Risk assessment for winter in Ukraine

December 2022

World Health Organization
European Region

BACKGROUND

Ukraine's cold weather season can be experienced for up to a six-month period. The coldest months are December to March, where temperatures can drop as low as –20 °C and climb as high as +13 °C. The cold temperatures experienced during the 2022–2023 winter will be no different in severity than those in previous years, but this winter will be particularly challenging. In the context of escalating war, large numbers of people who have been displaced and population movements, damaged infrastructure, social and economic factors, disrupted health systems and lack of access to essential services, this winter can result in an increased risk of excess cold-related morbidity and mortality.

Severe cold weather is a common occurrence in several countries in the WHO European Region. Extremely cold weather increases mortality and poses a high health risk to many, particularly vulnerable groups such as children, the elderly, and people experiencing homelessness. This often represents a challenge for health and social services to provide care for an increased number of patients suffering from various cold-related outcomes, including cold-related injuries and accidents, hypothermia and frostbite, respiratory infections, and cardiovascular events. Disruptions in civilian services and infrastructure create an environment that can further indirectly aggravate these health impacts. Common mortality causes from cold include coronary heart disease, cerebral vascular accidents, respiratory diseases, and injuries associated with cold[i].

This risk assessment focuses on winter as a hazard, its potential impacts and actions that could be taken to reduce risk to the people in the Ukraine, those on the move and for health service delivery. For a broader and more detailed understanding of the public health situation in Ukraine and its threats viewed through an all-hazards lens, see the Ukraine public health situation analysis *(1)*.

POTENTIAL PUBLIC HEALTH IMPACTS OF WINTER AND PRIORITY ACTIONS*

Public health consequences	Potential impacts	Priority actions Note that this is a non-exhaustive list, meant to highlight some overarching activities that might reduce the impact of winter on the health of the population and/or health infrastructure.
Acute respiratory infection (ARI)	During winter, and particularly in the current context of the Ukraine crisis, there is an increased risk of spread and morbidity and mortality of various causes of ARI[i], including: • COVID-19 • seasonal influenza • respiratory syncytial virus (RSV) • other respiratory illnesses. Increased risk due to:	Actions to mitigate the spread and impact of ARI should build on existing programmes and communicate the change in context due to winter and the current situation in Ukraine, with the additional burden of cold-related injuries and illnesses that could increase pressure on the health system and reduce the capacity to respond (due to lack of staff, supplies, usable health facility space, etc.). • Identify people at highest risk, including the elderly, people with chronic diseases, children, pregnant women, people who are immunocompromised, as well as highest-risk locations, such as places that are crowded, with inadequate prevention measures.

[i] World Health Organization Regional Office for Europe, Preventing the health effects of cold weather and cold waves, [2013, internal technical guidance]

	• current circulating seasonal pathogens and strains (e.g., RSV, seasonal influenza, COVID-19); • population movements (e.g., internal to Ukraine and cross-border) and people who have been internally displaced or refugees in collective centres; • increased social mixing in closed spaces with less ventilation; • reduced capacity of surveillance, early detection and response systems; and • lack of sufficient prevention interventions such as vaccination, use of public health and social measures, and water, sanitation and hygiene (WASH). • lack of access to early testing, diagnosis and treatment.	• Enhance current programmes for risk communication and community engagement (RCCE), highlighting the current risks for prevention actions, early testing, vaccination, instructing people how to care for themselves in the home and when to seek care; particularly for those identified as most at risk of the health impacts of winter in the current situation in Ukraine. • Increase access to prevention interventions such as vaccination and measures to reduce spread, as well as personal protection, particularly for those at highest risk. • Increase surveillance and early reporting and response actions in areas identified as high-risk (such as group homes, collective centres, newborn and maternity wards, health centres). • Prepare health facilities and referral mechanisms for a potential increase in health-care provision for respiratory illnesses, including considerations for transport, staffing, space, infection prevention and control (IPC) measures and supplies in the context of the constraints of winter and the current situation in Ukraine. • Develop a contingency plan for disrupted transport links, including disrupted access to patients' homes and care facilities, referral services and possible delays in pharmaceutical and other supplies. • Put in place procedures to back up critical resources (such as health workforce, power, oxygen, water). • Identify vulnerable people who cannot access health care or who are on the move, and provide tailored health services. • Prepare (staffing, space, training and supplies) for a potential increase in weather-related injuries and illnesses at health facilities that can strain existing services. • Monitor to anticipate problems such as shortages or overuse of critical supplies.
Exacerbation of chronic disease	There are seasonal increases in chronic disease morbidity and mortality during cold months, particularly those listed below[i]. The risk increases with age and acute events may be aggravated by physical exercise. The risk is further increased in the current context of the Ukraine crisis. 1. Cardiovascular disease – hypertension, coronary and other heart disease, myocardial infarction, cerebrovascular accidents and stroke. Exposure to cold increases blood pressure (0.19 mm Hg	• Identify vulnerable groups (elderly), chronic diseases, and increased risk of exposure (homelessness, occupational). • Provide basic information and communicate the risk for exacerbation of chronic diseases, ways to protect yourself and others and prevent it, warning signals, what to do in the home and when to seek care. • Train health workers at all levels, particularly at primary health-care level, on how to be aware of the risks, expect increases in cases, adjust medications and provide advice to patients and the public. Develop job aids for health workers to manage the specifics of cold-related illnesses.

[i] World Health Organization Regional Office for Europe, Preventing the health effects of cold weather and cold waves, [2013, internal technical guidance]

	per each one-degree decrease in temperature) contributing to the 0–2% increase in cardiovascular disease per each one-degree decrease in temperature. 2. **Respiratory disease –** chronic obstructive pulmonary disease (COPD), asthma. Breathing of cold air results in cooling and drying of the respiratory tract, which causes narrowing and structural changes of the airways, hypothermia on the respiratory system involves increased secretions and decreased ciliary motility, which can impair the ability to clear secretions. 3. **Endocrine disorders.** Because thermoregulatory mechanisms are supported by hormones, endocrine disorders (like diabetes mellitus and age-related disorders) can affect thermogenic responsiveness, increasing the risk of cold-related morbidity and mortality. 4. **Musculoskeletal disorders.** Cold temperature exposure indoors and outdoors can exacerbate musculoskeletal conditions, such as carpal tunnel syndrome, tension neck syndrome, tenosynovitis and peritendinitis, particularly affecting mobility.	• If there is no time to train health workers, prepare and distribute an information pack on what they need to know and what to do, including a reminder about how specific drugs are adversely affected or altered by cold weather. • Prepare health facilities to receive additional patients experiencing exacerbation of their chronic diseases, including by ensuring adequate medical supplies. • Identify referral services for severe cases. • Monitor the health impacts of the cold and the effectiveness of interventions in a timely manner through a surveillance system such as event-based surveillance (EBS). Areas to monitor include (i) excess mortality; (ii) cold-related morbidity; and (iii) health service demand. • Advocate for other sectors (e.g., housing, transport, social services) to provide prevention and protection measures.
Public health impacts from indoor heating	During cold weather and particularly in the current situation in Ukraine, people are more likely to use alternate heating sources that may pose health risks, particularly if the boilers, cooking, and heating appliances used are unsuitable, poorly maintained or malfunctioning[i]. Additionally, closed windows will lead to reduced ventilation and alternate sources of heating may cause fire and burns or toxic emissions. 1. **Carbon monoxide poisoning –** combustion of gas or solid fuels is used for heating. Carbon monoxide (CO) is a colourless, odourless gas produced by burning material containing carbon.	• Identify vulnerable people (elderly people, children, people with respiratory illnesses), and locations where people are crowded and may use alternate or unsafe heating (such as hospitals, prisons, long-term care facilities, collective centres for displaced people and refugees, public housing, and housing in deprived areas). • Provide basic information and communicate the risk of indoor heating, how to protect yourself and others and how to prevent accidents (e.g., proper ventilation, CO detectors, what to do during a power failure), warning signals, what to do in the home and when to seek care. • Train health workers at all levels on case management of the health impact of indoor heating and how to provide advice to patients and the public. Develop job aids for health workers to

