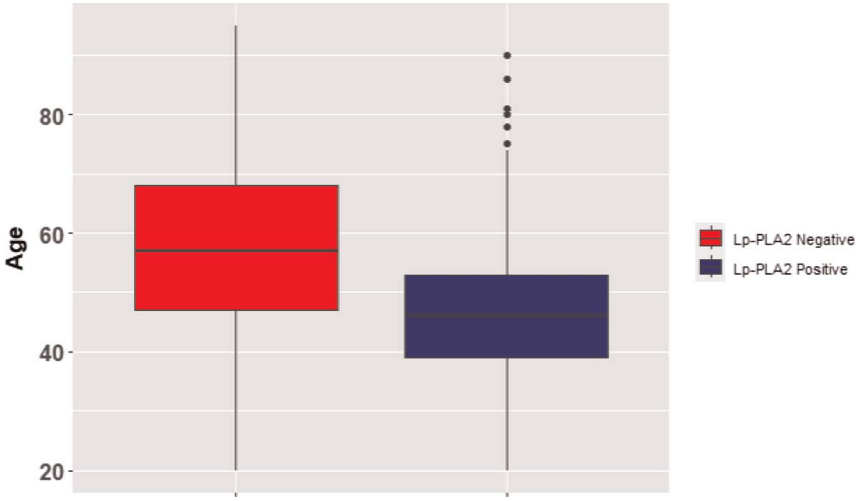

FIGURE 2. Age by PLA2 positivity.

treatment and had no known history of coronary artery disease, peripheral artery disease, or diabetes (insulin- and noninsulin-dependent) were included in the analysis. Patient data were collected between January 2015 and October 2022. During this time, 3330 patients were evaluated, of whom 3192 met all inclusion criteria, had complete datasets, and were included in the study. Statistical analyses were performed using Microsoft Excel (Microsoft Excel 365, 2024, Redmond Washington) and R (Microsoft R 2024, Redmond Washington). The same programs were used to run proportion tests on nonnumerical data. Statistical analyses were performed by Roar Analytics,™ Rogers Arkansas. The Cleveland Heart Laboratory, a subsidiary of Quest Diagnostics, performed all laboratory evaluations. The study was funded in its entirety by Sigma Tactical Wellness™.

RESULTS

Demographic data were collected from deidentified civilian and LEO clinic visits (Fig. 1). The overall database contained 3330 individuals, of whom 3192 met the inclusion criteria, including 2222 police officers and 970 civilians. Multiple variables were compared between the two groups (Table 1), including age (in years), sex (male or female), SBP (in millimeters of mercury) and diastolic blood pressure (DBP, in millimeters of mercury), hemoglobin A1c % (HbA1c), insulin level (in milligrams per deciliter), low-density lipoprotein cholesterol (LDL) level (in milligrams per deciliter), and smoking status (positive or negative). Lipoprotein-associated phospholipase A_2 positivity was defined as a level greater than 123 mg/dL (per Cleveland Heart Laboratory testing range) and was compared between the two groups. Individuals who were Lp-PLA2 positive were considered to be at high risk of coronary events.[27] Subsequently, all groups were identified as high or low risk using Lp-PLA2 measurement results, followed by the FRS (low, intermediate, or high risk), both with and without treatment for hypertension. The Student *t* test was used to compare statistical significance.

After analyzing the variables and identifying the covariates, several factors were identified that could be used to predict the significant influencers of Lp-PLA2 positivity. Using this Lp-PLA2 model enables better identification of individuals at high risk of CVD in law enforcement.

Age and Sex

Age was similar between the male and female participants; however, the civilian cohort tended to be older ($P < 0.001$). In this study, age seemed to be inversely related to Lp-PLA2 positivity; that is, younger individuals were more likely to be Lp-PLA2 positive ($P < 0.001$) (Fig. 2). The mean age of individuals who were Lp-PLA2 negative was 57 years, whereas that of individuals who were Lp-PLA2 positive was 46 years (Table 2). The observation that Lp-PLA2 was directly correlated with age was statistically significant (Fig. 2) and was contrary to that of a previous report regarding age and Lp-PLA2 positivity.[28]

Conventional CV Risk Factors

The SBP differed insignificantly between the two groups. Although there was a statistically significant difference in DBP, the difference of less than 5 mm Hg does not seem to be clinically significant. The markers of prediabetes and diabetes were similar. Similarly, fasting insulin levels, which can be an indicator of prediabetes and pending metabolic syndrome, and HbA1c, differed insignificantly between LEOs and civilians. The civilian cohort smoked more than the LEO population (Fig. 3, Table 3). In a previously published study, the use of tobacco products was positively correlated with Lp-PLA2 elevation.[29] However, our analysis indicated that this relationship was absent. In addition, although the civilian population was using tobacco at a higher rate, its Lp-PLA2 levels were lower than those observed in the LEO cohort.

