Analysis of Key Blood Biomarkers for Healthspan in First Responders

First responders—including firefighters, police officers, paramedics, nurses, and EMTs—dedicate themselves to serving and protecting their communities in times of crisis. The nature of their demanding and high-stress professions exposes them to elevated health risks, like cardiovascular health and stress. Previous studies on first responders demonstrate the mental and physical toll of this critical line of work.

A systematic review of police officers, firefighters, paramedics, and logistics personnel found that first responders have high turnover due to stress, workload, and fatigue. [1] It is critical to understand the needs of first responders, which can result in specialized programs to build resilience in stressful work environments. This is especially critical because exposure to stress and trauma puts first responders at an increased risk of post-traumatic stress disorder (PTSD), depression, and more. [2] Studies have also shown that first responders are prone to higher objective measures of stress, namely blood cortisol levels. [3]

Studies show that firefighters, as well as other first responders, are at an increased risk of sudden cardiac death compared to the general population. In fact, 45% of firefighter deaths were cardiac-related, accounting for more deaths than fire-related injuries. Researchers hypothesize that the increased risk of cardiac death can be due to several heart health risk factors that firefighters experience at a higher rate, including metabolic syndrome, coronary artery disease, sleep deprivation, and overall poor mental well-being. [4, 5]

Compared to the general population, firefighters are exposed to air pollution, mental and heat stress, altered circadian rhythms, and more. Short and long-term exposure to these factors put first responders at an increased risk for elevated inflammatory markers, like hsCRP, known to affect the immune system, heart health, and cancer, among other cardiovascular and respiratory diseases. [6]

First responders are also at risk for suboptimal cardiometabolic risk factors, like elevated LDL cholesterol, total cholesterol, triglycerides, and blood glucose levels, although these levels are comparable to the general population in the United States. That said, a study showed that 25% of first responders had low HDL cholesterol (higher HDL cholesterol levels are cardioprotective). [7]

InsideTracker's researchers hypothesized that the first responder cohort may be more susceptible to suboptimal indicators of heart health, inflammation, metabolism, and stress than the general population because of their line of work.

Study approach

At baseline, 323 first responders completed at least one test with InsideTracker. Blood biomarker mean values were assessed, and a t-test determined if the differences between mean biomarker values in the first responder versus the general InsideTracker population (n=15,000+) were significant.

Of the 323 first responders, 88 tested two or more times with InsideTracker. At follow-up, the 88 first responders who completed blood biomarker testing on at least two occasions that were 90 or more days apart were included in the analysis. These individuals were compared to >15,000 individuals in InsideTracker's general population. Researchers classified biomarker levels as "improved" if they moved towards a more optimal level between baseline and follow-up.

Results

<u>Baseline results</u>
On their first test with InsideTracker, first responders were "less healthy" than the general InsideTracker population. HDL cholesterol (a heart health indicator) and hsCRP (an inflammation marker) were significantly less optimal at baseline in the first responder cohort compared to the general InsideTracker population.

First responders had significantly lower total cholesterol levels than the general InsideTracker population at baseline, likely due to their significantly lower HDL cholesterol levels.

Biomarker	InsideTracker qualifying general population (n = >15,00t0) Mean value	First Responders (n = 323) Mean value	P-value (between tests) *Significance <0.05	% difference
HDL cholesterol* (mg/dL)	61.98	58.30	<0.01	6%
Total cholesterol* (mg/dL)	193.83	189.16	0.01	2.5%
hsCRP* (mg/dL)	1.32	1.56	0.04	18%
LDL (mg/dL)	114.10	111.75	0.13	2%
HbA1c (%)	5.22	5.25	0.18	0.6%
Triglycerides (mg/dL)	90.63	94.09	0.21	3.8%
Glucose (mg/dL)	89.56	90.40	0.26	0.9%
Cortisol (ug/dL)	13.59	13.33	0.33	2%
ApoB (mg/dL)	94.19	94.39	0.96	0.2%

* Indicates significant difference between first responder population and InsideTracker's general population.

Follow-up

First Responders saw improvements in certain blood biomarkers beyond the rates of improvement observed in the general InsideTracker population. Improvement was defined as any biomarker change in a more optimal direction. The first responder group was 33% more likely to improve HDL cholesterol and 19% more likely to improve fasting blood glucose levels than the general InsideTracker population.

Biomarker	% InsideTracker general population who improved	% first responders who improved	% difference
HDL cholesterol (mg/dL)	49%	65%	First responders were **33% more likely** to improve
Glucose (mg/dL)	57%	68%	First responders were **19% more likely** to improve
Triglycerides (mg/dL)	57%	58%	First responders were **2% more likely** to improve
hsCRP (mg/dL)	52%	52%	First responders were **equally likely** to improve
Total cholesterol (mg/dL)	52%	50%	First responders were **4% less likely** to improve
LDL (mg/dL)	48%	44%	First responders were **8% less likely** to improve
HbA1c (%)	45%	39%	First responders were **13% less likely** to improve
Cortisol (ug/dL)	60%	22%	First responders were **63% less likely** to improve
ApoB (mg/dL)	(Not enough data)		

Takeaways

HDL cholesterol is a critical biomarker to optimize, as optimal levels are cardioprotective, meaning they are beneficial for heart health. At baseline, first responders had significantly lower HDL cholesterol levels than InsideTracker's general population. At follow-up, first responders saw improvements in HDL cholesterol beyond the rates observed in the general InsideTracker population. [7]

Glucose improvements in the first responder cohort are promising for short-term blood sugar and metabolic control. However, the long-term measure of blood sugar levels, HbA1c, was a biomarker that first responders were less likely to improve than the general population. Future studies will measure the longer-term impact of InsideTracker's Action Plan on first responders to determine if the short-term impact of blood glucose levels translates to longer-term impacts on blood sugar via HbA1c. [7]

In first responders, cortisol, the stress hormone, improved at a decreased rate compared to the general population. As previous studies have cited, first responders often operate in high-stress environments. Inconsistent sleep schedules and high-stress occupational demands can increase stress and cortisol levels. Research demonstrates cortisol levels are readily influenced by lifestyle adjustments. [3] For example, prioritizing napping or catch-up sleep may be suitable to the first responder population. [8] They may also benefit from implementing moments of mindfulness meditation, which wearable devices like Garmin and Oura Ring help facilitate.

In line with other studies, hsCRP levels (a general marker of inflammation) were significantly higher at baseline in first responders compared to InsideTracker's general population. Higher levels of inflammation can result from high stress and inadequate recovery from physical activity, and can impact important functions like sleep and muscle-building. The recommendations that each user sees are personalized to the individual, based on their specific levels and health profile data. [6]

Next steps

The data reviewed illustrates the negative impacts of a high-stress first responder lifestyle but also supports this population's high drive and unique capacity for improvement when armed with science-backed, personalized health and lifestyle guidance.

So often, first responders work to keep others in good health. InsideTracker is committed to keeping first responders in good health as well. While each person's health is unique, significant group-level findings helped InsideTracker best understand how to create a custom blood panel to improve first responders' health.

Recognizing the urgent need to prioritize the well-being of these courageous individuals, InsideTracker developed a custom blood panel based on the findings of this research to test and analyze their results while providing personalized recommendations to support heart health, metabolism, inflammation, gut health, and stress.

Visit insidetracker.com/first-responder to learn more about the nine-biomarker first responders blood plan for optimizing total cholesterol, HDL cholesterol, LDL cholesterol, ApoB, triglycerides, glucose, HbA1c, cortisol, and hsCRP.

References

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