[i] World Health Organization Regional Office for Europe, Preventing the health effects of cold weather and cold waves, [2013, internal technical guidance]

	2. **Risk of burns** from indoor fires, malfunctioning/poorly managed fires, heating appliances and scalding from hot water increases during cold temperatures. 3. **Exacerbation of respiratory disease** through reduced ventilation and inhalation of toxic substances and exposure to ambient particulate matter from fire and heating appliances. Increased risk due to: • unsafe or inappropriate use of appliances to heat houses; • unsafe or inappropriate use of kerosene space heaters, propane heaters, stoves and gasoline- and diesel-powered generators; • unsafe or inappropriate use of heating sources or generators during power outages; • remaining indoors with inadequate ventilation; and • CO emitted by household appliances building up in the absence of proper ventilation.	manage the prevention and health consequences of indoor heating. • Prepare health facilities to receive patients with health impacts from indoor heating, including by ensuring adequate medical supplies. • Identify referral services for severe cases. • Monitor the health impacts of cold and the effectiveness of interventions in a timely manner through a surveillance system such as EBS. Areas to monitor include (i) excess winter mortality, (ii) cold-related morbidity, and (iii) health service demand. • Advocate for other sectors (e.g., housing, energy, social services, fire services), including specific actions for local communities to provide prevention and protection measures.
Disruptions in health service delivery and access	Cold weather can impact the health system and services through direct weather-related damage or via reductions in access for the population and health workers, particularly in the current context of the Ukraine crisis, with ongoing damage to infrastructure and impact of continued disruptions on health service delivery and access. Lack of adequate heating in health facilities can worsen the patients' condition. 1. **Reduced population access** due to ice, snow and extreme cold. 2. **Potential for population movement** due to extreme cold. 3. **Health workforce impacted** from all the cold-related risks listed above; workers are overburdened and overworked, at increased risk of making errors. The government has created teams to replace surgeons and trauma specialists to reduce the risk of medical errors. Health-care workers are working in a challenging environment, and winter will further	Continue essential and emergency health care and accommodate additional activities associated with cold weather (increase in cold-related injuries and illnesses). • Develop contingency and business continuity plans for health systems and services to continue critical services, including prioritization of health services according to the current context. • Develop a contingency plan for disrupted transport links, including disrupted access to patients' homes and care facilities, referral services and possible delays in pharmaceutical and other supplies. • Put in place procedures to back up critical resources (such as health workforce, power, oxygen or water). • Identify pregnant women who may need antenatal or delivery care during the winter months and develop targeted plans for accessing skilled birth attendants and care. • Identify vulnerable people (such as pregnant and lactating women, elderly and disabled people) who cannot access health care or who are on the move, and provide tailored health services.

	compound this, with health-care infrastructure damage, appropriate heating of health facilities will be challenging. Health-care workers are witnessing and experiencing traumatizing events at work and in their country, which can take a mental toll. 4. **Direct damage and impact to infrastructure** (such as water, electricity and heating outages) – there have been 715 attacks on health care in Ukraine since the escalation of the conflict in February 2022 *(2)*. The attacks on infrastructure have put thousands of health facilities at risk and disrupted health service provision. In November 2022, at the onset of the coldest months in Ukraine, there was an escalation of targeted attacks on essential infrastructure *(3)*. These and other, more sustained attacks affect the functioning of the health facilities targeted and overburden others. There is a critical need for electricity, alternate power sources such as generators, and heating devices at health facilities. 5. **Reduced transport and delivery services** due to ice and snow (including delivery of medical supplies and laboratory samples). Disruptions in the supply of medical equipment, including personal protective equipment, expose health-care workers to infectious disease, while disruptions in medicine supplies have an impact on the patients' outcomes. 6. **A potential large increase in additional patients and care needed** for cold-related injuries and illnesses. Prolonged exposure indoors to low temperatures can lead to an increase in cardiovascular events, respiratory disease, mental health problems, and many more. Therefore, the current lack of heating in many parts of Ukraine (regardless of cold waves) can put a significant strain on Ukrainian people (particularly those with chronic diseases, the elderly and children) and lead to	• Prepare (staffing, space, training and supplies) for a potential influx of weather-related injuries and illnesses at health facilities. • Monitor to anticipate problems such as shortages or overuse of critical supplies.

	increased hospital admissions, independent of any cold injuries.	
Cold-related injuries	Cold temperatures, ice and snow exposure can lead to cold-related injuries and disrupt access to health services[i] for staff and patients due to impacts on transport, human resources and functioning of health services. Cold-related injuries can occur locally in Ukraine, in transit to a border and when crossing the border to other countries. 1. **Cold-associated accidents** – ice and snow increase the risk of slipping and falling, and traffic accidents. Cooling of the body can decrease performance and lead to injuries, and accidents occurring outdoors can further increase the risk of hypothermia and frostbite. 2. **Road accidents –** ice and snow increase the risk of motor vehicle accidents. Attacks on Ukraine's energy infrastructure have disrupted power supply, causing limited lighting on roads. 3. **Hypothermia and frostbite –** lowering of the core body temperature below 35 °C. Hypothermia occurs not only in extreme cold, but also in temperate climate conditions. Frostbite is tissue injury resulting from cooling and subsequent freezing of tissue that may involve only superficial tissues or may extend to the bone. 4. **Dermatological conditions –** cold urticaria (hives), pernio (chilblains), psoriasis, atopic dermatitis.	• Identify vulnerable groups (the elderly), children (including preterm/low-birthweight newborns), chronic diseases (such as cardiovascular and pulmonary disease, diabetes and arthritis), increased risk of exposure (homelessness, occupational, prolonged indoor or outdoor cold exposure) and excessive alcohol/drug use. Identify sites/locations that are more vulnerable (in transit for long periods, long queues, for example at pharmacies, grocery shops, places more vulnerable to heating problems such as hospitals, collective centres, prisons, public housing, schools, barracks, etc.). • Provide basic information and communicate the risk on cold-related injuries, ways to protect yourself and others to prevent them (reduction of outdoor physical activity, adequate clothing, shortening or avoiding exposure, indoor heating options, thermometers to monitor indoor/outdoor temperature, etc.), warning signals, what to do in the home and when to seek care. Prepare information materials such as flyers, the home pages of health-care providers' websites, social media, TV, radio, etc. Decide on the appropriate alternative information channel for various types of cold risk communication, confirm its usability and test it (e.g., hotline for quick advice). • Train health workers at all levels, particularly at primary health-care level, as well as paediatric clinics, and other areas identified as being at risk, including at border crossings, on case management of cold-related injuries and how to provide advice to patients and the public. Develop job aids for health workers to manage cold-related injuries. • Prepare health facilities (including paediatric, maternity and neonatal clinics) to receive patients with cold-related injuries, including by ensuring adequate medical supplies. • Identify referral services for severe cases. • Monitor the health impacts of the cold and the effectiveness of interventions in a timely manner through a surveillance system, such as EBS. Areas to monitor include (i) excess mortality, (ii) cold-related morbidity, and (iii) health service demand. • Advocate for other sectors such as housing, transport, or social services, to provide prevention and protection measures (blankets, heating, nutrition supplies), including centres where vulnerable people can stay during extreme cold weather. • Information on road safety and preparing for travel during the cold months should be provided to the public to reduce the risk of accidents.

