

A satellite view of Earth from space, showing the Western Hemisphere. The Americas are visible, with North and South America in the lower half and the Atlantic and Pacific Oceans in the upper half. The image is used as a background for the presentation slide.

# **Surgery in the Climate Emergency: Responsibility Without Borders**

Josh Ng-Kamstra MDCM, MPH FRCSC FACS



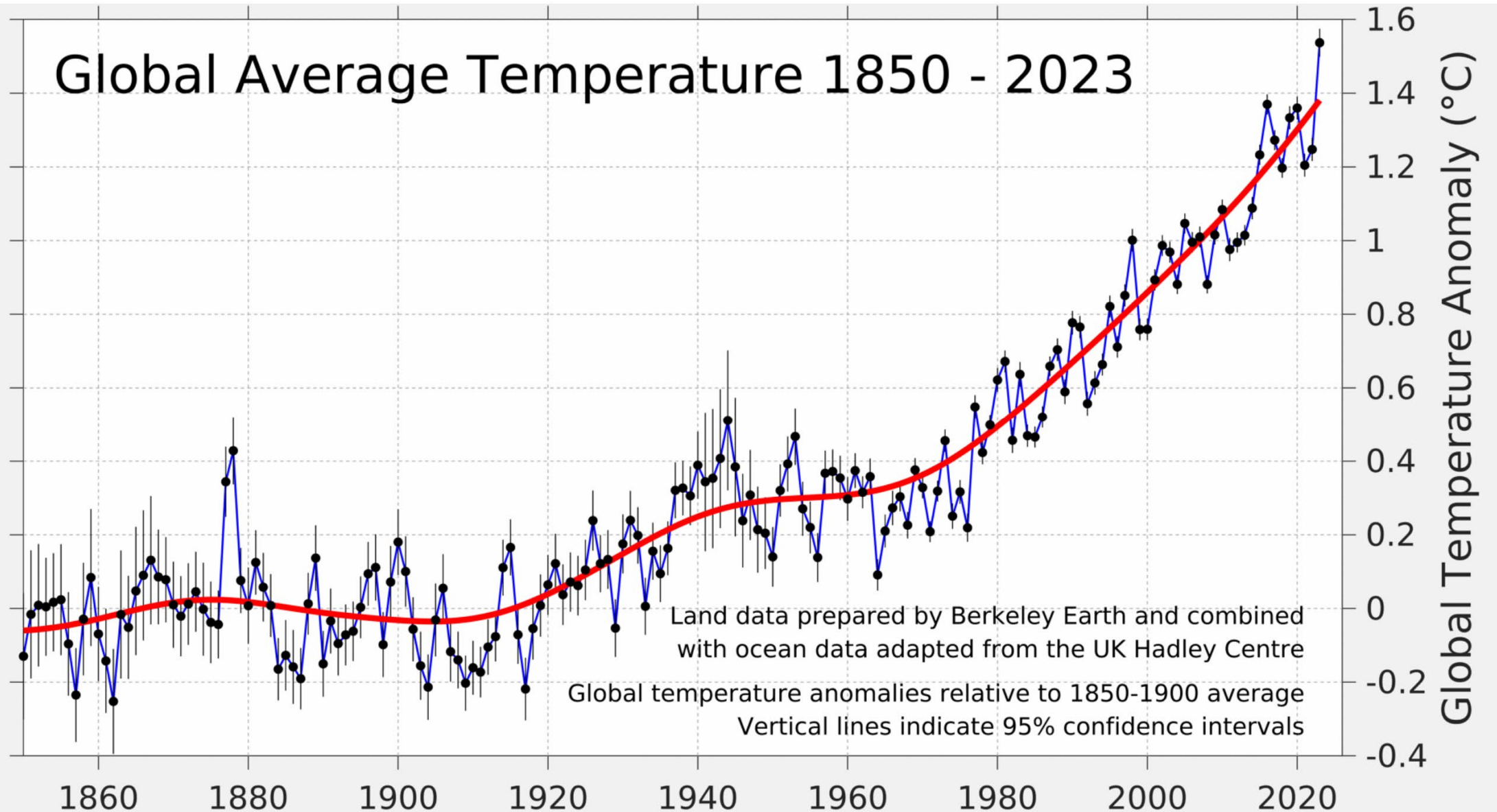
**HARVARD**  
MEDICAL SCHOOL

**BLAVATNIK INSTITUTE**  
GLOBAL HEALTH &  
SOCIAL MEDICINE

PROGRAM IN GLOBAL SURGERY  
AND SOCIAL CHANGE



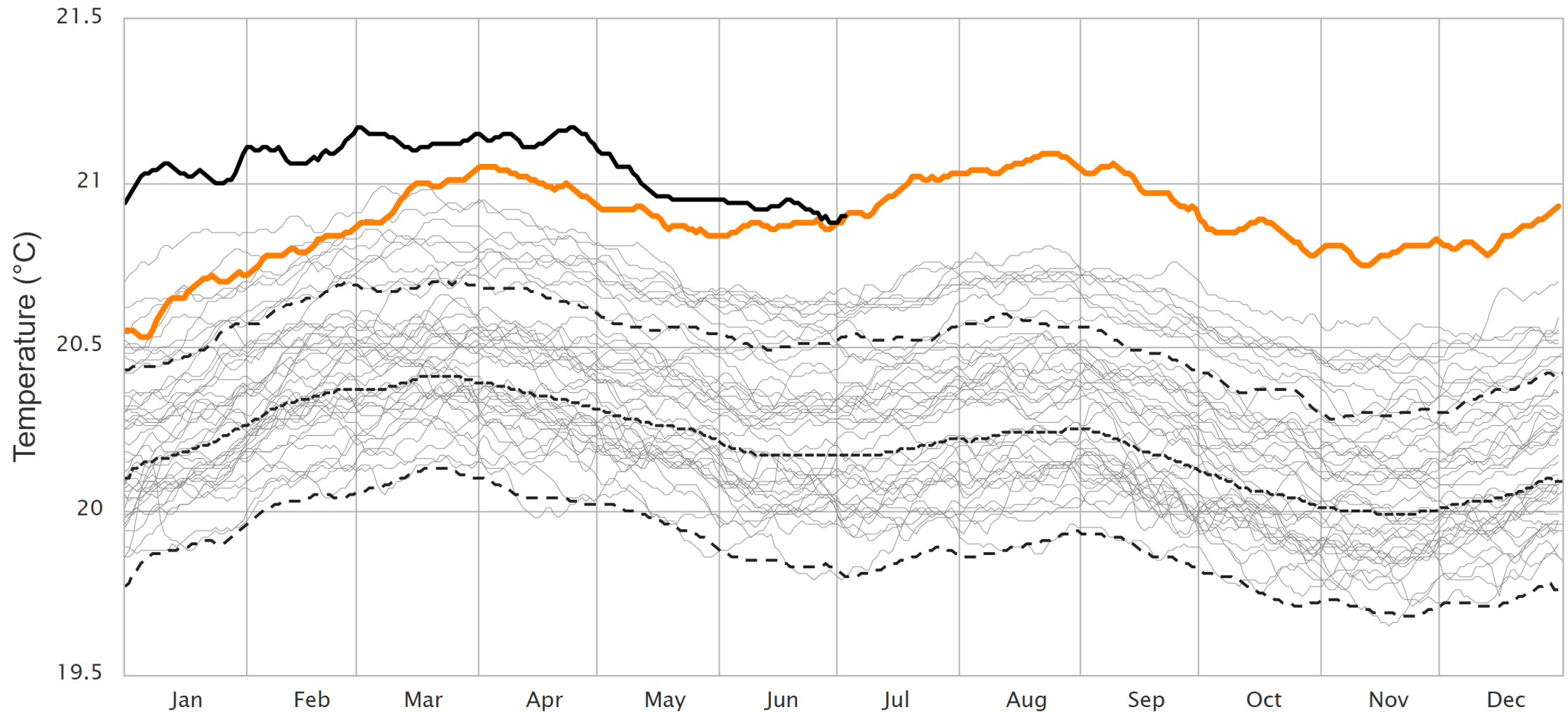
# Global Average Temperature 1850 - 2023

