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HEAT-HEALTH IN ITALY
Local adaptation in social and health care

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ABSTRACT

Alessia Greselin: Heat-health in Italy – Local adaptation in social and health care
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Climate change undoubtedly represents one, if not the biggest, challenge of the 21st century. While mitigation strategies aim at reducing the impact of anthropogenic pressure on the environment, climate change-related hazards already threaten the livelihood of societies. Different phenomena are projected to intensify due to climate change, and heatwaves among others. Adaptation at different levels as well as across policy fields is therefore needed. With social and health care being directly responsible for the health and well-being of the population in a welfare state, adaptation in those policy fields is fundamental and worth further research.

Italy represents a valuable case study to investigate social and health care adaptation for different reasons. On the one hand, it is the country with the highest heat mortality worldwide. On the other hand, as in other European countries, there is an increasingly elderly population. As social and health care in Italy are both highly decentralized and different in development and organization, a sub-national perspective can provide valuable insights on heat adaptation across the country. After the European heatwave of 2003, several countries have adopted a heat plan. In Italy, in addition to the national heat plan, regions and cities have also equipped themselves with regional and local heat plans. However, due to the sub-national differences, adaptation could be interpreted and realized differently within the country. Therefore, in this thesis, I investigated the following research question: *How have cities and regions interpreted and realised adaptation to heat-related threats to public health?*

To answer the research question, I conducted a qualitative sub-national comparative study with regional and local heat plans as data. First, I selected the cities and regions to study both based on sub-national differences in social and health care as well as data availability. Second, I analysed the heat plans through thematic analysis and outlined three major themes. The findings show that heat adaptation in the plans 1) has involved intersectoral cooperation between social and health care, 2) has defined theoretically vulnerable people groups but only one is the service recipient, and 3) has included both home care and transfers to emergency location as main measures for care during a heatwave. Those findings are relevant both in the heat as well as social and health care research context. For heat adaptation research, the findings highlight the cooperation across policy fields, different layers of adaptation and how vulnerability factors can overlap. In the context of social and health care research, features of the Italian welfare regime(s) emerged in the fragmented and weak institutional social care system relying primarily on domestic and/or informal care. How adaptation is realised and how it differs at a sub-national level has implications on the well-being and health of the population. Regional and local differences have been detected, with some adaptation plans being far more comprehensive than others. Such differences could be related both to the impact of heat stress on the areas and on the features of the sub-national social and health care regimes.

As the ongoing climate crisis requires cooperation among different actors and policy fields, further research on adaptation from social policy scholars is needed. Additionally, sub-national differences highlight the need for policymakers to strengthen social and health care integration and to even differences across the country.

Keywords: heatwaves, Italy, social care, health care, adaptation

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1. Introduction - Adapting to a changing climate: heatwaves and health

Climate change undoubtedly represents one, if not the biggest, challenge of the 21st century (World Health Organization, 2018). Since the beginning of the industrial era, intense and highly polluting human activities have caused an unprecedented change in the Earth system, such that the contemporary geological era has been named Anthropocene. Yet, such effects of human-induced climate change not only threaten the planet, but also the livelihood of all the living beings on Earth. Among different risks arising from climate-related phenomena, human health represents one of the key aspects on the front line as it constitutes, indeed, the premise of people's well-being. Since the social policy is concerned with the well-being of the population in welfare states, the study of new threats arising from the ongoing climate crisis represents a relatively new yet relevant strand of research for social policy scholars. In this thesis, I investigated how adaptation to heatwaves has been realised in two specific social policy fields, social and health care, in the context of Italy.

Several weather phenomena have been detected as likely to intensify in terms of magnitude, length, and frequency due to climate change and heatwaves are one of them. However, regions around the world experience climate-related phenomena differently. In the case of heatwaves, the Mediterranean basin has been detected as a hot spot, where heatwaves are expected to further intensify in the upcoming decades. The expected increase of the phenomenon, reinforced by the trends of ageing populations and urbanisation in the European and Eastern Mediterranean areas, creates particular stress in the region (Watts *et al.*, 2021). With the highest heat-mortality rates (World Health Organization, 2016), Italy represents a particularly relevant case study being a country on the front line of this phenomenon. Indeed, as also other countries are currently under threat and are expected to experience an intensification of heatwaves in the future, the long history of heat effects on health and consequent adaptation in the Italian case can offer insights and be a source of valuable knowledge for other countries as well.

To respond to climate change-related threats, short- and long-term approaches are advanced by countries around the planet. While mitigation policies are necessary to reduce the impact of human activity on the environment, some climate change effects already represent a threat even in a mitigation scenario as seen in the case of heatwaves (World Health Organization, 2016). As such, adaptation measures complement mitigation in that they alleviate the burden of those climate change impacts on societies. Considering adaptation, different areas of society are implementing measures to adapt, ranging from urban planning to social and health care, each

complementing the others. Among their responsibilities, well-being and health institutions need to consistently adapt to relieve the population of the burden of health risks resulting from heatwaves. Thus, the adaptation from social and health care can provide insights into these processes as they represent the policy fields directly concerned with the population's well-being and health.

In Italy, adaptation policies in social and health care have been introduced in terms of a national strategy coordinated by a national centre, the Lazio Region Department of Epidemiology. Further responsibilities outlined in the national plan are left to regional and local actors, which draft and implement regional and local heat plans. As social and health care in Italy are mostly realised at a regional and local level, both policy fields are subject to significant sub-national differences across the country. Despite the salience of the topic, previous research on the relationship between heatwaves and health in Italy has mostly focused on heat mortality and morbidity. Thus, specific heat adaptation measures in social and health care considering also sub-national differences have not been investigated and detailed knowledge on that is still lacking. In this thesis, I will try to fill this research gap and answer the following research question: *How have cities and regions interpreted and realised adaptation to heat-related threats to public health?*

As heatwaves are estimated to become more frequent, intense, and longer and carry considerable risks for the health and well-being of the population, a thorough understanding of regional and local adaptation in social and health care is fundamental both for social policy scholars and decision-makers. To answer the research question, I conducted a qualitative sub-national comparative study including two Italian regions and two cities and I used thematic analysis to analyse the respective regional and local heat plans.

After the first introductory chapter, the structure of the thesis is organised as follows. In the second chapter, I introduce the conceptual framework for this thesis and review previous literature on 1) health and climate change interconnectedness, 2) the phenomenon of heatwaves, and 3) adaption strategies that have been pursued as a response to heat-related health risks. The third chapter will set the context of the research with a close-up of Italy and health and social care as selected policy fields, acknowledging sub-national differences in the sectors. In the fourth chapter, I will lay the methodological ground for the thesis, describing the study design and the processes of data collection and data analysis. Subsequently, the fifth chapter will present the findings emerging from the qualitative thematic analysis that answers

the research question. I then discuss the findings considering previous literature on the policy field and the conceptual framework. Lastly, the conclusion summarises the main results from this thesis and provides recommendations for future research.

2. Heatwaves and health: a literature review

Heatwaves and health intersect through different aspects. In this chapter, I present the conceptual framework used for this thesis. Thereafter, I include a literature review on the topic including the relationship between environment and society in the Anthropocene, what are heatwaves and how they affect health, and how to adapt to heatwaves.

2.1. Conceptual framework

In this Master's thesis research, I focus on heatwaves as the extreme weather event under study. More specifically, I investigate local heat adaptation in health and social care in the Italian sub-national context, further explained in the following chapter. Key concepts for the thesis thus include *climate change*, *heat waves*, *health*, *vulnerability* and *adaptation*.

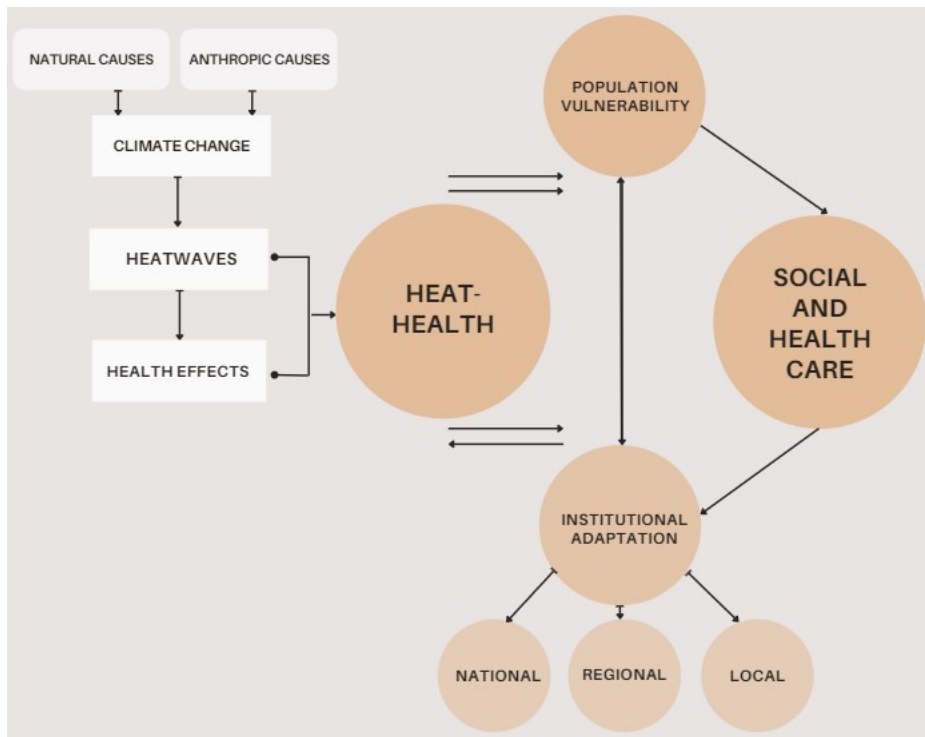
Climate change represents the broader concept within which the framework for the thesis is embedded. It is defined in the Intergovernmental Panel on Climate Change (2018) as “a change in the state of the climate that can be identified [...] by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer”. As previously presented, climate change is related to different phenomena, such as heatwaves and other extreme weather events. While *heatwave* is a debated concept and there is no globally agreed definition for that, in this thesis it will be considered as a prolonged and significant increase in the average air temperature in a given region, as described by Maggiotto *et al.* (2021). In the Italian context, the Italian Statistic Institute (ISTAT, 2020) reports heat waves as days in which the daily maximum temperature is above the 90th percentile of the average maximum temperature.

The constitution of the World Health Organisation defines *health* as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (World Health Organization, 2020). In the light of heat threat to population health, *vulnerability* represents an important concept to introduce and is defined by Xu *et al.* (2019) as determined by exposure levels, sensitivity, and adaptive capacity of a population. On such a basis, adaptation measures are taken both at an individual as well as population level, including supranational, national and sub-national strategies. *Adaptation* is defined by Kovats and Ebi (2006) as the sum of the “strategies, policies, and measures [...] undertaken now and in the future to reduce the burden of climate-sensitive health determinants and outcomes”. *Social and*

health care represent the two policy fields through which the welfare state directly impacts the health and well-being of the population.

The relationship between those key concepts builds up the conceptual framework is illustrated in Figure 1. Heatwaves represent a threat to the health of a population in different ways. Yet, the impact of such a relationship between heat waves and health (heat-health) on the population is determined by different factors, such as vulnerability and adaptation. On the one hand, the relationship between heat-health and vulnerability is indirect, meaning that the effects of heatwaves on health increase as individual and population vulnerability grow. On the other hand, heat-health effects decrease as different kinds of adaptations are developed, thus representing a direct relationship between them. Within the different layers of adaptation, sub-national (local and regional) heat adaptation plans in Italy constitute the primary focus of this thesis. Vulnerability and adaptation also affect each other in a bidirectional relationship, and both interact with social and health care. The population vulnerability affects social and especially health care, which, in turn, can implement adaptation measures.

Figure 1. Conceptual framework.



Throughout the literature review, I thoroughly describe the relationship between the key concepts included in the conceptual framework. More specifically, I begin by reviewing the effects and countereffects of the relationship between climate change and society, followed by a deeper consideration of heatwaves and their effects on health. Lastly, I consider heat adaptation strategies and introduce the context of social and health care in Italy.

2.2. Effects and countereffects: society and environment

The interaction of society with nature has long been investigated and considered in terms of an external relationship, setting a clear boundary between what belongs to humanity and what to the environment (Folke *et al.*, 2016). Yet, society and the environment are interdependent. On the one hand, human activities have an impact and influence the environment, but on the other hand, changes in the environment affect human lives. Indeed, considering the first side of this relationship, Folke *et al.* (2016) retrace the impact of humankind on the environment. Following the fundamental premise that the biosphere is constituted of every living being on the planet, the authors argue that such common distinctions between society and the biosphere are essentially artificial and that social and ecological sides constitute together the Earth system. Indeed, as a complex system, the Earth system is composed of four different spheres, atmosphere, hydrosphere, biosphere, and geosphere. Thus, humankind does not represent an external factor affecting the biosphere, but, rather, it is embedded in this system and challenges it from within (Folke *et al.*, 2016, p. 1).

Since the beginning of the geological Holocene era, the impact of human activities has become so visibly significant on the environment that the beginning of the new era of Anthropocene has been advanced (Steffen *et al.*, 2018). Indeed, significant variations in the Earth system have been detected by scientists as a result of intense and highly polluting human activities such as greenhouse gas (GHG) emissions, contributing to the warming of the planet. Considering current trends and future predictions, Bradshaw *et al.* (2021) have presented the major challenges to the Earth system resulting from intensive human activities. Among those, rapid and significant biodiversity loss including species and population has been reported. While this alone threatens mass extinction, it also causes a domino effect on the ecosystem as regards carbon sequestration, pollination, soil degradation, flood, frequency and capacity of fires (Bradshaw *et al.*, 2021, p. 2). Additionally, intensified societal production and consumption have contributed, on the one hand, to the annual ecological overshoot of the Earth's resources

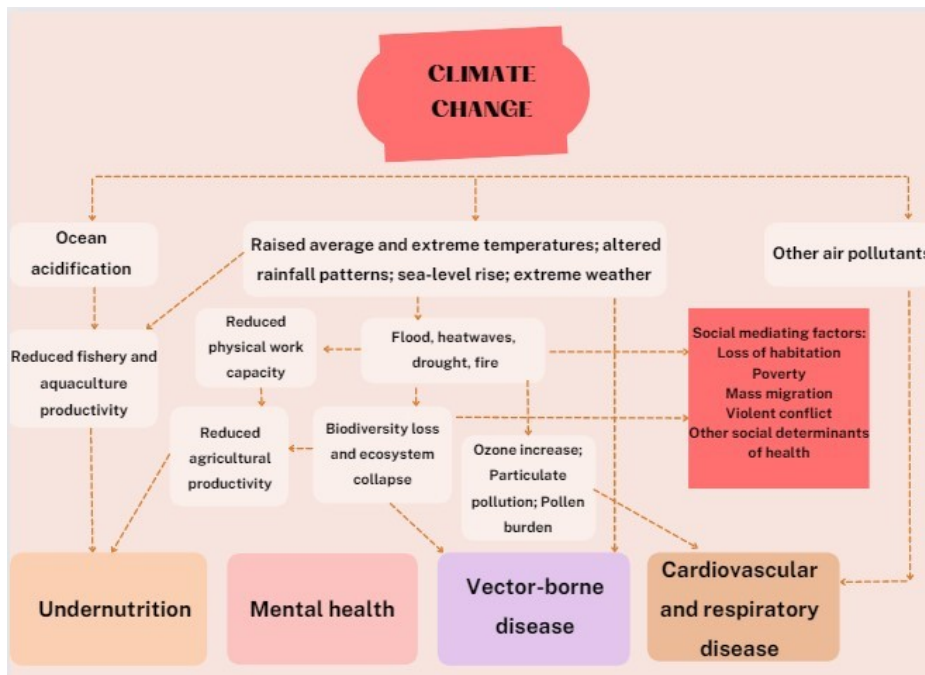
and, on the other hand, to increasing environmental pollution resulting from consumption waste (Bradshaw *et al.*, 2021, pp. 3–4).

