Supplementary Tables:

Supplementary Table 1: Summary characteristics of eligible studies included in the systematic literature review.

Authors	Design	Occupation /sample size	Location, Country	Outcome	Intervention	Study Period	Measurement of interest [Env. and phy.]	Quality	Main Finding
Mizelle et al. [46]	Mixed Method	Agriculture/ quantitative =30; focus group=28	Eastern North Carolina, USA	Kidney health, hydration status		July-August 2020	USG, WBGT, beverage intake	Low	H_2O intake=0.2L/hr., total fluid intake=0.35 L/hr. workers dehydrated prior to work, which increased after work
Langer et al. [39]	Cross-sectional	Agriculture/ N=587 farmworkers	California, USA	HRI	Cal/OSHA HRI prevention regulation	Summer 2014 and 2015	CBT, WBGT	High	Limited HRI prevention training and hydration replacement
Wagoner et al. [47]	Cross-sectional	Agriculture/ N=28 migratory farmworkers	North Mexico, Mexico	Hydration Status		March, June, August 2016	WBGT, USG, DBGT, CBT	High	USG median=1.020 to 1.030
Ashtekar et al. [41]	Quasi experimental	Construction/ N=29 workers	Ahmedabad City, India	Physiological response	Personal Cooling Garment (PCG) [PPE Control]	Summer months	WBGT, heart rate, oral temperature	High	Wearing PCG, reduced heart rate, sweat loss, skin temperature more
Culp & Tonelli [36]	Mixed	Agriculture/ N=168 Hispanic Migrant and seasonal farmers	Iowa, USA	HRI signs and symptoms	Hydration practice and rest break	June-July	WBGT, heart rate, breathing rate, CBT, skin temperature, BP	Low	Normal mean serum osmolarity [278.19/mOsmol/kg (SD=4.24)
Bethel et al. [57]	Cross sectional	Agriculture/ N=197 (Oregon=100,	Oregon, Washington, USA	HRI	Hydration and cooling	July and August 2013		High	Most common cooling measure (taking

		Washington =97)			practices				shades under tree), 98% drink water at work, received. HRI training is low
Mix et al. [50]	Cross sectional	Agriculture/ N=192	Florida, USA	Kidney function and acute kidney injury (AKI)		555 work days during 2015 and 2016 Summer	USG, HI, WBGT	High	Post-shift USG 4 times above 1.020 than pre-shift
Marquez et al. [59]	Randomized trail	Agriculture/ N=83 (intervention=43, comparison =40)	Washington, USA	Heart-related symptoms	HEAT tool (heat education based)	Summer 2019		High	Improved pre-post knowledge score: [intervention: avg. diff.=1.6; SD=2.0; comparison group: avg. diff=0.41; SD=1.7]
Smith et al. [58]	Cross sectional	Agriculture/ N=60 migrant farmworkers	Georgia, USA	HRI symptoms, first aid knowledge	Hydration practices	2018		High	72.95 oz liquid consumed per day, limited HRI, first aid knowledge
Chicas et al. [62]	Randomized trail	Agriculture/ N=84 workers	Florida, USA	HR symptoms	Personal cooling gear (cooling vest, bandana)	April-May of 2018 and 2019	HI, CBT	High	CBT >38^{o}C: bandana use [OR=0.7; 90% CI: 0.2-3.2]; vest use [OR =1.8; 90% CI:0.4-7.9] bandana + vest use= little positive effect
Luque et al. [52]	Qualitative	Agriculture/ N=29 workers	South Carolina, USA	HRI kidney prevention	OSHA heat safety tool mobile phone	October and December 2017		High	Positive feedback about OSHA heat safety training

					App, heat education				educational contents
Mizelle et al. [56]	Qualitative (focus group)	Agriculture/ N=28	North Carolina, USA	Fluid intake perception (hydration practice)		July-August 2020		High	Limited workplace safety practices knowledge of heat. Stress prevention; fluid intake influenced by power system and interlocking social categories
Zhao et al. [48]	Quasi	Construction/N=14 steel bar fixing	Hong Kong	Heat strain	Anti-heat stress clothing uniform	August – September 2016	WBGT, RPE PeSI, PSI_{HR}, tympanic temperature	High	Intervention alleviated heat strain
Montazer et al. [32]	Quasi	Construction/ N=60 workers (exposed=30, control=30)	Tehera n, Iran	Hydration status			USG, TWL	High	Mean USG=1.0213 ±0.0054 for both group
Chavez-Santos et al. [51]	Randomized trail	Agriculture/ N=75 workers (intervention=43, comparison=43)	Washington, USA	PSI, HRI risk	Multi-level HEAT education, HEAT app (workers and supervisor)	May-September 2019	PSImax, HI	High	No Clear relationship between PSI_{max} and number of reported HRI symptoms
Wegman et al. [49]	Quasi	Agriculture/ N=80 workers (intervention=40, comparison=40)	El Salvador	Kidney function damage	WRS	January – April, 2025	Daily WBGT	High	Biomarker changed, eGFR reduced slightly
Chicas et al [63]	Qualitative	Agriculture/ N=61 workers	Florida, USA		Personal cooling gear (cooling vest	April-May of 2018 and 2019		High	Vest effective with mixed practical use

