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INTERNATIONAL CONFERENCE ON CLIMATE JUSTICE – 26th October

The heat-health nexus within the urban context by looking at social-inequalities: focus on gender

Euro-Mediterranean Center on Climate Change (CMCC)

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The Euro-Mediterranean Center on Climate Change (CMCC)



OFFICES CMCC is organized in the form of a network distributed throughout Italy.



<u>REgional Models and geo-Hydrological Impacts</u>

- Assessment of inequalities looking at high-resolution climate data and vulnerabilities associated with socioeconomic factors and the built environment.
- Research aimed at identifying risk assessment determinants for different sectors and systems.

Impacts on Agriculture, Forests and Ecosystem Services

 Consultant for international negotiations, supporting the Ministry of Ecological Transition (MiTE, IT) for issue related to ADAPTATION to climate change.





BACKGROUND OF MY RESEARCH



- **POPULATION GROWTH**
- URBAN POPULATION

IMPACTS of CLIMATE CHANGE

SOCIAL INEQUALITIES





Source: IPCC (2022)

URBAN POPULATION GROWTH

POPULATION INCREASE BY 2050



"While city life continues to offer many opportunities, including potential access to better health care, today's urban environments can concentrate health risks and introduce new hazards."



Source: https://worldmapper.org



HEALTH, TEMPERATURES AND SOCIAL-INEQUALITIES

SPM.B.1.5 In urban settings, observed climate change has caused impacts on human health, livelihoods and key infrastructure (*high confidence*). Multiple climate and non-climate hazards impact cities, settlements and infrastructure and sometimes coincide, magnifying damage (*high confidence*). Hot extremes including heatwaves have intensified in cities (*high confidence*), where they have also aggravated air pollution events (*medium confidence*) and limited functioning of key infrastructure (*high confidence*). Observed impacts are concentrated amongst the economically and socially marginalized urban residents, e.g., in informal settlements (*high confidence*). Infrastructure, including transportation, water, sanitation and energy systems have been compromised by extreme and slow-onset events, with resulting economic losses, disruptions of services and impacts to wellbeing (*high confidence*). {4.3, 6.2, 7.1, 7.2, 9.9, 10.4, 11.3, 12.3, 13.6, 14.5, 15.3, CCP2.2, CCP4.2, CCP5.2}

SPM.C.4 There is increased evidence of maladaptation¹⁵ across many sectors and regions since the AR5. Maladaptive responses to climate change can create lock-ins of vulnerability, exposure and risks that are difficult and expensive to change and exacerbate existing inequalities. Maladaptation can be avoided by flexible, multi-sectoral, inclusive and long-term planning and implementation of adaptation actions with benefits to many sectors and systems. (*high confidence*) {1.3, 1.4, 2.6., Box 2.2, 3.2, 3.6, Box 4.3, Box 4.5, 4.6, 4.7, Figure 4.29, 5.6, 5.13, 8.2, 8.3, 8.4, 8.6, 9.6, 9.7, 9.8, 9.9, 9.10, 9.11, Box 9.5, Box 9.8, Box 9.9, Box 11.6, 13.11, 13.3, 13.4, 13.5, 14.5, 15.5, 15.6, 16.3, 17.3, 17.4, 17.6, 17.2, 17.5, CCP5.4, CCB NATURAL, CCB SLR, CCB DEEP, CWGB BIOECONOMY, CCP2.3, CCP2.3}







INEQUALITY AND CLIMATE CHANGE VICIOUS CYCLES





Source: Islam et al. (2017)



EPIDEMIOLOGY OF TEMPERATURE-RELATED MORTALITY



Figure 2: Fraction of all-cause mortality attributable to moderate and extreme hot and cold temperature by country Extreme and moderate high and low temperatures were defined with the minimum mortality temperature and the 2-5th and 97-5th percentiles of temperature. distribution as cutoffs.

Italy holds the upper-most heat-related effects on daily mortality considering hot temperatures and these impacts are projected to increase consistently in the future due to climate change.





