

ARTICLES

ADVANCING ENVIRONMENTAL HEALTH AND JUSTICE: A CALL FOR ASSESSMENT AND OVERSIGHT OF HEALTHCARE WASTE

APHA POLICY STATEMENT NUMBER 20224, ADOPTED
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BY

TIFFANY CANATE,* MICHELE OKOH,** CRYSTAL DIXON,*** NATALIE
SAMPSON,**** KANDYCE DUNLAP,***** FATEMEH SHAFIEL,***** JAY
HERZMARK,***** LINDSAY TALLON,***** NA'TAKI OSBORNE JELKS,*****
THEODORA TSONGAS,***** DENISE PATEL,***** OLIVIA
WILSON,***** ERIC PERSAUD,***** OMEGA & BRENDA

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*MPH, Boston University School of Public Health.

**JD, MPH, Lewis & Clark Law School.

***MPH, MA, MCHES®, Wake Forest University.

****PhD, MPH, University of Michigan-Dearborn.

*****MPH, CHES®, University of Alabama.

*****PhD, Spelman College.

*****RN, MSN, SafeWork Washington.

*****PhD, CPH, Massachusetts College of Pharmacy and Health Science.

*****PhD, MPH, Spelman College.

*****PhD, MS, Environmental Health Scientist.

*****MPH, Environmental Health Consultant.

*****Miken Institute of Public Health, The George Washington University.

*****DrPH, MEA, Occupational Health.

WILSON,*****VINCENT MARTIN,*****KELLY
 MCLAUGHLIN,***** & MARGARITA ASIAIN*****

Healthcare waste adversely impacts society in ways that people have overlooked for decades, and the COVID-19 pandemic has accelerated this issue significantly. This Policy Statement addresses the human impacts that occur as the healthcare industry processes, transports, landfills, or incinerates healthcare waste. With limited federal tracking and lack of regulation, patterns of environmental racism persist. Communities of color and low-income communities most often experience the greatest environmental health burdens through disposal of waste in their communities. Many communities have called for action for decades, as our massive healthcare industry contributes greatly to these harms. Centering these communities, public health professionals must advocate for: (1) evidence-based federal policies with transparent, accessible data about healthcare waste generation, type, and fate; (2) leadership within the healthcare industry—from hospitals, accrediting bodies, professional organizations, medical health professionals, and healthcare administration training programs—to address environmental health and justice issues related to waste; (3) health impact assessments, cost-benefit analyses, and circular economy research with healthcare systems and communities to identify cost-effective, feasible, and just solutions; and (4) federal initiatives to prioritize funding towards mitigation of cumulative exposures and impacts, reparation for harms, and investment in well-being for communities fence-line to waste—healthcare or otherwise. Some public health experts anticipate that we may be entering a “pandemic age,” which suggests that without intervention, intersecting issues of infectious disease, climate change, waste, and environmental health and justice will remain and reoccur.

Relationship to Existing APHA Policy Statement:

- *202116: Ensuring Equity in Transportation and Land Use Decisions to Promote Health and Well-Being in Metropolitan Areas*
- *20218: Health Inequities in the U.S. Coronavirus Disease 2019 Pandemic and Response*
- *20197: Addressing Environmental Justice to Achieve Health Equity*
- *20189: Achieving Health Equity in the United States*

*****MA & MA Ed, Co-Founders West End Revitalization Association.

*****Original United Citizens of SW Detroit.

*****MPH, MCHES®, New Jersey Department of Health.

*****Public Health Nurse.

- *201711: Public Health Opportunities to Address the Health Effects of Air Pollution*
- *20158: Preventing Occupational Transmission of Globally Emerging Infectious Disease Threats*
- *20078: Addressing the Urgent Threat of Global Climate Change to Public Health and the Environment*
- *200412: Support for Community-Based Participatory Research in Public Health*

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I. RATIONALE FOR CONSIDERATION

