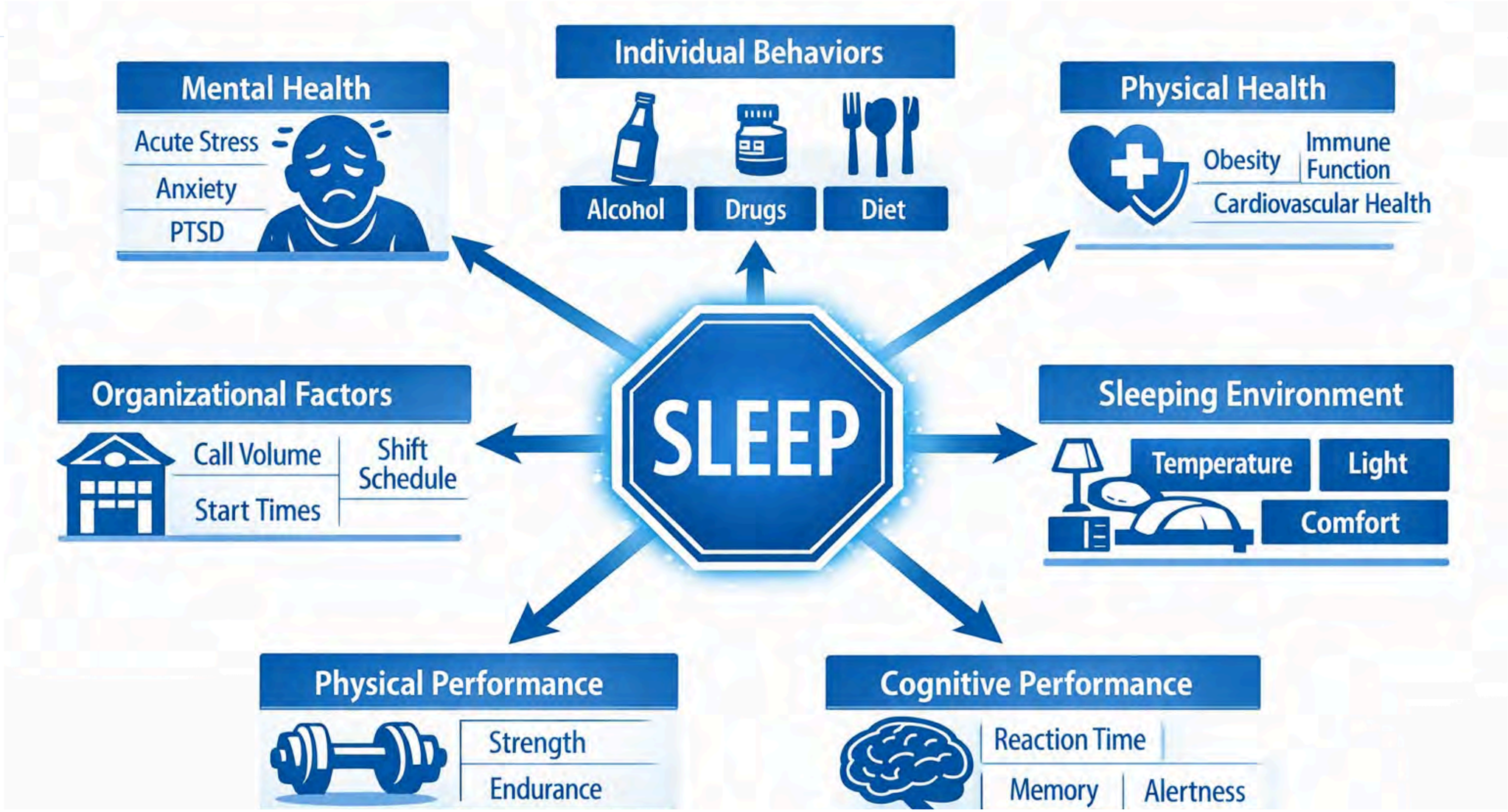
INTERNATIONAL ASSOCIATION OF FIRE FIGHTERS

FATIGUE RECOVERY RESEARCH

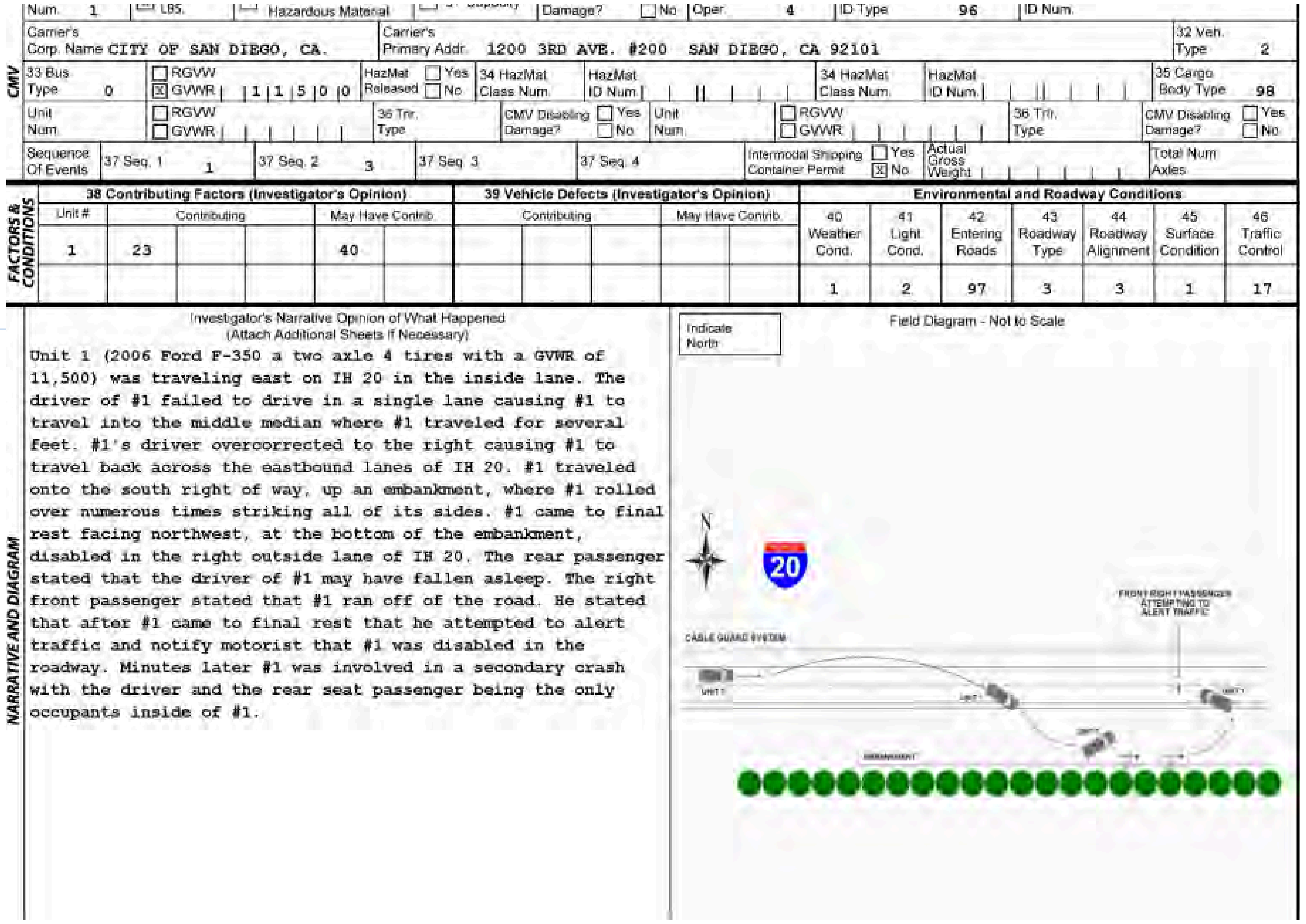
Joel Billings, PhD Shannon White, PhD Mike Binney

STRIVE FOR EXCELLENCE

Relationships of sleep



Driving while sleepy



Num. 1 | LBS. | Hazardous Material | Damage? No | Oper. 4 | ID Type 96 | ID Num.

Carrier's Corp. Name CITY OF SAN DIEGO, CA. | Carrier's Primary Addr. 1200 3RD AVE. #200 SAN DIEGO, CA 92101 | 32 Veh. Type 2

CMV

33 Bus Type 0 | RGVW / [X] GVWR 11500 | HazMat Released Yes / No | 34 HazMat Class Num. | HazMat ID Num. | 34 HazMat Class Num. | HazMat ID Num. | 35 Cargo Body Type 98

Unit Num. | RGVW / GVWR | 36 Trlr. Type | CMV Disabling Damage? Yes / No | Unit Num. | RGVW / GVWR | 36 Trlr. Type | CMV Disabling Damage? Yes / No

Sequence Of Events | 37 Seq. 1 1 | 37 Seq. 2 3 | 37 Seq. 3 | 37 Seq. 4 | Intermodal Shipping Container Permit Yes / [X] No | Actual Gross Weight | Total Num Axles

FACTORS & CONDITIONS

38 Contributing Factors (Investigator's Opinion)						39 Vehicle Defects (Investigator's Opinion)				Environmental and Roadway Conditions						
Unit #	Contributing			May Have Contrib.		Contributing		May Have Contrib.		40 Weather Cond.	41 Light Cond.	42 Entering Roads	43 Roadway Type	44 Roadway Alignment	45 Surface Condition	46 Traffic Control
1	23			40												
										1	2	97	3	3	1	17

NARRATIVE AND DIAGRAM

Investigator's Narrative Opinion of What Happened
(Attach Additional Sheets If Necessary)

Unit 1 (2006 Ford F-350 a two axle 4 tires with a GVWR of 11,500) was traveling east on IH 20 in the inside lane. The driver of #1 failed to drive in a single lane causing #1 to travel into the middle median where #1 traveled for several feet. #1's driver overcorrected to the right causing #1 to travel back across the eastbound lanes of IH 20. #1 traveled onto the south right of way, up an embankment, where #1 rolled over numerous times striking all of its sides. #1 came to final rest facing northwest, at the bottom of the embankment, disabled in the right outside lane of IH 20. The rear passenger stated that the driver of #1 may have fallen asleep. The right front passenger stated that #1 ran off of the road. He stated that after #1 came to final rest that he attempted to alert traffic and notify motorist that #1 was disabled in the roadway. Minutes later #1 was involved in a secondary crash with the driver and the rear seat passenger being the only occupants inside of #1.

Indicate North

Field Diagram - Not to Scale

CBSNews

Big Stats to Share

37.2%

N=6,933

Screened positive for at least 1 sleep disorder

Common Sleep Disorders Increase Risk of Motor Vehicle Crashes and Adverse Health Outcomes in Firefighters
https://doi.org/10.5664/jcsm.4534

40.4%

N=4,957

Screened positive for at least 1 sleep disorder

Sleep Disorders, Health, and Safety in Police Officers
doi:10.1001/jama.2011.1851

70%

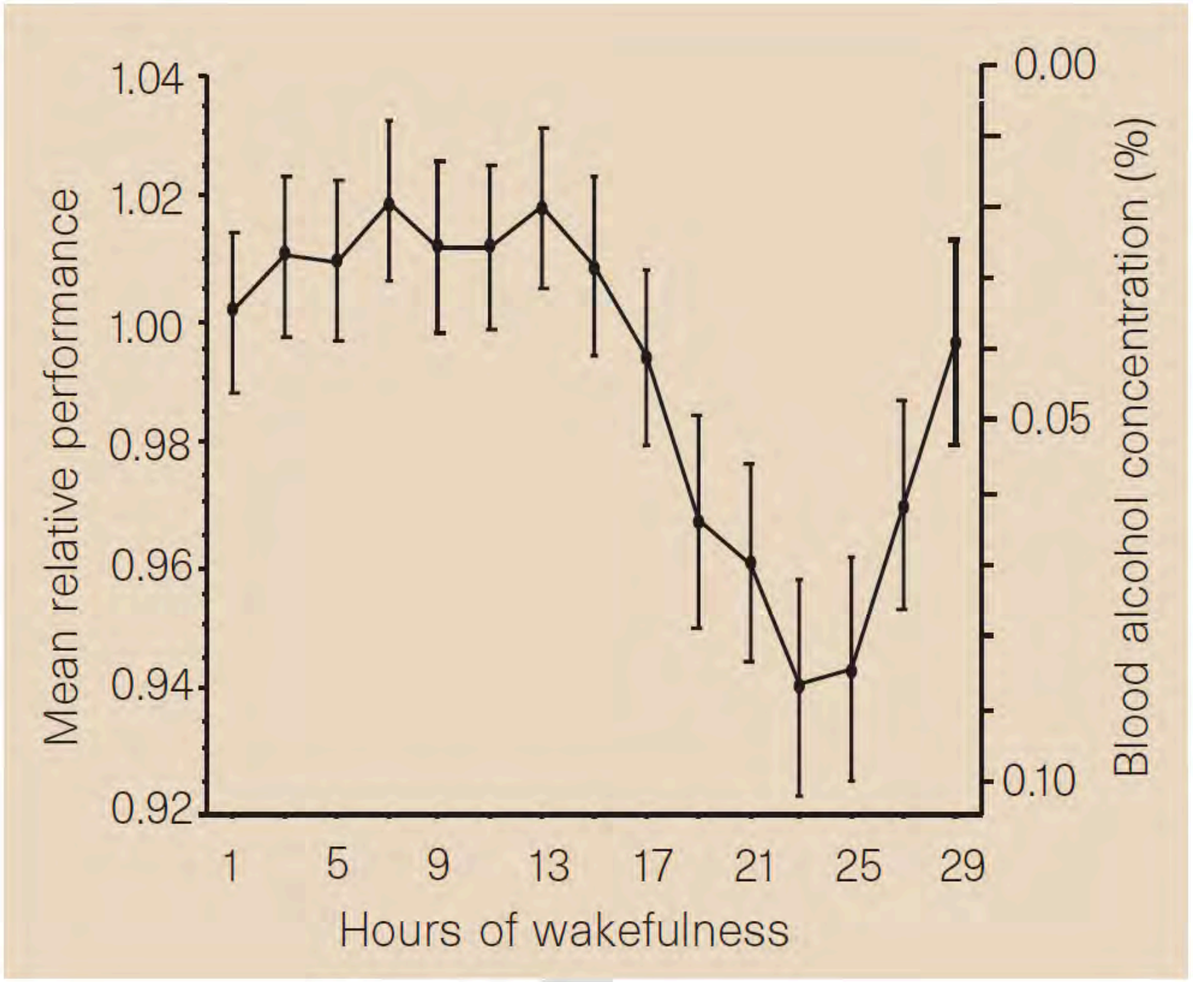
N=1,854

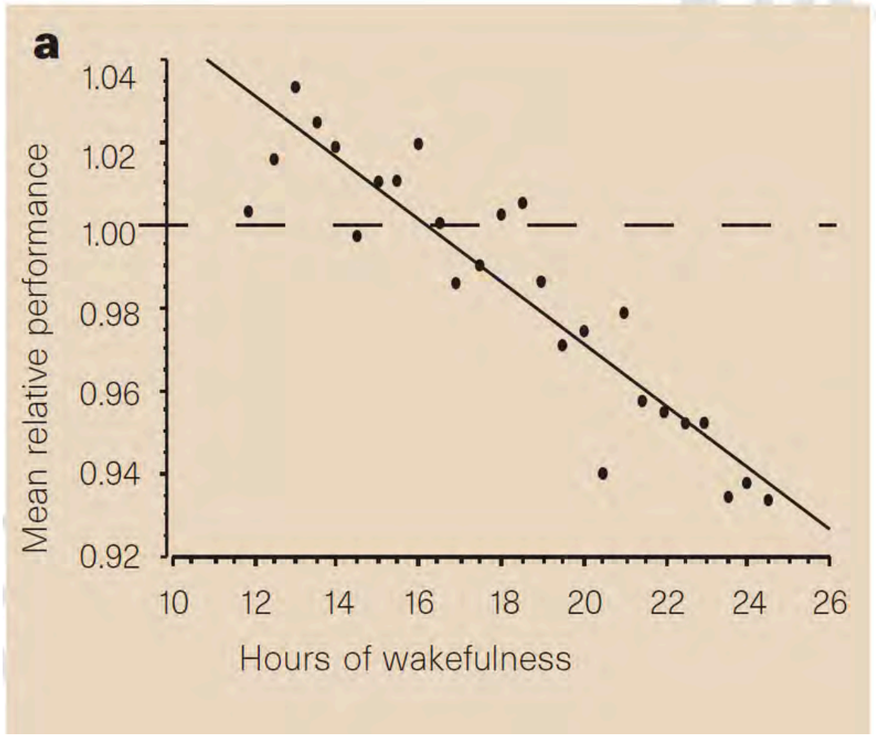
Reported at least 1 sleep problem

The prevalence of sleep problems in emergency medical technicians
doi.org/10.1007/s11325-010-0467-8

Is it truly that simple?

What happens without sleep





Dawson, Drew and Kathryn Reid. (1997) "Fatigue, Alcohol and Performance Impairment." *Nature, 388(6639):235-235,*

What happens without sleep

Table 6 Equating the effects of sleep deprivation and alcohol consumption

	Hours (decimal) of wakefulness equivalent to BAC concentrations					
	BAC 0.05%			*BAC 0.1%*		
Test and measure	*Mean*	*95% CI*	*%**	*Mean*	*95% CI*	*%**
Reaction time task:						
Speed (ms)	18.04	17.12 to 18.96	76	18.71	17.56 to 19.86	64
Accuracy (misses)	17.31	16.51 to 18.11	42	17.74	16.51 to 18.97	45
Dual task:						
Speed (ms)	17.73	16.75 to 18.71	84	19.65	18.58 to 20.77	67
Hand-eye coordination (level of difficulty)	18.43	17.41 to 19.45	79	19.42	18.40 to 20.44	58
Tracking task:						
Hand-eye coordination (level of difficulty)	18.25	17.37 to 19.13	74	19.01	18.91 to 19.97	61
Mackworth clock vigilance:						
Speed (ms)	17.08	16.20 to 17.96	82	18.10	16.85 to 19.35	58
Accuracy (misses)	17.64	16.72 to 18.56	68	18.80	17.93 to 19.67	76
Symbol digit task:						
Speed (ms)	18.55	17.43 to 19.67	50	18.91	17.92 to 19.90	48
Speed (symbols inspected (n))	18.52	17.46 to 19.58	57	18.64	17.65 to 19.63	79
Accuracy (correct (%))	16.91	15.72 to 18.10	41	18.39	17.01 to 19.77	42
Spatial memory task:						
Accuracy (length of recalled sequence)	18.05	17.09 to 19.01	86	17.88	16.92 to 18.84	64

*Numerator=number of subjects contributing data; denominator=number of subjects whose range of BAC incorporated 0.05% (n=37 or 38) or 0.1% (n=33).

Amount of sleep deprivation required to produce performance decrements equivalent to varying concentrations of blood alcohol (BAC), and the time of day at which the equivalence occurred in this study.

