THE ROI OF READINESS

EIGHT YEARS OF PROVEN RETURNS FROM INVESTING IN FIREFIGHTER HEALTH

VANESSA FROST-PIEDRAHITA
HEALTH & FITNESS COORDINATOR
MSED, CSCS*D, RSCC*D

BOBBY ORTIZ
BATALLION CHIEF
*****

NFPA 1580 10.1 ESSENTIAL JOB TASKS

10.1.1

The fire department shall evaluate the following 15 essential job tasks against the types and levels of emergency services provided to the local community by the fire department, the types of structures and occupancies in the community, and the configuration of the fire department to determine which tasks apply to individuals:

(1)* Wearing personal protective equipment (PPE) and self-contained breathing apparatus (SCBA) while performing firefighting tasks (e.g., hose line operations, extensive crawling, lifting and carrying heavy objects, ventilating roofs or walls using power or hand tools, forcible entry), rescue operations, and other emergency response actions under stressful conditions, including working in extremely hot or cold environments for prolonged time periods

(2) Wearing the respirators required by the jurisdiction (e.g., N-95, half-face elastomeric, PAPR, SCBA), which includes a demand-valve-type positive-pressure facepiece or filter respirator, achieving a successful fit-test and tolerating increased respiratory workloads

(3) Exposure to toxic fumes, irritants, particulates, biological (i.e., infectious) and nonbiological hazards, or heated gases, despite the use of PPE and SCBA

(4) Climbing at least six flights of stairs or walking a similarly strenuous distance and incline in jurisdictions without tall buildings while wearing PPE and SCBA, commonly weighing 40–50 lb (18–23 kg) and carrying equipment/tools weighing an additional 20–40 lb (9–18 kg)

(5) Wearing PPE and SCBA that is encapsulating and insulated, which will result in significant fluid loss that frequently progresses to clinical dehydration and can elevate core temperature to levels exceeding 102.2°F (39°C)

(6) Working alone while wearing PPE and respirators required by the jurisdiction, searching, finding, and rescue-dragging or carrying victims to safety in hazardous conditions and low visibility

(7) While wearing PPE and SCBA, advancing water-filled hose lines up to 1 $^{3}/_{4}$ in. (45 mm) in diameter from fire apparatus to occupancy [approximately 150 ft (50 m)], which can involve negotiating multiple flights of stairs, ladders, and other obstacles

(8) While wearing PPE and SCBA, climbing ladders, operating from heights, walking or crawling in the dark along narrow and uneven surfaces that might be wet or icy, and operating in proximity to electrical power lines or other hazards

(9) Unpredictable, prolonged periods of extreme physical exertion as required by emergency operations without benefit of a warm-up period, scheduled rest periods, meals, access to medication(s), or hydration

(10) Operating fire apparatus or other vehicles in an emergency mode with emergency lights and sirens

(11) Critical, time-sensitive, complex problem solving during physical exertion in stressful, hazardous environments, including hot, dark, tightly enclosed spaces, that is further aggravated by fatigue, flashing lights, sirens, and other distractions

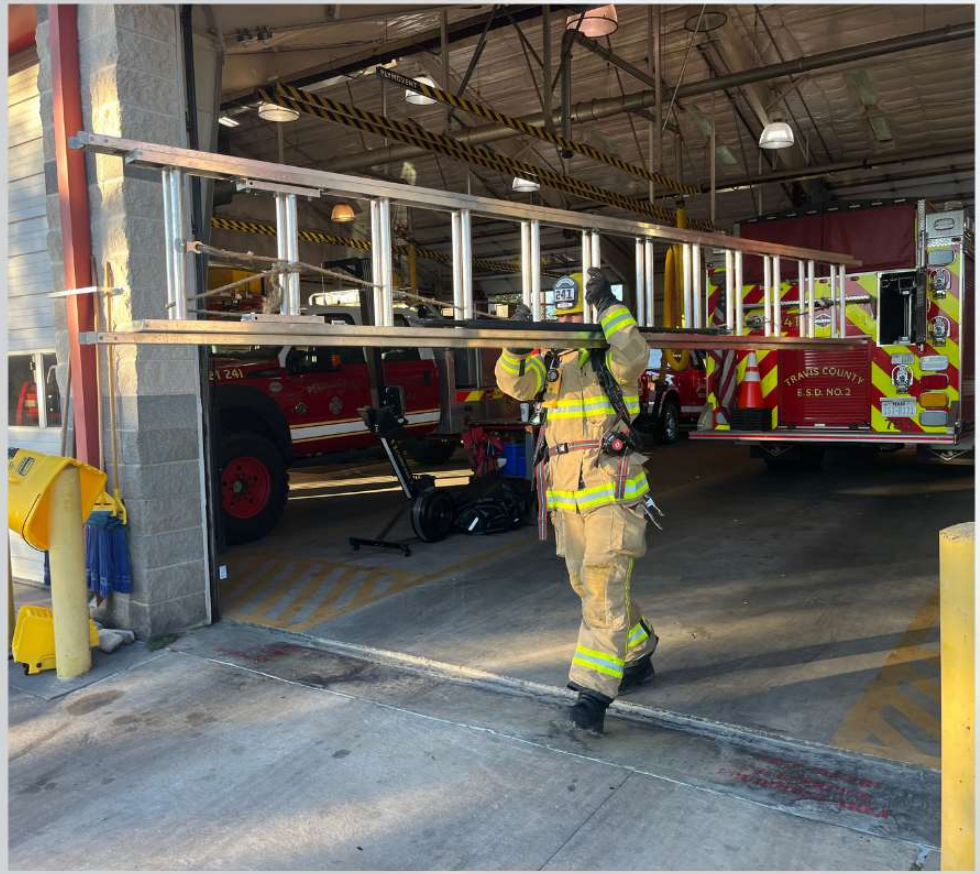
(12) Ability to communicate (i.e., give and comprehend written or verbal orders) while wearing PPE and respirators required by the jurisdiction under conditions of high background noise, poor visibility, and drenching from hose lines or fixed protection systems (e.g., sprinklers)

(13) Functioning as an integral component of a team, where sudden incapacitation of a member can result in mission failure or in risk of injury or death to members of the public or other team members

(14) Working in shifts, including during nighttime, that can extend beyond 12 hours

(15) Performing emergency medical service (EMS) tasks, such as cardiopulmonary resuscitation (CPR) or lifting or moving patients, while wearing PPE and respirators required by the jurisdiction

Getting to the Fire:



Gear 45 lbs

SCBA 35 lbs

24' ladder 72 lbs

152+lbs TOTAL

DOI: 10.1080/00140139.2024.2375026

Redline First Responder Gear cleaning

First Out Rescue Equipment

During Interior FF tasks:

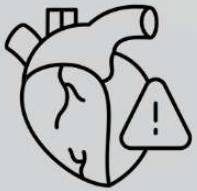
8-13 METs

Long Standing Recommended Vo2 max

12 METs

doi: 10.1080/00140130802120259
doi:10.3390/safety5030050

Causes of Firefighter Fatalities



~45% Sudden Cardiac Death
of annual LODD

~66% Cancer
of LODDs over last 20 years

80 FF Suicide
in 2025

doi: 10.1097/JOM.0000000000002490
Firefighter Cancer Support Network
FF Behavioral Health Alliance
NFPA Firefighter Fatalities in the US


IN COME HEALTH & FITNESS PROGRAMS
FIRE
RESCUE
TRAINING • HEALTH • READINESS
WELLNESS
FIRE
DEPARTMENT
HEALTH &
WELLNESS
STAY
STRONG
STAY
READY

27% US Department with wellness programs

IAFF WFI 4th Edition

27% US Department with wellness programs

IAFF WFI 4th Edition

12.5% FF meet policy of exercising 45 mins every shift (3 days)

PMID: 37304748

14% FF considered 'active' off-shift based on step count Active = 10k

PMID: 33333835

Does sustained investment in firefighter fitness produce measurable operational and financial returns?

