



Article

Occupational heat-related illnesses and injuries in Italy from 2020 to 2022. Results of an analysis of the Italian press carried out as part of the WORKCLIMATE project

Giulia Ionita¹, Michela Bonafede², Alessandro Marinaccio², Marco Morabito³ and Miriam Levi⁴ on behalf of the WORKCLIMATE Collaborative Group† *

¹ Medical Specialization School of Hygiene and Preventive Medicine, University of Florence, 50134 Florence, Italy; giulia.ionita@unifi.it

² Occupational and Environmental Medicine, Epidemiology and Hygiene Department, Italian Workers' Compensation Authority (INAIL), 00143 Rome, Italy; m.bonafede@inail.it (M.B.); a.marinaccio@inail.it (A.M.)

³ Institute of Bioeconomy, National Research Council (IBE-CNR), 50019 Florence, Italy; marco.morabito@ibe.cnr.it

⁴ Epidemiology Unit, Department of Prevention, Local Health Authority Tuscany Centre, 50135 Florence, Italy; miriam.levi@uslcentro.toscana.it

† Membership of the WORKCLIMATE Collaborative Group is provided in the Acknowledgments.

* Correspondence: miriam.levi@uslcentro.toscana.it (M.L.); giulia.ionita@unifi.it (G.I.)

Abstract: Exposure to heat is a recognized occupational risk factor. Deaths and accidents at work caused by high temperatures are underestimated. With the aim to detect and monitor heat-related illnesses and injuries, a prototype observatory of occupational events attributable to critical thermal conditions published in Italian newspapers was created. Information was analyzed from national and local online newspapers, using a web application. The analysis was conducted from May to September in the three-year period 2020–2022. Articles concerning 35 occupational heat-related illnesses and injuries were selected. Almost a third (31.4%) of total accidents occurred in July 2022, testifying the recovery of economic activities following the contraction in the first two years of the Covid-19 pandemic. Fatal heat-related illnesses were the most frequent conditions described. In most cases, workers had been involved in outdoor activities in the construction sector. We gathered all retrieved newspaper articles in a report, to increase awareness of the phenomenon of occupational heat-related illnesses among all relevant stakeholders, in order to foster the need for heat-risk prevention strategies in a context such as the current one, in which heat waves are more and more frequent, intense and long-lasting.

Keywords: heat-related illness; heat stress; news; occupational injuries; press; workers health; workplace

Citation: To be added by editorial staff during production.

Academic Editor: Firstname Last-name

Received: date

Accepted: date

Published: date

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2022 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Climate change is the primary cause of the increased frequency of extreme weather conditions such as heatwaves, floodings and wildfires [1]. Events such like heatwaves play an important role in population health and studies confirm a general increase in heat-related mortality [2–5]. Indeed, a reduced capacity to respond and adapt to extreme heat increase the risk of organ damages, because of the exceeding of the physiological thermoregulatory capacity [6]. Exposure to excessive heat is also a well-known occupational hazard. Workers, under heat stress conditions, appear to be four times more likely to experience heat strain, compared to individuals working in an environment with neutral temperatures [7]. Heat-related occupational health risks are exacerbated during activities

carried out in outdoor sunny environments and in indoor workplaces when lack of ventilation, a poor cooling system and processes with heat generation do not allow proper regulation of temperatures [8]. Workers in agricultural and construction sectors are among those most exposed, especially those with jobs requiring high levels of physical exertion, the use of personal protective equipment and/or heavy clothes which could prevent heat loss [9]. Negative health effects arising on account of dehydration and overheating, such as sweating, dizziness, poor sleep quality, physical and mental exhaustion with an impairment of reasoning and increased reaction times, may increase the risk of injury [10]. Moreover, short-term heat-related illnesses, such as heat cramps, heat exhaustion and heat stroke, may also arise [11]. Heat stroke, if not adequately and promptly treated, is a fatal condition. Some workers have a greater susceptibility to heat-related illness: factors such as pre-existing heart and respiratory diseases, taking certain medications (hypotensives, diuretics, sedatives, etc.) [12], being pregnant or disabled increase the risk associated with exposure to high temperatures [13].

Heat exposure makes workers a vulnerable population; depending on the work situation, they often don't have the authority to limit exposure time, to find a shady place [14], to organize refreshing breaks, to have constant access to water and, in many cases of undeclared work, they are not covered by employment injury insurance. These occupational conditions make certain categories of workers more subject to the negative effects of heat exposure in the workplace.

A study was conducted in warmer months in the three-year period 2020-2022 as part of the WORKCLIMATE Project ("Impact of environmental thermal stress on workers' health and productivity: intervention strategies and development of an integrated heat and epidemiological warning system for various occupational sectors") [15] to assess the use of online newspapers as a source of information for prompt detecting and monitoring of heat-related illnesses in the workplace in Italy, as well as for fostering interventions for the health protection of workers exposed to heat.