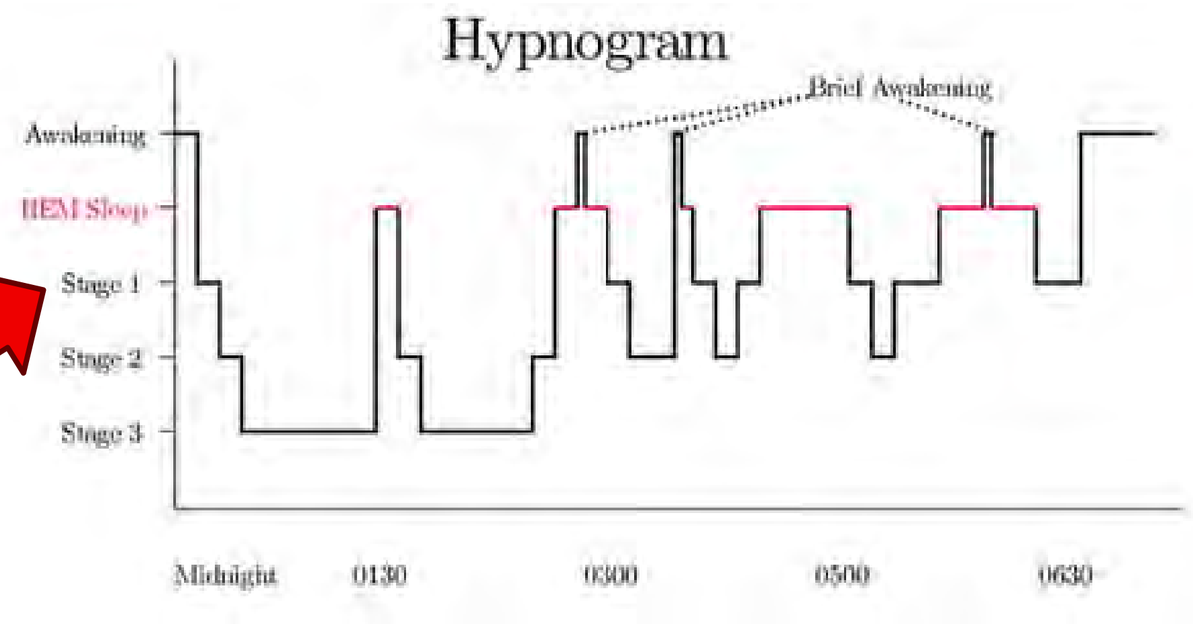
Williamson, Ann M. and Anne-Marie Feyer. (2000) "Moderate Sleep Deprivation Produces Impairments in Cognitive and Motor Performance Equivalent to Legally Prescribed Levels of Alcohol Intoxication." *Occupational and Environmental Medicine, 57(10):649,*

UNDERSTANDING THE PROBLEM

What happens during sleep

Stage N1: Drifting off!

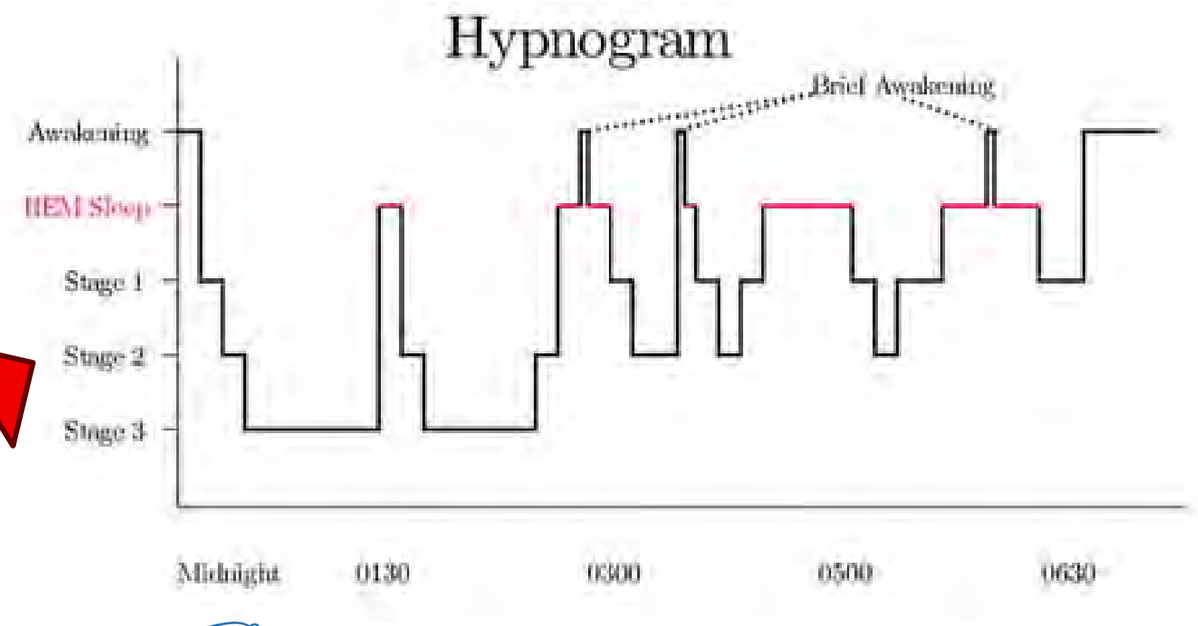
- Transition into sleep; body relaxes, eye blinking stops, muscle activity slows
- Easiest to wake from, usually the least impairment right after waking.



What happens during sleep

Stage N2: Sleep!

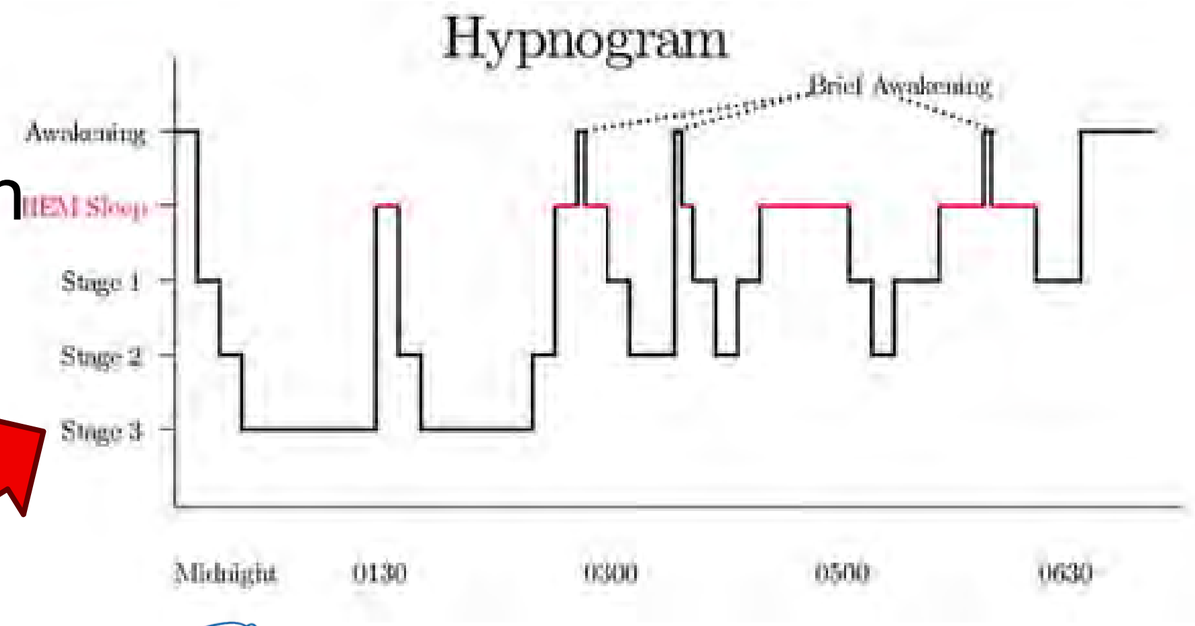
- Stable sleep; heart rate and body temperature decrease
- Supports learning and memory processing
- Harder to wake from than N1, w… more sleep inertia than N1.



What happens during sleep

Stage N3: Deep Sleep!

- Strongest stage for physical restoration, immune support, growth hormone release, and tissue recovery
- Hardest to wake from and usually the worst stage for immediate alertness after awakening.



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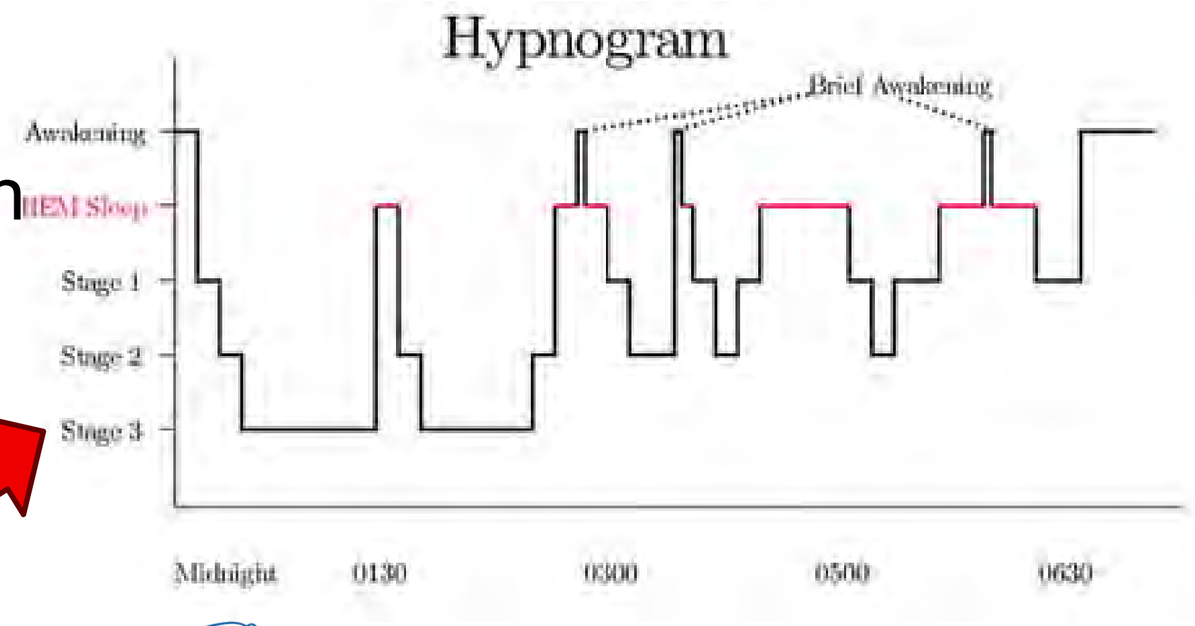
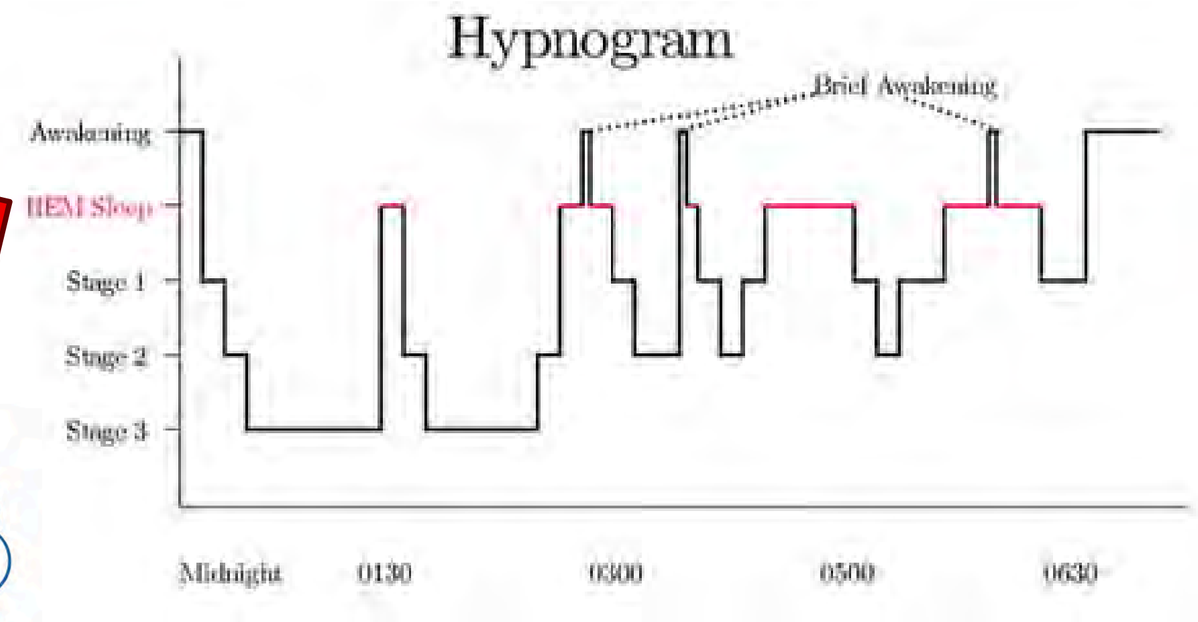


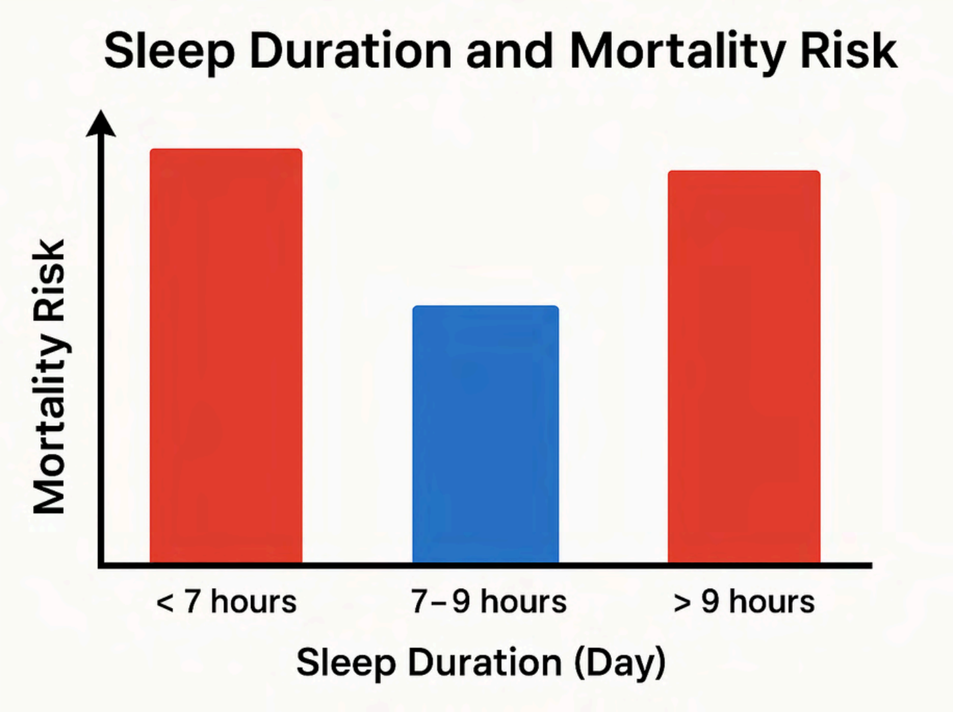
What happens during sleep

REM Sleep: Dreaming!

- Vivid dreaming more common; supports emotional processing, mental recovery, and memory integration.



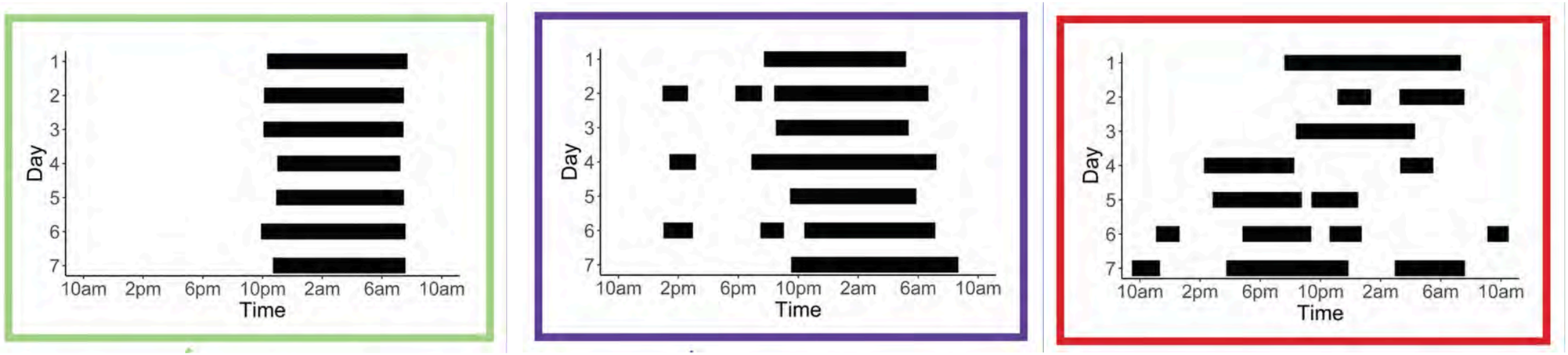
Why Sleep Duration matters



- 7-9 hours is important for optimal health and longevity
- Short and Long Sleep Duration associated with mortality risks.
- Cognitive impairments, increased reaction time, motor vehicle accidents and early mortality, elevated risk for metabolic disorder (obesity, type 2 diabetes, and cardiovascular disease), and psychiatric disorders.