MY (PhD) RESEARCH ACTIVITIES:

QUALITATIVE

Literature Review on heat-health nexus

STUDY PERIOD: 2000 - 2019

UNIT of ANALYSIS: Urban and Metropolitan area

CLIMATE RESOLUTION:

Step 1

METHOD: Systematic Literature Review Heat-attributable mortality risks by social inequalities

STUDY PERIOD: 1982 – 2018

UNIT of ANALYSIS: Urban area

Step 2

CLIMATE RESOLUTION: 5.5 km (Uerra Mescan-Surfex)

METHOD: Distributed Lag Non-linear Model

QUANTITATIVE

Trends in cold- and heatattributable mortality risks

STUDY PERIOD: 1982 - 2018

UNIT of ANALYSIS: Urban area

Step 3

VULNERABILITY

EXPOSURE

HAZARD

CLIMATE RESOLUTION: 5.5 km (Uerra Mescan-Surfex)

METHOD: 25-years moving period DLNM

QUANTITATIVE

Cold- and heatattributable mortality risks by sub-urban areas

11 SUSTAINABLE CITIL AND COMMUNITIES

13 CLIMATE ACTION

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STUDY PERIOD: 1982 - 2018

3 GOOD HEALTH AND WELL-BEING

-W'

UNIT of ANALYSIS: Sub-urban areas

Step 4

10 REDUCED INEQUALITIES

CLIMATE RESOLUTION: 2 km (COSMO-REA2)

METHOD: DLNM + Meta-Analysis

QUANTITATIVE

Centro Euro-Mediterraneo sui Cambiamenti Climatici



HEAT-HEALTH NEXUS – INEQUALITIES – URBAN CONTEXT

Uther Climate 44 (2020) 100076 Contents lister available at ScienceDerect Urban Climate journal homepage: www.elsevier.com/locate/uclim	Bites of diversemental Meal 2020 19116 https://doi.org/10.1166/12940.000.00697.x RESEARCH Open Access Social inequalities in heat-attributable	Environmental Research 24 (2022) 11-682 Comment like available at ScienceOfficer Environmental Research journal homesage: www.attevier.zom/locate/devires
The heat-health nexus in the urban context: A systematic literature review exploring the socio-economic vulnerabilities and built environment characteristics Marta Ellena ^{ther} , Margaretha Breil ¹⁵ , Stefano Soriani ¹⁶	mortality in the city of Turin, northwest of Italy: a time series analysis from 1982 to 2018 Marta Eleca ^{1,2} (Lian Balleter ² , Paola Mercogliano ² , Elsa Ferracin ⁴ , Guilana Barbato ² , Giuseppe Costa ⁴ and Vijendra Ingole ¹	Evolution of temperature-attributable mortality trends looking at social inequalities: An observational case study of urban maladaptation to cold and heat Marta Ellena ^(h,h) , Joan Ballester [*] , Giuseppe Cotat ^(A) , Hicham Achebak ^(A) ^{**} Pointeen Gorne Information of Interest, Industry Cotat ^(A) , Hicham Achebak ^(A) ^{**} Contained Gorne, Information of Interest, Industry Cotat ^(A) , Hicham Achebak ^(A) ^{**} Contained Gorne, Information of Interest, Industry Cotat ^(A) , Hicham Achebak ^(A) ^{**} Contained Gorne, Information of Interest, Industry Cotat ^(A) , Hicham Achebak ^(A) ^{**} Contained Gorne, Information, Industry Cotation (Interest of Interest
ARTICLENSON ARTICLESSON Construction Constru	Autricet Background: Indestruating content specific heat-heath risks in urban areas is important, especially given anticipated severe increase in summer temperatures due to dimate charge effects. We investigate social inegulates in the association between divent groups is such as see, age, exhausteral level, martial status and household occupants. Methods: Nonraig due are represented to prividual all-acus enrolling outs of the summer norths between 1982 and 2018. Societocomerc: level end day mean temperature were assigned to each discated. A time series between sign morality and temperatures and marking. The morality risk due to bask is generated by the Native Bisk (98) at the 99h percentile of day) summer temperatures for each polyadation study. The Method Bisk (98) at the 99h percentile of days summer temperatures for each polyadation study. The Method Bisk (98) at the 99h percentile of days summer temperatures for each polyadation study. The 20, 20, 80h (96) study of 90h percentile of days summer temperatures for each polyadation study. The 20, 20, 80h (96) study. The 30h (96) study and the signed temperature in the signed temperature were associated for the site of 19, 99h (90h (= 19, 20, 20h), (16, 59h (= 1-18), 20h), while risk of version styles for the beaut exclusional level (10, 59, 99k (= 1-19, 20h), (16, 59h (= 1-18), 20h), while risk of version should for balance the site of 19, 99h (= 10, 20h), (16, 59h (= 1-18), 20h), while risk of version should for the site of version result status healt failer at strugger association for weak were in result (16, 59h (= 1-13), 20h), (16, 59h (= 1-13), 20h), the site of version should result and result result and failer at an excert strugger association for the version result (16, 59h (= 1-13), 20h), (16, 59h (= 1-13), 20h), the site of version should result and result result and failer at an excert strugger associable for the site of the sinter strugger associable and	ATTELLETION AGONG TABLESS AND
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Climate Justice Jean Monnet Centre of Excellence