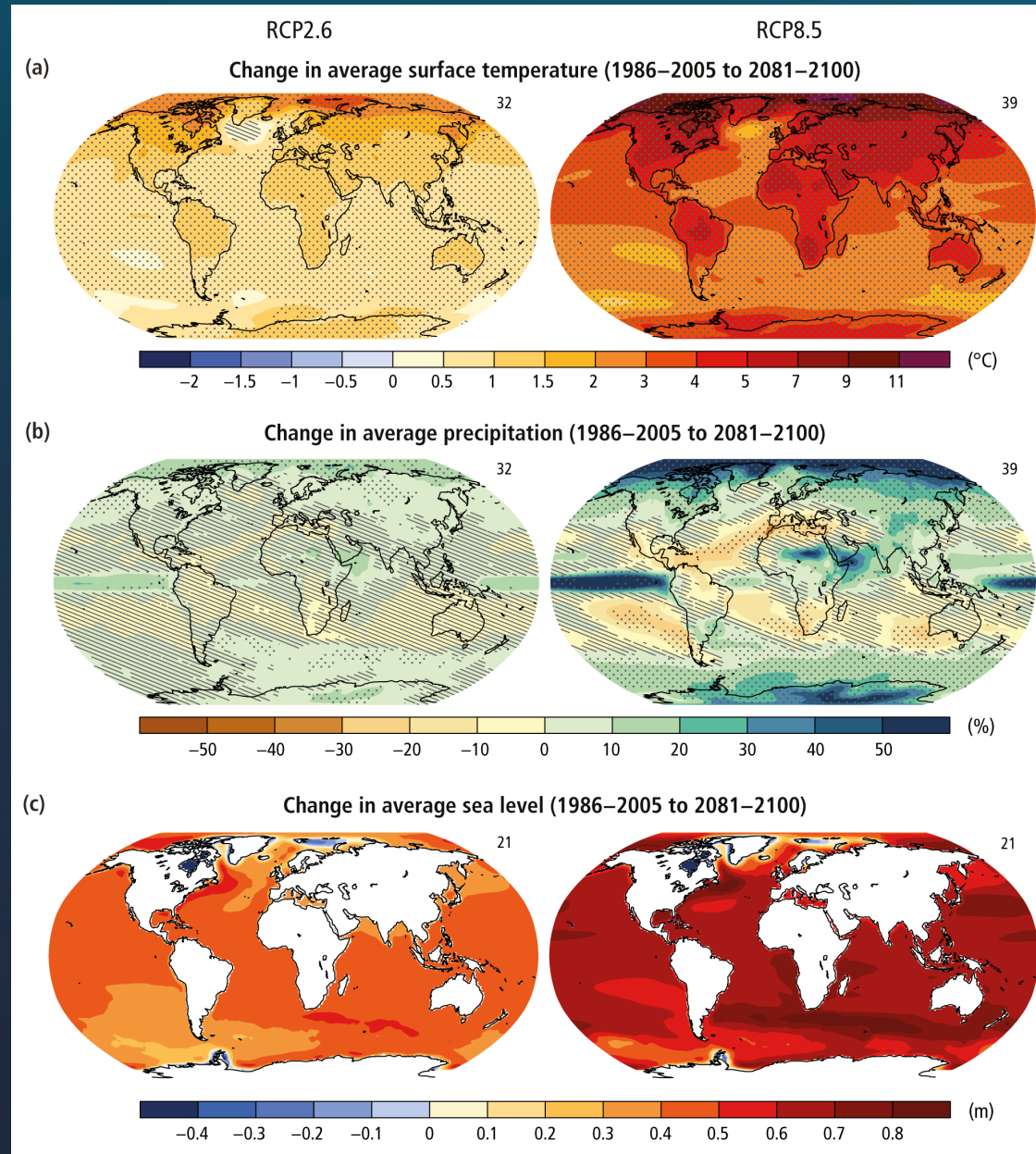


# Daily Sea Surface Temperature, World (60°S–60°N, 0–360°E)

≡ [Export Chart](#)

Dataset: NOAA OISST V2.1 | Image Credit: ClimateReanalyzer.org, Climate Change Institute, University of Maine