2. Materials and Methods

News articles regarding the effects of extreme thermal conditions on workers' health published in the Italian daily press during the warm months (May to September) in the three-year period 2020-2022 were quantitatively and qualitatively assessed. The search for articles was set up using a web application accessible via web browser (VALIRIA), that allows the configuration and execution of customized queries to be launched on the Google search engine. The search strategy performed was the following: ["climate change" OR "killer heat" OR "scorching heat" OR temperature* OR "global warming" OR sultriness OR hot OR drought) AND (work OR worker* OR "construction site" OR "day laborer" OR farmer OR company OR tractor OR farming OR garden) AND ("heat stroke" OR accident OR injury OR "sudden illness" OR dead OR die OR fall)]. A daily report of search results was automatically sent by email to 2 researchers (G.I. and M.L.). The search was conducted in both national and local online newspapers, chosen because of their large readership as assessed by ADS, the association that publishes data on the circulation of the daily and periodical press in Italy [16]. Articles were included if they focused on heat-related illnesses and injuries among workers, directly due to high temperatures' exposure. In addition, a manual search was conducted every two weeks to verify that all relevant news had been captured by the WebApp. Articles with no mention of extreme hot conditions or work environment were excluded.

The events were classified as "injuries" in case of traumatic events or as heat-related illnesses, based on the description provided in the article. For each article, when available, information about sex, age, nationality, Italian region in which the accident occurred, labour sector in which the worker was employed, activity performed right before the event and severity (fatal versus non-fatal) of heat-related illnesses/injuries was collected. The occupational sector of each worker was classified according to the ATECO classification of economic activities adopted by the Italian National Institute of Statistics - Istat [17].

3. Results

On average, the Web App mail report showed five to thirty daily articles, with detection peaks during heat waves. All selected articles were included in a final report that was made available free of charge in the homepage of the WORKCLIMATE project website <https://www.workclimate.it/> [18, 19].

From May 2020 to September 2022, cases that appeared in newspapers were selected, and, if reported in multiple articles, the event was counted only once. All links to articles in which the incident was mentioned were reported in the final report. According to web-based press and inclusion criteria, 35 workers suffered from health outcomes related to occupational heat stress in Italy in the three-years period considered (Table 1).

Table 1. Summary table of heat-related illnesses and injuries occurred at the workplace reported in the Italian national press. Details of published data - years 2020-2022.

Year	Age (years)	Sex	Nationality	Occupational Sector, Activity	Region	Event (illness or injury) and Severity	Link to the online newspaper	
1	2020, July	55	Man	Italian	Agriculture and forestry, Gardener	Lazio	Illness, Fatal	http://bit.ly/3ERTz05
2	2020, July	53	Man	Polish	Construction activities, Worker engaged in canal reclamation	Emilia-Romagna	Illness, Fatal	http://bit.ly/3B2RWqG
3	2020, Aug.	36	Man	Romanian	Construction activities, Fiber optic placement	Friuli-Venezia Giulia	Illness, Fatal	http://bit.ly/3B1epUO
4	2020, Aug.	-	Woman	Italian	Public administration, Municipality employee	Tuscany	Illness, Non-fatal	http://bit.ly/3ulSiEQ
5	2021, June	-	Man	-	Construction activities, Worker in a construction site	Apulia	Illness, Non-fatal	http://bit.ly/3B0Vs4P
6	2021, June	-	Man	-	Construction activities, Worker in a construction site	Apulia	Illness, Non-fatal	http://bit.ly/3B0Vs4P
7	2021, June	-	Man	-	Construction activities, Worker in a construction site	Apulia	Illness, Non-fatal	http://bit.ly/3B0Vs4P
8	2021, June	-	Man	-	Construction activities, Worker in a construction site	Apulia	Illness with onset of coma, Non-fatal	http://bit.ly/3B0Vs4P
9	2021, June	38	Man	Italian	Transport and storage, Tanker truck driver	Apulia	Illness, Fatal	http://bit.ly/3UD-MNMR
10	2021, June	27	Man	Mali	Agriculture and forestry, Day labourer	Apulia	Illness, Fatal	http://bit.ly/3VFt-mUC

11	2021, June	35	Man	Italian	Other service activities, Leafleting	Apulia	Illness, Fatal	http://bit.ly/3it03pY
12	2021, June	-	-	-	Agriculture and forestry, Harvesting of agricultural products	Veneto	Illness, Fatal	http://bit.ly/3VIqpCN
13	2021, June	-	-	-	Agriculture and forestry, Harvesting of agricultural products	Veneto	Illness, Non-fatal	http://bit.ly/3VIqpCN
14	2021, July	42	Man	Italian	Construction activities, Working on a scaffold	Sicily	Injury (Fall), Fatal	http://bit.ly/3ueoU3B
15	2021, Aug.	62	Man	Italian	Agriculture and forestry, Forestry worker	Apulia	Illness, Fatal	http://bit.ly/3ug-MWLb
16	2022, May	-	Man	-	Construction activities, Working on a scaffold	Umbria	Illness, Non-fatal	http://bit.ly/3W5Zh0Y
17	2022, June	47	Woman	Italian	Water supply; sewerage, waste management and sanitation activities, Ecological worker	Tuscany	Illness, Fatal	http://bit.ly/3Vr97KK
18	2022, June	65	Man	Italian	Construction activities	Lombardy	Injury (Fall), Non-fatal	http://bit.ly/3hx5mVo
19	2022, June	-	Woman	Italian	Public administration, Judge	Lombardy	Illness, Non-fatal	http://bit.ly/3v2wgY5
20	2022, June	49	Man	Italian	-	Campania	Illness, Fatal	http://bit.ly/3HCp33X
21	2022, June	45	Man	-	Manufacturing activities	Emilia- Romagna	Illness, Non-fatal	http://bit.ly/3VHTldZ
22	2022, July	59	Man	Italian	Agriculture and forestry, Day labourer	Calabria	Illness, Fatal	http://bit.ly/3uTATUz
23	2022, July	-	Man	-	Public administration, Municipal employee	Campania	Illness, Non-fatal	http://bit.ly/3WFUZxx
24	2022, July	-	Woman	French	Other service activities, Model for fashion shows	Sicily	Illness, Non-fatal	http://bit.ly/3VoR481
25	2022, July	20	Man	Albanian	Agriculture and forestry, Day labourer in a greenhouse	Campania	Illness, Fatal	https://bit.ly/3XSDknP