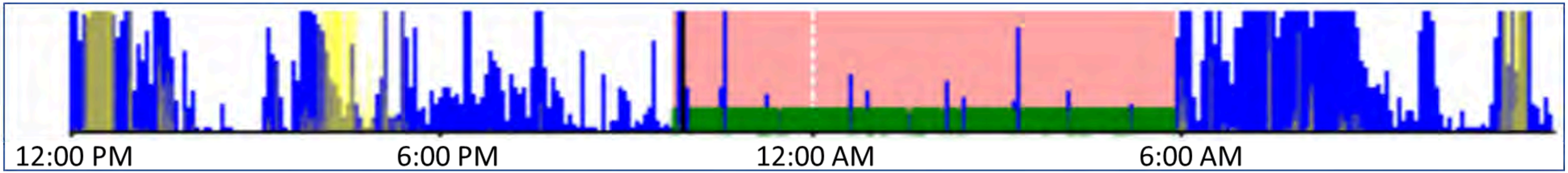
Why Sleep pattern matters

- Regular sleep-wake timing may be more important for some health outcomes than sleep duration.
  - Adverse cardiometabolic outcomes, epigenetic aging, depressed mood, lower quality of life. In addition, irregular patterns of env stimuli, time behaviors (physical activity, diet, pre-bed routine)

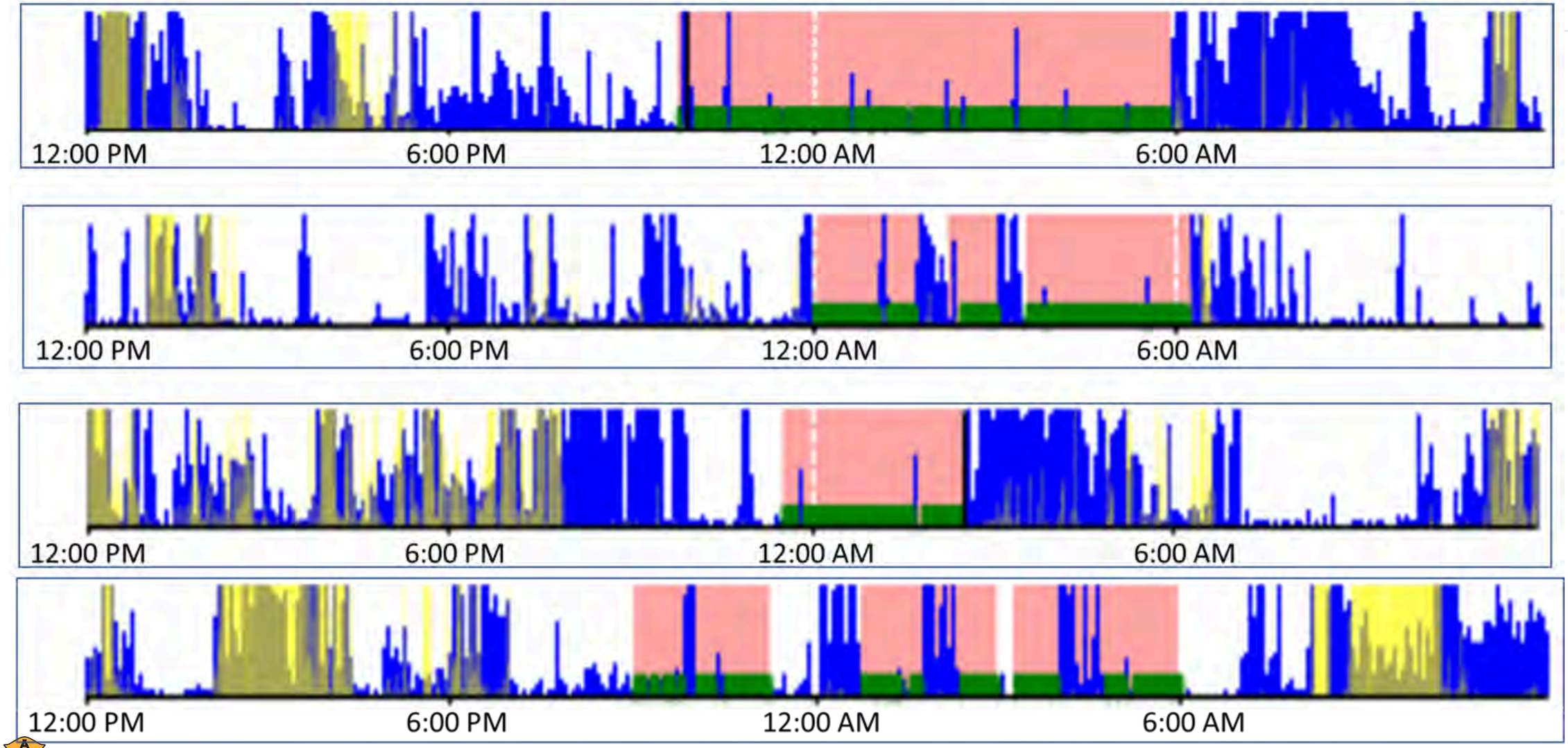


A LOOK INTO FIRE FIGHTER SLEEP

Examples of fire fighter sleep data

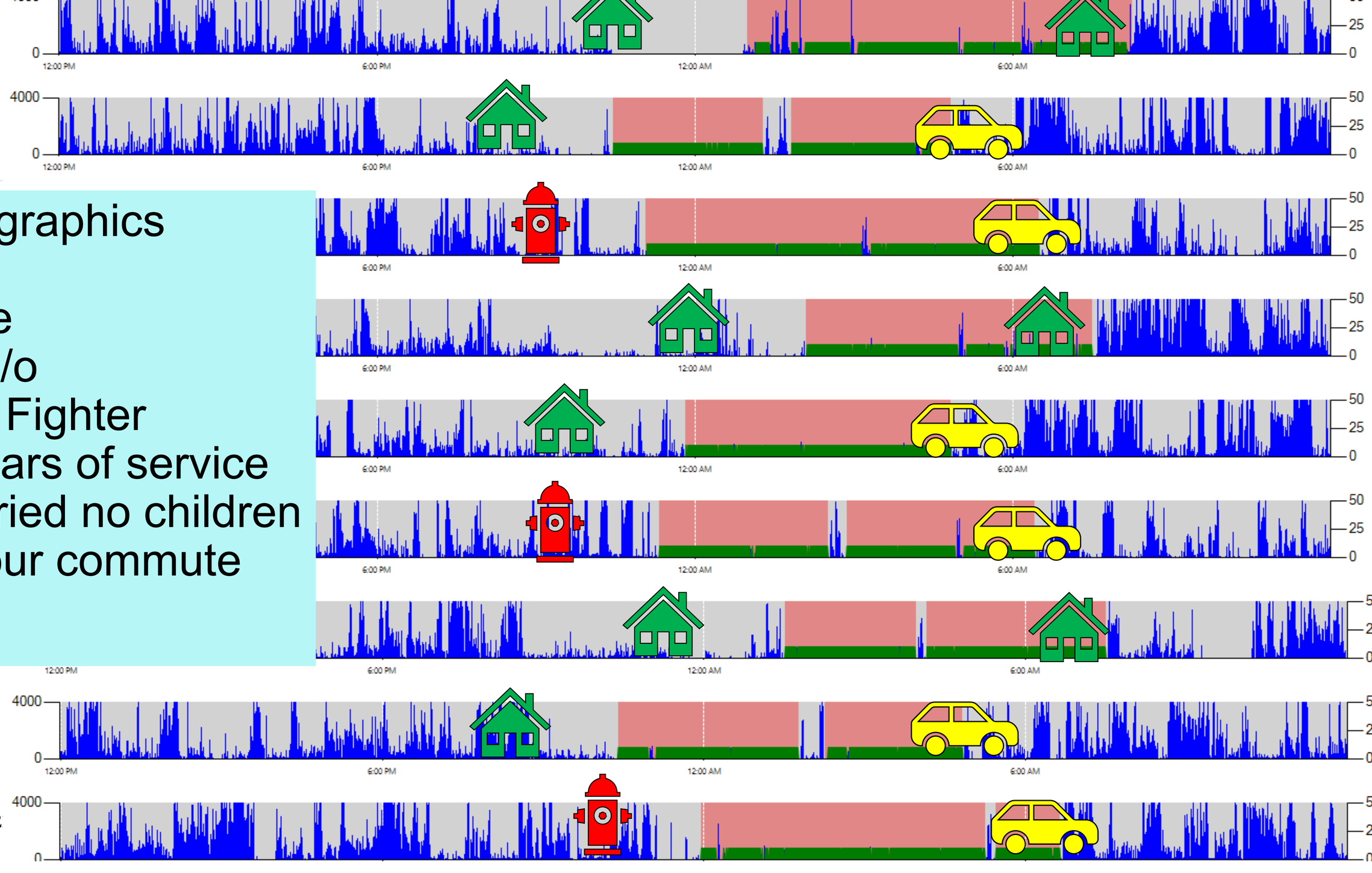


Examples of fire fighter sleep data

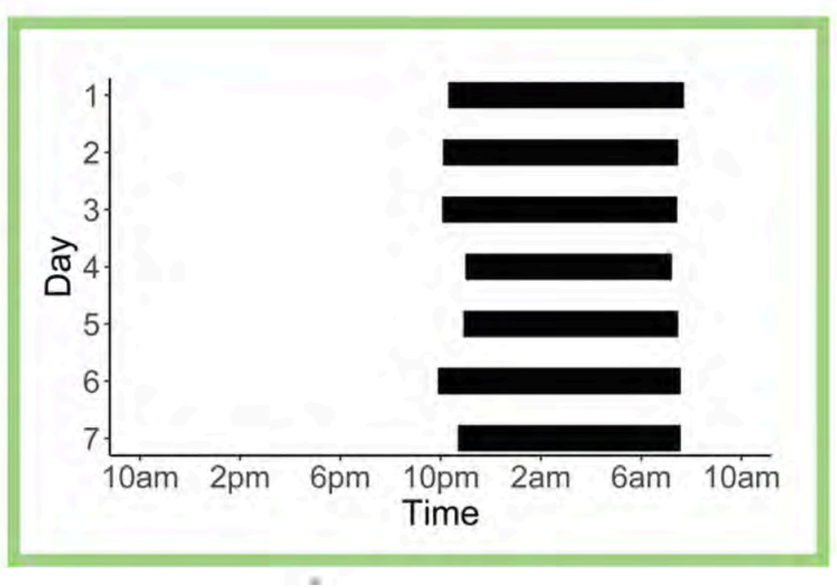


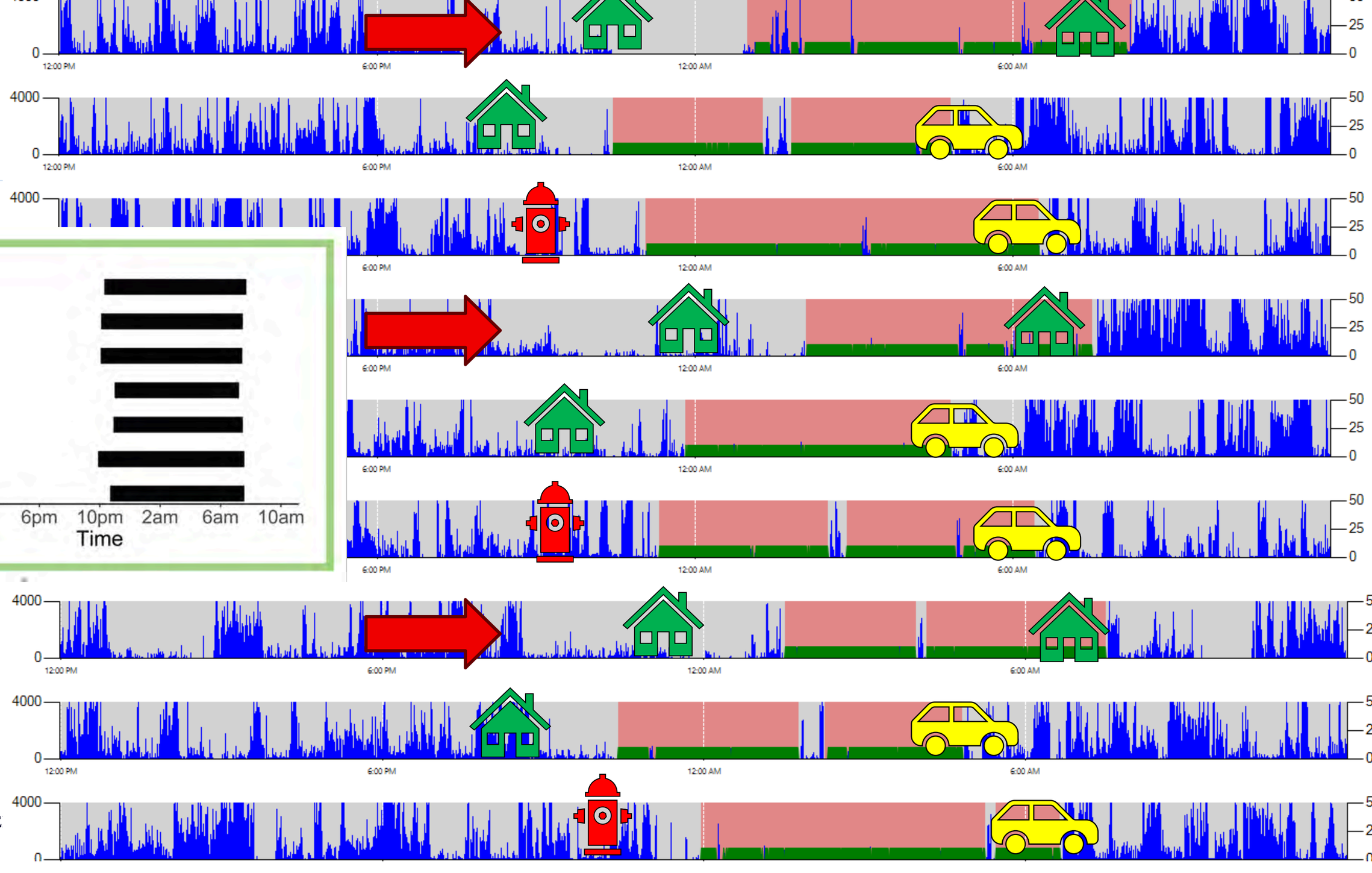
Demographics

- Male
- 24 y/o
- Fire Fighter
- 5 years of service
- Married no children
- 1 hour commute