Google Earth

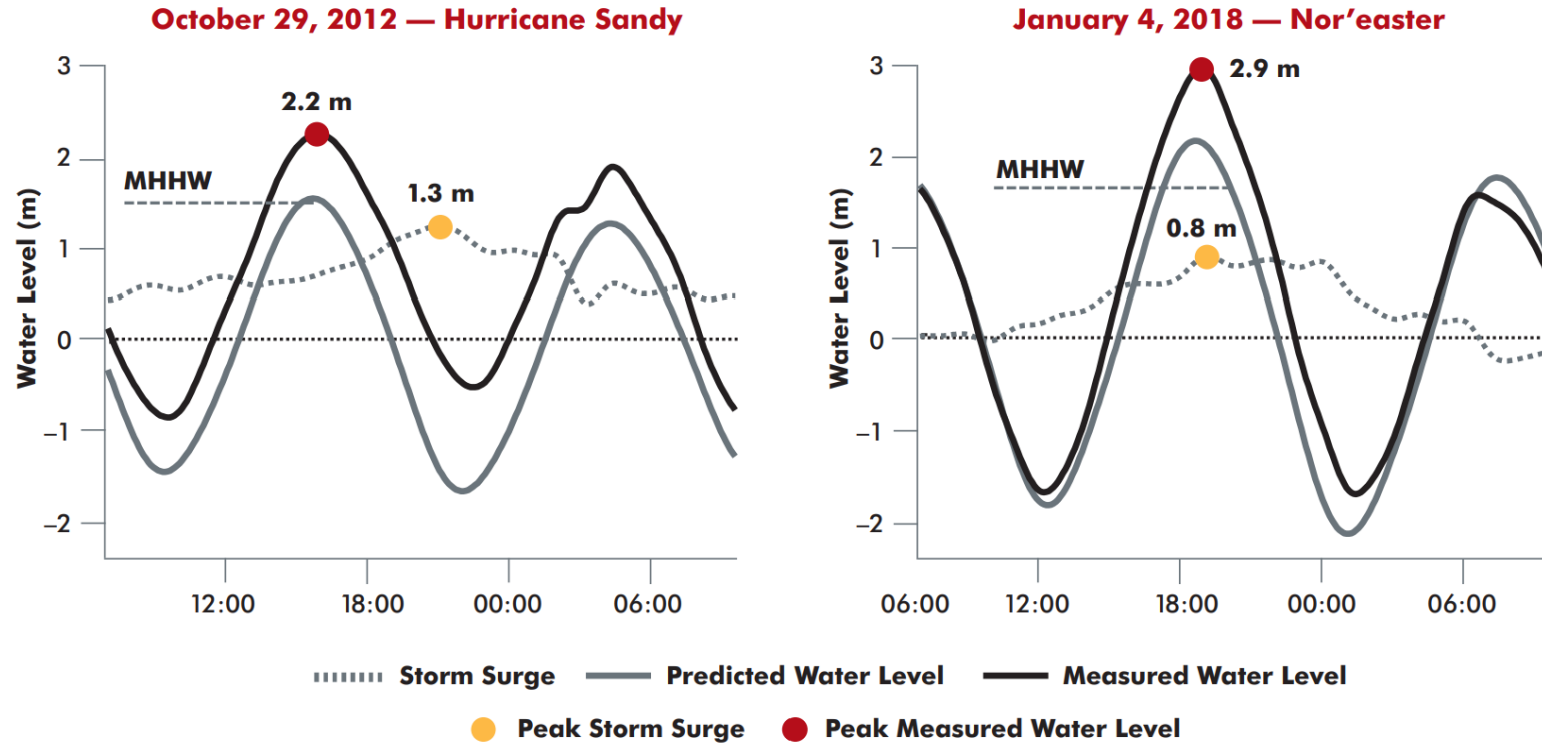







**Figure 4.6**

**Comparison of flooding during the record-breaking January 2018 Nor'easter and Hurricane Sandy in 2012.**



2-3 ft of sea level rise by 2100



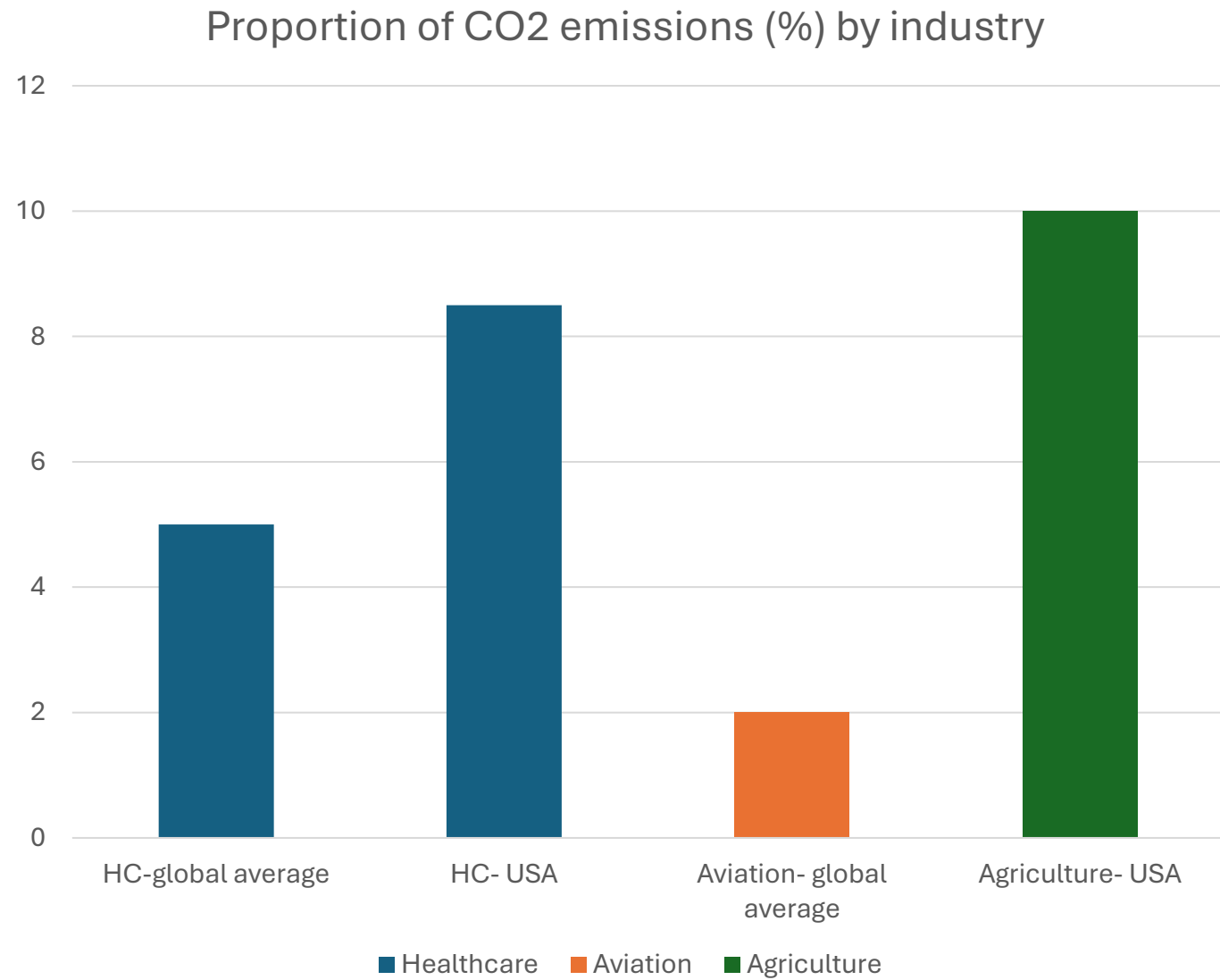
“Climate change implies precipitous declines in output, capital and consumption that exceed 50% by 2100. These changes imply a 31% welfare loss in permanent consumption equivalent in 2024, that grows to nearly 52% by 2100. These magnitudes are ***comparable to the economic damage caused by fighting a war domestically and permanently.***”