26	2022, July	54	Man	Romanian	Construction activities, Electrician working on a roof	Liguria	Illness, Fatal	http://bit.ly/3GZVNs n
27	2022, July	61	Man	Italian	Manufacturing activities	Piedmont	Illness followed by head injury, Fatal	http://bit.ly/3BI5R5T
28	2022, July	-	Man	-	Manufacturing activities	Trentino - Alto Adige	Illness followed by head injury, Fatal	http://bit.ly/3Up1fI8
29	2022, July	47	Man	Moroccan	Accommodation and food service activities, Dishwasher	Liguria	Illness, Fatal	http://bit.ly/3V3g83e
30	2022, July	-	Man	-	Transport and storage, Rider	Lombardy	Illness, Non-fatal	http://bit.ly/3FibcTp
31	2022, July	67	Man	-	Construction activities, Worker on a roof	Emilia-Ro- magna	Illness, Fatal	http://bit.ly/3gLhvFW
32	2022, July	-	Man	African origin	Agriculture and forestry, Day labourer in a greenhouse	Campania	Illness, Fatal	http://bit.ly/3XSDknp
33	2022, Aug.	50	Man	-	Manufacturing activities, Worker in a shed	The Marche	Illness, Non-fatal	http://bit.ly/3uX2Hre
34	2022, Aug.	30	Man	-	Manufacturing activities, Shipyard worker	The Marche	Illness, Non-fatal	http://bit.ly/3uX2Hre
35	2022, Aug.	-	Man	-	Other service activities, Airport baggage loading/unloading attendant	Veneto	Injury (ankle fracture), Non-fatal	http://bit.ly/3gRO-BUp

Heat-related illnesses were the most reported (n=32; 91.4% of all reported events), with only three being injuries (Table 2). Fatal events were 20, corresponding to 57.1% of all heat-related events. All except one, among fatal events, were caused by heat-related illnesses, the remaining death being ascribed to a fall.

Table 2. Severity of heat-related illnesses and injuries as reported by the Italian online newspapers in the years 2020 to 2022.

	Fatal		Non-fatal		Total	
	N	%	N	%	N	%
Heat-related Illnesses	19	54.3%	13	37.1%	32	91.4%
Injuries	1	2.9%	2	5.7%	3	8.6%
Total	20	57.1%	15	42.9%	35	100.0%

In 26 cases (74.3% of all reported cases) the activities have been carried out outdoors and in 9 cases the laborers were working in indoor environments, mainly sheds. For one event, neither the activity nor the occupational sector in which the victim was involved were indicated.

Based on the distribution of events over time, 4 heat-related illnesses/injuries were reported in 2020, corresponding to 11.4% of the events occurred in the three-year period considered (Figure 1). In 2021, 11 accidents were reported (31.4% of events occurred in the three-year period 2020-2022); of these, almost all (n=9; 81.8%) occurred during a heat wave in June. Finally, 20 events (57.1% of events occurred in the three-year period) were reported in 2022, particularly during heat waves in July, when 11 events were reported (55.0% of events occurred in 2022 and 31.4% of events occurred in 2020-2022).

Only one event was reported in hot May 2022 (the hottest ever since 2003, with record drought across many regions), and no events were reported in the month of September in the three-year period.

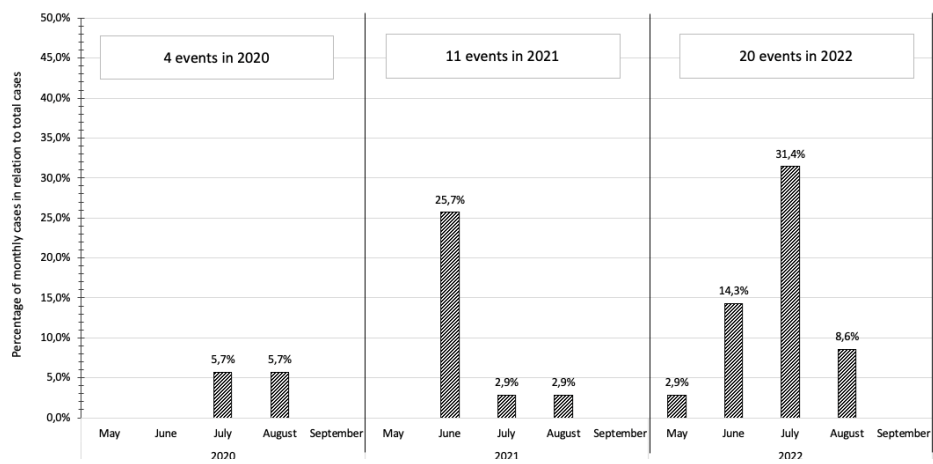


Figure 1. Distribution of events reported by the Italian online newspapers in the years 2020 to 2022 by month and year of publication.