The LEO population had higher total cholesterol and LDL levels and slightly lower high-density lipoprotein levels (Fig. 3, Table 3). These differences were statistically significant and possibly contributed to the elevation of inflammatory marker levels.[30] However, our data analysis indicated that LEOs have an increased odds of Lp-PLA2 positivity by more than 795% (odds ratio = 8.95, 95% confidence interval = 6.73, 11.96) compared with their civilian

TABLE 2. Age Statistical Significance by Lp-PLA2 Positivity

	Age Statistical Significance by Lp-PLA2 Positivity		
Populations Compared	**Mean Age, yr**	**SD**	**Statistical Significance (Expressed as *P*)**
Lp-PLA2 negative	57.2	14.31	$P < 0.001$
Lp-PLA2 positive	46.05	9.74	

Lp-PLA2, lipoprotein-associated phospholipase A_2.

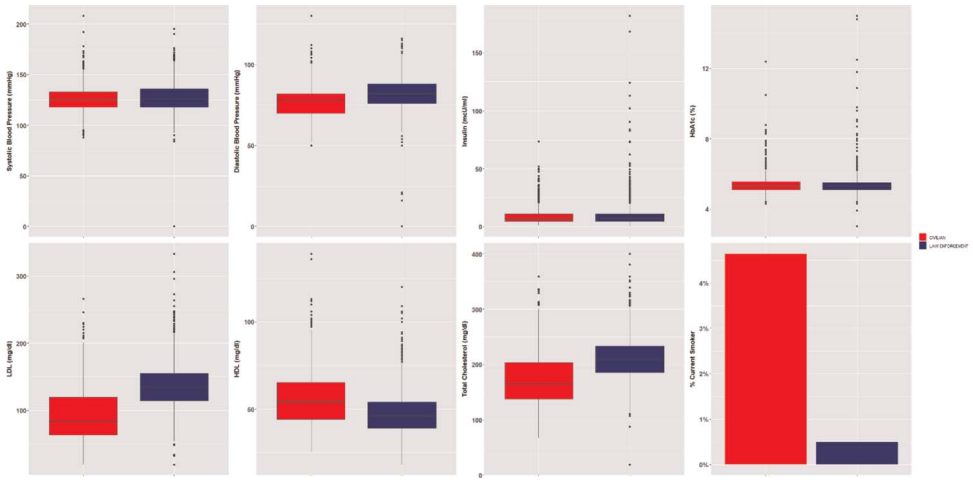

FIGURE 3. Cardiovascular risk factors.

cohorts. Based on differences in the LDL levels alone, these differences in increased odds would only cause a 202% increase (using average LDL levels of civilians and LEOs of 93.5 and 136.3 mg/dL, respectively, along with the determination that for each 1 mg/dL increase in the LDL level, there is an increased odds of 4.74% of being Lp-PLA2 positive). This was far below the increased odds observed in the LEO cohort of 795% (Table 4).

Framingham Score Calculation and Analysis

The FRS is an accepted tool for predicting the 10-year risk of developing CHD. The FRSs were calculated twice for all groups. First, by assuming that the SBP was not treated, followed by an assumption that antihypertensive treatment was used, as this factor can change the FRS. These calculations were performed because data on hypertension treatment were unavailable. There were insignificant differences in either group; therefore, untreated data points are presented in this article.

Lp-PLA2

On reviewing the Lp-PLA2 data, LEOs had a significantly higher proportion of Lp-PLA2 positivity than civilians ($P < 0.001$) (Fig. 4). This contradicts what was published previously, as Lp-PLA2 positivity has been shown to be directly correlated with age and tobacco usage.[28,29] In our study, despite being younger, smoking less, LEOs had significantly higher rates of inflammatory plaque, as measured by Lp-PLA2 activity (Figs. 4, 5; Table 5).