-Bilal & Känzig, 2024



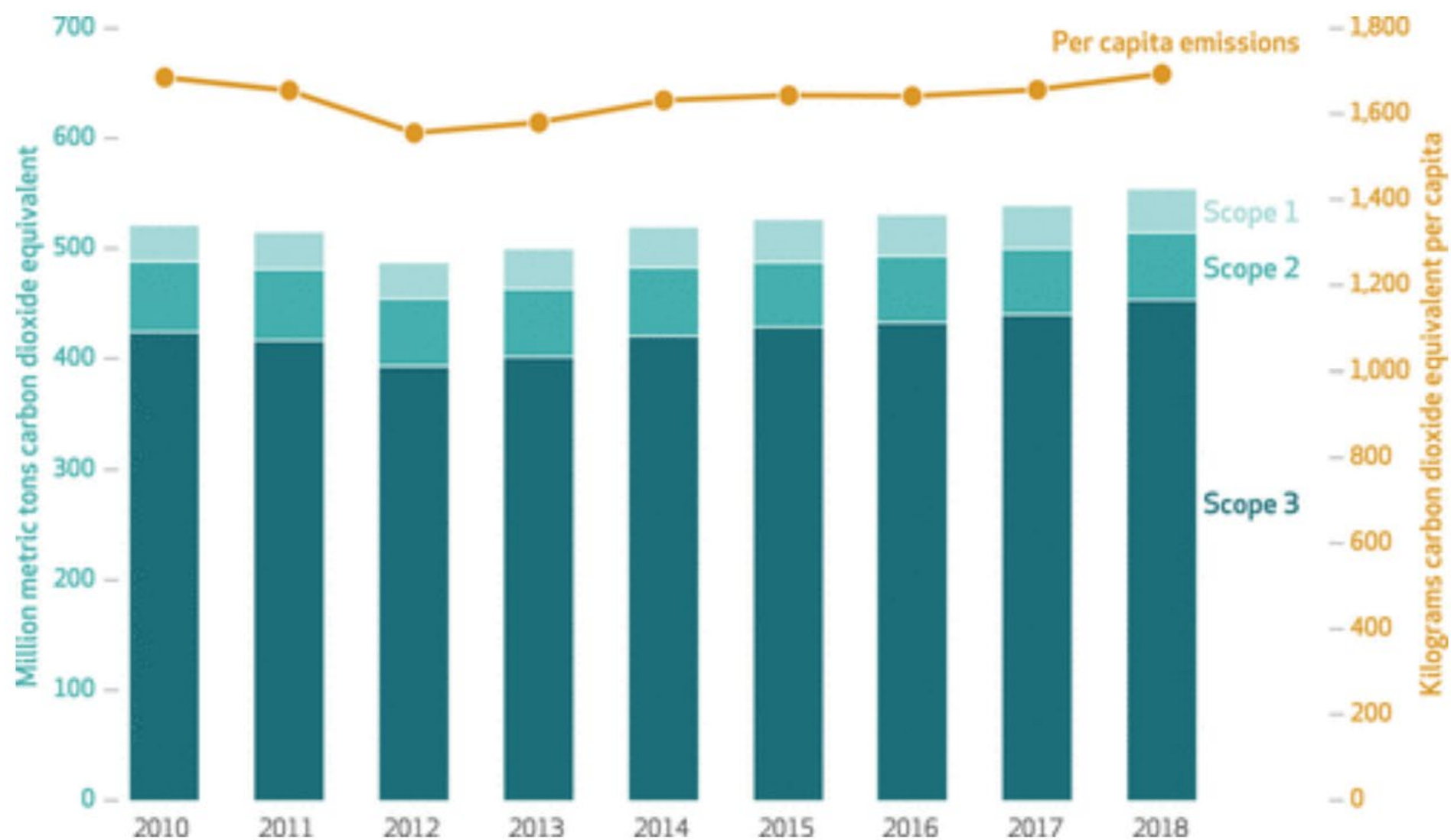
What does this have to do  
with surgery &  
healthcare?

