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Supplemental Table 1: Equations used to calculate total sweat volume and sodium

Variable	Equation
Total sweat volume (liters)	Measured sweat volume (L) × [Patch surface area/Runner surface area] × [26.2 miles/5 miles].
Patch surface area	Calculated by multiplying the length and the width of the patch (cm ²)
Runner surface area (cm ²)	007184 × [Weight (0.425)] × [Height (0.725)] × 10,000
Total sweat sodium content (grams)	Measured sweat sodium concentration (mmol/L) × Total Sweat Volume Loss (L) × 23.

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Sample type	Biomarker	Intra-assay CV (%)	Inter-assay CV (%)
Urine	NGAL	5.1	7.6
	IL-18	2.0	8.2
	KIM-1	2.0	11.4
	MCP-1	3.8	9.8
	YKL-40	1.7	6.8
Plasma	Copeptin	9.0	11.0
	NGAL	7.2	6.4
	IL-18	7.3	7.0
	KIM-1	3.1	5.4
	MCP-1	12.2	17.7
	YKL-40	2.4	5.6
	IFN- γ	4.0	7.7
	IL-10	6.6	7.1
	IL-12p70	14.4	14.5
	IL-13	0.92	6.0
	IL-1 β	5.8	6.3
	IL-2	4.3	10.0
	IL-4	1.4	9.6
	IL-6	3.4	10.4
	IL-8	1.3	6.6
TNF- α	1.8	6.6	

Supplemental Table 2:
Coefficients of variance (CV) for copeptin and kidney injury biomarkers

Supplemental Table 3: Day of race biomarker levels by time point

Biomarker	Day 0 (n=22)	Day 1 (n=22)	Day 2 (n=22)	P-value
Plasma biomarkers day of race				
IFN (pg/mL)	3.03 (2.31, 4.59)	2.43 (1.9, 3.61)	2.57 (1.84, 3.72)	0.376
IL-10 (pg/mL)	0.2 (0.14, 0.24)	11.04 (1.38, 16.81)	0.27 (0.22, 0.35)	<.001
IL-12 (pg/mL)*	0.13 (0.1, 0.21)	0.21 (0.14, 0.3)	0.11 (0.09, 0.19)	0.006
IL-13 (pg/mL)*	0.55 (0.28, 0.86)	0.61 (0.46, 1.13)	0.74 (0.61, 0.95)	0.183
IL-18 (pg/mL)	231.26 (187.75, 252.13)	280.42 (246.97, 337.94)	238.22 (215, 293.34)	0.003
IL-2 (pg/mL)	0.15 (0.09, 0.21)	0.22 (0.14, 0.29)	0.15 (0.14, 0.27)	0.177
IL-4 (pg/mL)*	0.01 (0.01, 0.02)	0.03 (0.02, 0.04)	0.01 (0.01, 0.02)	<.001
IL-6 (pg/mL)	0.56 (0.36, 0.76)	21.96 (9.98, 33.73)	0.89 (0.49, 1.44)	<.001
IL-8 (pg/mL)	3.28 (2.85, 4.25)	15.3 (11.9, 21.14)	3.44 (2.81, 3.92)	<.001
Kim-1 (pg/mL)	94.62 (71.29, 102.6)	88.13 (73.63, 139.02)	107.57 (84.97, 147.93)	0.136
MCP-1 (pg/mL)	151.09 (138.01, 171.14)	378.02 (312.45, 486.45)	173.08 (152.3, 201.43)	<.001
NGAL (ng/mL)	76.48 (68.93, 89.08)	143.54 (122.27, 200.78)	73.59 (62.88, 96.62)	<.001
TNF- α (pg/mL)	1.73 (1.5, 2.05)	2.84 (2.22, 3.05)	1.98 (1.68, 2.5)	<.001
YKL-40 (ng/mL)	25.14 (21.78, 40.53)	36.98 (32.54, 50.61)	52.32 (32.27, 100.35)	<.001
Urine biomarkers day of race				
Urine IL-18 (pg/mL)	7.58 (3.55, 18.25)	74.72 (40.87, 180.56)	18.51 (5.13, 50.15)	<.001
Urine Kim-1 (pg/mL)	63.36 (30.82, 311.43)	2679.92 (741.27, 3314.11)	462.71 (123.15, 1898.43)	<.001
Urine MCP-1 (pg/mL)	16.06 (6.27, 77.92)	863.62 (143.26, 1635.18)	102.92 (12.39, 435.86)	<.001
Urine NGAL (ng/mL)	3.67 (1.69, 13.86)	44.14 (15.99, 100.53)	8.97 (3.40, 29.47)	<.001
Urine YKL-40 (pg/mL)	159.84 (72.95, 477.65)	2114.19 (610.95, 4007.7)	302.59 (99.72, 1258.84)	<.001