Concurrent with ecological damages, changes in the trajectory of the Earth system in terms of temperature rise constitute another extremely urgent environmental challenge. As reported by Steffen *et al.* (2018), global temperature and sea levels during the Anthropocene have been increasing, altering the Interglacial fraction of which the Earth system is part and threatening the beginning of a Hothouse Earth which could last millennia. In their analysis, the authors investigated what the tipping point of the system is, that is the maximum temperature rise since pre-industrial levels that the system can tolerate to avoid starting a Hothouse Earth scenario and re-insert itself into the Glacial-Interglacial Cycle it belongs. In conclusion, while Steffen *et al.* (2018) argue that the threshold is still uncertain, they advance the proposal that this could be around 2°C and that the effort to prevent exceeding it requires collective human action.

As previously mentioned, being a part of the Earth system, such changes in the biosphere influence and challenge, in turn, societal lives. Indeed, while the influence of human activities on the biosphere represents one side of the relationship, the other side is that societies depend on the resilience of the rest of the Earth system (Folke *et al.*, 2016, pp. 8–10), making this a prerequisite for human welfare. As such, anthropogenic climate and environmental changes represent an extremely significant threat to social well-being in several ways, pressuring welfare states to adapt and respond to such risks.

Defined as a basic human need, health represents a priority research area in the study of environmental effects on social policy as it is considerably exposed to such changes. Indeed, climate and environmental change represent a threat to human health through several different paths, an overview of which is presented in Figure 2 (Watts *et al.*, 2015). Climate change is composed of diversified phenomena in the Earth system, including ocean acidification, additional air pollutants, raised average and extreme temperatures events such as altered rainfall patterns, sea-level rise, and extreme weather events (Watts *et al.*, 2015, p. 1863), each of which alone affects human health. Yet, as such phenomena do not happen independently to one another, but rather usually coexist and their impact on health is amplified, as in the case of air pollution alongside heatwaves, leading to a higher health risk (De Donato, 2014, p. 621).

Figure 2. Circle of greenhouse gas emissions, climate change and health effects.



Source: adapted from Watts et al. (2015), p. 1863.

In brief, the impact of such changes on health is likely to be both direct and indirect:

- Direct effects on health resulting from climate-induced and climate-intensified phenomena include for instance heatwaves and extreme weather events (Wolf *et al.*, 2013) such as storms, forest fires, floods, drought, leading to, among others, mental health illnesses such as post-traumatic stress disorder, but also to physical impacts and even mortality (Watts *et al.*, 2015; Ebi and Hess, 2017; Gough, 2017, p. 110);
- Indirect effects are mediated through the ecosystem and the socio-economic structures range for instance from agricultural losses, thus disrupting food supplies and affecting the quality and quantity of population nutrition, to changing patterns of vector-borne diseases (Ebi and Hess, 2017), facilitated for instance by mass migrations, high temperatures and decrease in air and water quality (Watts *et al.*, 2015; Bradshaw *et al.*, 2021).

Although climate change will constitute a threat at a global level, such an impact is likely to be differentiated among regions around the world. Indeed, as previously illustrated, climate change-related phenomena range, among others, from ocean acidification to extreme weather events and, even in the latter group, multiple aspects are involved – while some regions might

be hit by fire and droughts, others might be more subjects to floods. In other words, global regions will be hit with a different magnitude and affected by specific phenomena among those previously illustrated. This suggests that the consequent health risks and the territory preparedness level to respond to such effects are also differentiated.

Furthermore, even within the same region, the impact of climate change-related health risks leads to different outcomes within the population. The assessment of social vulnerability to health risks resulting from climate change phenomena represents an additional layer to be considered, depending on several factors:

1. *sensitivity*, thus how sensitive the health system is to weather and climate changes,
2. *exposure* to climate change-related events, including the frequency, intensity, and duration of such phenomena, and
3. *adaptation*, thus the measures taken to contrast such risks (Kovats, 2003, pp. 16–28; Ebi, Kovats and Menne, 2006).

In addition to such individual assessment, it is essential to consider that some portions of the population might find themselves already in a vulnerable condition, such as elderly people, children, people with low income and chronically ill people among others (Kovats, 2003, pp. 94–95), making them more exposed to such increasing health risks.

Lastly, it is noteworthy to mention that such effects of climate and environmental changes on social welfare are subject to local differences worldwide. On the one hand, countries around the world will experience the climate and environmental changes differently according to their specific geographical location. On the other hand, the social components of different countries significantly determine the possible means that countries and territories possess to respond to such changes.

2.3. Heatwaves: health risks and effects

Climate change as a broad process includes a variety of different transformations occurring on the Earth system that challenge social resilience and adaptive capacities of societies. The consequent effects on health include a much-diversified picture, affecting mental and physical health both through direct and indirect impacts. Among different phenomena, the effects of climate change on air temperature have been largely discussed by environmental health scholars. In the present section, the phenomenon of heatwaves will be considered in detail

concerning its relation to climate change, the consequent public health-risk outcomes, and the adaptation policies that have been pursued.

As an extreme weather event, heat waves are increasingly investigated in studies on health risks emerging from climate change. Heat waves are understood as phenomena leading to a prolonged and significant increase in the average air temperature in a given region (Maggiotto *et al.*, 2021, p. 1). Yet, despite such visibility of the phenomenon and flourishing academic discussions around it, a more precise and commonly agreed definition of heatwaves is still lacking, due to different interpretations of the phenomenon concerning the average temperature of the region under study (Zuo *et al.*, 2015; Xu *et al.*, 2016). In that regard, minimum mortality temperatures (MMT) represents a valuable indicator describing human adaptability to heatwaves in the local context, highlighting the different impact of heatwaves on countries and population groups (Yin *et al.*, 2019). Through the evolution of MMT over time, the adaptability of the population can be detected.

While there is no single standard definition of the heatwave, several common points on their impacts have been commonly identified. First, the impact of heatwaves greatly depends on the combination of environmental factors it is composed of, specifically temperature, humidity, solar radiation, wind speed, and pollution (Zuo *et al.*, 2015). Furthermore, to assess the impact of heatwaves, three risk factors are considered as most important, namely 1) their duration, 2) their intensity, and 3) their frequency (Zuo *et al.*, 2015). Given the current context, each of these three risk factors is deemed to be exacerbated by climate change, making heat waves longer, more extreme, and more frequent (Ebi *et al.*, 2021, p. 698) with consequently more severe effects on public health. Indeed, the likelihood of extreme heatwaves worldwide since 2000 (2003, 2006, 2007, 2010, 2014, 2015, 2017 and 2018) has been facilitated by anthropogenic climate change (Ebi *et al.*, 2021, p. 698) and future predictions estimate heatwaves to be even stronger and recurrent every two years from the 2050s onwards with Southern Europe being at the highest risk in Europe (*European Environment Agency*, no date).

Climate change affects human health in a variety of different ways, threatening populations' health as extreme weather events and hazards intensify. While an overview of the different effects of climate change on health has been presented above, a review of the impact of heatwaves on health outcomes will now be illustrated. Overall, the heat-health relationship has been mainly investigated regarding morbidity and mortality through time-series studies in different population groups, defining the most vulnerable subjects to such outcomes (Kovats,

2003; Mayrhuber *et al.*, 2018; Rocque *et al.*, 2021). Indeed, the major impacts of heatwaves on health systems can be briefly summarized as leading to an increase in hospital emergencies, ambulance callouts, and morbidity and mortality (Zuo *et al.*, 2015).

To begin with, the relationship between air temperature and population mortality has been described as V- and J-shaped, meaning that the mortality rates are lower with regional average temperature, and they tend to become higher as the temperature increases (J-shaped) or decreases (U- or V-shaped) (Ballester, 2003; de' Donato and Michelozzi, 2014). Among several causes, cardiovascular mortality and heat stroke mortality have been particularly investigated as health outcomes resulting from heat waves (Kovats, 2003; de' Donato and Michelozzi, 2014). Indeed, the increase in such death causes has been associated with heatwaves in terms of a short-term increase in mortality rates (Kovats, 2003; de' Donato and Michelozzi, 2014).

Additionally, the relationship between heat waves and different diseases has been subject to studies. While, on the one hand, heatwaves have been associated with an increase in cardio-respiratory diseases (as a joint cause with air pollutants concentration) (Kovats, 2003; de' Donato and Michelozzi, 2014), and long-term neurological outcomes resulting from heat stroke (Rocque *et al.*, 2021), the exacerbation of pre-existing conditions in mental and physical health has also been largely investigated as a risk factor for that population group. In particular, psychiatric, cardiovascular and pulmonary illnesses have been identified as the pre-existing chronic conditions most associated with considerable worsening leading to death outcomes during heatwave events (Mayrhuber *et al.*, 2018).

Furthermore, although less frequent among studies in that area, the impact of heatwaves on health has been associated with additional outcomes such as sunburn, heat stress, heat exhaustion, kidney failure, and heart attacks (Zuo *et al.*, 2015). Moreover, heatwaves have been investigated as a concurring factor in other health outcomes. When combined with high levels of humidity, heatwaves contribute to the increase in the feeling of discomfort and heat stress while together with air pollution, heat exacerbates the negative effects of the phenomena on health (de' Donato and Michelozzi, 2014, p. 621). Additionally, correlations between heat waves and birth outcomes have also been found, influencing length of gestation, birth weight and neonatal stress (Maggiotto *et al.*, 2021).

2.4. Healthcare adaptation strategies: responses to health risks from heat stress

The health threats resulting from heatwaves represent a major concern for public health, requiring an adaptation response in the health care and social care system. Yet, such threats affect the health of the population unequally, according to a person's individual levels of vulnerability to heat waves. As such, it is important to outline the most vulnerable groups within the population to which further attention has to be directed when designing adaptation policies. In this sub-chapter, I review the literature on social vulnerability to heatwaves and present some adaptation measures taken in different countries.

Social vulnerability to climate change has been largely investigated as a valuable tool for policymakers to design and target adaptation and mitigation policies (Kovats, 2003, pp. 16–28; 94–95). The vulnerability of each person to heatwaves depends on three fundamental factors:

1. their exposure levels,
2. their sensitivity,
3. and their adaptive capacity (Xu *et al.*, 2019, p. 2).

Based on such criteria, a considerably high number of studies has investigated differences in mortality and morbidity risk among different population groups.

Overall, people affected by **pre-existing illnesses and diseases** are identified as part of one population group particularly vulnerable. Subjects with pre-existing chronic illnesses are at the highest risk of dying during heatwave events, especially those suffering from cardiovascular disease, respiratory disease, disease of the central nervous system, psychological illnesses and persons with metabolic/endocrine gland disorders and diabetes (de' Donato and Michelozzi, 2014, p. 619). Additionally, further correlations between other diseases and heatwave effects have been investigated, as in the case of Xu *et al.*'s study (2019) on hospitalization and post-discharge mortality among people with Alzheimer's disease in Brisbane, Australia. In a conclusion, Xu *et al.* (2019, p. 3) explain that the nature of Alzheimer's disease can constitute a higher risk factor for heatwave-related morbidity and mortality and an exacerbation of the disease symptoms.

Furthermore, additional factor risks are determined by **socio-economic disparities** including a 1) low socio-economic status, 2) household structure and 3) marital status with people living alone being at the highest risk due to social isolation (Gronlund *et al.*, 2015, p. 456), 4) education level, 5) limited or no access to air conditioning and 6) living in an urban or rural context, with the urban environment being most subject to the urban heat island (UHI) effect

(D'Ippoliti *et al.*, 2010; de' Donato and Michelozzi, 2014, pp. 619–620; Ellena *et al.*, 2020). Indeed, the impact of the heatwave in the urban context is further aggravated as the global increase in temperature converges with the UHI (Fernandez Milan and Creutzig, 2015), where warmer temperatures are stored in cities as a consequence of darker surfaces of buildings and pavements and less vegetation compared to rural areas (Araos *et al.*, 2016, p. 54). Additionally, sex has been identified in several studies as associated with higher heat mortality rates, but it has been also noted that this might be related to longer life expectancy for women than men and, therefore, having more elderly women more vulnerable to heatwaves events (Ellena *et al.*, 2020).

Lastly and related to previous aspects, a crucial factor risk largely investigated by scholarly research is constituted by **old age**. Indeed, a great portion of studies on heat-health has focused on the risk factors that put the elderly population (defined in several studies as starting from >65 or >75) among the most vulnerable ones, identifying several factors related to their vulnerability:

- diminished thermoregulatory ability due to their age (reduced sweat gland output, reduced skin blood flow, smaller increase in cardiac output)
- increased likelihood of living alone
- increased likelihood of being physically inactive
- increased likelihood of suffering from a chronic disease
- increased likelihood of taking medications (Cheng *et al.*, 2018).

While major risk factors for heatwaves have been outlined above, it is noteworthy mentioning that local variations including additional features might influence people's vulnerability. As an example, acclimatisation represents an additional important factor considered (Wolf *et al.*, 2013). Furthermore, it is worth reminding that risk factors tend to overlap with each other (e.g., old age, chronic illness, and low socioeconomic status), thus further increasing the vulnerability of some specific people (Gronlund *et al.*, 2015). However, while such groups with overlapping vulnerability factors are indeed at the highest risk, a considerable portion might also live in dedicated care institutions, meaning that they can receive prompt care and are therefore in a different situation from those staying in their own homes. Such considerations of risk factors are therefore fundamental in planning adaptation and mitigation.

While it is important to highlight that mitigation policies are necessary to limit the ongoing climate crisis, from which clearly also health could benefit, complementary measures are

necessary (Vicedo-Cabrera *et al.*, 2018). Indeed, although some success in mitigation, current threats are visible and future predictions estimate that, even in a low-emission scenario, phenomena like heat waves will be intensified compared to pre-industrial levels (Austin *et al.*, 2015). As such, adaptation measures are required to tackle the increasing risks, in that case, related to public health.

Adaptation policies encompass all current and future actions pursued to mitigate the climate-related health effects (Ebi, Kovats and Menne, 2006). Such policies might either be anticipatory, thus taken before the occurrence of a climate change-related event, or responsive, thus taken after the phenomenon has happened (Ebi, Kovats and Menne, 2006). Considering heatwaves, most adaptation policies are classified as responsive ones, such as in the case of national adaptation plans adopted by several European countries after the 2003 heatwaves (Michelozzi *et al.*, 2010).