ARE FITNESS PROGRAMS WORTH THE INVESTMENT?

WHY LEADERSHIP MOVED EARLY

Establish Health & Fitness Commitee

Start using CPAT

Begin placing equipment in stations

2011

EARLY FOUNDATION & FOMAL LAUNCH

Establish Health & Fitness Commitee

Start using CPAT

Begin placing equipment in stations

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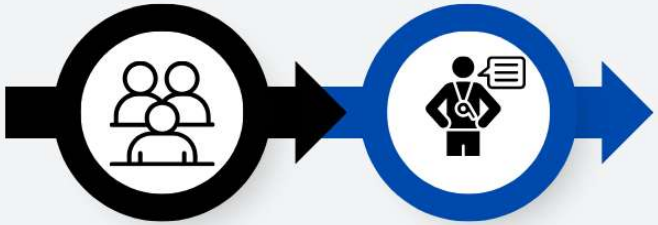


2016

Hire Health & Fitness Coordinator

Quarterly Benchmarks Station Workouts

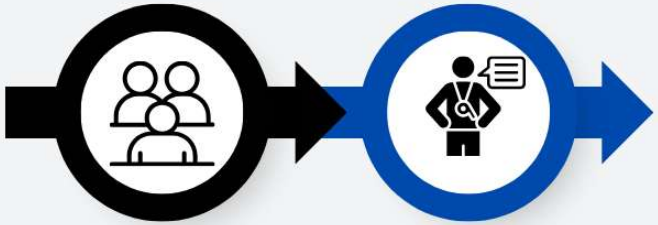
BUILDING STRUCTIRE INTO READINESS

Establish Health & Fitness Commitee

Start using CPAT

Begin placing equipment in stations

2011



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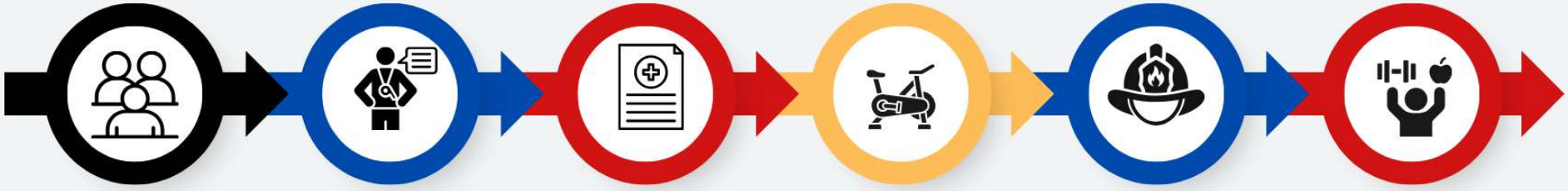


Establish Health & Fitness Commitee

Start using CPAT

Begin placing equipment in stations

2011

2016

Hire Health & Fitness Coordinator

Quarterly Benchmarks Station Workouts

Begin NFPA 1582 Compliant Medical Physicals

2017

2021

Starting using bike for CPET & Inbody

Launch Cadet Hiring Program

6 months of Fitness

2022

2023

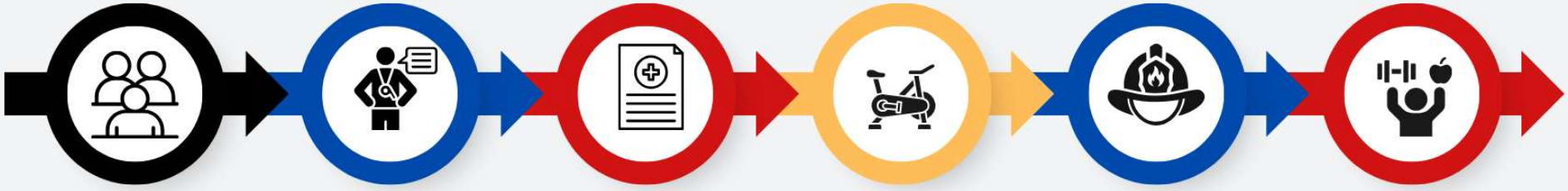
Implement Health & Fitness Work Group

DEVELOPMENT OF THE HEALTH & FITNESS PROGRAM

2011 2016 2017 2021 2022 2023 2024

75
Firefighters

234
Firefighters

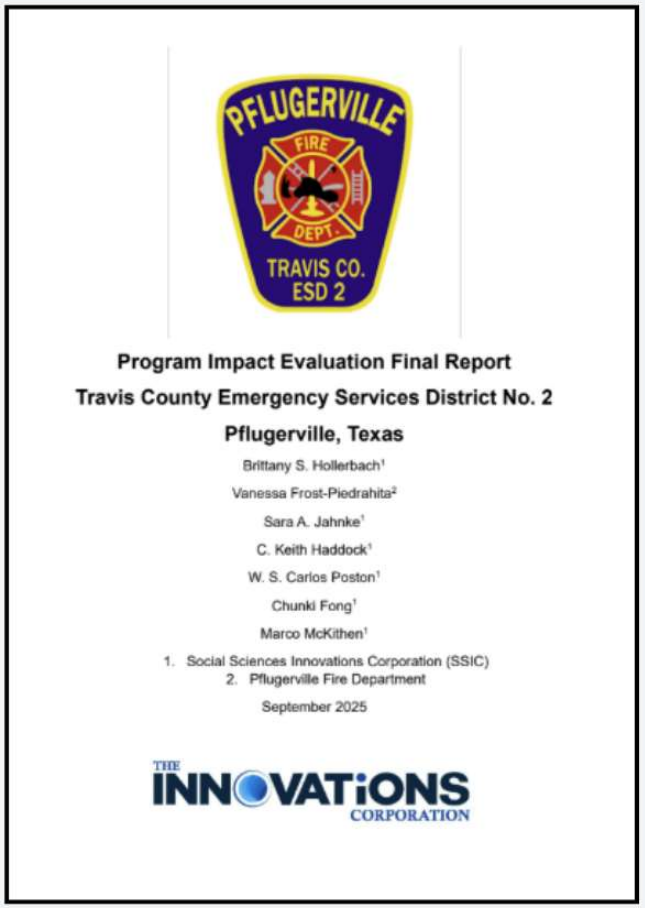


PROGRAM GROWTH & PEER ENGAGEMENT

IMPLEMENTATION CHALLENGES

- Cultural Resistance
- Competing Resource Demands
- Scheduling (day to day & over years)


HEALTH & FITNESS
ARE A PART OF
OPERATIONAL READINESS



Program Impact Evaluation Final Report

Travis County Emergency Services District No. 2

Pflugerville, Texas

Brittany S. Hollerbach[1]
Vanessa Frost-Piedrahita[2]
Sara A. Jahnke[1]
C. Keith Haddock[1]
W. S. Carlos Poston[1]
Chunki Fong[1]
Marco McKithen[1]