Epidemic-prone disease outbreaks	During winter and in the context of the Ukraine crisis, there is an increased risk of spread of epidemic-prone diseases, including: • measles • gastrointestinal, rotavirus, cholera • poliomyelitis • diphtheria • tuberculosis (TB). Increased risk due to: • current circulating pathogens and strains, including seasonality; • population movements, including across and within borders, and refugees in collective centres; • increased social mixing in closed spaces with less ventilation; • reduced capacity of surveillance, early detection and response systems; • lack of sufficient prevention interventions such as vaccination, use of public health and social measures, and WASH; and • lack of access to early testing, diagnosis and treatment.	Actions to mitigate the spread and impact of epidemic-prone diseases should build on existing programmes, communicating the change in context due to winter and the current situation in Ukraine, with the additional burden of cold-related injuries and illnesses that could increase demand on the health system and reduce the capacity to respond (such as lack of staff, supplies or usable health facility space). • Identify those most at risk, including children, people who are unvaccinated or immunocompromised, as well as locations, such as places that are crowded, with inadequate prevention measures. • Enhance current RCCE programmes, highlighting the current risks for prevention actions, early testing, vaccination, WASH, information on ways to care for yourself in the home and when to seek care; particularly for those identified as most at risk from the health impacts of winter in the current situation in Ukraine. • Increase access to prevention interventions such as vaccination, WASH, public health and social measures and personal protection to reduce spread, particularly for those at highest risk. • Increase surveillance and early reporting and response actions in areas identified as high-risk (schools, group homes, collective centres, newborn and maternity wards, health centres). • Prepare health facilities for a potential increase in demand for care for epidemic-prone diseases, including considerations for staffing, space, IPC measures, supplies in the context of the constraints of winter and the current situation in Ukraine. • Develop a contingency plan for disrupted transport links, including disrupted access to patients' homes and care facilities, referral services and possible delays in pharmaceutical and other supplies. • Put in place procedures to back up critical resources (such as health workforce, power, oxygen or water). • Identify vulnerable people who cannot access health care or who are on the move, and provide tailored health services. • Prepare (staffing, space, training, supplies etc.) for a potential influx of weather-related injuries and illnesses at health facilities that can strain existing services. • Monitor to anticipate problems such as shortages or overuse of critical supplies.

Mental health	During winter and in the current situation in Ukraine, both internally and across borders, the following factors can lead to increased risk of mental health concerns. 1. **Exacerbation of chronic mental health symptoms.** People suffering from chronic depression often experience an exacerbation of symptoms with the arrival of winter, and the number of people presenting with depression increases due to seasonal changes. This can present as sadness, lack of energy, social withdrawal, loss of appetite and changes in sleep patterns. 2. **Isolation.** During cold winter months, opportunities to stay connected can be severely reduced. As a result, many people may feel alone and cut off from their support networks. Individuals separated from their families, people who have been internally displaced and refugees are particularly vulnerable, especially if they are older or have a disability. 3. **Compounded stress.** Winter holidays can also trigger strong stress reactions, especially in people who are grieving, separated from their families and/or homes, or unable to observe their traditional holidays for other reasons. For people who are displaced by war, holidays can also be a grim reminder of their present hardships and an uncertain future.	• Identify people or locations at highest risk of mental health impacts of winter in the current situation in Ukraine. • Set up and disseminate information about support hotlines. • Organize check-in calls and/or visits with people who are separated from their support networks. • Raise awareness about common signs of seasonal depression and teach coping techniques (such as grounding, mindfulness and breathing exercises), and/or offer self-help tools like *Doing What Matters in Times of Stress.* • Provide warm and welcoming safe spaces where people can get together with others during the holidays. • Provide training to frontline workers on psychological first aid and suicide risk prevention and response. • Put in place referral systems for those requiring more specialized services. • Encourage healthy lifestyle choices (exercise, eating hot nutritious foods, socializing, etc.). • Ensure that mobile outreach service providers are aware of people with mobility issues and can check in with them regularly. • Enable people with mobility issues to get to necessary appointments – even if it is just arranging for someone to walk with them.
Sexual and gender-based violence (SGBV) and exploitation	Conflicts increase the exposure of females of all ages to war crimes, including arbitrary killings, rape and trafficking *(4)*. A 2019 UNFPA/OSCE survey *(5)* of women from eight Eastern European countries found that approximately 70 percent of women had experienced some form of violence since the age of 15, and one in three has suffered physical or sexual violence. During winter and in the current context of the war in Ukraine, people moving both internally and across the border to other countries are vulnerable to heightened risks.	Actions to prevent and reduce the risk of violence in crowded living spaces and to ensure that referral pathways are available for survivors, building on existing programmes. • Enhance RCCE to provide basic information on gender-based violence (GBV), ways to protect yourself and others and to prevent it, including warning signals, referral services, ways to access help and available services. • Coordinate mental health and psychosocial support programmes and services. • In coordination with protection cluster/programmes, ensure functionality of referral pathways, including provision of essential health services for GBV survivors, such as clinical management of rape.

	1. **Increased risk of SGBV.** Living conditions resulting from winter weather (for example, isolation of domestic violence survivors; crowded living conditions in shelters), coupled with exacerbation of mental health concerns, may increase the risk of SGBV, while disruption in access to and provision of health services (including due to transportation challenges) may decrease access to care for survivors. *(5)* 2. **Increased risk of exploitation.** Forcibly displaced women and children are exposed to a higher risk of arbitrary killings, rape and trafficking *(6)*. As a result of martial law, numerous Ukrainian families have been separated, with many women and children moving within Ukraine and fleeing across the border to other countries. Five percent of the people crossing into border countries reported having a non-familial/unrelated child travelling with them *(7)*. People moving for safety, assistance and shelter during the winter months are likely to be more vulnerable than people who moved in previous waves, which puts them at higher risk of exploitation.	• Engage with local nongovernmental organizations (NGOs)/civil society organizations on the design and implementation of these interventions. • Implement gender-responsive interventions to reduce the risk of exploitation of women and children in countries receiving refugees from Ukraine.