The American Public Health Association (APHA) Joint Policy Committee and staff have not identified this topic as a policy statement gap for the current year. The last policy statement drafted to explicitly address waste as a public health issue was in 1986 (8911: Resource and Solid Waste Management) and is now archived.² APHA recently approved policy statements related to structural racism (LB20-04) (although now expired) and environmental justice (20197) that provide a foundation for this statement on healthcare waste as a public health issue.³ Recent statements related to COVID-19 are relevant (for example, 20218), as the COVID-19 pandemic has illuminated the scale and implications of our

² *Resource and Solid Waste Management*, AM. PUB. HEALTH ASS'N (Jan. 1, 1989), <https://perma.cc/6BHP-APCU>; see also *Public Health Association Takes Stand Against Incineration of Solid Waste*, ENV'T RSCH. FOUND.: RACHEL'S HAZARDOUS WASTE NEWS (Jan. 9, 1991), <https://perma.cc/D3BA-KLA7> (providing contents of Policy Statement Number 8911).

³ *Structural Racism is a Public Health Crisis: Impact on the Black Community*, AM. PUB. HEALTH ASS'N (Oct. 24, 2020), <https://perma.cc/UWD5-TB4B>; *Addressing Environmental Justice to Achieve Health Equity*, AM. PUB. HEALTH ASS'N (Nov. 5, 2019), <https://perma.cc/ST7Q-A6PA>.

healthcare waste stream.⁴ Finally, this proposed statement expands upon the U.S. Call to Action on Climate, Health, and Equity: A Policy Action Agenda, to which APHA is a signatory.⁵ That statement calls for the current federal administration to strengthen U.S. health systems “to protect and promote health . . . in the era of climate change,” but with no mention of healthcare waste.⁶ None of these statements combine the issues of environmental justice and healthcare waste management with clear evidence and actionable steps needed to address this long-overlooked issue as a matter of health equity. This proposed Policy Statement is responsive to environmental justice leaders calling on public health leaders to address this long-standing issue that has worsened since the COVID-19 pandemic.⁷

II. PROBLEM STATEMENT

Healthcare waste refers to all waste related to medical procedures—including waste generated within healthcare facilities—laboratories, research centers, homes, communities, veterinary healthcare settings, and other minor sources.⁸ This may entail waste from healthcare-related food systems, medical waste plastics (MWP), pharmaceutical, chemical, radiological or infectious agents, personal protective equipment (PPE), and human or animal tissues and remains, among other types.⁹ In sum, the U.S. healthcare industry generates more than five million tons of waste each year,¹⁰ with over five billion pounds (or about half) attributable to the nation’s nearly 6,100 private and public hospitals.¹¹

⁴ *Call for Urgent Actions to Address Health Inequities in the U.S. Coronavirus Disease 2019 Pandemic and Response*, AM. PUB. HEALTH ASS’N (Oct. 26, 2021), <https://perma.cc/5HEJ-LG5E>; see also *Advancing Environmental Health and Justice: A Call for Assessment and Oversight of Health Care Waste*, AM. PUB. HEALTH ASS’N (Nov. 8, 2022), <https://perma.cc/V7PH-9FU9> (discussing how the COVID-19 pandemic has accelerated the adverse impacts of healthcare waste on society).

⁵ CLIMATE HEALTH ACTION, U.S. CALL TO ACTION ON CLIMATE, HEALTH, AND EQUITY: A POLICY ACTION AGENDA (2019) [hereinafter U.S. CALL TO ACTION], <https://perma.cc/6XY5-S8SY>; *U.S. Call to Action on Climate, Health, and Equity: A Policy Action Agenda: Organizations*, CLIMATE HEALTH ACTION, <https://perma.cc/24PF-HTYG> (last visited Apr. 6, 2023) (showing all the organizations that have signed the Policy Agenda).

⁶ U.S. CALL TO ACTION, *supra* note 5, at 2.