1. Social Sciences Innovations Corporation (SSIC)
2. Pflugerville Fire Department

September 2025

Data 2017-2024

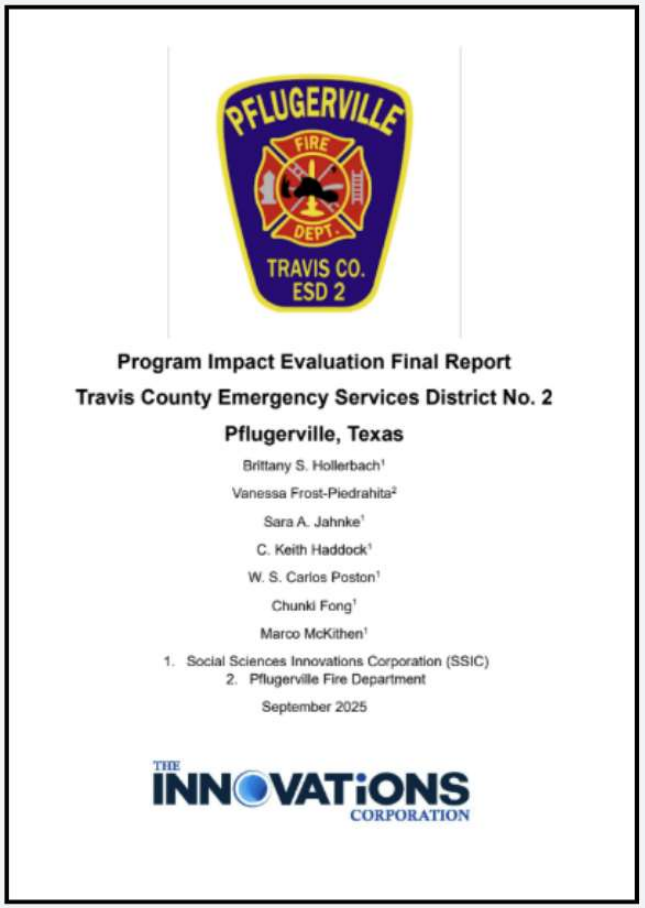
Fitness Assessments

Fitness Program Cost Data

Health Metrics

Workers' Compensation Claims

2022-2025



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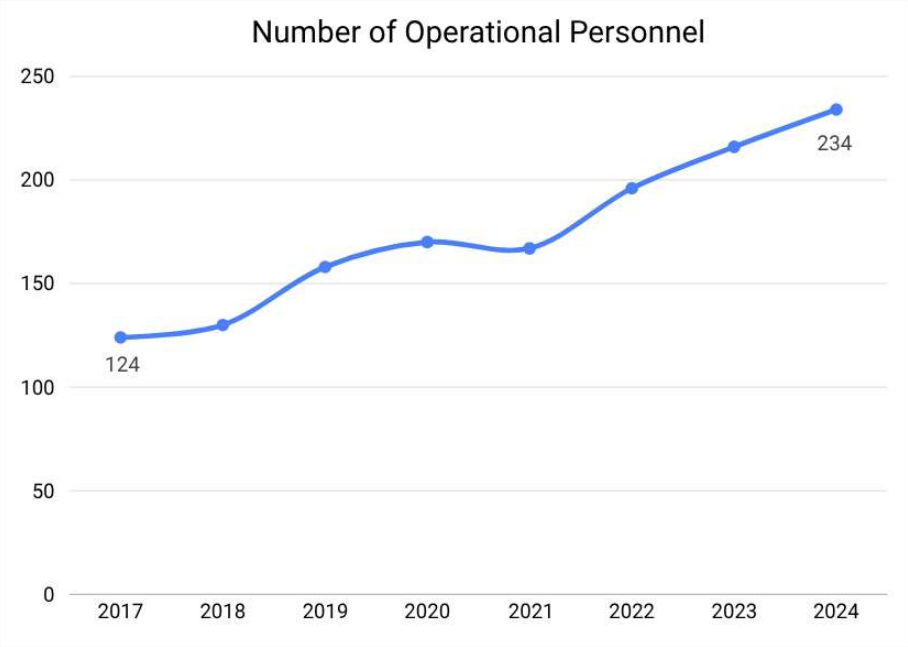
September 2025

Analytical Approach

- Longitudinal analysis health/fitness
- Comparative years/personnel
- Economic modeling for ROI
- Integration of quantitative & operational context to interpret outcomes

POPULATION



Group of personnel from 2017 to 2024

n= 30-98, varying by metric

HEALTH OUTCOMES

BODY COMPOSITION

BODY COMPOSITION

Weight
~202 lbs
199 -208 lbs**

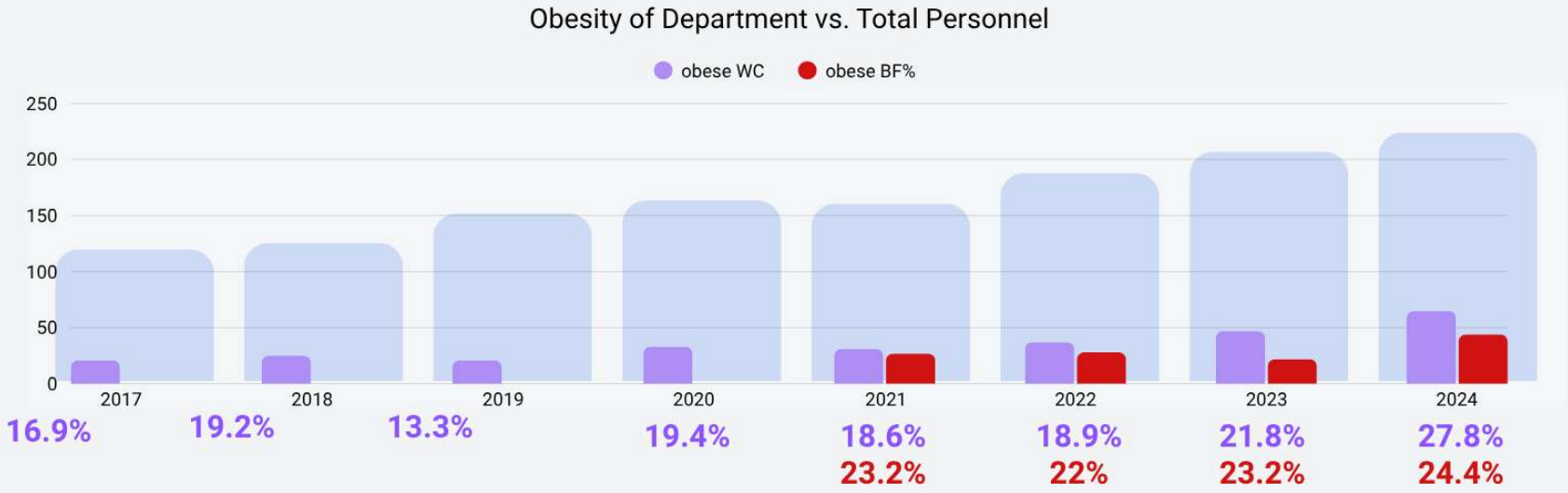
Waist Circumference
36.7 - 37.4 in **
36.2 - 37.7 in **