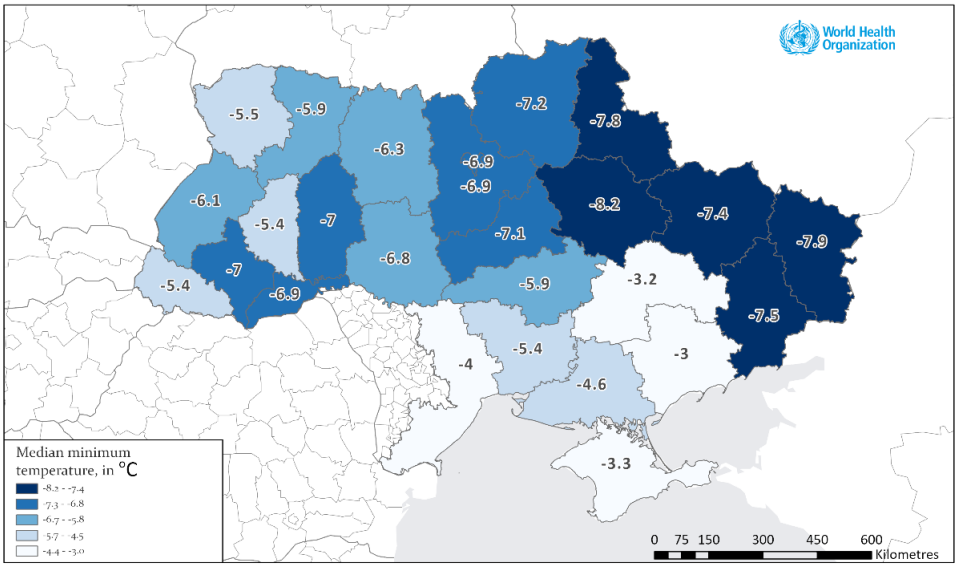
**Source: Preventing the health effects of cold weather and cold waves, WHO Regional Office for Europe, 2013*[i]

HAZARDS

Cold weather conditions in Ukraine typically last from October to March. During this six-month period, in the years 2010–2020, there were an average of 105 frost days (the temperature briefly dropping below zero degrees during the day), ranging from 61 to 160 frost days, depending on the geographic location and altitude of the oblast *(8,9)*. During the winter months, from December to February, the mean temperature ranged from –11.9 to 7.1 °C (see Fig. 1 for the distribution of median minimum temperatures by oblast). Wind speed can make cold temperatures feel even colder in an effect known as wind chill, which affects how the human body experiences temperature: the stronger the wind, the faster the cooling of the skin. This has the effect of moving heat away from the body and making the surrounding air feel colder than it is, thereby increasing exposure to cold and particularly increasing the risk of frostbite and hypothermia.

[i] World Health Organization Regional Office for Europe, Preventing the health effects of cold weather and cold waves, [2013, internal technical guidance]

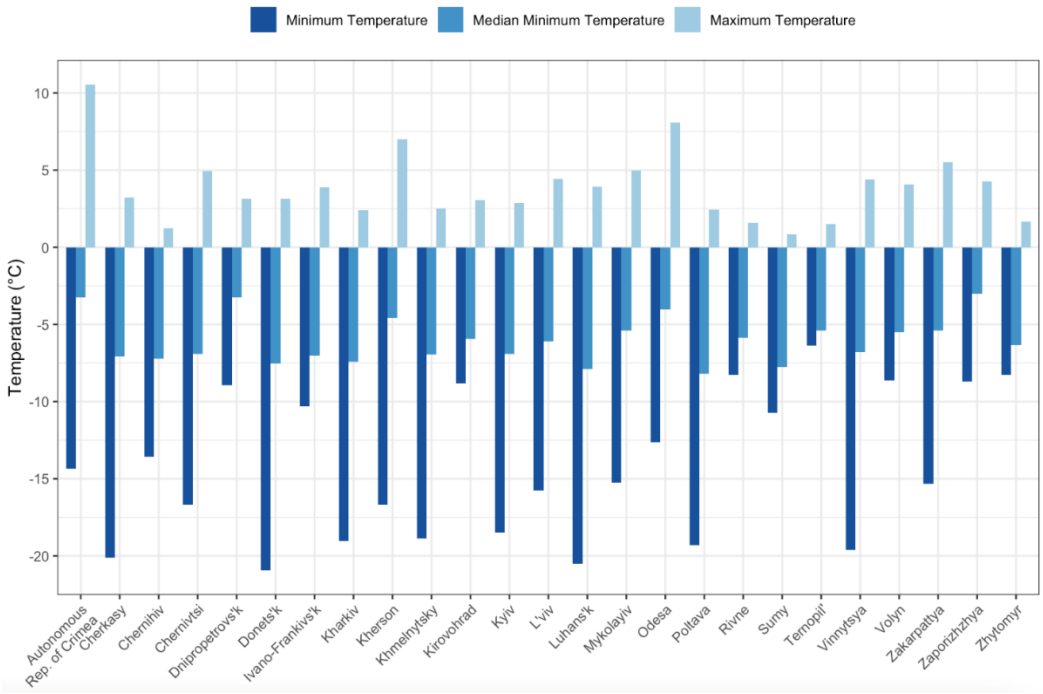
Fig. 1. Median minimum temperatures (°C) in Ukraine by oblast from December to February, 2000–2005



Source data: Global Summary of the Month (GSOM) data from the National Centers for Environmental Information at NOAA

Comparison of absolute minimum of average minima and absolute maximum of average maxima shows that temperatures can drop as low as –20 °C and climb as high as +13 °C in the period from December to March, of which half the minimum temperatures remain around –5 °C (Fig. 2). In this report, monthly mean maximum, mean minimum and mean temperatures are extracted from the Global Summary of the Month (GSOM) data from the National Centers for Environmental Information at the United States National Oceanic and Atmospheric Administration (NOAA) *(10)*.

Fig. 2. Comparison of absolute minimum and maximum temperatures in Ukraine by oblast from December to February, 2000–2005



Source data: Global Summary of the Month (GSOM) data from National Centers for Environmental Information at NOAA

The heating season (period during which central heating is necessary) in Ukraine is based on oblast temperatures and activated by local authorities when the mean temperature drops below 8 °C for three consecutive days. This usually occurs in mid-October and tends to last until April, after three consecutive days with temperatures above 8 °C are recorded *(8,9)*. The heating season starts earlier in the northern and western oblasts.

Ukraine experienced extreme cold waves in 2000, 2006, 2012 and 2017 (Table 1.).