The heat-health nexus in the urban context:

A literature review exploring the socio-economic vulnerabilities and built environment characteristics



https://doi.org/10.1016/j.uclim.2020.100676





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AIM

Identify **demographic** and **socio-economic factors** as well as factors in the **indoor** and **outdoor environment** that contribute to increase/decrease the vulnerability of individuals to extreme temperatures.

FINDINGS

Results demonstrated a **heterogeneous spatial distribution of case studies** and variables and highlighted different aspects related to the climate hazards, the **vulnerabilities** factors as well as the **enhanced exposure** variables worldwide.



The heat-health nexus in the urban context:



A literature review exploring the socio-economic vulnerabilities and built environment characteristics

Centre of Excellence

		Categories	Groups	Variables	
	(i) Mental and Physical Health	Social	Education	Education, in general	
/ dictingt actogories	(i) Mental and Thysical Health			Without education Primary education High school education	
of determinants	(ii) Demographics		Social status	Ethnic minorities	
	(iii) Social status				
	(iv) Economic status	Mental and Physical Heath	Health status	Asthma (> 18 years old) Cardiovascular disease: - Chronic obstructive disease (> 18 yea - Coronary heart disease (> 18 years old) - High blood pressure (> 18 years old) - High cholesterol (> 18 years old) Diabetes (> 65 years old)	ars old) Jd)
	Г	•••		•••	
2 Enhanced Exposure		nment Building standard	Aeration capacity in summer	Outdoor Environment Building standard	Building status*
determinants	I. INDOOR		Air Conditioning		Direction of the window front Need for maintenance/repairs* Reflectivity of roofing material Size and chading options for windows
	ii. OUTDOOR		Blinds Cooling energy for workplaces	Urban morphology & Building standard	Green Roofs Material Index: n° of houses per hectare with light materials in external walls
			Double-glazed windows Fans Lack central air conditioning	Residential standard	Building age*
https://doi.org/10.1016/i.uclim.2020.100676			• ·		
(15.5)					Centro Euro-Mediterraneo sui Cambiamenti Climatici
Size2-2022 Decli Studi Di Padova	Climate Justice				_

The heat-health nexus in the urban context: focus on GENDER

- With regard to the demographic category, about the majority of the analysed paper (90%) introduced the concept of age differentiation and **gender differences**.
- Demographic Age Age thresholds Elderly People under 5 years old People over 60 years old People over 65 years old Gender People over 75 years old Male and female
- Women live longer and die older than men, therefore gender and age are here interlinked.
- By looking at gender, most of the case studies highlighted how **females were found at higher risk in respect to males** during heatwaves.

This discrepancy may arise from differences in response to thermal stress due to physiological characteristics in body temperature regulation as well as pre-existing socio-demographic characteristics in the inhabited society, such as the lower social condition that characterises elderly women, which often live alone due to longer life expectancy compared to men.

https://doi.org/10.1016/j.uclim.2020.100676









Turin (45°6′ 58″ N and 7°44′ 33″ E) is located in the north-west part of Italy and it is the **fourth largest Italian urban area** with a population of **860.000 inhabitants**.