Body Fat%
~23%
~25%

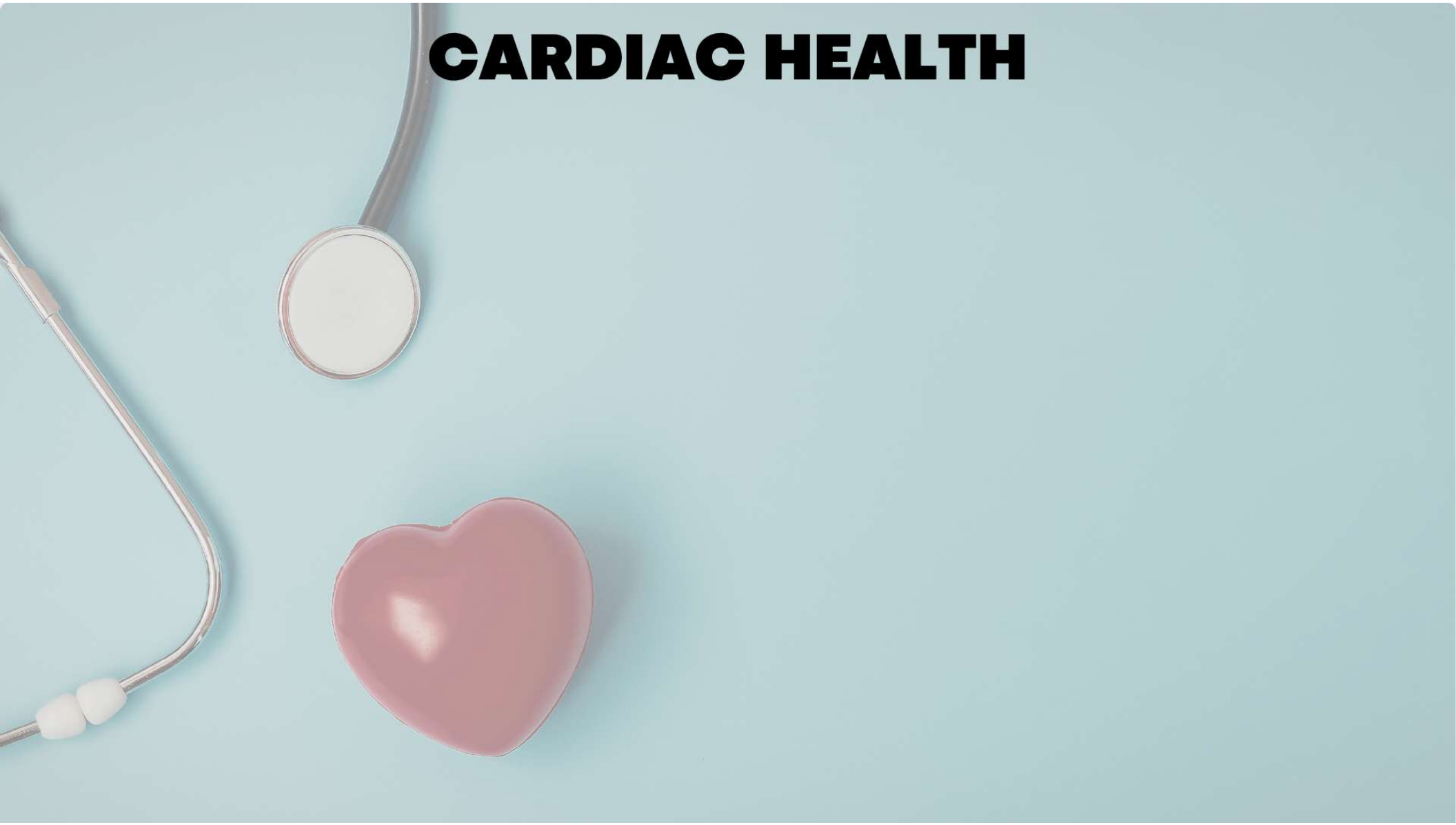
BMI
~28
~29

Visceral Fat
~9.5
~10.4

Muscle Mass
~88.0 lbs
~87.6 lbs



CARDIAC HEALTH



CARDIAC HEALTH

Systolic BP
132 - 121 mmHg**
131 - 126 mmHg**

Cholesterol
~188 mg/dL
~193

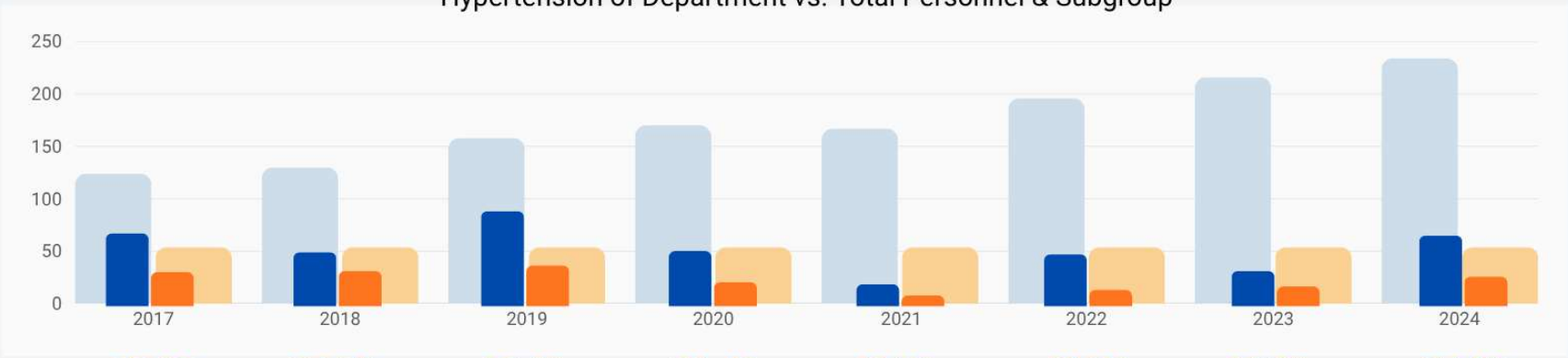
LDL
~114 mg/dL
107 - 120 mg/dL**

Diastolic BP
81 - 77 mmHg**
~80

Triglycerides
128 - 102 mg/dL**
~135

HDL
~54
~51

Hypertension of Department vs. Total Personnel & Subgroup



2017	2018	2019	2020	2021	2022	2023	2024
53.2%	37.7%	54.4%	29.4%	12.0%	24.0%	14.8%	27.4%
57.4%	59.3%	68.5%	40.7%	18.5%	27.8%	33.3%	50.0%

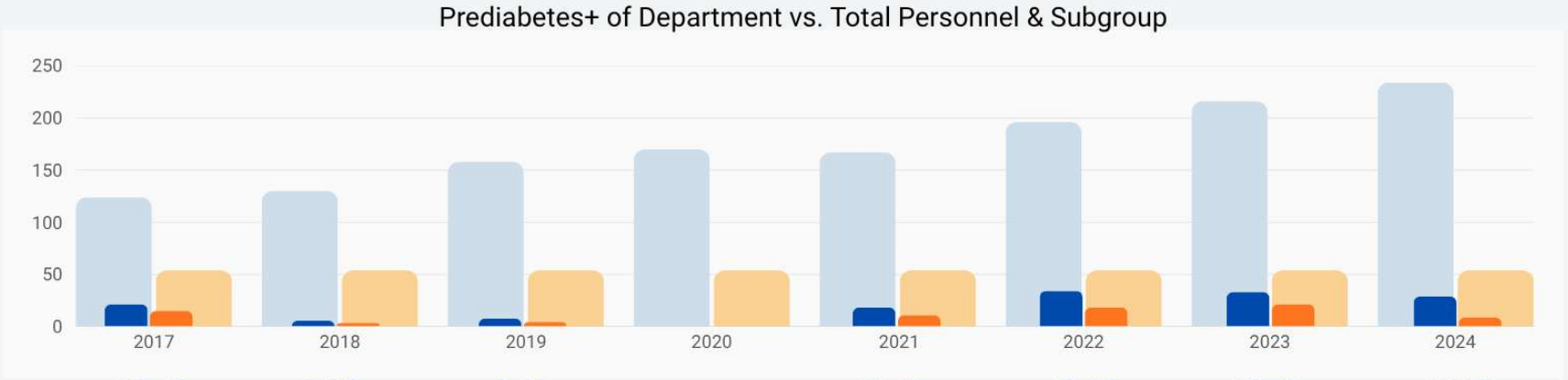
METABOLIC HEALTH

METABOLIC HEALTH

A1C

~5.4%

~5.6%



2017	2018	2019	2020	2021	2022	2023	2024
16.1%	3.8%	4.4%		10.2%	16.3%	14.4%	11.5%
26.9%	5.8%	7.7%		19.2%	32.7%	38.5%	15.4%