TABLE 3. Univariate Differences between Civilians and LEOs

Measure	Civilian	LEO	*P*
SBP, mean, mm Hg	126.03	127.02	0.08513
DBP, mean, mm Hg	77.27	81.96	<0.001
Insulin, mean, mc U/mL	8.91	9.55	0.05768
HbA1c, mean, %	5.39	5.4	0.7058
LDL, mean, mg/dL	93.54	136.3	<0.001
HDL, mean, mg/dL	56.16	47.56	<0.001
TC, mean, mg/dL	171.73	210.75	<0.001
Smoking	4.64%	0.495%	<0.001

DPB, diastolic blood pressure; HbA1c, hemoglobin A1c; HDL, high-density lipoprotein; LDL, low-density lipoprotein; LEO, law enforcement officer; Lp-PLA2, lipoprotein-associated phospholipase A_2; SBP, systolic blood pressure.

Low/Intermediate Framingham Versus Positive Lp-PLA2 Analysis

While Framingham Risk Score analysis is an effective method for predicting CHD/CVD risk in the general population, it significantly underestimates the risk in LEOs. We compared all data sets in our study population that had an FRS of "low or intermediate" risk and compared this with the percentage of individuals who were Lp-PLA2 positive. This comparison was conducted across LEO and civilian cohorts in separate male and female populations. In both the male and female population studies, the law enforcement cohort had a significantly greater percentage of Lp-PLA2 positivity than the civilian cohort, making the Framingham Risk Score analysis unreliable (Fig. 5, Table 6). Lipoprotein-associated phospholipase A_2 activity measurement revealed that more than 92% of the LEOs identified as "low or intermediate" risk using the FRS were found to be at a high risk using inflammatory biomarker analysis (Fig. 6). This was a significant distinction from that in civilians, among whom only 24% were not properly identified (Figs. 7, 8; Table 7).

Coronary Artery Calcium Score Calculation

Of the 3330 patients screened, 3250 (478 civilians and 2772 LEOs) underwent CAC score calculation. For this analysis, the presence of identifiable coronary calcium was considered abnormal, that is, any Agatston Score higher than 0. The Agatston Score is calculated

TABLE 4. Logistic Regression Model to Predict the Probability of Being Lp-PLA2 Positive

Coefficient	Logit Estimate	Odds Ratio	*P*
Intercept	−6.9493	0.0010	<0.001
		95% CI (0.0004–0.0018)	
Job group law enforcement	2.1919	8.9524	<0.001
		95% CI (6.7327–11.9557)	
Male sex	1.2810	3.6005	<0.001
		95% CI (2.5658–5.0773)	
LDL, mg/dL	0.0463	1.0474	<0.001
		95% CI (1.0423–1.0527)	
Current smoker	0.2007	1.2222	0.637
		95% CI (0.5229–2.7705)	

CI, confidence interval; LDL, low-density lipoprotein.

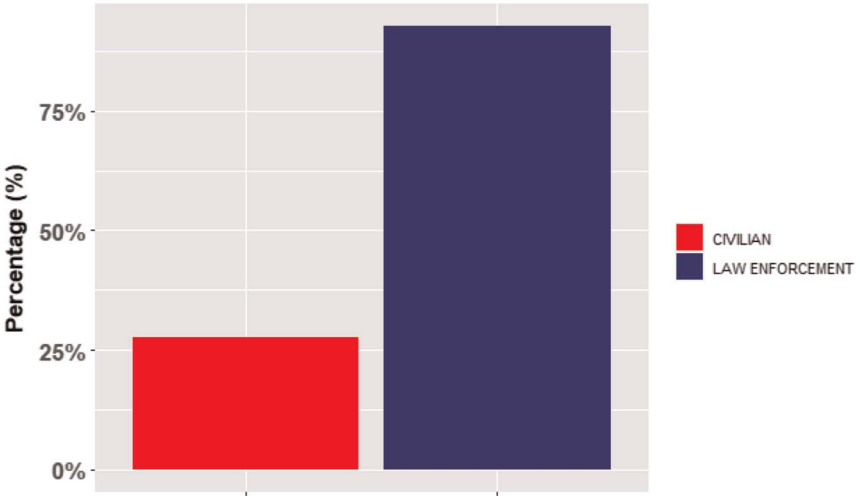

FIGURE 4. Liposomal-associated PLA2 positivity statistical significance by job group.