Table 1. The impact of extreme cold wave events in Ukraine in the past 20 years

Year	Significant impacts*
2000	Severe ice storm affecting 11 regions, leaving four people dead, 700 injured, with electricity cuts in large swaths of the country. The Ministry of Emergencies of Ukraine deployed approximately 7200 workers to restore electricity in the hardest-hit regions, focusing on affected hospitals, 743 kilometres of railway power lines, and bakeries. The storm also affected two nuclear power plants, leading to a temporary reactor shutdown.
2006	Temperatures dipped below –28 °C in parts of the country during the cold spell, and the eastern city of Luhansk saw temperatures fall to –40 °C. According to the Ukrainian Red Cross, approximately 900 people died, 5500 people were hospitalized with frostbite or hypothermia, and 730 000 hectares (12%) of Ukraine's winter crops were destroyed.
2012	In late January 2012 and the first week of February 2013, Ukraine experienced temperatures that fell below –30 °C. Gas supplies ran low. An estimated 151 deaths were reported, of which approximately 100 were unhoused people, and in most cases prior alcohol consumption was a contributing factor. Prolonged exposure to severe cold resulted in 1800 hospitalizations, and 600 people were treated for frostbite and hypothermia.
2017	In January 2017, a cold wave swept the country, with temperatures dropping to –30 °C. Forty people died and approximately 900 sought medical care. Frost-damaged heating systems led to disruptions in heat supply. Temperature drops were experienced in shelters for displaced people and dwellings for non-displaced people affected by the war, which typically have poor insulation.

*Details extracted from media and situation reports

While the severity of cold and cold wave temperatures has not changed in Ukraine, the context in which this year's winter will take place amidst war, population movement, internal displacement, damaged infrastructure, social and economic factors, disrupted health systems and a lack of access to services, puts populations at compounded risk of direct and indirect adverse effects of severe cold weather. Cold wave events have occurred every 5–6 years over the past 20 years. If there is an extreme cold event during the 2022–2023 winter in Ukraine, it would take a huge toll on the overall population and apply massive pressure on the already overstretched health system.

EXPOSURE AND VULNERABILITY

Exposure to cold temperatures in the winter months is inevitable across Ukraine and the region, and affects the country's entire population. It can be experienced in the home (indoors), at work, during general movement or time spent outdoors, cross-border movement, and by people experiencing homelessness. People make seasonal preparations for the cold winter months, but certain geographic, security and socioeconomic factors impact their ability to adequately prepare for winter this year. In this respect, humanitarian assistance has been needed to support winterization efforts, particularly for people who have been displaced and people living in frontline areas. The government and partner organizations have distributed financial aid, blankets, warm clothing, generators, and other items needed for survival. Repairs to dwellings and the winterizing of infrastructure (including health services) have also been prioritized for and during the winter months. Since the outbreak of the war in February 2022, an estimated

17.7 million people in Ukraine have been affected, of which 12.1 million are considered in need of humanitarian health care. With the ongoing destruction of and damage to civilian infrastructure before the onset of cold weather, people in need will be faced with an additional threat due to winter, which will cause them to seek safety, shelter, and assistance in the coming months. To reduce the risk of exposure, particularly for the most vulnerable groups, it is important to winterize homes, shelters, health facilities and infrastructure, as well as increase the capacity at health facility level to cope with heightened seasonal needs. In addition, communicating to people, particularly those most at risk, how they can protect themselves to reduce the risk of exposure can supplement structural winterization actions.

VULNERABLE GROUPS

The following groups are deemed to be the most vulnerable to adverse effects from exposure to low temperatures and their impact on infrastructure *(1)*.

- **People over 60 years of age.** It is estimated that 20% of the population of Ukraine are people 60 years and older – the highest proportion of elderly people in a humanitarian setting in the world *(1)*. The elderly (of whom two thirds are women) can be more vulnerable to cold, particularly those who have made the decision to stay in their local communities, who may be socially isolated or living in rural and remote areas. Elderly people are more likely to suffer from pre-existing chronic illness, be immobile or have reduced movement and, in some instances, limited temperature regulation due to nutrition, medical conditions, or side effects from medication. Those with conditions such as dementia and Alzheimer's disease are also at risk as they may be less aware of the need to modify their behaviour to stay warm.
- **Children under five years of age, including newborns.** Children under the age of five are vulnerable to the cold due to underdeveloped thermoregulation skills and a high level of dependency, with increased risk among children under one year, premature and low-birthweight newborns.
- **Pregnant women.** With increased cardiac load and reduced thermoregulatory ability, pregnant women are more vulnerable to the adverse effects of cold weather, particularly upon prolonged exposure to cold. There is some association between preterm pregnancy and extreme weather events. In the current context, women may have limited access to health services due to movement to new areas, distance to nearest facility and infrastructure damage.
- **People with a chronic illness.** Ukraine has a very high prevalence of noncommunicable diseases (NCDs) and their behavioural and biological risk factors, especially in men *(1)*. Access to essential health services and medications is crucial in the treatment of NCDs, particularly for older people, many of whom have been unable to flee due to limited mobility. There is a higher risk of aggravation of chronic and severe illness, including heart conditions, cardiovascular disease, asthma, COPD, TB, depression and anxiety, diabetes, and arthritis during winter, compounded by limited access to medications and health services.
- **People with prolonged exposure to outdoor temperatures.** This group includes people who have been displaced, people on the move, fleeing conflict areas, at border crossings, seeking safer shelter, people experiencing homelessness, and people whose jobs require prolonged outdoor activities (such as health-care workers, first responders or military personnel). Exposure to cold and risk of adverse outcomes from cold weather conditions can be increased by other factors, such as social isolation, smoking, substance dependencies, mental illness and chronic and respiratory diseases, which may be more prevalent among more vulnerable groups.
- **People living in dwellings without adequate winterization.** Inability to maintain ambient indoor temperatures due to infrastructure damage (water, electricity, and heating systems), damaged or destroyed dwellings, intermittent or no power supply, limited access to fuel, and living conditions in alternate shelters may pose a risk to the health and safety of many people in Ukraine this winter.

Vulnerable groups exist throughout the country but make up a larger percentage of the population in frontline and de-occupied regions, this can be seen more prominently in table 3 by oblast or table 4 by region.