Studies on adaptation methods have focused on identifying different strategies adapted, both at an individual (Sampson *et al.*, 2013; Jay *et al.*, 2021), as well as a population level (Zuo *et al.*, 2015; Jay *et al.*, 2021), briefly summarised by the overview Table 1. Cultural and behavioural interventions are targeted at raising awareness and producing changes at an individual level, such that the risks arising from heatwaves are known by the population, who, in turn, can adapt to them (Zuo *et al.*, 2015) by applying several individual practices, such as using fans or ice towels (Jay *et al.*, 2021, p. 713). On top of individual-level strategies, structural/institutional as well as technological interventions are promoted at a population level, including measures such as heatwave warning systems and climate-adapting buildings (Zuo *et al.*, 2015). Overall, considerable importance in the adaptation has been given to urban planning strategies, including the expansion or creation of green areas (Jay *et al.*, 2021, p. 712), cooling centres (Sampson *et al.*, 2013, p. 476) and urban shading (Cheng and Berry, 2013, p. 306).

Table 1. Heatwaves adaptation strategies.

Individual-level	Population-level
<ul style="list-style-type: none"> • Rise in awareness • Behavioural changes • Use of air conditioning • Health promotion for people with pre-existing conditions 	<ul style="list-style-type: none"> • Warning systems • Social and public health prevention measures • Emergency protocols

Source: adapted from De Donato, 2014, p. 622.

Local adaptation strategies have also been frequently compared among each other, especially among European and OECD countries (Kovats and Ebi, 2006; Grewe and Blättner, 2011), as shared knowledge on and assessment of different methods contributes to knowledge-building, which might then influence the diffusion of valuable approaches. Such comparisons have been pursued both at a city-level as well as a country-level (Grewe and Blättner, 2011), especially concerning the widespread mechanism of the heatwave warning system, where considerable local variation in the adoption has been detected.

Furthermore, another strand of scholarly literature on adaptation policies has concentrated on the assessment of such measures, particularly 1) providing a framework for assessment (Ebi, Kovats and Menne, 2006), 2) evaluating the strategies (Maggiotto *et al.*, 2021), 3) highlighting barriers and limitations to the adoption of such policies (Wardekker *et al.*, 2012; Huang *et al.*, 2013; Pasquini, Cowling and Ziervogel, 2013), such as financial, administrative, cognitive constraints (Huang *et al.*, 2011) and 4) providing further recommendations to the local responsible government (Blashki *et al.*, 2011; Kravchenko *et al.*, 2013; Fernandez Milan and Creutzig, 2015), often combining more of those elements in the same article.

Overall, while the adaptation measures presented above contribute to reducing people’s vulnerability to heatwaves, actual adaptation in healthcare and social care systems has been less frequently analysed in scholarly research. Within this strand, Blashki *et al.* (2011) carried out a study on healthcare preparedness for climate change events in Australia, proposing a 3-points approach for the sector to adapt to heatwave risks, overviewed in Table 2.

Table 2. Heatwave preparation in the healthcare sector.

PERSONNEL	INFRASTRUCTURE	COORDINATION
Prepare the frontline of health workforce (e.g., ambulances and emergency services) to be prepared to manage the symptoms of heat stress	Develop strategies to ensure essential backup power supplies (e.g., for crucial air conditioning)	Develop fully integrated bushfire/heatwave health response plans (e.g., Heatwave plan)
Prepare, equip, and make available mobile personnel ready to respond to critical bushfire events	Develop capacity to deploy temporary infrastructure to ensure delivery of the range of health services required to respond to fire in affected regions	Heatwave warning systems and the use of pre-recorded health messages
		Collaborate with urban planning and housing regulators to advocate for more appropriate housing design

Source: adapted from Blashki et al., 2011, pp. 138S-139S; Greselin and Vaalavuo (2022).

To conclude, adaptation strategies represent a complementary measure to mitigation. While heat adaptation has been studied both on the individual as well as institutional level worldwide, the focus on health and social care adaptation has been less frequent. In the following chapter, I present the context in which I study adaptation, that is the social and health care in Italy.

3. A close-up: health and social adaptation in Italy

After a first literature review including the relationships among the different key concepts from the conceptual framework, I present the context in which these concepts are studied, that is the social and health care sectors in Italy. In this chapter, I first present the impacts of heatwaves in Italy and the consequent adaptation measures that have been introduced. Then, I briefly describe the social care and health care sectors in the Italian context, including sub-national differences.

3.1. Heat in Italy: risk factors and the state of the art

The global impact of climate change depends on region-specific characteristics, such as which phenomena (e.g., heatwaves, floods, droughts) a country is or might become most subject to. Globally, the Mediterranean climate-type regions, characterized by hot and dry summers followed by mild climate and rainfall during winter, have been identified as zones vulnerable to climate change due to area-specific features, including environmental as well as socio-economic reasons (Paz *et al.*, 2016; Gough, 2017). Considering geographical factors, the Mediterranean climate-type regions are distinguished by 1) their location between subtropical and mid-latitude zones as well as 2) their complex morphological features including mountainous areas and land-sea interactions, making them particularly subject to climate changes (Paz *et al.*, 2016). As for socio-economic features, the mild climate characterizing those areas attracts large flows of people, making them highly populated and urbanized areas, thus threatened by consequent risks such as the UHI effect (Paz *et al.*, 2016).

Since the exceptional European heatwave of 2003, a growing body of scholarly literature concerning climate change and health has arisen, including a niche focusing on the Mediterranean region and specifically investigating the health risks resulting from extreme temperatures and heatwaves (Wolf *et al.*, 2013). Indeed, in the case of heatwaves, the Mediterranean basin has been specifically investigated as a hot spot for such a phenomenon. While an increase in intensity, frequency, and duration of heatwaves in the Mediterranean basin has already been documented since the 1960s (Paz *et al.*, 2016, p. 2), a further increase in the phenomenon in Southern and Eastern Europe is expected by experts in the near future (de' Donato and Michelozzi, 2014, p. 622).

On the European shore of the Mediterranean basin, Italy has been identified as a country particularly vulnerable to heatwaves with consequent public health emergencies arising.

According to the WHO (2016), Italy has the highest heat-related daily mortality concerning both hot temperatures and overall summer temperatures. With future predictions suggesting an increase in intensity, frequency, and length of heatwaves even in a low-emission scenario, public health is and will continue to be severely threatened by such phenomenon. As projected by the WHO (2016, p. 2), in a low-emission scenario requiring intensive decarbonization, heatwaves can become as frequent as 10 days per year in 1990 up to 75 around 2100 while in a high-emission scenario the average for 2100 is 250 days per year.

Until now, changes in the air temperature have occurred in all major Italian cities, although to a different degree. The Italian Statistic Institute (ISTAT) annually reports climatic data on the variation in temperature and rainfall patterns in regional capital cities. Table 3 reports two indicators in temperature variations, that is anomaly on the average temperature in Celsius degrees and on the number of summer days, thus days in which the temperature is above 25 Celsius degrees (ISTAT, 2022a).

Table 3. Temperature anomalies in Italian regional capital cities in 2020.

Capital cities	Region	NUTS 1 area in Italy	Average temperature – anomaly in 2020 expressed in Celsius degrees (compared to 1971–2000)	Summer days - anomaly in 2020 expressed in days (compared to 1971–2000)
Aosta	Aosta Valley	North-West	+1.4	+41
Genoa	Liguria	North-West	+0.9	+10
Milan	Lombardy	North-West	+1.9	+18
Turin	Piedmont	North-West	+1.7	+16
Bologna	Emilia-Romagna	North-East	+1.8	+15
Trieste	Friuli-Venezia Giulia	North-East	+1.5	+26
Trento	Trentino South Tyrol	North-East	+1.3	+20
Bolzano			+1.3	+16
Venice	Veneto	North-East	+1.0	+8
Rome	Lazio	Centre	+2.0	+27
Ancona	Marche	Centre	+0.7	+1
Florence	Tuscany	Centre	+1.1	+1

Perugia	Umbria	Centre	+2.1	+35
L'Aquila	Abruzzo	South	+0.9	+22
Bari	Apulia	South	+0.3	+7
Potenza	Basilicata	South	+0.9	+12
Catanzaro	Calabria	South	+1.2	+17
Naples	Campania	South	+1.3	+6
Campobasso	Molise	South	+1.4	+9
Cagliari	Sardinia	Islands	+1.0	+13
Palermo	Sicily	Islands	+0.6	-9

Source: ISTAT (2022b, 2022c).

The ISTAT reports a steady increase in temperature averages in all regional capital cities in Italy in 2020 compared to the baseline period of 1971-2020 (ISTAT, 2022a). As seen in Table 3, Perugia, Rome, Milan, and Bologna have seen the highest variation in average temperature anomaly in 2020 whereas Aosta and Perugia have had the highest increase in the number of annual summer days. Thus, cities have experienced variations toward a hotter climate differently.

While research on heatwaves and health in the Mediterranean is still a niche (Wolf *et al.*, 2013, p. 265), studies on heat-related mortality and future projections including different Italian cities have been increasing in the last decades (Cristo, Mazzearella and Viola, 2007; Schifano *et al.*, 2009, 2012; D'Ippoliti *et al.*, 2010; Morabito *et al.*, 2012; Leone *et al.*, 2013; Scortichini *et al.*, 2018; Ellena *et al.*, 2020; Keppas *et al.*, 2021), suggesting the growing importance of the topic. Indeed, as social policy is focused on guaranteeing the well-being of the population and this is under threat due to heatwaves and other climate change-related hazards, adaptation to heatwaves represents a relevant topic for social policy scholars.

In line with the general trend of several European countries implementing an adaptation strategy after the European heatwave of 2003, the Italian national prevention plan of heat-health effects has been introduced by the Italian Department of Civil Protection and the Ministry of Health in 2004 (World Health Organization, 2016). As the heat-related impact on health is greater in urban contexts, the plan started including all regional capitals and cities having more than 200,000 inhabitants, which is then further extended to the 34 major cities in the peninsula (Michelozzi *et al.*, 2010; World Health Organization, 2016). Specifically, the

prevention plan included the components illustrated in Table 4, for each of which a brief description is also provided (Michelozzi *et al.*, 2010).

Table 4. Key components of the national heat adaptation plan.

Key points	Description
1. City-specific Heat Health Watch Warning Systems (HHWWS)	<ul style="list-style-type: none"> • Prediction models of city-specific mortality rates based on weather conditions • National warning bulletins for 27 cities, including the following 24, 48 and 72 hours according to 4 levels, with Level 0 being the zero-risk level to Level 3 being the heatwave alert
2. A rapid real-time mortality surveillance system	<ul style="list-style-type: none"> • Time series analysis of the relationship between weather and mortality
3. Local registries of subgroups of the population at risk	<ul style="list-style-type: none"> • Identification of groups at risk through population registries (in 17 cities) or general practitioners (GPs, in 8 cities) • Registries updated every year before summer
4. National prevention guidelines – actuated by local authorities	<ul style="list-style-type: none"> • Social interventions (educational campaign, telephone helpline, social support services, availability of air-conditioned places, educational programmes for social and health workers) • Health interventions (health surveillance of susceptible individuals, local registries of susceptible individuals, emergency protocols)
5. Local network for the distribution of the warning bulletin	<ul style="list-style-type: none"> • Creation of city-specific warning bulletins at the national level
6. Evaluation of warning systems and prevention programmes	<ul style="list-style-type: none"> • Mortality surveillance data

Source: adapted from Greselin and Vaalavuo (2022), Michelozzi *et al.* (2010).

Concretely, the realisation of the national prevention plans involves the participation of and collaboration among different actors, ranging from the Meteorological Service of the Department of Civil Protection to Municipal Registry Offices. At the national level, the Lazio Region Department of Epidemiology represents the National Coordination Centre responsible for managing city-specific warning bulletins while the local prevention plans and information networks are the responsibility of the local centre, that is usually the Local Civil Protection,

Municipality, and Local Health Authority (Michelozzi *et al.*, 2010). Overall, while local variations have been detected, studies assessing heat mortality before and following the introduction of the national heat-health prevention plan have generally indicated a decrease in the mortality rates of elderly people, suggesting a positive outcome resulting from the city-level strategies (Schifano *et al.*, 2012, p. 4). In this thesis, I particularly focus on the points concerning social care and health care adaptation, namely “local registries of subgroups of the population at risk”, “national prevention guidelines – social and health interventions”, and “local distribution of the warning bulletin”. To understand the context in which sub-national plans have emerged, I will now introduce the social care and health care sectors in Italy.

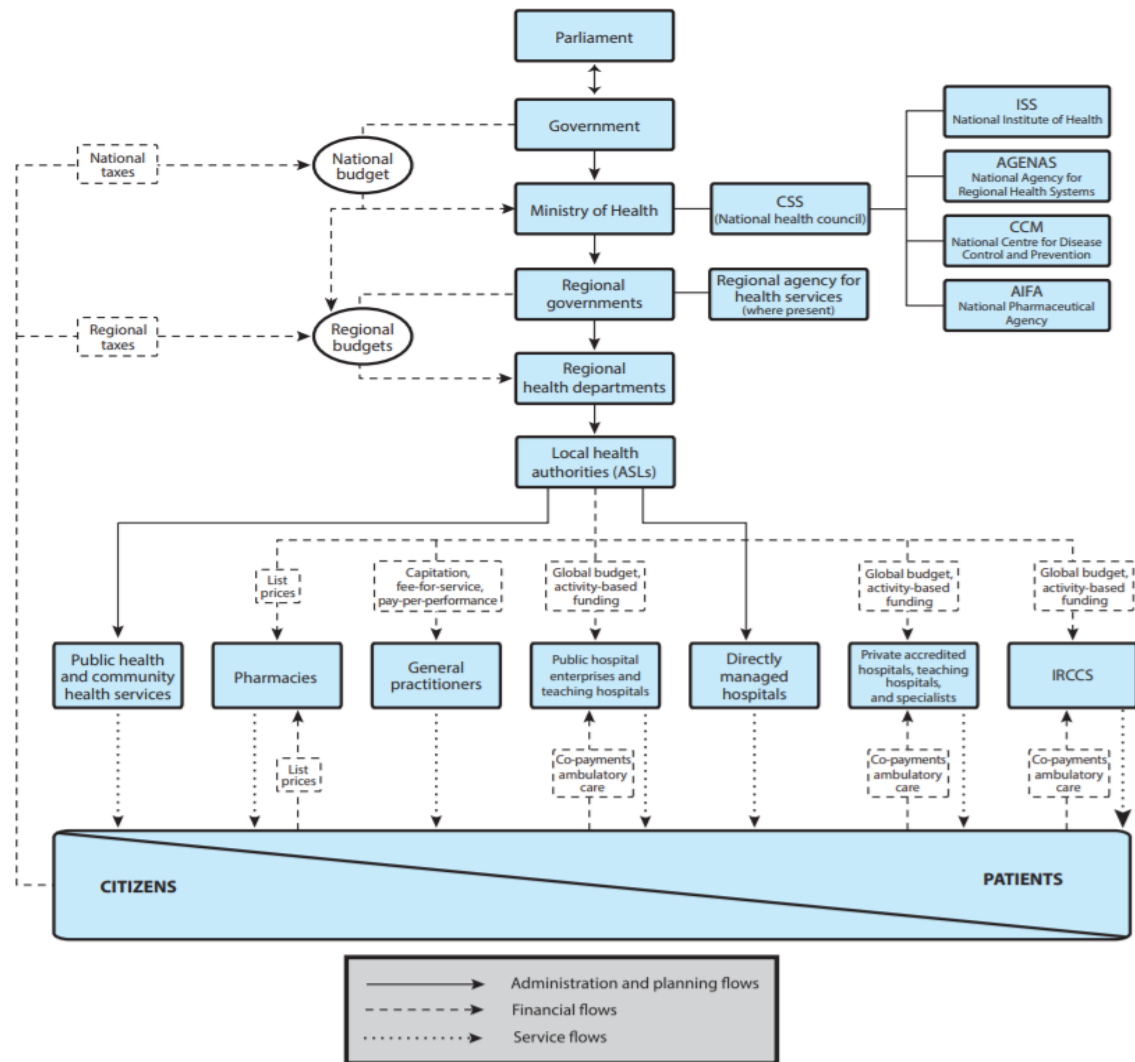
3.2. Selected policy fields: health and social care

Health and social care constitute two interconnected, albeit in most of the cases formally and institutionally separated, policy fields building up the welfare state. In the last decades, reforms in Italy have aimed at a deeper integration of health and social care due to a two-fold need related to an increasingly old population. On the one hand, this approach is related to an increasing reconsideration of “care” in more holistic terms and is not only strictly associated with medical care. On the other hand, this is associated with increased de-hospitalisation and de-institutionalisation of health and social care services (Tousijn, 2012).