Among the 35 workers involved, 31 (88.6%) were men and only 4 (11.4%) women. Regarding the nationality, 12 (34.3%) were Italian, 8 (22.9%) were of foreign nationality and for 15 workers (42.9%) nationality was not mentioned in the news.

Almost half (40.0%) of the events involved middle-aged workers (30-59 years) (Table 3). Only 2 workers (5.7%) were younger than 30. No worker was older than 70. The age of 12 men and 3 women (corresponding to 42.9% of all workers) was unknown.

Table 3. Demographic characteristics (gender, age and nationality) as reported by the Italian online newspapers in the years 2020 to 2022, by age group.

Age groups	Nationality						Gender				Total	
	Italian		Foreigner		Unknown		Male		Female		N	%
	N	%	N	%	N	%	N	%	N	%		
<30 years	0	0,0%	2	5,7%	0	0,0%	2	5,7%	0	0,0%	2	5,7%
30-39 years	2	5,7%	1	2,9%	1	2,9%	4	11,4%	0	0,0%	4	11,4%
40-49 years	3	8,6%	1	2,9%	1	2,9%	4	11,4%	1	2,9%	5	14,3%
50-59 years	2	5,7%	2	5,7%	1	2,9%	5	14,3%	0	0,0%	5	14,3%
60-69 years	3	8,6%	0	0,0%	1	2,9%	4	11,4%	0	0,0%	4	11,4%
Unknown	2	5,7%	2	5,7%	11	31,4%	12	34,3%	3	8,6%	15	42,9%
Total	12	34,3%	8	22,9%	15	42,9%	31	88,6%	4	11,4%	35	100,0%

Events occurred throughout Italy, except for 5 regions (Aosta Valley, Abruzzo, Molise, Basilicata, Sardinia), where no events were reported in the online newspapers. Apulia recorded the highest number of heat-related illnesses/injuries in the examined period (n=8; 22.9%) (Figure 2).

144
145
146
147
148



Figure 2. Number of occupational heat-related illnesses and injuries as reported by the Italian online newspapers in the years 2020 to 2022, by region.

149
150
151

The highest number of events was reported in the construction sector (n=11; 31.4% of all recorded events), followed by agriculture and forestry (n=8; 22.9% of all recorded events) and manufacturing activities (14.3%). Traumatic accidents (injuries) were recorded in construction activities and for an airport service worker (included in “other service activities”) (Figure 3).

152
153
154
155
156

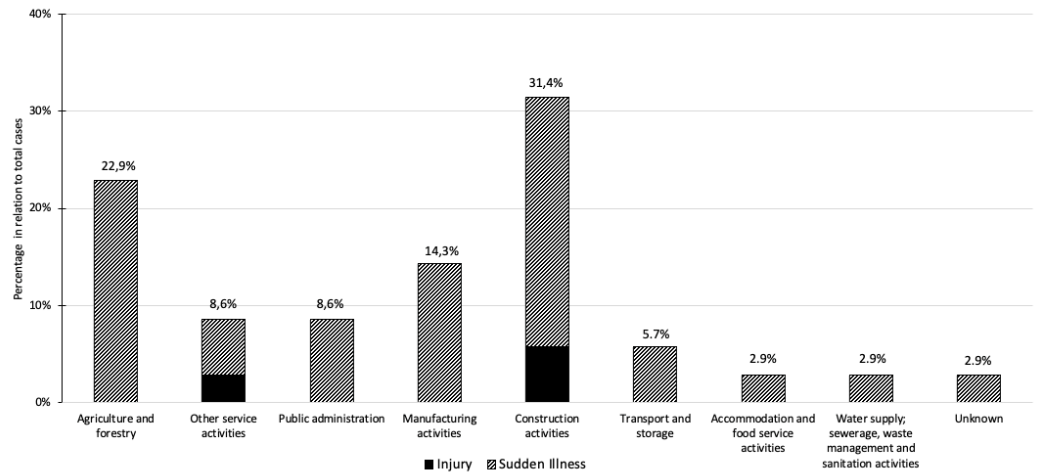


Figure 3. Number of occupational heat-related illnesses and injuries as reported by the Italian online newspapers in the years 2020 to 2022, by occupational sector.