IFN: Interferon; IL: interleukin; KIM-1, kidney injury molecule-1; MCP-1, monocyte chemoattractant protein-1; NGAL, neutrophil gelatinase-associated lipocalin; TNF- α , tumor necrosis factor alpha; YKL-40, human cartilage glycoprotein-39.

*IL-12 has 3 missing values. IL-13 has 2 missing values. IL 4 has 5 missing values.

P-value was calculated using Wilcoxon Rank-Sum test. P-values <0.05 are shown in dark pink, and p-values <0.10 are shown in light pink.

Supplemental Table 4: Pre-race biomarker levels stratified by AKI status

Biomarker	Total (n=22)	Plasma biomarkers pre race		P-value
		No AKI (n=10)	AKI (n=12)	
IFN (pg/mL)	3.03 (2.31, 4.59)	2.67 (2.28, 3.64)	3.46 (2.44, 4.95)	0.20
IL-2 (pg/mL)	0.15 (0.09, 0.21)	0.10 (0.05, 0.16)	0.16 (0.13, 0.31)	0.06
IL-4 (pg/mL)*	0.01 (0.01, 0.02)	0.01 (0.01, 0.01)	0.01 (0.01, 0.02)	0.80
IL-6 (pg/mL)	0.56 (0.36, 0.76)	0.66 (0.50, 0.76)	0.45 (0.29, 0.84)	0.49
IL-8 (pg/mL)	3.28 (2.85, 4.25)	3.26 (2.85, 4.40)	3.49 (2.80, 4.07)	0.87
IL-10 (pg/mL)	0.20 (0.14, 0.24)	0.19 (0.14, 0.24)	0.21 (0.13, 0.28)	0.69
IL-12 (pg/mL)*	0.13 (0.10, 0.21)	0.11 (0.08, 0.12)	0.14 (0.13, 0.28)	0.02
IL-13 (pg/mL)*	0.55 (0.28, 0.86)	0.62 (0.35, 0.71)	0.51 (0.20, 0.89)	0.76
IL-18 (pg/mL)	231 (188, 252)	243 (227, 275)	201 (185, 246)	0.22
KIM-1 (pg/mL)	95 (71, 103)	91 (71, 102)	95 (66, 111)	0.92
NGAL (ng/mL)	76 (69, 89)	75 (69, 86)	79 (69, 111)	0.53
TNF- α (pg/mL)	1.73 (1.50, 2.05)	1.77 (1.50, 1.94)	1.72 (1.47, 2.29)	0.87
MCP-1 (pg/mL)	151 (138, 171)	147 (139, 161)	164 (138, 176)	0.49
YKL-40 (ng/mL)	25 (22, 41)	26 (23, 29)	24 (19, 49)	0.97
Urine biomarkers pre race indexed to creatinine				
IL-18 (pg/mg)	20 (14, 26)	22 (19, 27)	18 (12, 24)	0.16
KIM-1 (pg/mg)	251 (126, 320)	272 (172, 351)	223 (129, 304)	0.49
NGAL (ng/mg)	11.8 (4.4, 47.4)	27.0 (94.9, 49.5)	6.2 (3.7, 36.4)	0.12
MCP-1 (pg/mg)	52 (29, 115)	54 (50, 132)	33 (27, 81)	0.25
YKL-40 (pg/mg)	400 (295, 786)	361 (295, 467)	642 (317, 1244)	0.16

IFN: Interferon; IL: interleukin; KIM-1, kidney injury molecule-1; MCP-1, monocyte chemoattractant protein-1; NGAL, neutrophil gelatinase-associated lipocalin; TNF- α , tumor necrosis factor alpha; YKL-40, human cartilage glycoprotein-39.