METABOLIC SYNDROME

Waist Circ.
M >40in
F >35in

Hypertension
>130s or >85d

A1C > 5.7%

Triglycerides
>150 mg/dL

HDL
M ⩽40mg/dL
F ⩽50mg/dL

METABOLIC SYNDROME

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F >35in

Hypertension
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METABOLIC SYNDROME INCREASES RISK OF:

- Stroke PMID: 37280576
- CVD PMID: 28130064
- T2 Diabetes PMID: 32550195
- NAFLD PMID: 19240815
- Cancer PMID: 19284314
- PCOS PMID: 34940628

9 - 22.3% OF FIRE SERVICE

n=4,500
PMID: 34354906

n=31,000
PMID: 37835084

METABOLIC HEALTH

Waist Circ.
M >40in
F >35in

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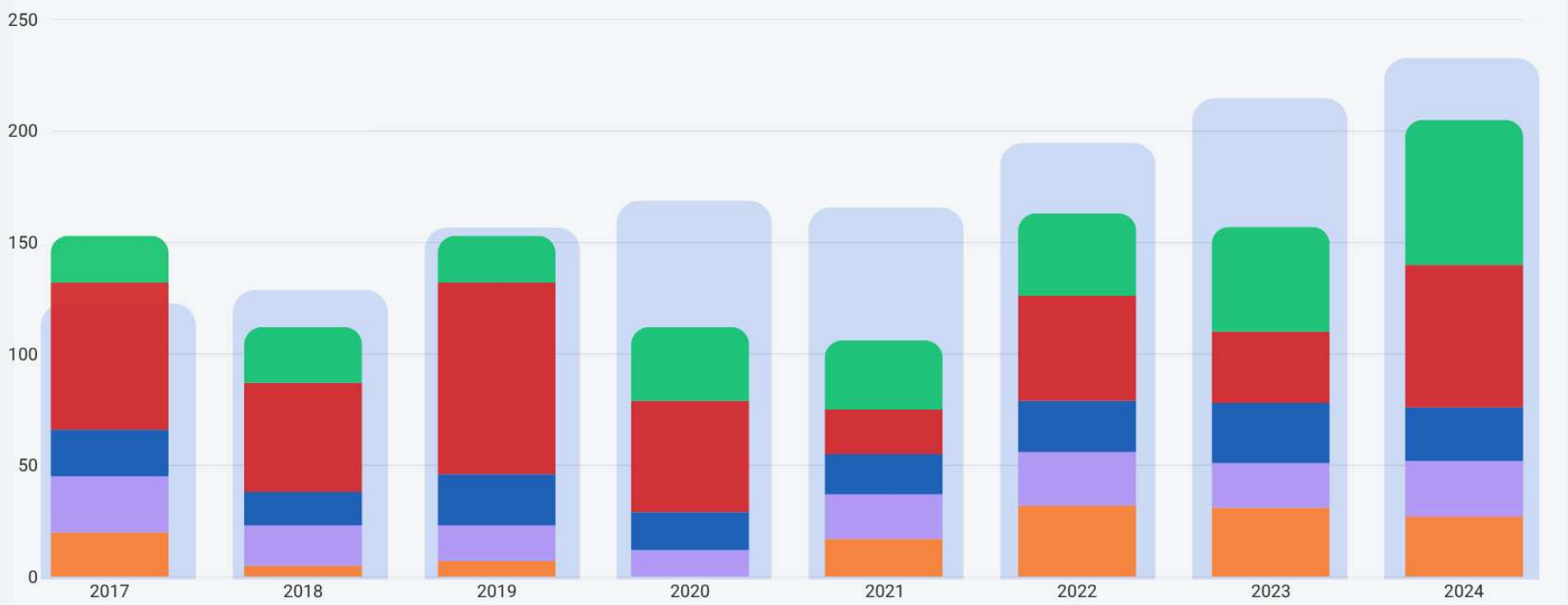

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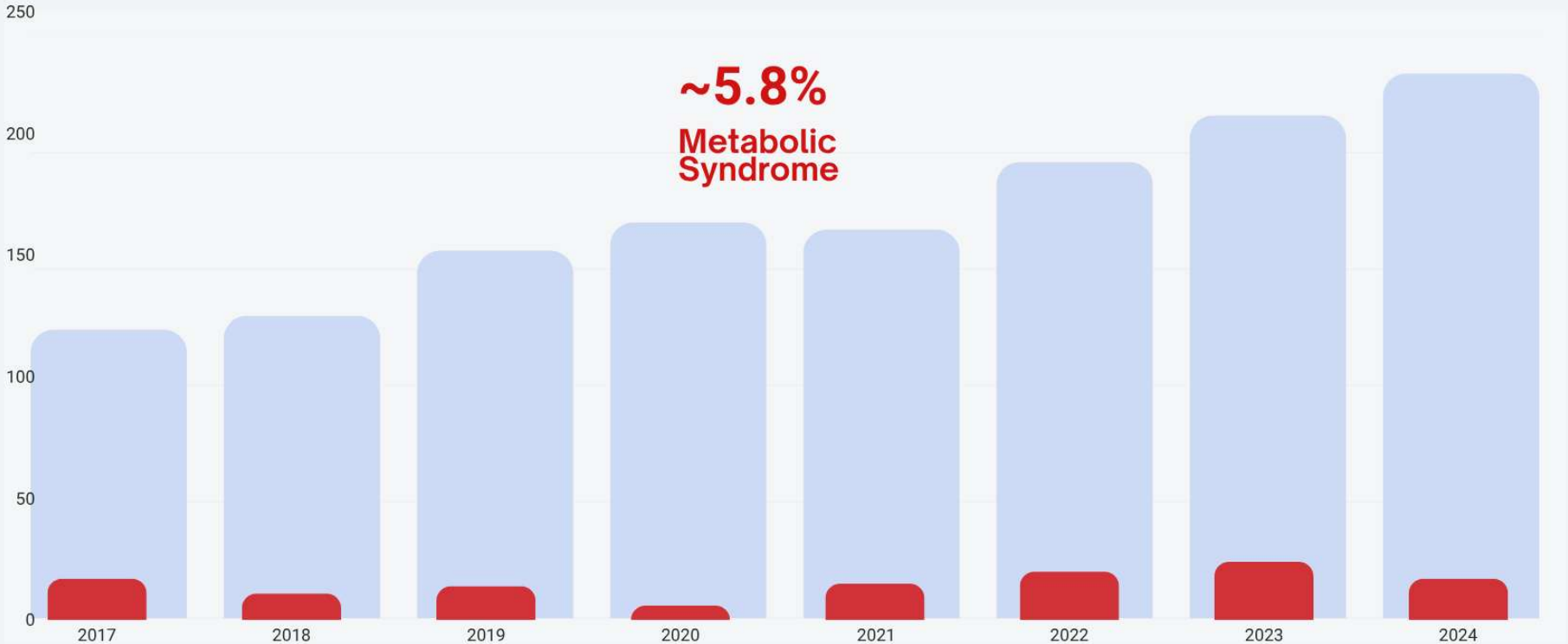
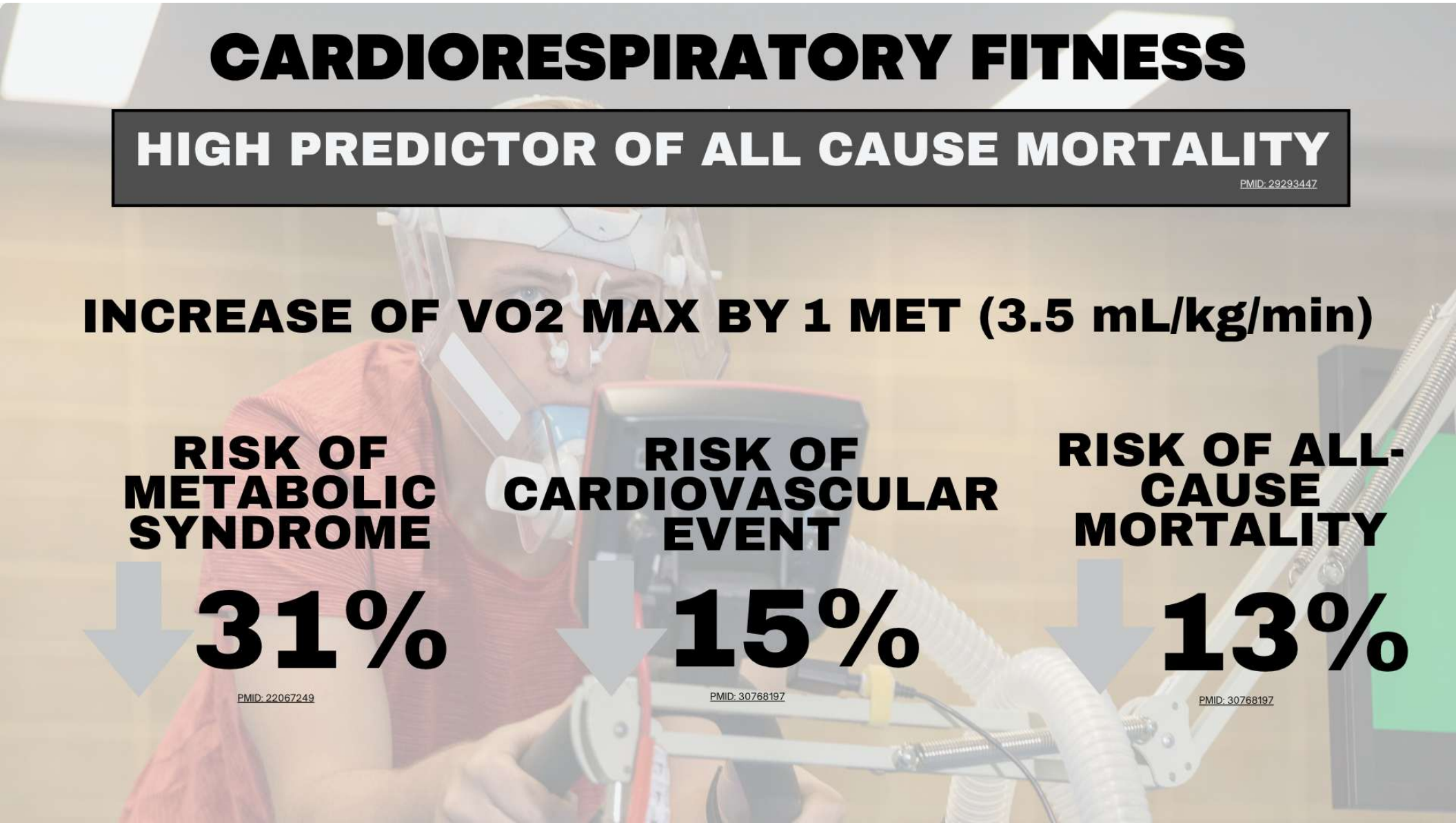