We're  
responsible





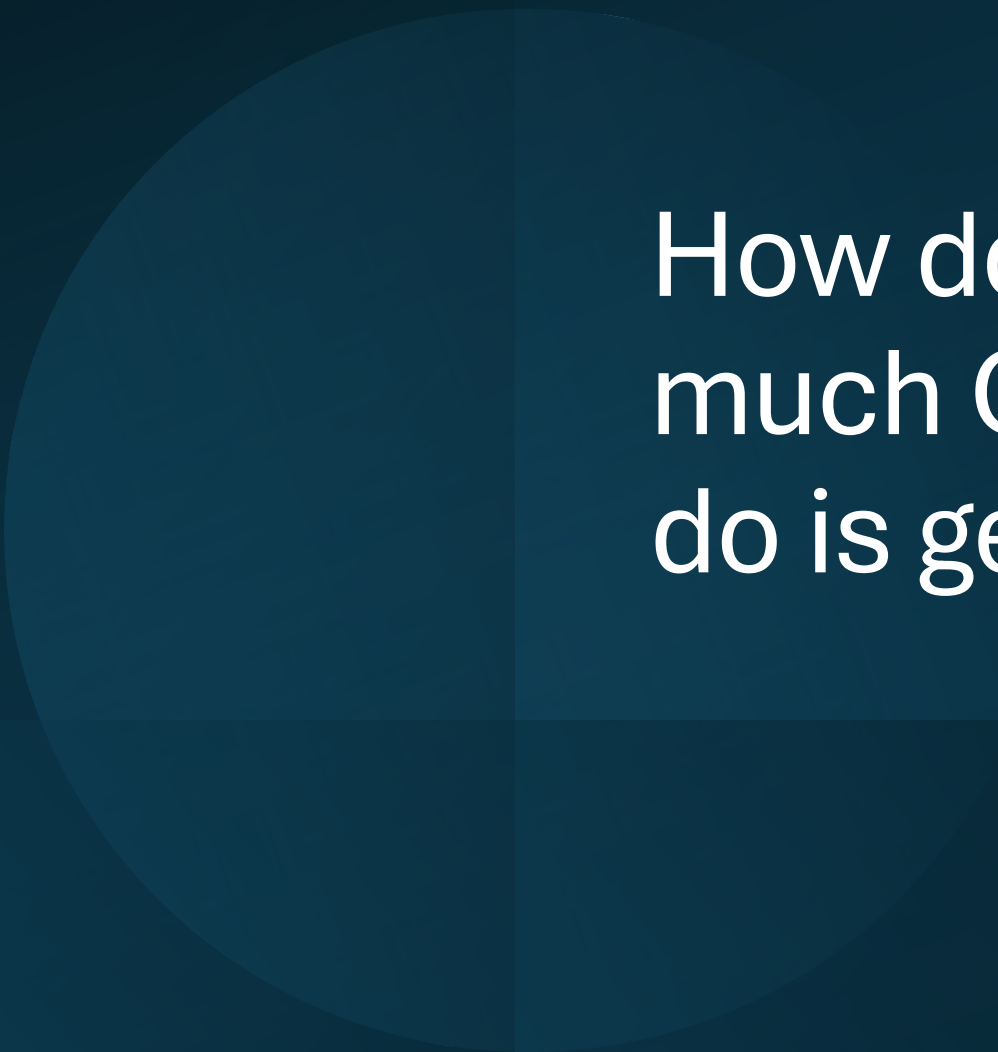
## Exhibit 1 US national health care greenhouse gas (GHG) emissions, 2010–18



Why focus on  
surgery?

**“Operating rooms (ORs) account for 20 to 33 percent of hospital waste and can be three to six times more energy-intensive than hospitals as a whole.”**





How do we know how  
much CO<sub>2</sub> the surgery we  
do is generating?

## Operating in a Climate Crisis: A State-of-the-Science Review of Life Cycle Assessment within Surgical and Anesthetic Care

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**BACKGROUND:** Both human health and the health systems we depend on are increasingly threatened by a range of environmental crises, including climate change. Paradoxically, health care provision is a significant driver of environmental pollution, with surgical and anesthetic services among the most resource-intensive components of the health system.

**OBJECTIVES:** This analysis aimed to summarize the state of life cycle assessment (LCA) practice as applied to surgical and anesthetic care via review of extant literature assessing environmental impacts of related services, procedures, equipment, and pharmaceuticals.

**METHODS:** A state-of-the-science review was undertaken following a registered protocol and a standardized, LCA-specific reporting framework. Three bibliographic databases (Scopus®, PubMed, and Embase®) and the gray literature were searched. Inclusion criteria were applied, eligible entries critically appraised, and key methodological data and results extracted.

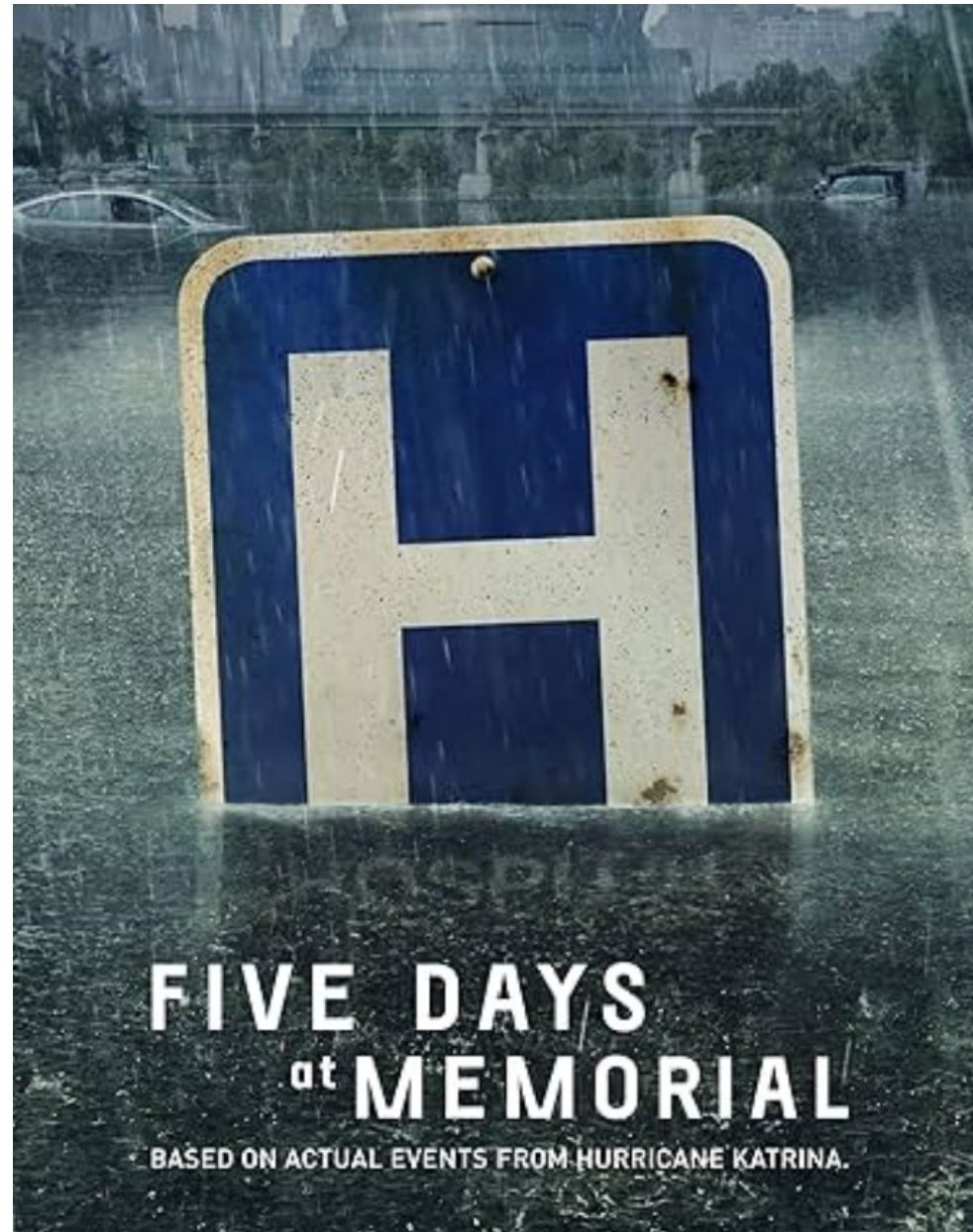
**RESULTS:** From 1,316 identified records, 44 studies were eligible for inclusion. The annual climate impact of operating surgical suites ranged between 3,200,000 and 5,200,000 kg CO<sub>2</sub>e. The climate impact of individual surgical procedures varied considerably, with estimates ranging from 6 to 1,007 kg CO<sub>2</sub>e. Anesthetic gases; single-use equipment; and heating, ventilation, and air conditioning system operation were the main emissions hot spots identified among operating room- and procedure-specific analyses. Single-use equipment used in surgical settings was generally more harmful than equivalent reusable items across a range of environmental parameters. Life cycle inventories have been assembled and associated climate impacts calculated for three anesthetic gases (2–85 kg CO<sub>2</sub>e/MAC-h) and 20 injectable anesthetic drugs (0.01–3.0 kg CO<sub>2</sub>e/gAPI).