Table 3. Distribution of vulnerable people by oblast in Ukraine, December 2022*

	Age								
	<1 year[1]	1–5 years[1]	60+ years[2]	Internally displaced people (IDP)[3]	Pregnant and lactating women (PLW)[4]	Chronic illness[5]	People with disabilities (PWD)[6]	TB[7]	Current population[8]
Frontline regions									
Donetsk	8 667 (0.3%)	14 731 (0.5%)	700 518 (21.8%)	720 949 (22.5%)	24 576 (0.8%)	622 604 (19.4%)	267 397 (8.3%)	226 (0.0%)	3 207 607
Kharkiv	15 092 (0.8%)	25 650 (1.4%)	498 015 (26.5%)	718 687 (38.2%)	17 471 (0.9%)	442 624 (23.5%)	189 260 (10.1%)	1 129 (0.1%)	1 879 577
Kherson	6 362 (2.1%)	10 813 (3.6%)	71 613 (23.6%)	45 837 (15.1%)	2 512 (0.8%)	63 648 (21.0%)	28 853 (9.5%)	684 (0.2%)	302 911
Luhansk	3 007 (0.2%)	5 111 (0.3%)	340 832 (20.1%)	273 763 (16.2%)	11 957 (0.7%)	302 924 (17.9%)	132 147 (7.8%)	173 (0.0%)	1 693 050
Mykolayiv	6 860 (0.9%)	11 660 (1.6%)	163 247 (22.1%)	166 027 (22.5%)	5 727 (0.8%)	145 091 (19.6%)	63 229 (8.6%)	431 (0.1%)	739 478
Odesa	18 848 (0.9%)	32 034 (1.6%)	226 539 (11.0%)	215 864 (10.5%)	7 947 (0.4%)	201 342 (9.8%)	74 097 (3.6%)	3 003 (0.1%)	2 059 594
Zaporizhzhya	9 684 (0.8%)	16 458 (1.4%)	276 143 (22.7%)	389 764 (32.1%)	9 688 (0.8%)	245 430 (20.2%)	105 406 (8.7%)	773 (0.1%)	1 214 172
De-occupied regions									
Chernihiv	5 732 (0.7%)	9 742 (1.1%)	177 314 (20.3%)	175 368 (20.1%)	6 221 (0.7%)	157 593 (18.1%)	67 566 (7.7%)	330 (0.0%)	872 450
Kyiv	16 247 (0.9%)	27 613 (1.5%)	452 666 (25.0%)	686 950 (37.9%)	15 880 (0.9%)	402 319 (22.2%)	172 277 (9.5%)	758 (0.0%)	1 814 083
City of Kyiv	20 987 (1.0%)	35 669 (1.7%)	502 105 (23.7%)	410 000 (19.3%)	17 615 (0.8%)	446 259 (21.0%)	192 177 (9.1%)	636 (0.0%)	2 121 308
Sumy	6 066 (0.7%)	10 310 (1.1%)	236 170 (26.3%)	119 561 (13.3%)	8 285 (0.9%)	209 902 (23.3%)	88 442 (9.8%)	294 (0.0%)	899 284
Zhytomyr	8 924 (0.8%)	15 167 (1.3%)	227 514 (19.9%)	171 091 (14.9%)	7 982 (0.7%)	202 209 (17.6%)	86 190 (7.5%)	832 (0.1%)	1 146 053
Support regions									
Cherkasy	7 502 (0.7%)	12 750 (1.1%)	150 759 (13.5%)	320 064 (28.6%)	5 289 (0.5%)	133 991 (12.0%)	52 395 (4.7%)	412 (0.0%)	1 119 592
Dnipropetrovsk	20 495 (0.7%)	34 833 (1.2%)	422 943 (14.9%)	672 612 (23.6%)	14 838 (0.5%)	375 902 (13.2%)	166 331 (5.8%)	3 054 (0.1%)	2 846 032
Kirovohrad	5 846 (0.7%)	9 937 (1.2%)	97 942 (11.8%)	196 082 (23.6%)	3 436 (0.4%)	87 049 (10.5%)	34 156 (4.1%)	822 (0.1%)	831 032
Poltava	8 817 (0.7%)	14 986 (1.1%)	195 893 (14.9%)	443 716 (33.7%)	6 872 (0.5%)	174 105 (13.2%)	68 525 (5.2%)	638 (0.0%)	1 314 761
Vinnytsya	11 121 (0.7%)	18 901 (1.3%)	206 442 (13.7%)	405 814 (27.0%)	7 242 (0.5%)	183 481 (12.2%)	70 316 (4.7%)	708 (0.0%)	1 502 897
Backline regions									
Chernivtsi	8 034 (0.9%)	13 654 (1.5%)	87 548 (9.9%)	163 626 (18.6%)	3 071 (0.3%)	77 811 (8.8%)	29 754 (3.4%)	380 (0.0%)	881 015
Ivano-Frankivsk	11 619 (0.9%)	19 748 (1.6%)	129 124 (10.3%)	249 342 (19.9%)	4 530 (0.4%)	114 762 (9.2%)	44 630 (3.6%)	368 (0.0%)	1 252 785
Khmelnytsky	9 549 (0.9%)	16 229 (1.5%)	111 274 (10.4%)	216 371 (20.2%)	3 904 (0.4%)	98 897 (9.2%)	38 777 (3.6%)	524 (0.0%)	1 070 877
Lviv	20 833 (0.9%)	35 407 (1.5%)	198 485 (8.1%)	294 816 (12.1%)	6 963 (0.3%)	176 409 (7.2%)	66 065 (2.7%)	1 121 (0.0%)	2 440 922
Rivne	11 476 (1.1%)	19 505 (1.8%)	99 370 (9.2%)	171 609 (15.9%)	3 486 (0.3%)	88 318 (8.2%)	34 163 (3.2%)	671 (0.1%)	1 082 192
Ternopil	7 692 (0.8%)	13 074 (1.3%)	98 922 (9.9%)	184 668 (18.5%)	3 470 (0.3%)	87 920 (8.8%)	33 961 (3.4%)	283 (0.0%)	996 767

Volyn	9 384 (0.9%)	15 948 (1.5%)	87 975 (8.4%)	135 627 (12.9%)	3 086 (0.3%)	78 190 (7.4%)	29 781 (2.8%)	405 (0.0%)	1 053 028
Zakarpattya	12 040 (0.9%)	20 463 (1.6%)	169 838 (13.2%)	389 580 (30.2%)	5 958 (0.5%)	150 948 (11.7%)	59 313 (4.6%)	1 004 (0.1%)	1 288 977

1 Total number of children in need of health support (data source: OCHA)
2 Number of people over 60 years in the affected population (data source: OCHA)
3 Number of internally displaced people in the affected population (data source: IOM Ukraine Area Baseline Survey)
4 Number of pregnant and lactating women (data source: UNFPA)
5 Estimates correspond to the estimated burden of hypertension among people aged 18–69 years (data source: OCHA)
6 Estimated number of people with disabilities (PWD) out of the total cluster people in need (PIN) (data source: OCHA)
7 Number of registered patients with active TB as of July 2022 (data source: UkrMedStat / MoH)
8 Estimated population currently living in Ukraine (data source: Oxford University LCDS)
** Population data are extracted from PIN data; due to the current situation, increased population movement is being reported and data should be interpreted with care.*

Table 4. Distribution of vulnerable people by region status in Ukraine, December 2022*

	Age								
	<1 year[1]	1–5 years[1]	60+ years[2]	Internally displaced people (IDP)[3]	Pregnant and lactating women (PLW)[4]	Chronic illness[5]	People with disabilities (PWD)[6]	TB[7]	Current population[8]
Frontline region	68 520 (0.6%)	116 456 (1.0%)	2 276 908 (20.5%)	2 530 891 (22.8%)	79 879 (0.7%)	2 023 664 (18.2%)	860 389 (7.8%)	6 419 (0.1%)	11 096 389
De-occupied region	57 955 (0.8%)	98 501 (1.4%)	1 595 769 (23.3%)	1 562 969 (22.8%)	55 983 (0.8%)	1 418 282 (20.7%)	606 653 (8.9%)	2 850 (0.0%)	6 853 177
Support region	53 782 (0.7%)	91 407 (1.2%)	1 073 979 (14.1%)	2 038 287 (26.8%)	37 677 (0.5%)	954 528 (12.5%)	391 723 (5.1%)	5 634 (0.1%)	7 614 313
Backline region	90 627 (0.9%)	154 028 (1.5%)	982 535 (9.8%)	1 805 640 (17.9%)	34 469 (0.3%)	873 255 (8.7%)	336 445 (3.3%)	4 756 (0.0%)	10 066 564