CARDIORESPIRATORY FITNESS

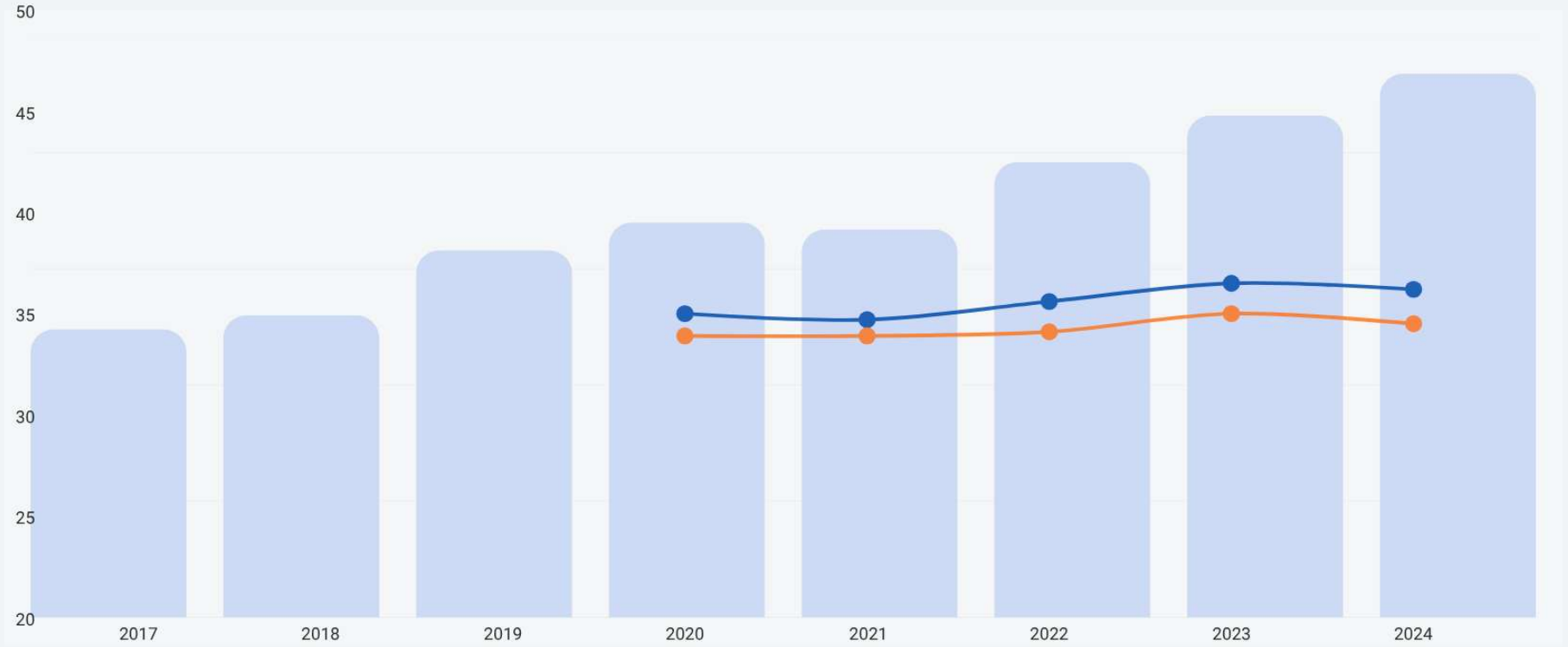

CARDIORESPIRATORY FITNESS
HIGH PREDICTOR OF ALL CAUSE MORTALITY
PMID: 29293447
INCREASE OF VO2 MAX BY 1 MET (3.5 mL/kg/min)
RISK OF METABOLIC SYNDROME
31%
PMID: 22067249
RISK OF CARDIOVASCULAR EVENT
15%
PMID: 30768197
RISK OF ALL-CAUSE MORTALITY
13%
PMID: 30768197