* Values below the limit of detection (BLD) were excluded from analysis, IL-12 has 2, and 1 values BLD in the AKI and non AKI group, respectively. IL-13 has 1 value BLD from both AKI and non AKI groups. IL-4 has 1 and 4 values BLD from the AKI and non AKI group, respectively.

P-value was calculated using Wilcoxon Rank-Sum test. P-values <0.05 are shown in dark pink, and p-values <0.10 are shown in light pink.

Supplemental Table 5: Fold Change in Biomarkers by AKI status (n=22, excluded runner 42)

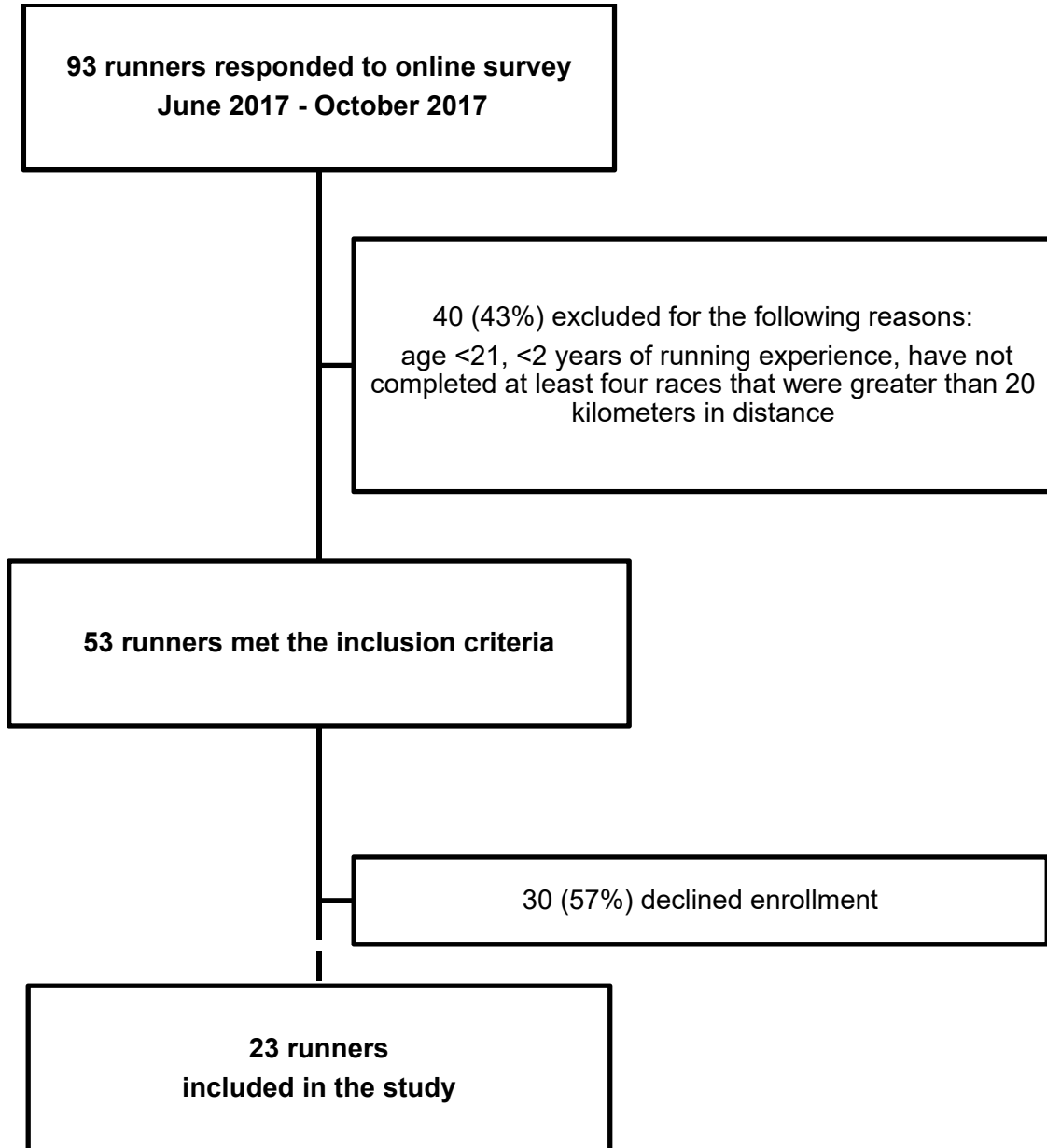
Fold change from Day 0 to Day 1	Total n=22	No AKI n=10	AKI n=12	P-value
Plasma biomarkers day of race (day 1)				
IFN	0.82 (0.65, 1.05)	0.94 (0.64, 1.21)	0.69 (0.65, 0.99)	0.34
IL-10	50.42 (9.44, 85.46)	32.46 (7.74, 71.25)	53.75 (20.84, 88.24)	0.28
IL-12 *	1.74 (0.74, 3.11)	2.20 (1.72, 3.11)	1.14 (0.70, 2.35)	0.21
IL-13 *	1.34 (0.96, 2.47)	1.22 (0.95, 1.41)	1.38 (1.01, 3.73)	0.36
IL-18	1.255 (1.08, 1.35)	1.11 (1.06, 1.18)	1.33 (1.26, 1.96)	0.01