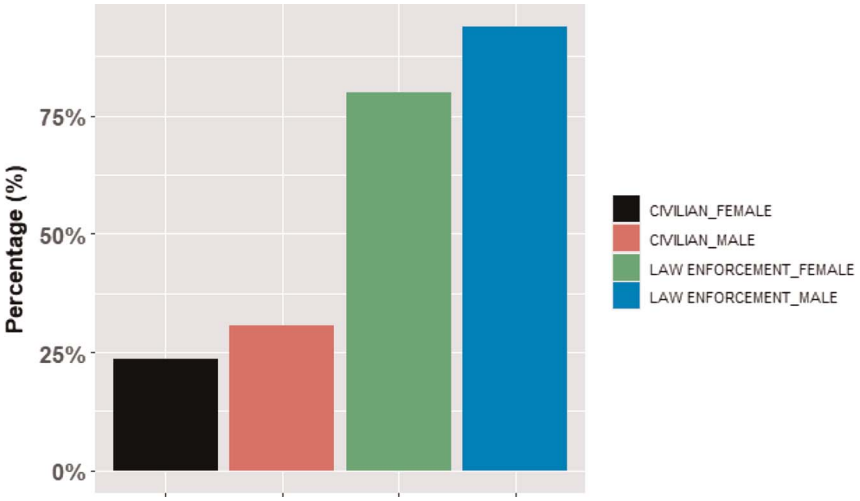

FIGURE 5. Phospholipase A2 positivity by job group and sex.

based on the total area and density of calcium deposition within the coronary arteries. A score of zero means no calcified plaque is detected. There was no standardization regarding the type of computed tomography scan used as multiple scanners were used in several cities throughout the United States, although standard Agatston scoring protocol was used. The CAC positivity in LEOs was similar to that in civilians ($P = 0.192$; Fig. 9, Table 8). This subset reproduces the data from Wanahita et al,[31] who found a similar relationship in 2010.

Summary

Using the collected data and identifying covariates, a final model was derived by identifying the variables that significantly influenced Lp-PLA2 positivity. These variables included the profession as a LEO, male sex, and LDL concentration. Lipoprotein-associated phospholipase A_2 levels were inversely associated with age and tobacco use. That is, despite being older and using tobacco at a higher rate, civilians had lower levels of this inflammatory marker, which cannot be explained by the higher LDL concentration alone observed in the LEO cohort.

We exponentiated our logistic regression model using coefficient log odds estimates and obtained odd ratios for each variable. Therefore, with all other variables equal, our analysis revealed that LEOs were 8.95 times or 795.25% more likely to be Lp-PLA2 positive than civilians. Male individuals were 3.6 times or 260.05% more likely to be Lp-PLA2 positive than female individuals. For each 1 mg/dL

TABLE 5. Low/Intermediate Framingham Risk Score: Lp-PLA2 Positivity by Job Group

Lp-PLA2 Positivity, Civilian Versus Law Enforcement		
	Yes	**No**
Civilian	269 (27.73%)	701 (72.27%)
Law enforcement	2063 (92.84%)	159 (7.16%)
P	<0.001	

Lp-PLA2, lipoprotein-associated phospholipase A_2.

TABLE 6. Lipoprotein-associated phospholipase A_2 Positivity Statistical Significance by Job Group and Sex

Lp-PLA2 Positivity, Civilian Versus Law Enforcement		
	Yes	**No**
Civilian female	92 (23.5%)	300 (76.5%)
Civilian male	177 (30.6%)	401 (69.4%)
Law enforcement female	143 (79.9%)	36 (20.1%)
Law enforcement male	1920 (94%)	123 (6%)
P	<0.001	

Lp-PLA2, lipoprotein-associated phospholipase A_2.

increase in the LDL level, the likelihood of Lp-PLA2 positivity increases by 1.05 times or 4.74%. Current smokers are 1.22 times or 22.23% more likely to be Lp-PLA2 positive than nonsmokers (Table 4).