⁷ See, e.g., *Pollution and Pandemics: Covid-19’s Disproportionate Impact on Environmental Justice Communities: Virtual Hearings Before the H. Subcomm. on Env’t and Climate Change of the Comm. on Energy and Com.*, 116th Cong. 93–94 (2020) (letter from Omega Wilson, West End Revitalization Association) (urging subcommittee members to conduct oversight and investigations into the management of hazardous and medical waste from the COVID-19 pandemic).

⁸ K.K. Padmanabhan & Debabrata Barik, *Health Hazards of Medical Waste and its Disposal*, in *ENERGY FROM TOXIC ORGANIC WASTE FOR HEAT AND POWER GENERATION* 99, 105–06 (Debabrata Barik ed., 2019).

⁹ *Id.* at 101–06.

¹⁰ *Waste*, PRAC. GREENHEALTH, <https://perma.cc/9AYC-6P9Y> (last visited Apr. 6, 2023).

¹¹ Andrea Wisniewski, Matt Zimmerman, Tyrone Crews Jr., Alex Haulbrooks, David C. Fitzgerald, & Joseph J. Sistino, *Reducing the Impact of Perfusion Medical Waste on the*

Moreover, the healthcare sector is responsible for 8.5% of greenhouse gas emissions, which causes worsening health disparities.¹² Beginning in 2020, the COVID-19 pandemic globally accelerated the production of most types of healthcare waste due to increased demands on the system from testing, vaccination, and treatment, as well as the increase of single-use MWPs with early concerns of SARS-CoV-2¹³ transmission and infection.¹⁴

Federal U.S. policy does not define “regulated medical waste” (RMW) but the healthcare industry generally considers it to be “the portion of the waste stream that may be contaminated by blood, body fluids or other potentially infectious materials, thus posing a significant risk of transmitting infection.”¹⁵ This includes microbiological laboratory waste, pathological and anatomical waste, blood specimens and products, and other body-fluid specimens, as well as vaccine sharps and vials. Approximately 75–90% of healthcare waste is non-hazardous, whereas 10–25% is infectious, toxic, or radioactive and considered RMW in the United States.¹⁶ In the United States, the healthcare industry typically autoclaves (that is, sterilizes with steam) 20–37% or incinerates 49–60% of RMW, and only sometimes processes it with other technologies, 4–5%.¹⁷ Large healthcare facilities treat much of their RMW on-site, but most rely on other companies to take it off-site.¹⁸ Notably, off-site companies like Stericycle, the largest medical waste incinerator company in the world, also create public health concerns through treating RMW and spreading dangerous fine particle matter, which harms nearby vulnerable communities.¹⁹ By the end of 2021, RMW had increased at unprecedented rates—with more than eight billion SARS-CoV-2 vaccine doses given globally—resulting in an additional 144,000 tons of RMW from glass

Environment, 52 J. EXTRACORPORAL TECH. 135, 135 (2020); *Fast Facts on U.S. Hospitals, 2022*, AM. HOSPITAL ASS'N, <https://perma.cc/4CJ6-NX5Q> (last visited Apr. 6, 2023).

¹² Ava Ferguson Bryan, Elizabeth Yates, & Neelima Tummala, *How Should We Respond to Health Sector Emissions That Exacerbate Climate Change and Inequity?*, 24 AMA J. ETHICS 927, 928 (2022).

¹³ SARS-CoV-2 is the virus that causes COVID-19. SARS-CoV-2, NAT'L CANCER INST., <https://perma.cc/8VP8-QTBY> (last visited May 5, 2023).

¹⁴ WORLD HEALTH ORG., GLOBAL ANALYSIS OF HEALTHCARE WASTE IN THE CONTEXT OF COVID-19: STATUS, IMPACTS AND RECOMMENDATIONS 5–6, 8 (2022) [hereinafter WHO: GLOBAL ANALYSIS], <https://perma.cc/C5R2-GPP6>.