IL-2	1.45 (1.11, 2.01)	1.34 (1.08, 2.26)	1.60 (1.20, 1.95)	0.87
IL-4 *	2.12 (1.25, 5.72)	2.22 (1.33, 2.78)	1.97 (1.16, 6.52)	0.88
IL-6	33.86 (25.14, 62.26)	29.35 (12.67, 41.29)	45.13 (27.04, 72.56)	0.31
IL-8	4.60 (3.07, 6.42)	3.72 (2.53, 4.94)	5.90 (4.07, 6.89)	0.08
Kim-1	1.09 (0.81, 1.37)	0.82 (0.75, 1.37)	1.29 (0.91, 1.42)	0.09
MCP-1	2.44 (1.97, 3.08)	2.28 (1.93, 2.81)	2.51 (1.97, 3.44)	0.28
NGAL	2.01 (1.58, 2.75)	1.63 (1.40, 1.95)	2.45 (1.99, 2.90)	0.01
TNF- α	1.56 (1.21, 1.99)	1.33 (1.14, 1.54)	1.83 (1.39, 2.37)	0.05
YKL-40	1.44 (1.23, 1.67)	1.36 (1.14, 1.46)	1.58 (1.27, 1.98)	0.11
Urine biomarkers day of race (day 1)				
Urine IL-18	7.68 (3.46, 19.47)	5.39 (3.46, 10.22)	8.15 (2.88, 43.86)	0.34
Urine Kim-1	19.37 (6.23, 52.31)	8.79 (6.23, 25.08)	23.45 (4.0, 105.04)	0.25
Urine MCP-1	15.09 (6.24, 141)	10.61 (3.17, 17.42)	60.84 (6.24, 188.71)	0.08
Urine NGAL	8.29 (1.87, 15.67)	3.10 (1.58, 11.12)	13.02 (5.49, 48.38)	0.03
Urine YKL-40	6.98 (3.95, 28.25)	6.79 (3.54, 9.76)	8.23 (3.96, 32.72)	0.45