Healthcare systems represent one of the institutions of welfare states, aiming at guaranteeing good health for the population. Studies on international comparisons of health systems have produced different categorisations and typologies, usually considering aspects such as organisation, funding, and access to the system (Wendt, 2009). Roughly, healthcare systems in modern welfare states have been commonly divided into Social Health Insurance (SHI) and (early or late) National Health Service (NHS) types. However, depending on the factors considered in creating such typologies, the outcome varies considerably.

Considering Italy, health care has universalistic features with the National Health Services being established in 1978. Gradually, the health system has been decentralised giving more responsibilities to regional and local bodies. As illustrated in Figure 3, the health system is organised through the National Health Service (Sistema Sanitario Nazionale, SSN) and involves different levels, namely national, regional, and local. At a national level, the objectives and principles of the health system are defined by the Ministry of Health, administered by regional health agencies, which are responsible for the delivery of the services at the local level (Ferré *et al.*, 2014).

Figure 3. The Italian health system structure.



Source: Ferré et al. (2014).

While the structure and the functioning of the healthcare system are more easily identifiable, social care organisation is by its nature much more fragmented. First, the targeting group of social care varies. Although social care can be directed toward children and adults, most of the care focuses on the life stages where most care is needed, thus in the early (early childhood education and care, ECEC) and late stages (elderly care). However, fragile adults (e.g., due to a disability or illness condition) are also recipients of social care (Daly and Lewis, 2000).

Secondly, the arrangements of social care are also diversified. To give an example, research on social care in different welfare states has highlighted dichotomies surrounding the world of care, such as those concerning public or private, formal, or informal, paid or unpaid care services (Daly and Lewis, 2000).

Thirdly, and related to the previous point, the complexity of social care has been also identified through research on the provision “mix”, conceptualised in the “welfare diamond” with family, market, state, and community composing the four corners. Those four actors represent the responsible subject of social care in welfare states and the degree of involvement of each of those in the care sector determines the social care “mix”. It is worth mentioning, however, that those “mixes” are not static, but rather, are shaped by changes and recent trajectories in European countries include a shrinking in the role of the state in favour of a “re-mix” of family, market, and community (Leibetseder *et al.*, 2017).

Considering Italy, social care policies have Bismarckian roots and were reformed twice in the 2000s. As an outcome, social care responsibilities have been shifted from the national to regional and local authorities, where the state is involved only in economic regulation (Bertin and Pantalone, 2018). However, increased decentralisation in organising and providing social care did not correspond to a transfer of funding resources from the national to the regional level, resulting in the development of a weak social care system (Kröger and Bagnato, 2017). Furthermore, due to a high decentralisation in social care, the organisation, funding, and governance of those services are locally differentiated (Bertin and Pantalone, 2018).

At a national level, there are some common features concerning social care. A comparative study by Anttonen and Sipilä (1996) on quantitative variations of ECEC and elderly care in Europe has provided information on the volume of those two services in Italy compared to other European countries. In Italy, while ECEC services are abundant, elderly care services are scarce. Additionally, considering the welfare diamond, social care in Italy is still predominantly dependent on family and community through domestic informal work (Gori, 2012). Indeed, social care is both less developed and institutionalised than health care in Italy.

As previously mentioned, health and social care are fairly decentralised and sub-national differences are visible. Since the publishing of *Three Worlds of Welfare Capitalism* by Esping-Andersen (1990), studies comparing, and clustering welfare states have proliferated. However, rooted regional differences in countries like Italy have challenged such classifications in international comparison. Considering health and social system, Bertin and Pantalone (2018) mapped regional health and social care and proposed sub-national clusters.

First, the authors considered health systems in terms of:

- 1) *funding*, either public, mixed, or private,
- 2) *service provision*, either public, mixed, or private,

- 3) *governance approach*, either hybrid (both gatekeeping and cost-sharing functions), hybrid with public prevalence (mixed but mostly toward gatekeeping) or public-hierarchical (strong gatekeeping and weak cost-sharing function).

Second, they classified social care systems through:

- 1) *subjects involved* in social care provision, either mixed (private, public, third sector and family) or mixed toward corporatism (strong cooperative dimension of the third sector),
- 2) *diffusion of traditional* (elderly care and health screening) *or innovative* (integrated care provided by public and private actors) *services*.

The analysis of regional health and social systems through the chosen dimensions resulted in six social care clusters and eight health care clusters, which suggest a much more complex fragmentation than the traditional North-South divide. Considering regional health care regimes, the following clusters have been identified:

1. public (primarily) both in funding system and in service provision, hybrid governance: Liguria, Tuscany, Umbria, Basilicata;
2. public prevalence in funding system, mixed in service provision, hybrid governance: Veneto, Marche, Molise, Abruzzo, Apulia;
3. public prevalence in the funding system, private in service provision, hybrid governance: Calabria, Campania, Lazio;
4. mixed in the funding system, public prevalence in service provision, hybrid governance: Emilia-Romagna;
5. mixed (primarily) both in funding system and in service provision, hybrid governance: Lombardy;
6. mixed in the funding system, public prevalence in service provision, hybrid governance (public prevalence): Friuli Venezia Giulia, Piedmont;
7. public (primarily) both in funding system and in service provision, public-hierarchical governance: Trentino-Alto Adige / South Tyrol;
8. public prevalence in the funding system, mixed in service provision, public-hierarchical governance: Aosta Valley, Sicily, Sardinia (Bertin and Pantalone, 2018).

As for regional social care regimes, the authors identified six different clusters:

1. generalised and generous system: Veneto, Emilia-Romagna, Lombardy, Friuli-Venezia Giulia;
2. generalised social system mixed with a corporative system: Trentino-Alto Adige / South Tyrol, Aosta Valley;
3. mixed structure: Liguria, Tuscany, Umbria, Marche;
4. consolidated, but less innovative: Piedmont;
5. residual with some corporative input: Basilicata, Molise, Sardinia;
6. minimal system: Abruzzo, Apulia, Calabria, Campania, Lazio, Sicily (Bertin and Pantalone, 2018).

When crossing clusters for social care and healthcare regimes, few regions share the exact same social and healthcare cluster, namely the three groups of 1) Liguria, Tuscany, Umbria, 2) Calabria, Campania, Lazio, and 3) Abruzzo and Apulia. In that regard, two points are worth mentioning from the crossing of clusters. On the one hand, there is no sharp division into a few crossed clusters of social and health care, but rather a variety of systems and, on the other hand, there does not seem to be a correlation between how social and health care developed across regions (Bertin and Pantalone, 2018). This results in fragmented and almost region-specific features – except for the three groups mentioned above in this paragraph – of joint social and health care systems with pronounced regional differences. Such differences, in turn, influence the quality and extension of local and regional services provided to the citizens across Italy and relate to the phenomenon of intra-country tourism to receive assistance, mainly health care, in other regions other than those of residence (Bertin and Carradore, 2016; Manna *et al.*, 2020).

To sum up, social care and health care in Italy are fragmented as, on the one hand, they are two distinct policy fields, and, on the other hand, they are subject to significant regional differences. When analysing social and health care processes and dynamics, such differentiations among the regions and policy fields need to be considered. As health care is more developed than social care in Italy, the health dimension could perhaps also appear to be predominant in heat plans compared to the social sphere. Furthermore, as the features and development of social and health care are regionally different in Italy, innovative and more generous regions could have a more comprehensive heat adaptation than regions with weaker social and health systems.

4. Methodology and methods

In the previous chapters, I have presented the conceptual and theoretical framework, which together with the context, builds up the relevant literature review for this thesis. This chapter focuses on the methodology and methods used in this thesis to answer the research question. It is divided into three different sections, including the qualitative comparative research design, the collection and selection of data, and the analysis of data through thematic analysis.

4.1 Research design

Heatwave episodes pose a significant threat to public health. The predicted intensification of such a phenomenon in Italy resulting from climate change makes it a priority for the healthcare and social care sector. While in Italy there is a comprehensive national heat plan with national guidelines, many responsibilities to implement the plan are left to local authorities, in line with the decentralised social and health care systems. As adaptation contributes to mitigating heat effects on population health, how *adaptation* and *vulnerability* are interpreted and realised at a regional and local level is crucial. Therefore, in this thesis, I tried to answer the research question: *How have cities and regions interpreted and realised adaptation to heat-related threats in social and health care?*

To answer the research question, I performed a sub-national qualitative comparative study. Comparative research scaling down to the sub-national level has several advantages, as it allows social scientists to gain a more accurate understanding of the interconnections among the different levels involved and it highlights local variation and divergent patterns within the same country (Snyder, 2001). In this thesis, the degree of decentralisation of social and health care provides a variegated picture in the national scenario, justifying the interest in analysing and comparing sub-national units. As the careful selection of case studies is imperative in sub-national comparison methods, I relied on the previous literature on sub-national social and health care systems in Italy to define which cities and regions to investigate (Jacob, 2015). The sub-national units under investigation are a number of regions and regional capital cities in Italy. Given the regional differences in social and health care systems, the choice of the regions and cities for this thesis is based on the social and health clusters the respective region is located (Bertin & Pantalone, 2018).

As the main purpose of the thesis is to investigate in detail and compare the adaptation strategies pursued at the regional and local levels, qualitative methodology suits this thesis best.

Frequently contrasted with quantitative research, qualitative research is a research process concerned with the “quality of things” that has been flourishing in the social sciences throughout the last decades (Mason, 2017). While often used as a synonym for qualitative analysis, qualitative research is a more encompassing term referring to the whole process and approach used in the research (Alasuutari, 1995).

The data used to perform the sub-national comparative study include official documents on regional and local heat plans from local authorities (Local Civil Protection, Municipality, Local Health Authority). While written documents are widely available as they range from newspaper articles to post-its and provide valuable data to study contemporary societies, they are still underused compared to other methods (e.g., interviews) in qualitative research. Despite being still less adopted than other methods, policy documents have become increasingly used as data in qualitative research (Rapley and Rees, 2018).

4.2. Data collection

In this section, I describe the process I conducted to collect and select the data. In a research process, data collection represents a fundamental step with the aim of “*provid(ing) materials for an empirical analysis of a phenomenon that a study is about.*” (Flick, 2018, p. 6) To turn the materials into data to be analysed, Flick (2018) advances several choices to be pursued by the researcher, namely 1) an interesting topic to study, 2) which aspects of the topic to focus on, and 3) which methodological approach to apply. Based on such methodological background, for my data collection plan, I followed the steps given in Table 5 below.

Table 5. From materials to data.

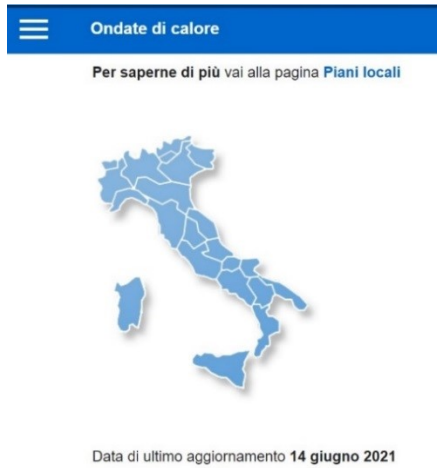
Topic under investigation	Heat adaptation in health and social care in Italy
Aspects to consider	Regional and local differences
Methodological approach	Comparative study using policy documents as data

Source: Flick (2018).

Following the preliminary stage to determine how to analyse the phenomenon under investigation, I then proceeded to the data collection process. In the case of this thesis, primary sources (policy documents at a regional and local level) constitute the data providing empirical evidence on the phenomenon. With regard to the topic of heat adaptation in Italy, a dedicated

website with news and a national map with local plans (Figure 4) has been created by the Ministry of Health and is currently active.

Figure 4. Map of Italy with local plans on the national website.



Source: retrieved from the Ministero della Salute (no date a).

Given the wide availability of policy documents on heat adaptation from different regions and cities on the national website, I started the data collection process from this platform. As illustrated in Figure 5, when selecting a specific region, the regional and city-specific plans are listed with the responsible body (column 1), useful numbers (column 2), opening hours (column 3) and services offered (column 4). When selecting the specific responsible body, a link directs the user to the dedicated regional/local webpage or plan.

Figure 5. Close-up on a specific region.

TIPO ENTE	NUMERI UTILI	ORARIO	SERVIZI OFFERTI
Comune di Genova - ASL 3	800995988	Lun - Dom dalle ore 8:00 alle ore 20:00	Informazioni sui servizi e sulle attività di socializzazione per gli anziani, compagnia, consigli su come affrontare il caldo, servizio di spesa e consegna farmaci a domicilio, altri servizi di prossimità
Regione Liguria	800593235	Lun - Dom dalle ore 8:00 alle ore 20:00	Informazioni sui servizi e sulle attività di socializzazione per gli anziani, compagnia, consigli su come affrontare il caldo, servizio di spesa e consegna farmaci a domicilio, altri servizi di prossimità
Comune di Savona	800 99 59 88	ore 8-20 tutti i giorni festivi compresi	Informazioni sui servizi per gli anziani e telesoccorso

Source: retrieved from the Ministero della Salute (no date b).

While the national platform indeed represents a valuable starting point, it does not constitute an exhaustive database, requiring additional steps for the data collection process. To first understand which regions/cities have elaborated a specific plan, a national assessment document (Ministero della Salute, DEP Lazio, 2021) has provided the basis for further investigation. At this point, the regions and capital cities with neither a regional nor a city-level plan have been discarded, an overview of which is provided in Table 6.

Table 6. Italian cities and regions coverage by regional and local plans.

	Region	Capital city	Other major cities included in the national plan
<i>Both regions and cities have a heat plan</i>	Piedmont	Torino	
	Aosta Valley	Aosta	
	Lombardy	Milan	Brescia
	Veneto	Venice	Verona, Padua
	Liguria	Genoa	
	Emilia-Romagna	Bologna	
	Umbria	Perugia	
	Campania	Naples	
<i>Only the region has a plan</i>	Sicily	Palermo	Catania, Messina
	Tuscany	Florence	
	Friuli Venezia Giulia	Trieste	
<i>Marche</i>	Marche	Ancona	
<i>The region and only one of the cities (Frosinone) have a heat plan</i>	Lazio	Rome	Civitavecchia, Frosinone, Latina, Rieti, Viterbo
<i>Only the cities have a heat plan</i>	Apulia	Bari	Taranto
<i>Neither the region nor the cities have a heat plan</i>	Abruzzo	L'Aquila	Pescara
	Molise	Campobasso	
	Trentino South Tyrol	Trento	Bolzano
	Basilicata	Potenza	
	Calabria	Catanzaro	Reggio Calabria
	Sardinia	Cagliari	

After checking the data available for different regions and cities, I have considered clusters of sub-national health and social care regimes (Bertin and Pantalone, 2018). Crossing clusters from health and social systems, I have focused on two sets of three regions that share the same

group, namely cluster 1) Lazio, Calabria and Campania and cluster 2) Liguria, Toscana and Umbria.