					bandana)				
Pacheco-Zenteno et al. [55]	Qualitative	Agriculture/ N=23 participants	Chichigalpa, western Nicaragua	Heat stress prevention	WRS	February 2020		High	Foremen also benefitted from the WRS intervention
Vega-Arroyo et al. [38]	Cross sectional	Agriculture/ N=259 workers	California, USA	CBT		Summer 2015 (June - September)	CBT, WBGT, HI, work rate	High	15% workers were hypo hydrated
El-Shafei et al. [37]	Randomized trail	Construction/ N=89 workers(Solomon 4-group design)	Port Said City, Egypt	EHI knowledge, hydration status	Heat education program	Summer 2016 (June - August)	WBGT, USG	High	EHI knowledge improve ($p<0.01$) after intervention, mean USG indicated hypohydration
Bodin et al. [35]	Mixed	Agriculture/ N=60 cane cutters	El Salvador	Dehydration, heat stress symptoms	OSHA WRS	November 2014-April 2015	Daily WBGT	Low	Post-intervention heat exhaustion symptoms and dehydration decreased
Hunt et al. [40]	Cross sectional	Mining/ N=15 surface mine blast crew	Northern Australia	Hydration status, heat strain			HR, CBT, USG, WBGT	High	Over 80% of workers were dehydrated before starting work
Farshad et al. [27]	Randomized trail	Construction/ N=60 (exposed=30, unexposed)	Tehran City, Iran	Dehydration		September 2020 (end of summer)	TWL, WBGT, USG	High	USG > 1.030 for both group; workers at allowed heat stress level TWL had some Merit over WBGT
Ueno et al. [30]	Cross sectional	Construction/ N=23 workers	Aichi prefecture, Japan	Heat strain, heat stroke		August 2009	HR, WBGT, USG, weight loss	High	78% of workers exceeded at least one ACGIH TLV

									heat strain physio-logical guidelines
Dillane & Balany [45]	Cross sectional	Agriculture/ [area monitoring]	North Carolina, USA	Heat-related, illnesses and deaths	OSHA-April-NIOSH heat safety mobile app tool	August 2019	WBGT, HI	High	App reliability decrease as heat stress conditions became more severe
Al-Bouwarthan et al. [33]	Cross sectional	Construction/N=23 residential construction workers	Al-Ahsa Saudi Arabia	Heat strain, Hydration status		June-September 2016	HR, USG, WBGT	High	¾ of workers arrive to work dehydrated dehydration persisted post-shift
Ahmed et al. [31]	Cross sectional	Construction/[area Monitoring]	United Arab Emirates				WBGT index, HSI, TWL	High	WBGT exceed recommended TLV
Zare et al. [29]	Cross sectional	Mining/ N=50 workers	South eastern Iran	Physiological response		July-August 2017	UTCI, WBGT, WBDT, TSI, HR, SBP, DBP, skin temperature, tympanic temperature	High	UTCI value indicate workers exposed to severe heat stress
Yasmeen et al. [44]	Mixed	Construction/ N=10 acclimatized laborers	Chongqing Municipality, China	Physiological Conditions		Summer (July-mid August 2017)	HR, BP, skin temperature, sweat rate, WBGT	Low	Systolic and diastolic BP reduced; higher sweat rate for acclimatized workers than non-workers
Dally et al. [34]	Cross Sectional (secondary data)	Agriculture/ N=4000 workers	Southwest Guatemala	Occupational injury risk (cuts, slips, trips, and falls etc.),		November 2014-April 2018 data	Average daily WBGT	High	Annual dehydration =1.57 per 100 workers; daily $WBGT_{mean}$ highly correlation with daily