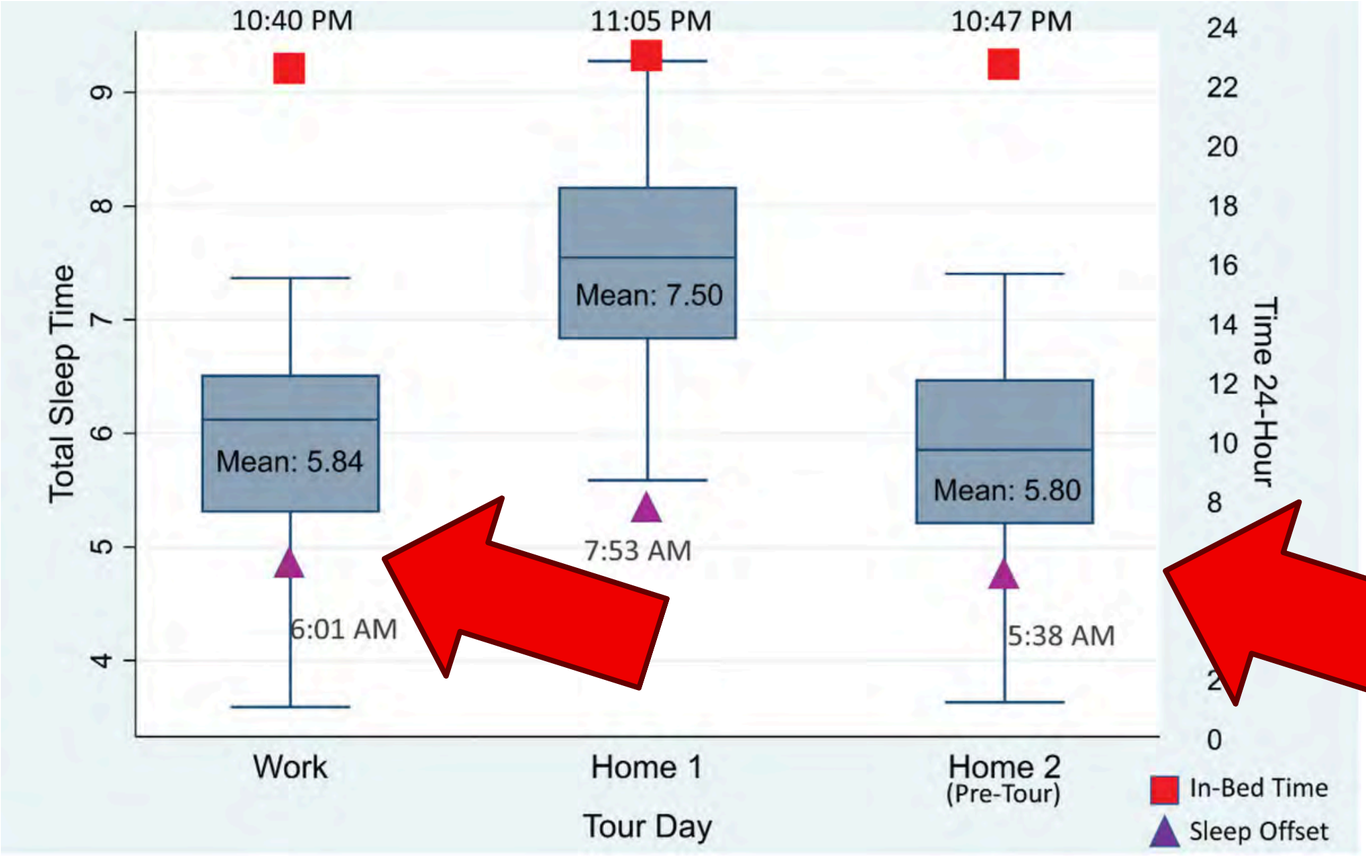
INTE

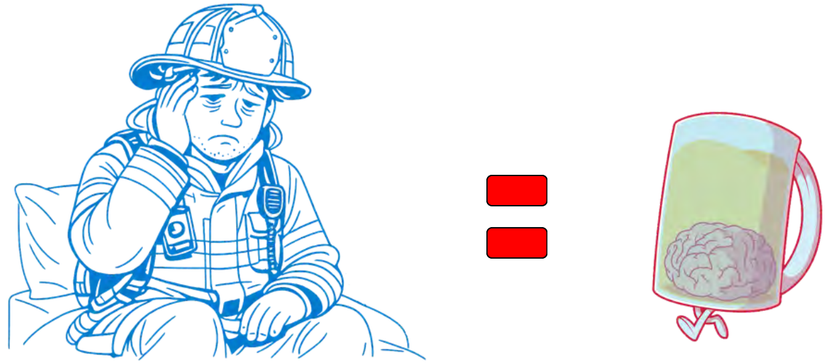

Day
1
2
3
4
5
6
7
10am
2pm
6pm
10pm
2am
6am
10am
Time


4000
0
12:00 PM
6:00 PM
12:00 AM
6:00 AM
50
25
0

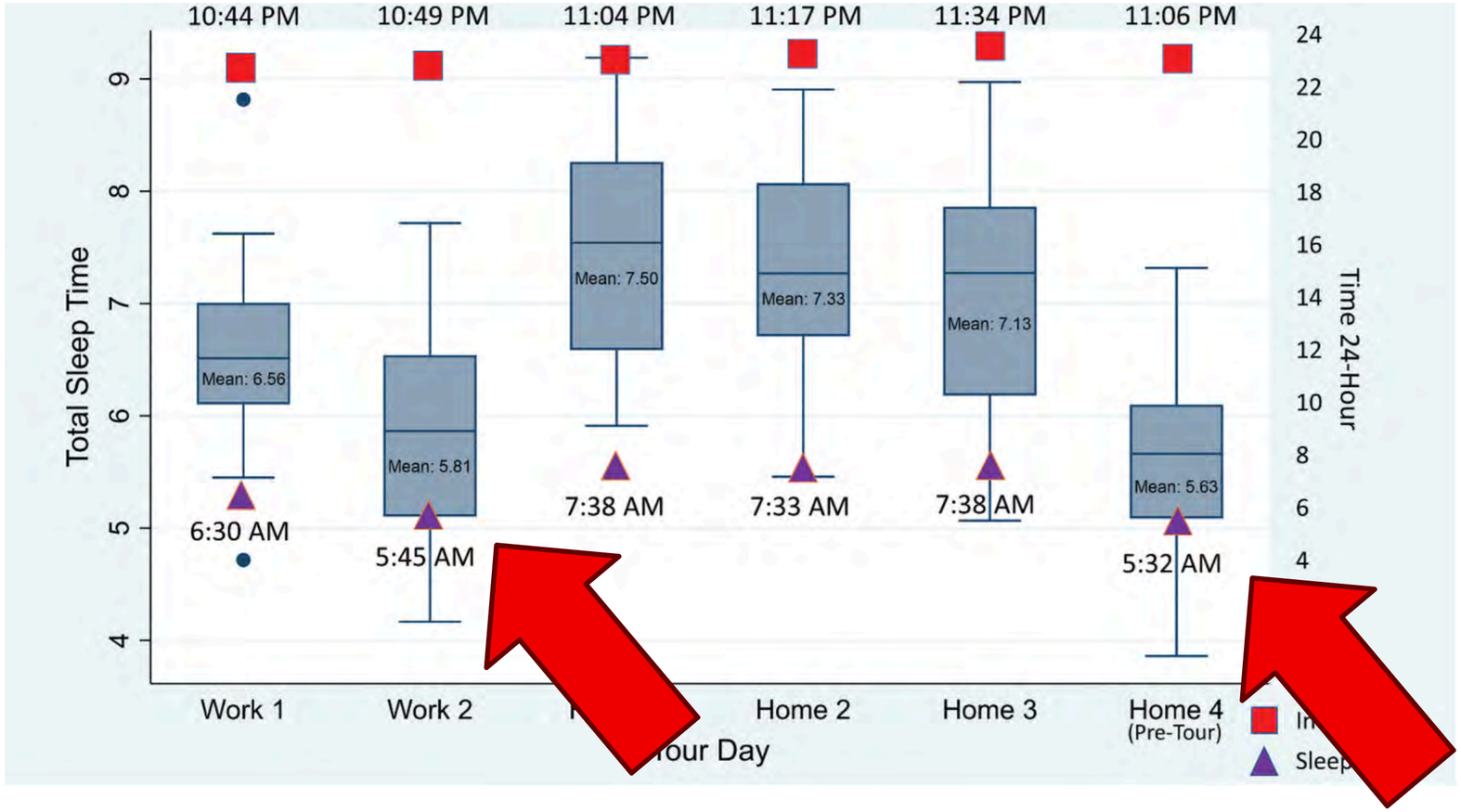
INTE

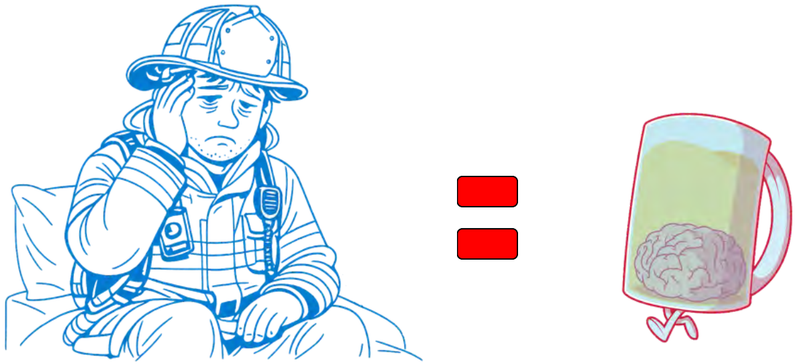
Night-by-night insights





Night-by-night insights



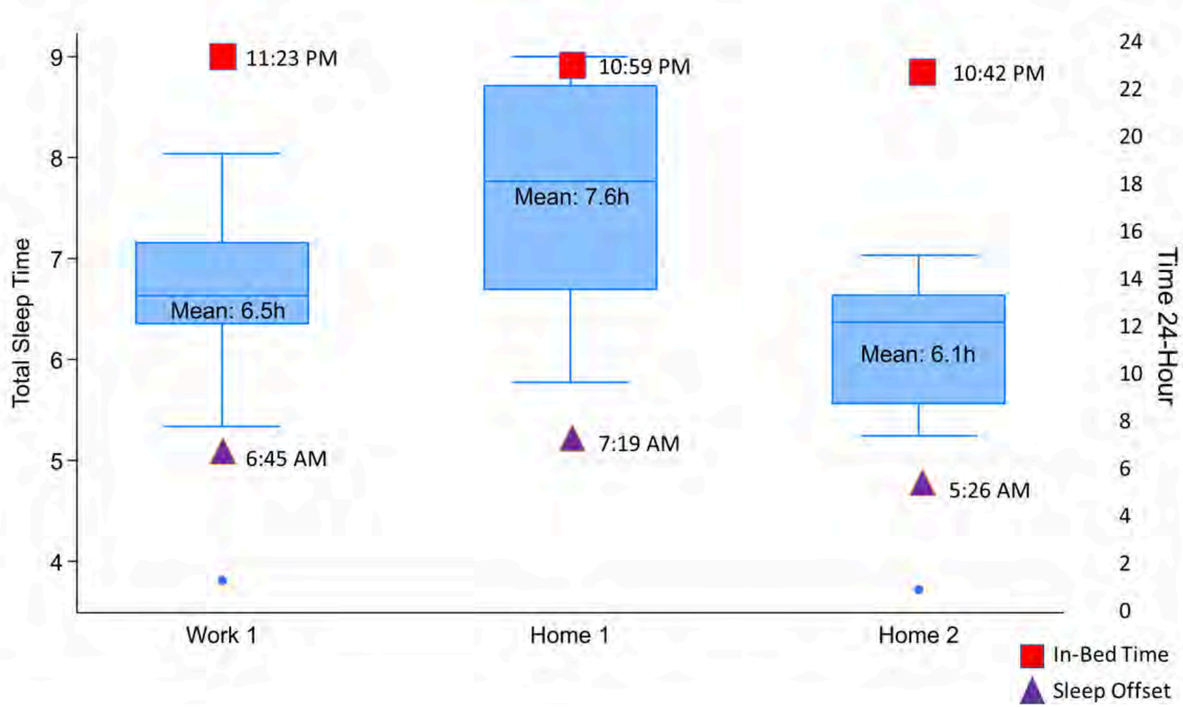


Data in Action!

- Pilot study
- 24/48 to 48/96
- 8am to 11am

- Assessed sleep before and after using wrist actigraphy

- Noticed improvements in sleep pattern, duration, mood, fatigue, depression, insomnia, sleep quality, sleep apnea



Why monitor your sleep

1. Helps see patterns that might otherwise be normalized
2. It makes the impact of calls and schedule impacts visible
3. It can help with understand readiness, recovery, and fatigue risk.
4. Can use data to support better habits, routines, and wellness.
5. It can help identify when something may need medical follow-up.

How to monitor your sleep

How to monitor your sleep

What they are best for:

- Total sleep time across many nights
- Sleep timing and consistency
- Night-to-night disruption trends

What to avoid overinterpreting:

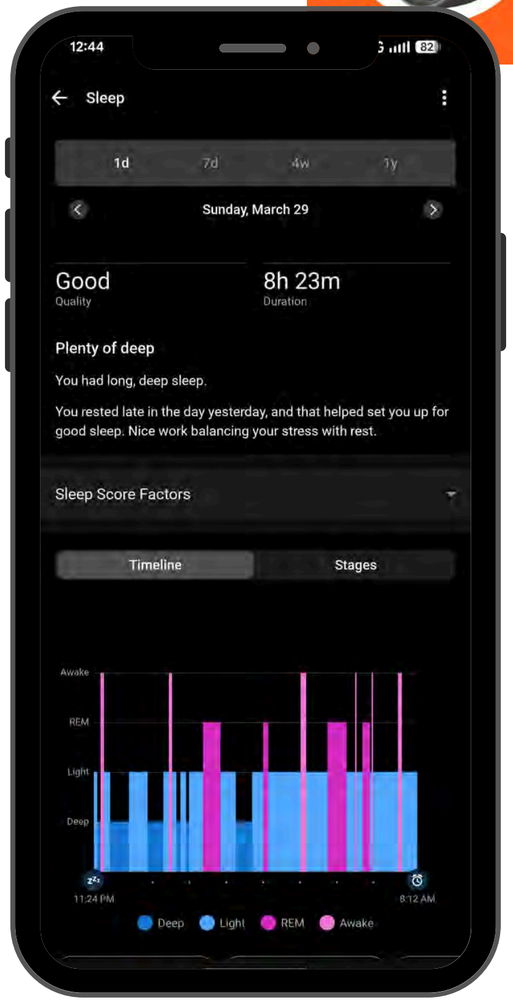
- Exact minutes awake during the night
- Exact deep and REM sleep stages
- Self-diagnosis of a sleep disorder

May count calls as WASO

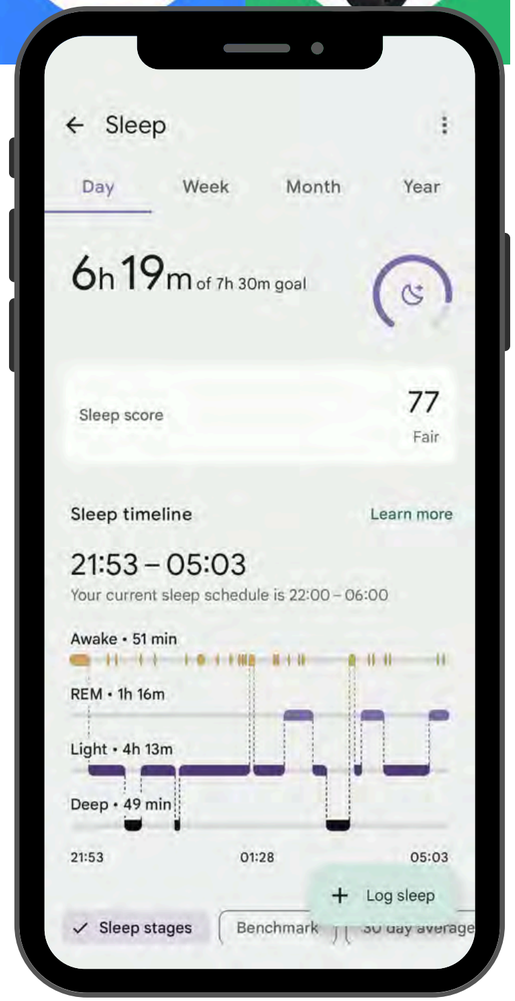
How to monitor your sleep

WHOOP

Oura



Garmin

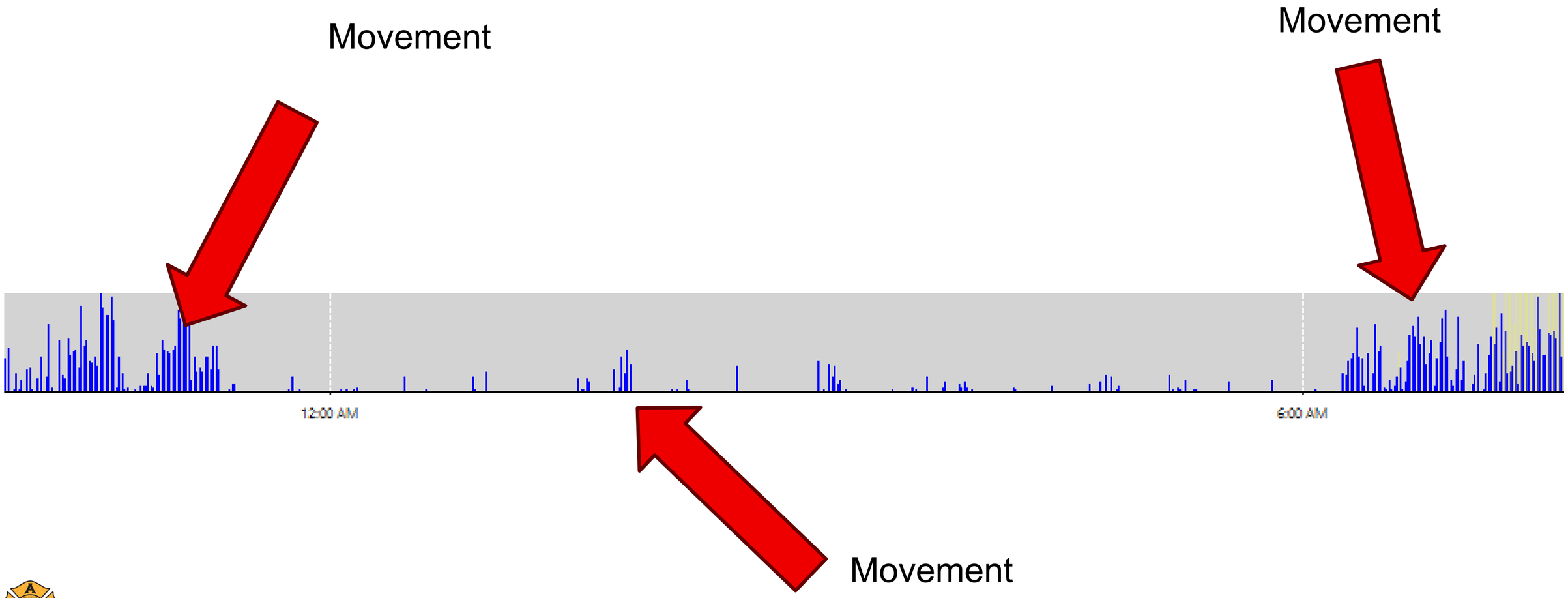


Fitbit

How to interpret the data

1. Time Laid in Bed: Clock time individual got into bed with the *intent* to fall asleep
2. Time Out of Bed: Clock time individual got out of bed to end their sleep period
3. Sleep Onset: Clock time individual fell asleep as determined by the actigraph based on the sleep-scoring algorithm or hand-scoring rules
4. Sleep Offset: Clock time individual woke up as determined by the actigraph based on the sleep-scoring algorithm or hand-scoring rules
5. Sleep Onset Latency (SOL): Duration to fall asleep when one attempts to sleep
6. Time-in-Bed (TIB): Duration between when one enters bed to when one exits the bed
7. Wake After Sleep onset (WASO): Duration of wake during the sleep period (reported in hours or minutes)
8. Total Sleep Time (TST): Duration of sleep during the major sleep period (reported in hours or minutes)
9. Sleep Efficiency (SE): proportion of time one slept of the total time in bed

How to interpret the data



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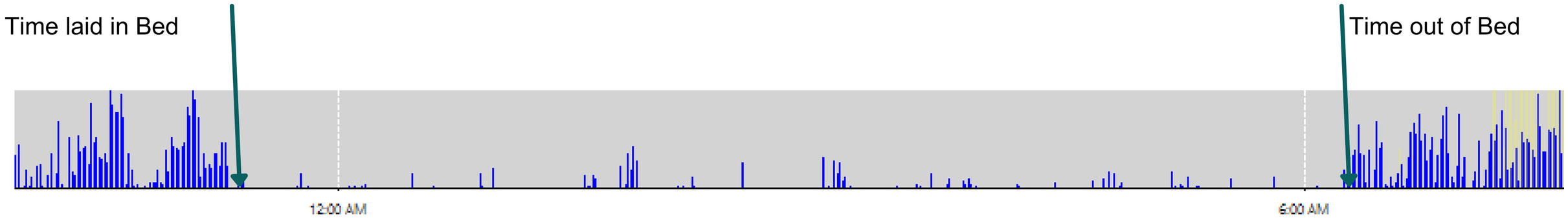

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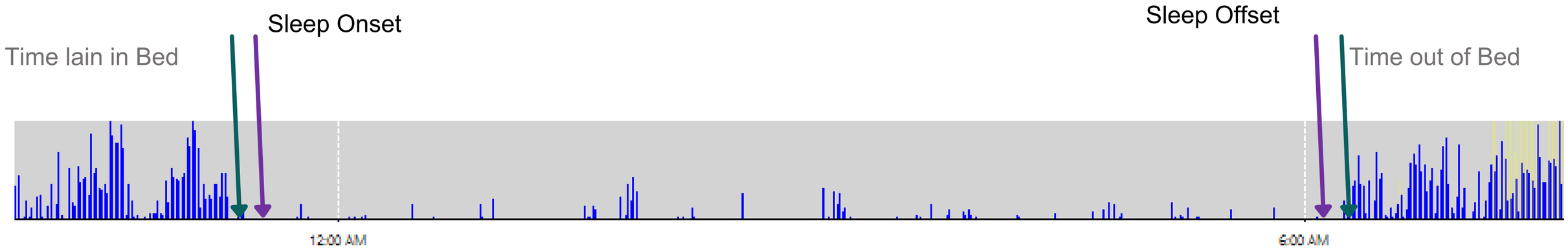
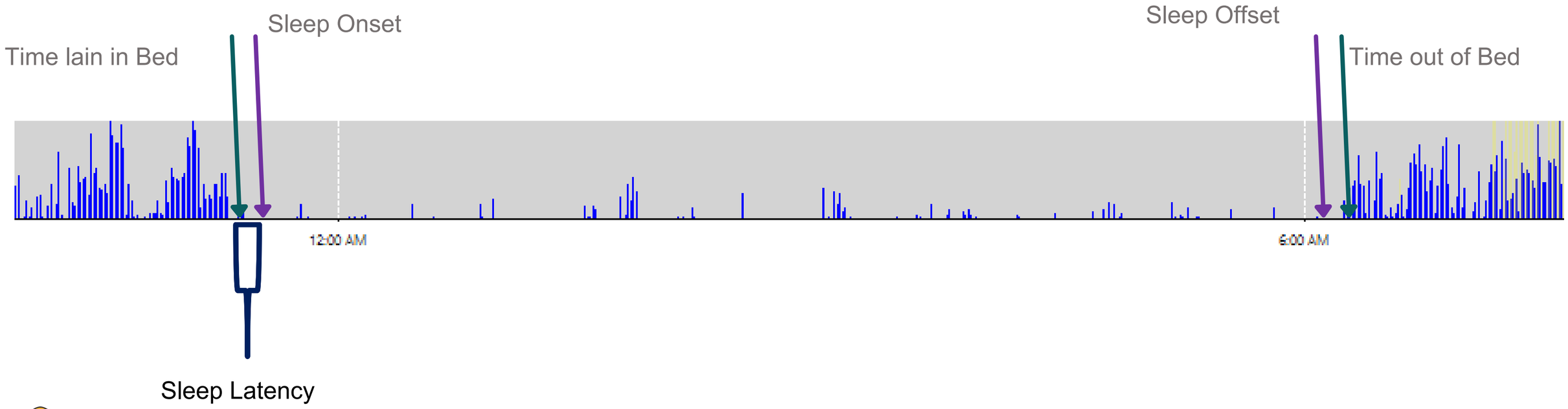


