

Urban climate vulnerability, housing and drug supply

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Shifting illicit drug supplies and extreme weather patterns are heightening health risks for unhoused drug users in cities, but these dynamics are largely absent from climate planning. To address the compounded risks faced by this highly at-risk population, urban climate equity frameworks must integrate attention to the drug supply.

The illicit drug supply is evolving rapidly, and attention to these changes is a missing dimension of climate risk in many cities. In the USA and increasingly worldwide, potent sedatives and tranquilizers are reshaping illicit drug use, affecting thermoregulation and mobility, and leading to extreme sedation^{1,2}. These symptoms intensify climate risks for unhoused people who use drugs – who have less access to climate-controlled spaces – by diminishing responses to extreme weather^{3,4}. The experience in Philadelphia, where the emergence of the adulterant sedative medetomidine has rapidly transformed drug use and addiction medicine, illustrates how these compounding crises are unfolding^{3–5} (Box 1). By advancing research on the connections between changes to the drug supply, housing precarity and severe climate concerns, scientists can contribute to developing a policy framework that addresses the extreme effects of these converging crises for a highly marginalized population.

A shifting landscape of illicit drug use

Discourse on fentanyl, an opioid that has replaced heroin in most US cities¹ and spread internationally, has reached many news outlets and scientific studies, and now its combination with new adulterants is changing the way that users react to environmental changes, including heat and cold³. Although global public attention has often centered on fentanyl in the illicit opioid supply, the combination of drugs known as ‘dope’ now includes more tranquilizers and anesthetics¹, which are introduced to prolong the intoxication of fentanyl (which has a short half-life). Adulterants such as xylazine and medetomidine (veterinary-grade tranquilizers found in fentanyl supplies in recent years⁶) have changed the pace of addiction medicine, as providers face changing supplies and novel symptoms across the country.

In response to this public health crisis, health scholars have called for urban areas to closely monitor drug supplies and adapt medical protocols to meet the needs of affected drug users⁷, many of whom are also living without housing⁴. Within this context, many unhoused drug users are also exposed to increasingly severe temperatures, which results in compounding health risks. Cities often treat these crises as separate, and lack climate-protected areas for drug users to simply exist without fear of being asked to move along.

Climate shelters, cooling centers and drop-in centers have begun to fill this need; however, they often come with barriers such as limited hours or behavioral requirements⁸.

Illicit drug supply as a missing dimension of climate planning

Cities worldwide are facing severe, interconnected risks of intensifying weather patterns, economic inequality and housing insecurity⁹. Within this context, policymakers are increasingly required to address drug use and supply, but drug use remains largely unincorporated in urban planning and climate equity frameworks. Rather than operating as separate challenges, drug use, homelessness and extreme weather intersect in ways that amplify risk and strain urban systems. These dynamics are part of a polycrisis framework, in which rapidly accelerating climate, housing and economic crises compound one another to produce greater challenges⁹. Although climate scholars have begun to study the effect of extreme weather on people who use drugs¹⁰, the polycrisis framework is underdeveloped in its attention to drug use and homelessness as interacting urban crises.

Climate vulnerability in the context of a shifting drug supply and precarious housing contexts can be understood as the interaction between physiological sensitivity (such as increased sedation), heightened exposure (from unsheltered living conditions) and institutional invisibility (in which people who use drugs are insufficiently considered in climate planning and response systems). Further research into each of these pathways and their interaction with each other can clarify how drug supply changes interact with extreme weather. Longer-term research incorporating drug use into the polycrisis framework is further needed to better understand the interactions of these compounded risks and the changes needed to broader urban systems.

Policy recommendations for drug use and climate planning

Integrating these dynamics into climate equity planning requires both conceptual and practical advances. In the short term, precise and practical policies must respond to the rapidly evolving effects of adulterants.

Climate coordination, data and research. Although healthcare practitioners in cities with long histories of drug use have developed best practices to respond to changing drug supplies³, these practices have yet to be incorporated into climate vulnerability research and planning. Many cities lack address-level data for emergency room presentation, which limits tracking between housing status, weather-related illness and drug use¹¹. Furthermore, chronic exposure to extreme weather may not be considered when patients present with acute conditions such as heart attacks, which complicates the documentation of weather-related emergency room presentations and fatalities¹². Improved data collection and targeted research of trends are essential to linking drug supply changes to climate risks.

Cities can also establish cross-sectoral task forces that incorporate sustainability, public health, addiction medicine and emergency

BOX 1

Risks of and responses to increases in medetomidine in Philadelphia

Philadelphia offers a striking example of converging homelessness, illicit drug supply changes and climate risk. A city affected by severe heat, flooding and increasingly unpredictable winters, Philadelphia's more than 5,000 people experiencing homelessness¹⁴ — many of whom use drugs — face elevated health risks from both rapid changes to the fentanyl supply and extreme temperatures³. These effects have resulted in strains to the healthcare system as well as swift, coordinated responses from many providers²⁻⁴.