**DISCUSSION:** Despite the recent proliferation of surgical and anesthesiology-related LCAs, extant studies address a miniscule fraction of the numerous services, procedures, and products available today. Methodological heterogeneity, external validity, and a lack of background life cycle inventory data related to many essential surgical and anesthetic inputs are key limitations of the current evidence base. This review provides an indication of the spectrum of environmental impacts associated with surgical and anesthetic care at various scales. <https://doi.org/10.1289/EHP8666>



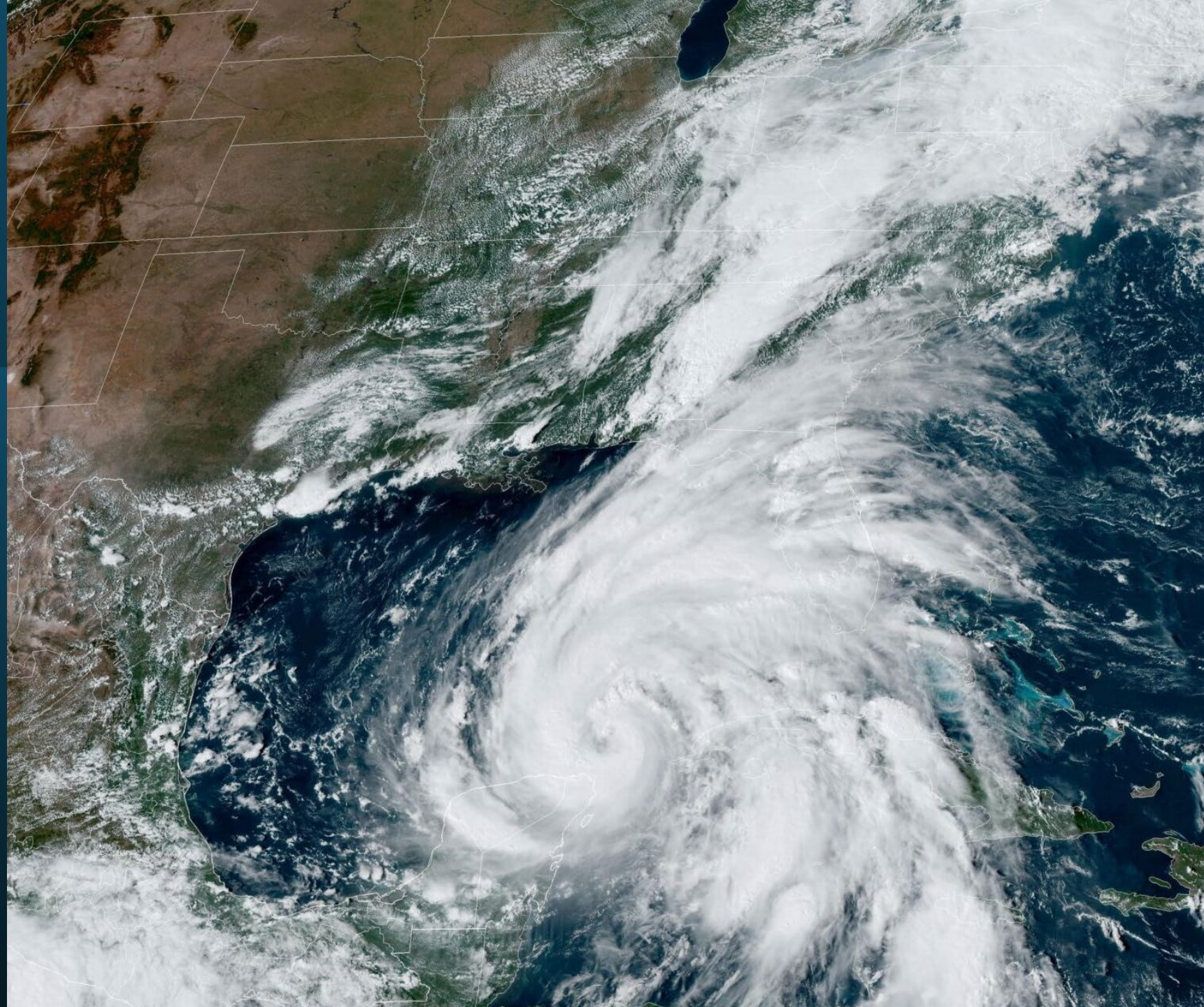
What does this have to do  
with surgery &  
healthcare?