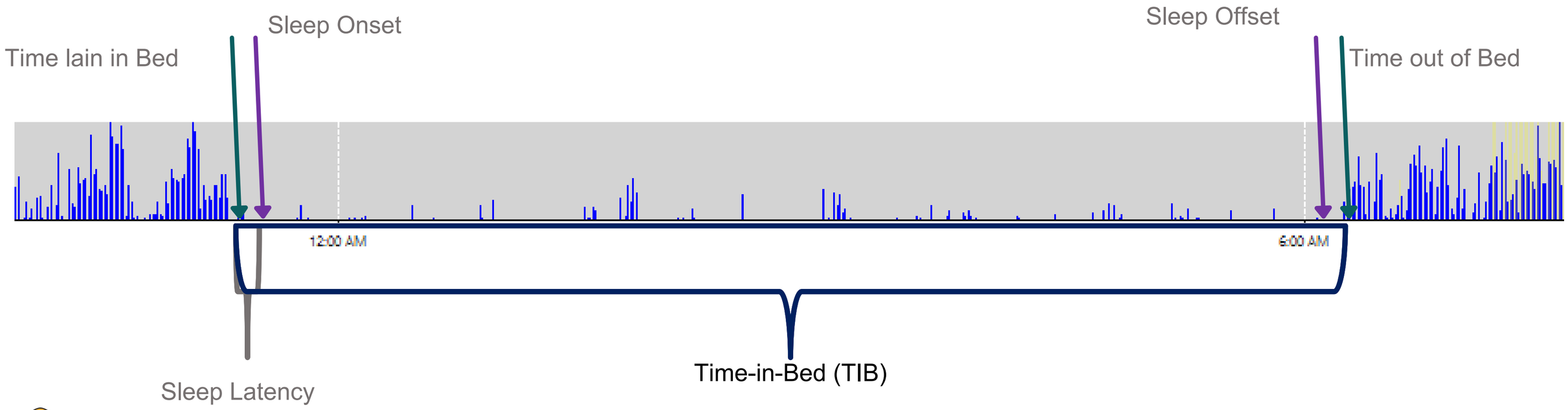
How to interpret the data

5. Sleep Onset Latency (SOL): Duration to fall asleep when one attempts to sleep



How to interpret the data

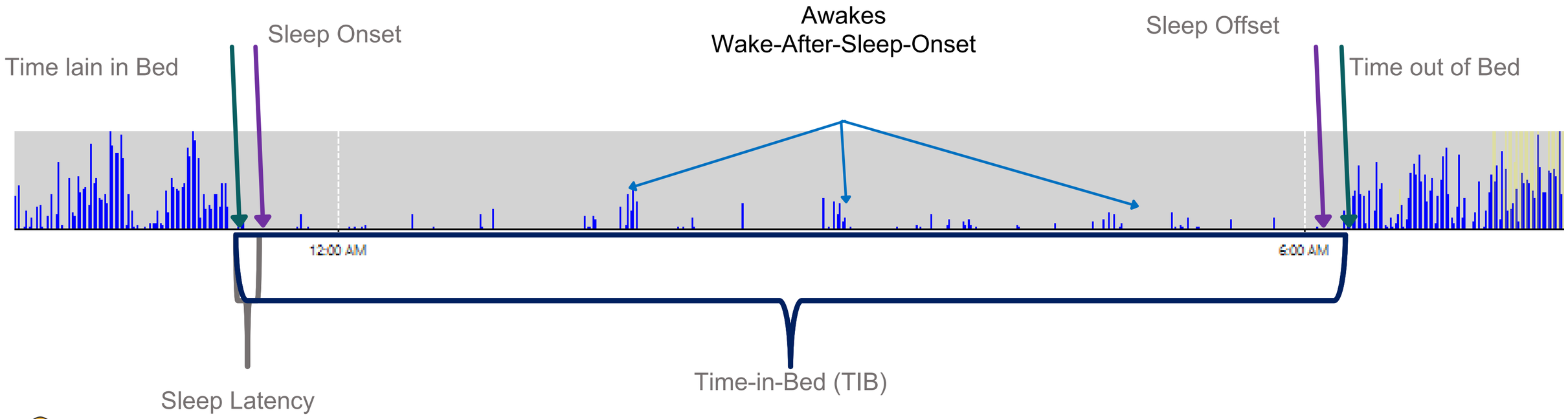
6. Time-in-Bed (TIB): Duration between when one enters bed to when one exits the bed



Not to be confused with “Time lain in Bed”

How to interpret the data

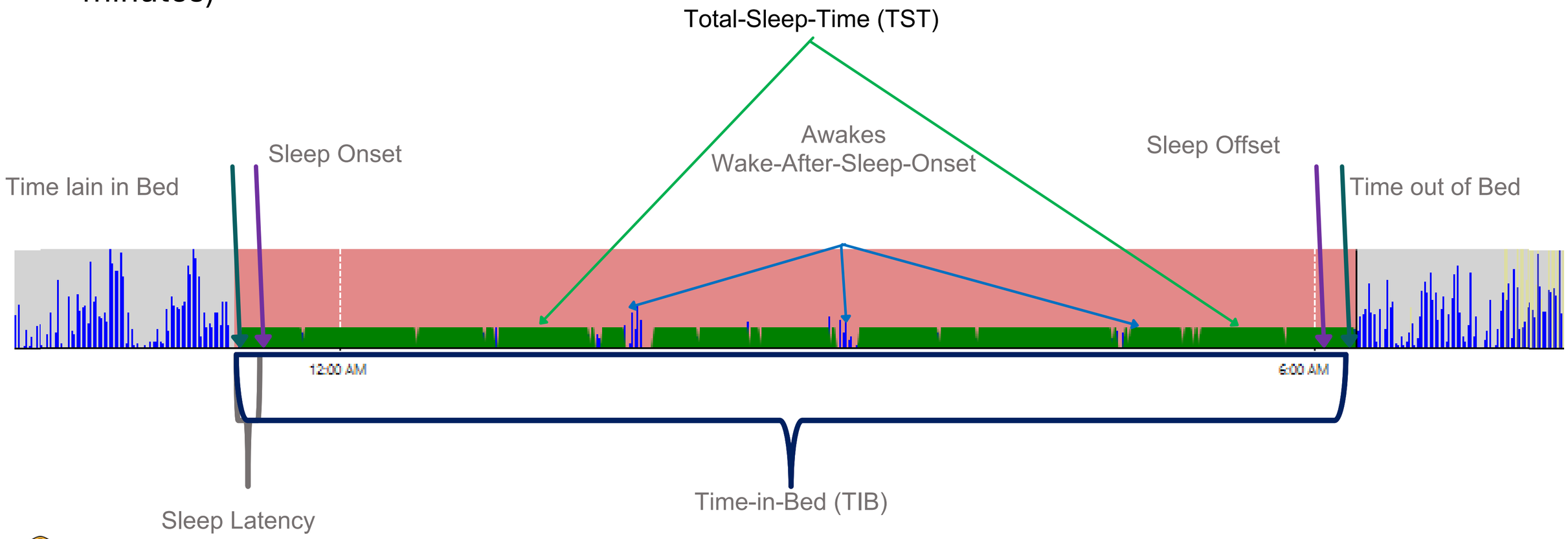
7. Wake After Sleep onset (WASO): Duration of wake during the sleep period (reported in hours or minutes)



Not to be confused with “Time lain in Bed”

How to interpret the data

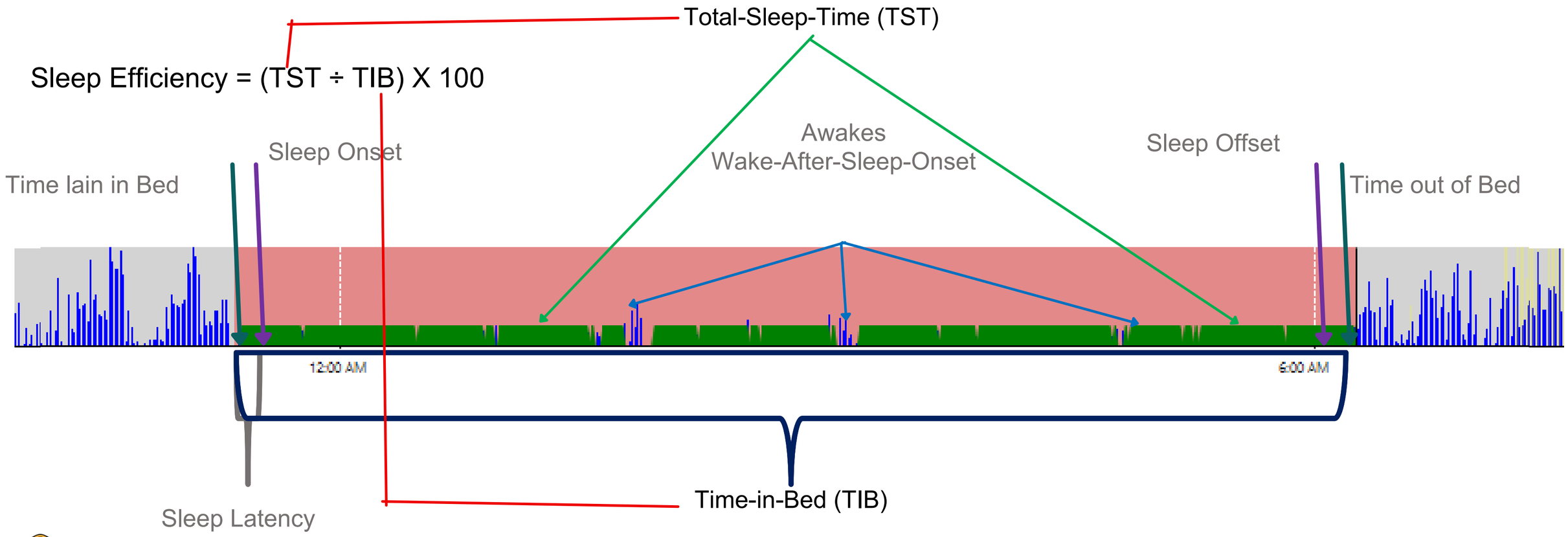
8. Total Sleep Time (TST): Duration of sleep during the major sleep period (reported in hours or minutes)



Not to be confused with “Time lain in Bed”

How to interpret the data

9. Sleep Efficiency (SE): proportion of time one slept of the total time in bed



Not to be confused with “Time lain in Bed”

Consumer Devices VS PSG

Device	TST	SE	SOL	WASO	Light	Deep	REM
Fatigue Science Readiband	Agree	Agree	Agree	Agree	N/A	N/A	N/A
Fitbit Alta HR	Agree	Agree	Differs	Agree	Differs	Agree	Differs
Garmin Fenix 5S	Differs	Differs	Agree	Differs	Differs	Agree	Agree
Garmin Vivosmart 3	Differs	Differs	Agree	Differs	Differs	Agree	Agree
EarlySense Live	Differs	Differs	Agree	Differs	Differs	Differs	Agree
ResMed S+	Agree	Agree	Differs	Agree	Differs	Differs	Differs
SleepScore Max	Agree	Agree	Differs	Differs	Differs	Differs	Differs

Chinoy, E.D. et. al. (2021). *Performance of seven consumer sleep-tracking devices compared with polysomnography*. *Sleep, 44*(5), zsaa291. https://doi.org/10.1093/sleep/zsaa291

Consumer Devices VS PSG

Device	TST	SE	SOL	WASO	Wake	Light	Deep	REM
Oura Ring Gen3	Agree	Agree	Differs	Agree	Agree	Agree	Agree	Agree
Fitbit Sense 2	Agree	Agree	Agree	Agree	Agree	Differs	Differs	Agree
Apple Watch Series 8	Agree	Agree	Agree	Differs	Differs	Differs	Differs	Agree

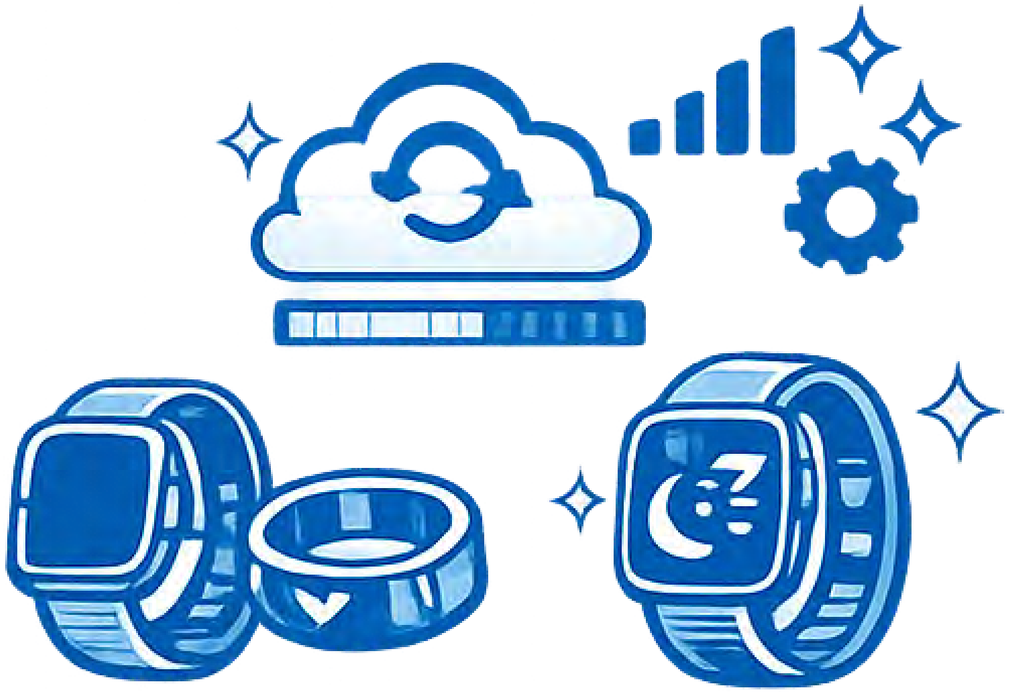
Robbins, R., et al. (2024). *Accuracy of three commercial wearable devices for sleep tracking in healthy adults*. *Sensors, 24*, 6532. https://doi.org/10.3390/s24206532

Consumer Devices VS PSG

Device	TST	SE	SOL	WASO	Wake	Light	Deep	REM
Fitbit Sense	Agree	Differs	Agree	Differs	Differs	Differs	Agree	Agree
Fitbit Charge 5	Agree	Differs	Agree	Differs	Differs	Differs	Agree	Agree
Whoop 4.0	Differs	Differs	Differs	Differs	Differs	Differs	Differs	Differs
Withings Scanwatch	Differs	Differs	Agree	Differs	Differs	Differs	Differs†	N/A†
Garmin Vivosmart 4	Differs	Differs	Agree	Differs	Differs	Agree	Differs	Agree
Apple Watch Series 8	Differs	Differs	Agree	Differs	Differs	Differs	Differs	Differs

Schyvens, A.-M., et. Al. (2025). *A performance validation of six commercial wrist-worn wearable sleep-tracking devices for sleep stage scoring compared to polysomnography*. *Sleep Advances, 6*(2), zpaf021. https://doi.org/10.1093/sleepadvances/zpaf021

Consumer Devices VS PSG



Improvements always occurring

THANK YOU!
ANY QUESTIONS?

Joel M. Billings

Assistant Professor ERAU
Joel.Billings@erau.edu

Turning Sleep Science Into Action: A Human Centered Approach to Fire Fighter Fatigue

DR. SHANNON C. WHITE


FIRE STATION

Human centered design… WHY?

- **Because traditional wellness programs often fail when:**
  - They don’t reflect shift realities
  - They feel judgmental or irrelevant
  - They’re designed for fire fighters, **not with them**
  - Fire fighters distrust how their data will be used

We needed a better way to design solution!

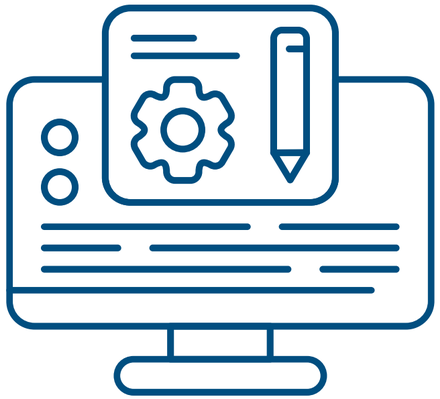
Multi-phase design approach

PRELIM PHASE

Understand & Ideate

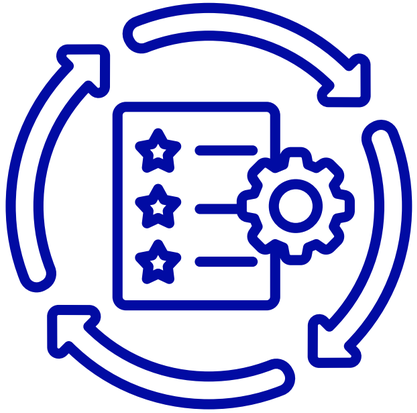
STAGE 1

Observe & Understand



STAGE 2

Prototype Testing



STAGE 3

Implement & Evaluate

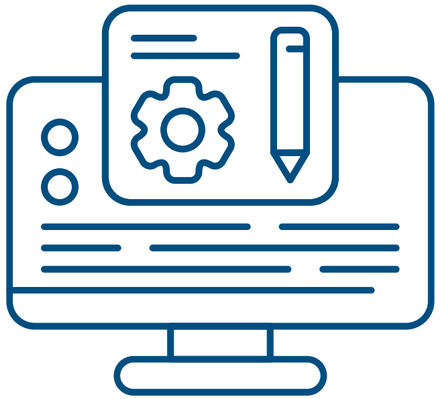
Multi-phase design approach

PRELIM PHASE

Understand & Ideate

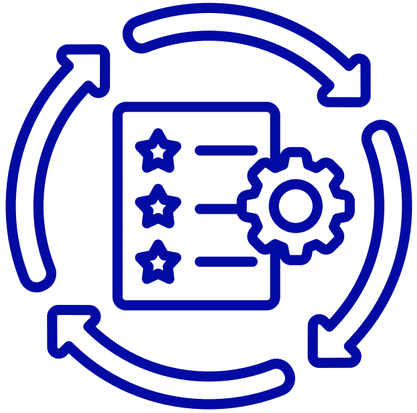
STAGE 1

Observe & Understand



STAGE 2

Prototype Testing



STAGE 3

Implement & Evaluate


LOUDOUN COUNTY
ENGINE CO.
624
FIRE RESCUE


FIRE RESCUE


OUDOUN COUNTY
FIRE-RESCUE


1200
900
600


ASHBURN 6


ALDIE VOLUNTEER FIRE DEPT. CO. 7
607

What we heard from fire fighters

SLEEP BARRIERS

- Difficulty falling asleep
- Difficulty staying asleep
- Long commute times impacting pre-shift rest

"As we become officers, we sleep less because we are always watching and listening for everything that's going on."

PROGRAM BARRIERS

- Simple and low burden
- Providing data and feedback
- Perceptions of existing wellness programming
- Instruction delivery

"I think definitely if you're able to show the results of them actually getting better, that would be huge…if there's one thing that these guys love is data within reason."


Now
what?