¹⁵ *Pollution Prevention and Compliance Assistance Information for the Healthcare Industry: Regulated Medical Waste—Overview*, HEALTHCARE ENV'T RES. CTR., <https://perma.cc/2T34-VU4S> (last visited Apr. 6, 2023) (emphasis omitted).

¹⁶ Padmanabhan & Barik, *supra* note 8, at 106; *Health-Care Waste*, WORLD HEALTH ORG. (Feb. 8, 2018) [hereinafter WHO: *Health-Care Waste*], <https://perma.cc/2CE9-UQVZ>.

¹⁷ Wisniewski et al., *supra* note 11, at 135.

¹⁸ See, e.g., Ben Brenner, *What is Medical Waste? Definition, Types, Examples, & More*, MEDPRO DISPOSAL (July 13, 2020), <https://perma.cc/EA3F-ARDU> (stating that on-site treatment is generally limited to larger facilities because it is “more cost-effective” for smaller facilities to use a third-party to treat and dispose of RMW).

¹⁹ Lisa Sorg, *Two Dozen Violations and \$40,000 Later, Stericycle in Haw River Still Pumping Pollutants into Vulnerable Communities*, NC NEWSLINE (Jun. 9, 2022), <https://perma.cc/89ND-UQHJ>.

vials, syringes, needles, and safety boxes.²⁰ RMW includes bodily remains as well.²¹ In 2020, at the onset of the pandemic, with an overwhelming number of lives lost to SARS-CoV-2, management of RMW entailed disaster morgues and mass graves in the United States and across the planet.²²

Overall, healthcare waste poses many threats to public health, including from excessive production and disposal of petroleum-based, single-use MWP, unsustainable waste management practices that contribute to climate change (for example, failure to adequately segregate RMW from non-hazardous waste), and inequities associated with transport and siting of healthcare waste that disproportionately harm communities of color and low-income communities. This includes both urban and rural populations globally, from the frontline and all throughout the waste stream. Of course, the exposure scenarios and environmental risk factors for these related issues vary greatly, and the United States needs multiple, coordinated policy solutions to improve oversight towards health equity. To begin, this Policy Statement focuses on common types of healthcare waste, including single use and MWP and RMW from U.S. hospital settings, that contribute to notable health inequities downstream.²³

A. Healthcare Waste Management Standards, Regulations, & Guidance

In the United States, a variety of agencies have responsibilities for healthcare waste management:

- The Environmental Protection Agency (EPA) oversees waste management through the Resource Conservation and Recovery Act (RCRA),²⁴ which gives a legal framework for management of both hazardous and non-hazardous solid

²⁰ WHO: GLOBAL ANALYSIS, *supra* note 14, at 12–13.

²¹ See U.S. ENV'T PROT. AGENCY, EPA GUIDE FOR INFECTIOUS WASTE MANAGEMENT ix (1986), <https://perma.cc/Q3CE-GHEC> (outlining that EPA recommends that pathological waste, such as tissues and body parts, be designated as infectious waste).

²² See, e.g., Press Release, South Coast Air Quality Management District, South Coast AQMD Issues Emergency Order for Crematoriums due to COVID-19 (Jan. 17, 2021), <https://perma.cc/7U35-6ZNA> (“The current rate of death is more than double that of pre-pandemic years, leading to hospitals, funeral homes, and crematoriums exceeding capacity without the ability to process the backlog of cases.”); See also Yuna Han, Katharine M. Millar, & Martin J. Bayly, *COVID-19 as a Mass Death Event*, 35 ETHICS & INT’L AFFAIRS 5, 5 (2021) (“Even for those fortunate enough to be shielded from the direct effects of the virus, it has been near impossible to escape the global images of struggling intensive care units, overflowing mortuaries, and the construction of mass graves.”).

²³ Healthcare waste generated in households is beyond the scope of this Policy Statement.