Discarding Calabria, as it is already known that no regional or local plan is available (see Table 6), I have proceeded to collect the policy documents for the regions and cities from regional (region, Department of Civil Protection) and local (municipality and Local Health Agency) websites. In the websites, the search function with the keywords "piano caldo" (heat plan), "piano ondate di calore" (heatwave plan), "ondate di calore" (heatwave) has been used. To double-check that the results were exhaustive, the search has been extended to the Google search function with region/municipality followed by the keywords (e.g., "Regione Liguria piano caldo"). While for some regions and cities a heat plan exists, a copy of such a document is not retrievable from the official websites. This has been the case for the regions Liguria and Toscana.

Once I retrieved the policy documents from Lazio, Campania, Umbria, Naples, Genoa, and Perugia, I selected those that were suitable for the analysis part. While the format is somewhat similar between them, I have discarded the regional and city plans from Campania and Naples as they were incongruent with the purpose of the analysis. In particular, for the city of Naples, the heat plan was mentioned on the webpage of the municipality, but the information available concerned social measures activated in case of emergency. While still interesting, the format and content would challenge the comparability of this heat plan to the other ones. With regard to the regional plan from Campania, the document contained brief general information on the services available and a list of all the local health authorities of the region with contacts of the responsible people for each of those. Again, the format and the content would have challenged the qualitative analysis. Thus, following the data collection and selection, Table 7 gives an overview of the documents that were selected to proceed with the qualitative analysis.

Table 7. Data for the analysis.

	TYPE OF PLAN	YEAR	LENGTH IN PAGES
LAZIO	Regional	2020	43
UMBRIA	Regional	2013	9
GENOVA	City	2021	6
PERUGIA	City	2014	34

To better understand the context in which those documents have been produced, I will briefly summarise the main points presented in the previous chapter. In 2004 the Italian Ministry of Health published the national heat adaptation plan with adaptation measures involving different actors, at the national, regional, and local levels. To define the responsible actors involved and outline the services available to adapt to and mitigate the effects of heatwaves, Italian cities and regions drafted their own regional and local heat plans. Both the national, regional and local plans are updated from time to time, meaning that since 2004 several versions have been published. While the national heat plans are renewed and published annually, regional and local plans are changed less frequently, which justifies the different publishing years from the selected heat plans. Additionally, while the format of regional and local plans is often similar, some plans contain more exhaustive information than others, explaining the differing length of pages.

4.3. Data analysis

After the data collection, I proceeded with the analysis of the data. One part of the wider process called qualitative research is qualitative analysis. Alasuutari (1995, p. 7) defines qualitative analysis as the “reasoning and argumentation that is not simply based on statistical relationships between 'variables'”, but rather similar to “riddle-solving” in the process and reasoning used to analyse and make sense of the data. Qualitative analysis comprises a wide array of different research methods and approaches applied to analyse qualitative data. Based on the theoretical framework and, consequently, the data, the chosen qualitative method needs to be “in harmony” with the rest of the research (Alasuutari, 1995, p. 42).

For this thesis, I decided to use thematic analysis, which is a widely recognised qualitative research method used to identify and analyse themes within a dataset (Nowell et al., 2017). Due to the high degree of flexibility of this method, thematic analysis can be adapted to a variety of different studies and can help highlight similarities and differences in the research dataset. As my interest in document analysis is related to specific factors, I identified the units of analysis through the following analytical questions:

1. Who are the actors mentioned?
2. What do the actors do?
3. Who are the vulnerable people?

For this step, I used the software Atlas.ti for qualitative data analysis and research. While most often researchers use Atlas.ti for the steps of coding and identifying themes or categories, I found it useful to start using it already at the stage of identifying the units of analysis, thus before generating actual codes. After uploading the four documents previously selected, I proceeded to ask the three analytical questions to my data and highlight the responses in the documents under three code groups (*Q1 WHO? Q2 WHAT? Q3 WHO VULN?*). Table 8 gives an overview of the result of this process. For each heat plan, I reported the number of codes found for each code group.

Table 8. Units of analysis.

Code groups	D1 - Perugia	D2 - Genova	D3 - Umbria	D4 – Lazio	Total
Actor - Q1	43	26	40	40	149
Action – Q2	44	16	35	53	148
Vulnerable - Q3	28	2	12	36	78

To ensure the trustworthiness of the research conducted with thematic analysis, I followed the step-by-step process outlined in detail by Nowell et al. (2017).

To begin with, I familiarised myself with my units of analysis. Through the export function, I downloaded the Excel sheet containing the units of analysis for each of the three code groups. From the Excel sheets, I reviewed the result of the previous step and corrected some technical errors. As one of the documents was uploaded in a format different from PDF, the units of analysis were not automatically retrieved and included in the Excel tables, so I added them manually to the files. Once all the units of analysis were included in the Excel files, I went through the dataset and reflected on the data.

In the following step, I reviewed my dataset and proceeded to generate initial codes. As mentioned by Nowell (2017), I tried to consistently apply the same technique to all of the data. In that regard, having done the process of coding in a short time period has helped to maintain the approach constant throughout the whole time. Additionally, the conceptual framework and previous knowledge of the context in which the documents have been produced allowed me to make more sense of the data.

In the process of coding, I worked on the three Excel sheets previously exported from Atlas.ti, adding a column to the right of the units of analysis to write the respective code. An example of this process is shown in Table 9.

Table 9. Example of coding.

	UNIT OF ANALYSIS	CODE
Q1	associazioni di volontariato	third sector organisation
Q2	L'insieme della parte anagrafica e di quella valutativa costituirà l'Anagrafe dei suscettibili.	registry of vulnerable people
Q3	vivere in ambiente metropolitano	living in an urban setting

The first coding process resulted in a broad number of codes. At this point, I identified different categories in which the units of analysis and codes can be grouped together before moving to define themes. To do so, I made use of basic functions on the Excel sheets through different colour coding. This step allowed me to better visualise the codes generated in the previous step and search for common grounds to generate possible categories. Thereafter, I added an additional column aside from the code column to include the category in which the code has been included. An overview of the categories generated, and the codes included in each category is presented in Table 10.

Table 10. Categories identified from codes.

Code groups	Categories	Codes included
Actors (Q1) <i>8 categories</i>	health agency	health district, hospital assistance centre, local health authority, regional health authority
	public institution	city, municipality, region, municipal social services, local coordinator
	civil protection and police forces	civil protection, traffic police
	non-profit	third sector assistance services, volunteer
	national-level services and bodies	meteorological service, national coordination centre, Ministry of Health
	health personnel	general practitioner, medical personnel (in hospitals)
	care structures	health institutes, nursing homes, hospitals
	social services personnel	social workers, home care

Actions (Q2) <i>11 categories</i>	internal organisation and coordination activities	create heat plan, contribute to heat risk prevention, be local responsible centre, define activation levels and pursue local heat plan, send the name of responsible people to local coordination centre, define activation levels, map interventions to vulnerable people, arrange additional measures, alert institutions to host people at risk, organise collective and individual protection, define levels of activation, regional guidelines for heatwaves effects, additional logistics measures, monitoring activities, draft a heat waves operation plan, send the data and information at regional and national level, creation of a technical group, actuation of operation plan, contact with the municipality, social services, protection of elderly people at risk, identify a responsible person, coordinate prevention plan, notify mortalities, database of heat mortality, activate measures to support the regional plan, ensure application of the procedures, inform social and health institutes about daily risk levels, monitor micro-climatic characteristics of recovery spaces, provide information about services, identify an hospitalisation space
	meteorological forecast	meteorological data, daily view of meteorological data, publish a meteorological bulletin for 72 hours
	define main target group	create a registry of vulnerable people, receive the registry of vulnerable people, classify vulnerable people according to risk level, take a census of vulnerable people, identify vulnerable people, define the most vulnerable, define people most in need, evaluate the heat susceptibility level of

		people, include patients at highest risk, add information of socio-demographic health and drugs intake conditions of patients
	HHWWS	adhere to national HHWWS
	external communication	spread information on risks and recommendations, activate the spread of information on risks and recommendations, provide information about services, spread the information through municipality general practitioners health institutes media and official websites, contact with civil society, contact with media to spread information, media communication and information, spread the information through the networks
	emergency locations and transfers	arrange emergency spaces for people at risk, prepare transfers of people at risk, activate social and health logistic support for transfers, transfer of people at risk, notify hospitalisation proposal, introduction of an airconditioned space
	awareness-raising	check the understanding and knowledge of risks and recommendations from people at risk, stimulate contact between people at risk and their general practitioner, raise awareness about risks and recommendations, informative activities, awareness-raising for vulnerable people, realisation of a mobile phone application, raise awareness for relatives of elderly and disabled people, contact patients at risk and their families, discuss with the general practitioner
	active health surveillance	organise rapid and continuous surveillance, activate surveillance of people at risk, activate surveillance of non-transferred people at risk, intensify surveillance and assistance of people at risk, active

		surveillance of people at risk and contact with their relatives, assistance to vulnerable groups, monitoring patients, add patients to surveillance, discuss the surveillance with general practitioners, home care for discharged people at risk, assistance to vulnerable groups, monitoring of vulnerable people
	phone help	telephone connections
	support to social and health workers	counselling for social workers, support to general practitioners and health workers, awareness raising for vulnerable people and health workers, raise awareness with medical and paramedical personnel, inform medical and paramedical personnel and social workers, call the general practitioner
	treatment and air-conditioning	adapt therapies for people at risk, reinforce the use of airconditioned spaces for patients at risk, favour air-conditioned places for patients, enhance home delivery, call a doctor
Vulnerable (Q3) <i>8 categories</i>	socio-demographic	fragile people due to health demographic or socio-economic factors, marginalised and socio-economically disadvantaged, personal and social factors, women, single and widowed, socially deprived, low income, low education level, socio-demographic factors, gender, civil status,
	old age	elderly over 65 years, fragile elderly
	young age	new-born, infants
	mental health	mental disease
	physical health	overweight, chronic disease, restricted to bed, disabled, health disease, comorbidity, health indicators,
	medicine	taking drugs
	in treatment	hospitalised

	housing and environment	exposed to negative environmental conditions, environmental factors, living in an urban setting, housing characteristics
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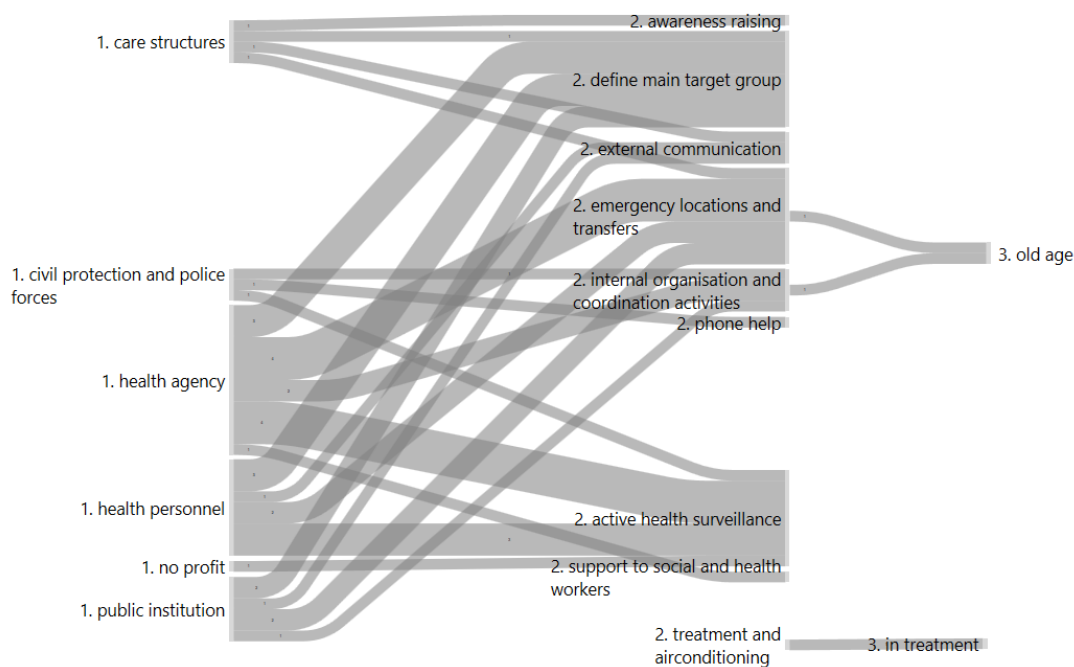
On Atlas.ti, I used the code function to group all codes into 27 categories. Table 11 shows the distribution of categories in the four documents, with colours ranging from pale grey (least frequent) to black (most frequent).

Table 11. Distribution of categories.

		Perugia	Genova	Umbria	Lazio	Totals
Actors	○ 1. care structures	5	3	1	3	12
	○ 1. civil protection and police forces	8	1	2	1	12
	○ 1. health agency	11	9	17	5	42
	○ 1. health personnel	3	7	1	15	26
	○ 1. national-level services and bodies	-	1	4	3	8
	○ 1. non-profit	2	-	1	1	4
	○ 1. public institution	12	3	14	6	35
	○ 1. social services personnel	2	2	-	6	10
Actions	○ 2. active health surveillance	7	-	2	14	23
	○ 2. awareness raising	6	3	2	6	17
	○ 2. define main target group	3	3	10	5	21
	○ 2. emergency locations and transfers	5	5	3	-	13
	○ 2. external communication	5	1	2	1	9
	○ 2. HHWS	-	-	1	3	4
	○ 2. internal organisation and coordination activities	14	3	12	13	42
	○ 2. meteorological forecast	-	-	3	1	4
	○ 2. phone help	2	-	-	-	2
	○ 2. support to social and health workers	2	1	-	3	6
	○ 2. treatment and air conditioning	-	-	-	7	7
	Target	○ 3. housing and environment	2	-	1	4
○ 3. in treatment		2	-	2	5	9
○ 3. medicine		2	-	1	1	4
○ 3. mental health		3	-	1	1	5
○ 3. old age		4	2	1	4	11
○ 3. physical health		11	-	3	10	24
○ 3. socio-demographic		2	-	2	10	14
○ 3. young age		2	-	1	1	4

After the coding process has ended with 27 categories identified (8 for Q1, 11 for Q2 and 8 for Q3), I started to search for themes, which DeSantis and Ugarriza (2000) described as “an abstract entity that brings meaning and identity to a recurrent experience and its variant manifestations. As such, a theme captures and unifies the nature or basis of the experience into a meaningful whole”. To do so, I analysed the co-occurrence and distribution of categories on Atlas.ti. Figure 6 overviews the co-occurrence of categories in all the documents.

Figure 6. Co-occurrence of categories in Atlas.ti.



In thematic analysis, themes can be either generated inductively (thus from the data) or deductively (thus from previous research and theoretical framework) and researchers are required to state which approach is used in their research (Nowell et al., 2017). For the data analysis of this thesis, I used an inductive approach.