Objective

- **Build a program that is**
  - Simple
  - Not disruptive
  - Tailored to the needs of fire fighters
  - Evidence-based
  - Enjoyable

Fire Fighter Integrated Health Optimization Training Program

Target 1
Sleep Hygiene

Target 2
Physical Activity

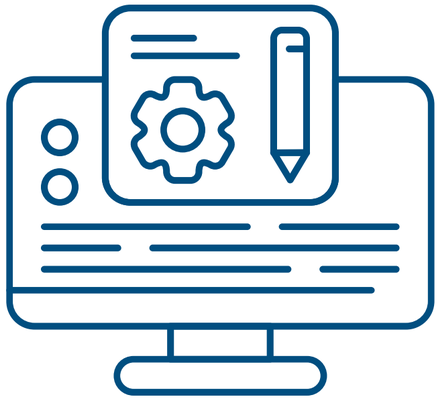
Multi-phase design approach

PRELIM PHASE

Understand & Ideate

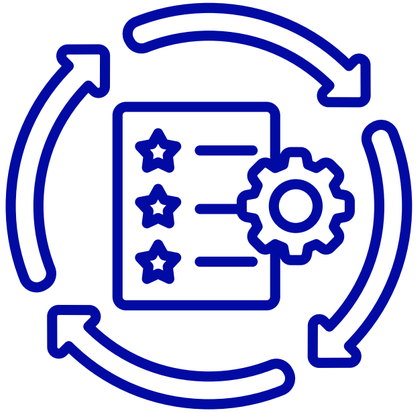
STAGE 1

Observe & Understand



STAGE 2

Prototype Testing



STAGE 3

Implement & Evaluate

Prototype

Today – Visit 1 (Day 0)

Cardiovascular Risk and Anthropometric Assessment
Complete assessment of body composition, blood pressure, and lipid profiles

+

Training
Downloading required apps to personal phone, learning how to sync device, and how to answer surveys

14 Days

Activity Monitor
Measures active time, sedentary time, sleep performance, and energy expenditure

Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 | Day 8 | Day 9 | Day 10 | Day 11 | Day 12 | Day 13 | Day 14

Phone Surveys
Assesses perceived quality of sleep, activity levels, and lifestyle behaviors

+

Micro-Interventions
Occupationally tailored intervention to increase physical activity and improve sleep hygiene

Visit 2 (Day 16)

Cardiovascular Risk and Anthropometric Assessment
Complete assessment of body composition, blood pressure, and lipid profiles

+

Debrief
Brief interview with lead researcher you collect participant feedback

Prototype feedback

INSTRUCTION & TRAINING

PROGRAM DELIVERY

SLEEP INTERVENTION

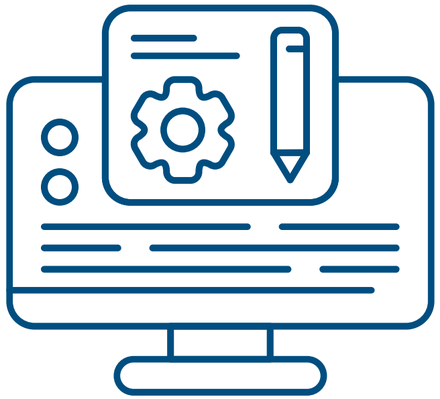
Multi-phase design approach

PRELIM PHASE

Understand & Ideate

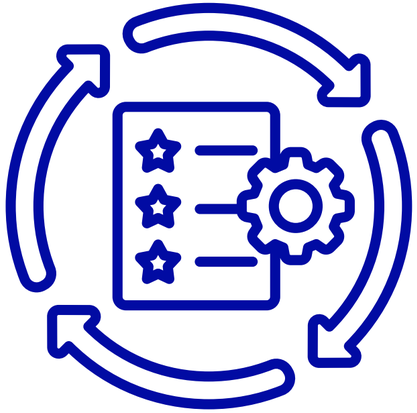
STAGE 1

Observe & Understand



STAGE 2

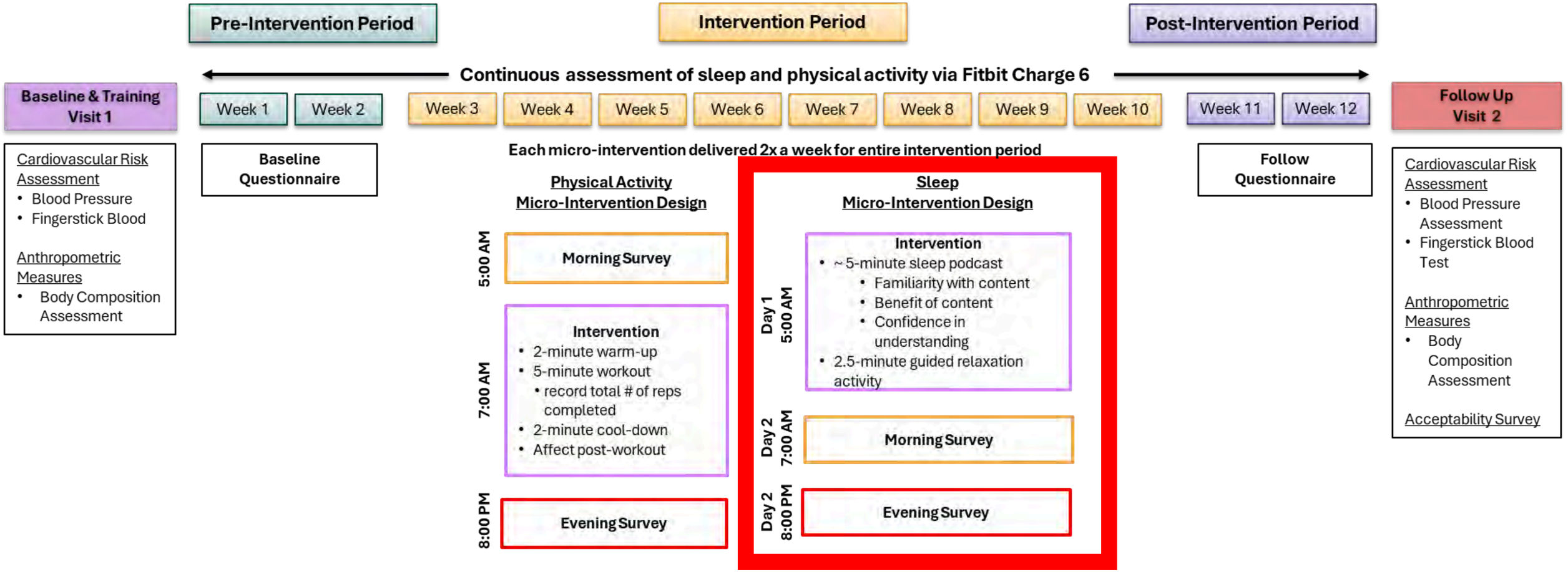
Prototype



STAGE 3

Implement & Evaluate

FIHOT Design



Sleep hygiene micro-intervention

Day T

8:00 PM

Micro-Intervention

5:00 AM

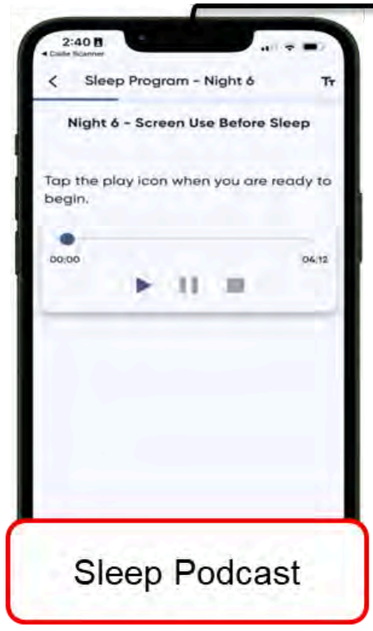
Morning Survey

Day T+1

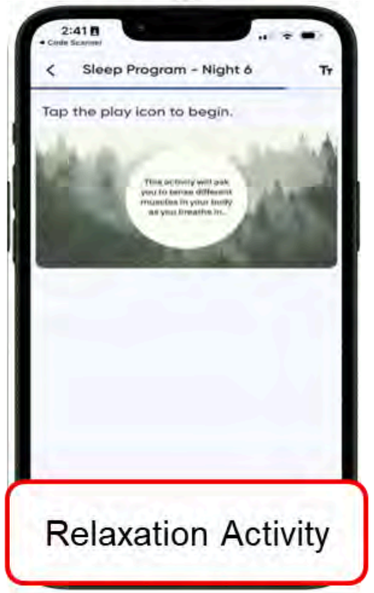
8:00 PM

Evening Survey

Day T



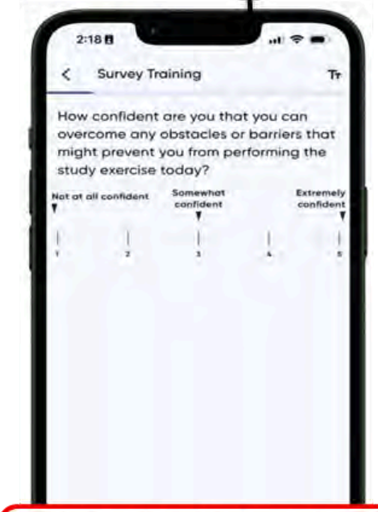
Sleep Podcast



Relaxation Activity

Day T + 1

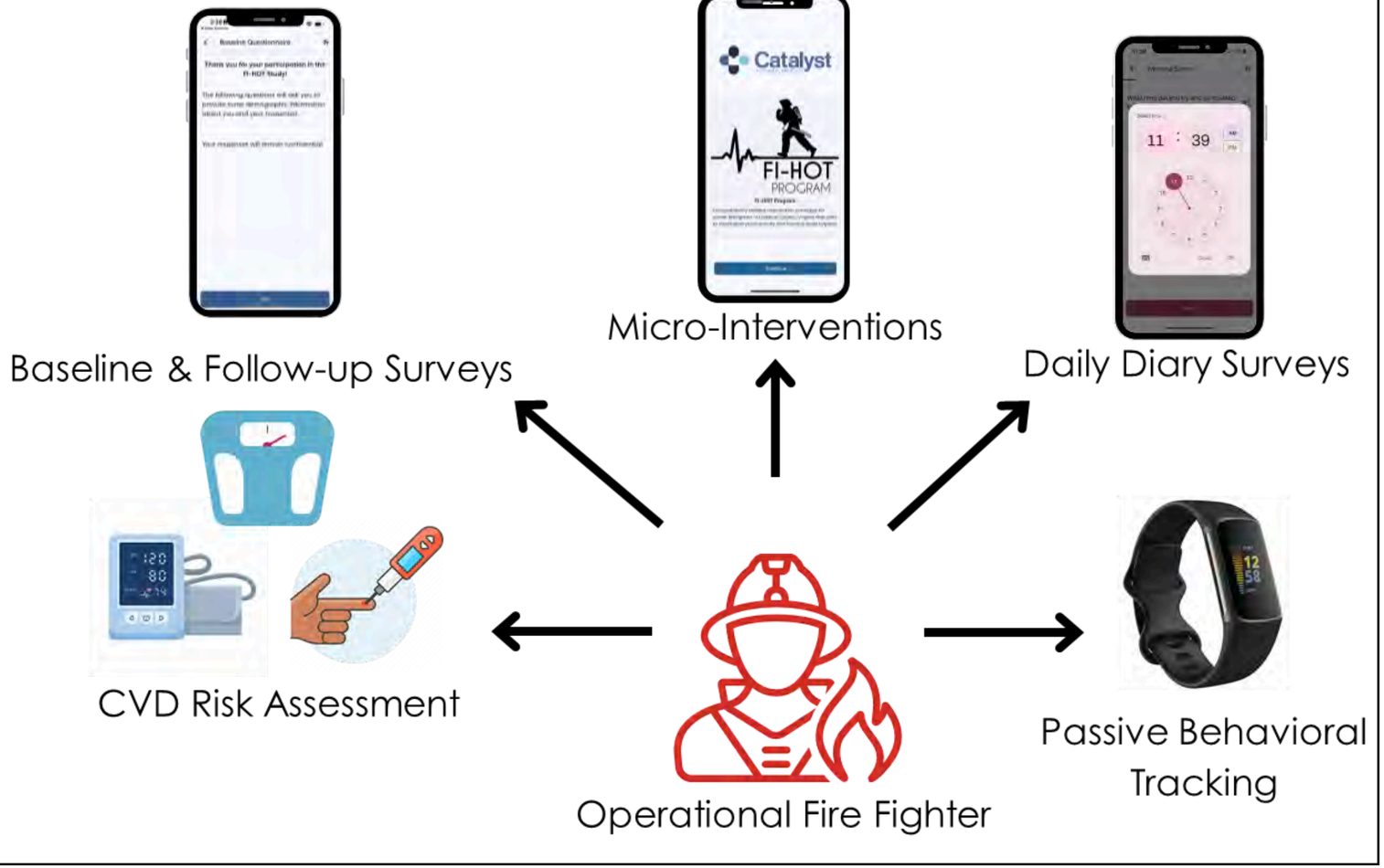
Program Resource



Morning & Evening Surveys

Data Sources

FI-HOT PROGRAM



DEPARTMENTAL

Sample Demographics

	Study Sample	Department
Mean Age	36.32	37.98
Mean Years of Service	11 years	12 years
Sex	10% Female	6.91% Female
Dept. Rank (%)		
Firefighter I + II/ EMT	60.77	53.01
Technician	17.69	23.24
Lieutenant	14.62	15.49
Captain	3.85	3.96
Battalion Chiefs	1.54	2.41
Shift Commanders	1.54	0.52

PROGRAM ENGAGEMENT

Firefighters successfully incorporated the FI-HOT program into their daily routines, with high engagement and positive feedback supporting its scalability.

81.5%

OF MICRO NTERVENTIONS WERE COMPLETED

80.3%

OF DAILY DIARY SURVEYS WERE COMPLETES

89%

OF FIRE FIGHTERS FOUND THE FI-HOT PROGRAM ENJOYABLE

74%

OF FIRE FIGHTERS WOULD RECOMMEND THE FI-HOT PROGRAM TO OTHERS

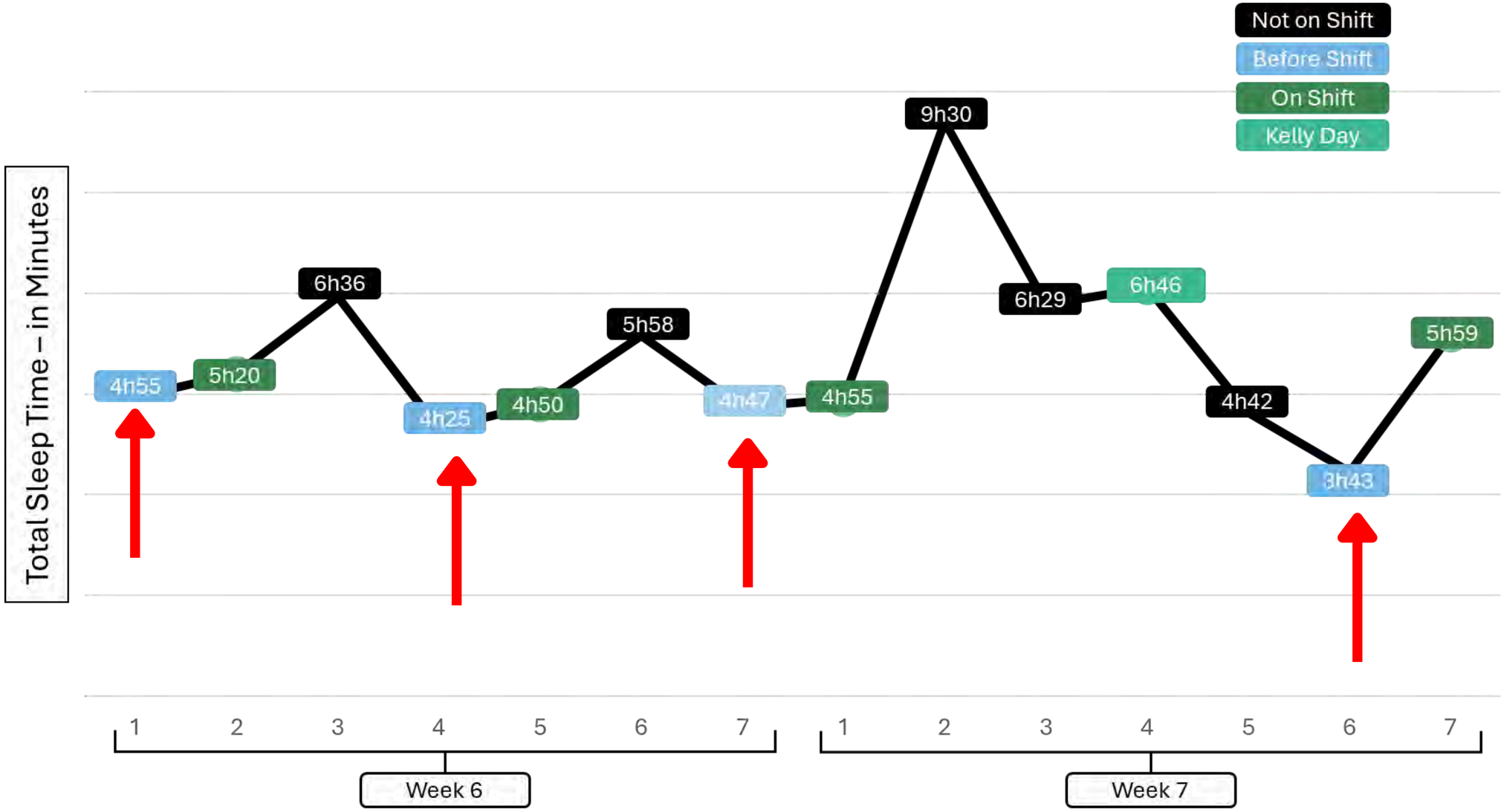
Sleep Findings

	Intervention Days	Non-Intervention Days	All Study Days
Total Sleep Time	—	—	↗
Sleep Efficiency	↗	↘	—
WASO	—	—	↗

What the data showed us

- Short, broken sleep on shift
- Catch-up sleep on days off
- Recovery becomes harder with years on the job
- Many firefighters are functioning tired, not rested

Real World Application



Participant

- Male
- Late 30's
- YOS = 6-15
- School age children

Why do these findings matter?

- Behavior change alone is not enough
- Delivery timing of supportive content **MATTERS**
- Small, easy, brief tools can improve sleep
- Fatigue solutions must be multi-layered, not individual-only
- This study worked because firefighters shaped it

THANK YOU!
ANY QUESTIONS?

Shannon C. White

Ohio State University |
white.4465@osu.edu

COOL, NOW WHAT?!