157
158
159



4. Discussion

Environmental temperatures and the number of heat waves have been increasing each year, and the three years in which we have been conducting the study (2020-2022) are among the warmest on record, according to the World Meteorological Organization [20]. Although exposure to high temperatures is considered an occupational risk factor and the preventive measures to reduce the hazard of developing heat-related pathologies are often easy to implement, 35 events were presented by the Italian press in the considered period. Most of the workers involved were males, employed in the construction sector and performing their tasks in an outdoor environment, in agreement with the findings from the scientific literatures [21,22]. However, no information is provided regarding prior workers' work experience or individual training levels [23,24] or their degree of heat acclimatization, despite studies reporting that most of the fatalities generally occur during the first week of work in the heat, when the body has not yet adapted to the high temperatures [12, 25]. Our results concerning the occupational sector agree with literature, which establishes a greater risk of injuries during heat waves for outdoor male workers [26]. Although it is well known in the scientific literature that young, less experienced, workers are particularly susceptible to heat-related occupational injuries [27], only two workers were younger than 30 among the reported cases. As with events involving women, the proportion of events in this age group was minimal, since older age groups and men are still more represented among at-risk jobs. In addition to cases reported in Table 1, several additional events indirectly linked to global warming occurred as well. In August 2021 two deaths occurred in the agricultural sector. These involved a 30-year-old man who was crushed by a tractor while putting out a fire in Sicily and a 42-year-old man swept away by a landslide while draining water after a flood in Trentino-Alto Adige region. In June 2022, in Piedmont (Northern Italy), a 57-year-old man, while burning brushwood, experienced a heat stroke which resulted in an organ failure that required the man to undergo a liver transplant, whereas in the province of Florence in Tuscany (Central Italy), several healthcare workers were caught sick in the operating room of a hospital due to a cooling system malfunction. In July 2022, due to abnormal heat, an avalanche fell from the Marmolada massif in the Alps (Trentino-Alto Adige), killing 3 mountain guides.

The number of heat-related occupational illnesses and injuries reported in the news appreciably increased from 2020 to 2022, so much so that only in the month of July 2022 events observed were numerically equal to those occurred in the previous year.

This trend testifies to the progressive recovery of commercial and industrial activities in Italy after the lockdowns caused by the Covid-19 pandemic.

In the three-year period of observation, only 4 news articles presented the episode describing it as a "heat stroke", and for the events recorded in summer 2022, characterized by particularly intense and long heatwaves, in no case this term was used, while in most of the articles the generic word "*malore*" (literally, "sudden illness") was found. With the aim of better communicate news to lay people, journalists use more easily understood terms, even if they are not appropriate [28]. Many articles among those emailed daily were excluded, because the events reported were not explicitly associated to the heat by the reporters, even if the circumstances (for example, the time of the day) could suggest a correlation. Even during heat waves, several journalists reported the formula "for reasons yet to be ascertained". This may be caused by the fact that journalists seldom interview the workers involved, or their colleagues [23]. Such a lack of information can cause readers to underestimate the risks associated with heat exposure in the workplace.

Unfortunately, it is not possible to correctly identify heat-related occupational illnesses or injuries in Italian administrative healthcare databases, such as the hospital discharge records database or emergency records and even in the Italian workers' compensation authority (INAIL) database [29]. From INAIL data regarding the Tuscany region (central Italy), 30 cases are calculated in the period 2014-2018. Those amount to only 0.02% of the total accidents for claims from all causes calculated in the same period (total 172.739,

269 of which fatal) [30]. Instead, an epidemiological study conducted throughout Italy showed an attributable fraction of extreme temperature work-related injuries for outdoor exposure of 0.14% [27], confirming that data from official authorities are probably underestimated. A recent systematic review confirmed that the risk of occupational injuries increases by 1% for every 1°C rise in environmental temperature and by 17.4% during heat waves, when there are several consecutive days with temperatures above the average for the period [31].

The present study has some limitations. Certainly, it was not possible to monitor all newspapers, especially local ones and those requiring a subscription to access. Also, only newspaper coverage data were considered, excluding other mass media tools that drive messages to the public, such as radio programs. Since it was not possible to confirm from press reports the exact date, time and location of the events, a correlation with weather and temperature data was not conducted to verify the climatic conditions of the accidents that occurred in the outdoor environment.

Nonetheless, we have showed that the monitoring of newspapers represents a useful tool by means of which it is possible to raise awareness about heat-related illnesses in the workplace among workers themselves and relevant stakeholders, thanks to the strong and extensive information capacity of the media, with the ultimate goal to prompt the implementation of heat stress prevention measures in the occupational setting.

Given heat stress impact on health [32]. The development of prevention measures is fundamental. The application of preventive measures reduces the risk of health outcomes related to exposure to heat. These strategies are based on clinical evidence [33] and gain improvements through technological elements that assist stakeholders in developing recommendations and guidelines. Key prevention and individual protection strategies for workers include [32,33]: stopping and reducing direct exposure to heat, scheduling breaks, taking adequate amounts of water on a regular basis, wearing personal protective equipment as appropriate to the task as compatible with the thermal environment, identifying workers susceptible to heat stress who may benefit from a temporary inability to perform work and encouraging mutual supervision among workers [12]. To improve the effectiveness of prevention measures, operational guidance for occupational prevention of risk from physical agents, including microclimate, was issued in Italy in summer 2021 [34]. Operational strategies developed as part of the WORKCLIMATE project, include a forecasting alert platform that can be used for risk assessment in outdoor work [35]. Developed based on the Wet Bulb Globe Temperature (WBGT) parameter, it provides workers with regional and sub-regional maps that show the prediction of heat stress for up to 3 days and recommendations to mitigate its health effects. Informational brochures to inform workers on how to deal with occupational risk conditions were also developed [36]. Such interventions have been shown to be effective in reducing the risk of heat-related illness; in fact, a randomized trial verified that in a group that had received an "intervention package" with behavioral preventive measures, the risk of heat stress was reduced by 63% compared to the group not affected by the intervention [37].