Once I completed a preliminary phase of defining themes, I checked whether some changes were required. As Nowell et al. (2017) mention, recoding (some parts of) the dataset can be expected in this step and themes can be revised by the researcher. To give an example, for some, I merged previously divided themes into a single theme while for others I revised the theme to better reflect the content of the codes and, therefore, of the units of analysis. Indeed, choosing the name of the theme is an extremely important step as it needs to immediately recall

to the reader the meaning and content of the theme (Nowell et al., 2017). However, as pointed out by Nowell (2017), researchers could theoretically never stop revising themes and need to decide when to end the process.

At this point, I defined the following themes to fit together in the whole story:

1. Intersectoral cooperation
2. Theoretically vulnerable people vs services recipients
3. Main emergency measures for care: home & transfer

As previously mentioned, for the last and most important step of thematic analysis, which is identifying themes, I decided to use the codes co-occurrence analysis tool provided by Atlas.ti to outline themes emerging from the data. While this represents a valuable means to do thematic analysis and understand relations in the database, it is worth mentioning the limit of the tool in that some relationships between different codes and categories might not have been captured by co-occurrences. Therefore, I integrated the findings by analysing and discussing further also some codes and categories distribution in the database for themes 2 and 3. I excluded theme 1 from this process as, differing from the other themes, it lays more on the relationship between actors and measures and would not benefit from such integration. The findings of the analysis will be presented in the next chapter.

5. How have cities and regions interpreted heat-health adaptation?

In this chapter, I present the findings of the thematic analysis conducted as part of the thesis following Nowell *et al.* (2017), who point out that for each theme, the researcher is required to write a detailed analysis and tell its story. In this findings chapter, I describe each theme separately and consider how each theme is present or not in the heat plans from the chosen cities (Perugia and Genova) and regions (Umbria and Lazio). To do so, I 1) looked in each co-occurrence which of the four documents included the relationship and 2) for themes 2 and 3 also considered the distribution of categories across the documents.

After describing the identified themes, I proceed to the report of the findings where general observations emerging from the data collection and selection processes are integrated into the joint discussion of the three themes for every region and city. The findings will be further discussed with previous literature in the subsequent chapter.

5.1. Theme 1 – Intersectoral cooperation

The first theme emerging from the coding and codes co-occurrence processes is intersectoral cooperation. While performing the codes co-occurrence, the expectation was to find clear connections between actors, measures, and target groups, identified with the three analytical questions (who are the actors, what do they do, who are the vulnerable people). However, as seen in Figure 6 (p. 43) with codes' co-occurrences, the picture has been much more diversified. The connections among actors and actions did not appear to be clear with one specific actor involved in only one of the measures, but rather 1) actors are involved in multiple measures and 2) measures result from joint actors' collaboration, calling for intersectoral cooperation.

The analysed documents show that actors in the health (health personnel, care structures, health agency), public and civil sector (civil protection and police forces, public institutions, non-profit) are involved in the implementation of the social and health measures from the heat plan. The actions are not related to one of the actors independently (except for phone help, awareness-raising, support for social and health workers), but rather it seems that actors from the health and social sphere cooperate on each task, showing the interconnectedness of social and health aspects in the heat plan. This is seen for instance in the following extracts from the local heat plan of the city of Perugia (extract 1) and the regional heat plan from the Region of Lazio (extract 2).

Extract 1: the preparation of emergency locations to host people at risk [organised] by municipalities and health districts [which are part of the local health authority].¹ (Piano comunale di gestione delle ondate di calore 2021; city of Perugia)

In extract 1, the cooperation among different actors includes both fields of health and social care. While at first, it might seem ambiguous that public institutions are so actively involved, it is noteworthy recalling that social care in Italy is managed by regions and municipalities independently and they are the responsible bodies for providing social care services.

Contrasting with extract 1, where both actors from social and health care are mentioned, in extract 2, the interaction of different actors and the complementarity of their actions comprises only the health sector. However, also within the same sector, health actors operate at different layers and have different responsibilities.

Extract 2: The regional programme is based on the following elements: [...] active health surveillance of people at risk by general practitioners [is] integrated into the care activities of local health agencies.² (Piano operativo regionale di intervento per la prevenzione degli effetti sulla salute delle ondate di calore in presenza dell'epidemia covid19; Region of Lazio)

As seen from extract 2, active health surveillance is tied more to the general practitioner, who most often represents the first direct contact of citizens with health care in case of need or emergency, and this is done at the patient's home. This measure seems to complement other health care measures performed by the local health agency, which operates at a higher level than general practitioners, coordinating the activities of pharmacies, general practitioners and both public and private hospitals in the province and municipalities that are part of a city.

Intersectoral and even intra-sectoral cooperation depicts how social and health care interact in responding to an emergency that threatens the population's health and well-being, as heatwaves

¹ Original text: *“la preparazione, da parte dei Comuni e dei Distretti sanitari, di ambienti di emergenza per ospitare le persone a rischio”*.

² Original text: *“Il programma regionale si basa sui seguenti elementi: [...] la sorveglianza attiva dei soggetti a rischio da parte dei MMG integrata con le attività dei servizi di cure primarie delle aziende ASL”*.

do. Adaptation as a response to climate change effects thus requires collaboration from different actors in the society, in this case from public institutions to health workers and the third sector, with shared responsibilities.

When considering codes co-occurrence for the regions (Umbria and Lazio) and the cities (Perugia and Genova) more specifically, the picture is more differentiated. This is overviewed in Table 12. As seen from the table, for actors on the health side, although with involvement in different measures, health agency is mentioned in all four documents and health personnel in all except for the region of Umbria. Care structures, on the other hand, are mentioned as involved in several measures only in the heat plans from the two cities of Perugia and Genova.

Considering actors outside the health sphere, the co-occurrence of non-profit actors and civil protection and police forces with some of the measures has been found only in the heat plan from the city of Perugia. Measures in which public institutions are involved have been identified only in the city of Perugia and the region of Umbria.

Table 12. Codes co-occurrence for intersectoral cooperation.

Who	What	Where
care structures	awareness-raising	Perugia
	define main target group	Perugia
	emergency location and transfers	Genova
	external communication	Perugia
civil protection and police forces	active health surveillance	Perugia
	internal organisation and coordination activities	Perugia
	phone help	Perugia
health agency	active health surveillance	Perugia, Lazio
	define main target group	Umbria, Genova
	emergency locations and transfers	Umbria, Perugia, Genova
	internal organisation and coordination activities	Umbria, Perugia
	support to social and health workers	Genova
health personnel	active health surveillance	Lazio
	define main target group	Perugia, Genova, Lazio
	emergency locations and transfers	Genova
	external communications	Perugia
non-profit	active health surveillance	Perugia
public institution	define main target group	Umbria, Perugia

	emergency location and transfers	Umbria, Perugia
	external communication	Perugia
	internal organisation and coordination activities	Umbria

5.2. Theme 2 – Theoretically vulnerable people vs services recipients

The second theme emerging from the analysis of the data concerns theoretically vulnerable people versus service recipients. As previously anticipated in the categories' frequency, different (theoretically) vulnerable population groups are mentioned in the four documents, with physical health, socio-demographic characteristics and old age being the three most frequent grounds for vulnerability among the population. Other factors, such as housing and environment, infancy, mental health, people in treatment and taking medicines are less frequently mentioned.

When analysing the documents, what emerges is that the vulnerable groups are mentioned in different parts of the heat plans. First, they are mentioned when acknowledging the factors that influence vulnerability (such as physical health or socio-demographic factors in the measure of defining the main target group), and second, when describing the measures to be implemented. An example of the first case is presented in extract 3 from the local heat plan from the city of Umbria, where a broad range of different factors is considered as influencing the vulnerability of a specific group of people.

Extract 3: [The following] are considered potential people at risk: elderly people above and including 65 years old; new-born and infants below 1 year old; people with a mental disease; overweight people with increased difficulty dispersing heat; people with a chronic disease; people assuming medicines or drugs; people who cannot move from their bed; hospitalised people; people negatively affected by socio-economic and marginalisation factors; people exposed to negative environmental conditions.³ (Linee di

³ Original text: “Sono considerati potenziali soggetti a rischio: gli anziani con età pari o superiore a 65 anni [...]; i neonati ed i bambini al di sotto di 1 anno [...]; i soggetti con malattie mentali [...]; i soggetti obesi che hanno maggiori difficoltà a disperdere calore; i soggetti portatori di malattie croniche [...]; i soggetti che assumono farmaci o sostanze [...]; i soggetti confinati a letto [...]; i soggetti ospedalizzati [...]; i soggetti sui quali incidono negativamente fattori socio-economici e di marginalizzazione [...]; i soggetti esposti a condizioni ambientali negative [...].”

indirizzo regionali per la prevenzione e la gestione degli effetti del caldo sulla salute;
Region of Umbria)

Despite recognising that the grounds for vulnerability are multifaceted and therefore that the definition of vulnerable population group lays on those factors, Figure 6 shows that the measures implemented only focus on elderly people and people in treatment (in care or health structures). An example of implemented measures directed exclusively toward vulnerable elderly people is presented in extract 4 as part of the local heat plan from the city of Genoa.

Extract 4: As in previous summers, to protect fragile elderly people in the event of an excessive heat wave (levels 2 and 3 from the national surveillance system), also in summer 2020 the local health authority 3 in Genoa will activate short hospitalisation up to 10 days for fragile elderly people presenting a high susceptibility risk to heat stress.⁴ (Azioni proposte per fronteggiare le situazioni a rischio di danni alla salute da ondate di calore degli anziani residenti nel territorio della ASL3 genovese nell'estate 2021; city of Genoa)

There is therefore an incongruence between those that are theoretically considered vulnerable people due to the factors previously mentioned and the service recipients resulting from the heat plans. At this point, it is worth noting that some of the documents refer to “vulnerable people” in general terms when mentioning specific measures (for instance active health surveillance) in the heat plans. This can be seen for instance in extract 5 from the regional heat plan from the region of Lazio. In that case, as the ground for the vulnerability of the target people was not specific enough to allow the inclusion in the coding (e.g., physical health), some connections between measures and service recipients could not be included and presented here.

⁴ Original text: “Al fine di tutelare gli anziani fragili nel caso di Ondate di calore eccessivo (livelli 2 e 3 del Sistema di Sorveglianza Nazionale) così come nelle estati precedenti anche nel 2020 saranno attivati dall’ASL3 Genovese percorsi di ricovero breve della durata massima di 10 gg per anziani fragili che presentino un rischio elevato di suscettibilità allo stress termico”.

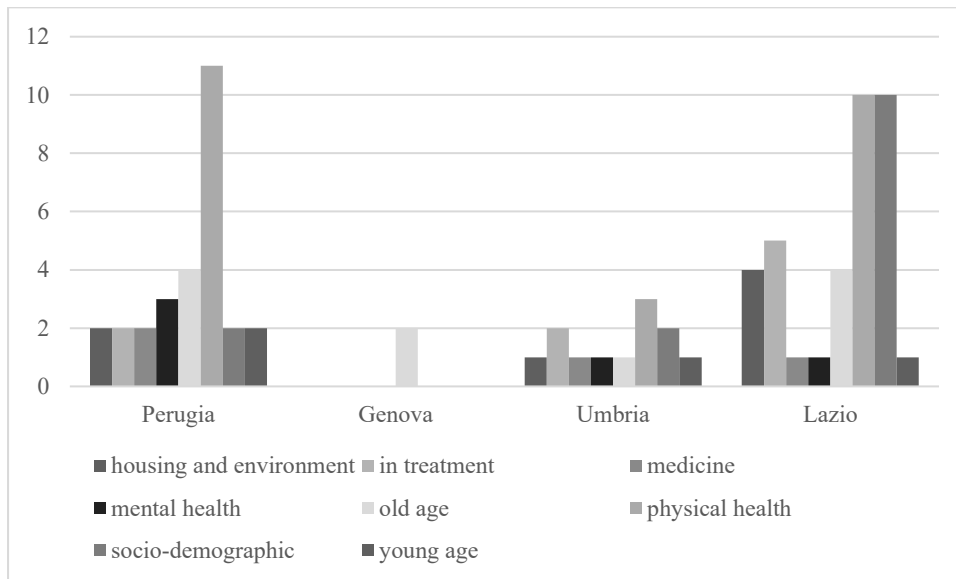
Extract 5: The social worker identifies and provides active health surveillance for people at risk and prepares the appropriate interventions.⁵ (Piano operativo regionale di intervento per la prevenzione degli effetti sulla salute delle ondate di calore in presenza dell'epidemia covid19; Region of Lazio)

The choice to address vulnerable people in the heat plans in general terms, rather than specific, also represents a significant finding. As seen from the analysed heat plans, defining vulnerable people is related to shared responsibilities among health agencies, health personnel, care structures (especially hospitals) and public institutions (in that case the municipality). Information on civil (age, household structure, social support) and health conditions are therefore crossed with each other to constitute the registry of people vulnerable to heatwaves. As the distribution of vulnerable people (and different vulnerability grounds) within the region, or even city, could be different, the decision of leaving the term more vague (people at risk) could contribute to acknowledging these spatial diversities and keep the possibility of directing interventions to the vulnerable people in the specific area. However, as the vulnerability ground of different groups focuses on specific characteristics, which mainly interfere with their thermoregulation (for instance through medicines, impossibility to move from the bed, obesity), the fact that the same intervention would be proposed to everyone represents a relevant finding in terms of vulnerable groups' needs and adopted measures.

After considering the theme at a general level, I consider the findings for the different cities and regions. When disaggregating codes co-occurrence from Atlas.ti in the different documents, the results show that the heat plan measures involve people in treatment for the region of Lazio and elderly people for the city of Genova while no co-occurrence was detected for the region of Umbria and the city of Perugia. Besides the codes' co-occurrence, it is significant to also consider the distribution of categories in the four heat plans reported in Figure 7.

⁵ Original text: “L’operatore di assistenza sociale individua e sorveglia i soggetti a rischio e predispone gli interventi opportuni”.

Figure 7. Grounds of vulnerability in the four heat plans.



Since in this thesis I decided to use a qualitative approach, the purpose of this figure is not to discuss the differences in the frequency of some of the factors compared to others, but rather to highlight the presence or absence of mentioning those factors in the heat plans. While the city of Perugia and the regions of Umbria and Lazio mention several factors as grounds for vulnerability among the population, the city of Genova only recognises old age in the heat plan.

5.3. Theme 3 – Main emergency measures for care: home & transfer

The third theme discussed regards the main emergency measures adopted during the heatwave emergency. In the heat plans, the measures that are mentioned can be roughly divided into those that are performed 1) before, 2) during, and 3) after the heatwave emergency. The measures most frequently mentioned in the codes co-occurrence are active health surveillance and emergency locations and transfers to those locations. While indeed both require planning before the emergency, the actual measures are mostly carried out during days of intense heat stress.

During a heatwave emergency, actors use a double approach to help vulnerable people, that is 1) in their own homes and 2) in care structures. For some vulnerable people, care structures, health agencies, health personnel, and public institution contribute to identifying emergency locations and organising transfers to those places during heat emergencies. In extract 6 from

the local heat plan of the city of Perugia, civil protection is involved in organising the emergency transfers to care structures.