IFN: Interferon; IL: interleukin; KIM-1, kidney injury molecule-1; MCP-1, monocyte chemoattractant protein-1; NGAL, neutrophil gelatinase-associated lipocalin; TNF- α , tumor necrosis factor alpha; YKL-40, human cartilage glycoprotein-39.

*IL-12 has 2, and 1 missing value in AKI and non AKI groups. IL-13 has 1 missing value from both AKI and non AKI groups. IL4 has 1 and 4 missing from AKI and non AKI groups.

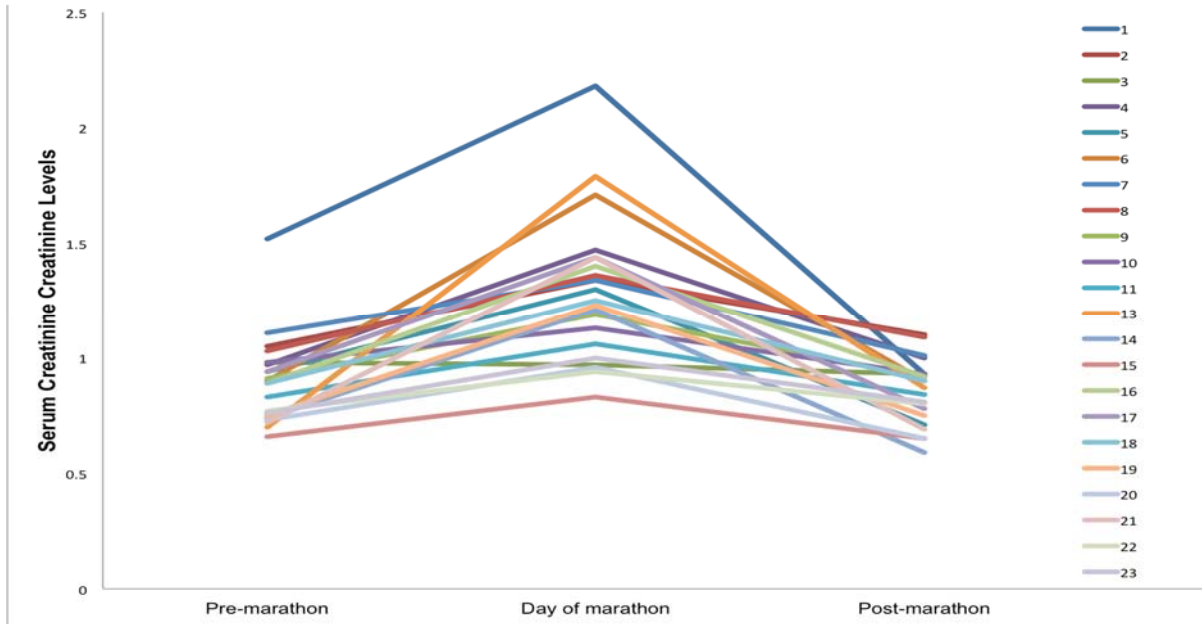
P-value was calculated using Wilcoxon Rank-Sum test. P-values <0.05 are shown in dark pink, and p-values <0.10 are shown in light pink.

Supplemental Figure 1: Enrollment chart of runners in the study cohort



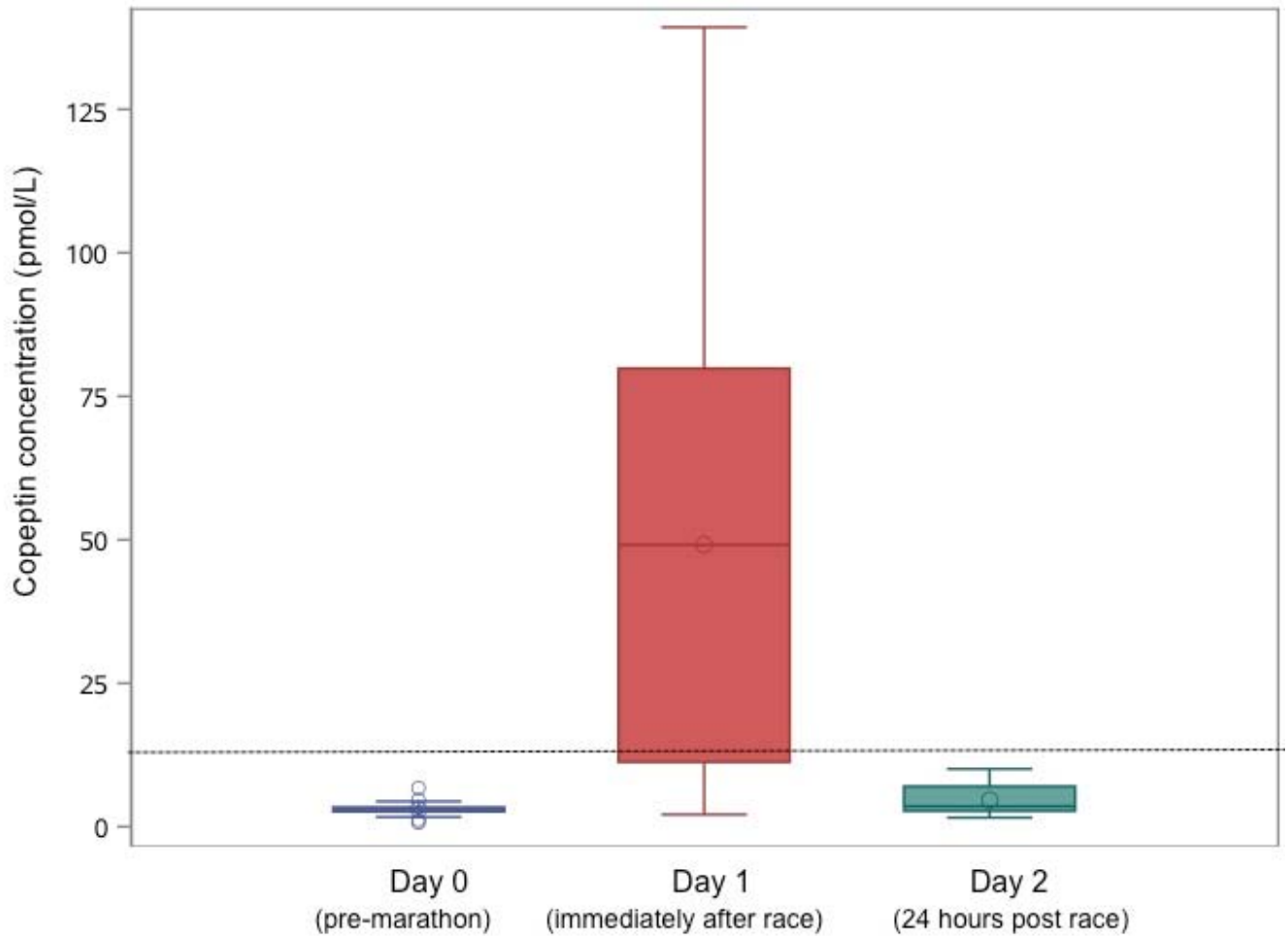
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Supplemental Figure 2. Serum Creatinine Levels per Runner