We need to  
be ready.

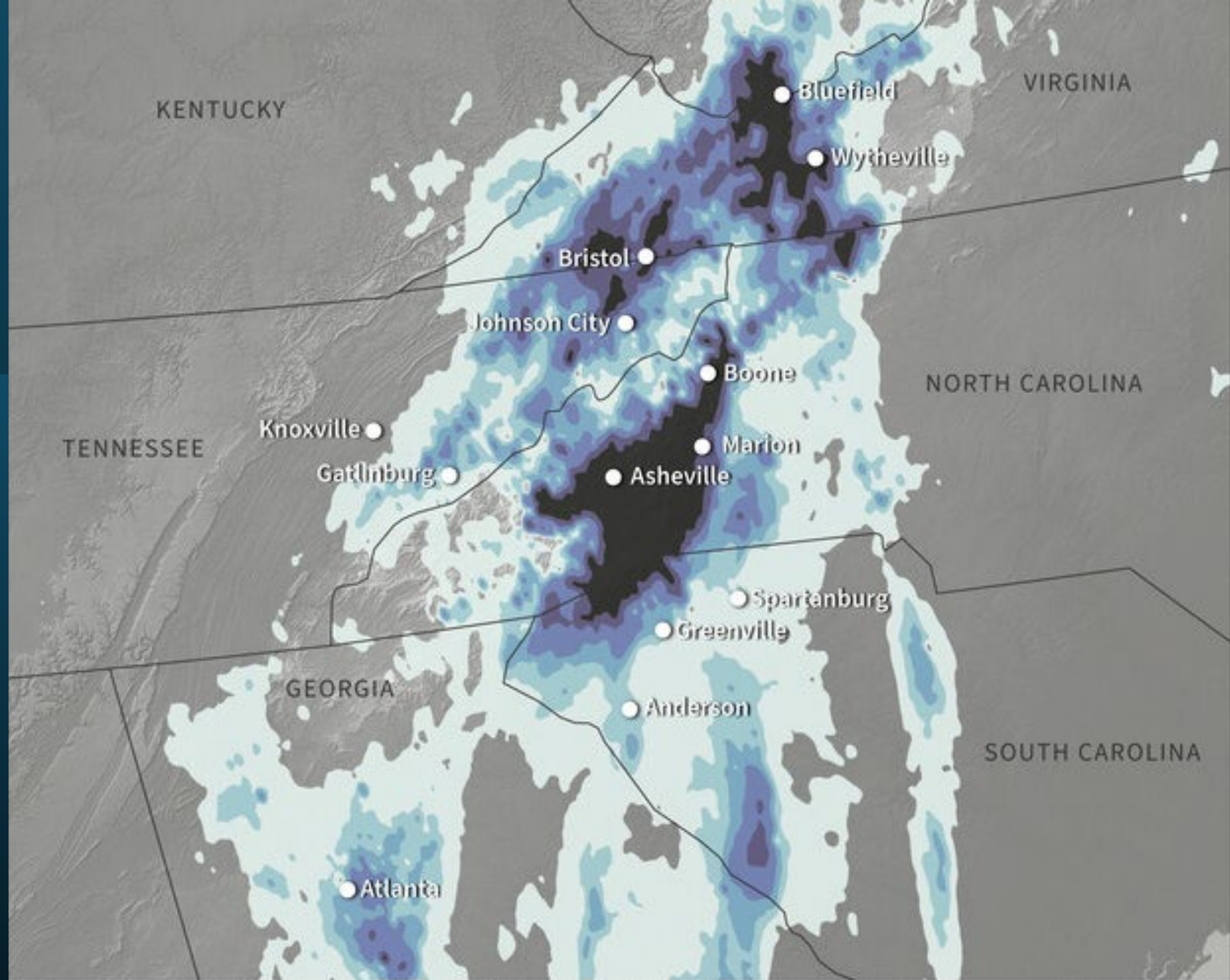




The climate  
has already  
changed







September 23-28, 2024

chances of exceeding observed rainfall in an average year

NOAA Climate.gov  
Data: NOAA



World  
Weather  
Attribution

- 3-day rainfall totals were **70% more likely** as a result of climate change
- Storms like Helene are **150% more frequent in the region** (once every 53 as opposed to 150 years) due to climate change
- Wind speeds **11% more intense** as a result of climate change



Members of the Department of Surgery,  
Please read the important update below.

-

Situation:

Due to Hurricane Helene, **a Baxter facility that produces 60% of the IV fluid for the US is currently shut down**; Baxter is the main IV Fluid supplier for MGB. **We anticipate receiving 40% of our normal**

**“A Baxter facility that produces 60% of the IV fluid for the US is currently shut down; Baxter is the main IV fluid supplier for MGB”**

sizes.

What you need to do:

1. **Pre- and post-procedure, do not order IV fluid for your patients unless it is truly necessary.**  
Ideally one bag can be ordered/hung by anesthesia when getting ready to start the case. **There is an Epic pop-up that alerts you if IV fluid automatically is ordered as part of your order set.**  
**Chose the option to discontinue the fluid order**

**“Permitted  
procedures  
during deferral:  
-Life and limb  
saving  
procedures. . .”**

**Permitted procedures during deferral**

- Life and limb saving procedures
- Treatment of life threatening / unstable disease
- Treatment of infections that would otherwise become life threatening
- Cancer
  - Cancers in patients who have completed their neoadjuvant therapy and are within the window of resectability, and for whom non-operative temporizing maneuvers are possible
  - Aggressive cancers that will grow significantly in 2 months for which other treatments cannot be used to temporize (e.g., triple-negative breast cancer)
  - Second part of staged procedures in which the first stage has been completed (e.g., patient has an open wound awaiting reconstruction)
  - Diagnostic procedure required to allow initiation of appropriate cancer therapy (e.g., diagnosis of lymphoma or diagnosis of metastatic cancer)
- Acute symptoms (e.g., GI bleeding, bowel obstruction, dysphagia and/or aspiration pneumonia, encroachment) for which alternative therapy is not appropriate
- Fractures needing surgical repair
- Cesarean sections and urgent obstetric procedures



What does this have to do  
with surgery *globally*?