Social inequalities in heat-attributable mortality in the city of Turin, northwest of Italy: a time series analysis from 1982 to 2018 AIM

Categories	Sub-categories	N° of deaths	MMT (°C)	95% CI	RR at P99	95% CI
Mortality by	Men	53909	16.2	(12.1, 18.0)	1.56	(1.45, 1.67)
Age-group	0–64 years old	12151	14.7	(9.0, 20.4)	1.32	(1.13, 1.55)
	65–74 years old	13006	14.5	(9.0, 19.2)	1.44	(1.23, 1.69)
	75-84 years old	17677	18.0	(11.2, 20.0)	1.53	(1.37, 1.71)
	85+ years old	11075	15.5	(15.0, 18.2)	2.04	(1.76, 2.38)
Education	No more than primary school	28417	15.8	(9.0, 18.2)	1.64	(1.49, 1.80)
	Secondary school	14564	18.8	(9.0, 21.1)	1.36	(1.20, 1.54)
	High school or more	10624	13.9	(9.0, 18.4)	1.66	(1.38, 1.99)
Marital status	Married	38704	16.3	(11.1, 18.3)	1.54	(1.41, 1.67)
	Separated and divorced	2479	20.6	(9.0, 26.2)	1.39	(1.07, 1.81)
	Unmarried	6062	11.7	(9.0, 19.7)	1.63	(1.20, 2.23)
	Widower	6630	16.0	(9.0, 19.8)	1.66	(1.38, 2.00
Household occupants	Alone	9489	17.9	(9.0, 21.4)	1.61	(1.39, 1.86
	Not alone	44187	15.7	(9.8, 17.9)	1.53	(1.42, 1.66
Mortality by	Women	56046	17.2	(15.6, 18.3)	1.88	(1.77, 2.00)
Age-group	0–64 years old	6799	14.4	(9.0, 32.1)	1.26	(1.00, 1.58
	65-74 years old	8422	16.7	(9.0, 19.1)	1.69	(1.43, 1.99
	75-84 years old	18277	17.1	(11.4, 19.0)	1.90	(1.71, 2.11)
	85+ years old	22548	17.9	(16.3, 19.0)	2.13	(1.94, 2.33
Education	No more than primary school	36827	17.2	(15.4, 18.3)	1.93	(1.79, 2.08
	Secondary school	12698	18.3	(13.8, 20.1)	1.83	(1.62, 2.07
	High school or more	6252	16.1	(9.0, 19.7)	1.69	(1.39, 2.05
Marital status	Married	17892	16.4	(9.0, 18.9)	1.71	(1.52, 1.92
	Separated and divorced	2069	16.9	(9.0, 32.1)	2.11	(1.51, 2.94
	Unmarried	7777	17.4	(9.0, 19.8)	1.87	(1.60, 2.20
	Widower	28267	17.5	(15.7, 18.7)	1.97	(1.81, 2.14
Household occupants	Alone	24055	17.9	(15.9, 19.1)	1.88	(1.72, 2.05
	Not alone	31451	163	(126, 180)	1.89	(174.206

investigate the association between daily To temperatures and mortality in summer in the city of Turin for the period 1982–2018 among different social and **demographic groups** such as sex, age, educational level, marital status and household occupants.

FINDINGS

The effect of heat on mortality largely varied by each analysed category, with higher RRs for women, the oldest, and among those who lived alone. In regard to education, the highest RR for men was observed among higher education levels, while for women were higher for the lower educational level

Attributable		JUNE			JULY			AUGUST		
fraction of deaths (AF) with CI 95%		Moderate	Extreme	Total heat	Moderate	Extreme	Total heat	Moderate	Extreme	Total heat
Mortality by:	Men	7.0% (4.0, 9.0)	1.0% (0.0, 1.0)	8.0% (4.0, 10.0)	11.0% (8.0, 15.0)	2.0% (2.0, 2.0)	13.0% (10.0, 17.0)	9.0% (6.0, 12.0)	3.0% (2.0, 3.0)	12.0% (9.0, 15.0)
Mortality by:	Women	8.0% (7.0, 10.0)	1.0% (1.0, 1.0)	9.0% (8.0, 11.0)	14.0% (12.0, 17.0)	3.0% (3.0, 3.0)	17.0% (15.0, 20.0)	12.0% (9.0, 14.0)	4.0% (4.0, 5.0)	16.0% (13.0, 19.0)







di Padova

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Evolution of temperature-attributable mortality trends looking at social inequalities: An observational case study of urban maladaptation to cold and heat