5. Conclusions

In conclusion, we have analyzed how media represent the workplace, and in particular problems and risks associated with it. Media outlets can emphasize some significant aspects over others, influencing public opinion's understanding of the problem [23]. How critical public health issues, such as heat-stress-related injuries and illnesses among workers, are framed in the media is the basis for informing the public about hazards [38]. As discussed by Wakefield et al., the presentation of an event "diagnoses, evaluates and prescribed solutions to social problems" [37]. The authors of the study consider the events published in newspapers as reports that, in a very short time, can bring to the attention of official bodies, public opinion and workers themselves the phenomenon of injuries and fatalities due to heat in the workplace. In fact, official statistics on occupational accidents are updated not as often as needed. In addition, newspaper articles can convey prevention

messages that, can help undertaking positive changes towards minimizing high-risk behaviors [40]. In the case of Italy, following the death of a young agricultural worker in 2021, an ordinance by the Governor of Apulia ruled that no work was allowed in the fields from 12.30 to 4.00 pm until the end of August, and cited the heat stress forecasting system for the initial screening of risks among outdoor workers developed in WORKCLIMATE. In fact, agricultural work was banned for the days forecasted as “high risk”, based on the results of the project. In that same year three other southern Italian regions, Basilicata, Calabria and Molise, took the same measure and in 2022, the ordinances were re-enacted.

The aim of the working group is to extend the monitoring of heat-related injury news coverage to social networks such as Twitter or Facebook in the near future.

Author Contributions: Conceptualization, M.L., M.B. and M.M. .; methodology, M.L.; software, Dynamedics S.r.l. .; validation, M.L. and G. I.; formal analysis, G.I and M.L.; investigation, G.I and M.L.; resources, M.L. and G.I.; data curation, G.I.; writing—original draft preparation, G.I, M.L., M.B and M.M.; writing—review and editing, all authors; visualization G. I.; supervision, A.M. M.L. and M.B; project administration, M.L. and M.B.; funding acquisition, A.M., M. B., M.M. . All authors have read and agreed to the published version of the manuscript.” Please turn to the [CRediT taxonomy](#) for the term explanation.

Funding: This research was funded by INAIL, Research Plan 2019–2021, Project P1O4, BRIC n. ID 06; ProjectWorkclimate: B14I19003320005”.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the CNR Research Ethics and Integrity Committee, CNR (protocol code XXX, 6th of February 2020).”

Informed Consent Statement: Informed consent was not needed for this specific activity within the Project since all gathered information had already been published in online newspapers.

Data Availability Statement: Not applicable.

Acknowledgments: Members of the WORKCLIMATE Collaborative Group: Alessandra Binazzi, Tiziano Costantini, Andrea Bogi, Michela Bonafede, Raimondo Buccelli, Alfonso Crisci, Francesca de’ Donato, Chiara Di Blasi, Tiziana Falcone, Simona Del Ferraro, Luca Fibbi, Claudio Gariazzo, Bernardo Gozzini, Valentina Grasso, Daniele Grifoni, Miriam Levi, Alessandro Marinaccio, Alessandro Messeri, Gianni Messeri, Paola Michelozzi, Vincenzo Molinaro, Stefano Monti, Marco Morabito, Antonio Moschetto, Pietro Nataletti, Francesco Pasi, Francesco Picciolo, Emma Pietrafesa, Iole Pinto.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

References

- Pörtner, H.-O.; Roberts, D.C.; Tignor, M.; Poloczanska, E.S.; Mintenbeck, K.; Alegría, A.; Craig, M.; Langsdorf, S.; Löschke, S.; Möller, V.; Okem, A.; Rama, B. *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press., Cambridge, UK and New York, NY, USA, 2022. doi:10.1017/9781009325844.
- Khatana, S.A.M.; Werner, R.M.; Groeneveld, P.W. Association of Extreme Heat with All-Cause Mortality in the Contiguous US, 2008–2017. *JAMA Netw Open* **2022**, *5*(5), e2212957. doi: 10.1001/jamanetworkopen.2022.12957.
- Hajat, S.; Kosatky, T. Heat-related mortality: a review and exploration of heterogeneity. *J Epidemiol Community Health* (1978) **2010**, *64*(9), 753–760. doi: 10.1136/jech.2009.087999.
- Romanello, M.; McGushin A.; Di Napoli, C.; Drummond, P.; Hughes, N.; Jamart, L.; ... & Hamilton, I. The 2021 report of the Lancet Countdown on health and climate change: code red for a healthy future. *The Lancet* **2021**, *398*(10311), 1619–1662. doi: 10.1016/S0140-6736(21)01787-6.
- Romanello, M.; Di Napoli, C.; Drummond, P.; Green, C.; Kennard, H.; Lampard, P.; ... & Costello, A. The 2022 report of the Lancet Countdown on health and climate change: health at the mercy of fossil fuels. *The Lancet* **2022**, *400*(10363), 1619–1654. doi: 10.1016/S0140-6736(22)01540-9.
- Ebi, K.L.; Capon, A.; Berry, P.; Broderick, C.; de Dear, R.; Havenith, G.; Honda, Y.; Kovats, R.S.; Ma, W.; Malik, A.; Morris, N.B.; Nybo, L.; Seneviratne, S.I.; Vanos, J.; Jay, O. Hot weather and heat extremes: health risks. *The Lancet* **2021**, *398*(10301), 698–708. doi: 10.1016/S0140-6736(21)01208-3.