CARDIORESPIRATORY FITNESS

VO2 Max

35.1 - 36.6 mL/kg/min = 10.0 - 10.4 METs **

~34.5 mL/kg/min = 9.86 METs



CARDIORESPIRATORY FITNESS

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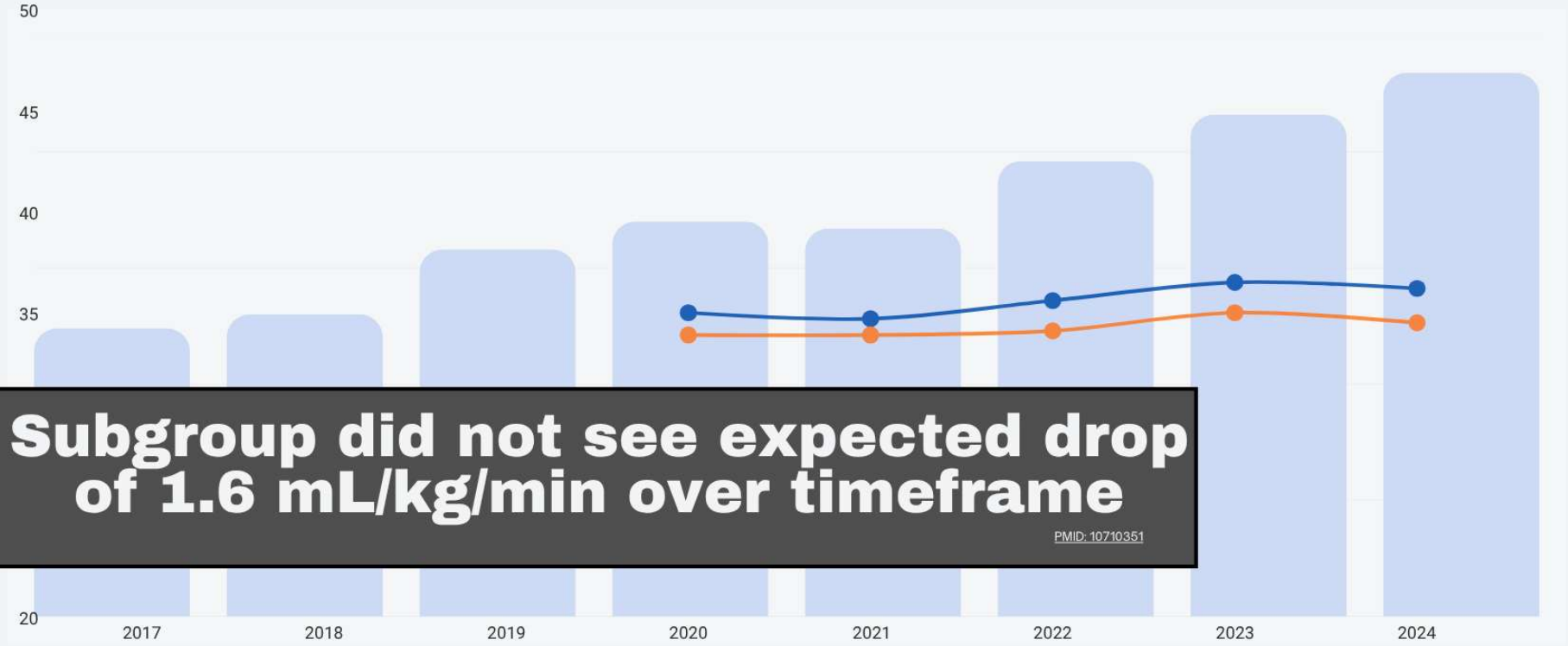

Subgroup did not see expected drop of 1.6 mL/kg/min over timeframe

PMID: 10710351

CARDIORESPIRATORY FITNESS

VO2 Max

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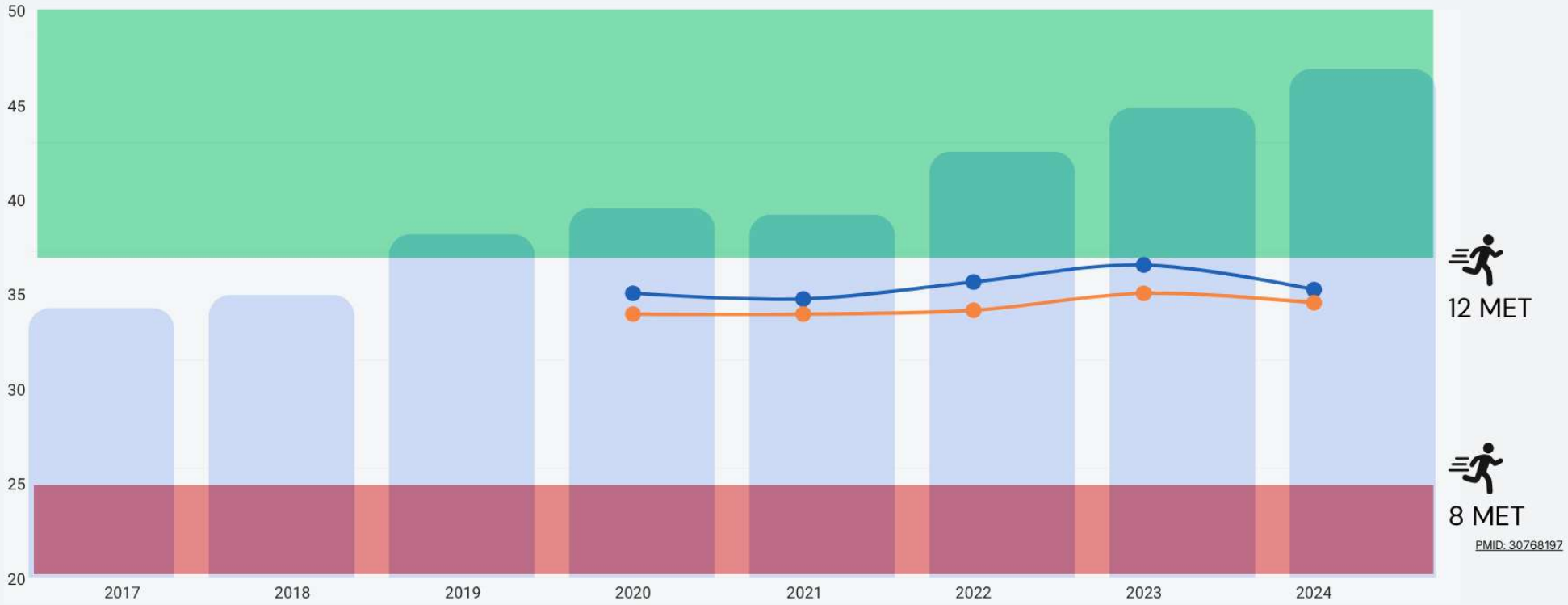

PMID: 30768197

		
Overweight & Obesity PMID: 21386691 PMID: 26254211	56-80%	29.5%
Obesity PMID: 34354906	36%	18.8%
Hypertension PMID: 37835084 PMID: 34069660	39-69%	27.4%
High Triglycerides PMID: 34354906 PMID: 37835084	12-30%	11.9%
Low HDL PMID: 34354906	25%	12.3%
Prediabetes+ PMID: 37835084 PMID: 40407432	21-50%	10.9%
Metabolic Syndrome PMID: 34354906 PMID: 37835084	9-22.3%	5.8%
Avg Bike VO2 Max PMID: 40358999	32.4 mL/kg/min	35.7 mL/kg/min

FITNESS BENCHMARKS

- Measurable benchmarks to monitor endurance, work capacity, and functional readiness over time.
- Routine testing helps identify decline early and gives the department actionable data for intervention and support.