MIKE BINNEY

LOCAL 1309

WEST METRO PROFESSIONAL FIREFIGHTERS

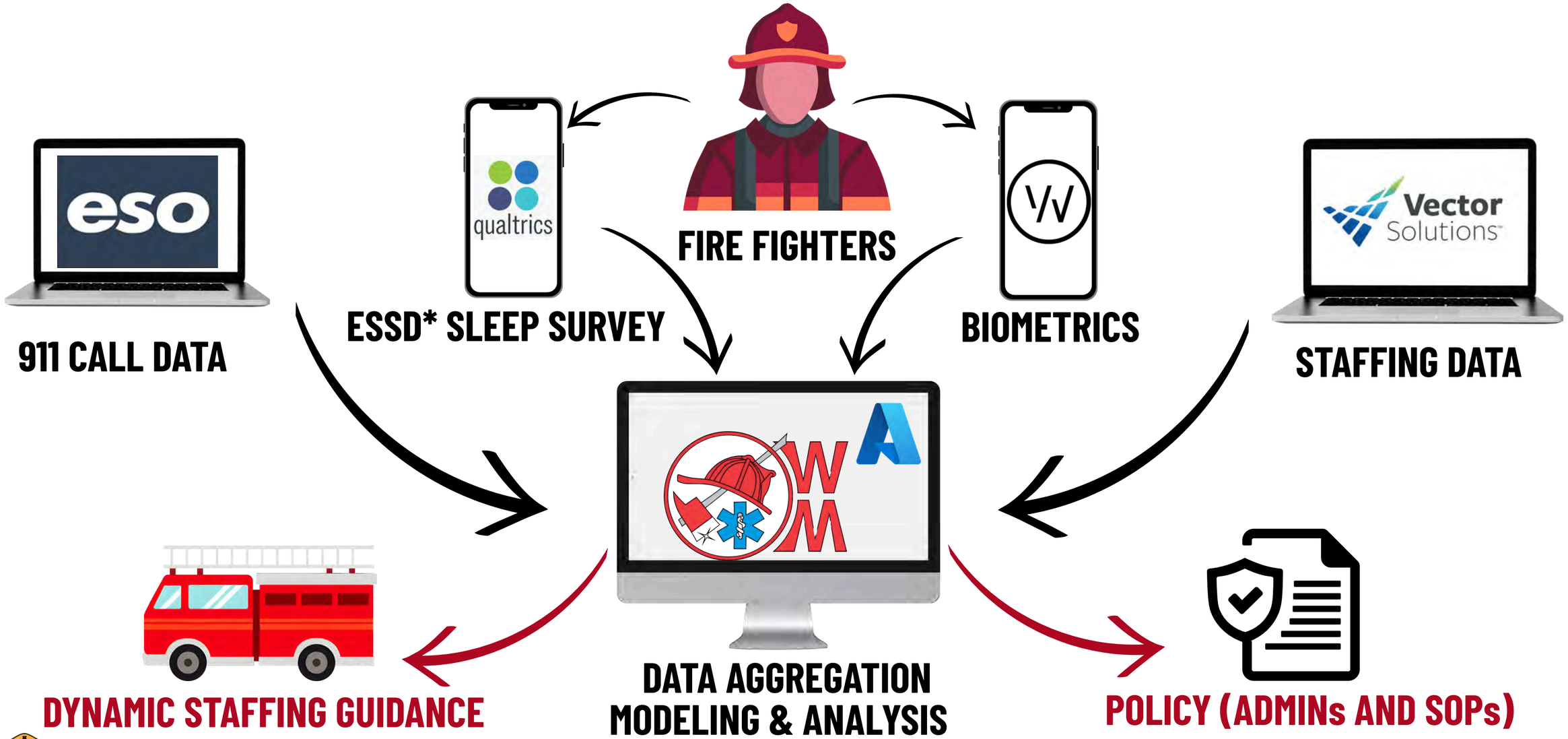
IAFF.ORG

THREE BIG IDEAS

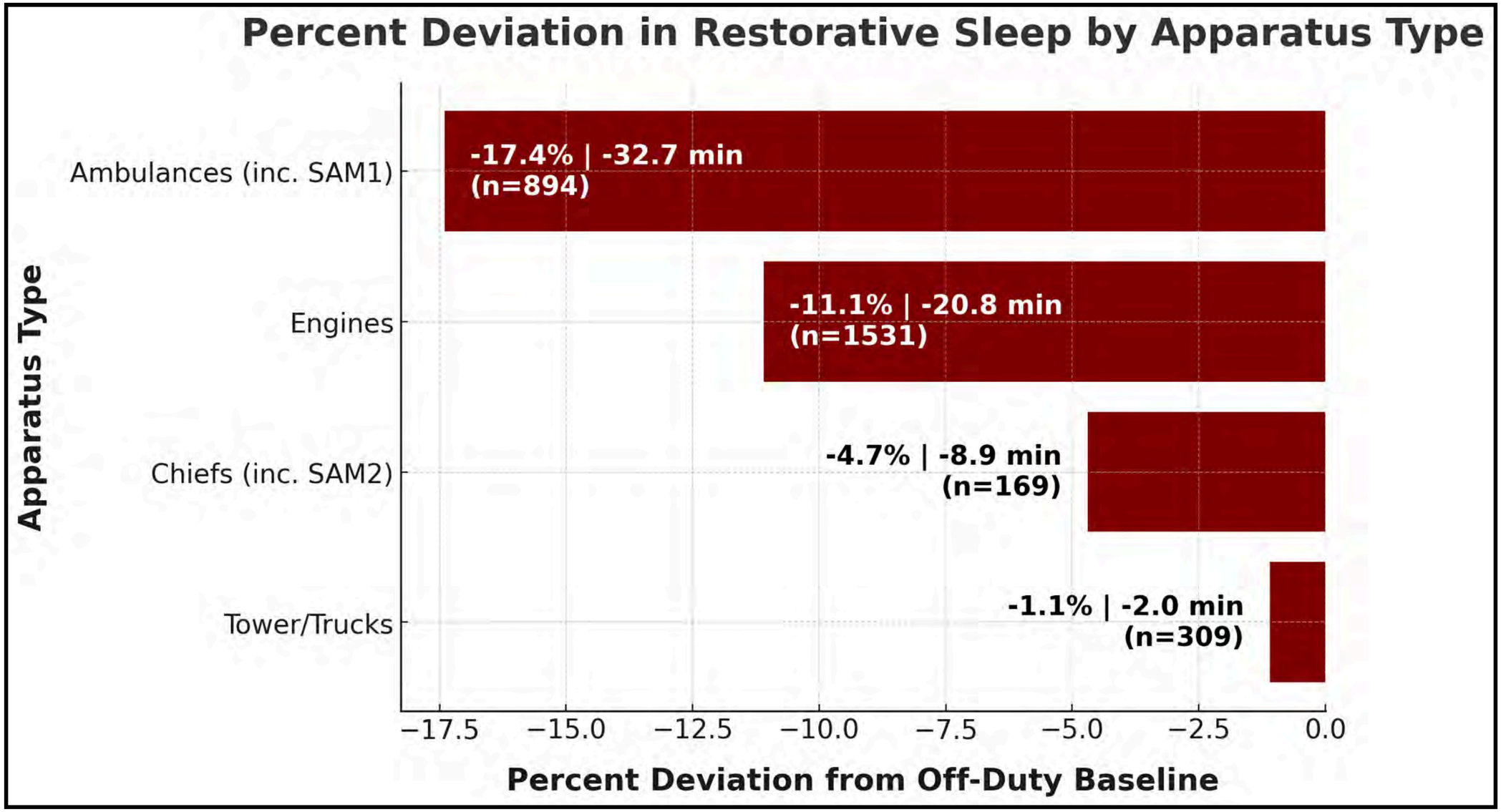
West Metro’s Project Overview

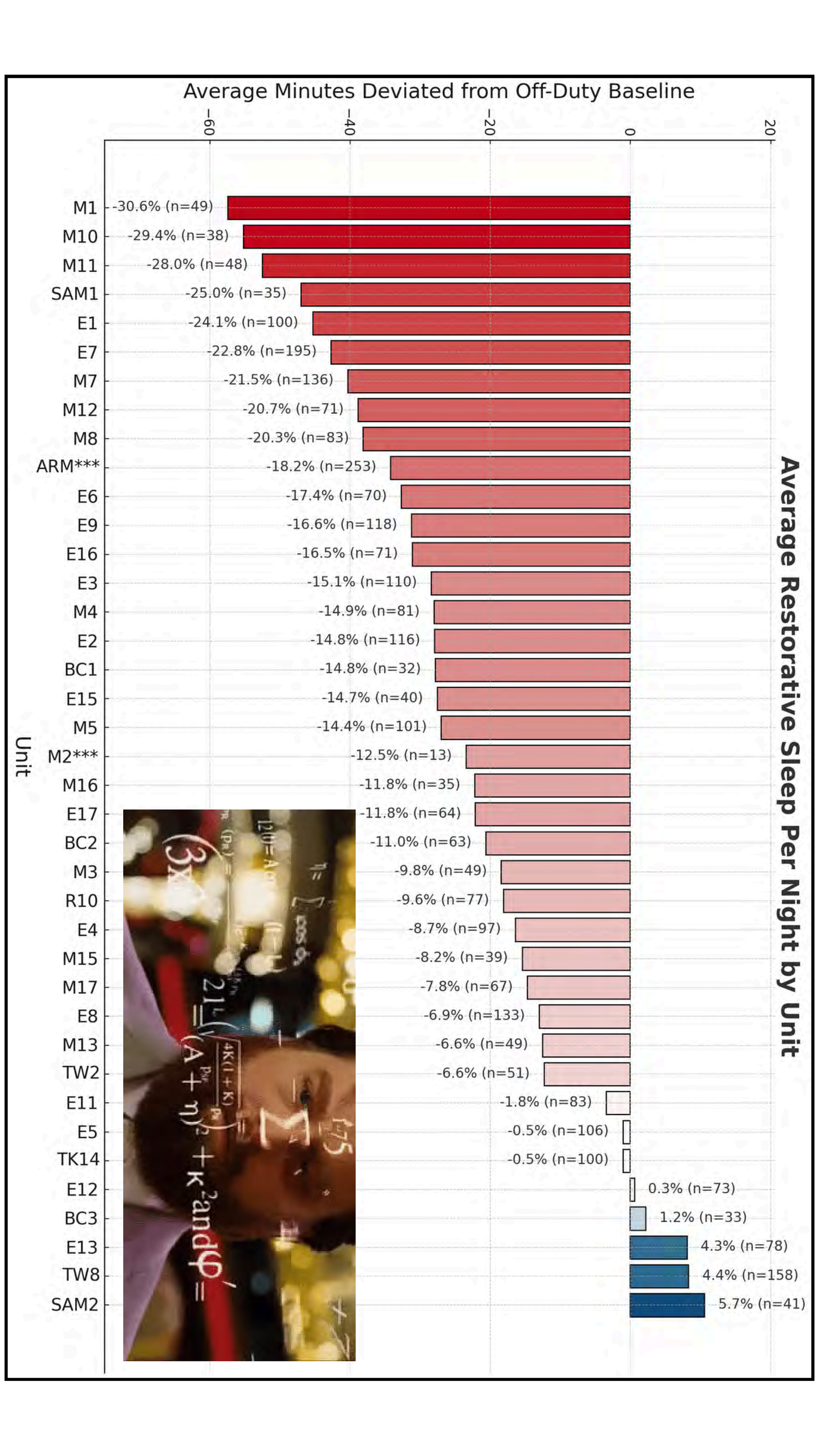
- Privacy above all
- Translate to tell a story
- Redirect to existing resources

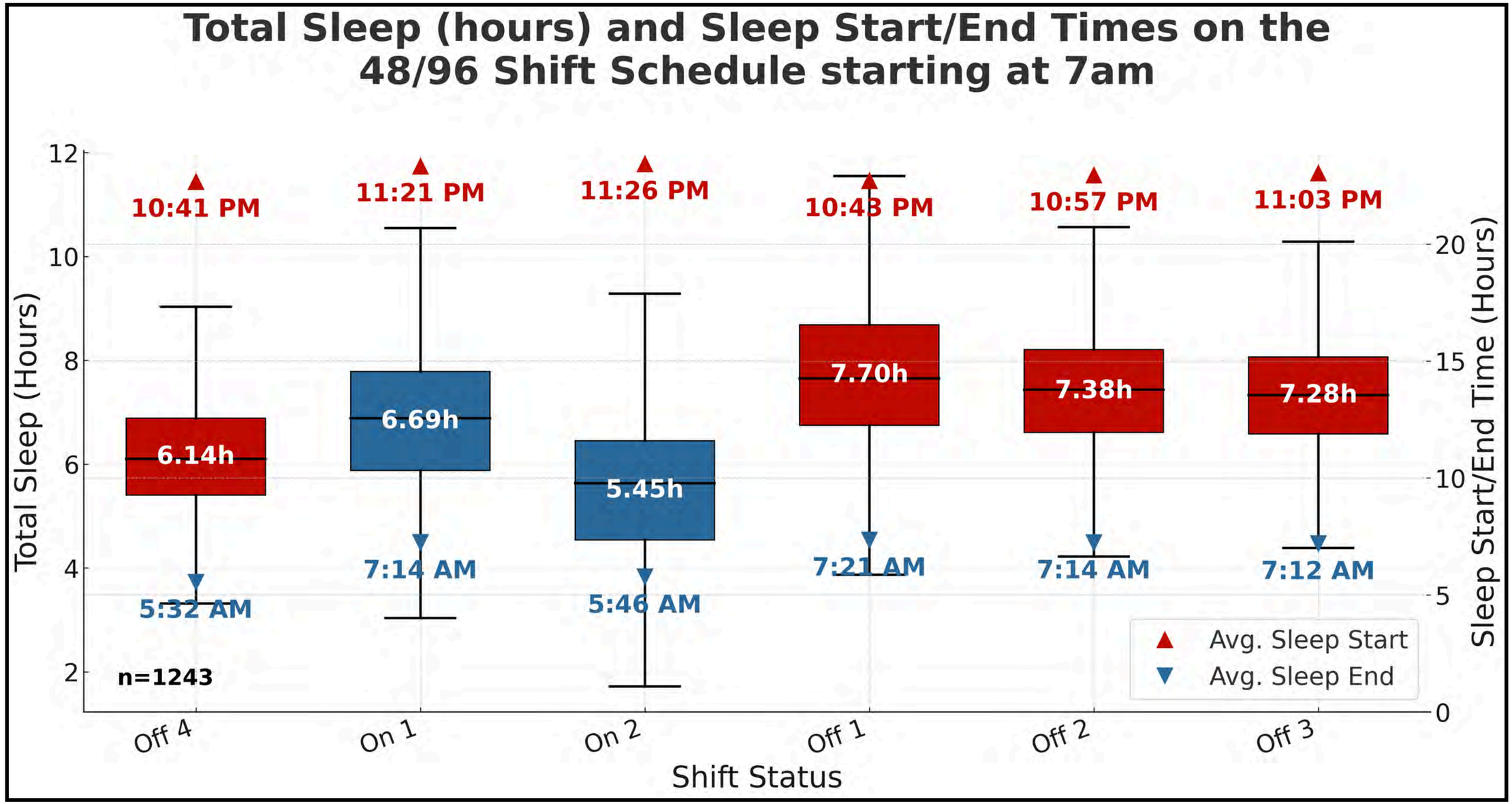
WEST METRO FIRE'S PROJECT



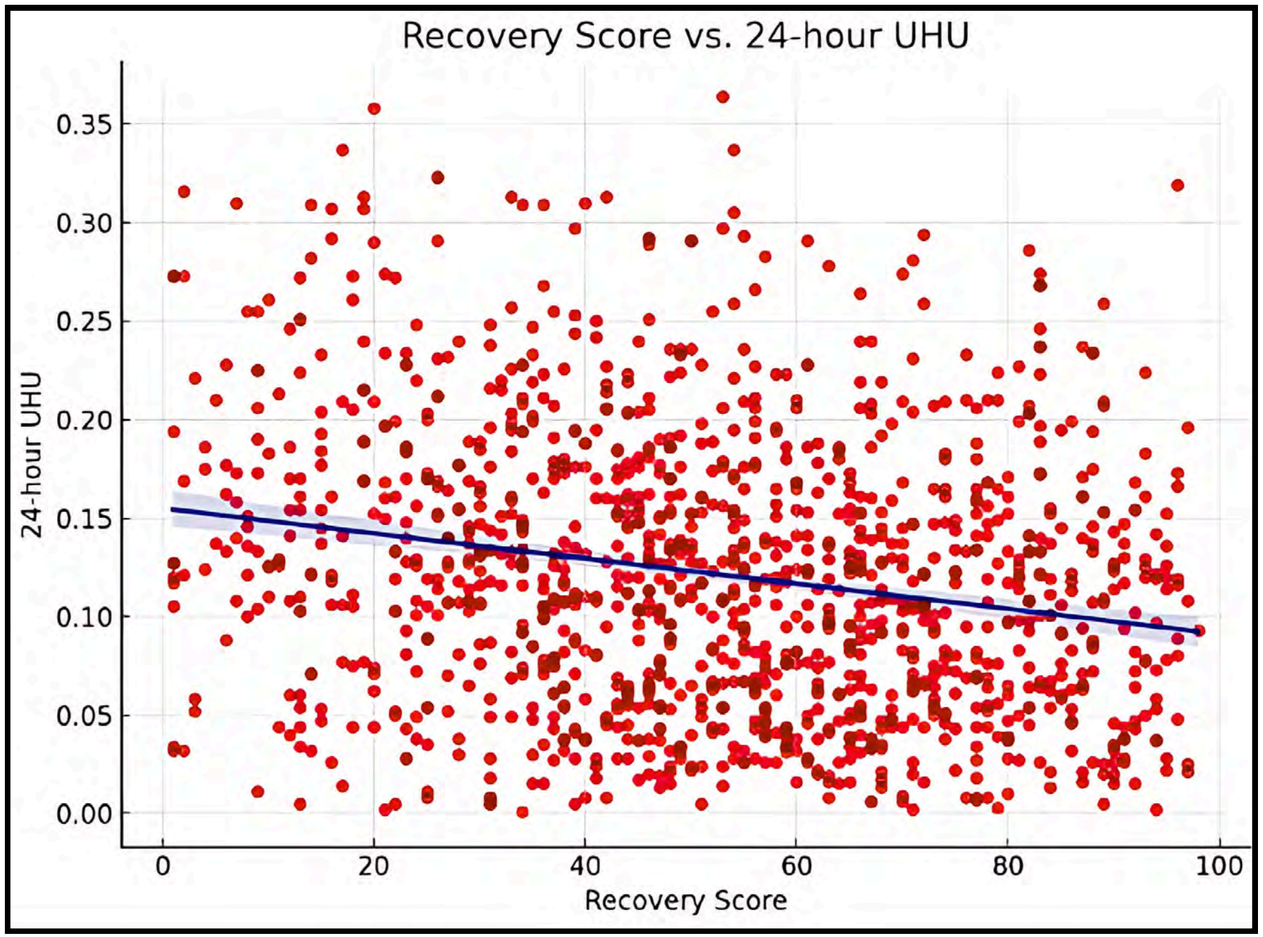
*Billings '22


Percent Deviation in Restorative Sleep by Apparatus Type
Apparatus Type
Ambulances (inc. SAM1)
Engines
Chiefs (inc. SAM2)
Tower/Trucks
-17.4% | -32.7 min
(n=894)
-11.1% | -20.8 min
(n=1531)
-4.7% | -8.9 min
(n=169)
-1.1% | -2.0 min
(n=309)
−17.5
−15.0
−12.5
−10.0
−7.5
−5.0
−2.5
0.0
Percent Deviation from Off-Duty Baseline

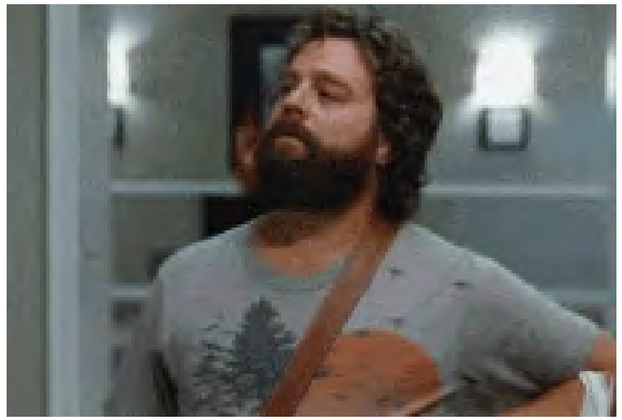

Average Minutes Deviated from Off-Duty Baseline
−60
−40
−20
0
20
Unit
Average Restorative Sleep Per Night by Unit
M1 -30.6% (n=49)
M10 -29.4% (n=38)
M11 -28.0% (n=48)
SAM1 -25.0% (n=35)
E1 -24.1% (n=100)
E7 -22.8% (n=195)
M7 -21.5% (n=136)
M12 -20.7% (n=71)
M8 -20.3% (n=83)
ARM*** -18.2% (n=253)
E6 -17.4% (n=70)
E9 -16.6% (n=118)
E16 -16.5% (n=71)
E3 -15.1% (n=110)
M4 -14.9% (n=81)
E2 -14.8% (n=116)
BC1 -14.8% (n=32)
E15 -14.7% (n=40)
M5 -14.4% (n=101)
M2*** -12.5% (n=13)
M16 -11.8% (n=35)
E17 -11.8% (n=64)
BC2 -11.0% (n=63)
M3 -9.8% (n=49)
R10 -9.6% (n=77)
E4 -8.7% (n=97)
M15 -8.2% (n=39)
M17 -7.8% (n=67)
E8 -6.9% (n=133)
M13 -6.6% (n=49)
TW2 -6.6% (n=51)
E11 -1.8% (n=83)
E5 -0.5% (n=106)
TK14 -0.5% (n=100)
E12 0.3% (n=73)
BC3 1.2% (n=33)
E13 4.3% (n=78)
TW8 4.4% (n=158)
SAM2 5.7% (n=41)


Total Sleep (hours) and Sleep Start/End Times on the 48/96 Shift Schedule starting at 7am
Total Sleep (Hours)
Sleep Start/End Time (Hours)
Shift Status
Off 4
On 1
On 2
Off 1
Off 2
Off 3
10:41 PM
11:21 PM
11:26 PM
10:43 PM
10:57 PM
11:03 PM
6.14h
6.69h
5.45h
7.70h
7.38h
7.28h
5:32 AM
7:14 AM
5:46 AM
7:21 AM
7:14 AM
7:12 AM
n=1243
Avg. Sleep Start
Avg. Sleep End

ISN'T UNIT HOUR UTILIZATION GOOD ENOUGH?