7. Flouris, A.D.; Dinas, P.C.; Ioannou, L.G.; Nybo, L.; Havenith, G.; Kenny, G.P.; Kjellstrom, T. Workers' health and productivity under occupational heat strain: a systematic review and meta-analysis. *Lancet Planet Health* **2018**, *2*(12), e521–e531. doi: 10.1016/S2542-5196(18)30237-7. 319–321
8. Wadsworth, E.; Walters, D. *Safety and Health at the Heart of the Future of Work: Building on 100 Years of Experience*. International Labour Office, Geneva, 2019. Available online: https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safe-work/documents/publication/wcms_687610.pdf 322–324
9. Kjellström, T.; Maître, N.; Saget, C.; Otto, M.; Karimova, T. *Working on a warmer planet: The effect of heat stress on productivity and decent work*. International Labour Office, Geneva, 2019. Available online: https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_711919.pdf 325–327
10. Binazzi, A.; Levi, M.; Bonafede, M.; Bugani, M.; Messeri, A.; Morabito, M.; Marinaccio, A.; Baldasseroni, A. Evaluation of the impact of heat stress on the occurrence of occupational injuries: Meta-analysis of observational studies. *American journal of industrial medicine* **2019**, *62*(3), 233–243. <https://doi.org/10.1002/ajim.22946>. 328–330
11. Wendt, D.; van Loon, L. J.; Lichtenbelt, W. D. Thermoregulation during Exercise in the Heat. *Sports Medicine* **2007**, *37*(8), 669–682. doi: 10.2165/00007256-200737080-00002. 331–332
12. Gun, R. Deaths in Australia from work-related heat stress, 2000–2015. *Int J Environ Res Public Health* **2019**, *16*(19). doi: 10.3390/ijerph16193601. 333–334
13. Narocki, C. *Heatwaves as an occupational hazard. The impact of heat and heatwaves on workers' health, safety and wellbeing and on social inequalities*. European Trade Union Institute, Brussels, 2021. Available online: <https://www.etui.org/sites/default/files/2021-11/Heatwaves%20as%20an%20occupational%20hazard%20The%20impact%20of%20heat%20and%20heat-waves%20on%20workers%20health%2C%20safety%20and%20wellbeing%20and%20on%20social%20inequalities-2021.pdf> 335–338
14. Lee, J.; Lee, Y.H.; Choi, W.J.; Ham, S.; Kang, S.K.; Yoon, J.H.; Yoon, M.J.; Kang, M.Y.; Lee, W. Heat exposure and workers' health: a systematic review. *Rev Environ Health* **2022**, *37*(1), 45–59. doi: 10.1515/reveh-2020-0158. 339–340
15. Workclimate - Clima Lavoro Prevenzione. Available online: <https://www.workclimate.it> (accessed on 04 Dec. 2022). 341
16. ADS - Accertamenti Diffusione Stampa. Available online: <https://www.adsnotizie.it> (accessed on 04 Dec. 2022). 342
17. Istat - Istituto Nazionale di Statistica. Available online: <https://www.istat.it/it/archivio/266993> (accessed on 04 Dec. 2022). 343
18. Workclimate Working Group. *Report Caldo e Lavoro 2021*. Available online: https://www.workclimate.it/wp-content/uploads/2021/09/Report-caldo-e-lavoro_-Estate-2021.pdf 344–345
19. Workclimate Working Group. *Report Caldo e Lavoro 2022*. Available online: https://www.workclimate.it/wp-content/uploads/2022/10/REPORT_caldo-e-lavoro_ESTATE_2022.pdf 346–347
20. WMO - World Meteorological Organization. Available online: <https://public.wmo.int/en/media/press-release/eight-warmest-years-record-witness-upsurge-climate-change-impacts> (accessed on 04 Dec. 2022) 348–349
21. Marinaccio, A.; Bonafede, M.; Morabito, M. Research and public health prevention policies of occupational heat exposure in Italy. *Occup Environ Med* **2022**, *79*(3), 215–216. doi: 10.1136/oemed-2021-107967 350–351
22. Levi, M.; Kjellstrom, T.; Baldasseroni, A. Impact of climate change on occupational health and productivity: a systematic literature review focusing on workplace heat. *La Medicina del lavoro* **2018**, *109*(3), 163–179. <https://doi.org/10.23749/mdl.v109i3.6851> 352–353
23. Gawley, T.; Dixon, S. One side of the story: Examining newspaper coverage of workplace injury and fatality in Ontario, 2007–2012. *Work* **2015**, *53*(1), 205–218. doi: 10.3233/WOR-152140. 354–355
24. Barnetson, B.; Foster, J. If it bleeds, it leads: the construction of workplace injury in Canadian newspapers, 2009–2014. *Int J Occup Environ Health* **2015**, *21*(3), 258–265. 356–357
25. Tustin, A.W.; Lamson, G.E.; Jacklitsch, B.L.; Thomas, R.J.; Arbury, S.B.; Cannon, D.L.; Gonzales, R.G.; Hodgson, M.J. Evaluation of Occupational Exposure Limits for Heat Stress in Outdoor Workers - United States, 2011–2016. *MMWR. Morbidity and mortality weekly report* **2018**, *67*(26), 733–737. <https://doi.org/10.15585/mmwr.mm6726a1> 358–360
26. Xiang, J.; Bi, P.; Pisaniello, D.; Hansen, A. The impact of heatwaves on workers' health and safety in Adelaide, South Australia. *Environmental research* **2014**, *133*, 90–95. <https://doi.org/10.1016/j.envres.2014.04.042>. 361–362
27. Marinaccio, A.; Scortichini, M.; Gariazzo, C.; Leva, A.; Bonafede, M.; De' Donato, F.K.; Stafoggia, M.; Viegi, G.; Michelozzi, P.; BEEP Collaborative Group. Nationwide epidemiological study for estimating the effect of extreme outdoor temperature on occupational injuries in Italy. *Environment international* **2019**, *133*, 105176. <https://doi.org/10.1016/j.envint.2019.105176> 363–365
28. Romeo, G.; Bertini, G.; Biffino, M.; Baldasseroni, A. Fatal injuries at work in Tuscany Region (Central Italy): content analysis of newspapers. *Epidemiol Prev* **2014**, *38*(2), 91–9. 366–367
29. Morabito, M.; Cecchi, L.; Crisci, A.; Modesti, P.A.; Orlandini, S. Relationship between work-related accidents and hot weather conditions in Tuscany (central Italy). *Industrial health* **2006**, *44*(3), 458–464. <https://doi.org/10.2486/indhealth.44.458>. 368–369
30. INAIL - Istituto Nazionale per l'Assicurazione contro gli Infortuni sul Lavoro. Available online: <https://dati.inail.it/opendata/default/Qualidati/index.html> (accessed on 04 Dec. 2022). 370–371
31. Fatima, S.H.; Rothmore, P.; Giles, L.C.; Varghese, B.M.; Bi, P. Extreme heat and occupational injuries in different climate zones: A systematic review and meta-analysis of epidemiological evidence. *Environment international* **2021**, *148*, 106384. <https://doi.org/10.1016/j.envint.2021.106384>. 372–374