Each colored solid line represents a runner with creatinine values plotted over time.

Supplemental Figure 3: Copeptin concentrations by time point



----- 13 pmol/L represents 97.5th percentile in healthy adults

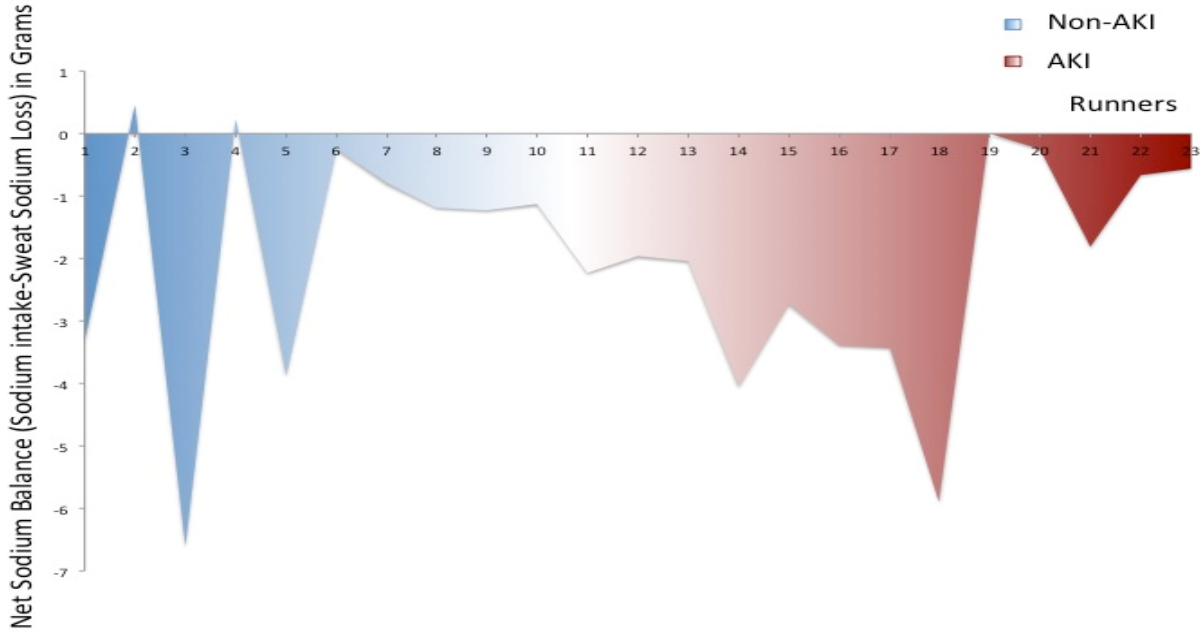
Box plot shows the 25th, 50th (median), and 75th percentile values for copeptin measurements on Day 0, Day 1 and Day 2.