Therefore, LEOs had an increased odds of 794.25% of being Lp-PLA2 positive compared with civilians ($P < 0.001$). Male individuals had an increased odds of 260.05% of being Lp-PLA2 positive compared with female individuals ($P < 0.05$). For each 1 mg/dL increase in the LDL level, there was an increased odds of 4.74% of being Lp-PLA2 positive ($P < 0.05$). Smokers had an increased odds of 22.23% of being Lp-PLA2 positive (Table 4).

DISCUSSION

Our analysis considered the baseline levels of classic and accepted CV risk factors in the law enforcement and civilian cohorts to identify if the LEO cohort had a significantly increased presence of classic CV risk factors. These risk factors consist of age, dyslipidemia, hypertension, diabetes, family history, and tobacco use. The LEO and civilian cohorts had no clinically significant differences regarding age, SBP, insulin level, or HbA1c. However, LEOs (both male and female) had statistically higher LDL and total cholesterol levels. This mild elevation in LDL did not seem to account for the disproportionally elevated Lp-PLA2 levels. Interestingly in this study, civilians were older and used tobacco at significantly higher rates (2 classically known cardiac risk factors). However, despite being younger and smoking less, LEOs had an increased risk via Lp-PLA2 positivity compared with their civilian counterparts, possibly because of elevated LDL levels and job-specific duties performed by LEOs.

According to the data collected, standard population-based risk modeling using the FRS is inadequate for identifying LEOs possibly at high risk of a coronary event, as the score does not account for the individual risk of plaque rupture. When this risk was identified, approximately 92% of officers with low or intermediate risk determined via the FRS were at substantially high risk of acute coronary events when inflammatory biomarkers were evaluated. This rate was definitively greater than that in civilians, where the FRS only underestimated approximately 24% of individuals at low or intermediate risk using inflammatory biomarker analysis. This significant discrepancy can be explained by the substantial increase in Lp-PLA2 positivity observed in the LEO cohort, as the cohort had an increased odds of 795% of this positive marker. The reason LEOs had more inflammatory plaques than civilians despite similar age, SBP, HbA1c, insulin levels, and less incidence of tobacco use is unclear. This discrepancy is likely due to increased LDL concentrations and job-specific functions.

Law enforcement is a stressful profession and certainly not unique in this regard. However, police officers have a unique stress pattern vastly different from that of civilians. According to data from more than 4500 US LEOs between 1984 and 2010, the risk of sudden cardiac death is exceedingly elevated during restraints and altercations, pursuits, physical training, and medical/rescue operations.[9]

The inherent nature of policing comprises extended periods of routine and sometimes mundane patrols or investigations punctuated by short periods of intense excitement, causing accelerated adrenaline release. This is the so-called pattern of policing, described as 98% boredom and 2% sheer terror. These unexpected and recurrent adrenergic responses cause several rapid physiological changes that may

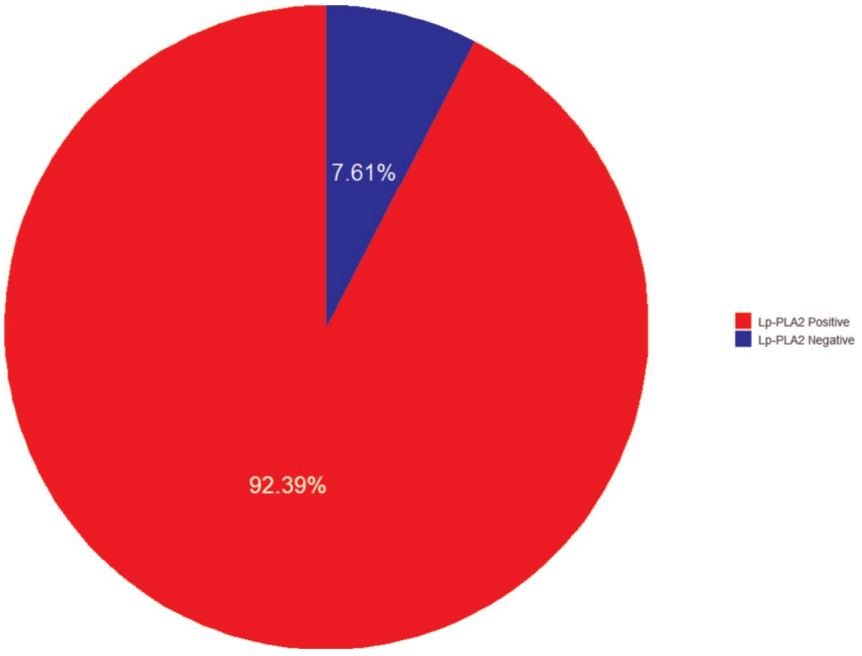

FIGURE 6. Low/intermediate Framingham risk vs Lp-PLA2 positivity in LEOs.