-
32. Roccatto, L.; Modenese, A.; Occhionero, V.; Barbieri, A.; Serra, D.; Miani, E.; Gobba, F. Colpo di calore in ambito lavorativo: descrizione di un caso con esito fatale [Heat stroke in the workplace: description of a case with fatal outcome]. *La Medicina del lavoro* **2010**, *101*(6), 446–452. 375
376
377
33. Sorensen, C.; Hess, J. Treatment and Prevention of Heat-Related Illness. *New England Journal of Medicine* **2022**, *387*(15),1404–1413. doi: 10.1056/NEJMcp2210623. 378
379
34. Coordinamento Tecnico per la sicurezza nei luoghi di lavoro delle Regioni e delle Province Autonome - Gruppo Tematico Agenti Fisici. Indicazioni operative per la prevenzione del rischio da Agenti Fisici ai sensi del Decreto Legislativo 81/08. Rome, 2021. Available online: https://www.portaleagentifisici.it/filemanager/userfiles/web_xxx_FAQ_totale_5_parti_2021_08_23.pdf?lg=IT 380
381
382
383
35. Workclimate - Clima Lavoro Prevenzione, Prototipo Di Piattaforma Previsionale Di Allerta Per Un Primo Screening Dei Rischi Legati Allo Stress Da Caldo Per I Lavoratori. Available online: <https://www.workclimate.it/scelta-mappa/> (accessed on 04 Dec. 2022). 384
385
386
36. Workclimate - Clima Lavoro Prevenzione, Materiale Informativo. Available online: <https://www.workclimate.it/materiale-informativo/> (accessed on 04 Dec. 2022). 387
388
37. Nitschke, M.; Krackowizer, A.; Hansen, A.L.; Bi, P.; Tucker, G.R. Heat Health Messages: A Randomized Controlled Trial of a Preventative Messages Tool in the Older Population of South Australia. *International journal of environmental research and public health* **2017**, *14*(9), 992. <https://doi.org/10.3390/ijerph14090992> 389
390
391
38. Hinchcliff, R.; Chapman, S.; Ivers, R.Q.; Senserrick, T.; Du, W. Media framing of graduated licensing policy debates. *Accident; analysis and prevention* **2010**, *42*(4), 1283–1287. <https://doi.org/10.1016/j.aap.2010.02.005> 392
393
39. Wakefield, M.; Clegg Smith, K.; Chapman, S. Framing of Australian newspaper coverage of a secondhand smoke injury claim: Lessons for media advocacy. *Crit Public Health* **2005**, *15*(1), 53–63. doi: 10.1080/09581590500048382. 394
395
40. Ozegovic, D.; Voaklander, D.C. What We Are Not Talking About: An Evaluation of Prevention Messaging in Print Media Reporting on Agricultural Injuries and Fatalities. *Am J Ind Med* **2011**, *54*, 603–608. 396
397
398