## Impact of climate change on surgery: A scoping review to define existing knowledge and identify gaps

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### ABSTRACT

With climate change accelerated at a worrisome rate, global warming also will have implications for surgery and surgical practice. The goal of this current study was to systematically survey the literature and better understand how climate change has affected surgical disease burden, surgical care delivery, and surgical outcomes. We performed a comprehensive scoping review, screening 3334 unique citations from three databases – 1766 from Embase, 1329 from Pubmed and 239 from Scopus – to identify studies that had associated climate change with surgery. After systematic searching, quality appraisal, and data extraction, we synthesized findings from qualitative and quantitative studies. Twenty-six studies that met the inclusion criteria were included in the review. The studies associating climate change with surgery spanned all surgical subspecialties, although most notable examples came from urology, trauma surgery, and burns and reconstructive surgery. Although there is increasingly strong evidence for how climate change might affect surgery, there is a paucity of research attempting to establish a more direct correlation or causal link between the two. Additionally, we identified several studies that did not directly address climate change but instead focused on chronobiology and its effects on surgery, highlighting directions for future research. The existing

# NSOAPs and Climate Change

## Letter to the editor

### Ecuador's National Surgical Strengthening Plan: first in Latin America, provides hope for surgical care agenda

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#### To the Editor:

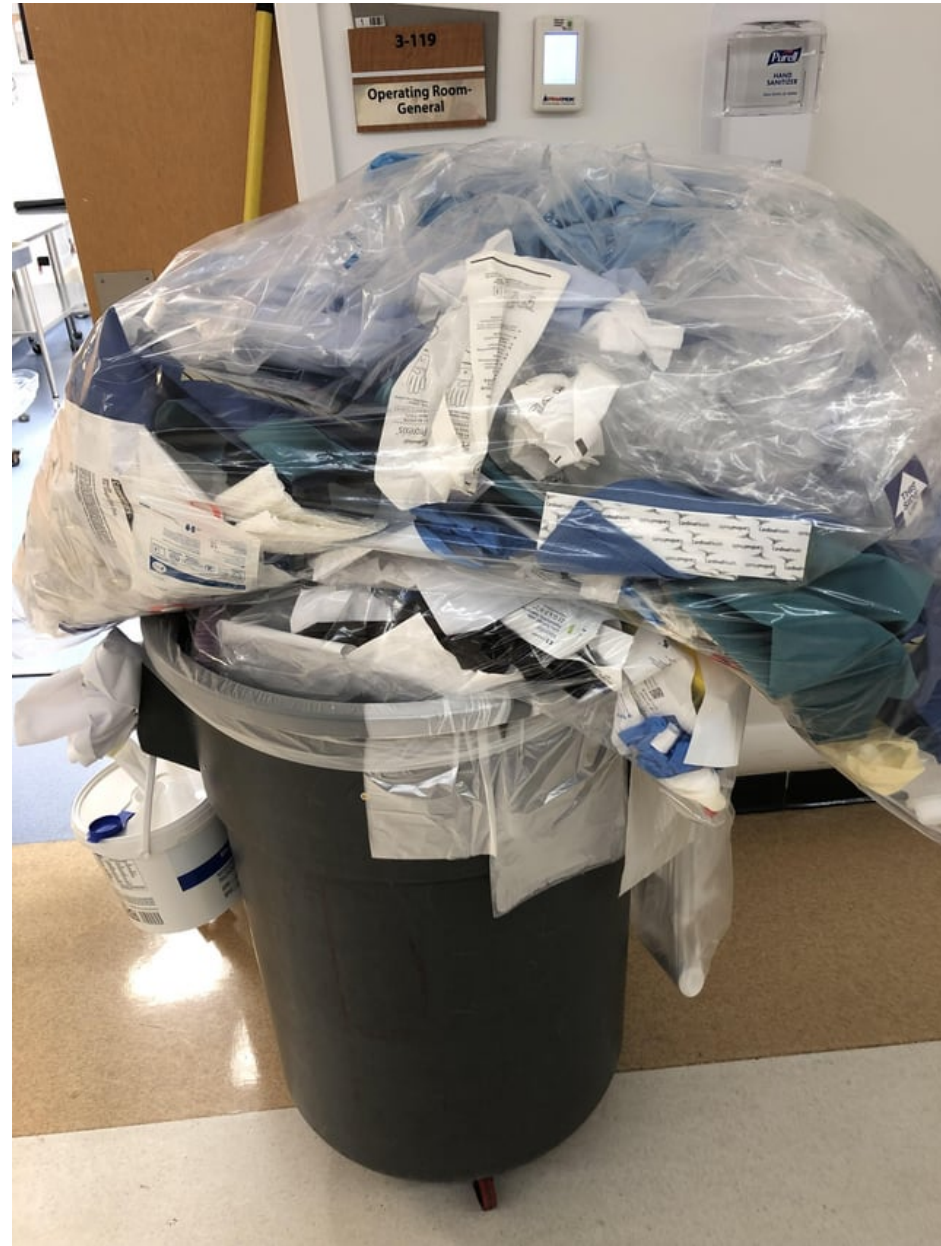
Since 2015, there has been a notable increase in global efforts by various stakeholders to promote and advance surgical care policies, as proposed by the Lancet Commission on Global Surgery (LCoGS) namely, the development of the National Surgical Obstetric Anesthesia Planning (NSOAP), a country-driven framework that offers a comprehensive approach to health ministries to enhance their surgical systems.<sup>1</sup> These plans are strategically designed for integration into national health policies, ensuring the development, implementation, and monitoring of surgical capacity.<sup>2</sup> The NSOAP addresses six key health system components: infrastructure, service delivery, information management, workforce, financing, and governance. This momentum has led to the promotion of NSOAPs in over 40 countries, with 11 having fully completed their plans.

poses a significant threat to the population's overall health and economic productivity. These efforts gained widespread recognition for embedding surgical infrastructure development within multilateral health organizations' core public health priorities, most notably PAHO, and reaffirming the country's steadfast commitment to achieving the targets outlined in the Sustainable Development Goals (SDGs).<sup>5</sup>

Ecuador's dedication to strengthening surgical care systems extends to the international stage. During the 75<sup>th</sup> Session of the Regional Committee of the World Health Organization (WHO) for the Americas, held in Washington D.C., United States of America, from September 25<sup>th</sup> to 29<sup>th</sup>, 2023, the government of Ecuador advocated for the inclusion of surgical system strengthening in the agenda for 2024 and led a side event convening international experts to better understand the political and



# Local work



# Implementation