Extract 6: to the limit of operational capabilities, [the Civil Protection responsible person] realises the transfer to host areas of people “at-risk” or those who request it.⁶ (Piano comunale di gestione delle ondate di calore 2021; city of Perugia)

Additionally, through active health surveillance, civil protection and police forces, non-profit actors, health agency and health personnel contribute to monitoring vulnerable people in their own homes. This measure is mentioned for instance in extract 7 from the regional heat plan from the Region of Lazio.

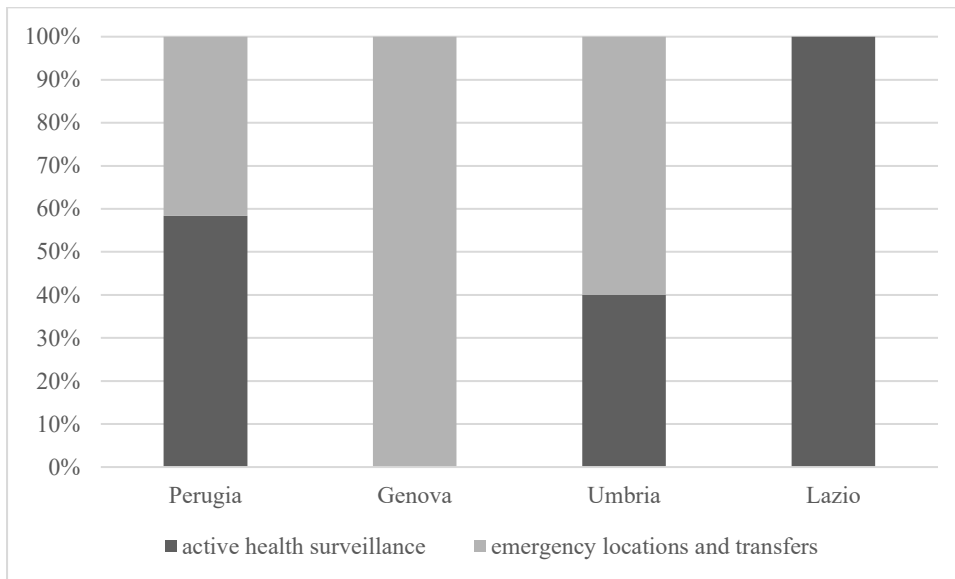
Extract 7: Active surveillance of people at high risk: make a check-up visit possibly within the following 48 hours.⁷ (Piano operativo regionale di intervento per la prevenzione degli effetti sulla salute delle ondate di calore in presenza dell'epidemia covid19; Region of Lazio)

Considering the codes co-occurrence for the chosen cities and regions, the results are again diversified. While active health surveillance is mentioned in co-occurrence with several actors in the heat plans from the city of Perugia and the region of Lazio, the co-occurrence of emergency locations and transfers with the actors is mentioned for the cities of Genova and Perugia and the region of Umbria.

⁶ Original text: “nei limiti delle capacità operative [il Responsabile della Protezione Civile] esegue il trasferimento nelle aree di accoglienza dei soggetti “a rischio” o di chi ne faccia richiesta”.

⁷ Original text: “Sorveglianza attiva dei soggetti a rischio elevato: effettuare una visita di controllo possibilmente entro le 48 ore successive”.

Figure 8. Distribution of home surveillance and transfers in the heat plans.



To integrate the results from the codes' co-occurrences, Figure 8 reports the distribution of the categories for the measures mentioned in the four heat plans, specifically concerning active health (or home) surveillance and emergency location and transfers. While the city of Perugia and the region of Umbria mention both home surveillance and emergency transfers, the city of Genova refers only to transfers and the region of Lazio only to active health surveillance.

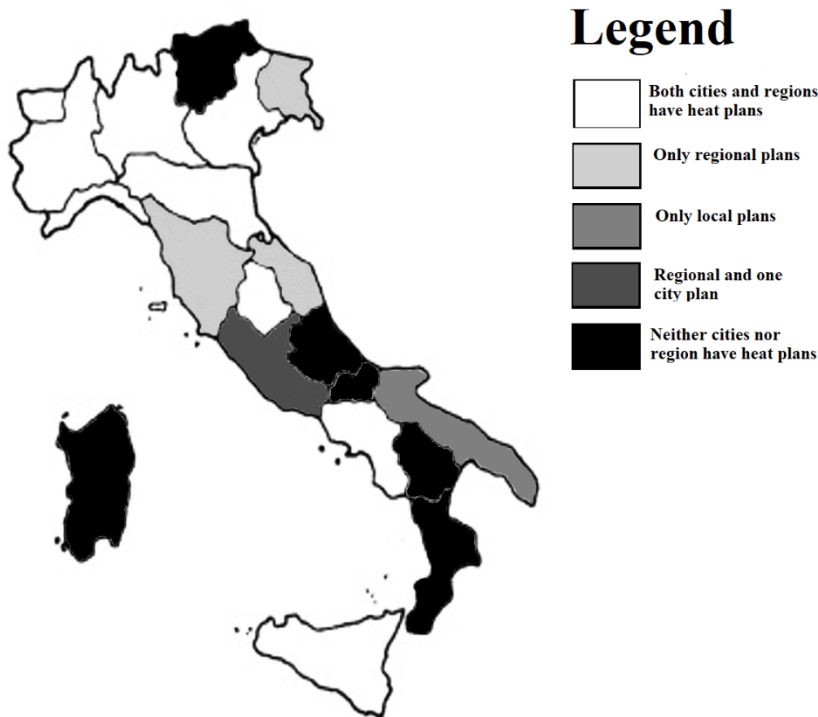
5.4. Summary of the findings

Coming to the last step of thematic analysis, the researcher has a clear picture of the themes and the story they tell (Nowell *et al.*, 2017). As a final part of the analysis, I attempt to provide "a concise, coherent, logical, non-repetitive, and interesting account of the data within and across themes" (Nowell *et al.*, 2017). After a first and more general overview, I briefly report the findings for the two cities and regions separately.

In addition to the data analysis process of this thesis, relevant findings have emerged also throughout the data collection and data selection steps. As previously presented, the drafting of regional and local heat plans has not been done homogeneously across Italy. Figure 9 depicts the multitude of cases within the peninsula with different colours. While in some cases both region and cities have drafted a heat plan (in white), in others neither the region nor the cities have (in black). In between, there are regions with only a regional plan (light grey), with a

regional and only one local plan out of all cities (dark grey), and with only local plans from the cities (grey).

Figure 9. Distribution of regional and local plans.



As seen in Figure 9, there is no sharp division of the peninsula considering the distribution of regional and local heat plans. While the Northern regions are predominantly equipped with both regional and local heat plans (Aosta Valley, Piedmont, Liguria, Lombardy, Veneto), there are still exceptions of regions with only a regional plan (Friuli Venezia Giulia) or with neither of the two (Trentino South-Tyrol). In Central Italy, the situation is again differentiated among regions with both plans (Umbria), only a regional plan (Tuscany and Marche) and regional together with a local plan (Lazio). Southern regions and islands are also mixed with a predominance of neither plans (Abruzzo, Molise, Basilicata, Calabria, Sardinia) and other regions with both plans (Campania and Sicily) or only local plans (Apulia).

Furthermore, the data collection and selection process has also highlighted differences in the availability and the structure of heat plans. While slightly more than half of the Italian regions are officially at least equipped with a regional heat plan, the availability of such plans through official channels, as the regional website is, is not always guaranteed (Liguria, Tuscany). When

available, heat plans can also vary in their structure and length. Heat plans can contain a longer preamble with data and information on heatwaves (Sicily), only regional or local measures implemented (city of Genoa) or a brief mention of the measures and extensive contact details of the local health authority responsible people in each city (Campania). In another case, no structured document was available under the dedicated webpage for heat plans, but rather there was a reporting of more general emergency and assistance measures available in the city (city of Naples).

Lastly, the thematic analysis of regional and local heat plans has provided insights into how heat adaptation in health and social care takes place. Actors from the social and health sphere cooperate with each other to activate measures before, during, and after the heat emergency takes place. Among the strategies, a double approach strategy is pursued by those actors during heat waves, which includes assistance and surveillance both at the home of vulnerable people and at previously identified emergency locations where vulnerable people can be transferred in the time of heat stress. While the multiple factors that make some portion of the population most vulnerable are often recognised in the heat plans, service recipients are frequently limited to elderly people.

5.5. Findings from regional and local plans

After a first and more general overview, I briefly report the findings for the two cities and regions separately. The themes emerging from the data considered the four heat plans together. However, when considering each city and region separately, the findings reveal some differences among them. In this part, I will highlight the narrative for the two cities and two regions separately considering each of the three themes.

In this thesis, I have analysed the heat plans from two Italian cities, which are Perugia and Genoa. Both are the most populated and the capital city of their respective region of Umbria and Liguria. Geographically, Perugia is located in Central while Genoa is in North-Eastern Italy.

Considering the city of Perugia, the findings make the regional heat plan stand out as the most comprehensive among the analysed plans in all three themes. Here, a wide range of different actors participates in the different stages of the local heat plan implementation, especially some from the social sphere who are less or not frequent at all in the other plans, such as non-profit actors or civil protection and police forces. While there is no co-occurrence between vulnerable

people and measures of the heat plan, Perugia acknowledges all the eight grounds for vulnerability identified at the general level in this thesis. The double approach of home surveillance and emergency transfers is also included in the plan in co-occurrence with several actors, but not with service recipients.

In addition to Perugia, the city of Genoa represented the other local heat plan analysed in this thesis. While for the city of Perugia the heat plan is considerably thorough, also reflected in the extensive length of the plan, the city of Genoa has a much shorter and concise plan. In the heat plan from the city of Genoa, different actors from the health sphere are included in the measures, from health agencies to care structures, whereas those from the social side are not mentioned in relation to the actions to be pursued. Among the different factors contributing to a person's vulnerability, Genova recognises only old age, with elderly people being co-occurrent with some of the measures of the heat plan. Thus, old age is the only factor outlined as vulnerability grounds, toward which the measures are directed. In the strategy pursued during a heatwave, emergency locations and transfers are mentioned and co-occurrent with different actors while home surveillance is not included. In other words, the local heat plan from Genoa distances itself from the three themes, that is 1) intersectoral cooperation – as social actors are scarcely mentioned compared to their health counterparts, 2) vulnerability vs service recipients – as only elderly people are acknowledged as part of the vulnerable group, and 3) the double approach – as the main care measure actuated during a heatwave is the emergency location and transfer.

As highlighted in the findings, the two local heat plans diverge in regard to the three themes. While social and health actors are both operating and cooperating in the local heat plan of Perugia, health actors predominate the scene in the case of Genoa. Additionally, the city of Genoa refers only to old age as a vulnerability ground to heatwaves, targeting the intervention to the specific group. Contrasting to that, the city of Perugia recognises other factors as determining a person's vulnerability, such as demographic factors or mental health. There is, however, a difference between the recognition of those vulnerable and the implementation of measures toward different groups. Lastly, the strategy adopted during a heatwave also differs between the cities. While the approach in the city of Genoa is limited to emergency transfers, the city of Perugia includes also active health surveillance in vulnerable people's homes.

The two regional plans that have been chosen for the thematic analysis of this thesis are from the Regions of Umbria and Lazio. In the case of Umbria, also the heat plan from the respective

regional capital city Perugia has been analysed, providing further insights into the vertical dimension region-city. Both regions are located in Central Italy, neighbouring each other. In terms of health and social care, arrangements for the two regions are different. For social care, the Region of Lazio has a public prevalence in the funding system, private in-service provision, and hybrid governance while Umbria has public (primarily) both in the funding system and in service provision, hybrid governance. For health care, Lazio presents a minimal system while Umbria has a mixed structure.

The regional heat plan from the Region of Umbria presents extensive similarities with the local health plan of the city of Perugia. For the region of Umbria, health agencies and public institutions represent the two actors from the social and health sphere co-occurring with the implemented measures. In line with the findings for the regional capital city of Perugia, Umbria does not show co-occurrence between vulnerable people and measures of the heat plan, yet it recognises all the different grounds for population vulnerability. Both home surveillance and emergency transfers are mentioned as part of the heat plan strategy, but only the first is co-occurrent with actors from the plan. As the main difference from the local heat plan of the city of Perugia, the regional heat plan from Umbria does not include co-occurrence of civil protection and police forces, care structures, and non-profit actors with measures implemented. However, all three are generally mentioned in the regional plan.

The regional heat plan from the Region of Lazio is less extensive than the one from the Region of Umbria. Concerning the Region of Lazio, only the health agency and health personnel are mentioned in co-occurrence with measures from the heat plan. While including different factors as grounds for vulnerability, Lazio shows co-occurrence of measures only with the group of people currently in treatment in care or hospital structures. Emergency locations and transfers are mentioned and co-occurring with several actors, but home surveillance is not included in the plan. Thus, the regional heat plan from the Region of Lazio also partially deviates from the three general themes, similarly to the city of Genoa, in that 1) only actors from the health sphere are actively mentioned in regard to measures to be implemented and 2) the double approach is not applied as it includes only emergency transfers, leaving out active health surveillance.

As for the differences between the cities of Perugia and Genoa, also the two regions diverge on certain points. The Region of Perugia retraces the city of Perugia as it represents a more comprehensive regional heat plan compared to the Region of Lazio. In particular, the lack both of actors from the social sphere involved in measures from the plan, and of active health

surveillance in vulnerable people's own home distance Lazio from Umbria. While both the region of Lazio and the city of Genoa are less extensive than the other subject of comparison, the two are similar to each other only in that they just mention health actors in carrying out the heat plan. However, in recognising factors influencing vulnerability, the Region of Lazio is closer to Umbria and Perugia than to the city of Genoa, which only focuses on old age.

To conclude, local and regional heat plans have provided insights on heat adaptation in social and health care at a sub-national level. The findings from thematic analysis highlighted differences among the different practise actuated by different sub-national actors, as regions and cities are. Not only do they have a great responsibility in organising and providing social and health care in the territory, but they also are on the frontline of tackling climate change-related emergencies, such as heatwaves, that threaten the health and well-being of the population. As such, their role and their response are crucial.

In the next chapter, I will discuss the findings of the thematic analysis together with previous literature, considering the policy field and the context.

6. Discussion

Three themes emerged from the thematic analysis of the four heat plans. In this chapter, I discuss the findings with the theory and policy background previously presented.

6.1. Cooperation between social and health care: adaptation as a holistic approach

Heat adaptation plans from Perugia, Genova, Umbria, and Lazio have provided insights into how adaptation has been interpreted and realised at a local and regional level. The adaptation process has been the product of horizontal (health and social sectors) and vertical (national, regional, local level) cooperation between actors. As discussed previously, health and social care in Italy can indeed be considered as two different sectors as they are 1) fairly decentralised (vertical dimension) and 2) independent from one another (horizontal dimension). While the cases reported in the thesis constitute an instance of local and regional level processes between those sectors, also at a national level the division is sharp. In contrast to Nordic countries such as Finland and Sweden, where the Ministry for Health and Social Affairs is responsible for legislating health and social care in the welfare state, in Italy also the highest function of the responsibilities are divided by the Ministry of Health and Ministry of Labour and Social Policy. These results are relevant both for the literature on heatwaves as well as on social and health care.