Only 27.6% Predictive of Measured Recovery



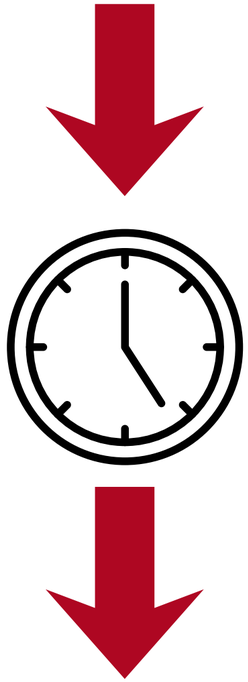
UHU= Unit Hour Utilization

WHAT DOES THIS MEAN TO FIRE FIGHTERS?

- Increase of 8-12 bpm in resting heart rate
- 15-20% reduction in HRV (autonomic dysfunction)
- Loss of 4 hrs and 6 min of total sleep during shift
- Loss of 2hrs and 2 min of restorative sleep (REM and SWS) during shift

CONTINUED PROGRESS

Enrollment



7am to 9am Shift Change Jan 7th, 2026

Analysis (in progress)

INTERNATIONAL ASSOCIATION OF FIRE FIGHTERS

Shift Scheduling & Sleep Health In Firefighters:

ANational Study onthe Impact of Shift Scheduling on Firefighter Sleep Health and Well-Being

Principal Investigator:
Sara Jahnke, Ph.D. | jahnke@ndri-usa.org

Why This Study?

Firefightersfacechronic sleep deprivation, increasing risks for cancer, heart disease, PTSD, depression, and injury. Shift work and early shift start times make this worse. This study will assess whether adjusting shift start time improves firefighter sleep and well-being. The primary outcomes are total sleep time and sleep consistency.

What We're Doing

- Testing later shift start times to measure effects on sleep, fatigue, and mood using biomonitoring bands and surveys
- Monitoring will occur 3 weeks before the change in shift start time
- One month after the change of shift start times, firefighters will again monitor their sleep for 3 weeks to determine if there are changes in sleep patterns

How We Measure Sleep & Fatigue

- Dailysleeplogs -Simpleself-reporting
- Online surveys -Sleep and behavioral health assessments
- A sub-sample of firefighters will be asked to wear a biomonitoring device during the study
- Firefighters will be given the chance to share a follow-up survey with their partners/spouses to assess the family impact of the change

Why Participate?

- Departments get data-driven insights to improve firefighter health
- Evidence-based recommendations on shift scheduling and sleep strategies
- Help shape national policies for firefighter well-being

CENTER FOR FIRE RESCUE & EMS HEALTH RESEARCH

Questions?
Brittany Hollerbach
Project Coordinator
hollerbach@ndri-usa.org

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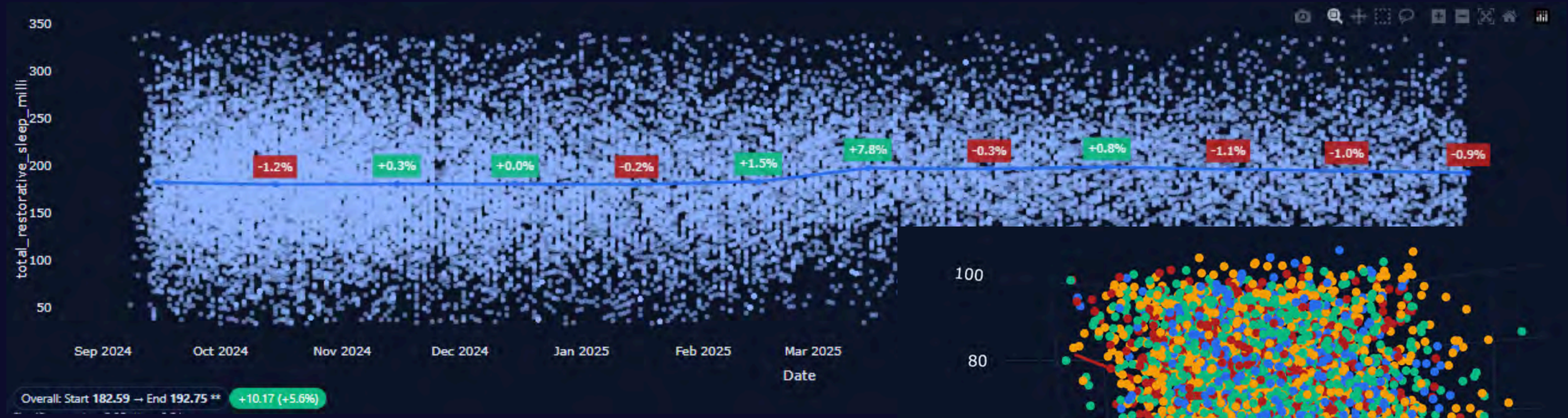
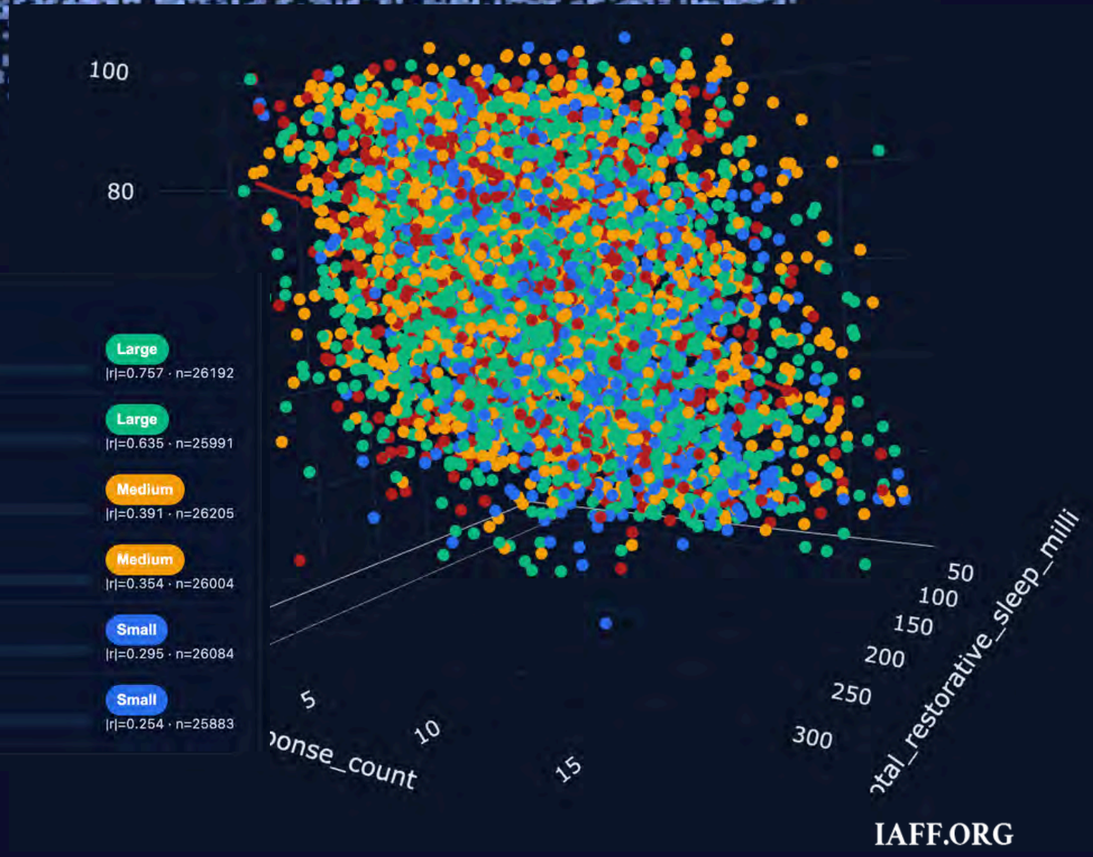
PRIVACY ABOVE ALL

- Partnerships
- Informed consent
- Ethical constraints (access)
- Data use agreements
- Legacy ownership

DON’T GET A WEDGIE, TELL A STORY





TOP POSITIVE

night_fire_responses ↔ sleep_cycle_count	Medium	|r|=0.310 · n=175
night_responses ↔ total_awake_min	Small	|r|=0.285 · n=3996
total_commit_time ↔ baseline_min	Small	|r|=0.274 · n=7218
ems_commit ↔ baseline_min	Small	|r|=0.264 · n=6823
night_responses ↔ total_time_in_bed_min	Small	|r|=0.260 · n=3996
night_ems_responses ↔ total_time_in_bed_min	Small	|r|=0.211 · n=3286

TOP NEGATIVE

age_cohort ↔ baseline_min	Large	|r|=0.757 · n=26192
years_of_service ↔ baseline_min	Large	|r|=0.635 · n=25991
age_cohort ↔ hrv_rmssd_milli	Medium	|r|=0.391 · n=26205
years_of_service ↔ hrv_rmssd_milli	Medium	|r|=0.354 · n=26004
age_cohort ↔ spo2_percentage	Small	|r|=0.295 · n=26084
years_of_service ↔ spo2_percentage	Small	|r|=0.254 · n=25883

Evaluated 357 ontology pairs across 26,205 rows (filters applied)

DON’T GET A WEDGIE, TELL A STORY

DON’T GET A WEDGIE, TELL A STORY

Controls

Home address

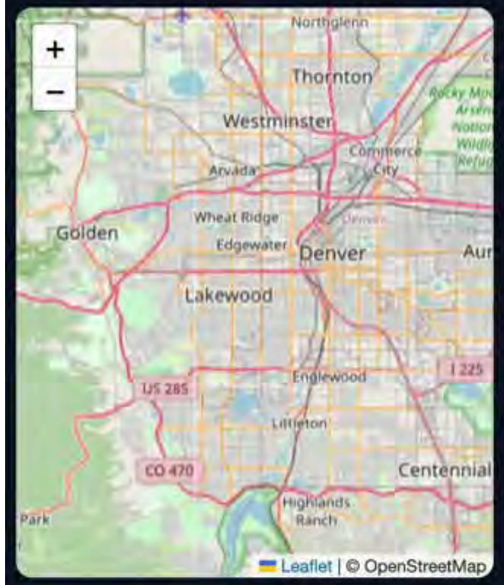
e.g., 433 S Allison Pkwy Lakewood, CO 80226

Station

Station 1

Show 7:00 Show 8:00 Show 9:00

Compute routes



Diagnostics

Drive Time to Work

shift start time	arrive at station	leave no later than	drive time (min)	drive time with no traffic (min)	drive time difference (min)	percent difference vs. no traffic (%)
07:00	07:30		0	0	0	0
08:00	08:30		0	0	0	0
09:00	09:30		0	0	0	0

Drive Time Home

shift start time	leave station	arrive home	drive time (min)	drive time with no traffic (min)	drive time difference (min)	percent difference vs. no traffic (%)
07:00		07:00	0	0	0	0
08:00		08:00	0	0	0	0
09:00		09:00	0	0	0	0

Total Drive Time

Shift Start Hour	Drive Time to Work (min)	Drive Time from Work (min)	Total Drive Time (min)
07:00	0	0	0
08:00	0	0	0
09:00	0	0	0

Estimated Sleep Benefit

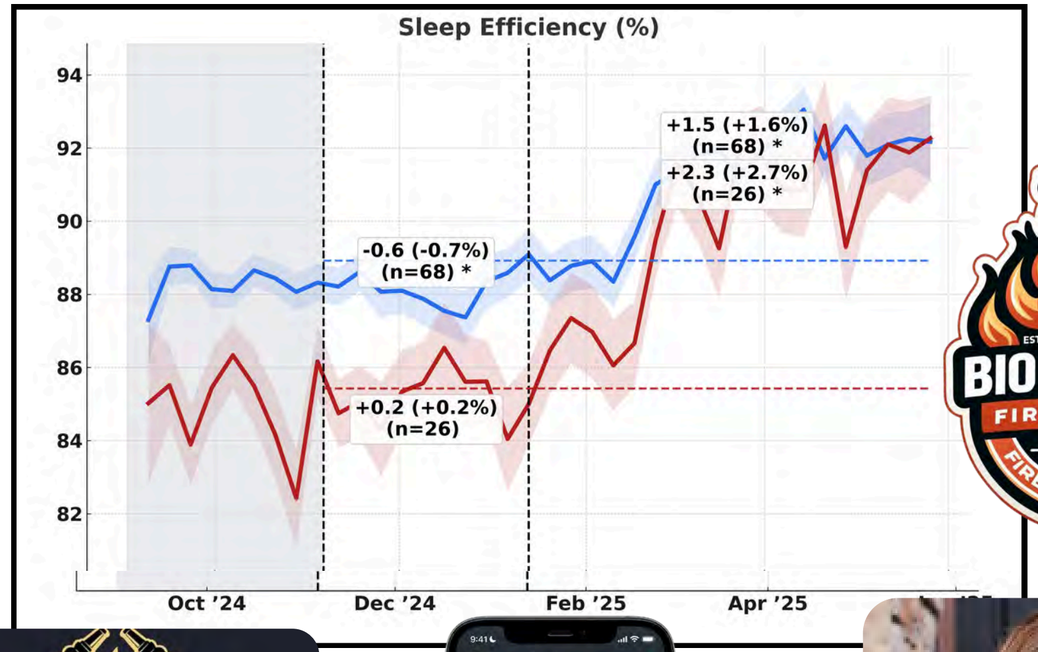
Shift Start Hour	Oncoming Sleep Benefit (min)	Offgoing Sleep Benefit (min)	Total Estimated Additional Sleep (min)
07:00	0	0	0
08:00	0	60	60
09:00	0	120	120

Open Sandbox

REDIRECT TO EXISTING RESOURCES

- Employee assistance programs
- Traditional health insurance
- Peer support
- Internal behavioral health

- Validate Tools and Policy
  - Wearables
  - Sleep training/education modules
  - Advocate for modality coverage



Emily Johnson, MA, LMFT

THANK YOU!
ANY QUESTIONS?

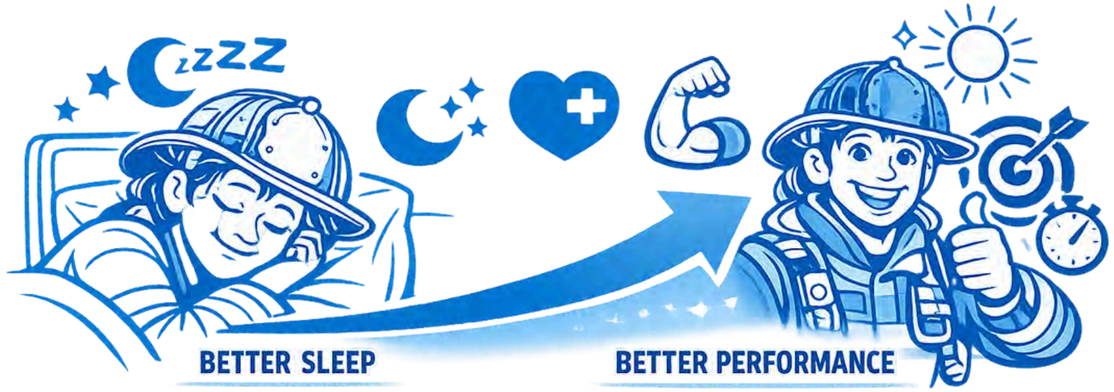
Mike Binney

West Metro Fire Rescue |
mbinney@westmetrofire.org

THE PLAYBOOK

Sleep into Action

- Firefighter sleep is often fragmented, irregular, and easy to normalize.
- Use the data! Look at trends.
- Technology is always changing and improving!



Individual & Group

Helath Behavior Awareness

- Strategic caffeine timing
- Post-shift rituals
- Revenge procrastination

Micro-Recovery Tools

- Controlled breathing
- Muscle relaxation
- Guided audio < 3 minutes

Organizational/Local Actions

- Privacy above all
- Translate the data to tell a story
- Amazing partners are out there!

Joel Billings, PhD
joel.billings@erau.edu

Shannon White, PhD
white.4465@osu.edu

THANK YOU!
QUESTIONS?

**Mike Binney-
Local 1309**

mbinney@westmetrofire.org

EVALUATION AND WIN AN IPAD!

- **Submit your workshop and overall evaluations to be automatically entered in two drawings for a new iPad!**
- **Complete your evaluations using the IAFF app:**
  1. Download the IAFF app and sign in with your iaff.org username
  2. Tap the 2026 Strive for Excellence Summit event image to enter the event's dashboard
  3. Tap "Sessions" and tap on the workshops you attended
  4. Tap "Evaluation" and complete the evaluation
  5. Tap "Submit"

  For the event's overall evaluation, follow steps 1 and 2, then tap "Event Evaluation" located in the event's Dashboard.