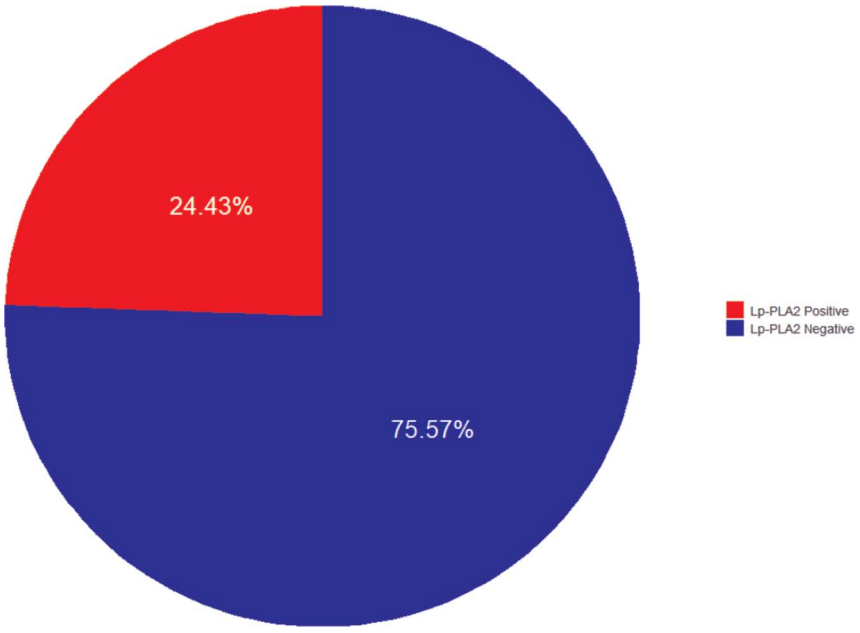

FIGURE 7. Low/intermediate Framingham risk vs Lp-PLA2 positivity in civilians.

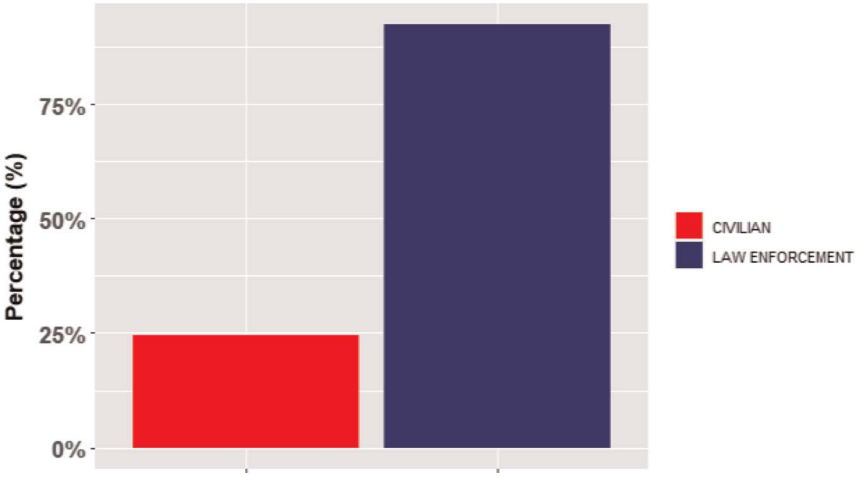

FIGURE 8. Proportion test of low/intermediate Framingham risk: Lp-PLA2 positivity by job group.

cause intramural coronary plaques to become unstable. In these incidences, there are sudden increases in the heart rate, SBP and DBP, overall cardiac output, and shear forces within the arterial walls. During episodes of acute physical stress, oxygen stores are depleted, and metabolism begins to shift toward the anaerobic threshold with a corresponding increase in lactic acid production, associated with increased CV events.[32] In certain instances, when officers fight to survive, these episodes can be prolonged and last many minutes.[33] The recurrent hyperadrenergic state and its corresponding physiological changes possibly increase plaque instability, which can be detected by analyzing inflammatory biomarkers, Lp-PLA2 in particular.