The connections between health risks from a changing drug supply and exposure to severe temperatures can be drawn by looking at the example of medetomidine, a tranquilizer found in the fentanyl supply of at least 18 US states¹. An adulterant that is 200–300 times more potent than its precursor (xylazine), medetomidine was first detected in the drug supply in Philadelphia in early 2024, when xylazine was still the predominant adulterant to the fentanyl supply. By late 2024, medetomidine was present in 87% of drug samples, whereas xylazine had dropped to 42% and by early 2025, emergency room visits due to withdrawal had tripled^{2,3}. Medetomidine use has been associated with several particularly dangerous symptoms, including heavy sedation and intense withdrawal. Tachycardia, severe hypertension, intractable nausea and vomiting associated with medetomidine withdrawal correlate with reduced efficiency of withdrawal management protocols^{4,6}. In the worst of cases,

medetomidine users are also beginning to die from withdrawal — a previously rare result of opioid withdrawals⁴.

The physiological effects of medetomidine compound climate risks. The combination of heavy sedation and intense withdrawal with extreme temperatures can range from unsafe to life-threatening, as users risk prolonging exposure to extreme temperatures with decreased sensitivity to its effects¹⁶. When taken during heat episodes, this increases risk of dehydration, heatstroke and hyperthermia¹⁵; in cold conditions, it can contribute to hypothermia and frostbite^{3,6}. Low temperatures the past two winters have prompted public health practitioners to issue directives on the overlap between prolonged sedation and cold exposure³.

Key lessons from Philadelphia

- The pace of medetomidine introduction and its swift changes to fentanyl use symptoms reflects the importance of localized tracking and response².
- Adulterants can severely affect healthcare systems, and require rapid changes and re-training in withdrawal and overdose protocols^{2,3}.
- Extreme temperatures are associated with heightened risk for medetomidine users and require specific health directives as well as more support for housing services; however, public health advisories were not tied to a wider climate planning narrative³.

management. Although public health and addiction medicine are often integrated, sustainability and climate departments are often disconnected from public health and harm reduction efforts^{10,13}. Additionally, the converging risks from using drugs in severe weather are not seen as a climate issue, which further segregates an already-marginalized population¹⁰. These coordination restrictions are often tied to funding, and climate and homelessness departments receive just a small fraction of what is allocated to enforcement-oriented departments¹³. Properly incorporating these connected planning realms includes equitable funding practices.

Health education for practitioners and public. Addressing extreme climate risks for people affected by a shifting drug supply requires education for both providers and the general public. For providers, training on substance use and housing status can lead to critical changes such as adjusting treatment plans based on unsheltered status and advocating for access to safe housing from a medical perspective, both of which prevent further recurrence of illness and symptoms. Additionally, educating the public on climate risks for unhoused drug users also increases safety for all community members. Public education campaigns on associated risks between severe weather and drug use, outreach numbers to call when witnessing someone who is heavily sedated during extreme temperatures, or locations of climate shelters help to integrate the needs of those most at-risk into public attention instead of further isolating their experience.

Strengthening infrastructure for climate protection and safer use. Partnering with affected populations to understand and address their climate shelter needs is a critical policy concern for urban areas. Additionally, cities can protect areas that unhoused people use to safeguard themselves from extreme weather. Encampments, although controversial in urban planning, often provide shelter from cold, heat and flooding, as well as storage for belongings that protect from these weather phenomena⁸. Cities can consider moratoriums on actions to clear encampments during extreme weather so as not to further expose users to compounded negative health effects. Urban areas can also expand harm reduction and drug use services, which provide spaces for people to safely receive health support indoors. Although these policy recommendations are necessary stop-gap measures to address climate adaptation needs, a primary, crucial frontier to address many of these converging issues is prioritizing affordable, climate-controlled housing to house the thousands of residents in want of shelter and avoid further evictions.

Towards integrated climate and health policy

As drug supplies in cities continue to change, unsheltered drug users are experiencing heightened health risks from chronic exposure to extreme weather. People who use drugs are often experiencing the effects of adulterants they did not initially choose to be on, which leave them at risk of falling unresponsive or in severe withdrawal during heat waves or winter storms. These conditions challenge climate equity

planning to incorporate new paradigms, as the field has yet to fully account for drug use (and its effects on individual and community health) as a dimension of climate vulnerability. Framing these risks through the pathways of physiological sensitivity, heightened exposure and institutional invisibility, and situating them within the broader polycrisis, provides a basis for integrating drug supply into climate, housing and health policy.

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