To begin with, intersectoral cooperation between social and health care in the context of heat adaptation recalls the trend in different European countries, including Italy, to integrate social and health care into welfare policies (Tousijn, 2012). As the heatwave case has shown, the boundaries between social and health care are blurred when a more holistic approach to considering well-being is adopted. While social and health care integration has not been extensively discussed in the social policy literature from Italy, some examples of social and health integration and cooperation have emerged from other European countries. With an increasing number of people suffering from different conditions, both related to health as well as social factors, an integrated care strategy is considered to improve the quality of services offered to those people (Hendry *et al.*, 2016). Indeed, in the findings that emerged from this thesis, multiple vulnerability grounds can overlap as mental and/or physical health and additional social conditions can co-exist and increase a person's vulnerability to heat waves. Combining health and social information considering the vulnerability of the population requires deep cooperation between social and health actors to ensure that 1) all subjects with a

potential vulnerability ground are included in the registry of vulnerable people and 2) that coordinated assistance is delivered to them. Further discussion concerning overlapping vulnerability grounds will be presented in the following theme discussion.

Furthermore, climate change-related emergencies require a deep integration and coordination among different sectors. Indeed, while social and health care are the main sectors directly concerned with human health and well-being, complementary actions from other fields such as urban and landscape planning are necessary (Jay *et al.*, 2021). However, as previously anticipated, despite the interconnectedness of their work, as well-being is intrinsically dependent on health, social and health care are formally separated sectors and, in that sense, “intersectoral cooperation” describes the relationship between them in heat adaptation. Due to the co-benefits for health resulting from improved adaptation, the health and social sectors play particularly relevant roles in driving climate change adaptation in a welfare state (Fox *et al.*, 2019). In that sense, a comprehensive approach to overcoming policy silos and coordinating among different sectors could be key to adapting to increasing climate change threats.

The findings for the first theme seem coherent with both literature on heatwaves and social and health care. On the one hand, intersectoral cooperation between social and health actors could be interpreted in the broader European trend of integrating social and health care to offer a higher quality of services and respond to increasing needs for a holistic approach to care. On the other hand, this deep cooperation aligns with the climate change literature to implement and coordinate adaptation in all sectors of society out of the policy silos logic.

6.2. Targeting elderly people: overlapping vulnerabilities and care arrangements

Heat adaptation plans have included the process of understanding vulnerabilities among different population groups and determining which factors to consider when designing the measures. Here, social and health characteristics intersect with each other, influencing a person’s vulnerability. The findings showed that while almost all the cities and regions under study recognise the different vulnerability factors, elderly people are the usual target group of the heat plans measures. In that regard, the theoretical framework and policy field can shed light on these findings.

From the perspective of heatwaves literature, it is worth considering two factors. First, previous studies have concentrated on studying heat morbidity and mortality across European cities, outlining elderly people as the largest population group suffering from that phenomenon and,

therefore, focusing on old age as the major vulnerability factor (Cheng *et al.*, 2018). Furthermore, multiple layers of vulnerability grounds can overlap with each other, meaning that in some cases they occur simultaneously (Gronlund *et al.*, 2015). Applied to the findings from this thesis, elderly people can be considered vulnerable 1) based on their age (which often relates with health conditions) and/or 2) in the overlap with other socio-economic factors, thus living alone, in an inadequate environment, with a low income, in treatment in care or health structures. Therefore, the focus on elderly people as service recipients can be justified in the light of these two grounds emerging from the literature on heatwaves. However, it is worth considering that not all vulnerable people necessary fall into the elderly group that is the main recipient of the services, leaving some people out of this target.

In the analysis of the result, it is also worth considering the context of the Italian welfare state. In international comparison, Italy represents an occupational elderly-oriented welfare state (Lynch, 2003). In other words, the ratio of welfare spending in Italy for the elderly to the non-elderly is highest, highlighting elderly people as the age-wise population group towards which the most social spending is concentrated. While at first, this seems to suggest a straightforward explanation for the result of elderly people being the only target group of heat adaptation measures, it is noteworthy considering what this elderly-oriented social spending is composed of. Indeed, when breaking it down, pension spending is the value well over EU averages while social care is largely underfinanced (Gori, 2012).

While comparative literature on care confirms that elderly care and childcare are the most prominent targets of social care in Italy compared to other groups, childcare is more developed in the country than elderly care (Anttonen and Sipilä, 1996). Indeed, although regional variations are significant, common features include social care in Italy not having developed to be public sector-dominated but rather highly relying on family and community support, as part of the welfare state diamond made of state, market, family, and civil society (Martinelli, 2014). Recent developments in elderly care in Italy have further moved into in-cash benefits despite earlier predictions of a possible shift towards in-kind benefits (Gori, 2012).

The findings from this theme of the thesis, thus with elderly people being the only mentioned service recipient group despite the multiple vulnerability grounds, offer interesting insights. On the one hand, the findings appear in contrast with the features of care in Italy in different ways. First, it contradicts the recent increasing in-cash benefits for elderly care, as the measure provides services, which are further discussed in the following theme. Second, it is in contrast

with the Italian care sector being greatly dependent on informal and domestic work, since the measures included in the heat plan targeted at elderly people involve formal and public care from the welfare state. Thus, this represents an example of public intervention in the in-cash financed informal-dominated field of care, justified by the heat emergency.

On the other hand, as social care is mostly discussed as composed of childcare and elderly care, the findings confirm the tendency of directing care toward one of the two groups, that is the elderly people. While elderly people might be suffering from the overlap of different heat vulnerability grounds, other younger vulnerable people could be left out of the targeting measures. Indeed, care for other vulnerable people is frequently left out of the discussion and literature on care for other vulnerable groups in Italy is lacking.

6.3. Dualism in the response: between care responsibilities and adaptation layers

Heat adaptation in social and health care has been implemented through a double strategy during the heat emergency period, that is both by providing care in structures that represent emergency locations and in vulnerable people's own homes.

In the light of the Italian welfare state, this duality could provide insights into the organisation of care responsibilities. While in care structures, hospitals, and additional emergency locations the care responsibilities lay mostly on the trained health personnel, home surveillance relies more heavily on domestic care with some external support from health personnel, social workers, and volunteers. This share of responsibilities among the different actors provides insights into the boundaries between the social and health sphere, with health-dominated care in emergency transfers and mixed care in-home surveillance.

In that sense, home surveillance and the inclusion of social actors could be seen as a way for the welfare state to intervene alleviating pressure on the family and community. This dual measure could perhaps represent an attempt from the Italian welfare state to alleviate the care burden from the family in the case of home surveillance by including actors also from the social sphere. Indeed, as briefly anticipated in the previous section, social care in Italy is highly reliant on domestic care, thus involving either family members or informal workers (Gori, 2012). This highlights the boundaries of the public responsibilities in providing social care, thus leaving the burden to informal domestic care.

When considering that elderly people have been mentioned as the main service recipients in heat plans, the duality of active health surveillance and emergency transfers and locations could be juxtaposed to ageing in place and at care structures. Indeed, while emergency transfers and locations mirror care structures, in that care is provided in dedicated structures, active health surveillance includes care in the domestic space, which is the main feature of ageing in place. In Italy, ageing in place has been the predominant option among families (Gori, 2012).

Furthermore, in the context of heat waves, adaptation to extreme weather events has taken different forms and layers. This includes both individual and institutional heat adaptation, thus strategies actuated by households as well as measures organised by national, regional, and local institutions (Sampson *et al.*, 2013; Jay *et al.*, 2021). Indeed, both active health surveillance and emergency locations and transfers are measures actuated institutionally, as they are included in regional and local heat plans and implemented by different actors from the social and health sphere. However, emergency location and transfers imply a temporary transfer and, in some cases, a short-term hospitalisation of the most vulnerable people during a heatwave, thus suggesting continuous care throughout the transfer period. On the contrary, active health surveillance is developed within the domestic space and implies the temporary monitoring of the most vulnerable people in their own homes by social and/or health specialists. In that case, as active health surveillance does not provide continuous assistance throughout the day, the institutional measure requires an integration of individual adaptation strategies by vulnerable people and their caregivers or family members. Thus, different layers of adaptation strategies build one upon the other.

6.4. Local and regional differences

Local and regional differences have emerged from the findings on heat adaptation in social and health care of this thesis. Overall, the city of Perugia has included a more comprehensive plan than the city of Genoa and the same finding has held true for the region of Umbria compared to Lazio. The findings are relevant both from the social and health care as well as heat adaptation literature.

From the perspective of social and health care regimes, the regions have different systems. In particular, the two cities from the local heat plans share the same regional social and health care regime, while the two regions whose regional heat plans were under investigation present two different regimes. Considering the regions of Umbria and Lazio, the differences in the

respective clusters are significant. While the region of Lazio represents a weak social care system with trouble providing assistance and scarce collaboration between public and private actors, the region of Umbria has a slightly more cooperative environment between public and third-sector actors (Bertin and Pantalone, 2018). Additionally, the service provision for health care is primarily public in the region of Umbria, while it is private in the region of Lazio.

The findings for the region of Lazio are particularly relevant when considering its regional social care regime, as the regional heat plan highlights the difficulties of this system to provide assistance. Indeed, social actors are not actively mentioned as involved in the measures implemented in the heat plan. Additionally, as previously pointed out, the measure of active health surveillance, which in other plans highlights the responsibility of actors from the social sphere to provide it, does not constitute part of the regional heat plan from Lazio. While it does not have the most extensive plan among the four, the region of Umbria does cover a better interaction between social and health actors and includes both emergency transfers and active health surveillance. Therefore, the findings from the two regions reflect features typical of their respective social and health regime clusters and provide insights into how such differences matter in the context of an emergency for citizens' health and well-being.

Considering the cities of Perugia and Genoa, the respective regions belong to the same cluster, yet present differing findings from their local plans. In this case, the context of heatwaves could provide insights into those differences. First, it is worth reminding that adaptation can be seen either as an anticipatory or reactive response to heat stress (Ebi, Kovats and Menne, 2006). Indeed, the drafting of the Italian national heat adaptation plan and the consequent proliferation of sub-national ones have emerged in responsive terms after the European heatwave of 2003. However, it is noteworthy considering that the Italian peninsula is extremely differentiated in its territory and that data about the increase of hot days anomaly and city temperature anomaly showed that the two cities have been hit differently by heat stress (ISTAT, 2022b, 2022c). Thus, the heat threat is much greater in the city of Perugia than in Genoa, which could have driven a much more comprehensive local adaptation plan in the first city. In other words, a greater impact of heat stress could correspond to a responsive heat plan, more comprehensive than an anticipatory heat plan resulting from a smaller impact of heat stress, justifying differences between the two local plans.

To conclude, while differences between the regional heat adaptation plans could be interpreted in the logic of social and health care regimes, those between the local heat plans suggest that

the impact of heat stress could result in either a comprehensive responsive adaptation or a basic anticipatory one.

7. Conclusion

This thesis examined heat adaptation in the health and social care sector in two Italian cities, Perugia and Genova, and two regions, Umbria and Lazio. In particular, the thesis aimed to understand *how cities and regions have interpreted and realised adaptation to heat-related threats in social and health care*. To answer the research question, I conducted a sub-national qualitative study and analysed two local and two regional heat plans through thematic analysis to investigate the differences among the chosen regions and cities. Based on data availability and sub-national social and health clusters, I selected heat plans from two cities whose regions share the same cluster and two regions from different clusters.

The findings from the thematic analysis show that 1) heat adaptation in social and health care involves cooperation among actors from both sectors in implementing the measures, 2) the two main strategies for care used during a heatwave include active health surveillance at patients' homes and emergency transfers in dedicated structures, and 3) those who are indicated as vulnerable are not necessarily identified to receive care during a heatwave. Considering the two cities and regions separately, the findings show that the Region of Umbria and its respective city of Perugia are extensive in their heat plans and fit in the overall results of the three themes. In contrast to that, the Region of Lazio and the city of Genoa diverge both from the general findings of the thematic analysis and each other. While the Region of Lazio only mentions active health surveillance, the city of Genoa focuses on emergency transfers. Furthermore, Lazio recognises several vulnerability grounds whereas Genoa includes only old age. However, both only present co-occurrence of health actors with measures, thus not including social actors. Thus, sub-national differences emerged among the chosen regions and cities.

The theoretical background on heat adaptation and the context of social and health care provided valuable tools to interpret the findings. As seen throughout the thesis, many different aspects of heat adaptation have emerged, including purpose (responsive vs anticipatory), spatial differences (across the territory), layering features (individual - institutional), governance (local-regional-national), and cooperation (health and social sectors). Furthermore, the main features of social care in the Italian welfare state have emerged from the findings, particularly considering its formal separation from health care and its weakness compared to this, with care being still highly reliant on family and community. All these elements from theory and policy fields interact in the understanding and implementation of adaptation and emerged through heat

plans. Most importantly, differences among heat adaptation plans highlight gaps and weaknesses in regional and local social care systems.

The ongoing climate crisis requires cooperation between and across different research and policy fields. As the social policy is concerned with the well-being of the population, adaptation strategies implemented to guarantee this well-being in the context of the climate crisis constitute a relevant and timely study field worth further investigation. This thesis contributes to this research field, providing some insights into adaptation in the Italian welfare state(s). How adaptation is realised and how it differs at a sub-national level has implications on the well-being and health of the population. From a social policy perspective, this thesis highlighted how differences in the development and organisation of social and health care impact the adaptation strategies to heatwaves. Indeed, weaker social care compared to health care has emerged throughout the findings both at a general as well as at a sub-national level. In social policy research, different welfare theories could provide valuable insights to investigate and understand adaptation processes in social and health care in the future. For instance, functionalism, as well as path dependence and policy diffusion, could provide valuable theoretical ground to analyse adaptation strategies in future research, in terms of 1) adaptation as the heat-health threat arises, 2) adaptation depending on previous welfare state development, and 3) sub-national and cross-national policy diffusion of adaptation practices.

For the purpose of this thesis, I have selected the Italian cities of Perugia and Genoa and the regions of Umbria and Lazio based on theory and availability of data. While the findings indeed revealed intriguing insights on how heat adaptation is organised at a local and regional level in Italy, the choice of the cities and regions under study does represent a limit of this study. As the differences emerging from the findings highlight, sub-national entities diverge from each other and, consequently, interpret and realise heat adaptation differently. In other words, the investigation of other heat plans from Italian cities and regions could provide significantly different results from those obtained in this thesis. Additionally, qualitatively studying heat plans from different clusters of regions (geographical position) or different clusters of sub-national care regimes (social and health care) would have represented an intriguing design, which, for time constraints, could not be pursued in this thesis. Therefore, as studies on heat adaptation at a local and regional level in Italy are currently lacking, further research on regions, cities and clusters could provide significant insights into climate change adaptation processes.

Additionally, the findings that emerged from this thesis can be useful for decision-makers as they represent a valuable source of knowledge on the Italian welfare state, particularly on health and social care and sub-nationalism in an emergency context. Discrepancies in the development of welfare in Italy have already been traced by scholars and are not a new addition to this thesis, but rather represent a constant in discussions considering the Italian welfare state(s). Indeed, phenomena such as internal movement within the country to receive higher quality health care treatments driven by strong regional differences are well known. However, as new social and environmental risks emerge, the cooperation between health and social care as well as the coordination across Italian cities and regions to provide such services must intensify to ensure the health and well-being standards of all citizens.

To conclude, the findings from this thesis provided a glimpse into local and regional adaptation to a climate change-related hazard. Social and health care are directly concerned with the health and well-being of the population and have therefore constituted the policy field under investigation. The ongoing climate crisis and consequent effects on society highlight the current and future relevance of the topic and call for further research in the field of adaptation.

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