In conclusion, Lp-PLA2 is an endothelium-dependent inflammatory biomarker disproportionally elevated in LEOs. This marker is an independent predictor of CVD and can be used to identify more than 90% of LEOs at high risk for CV events who cannot be identified using the FRS. Furthermore, the use of the CAC score cannot differentiate high-risk LEOs from their civilian counterparts. Therefore, law enforcement CV screening programs should include the measurement of Lp-PLA2 activity as an effective tool for identifying and subsequently reducing CVD across law enforcement occupations.

TABLE 7. Low/Intermediate Framingham Risk Score: Lp-PLA2 Positivity by Job Group

Lp-PLA2 Positivity, Civilian Versus Law Enforcement		
	Yes	**No**
Civilian	215 (24.4%)	665 (75.6%)
Law enforcement	1397 (92.4%)	115 (7.6%)
P	<0.001	

Lp-PLA2, lipoprotein-associated phospholipase A_2.

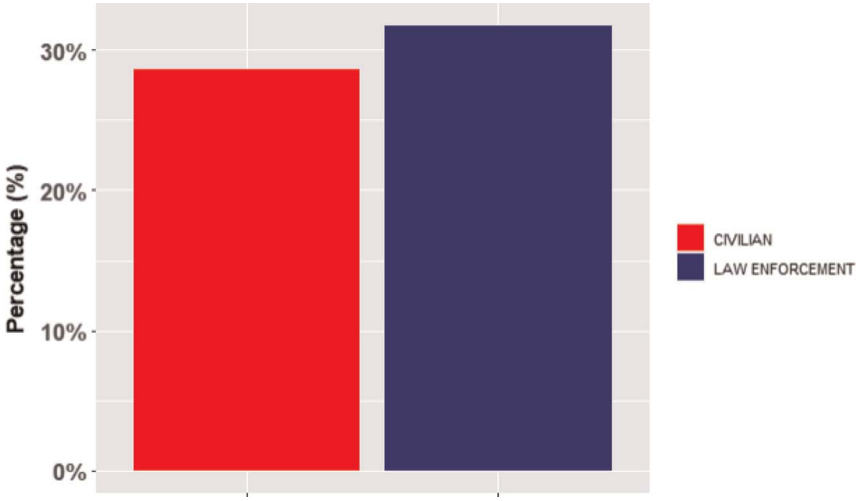

FIGURE 9. Positive CAC Score by Job.

Study Limitations

Although this study presents a very interesting concept that suggests using a novel biomarker approach to coronary risk determination in the law enforcement community, there are limitations in the study design. This study is a descriptive, retrospective chart review and therefore not as definitive as a prospective case-control study. Several factors could affect the resulting data. This retrospective analysis may inadvertently have caused selection and or information bias. Because Lp-PLA2 is expressed within the intravascular necrotic core and apoptotic macrophages,[34] the standard covariate analysis performed in this study using the classic cardiac risk factors (hypertension, age, tobacco, diabetes, and dyslipidemia) identifies that LEOs have elevation of Lp-PLA2 despite similar classic risk analysis. However, data regarding specific diet and exercise routines were not captured with this retrospective analysis. Although Lp-PLA2 is a novel predictor for acute coronary syndrome, this analysis did not look at the rate of coronary events in either the LEO or civilian cohort. As several already published studies support the independent predictive value of Lp-PLA2 for acute coronary events, it would certainly prove difficult (if not unethical) to withhold treatment from individuals who are found to have a serum elevation of this biomarker just to track event rate. Despite its potential limitations, this retrospective analysis is the first step to forming hypotheses that can be confirmed with a future prospective study.

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TABLE 8. CCS Positivity by Job Group

Lp-PLA2 Positivity, Civilian Versus Law Enforcement		
	Yes	**No**
Civilian	137 (28.66%)	341 (71.34%)
Law enforcement	881 (31.78%)	1891 (68.22%)
P	0.192	

Lp-PLA2, lipoprotein-associated phospholipase A_2.

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