Copeptin significantly increased after running reflecting the hypovolemic state runners are in post-race. These levels approached baseline one day after the race, which signifies that this hypovolemic state, with copeptin release, is transient and reversible.

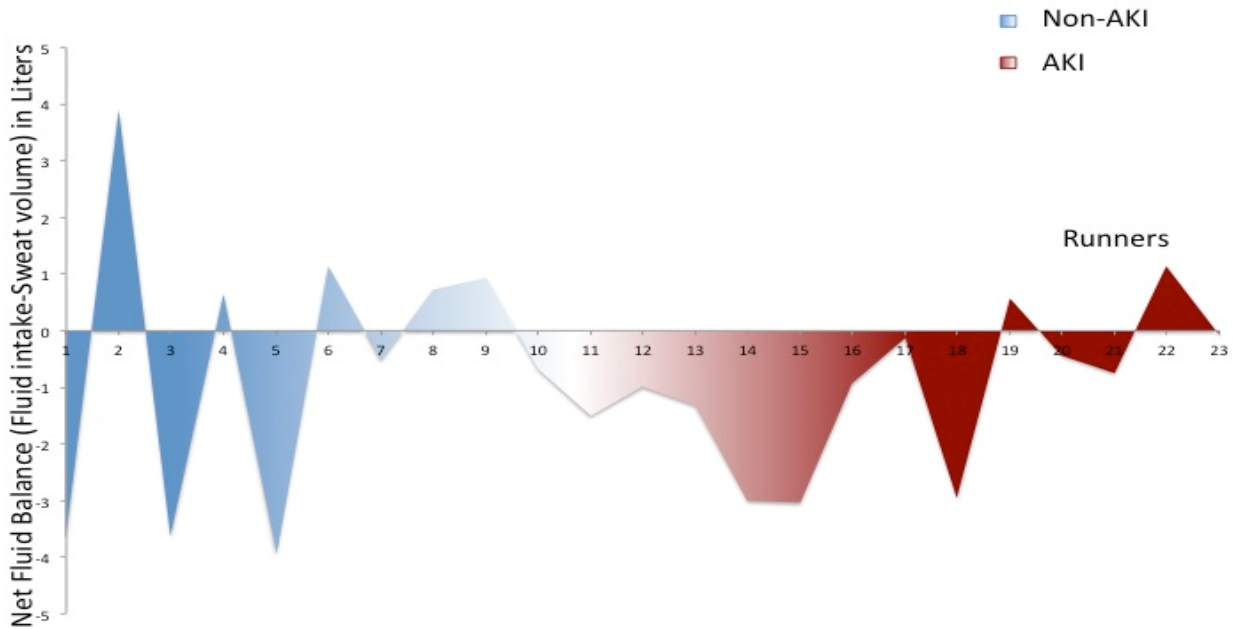
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Supplemental Figure 4: Net sodium and fluid balance during race per runner stratified by AKI status