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AIM

To investigate **trends** in cold- and heat**attributable mortality risk** and burden by sex, age, education, marital status, and household occupancy. (i.e., adaptation or mal-adaptation?).

FINDINGS

The overall increase in cold- and heatrelated mortality risk suggests a **maladaptation to ambient temperatures** in Turin.



environmental





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Evolution of temperature-attributable mortality trends looking at social inequalities: focus on GENDER

- Our analysis demonstrated how despite the considered subperiod women are characterized by greater risks under hot and cold conditions in respect to men.
- This result may also relate to the fact that most of the population over the age of 85 is composed by women, who in Italy have a longer life expectancy.
- Since the death records referred to the past decades, it is reasonable to assume that women have been generally characterized by lower level of education and higher level of isolation, given the more advanced age at which they died.





CLIMATE CHANGE, EXTREME WEATHER EVENTS and WOMEN

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United Nation Framework Convention on Climate Change



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(\mathbb{C})	Framework Convention on Climate Change	Distr.: General 1 June 2022
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Subsidiary Fifty-sixth se Sonn, 6–16 J tem 17 of th Gender and	Body for Implementation stan nee 2022 provisional agenda climate change	
	Dimensions and examples of the g impacts of climate change, the rol change and opportunities for won	ender-differentiated ie of women as agents of nen
	Synthesis report by the secretariat	
Summar	This report, prepared on the basis of organizations, a review of the contributions of the hierapovernmental Pane exchange, the role of venema as agents of change a change, the role of venema as agents of change a organization of the highlights the integrals of or experiation of the highlights the integral of the marginalized groups to participate in decision- manginalized groups to participate in decision- manginalized groups to participate in decision- maginalized groups to participate in decision- definition of the second second second second of organization initiatives and projects and emphasizis the regard.	submissions from Parties and observer Weeking Groups II and III to the Sixth To Chanter Change and a addent view of the second second second second second second of second secon

43. The adaptive capacity of women and men differs owing to women being less integrated into the formal economy, which in turn affects their position in decision-making processes. In Antigua and Barbuda, for example, women are more likely than men to generate income from informal tourism-related activities, which reduces their adaptive capacity in cases of extreme weather events such as hurricanes. In its submission, ILO highlighted that informal employment affects access to health and safety mechanisms at work, increasing the risks for informal employees in the event of climate-related disaster. Generally in the submissions, women were observed to have less capacity to adapt than men on account of their lower social status, poorer educational background and difficulties accessing resources.

44. In the cases of most marginalized groups, such as the 2SLGBTQQIA+³² community and indigenous peoples, their capacity to adapt to the impacts of climate change is lessened owing to the multi-faceted intersection of social factors, which makes them more vulnerable to such impacts. This is despite women and indigenous peoples being identified as custodians of traditional and indigenous knowledge. The AR6 highlights that adaptation efforts could be improved by integrating such knowledge into decision-making through inclusive governance mechanisms, such as civil participation initiatives.

45. According to several submissions from Parties and observer organizations, women in traditional gender roles as water providers and subsistence farmers in some countries have a microcosmic understanding of their local environment, such as local weather conditions. Some women in the Central African Republic and Kenya, for example, can predict changes in rainfall patterns and adapt their daily activities accordingly. Moreover, in its submission WECF reported that in some countries women of different generations often live together in one household and participate in similar gendered activities, during which they share orally traditional knowledge, which could be used to improve adaptation action. Their lack of involvement in decision-making, however, limits their contribution to and thus the integration of traditional and indigenous knowledge into policymaking.







https://unfccc.int/documents/494455



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THANK YOU

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