				dehydration					$WBGT_{max}$ (r=088)
Glaser et al. [54]	Quasi	Agriculture/ baseline =427, end harvest=488 workers	Northwestern Nicaragua	Kidney health (renal health)	Adelante initiative intervention (rest schedule, hydration and shade)	November 2018 – April 2019	WBGT, Serum Creatinine, eGFR	High	Mean eGFR decreased over harvest 2; IKI decreased by 70% in harvest 2 compared to harvest 1
Yang & Chan [43]	Randomized trail	Construction/ N=16 healthy workers	Hong Kong	Heat strain	Work uniform [PPE]	July-August 2014	WBGT, HR PSI	High	Intervention PeSI=4.47±1.85, for control =4.78±1.82; PSI alleviated by 1.6- 6.3 units for the intervention group
Chan et al. [42]	Quasi	Construction/ N=140 workers	Hong Kong	Heat strain	Hybrid cooling vest [HCV]	Summer 2016 (August-September)	PeSI, WBGT HR	High	PeSI alleviated during rest ($p<0.001$)
Nassiri et al. [28]	Cross sectional	Mining/ N=175 acclimatized open pit miners	Tehran, Iran			Summer 2016	HSI, WBGT, UTCI, HR, skin temperature, oral temperature, tympanic	High	WBGT & UTCI correlate +vely with all environmental parameters temperature
Luque et al. [53]	Cross sectional	Agriculture/ N=107 workers	Georgia, USA		OSHA heat illness prevention training (heat safety app)	August-October 2018		High	Heat safety knowledge avg score=3.2 (SD=1.3)
Scott et al. [60]	Cross sectional (secon	Construction/ N=957 (Austin=557, Dallas=400)	Texas, USA	Rest breaks	City Rest Break Ordinance (RBO) policies	Data from 2009, 2012 and		High	35% more likely to report receiving rest break in

	dary data)					2015 (summer)			Austin after RBO implementation; 16% less likely to report receiving rest break in Dallas

Note: Env: Environmental; HEAT: Heat Education and Awareness Tool; HRI: Heat-Related Illness; WRS: Water Rest Shade; EHI: Exertional heat illness; Phy: Physiological; USG: Urine specific gravity; WBGT: Wet bulb globe temperature; DBGT: Dry bulb globe temperature; CBT: Core body temperature; BP: Blood pressure; HI: Heat index; POC: point-of-care; TWL: Thermal work limit; SBP: Systolic blood pressure; DBP: Diastolic blood pressure; UTCI: Universal thermal climate index; RPE: Ratings of perceived exertion; HIS: Heat stress index; HR: Heart rate; PSI_{max}: maximum work-shift physiological strain index; HRR: Heart rate reserve; PSI_{HR}: Physiological strain index; PeSI: Perceptual strain index.

Supplementary Table 2A: Cross-sectional studies.

	Questions (responses: Yes, No, Unclear, NA=Not applicable)									
Articles	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Rate**	**Quality**
[35]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	High
[51]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	High
[52]	Yes	No	Yes	Yes	No	No	Yes	Yes	6	High
[57]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	High
[36]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	High
[28]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	High
[53]	Yes	Yes	Yes	No	No	Yes	Yes	Yes	6	High
[30]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	High
[55]	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	7	High
[59]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	High
[31]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	High
[58]	Yes	Yes	Yes	Yes	No	No	Yes	Yes	6	High
[56]	Yes	Yes	Yes	Yes	No	No	Yes	Yes	6	High
[44]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	High
[47]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	High
[41]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	8	High

Supplementary Table 2B. Quasi-experimental.

	Questions (responses: Yes, No, Unclear, NA=Not applicable)										
Articles	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Rate**	**Quality**
[37]	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	7	High
[48]	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	8	High
[60]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9	High
[43]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9	High

[42]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9	High
[39]	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	8	High
[29]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9	High

Supplementary Table 2C. Qualitative studies.

Articles	Questions (responses: Yes, No, Unclear, NA=Not applicable)										Rate	Quality
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10		
[40]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	9	High
[62]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	9	High
[46]	Yes	Yes	Yes	Yes	Yes	No	No	Unclear	Yes	Yes	7	High
[49]	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	8	High

Supplementary Table 2D. Randomized trial.

Articles	Questions (responses: Yes, No, Unclear, NA=Not applicable)														
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Rate	Quality
[27]	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10	High
[45]	Yes	No	Yes	Yes	No	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10	High
[63]	Yes	Yes	Yes	Unclear	Unclear	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10	High
[34]	Yes	No	Yes	No	Unclear	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9	High
[54]	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	10	High
[38]	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9	High

Supplementary Table 2E. Mixed Method Appraisal Tool (MMAT) mixed method.

Articles	Category of study designs					Rate	Quality
	Qualitative	Quantitative randomized controlled trials	Quantitative non-randomized	Quantitative descriptive	Mixed methods		
[33]			Yes	Yes	Yes	3	Low
[32]	Yes		Yes		Yes	3	Low
[40]	Yes			Yes	Yes	3	Low