A. Net sodium balance per runner in grams



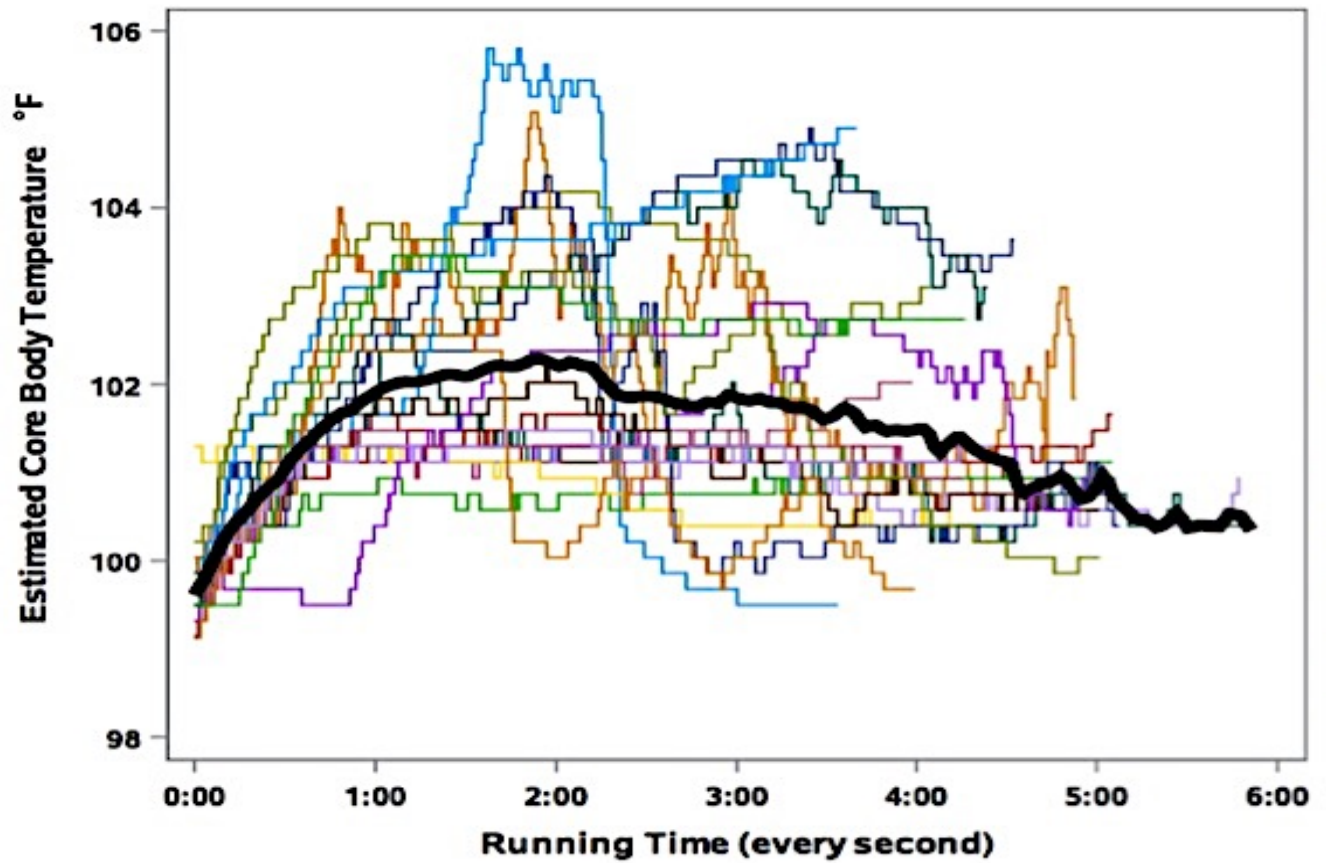
B. Net fluid balance per runner in liters



Legend: Majority of runners had a net negative sodium balance and a net negative fluid balance throughout the race. This implies that the inability of runners to replete the sodium and volume losses throughout the race lead to a hypovolemic state.

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Supplemental Figure 5: Series plot of core body temperature every second during the race per runner stratified by AKI status.



Temperature	Entire Race	Quartile 1 of Race	Quartile 2 of Race	Quartile 3 of Race	Quartile 4 of Race
Minimum	98.8 (98.8, 98.8)	99.5 (99.3, 99.7)	101.1 (100.9, 102.4)	101.1 (100.4, 101.3)	100.9 (100.4, 101.3)
25 th percentile	100.2 (99.9, 100.6)	100.4 (100.2, 100.4)	101.7 (101.1, 102.7)	101.1 (100.8, 102.7)	100.9 (100.4, 101.8)
Median	101.1 (100.8, 102)	100.9 (100.6, 101.3)	101.8 (101.1, 103.1)	101.3 (100.9, 102.7)	101.1 (100.6, 102.2)
75 th percentile	101.3 (101.3, 103.1)	101.5 (101.1, 101.8)	101.8 (101.3, 103.5)	101.4 (101.1, 103.1)	101.2 (100.8, 102.4)
Maximum	102.6 (101.5, 104.4)	101.8 (101.3, 102.7)	102.6 (101.3, 103.6)	101.8 (101.3, 104.2)	101.5 (101.1, 103.1)

Legend: Temperature significantly increased throughout race per runner, with max temperature reaching about 106 °F (41 °C). Temperatures were highest during the second quartile of the race