1. Total number of children in need of health support (data source: OCHA)
2. Number of people over 60 years in the affected population (data source: OCHA)
3. Number of internally displaced people in the affected population (data source: IOM Ukraine Area Baseline Survey)
4. Number of pregnant and lactating women (data source: UNFPA)
5. Estimates correspond to the estimated burden of hypertension among people aged 18–69 years (data source: OCHA)
6. Estimated number of people with disabilities (PWD) out of the total cluster PIN (data source: OCHA)
7. Number of registered patients with active TB as of July 2022 (data source: UkrMedStat / MoH)
8. Estimated population currently living in Ukraine (data source: Oxford University LCDS)
** Population data are extracted from PIN data; due to the current situation, increased population movement is being reported and data should be interpreted with care.*

CONTEXT AND COPING CAPACITY

DAMAGE TO CRITICAL INFRASTRUCTURE

- Significant infrastructure damage. Across most oblasts, infrastructure damage has recently been occurring with renewed intensity, as critical energy infrastructure is being targeted, leaving hundreds of thousands of people without electricity, water and heat *(3)*. Approximately six million people have either limited or no access to safe water, as active hostilities prevent repair teams from fixing damaged systems and restoring access. This comes as Ukraine enters the winter season, when indoor heating systems are needed the most.
- Inability to repair damage. Damage to infrastructure from the war has left over 650 000 people without access to electricity and gas, and increased the risk of losing access to heating. In areas with active hostilities it is often impossible to repair damage to housing and infrastructure. There is also an urgent need for access to solid fuels, generators, and heating devices.

POPULATION DISPLACEMENT AND MOVEMENT

- **Ongoing mass movement.** The International Organization for Migration (IOM) estimates *(11)* as of 5 December 2022, 5.9 million people are displaced across Ukraine. Among these, 680 000 have become newly displaced in the last 30 days, most new displacements took place from locations in the east and south. As the numbers of displaced people are fluid and reflect registrations, it is known that there are pendular movements within Ukraine and across country borders. As of 13 December, there have been over 16 million border crossings from Ukraine and over 8 million border crossings to Ukraine since 24 February 2022 *(12)*. This includes people who are now returning home despite damage to housing, civilian infrastructure and threat of further hostilities.
- **Winter leading to forced movement of vulnerable groups.** The first waves of people moving from Ukraine across the border and beyond were more likely to be under 60 years of age, women and children, have sufficient financial means to make the move, and a higher level of education *(12)*. The people who stayed in Ukraine were likely to be more vulnerable, male – due to the restricted freedom under martial law, of older age and less mobile. As a result of continuing hostilities and winter pressures, future waves of movement will see a more vulnerable population than those that moved at the escalation of the conflict in February 2022. This population will need additional humanitarian assistance, particularly during the cold months, in which the sub-zero temperatures in Ukraine could be life-threatening and force others to flee to seek safety, protection and assistance.

LACK OF ADEQUATE SHELTER

- **Hundreds of thousands of Ukrainians have lost their homes or livelihoods.** The war in Ukraine has resulted in the destruction of civilian infrastructure, leaving hundreds of thousands of Ukrainians without homes or livelihoods. Many are living in damaged homes or in buildings ill-suited to provide protection for the upcoming severe winter season *(13)*. Damage to residential and public infrastructure due to the war is now widespread across Ukraine. In an IOM survey of people who have been displaced *(14)*, approximately half of all respondents reported that their residence had been damaged (45%) or destroyed (5%). Of those, nearly all cited a lack of financial resources as the primary barrier to repairing the damage (94%) *(14)*.
- **Potential impact on collective centres and neighbouring countries.** The cold temperatures may force people to move away for safety, protection, and assistance, either within Ukraine or across the border to neighbouring countries, putting potential pressure on collective centres, border crossings and refugee centres in neighbouring countries. This could result in the separation of families and force people to move to shelters with poorer hygiene and sanitation, and overcrowding, thus seriously increasing the risk of infectious disease outbreaks, exacerbation of mental health symptoms, GBV, and posing a safety risk, particularly to vulnerable people.

REDUCED ACCESS TO HEALTH SERVICES

Health services, including prevention, diagnostics and treatment, have been disrupted in the current context. The winter months pose a higher threat of adverse health outcomes as the functioning of health facilities and population access may be further impacted.

- **Attacks on health facilities.** As of 24 July, more than 746 health-care facilities are in need of restoration, and more than 123 have been destroyed since the beginning of the war. As of 8 December 2022, the WHO Surveillance System for Attacks on Health Care has verified 715 attacks on health care, including 630 attacks affecting health facilities *(2,15)*, which put thousands of health-care workers at risk and disrupted health service delivery. Authorities are considering a halt/postponement of elective health services.

- Toll on health-care workers. Ukraine is dealing with health-care staff shortages, as many health-care workers were forced to leave their workplaces due to the war, leaving the remaining staff overwhelmed, overstretched, and working in resource-limited, dangerous environments with reduced IPC. The government has created teams to replace surgeons and trauma specialists to reduce the risk of medical error. Winter will further compound an already challenging work environment for health-care workers. With health-care service infrastructure damage, disruptions in electricity and water supply, and lack of alternate power sources, it will be challenging to keep health facilities operational and appropriately heated, which will impede the delivery of health-care services. Health-care workers are also witnessing and experiencing traumatizing events both at work and at home, which can take a huge mental toll on them and their families.
- Disrupted surveillance systems and health programmes. Even before the war, Ukraine was in need of strengthening its medical data collection and evidence generation systems, including early warning systems for potential public health events. This has become even more challenging to improve in the current situation. Due to disruptions to health care and laboratory testing capacity, particularly in areas of active hostilities, current surveillance systems may experience delays in reporting disease outbreaks. At present, the surveillance system is fully functional in the central and western regions, and largely non-functional in areas not under Government control and in areas that have recently been de-occupied.
- Disrupted supply chains. The war has limited the movement of medicines and consumables between and across institutions, cities, and regions. Cargo movement by air has stopped, many roads are blocked, trains and train stations are damaged, and as movement on roads continues to be risky, the supply of goods has been delayed. Snowfall and icy conditions in the winter will further impact access to distribution routes. Access to life-saving and essential medicines, such as life-sustaining oxygen and insulin, personal protective equipment, surgical supplies, anaesthetics, and safe blood products has improved since April 2022, but remains very limited in areas of active hostilities.
- Reduced access to health care. Access to health care has been limited in areas of active hostilities and in recently de-occupied areas. From February to April, when the war escalated, there was a decrease in the number of prescriptions dispensed and filled, which can be used as a proxy indicator for access to services. While there has since been an increase in the number of prescriptions filled and dispensed, it has not returned to pre-war levels. There has also been a decrease in electronic record entry from providers in areas affected by active hostilities and in recently de-occupied areas, with an increase in non-conflict areas in the number of people attending from outside their region of origin, due to large-scale population movements. Winter could further reduce people's access to health care due to weather-related issues.

