## The results of the literature search

A literature search was conducted to review the impacts of weather, climate and climate change for EMS and ED. The search was conducted 06/2022. The study process is presented in Table 1.

*Table 1: The literature search process*

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| 1. Search design:<br>• Subject: Impacts of weather and climate for emergency medicine service and emergency department from the aspect of climate change<br>• Inclusion criteria: published 2012–2022; languages Finnish & English; databases Medic (in Finnish), CINAHL, PubMed, grey literature; Full text available; Context EMS or ED and climate change |
| 2. Search terms:<br>• Medic (in Finnish): ilmasto* OR kasvihuoneilm* AND ensihoi* OR akuuttihoi* OR ensia* OR päivysty* OR sairaankuljetu* OR ambulanssi*<br>• PubMed (search with Abstract/Title inclusion criteria) & CINAHL: “climate change*” OR “global warming” OR “greenhouse effect” OR “climate crisis” AND “emergency treatment” OR "emergency medical treatment" OR “emergency medicine” OR “emergency care” OR “prehospital care” OR “acute care” OR ”emergency medical service*” OR “medical emergency service*” OR “hospital emergency service*” OR “first aid” OR “after-hours care” OR “after hours care” OR “out-of-hours medical care” OR “out of hours medical care” OR “transportation of patients” OR ambulance* OR “pre-hospital” |
| 3. Results:<br>• Medic: 2 results → 2 studies excluded (studies do not meet the inclusion criteria) → Total studies included **0**<br>• CINAHL: 66 results → 46 excluded (studies do not meet the inclusion criteria), 6 no access, 2 weak quality → Total studies included **12**<br>• PubMed: 76 results → 36 studies excluded (studies do not meet the inclusion criteria), 11 no access, 4 weak quality, 11 duplicates → Total studies included **14**<br>• Grey literature: Total studies included **4** (2 in English + 2 in Finnish) |
| 4. Thematic analysis |
| 5. The final themes about climate-related impacts for EMS and ED: 1) workload 2) morbidity and accidents 3) organization and management in EMS and ED |

### Workload

- Extreme temperatures are associated with the increased workload in emergency medical service (EMS) (1). However, there are areas in the world where the future development may be the opposite as extreme temperatures change in certain areas in a "safer direction" (13).
- Heatwaves are associated with increased EMS and emergency department (ED) workload (2-6,9-12). However, ED workload may decrease in areas with normally hot conditions (14).
- EMS call-outs increase especially in urban areas, as the heat island effect intensifies heat stress (3).

- Elderly, children, and those living in low socio-economic status are potentially vulnerable groups to heatwaves (3,5,7,8)
- Exposure to air pollution has been found to increase the need for emergency care. In particular, concurrent exposure to heatwaves or very cold periods increases the need (11,12).
- Severe weather conditions may be associated with increased ED utilizations. However, rainy weather seems to reduce ED visits (11). Storms can cause challenges, for example, if the number of beds in the ED must be reduced due to flooding water or if people come to the ED to take shelter from the storm (15).
- Climate change has been found to increase ED visits (16)

**Morbidity and accidents**

- The following symptoms and conditions are highlighted in EMS and ED during heatwaves: respiratory diseases, the worsening of MS disease symptoms, heatstroke, worsening of critical illnesses and need for more intensive care, multiple injuries, self-harm, assaults, occupational injuries, and illness (6-8,17-23).
- The effects of heatwaves on cardiovascular diseases are partly contradictory (6,7,24).
- Heatwave-related mortality and morbidity are associated with heat, especially in terms of emergency medical services, mental health problems and heat-related diseases (25).
- Flooding has been found to be associated with the occurrence of infectious diseases. Mudslides and floods may also cause accidents (26).
- Increased pollen levels have been found to slightly increase the use of acute care services (27).

**Organization and management in EMS and ED**

- Heatwaves place a significant economic burden on ED, hospital care and EMS. The economic burden is expected to increase in the future (28).
- Heatwaves require adaptation measures of social and health care providers in Finland. One way to do might be to temporarily increase the number of EMS units during heatwaves (9).
- Preparing for storms and floods may force increasing staff in high-risk areas in Finland such as EMS, the rescue service, and reconstruction work (29).
- Extreme weather events can make it difficult for patients, staff, and EMS to reach hospitals, for example due to flooding water and damaged infrastructure (15).
- Extreme weather events may cause the following challenges: availability problems in medicines and emergency care services, challenges in food supply, communication and transportation, dependence on volunteers, and patients may have difficulties accessing treatment (30).

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