CONSUMPTION DRILL

In Gear
10 tasks
8:00 ideal work pace
Work/Reserve Times

Completion Time

7.6- 7.1 min **
~ 7.1 min

Rate of Consumption

~252 psi/min
~256 psi/min

PACK WALK

3 miles
45 minutes
45 lb weight vest

Completion Time

7.6– 7.1 min **
~ 7.1 min

ANNUAL PHYSICAL ASSESSMENT

10:20 time frame
8 tasks
50 lb weight vest

Time Remaining from 10:20

2.0 - 1.6 min **
2.0 - 1.8 min **

FF FITNESS ASSESSMENT

Vertical Jump

20.3 - 25.0 inches**
20.6 - 23.8 inches**

(Power)
(2017-2024)

Pushups @ 80bpm

~29.2 repetitions
~28.5 repetitions

(Muscular Endurance)
(2022-2024)

FITNESS BENCHMARKS

- Despite that growth, fitness outcomes remained strong across core readiness measures.
- Not implemented as a side initiative; it became an operational system for sustaining fitness standards, supporting firefighter safety

BUT IS IT WORTH IT?

	2017	2018	2019	2020	2021	2022	2023	2024
Total Program Cost	$96,767	$107,496	$113,999	$111,920	$114,626	$112,471	$194,616	$208,364
Total Operational Firefighters	124	130	158	170	167	196	216	234

Program cost includes:

- **1x FTE (HFC)**
- **Equipment additions, repairs & replacement**
- **OT associated with fitness benchmarks**
- **OT associated with HFWG training**

BUT IS IT WORTH IT?

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Total Operational Firefighters	124	130	158	170	167	196	216	234

~$1,060,259 8 years of program

~$754.85 per firefighter/year

BUT IS IT WORTH IT?

INJURY RATES

- Worker's Compensation Data 2022-2025
- ~15 WC Claims per year
- ~$87,364/year for total WC Claims
- ~$5,824 per overexertion/strain

BUT IS IT WORTH IT?

Health & Fitness Program Cost

~$755 per FF/yr

BUT IS IT WORTH IT?

Health & Fitness Program Cost

~$755 per FF/yr

Worker's Compensation Claims

15
WC/year

54
WC/year
***similar size Dept**

District NF. NWFD Community Report 2023-24.

BUT IS IT WORTH IT?

Health & Fitness Program Cost

~$755 per FF/yr

Worker's Compensation Claims

$87,364
WC/year

$257,912
WC/year
*similar size Dept

Pena, Cost of Injury Claims in the Fre Service District NF. NWFD Community Report 2023-24.

BUT IS IT WORTH IT?

Health & Fitness Program Cost

~$755 per FF/yr

Worker's Compensation Claims

$5,824

Overexertion/Strain

$15,447

Overexertion

$12,769

Strain

Technical Note (NIST TN) - 2078

BUT IS IT WORTH IT?

Health & Fitness Program Cost

~$755

per FF/yr

~$723,815

2022-2025

Worker's Compensation Cost

~$1,626

per FF/yr

~$348,909

2022-2025

BUT IS IT WORTH IT?

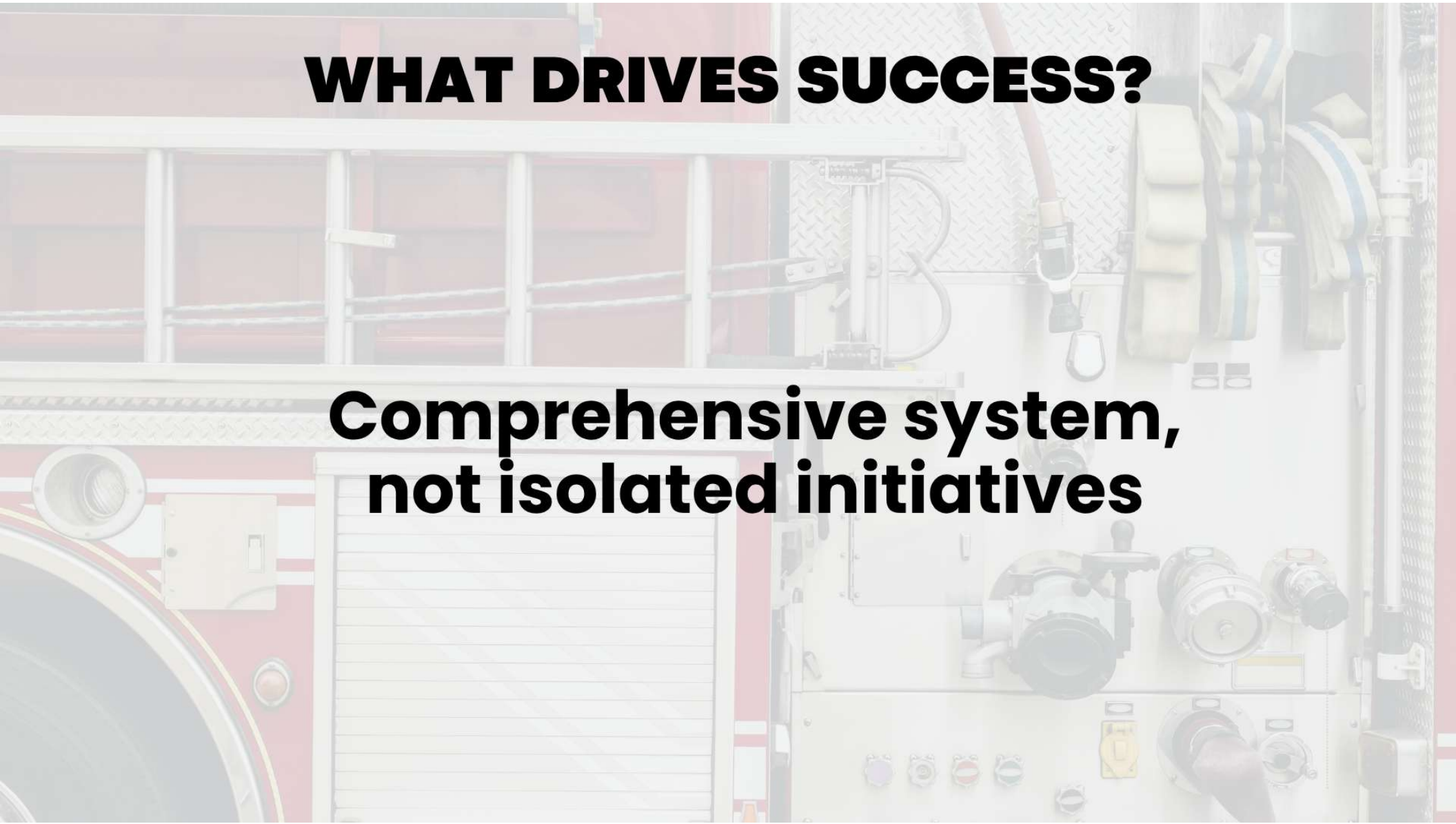
Health & Fitness Program Cost

~$755 per FF/yr

$226,000 SAVED

in Worker's Compensation in 3 years

Does not include any additional savings from time lost costs associated



WHAT DRIVES SUCCESS?

Comprehensive system, not isolated initiatives

WHAT DRIVES SUCCESS?

- **Dedicated Health & Fitness Coordinator**
  Ownership & continuity of the program
- **Quarterly Benchmarks**
  Structure, clear expectations, tie to operational readiness
- **Station Visits**
  Ongoing education, face-to-face interaction, trust

WHAT DRIVES SUCCESS?

- **Multiple Assessment Tools**
  Operations related, fitness related, health related
- **Ongoing Monitoring**
  Consitant data to help drive future decisions
- **Continuing Education**
  Always bringing it back to why health & fitness matters
- **Leadership's Commitment**
  Ongoing support and recognition of importance

ARE FITNESS PROGRAMS WORTH THE INVESTMENT?

INVESTING IN FITNESS

Improves health

Reduces injuries

Improves Performance

Sustains Performance

INVESTING IN FITNESS

is investing in

Service Delivery
Staffing Stability
Mission performance


INVESTING IN FITNESS
is investing in
a department's most
critical resource
FIREFIGHTERS