SOCIAL AND BEHAVIOURAL FACTORS

Exposure to cold in the home is both an economic problem and a social problem, which can be aggravated during cold waves.

- Economic factors, such as the quality of housing, affordability of heating, availability of power or alternate fuel sources, warm clothes, and regular hot meals, impact people's ability to prepare their homes for the winter months.
- Housing standards, such as energy-inefficient housing, poor home insulation, ventilation, and heating systems, may lead to a high cost of living and fuel poverty. Many people in Ukraine are also unable to procure services or repair heating systems for financial reasons, due to ongoing hostilities or lack of essential repair materials.
- Social isolation can result in increased exposure to cold and severe impacts during extreme cold events and the suffering from the cold can go unnoticed. This can include, but is not limited to, people isolated because they are unable to leave their shelter, people with mobility issues, people with disabilities or limited autonomy, elderly people, and people who are geographically isolated or whose movement has been restricted by cold weather events such as snowfall. In addition, in the context of Ukraine, people who have been displaced, are on the move or have fled across borders to other countries are likely to experience social isolation.

- **Behavioural factors**, such as excessive alcohol use, substance abuse and prolonged outdoor activities, may increase the risk of exposure to cold temperatures.

DEMAND AND SUPPLY MISMATCH

- **Need for generators and heating devices.** Currently there is an urgent need for generators and heating devices at health facilities, households, public institutions and in the private sector. The government and humanitarian community are responding but the need far outweighs the capacity. Ongoing attacks on civilian infrastructure and on health-care services hinder these efforts, increasing the risk of cold-related morbidity and mortality, compromising delivery of health services, creating challenging and unmanageable environments for health-care workers to provide care in, and putting patients at risk of adverse outcomes.
- **Increasing demand for solid fuel.** Electricity and gas shortages since the escalation of the conflict in February have led to a significant demand for solid fuel (such as firewood, coal, briquettes, peat briquettes, wood pellets and petrol), but there have also been moderate-to-significant impacts on supply. With the onset of the colder months, there is an expected increase in demand for electricity, solid fuel, and gas. While vendors do expect an increase in demand, supply will not match said demand, which will lead to solid fuel shortages and higher prices *(16)*.
- **Food insecurity.** A survey conducted in Ukraine by the World Food Programme in April 2022 found that one third of households nationally were food-insecure *(17)*, with the highest insecurity reported in the eastern and southern oblasts. Food supply chains will be affected by access issues related to both security concerns and winter conditions. Limited supply remains a critical issue, and lack of food that meets the specific needs of pregnant and breastfeeding women, newborn babies and infants, adolescents, people with disabilities and those with various health conditions is a major concern. In some cases, the winter conditions, in combination with economic strain, loss of livelihood and displacement, may force some Ukrainians to choose heat over food this winter. People who are malnourished are less likely to maintain their body temperature, which makes them even more susceptible to the effects of cold and risk of cold-related illness or injury.

EARLY PREPARATION AND COORDINATION

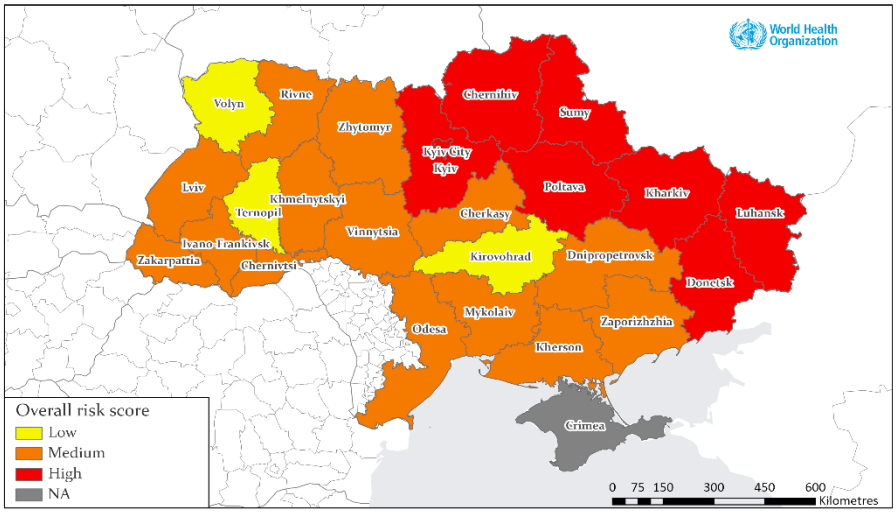
In anticipation of winter's impact on vulnerable groups and essential service delivery across Ukraine, the government started winterization efforts early. However, the number of people in need of assistance and the amount of support needed for winterization at health facility level in Ukraine this winter are impossible to overstate. United Nations (UN) agencies have developed a joint winterization plan *(18)* to protect the most vulnerable communities. This time the crucial procurement and repair plan focuses on procurement and distribution of core relief items, winterization of collective centres, insulation and repair of damaged homes in rural and remote areas, and reinforcing shelters for livestock. The Health Cluster led by WHO currently brings together 149 Partners (NGOs, UN agencies, national authorities, donors, and observers) engaged in the humanitarian health response in Ukraine. Across the country WHO and other Partners have delivered generators and supported the winterization of health-care facilities. However, with ongoing attacks on health care, damage to health service infrastructure and inability to repair in some cases, the demand far outweighs supply and implementation capacity.

RISK MATRIX

Oblast public health impact risk was determined based on exposure to hazard severity (median minimum temperatures between December and February), vulnerability (population demographics in each oblast) and coping capacity (access to health services, infrastructure damage, public health response capacity and security situation in each oblast). The risk across Ukraine has been mapped in fig 3.

Seven oblasts: Chernihiv (de-occupied), Donetsk (frontline), Kharkiv (frontline), Kyiv (de-occupied), City of Kyiv (de-occupied), Luhansk (frontline), Poltava (support) and Sumy (de-occupied) are at high risk of the public health impacts of cold temperatures in the winter months. These high-risk oblasts require immediate targeted interventions to reduce risk for vulnerable populations and to ensure functionality of health facilities. All Oblasts have vulnerable groups as identified in Table 3., therefore the fifteen Oblasts with medium risk and three with low risk require support for winterization of dwellings and health facilities, support for populations in need and in some cases, oblasts should prepare for increased population due to movement as a result of ongoing conflict and impact from cold temperatures.

Fig. 3. Risk of public health impacts from cold temperatures in Ukraine by oblast



There are limitations to the datasets used within the risk matrix. Findings should be interpreted with care and with local counterparts who understand the local context in each oblast. Datasets are collected at different time periods, through different methodologies, used based on availability and risk level is based on the indicators included within the risk matrix.

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