²⁴ 42 U.S.C. §§ 6901–6992k (2018).

waste. Much of the general healthcare waste stream makes its way to RCRA-managed waste facilities.²⁵

- The Occupational Safety and Health Administration (OSHA) and Centers for Disease Control and Prevention (CDC) provide rules and guidance for discarding RMW, and facilities that generate this type of waste are required to have a medical waste management plan to prevent infection.²⁶ OSHA has additional responsibilities over workplace safety for those managing waste.²⁷ The CDC is responsible for infectious disease management of waste.²⁸ The Department of Transportation (DOT), Department of Veterans Affairs, Department of Agriculture (USDA), Federal Emergency Management Agency (FEMA), and other agencies have their own regulations or guidelines that point to CDC and OSHA rules.²⁹
- Also, along with the CDC, OSHA, USDA, and FEMA, DOT enforces Hazardous Materials Regulations³⁰ with requirements for transport of RMW, as workers and communities may be at risk if problems occur in transit. Motivated by cases of Ebola in the United States between 2014 and 2015, DOT developed stronger protections for ‘Category A’ materials which DOT defined as those “known

²⁵ *Healthcare Waste Regulatory Resources*, MINN. TECH. ASSISTANCE PROGRAM, <https://perma.cc/RK6A-AS5T> (last visited Apr. 7, 2023) (“With the Resource and Recovery Act[] of 1970, all healthcare facilities must comply with Environmental Protection Agency [] rules around proper disposal.”); 40 C.F.R. §§ 260–282 (2021).

²⁶ 29 C.F.R. § 1910.1030 (2021); *Background I. Regulated Medical Waste: Guidelines for Environmental Infection Control in Health-Care Facilities (2003)*, U.S. CTR. FOR DISEASE CONTROL AND PREVENTION (Nov. 5, 2015) [hereinafter *CDC Guidelines*], <https://perma.cc/N3CW-SCT6>; Julia S. Garner and The Hospital Infection Control Practices Advisory Committee, *Guideline for Isolation Precautions in Hospitals*, 17 *INFECTION CONTROL & HOSP. EPIDEMIOLOGY* 53, 54 (1996).

²⁷ 29 C.F.R. § 1910.1030 (outlining precautionary steps that must be taken beyond the creation of a waste management plan, including exposure determinations, engineering and work practice controls, the provision of personal protective equipment, and performing heightened housekeeping responsibilities).

²⁸ See *CDC Guidelines*, *supra* note 26 (providing background information on the nature of CDC regulations regarding the management of medical waste); see also Garner, *supra* note 26, at 59–61 (discussing the history of CDC regulation of infectious waste).

²⁹ See, e.g., *Emergency Preparedness and Response: Getting Started*, U.S. DEPT. OF INTERIOR: OCCUPATIONAL SAFETY & HEALTH ADMIN., <https://perma.cc/4BAY-PPRW> (last visited May 5, 2023) (listing OSHA requirements for emergency planning); *Transporting Infectious Substances Overview*, U.S. DEPT. OF TRANSP. (Oct. 17, 2022), <https://perma.cc/R3FA-XKVU> (listing CDC and OSHA as some of the oversight standards for transporting infectious substances); see generally, U.S. DEPT. OF VETERAN AFF., SAFETY & HEALTH DURING CONSTRUCTION (2017), <https://perma.cc/AW8Q-KCNW> (providing OSHA policies regulating onsite safety for certain activities); *COVID-19 Pandemic: OSHA, CDC Issue Guidelines for Ag Industry*, SAFETY & HEALTH MAG. (Jun. 9, 2020), <https://perma.cc/6D8R-52XM>.

³⁰ 49 C.F.R. § 105.50 (2012).

or reasonably expected to contain a pathogen that is in a form capable of causing permanent disability or life-threatening or fatal disease in otherwise healthy humans or animals who are exposed to it.”³¹

These and many other federal protections are in place, and Congress and the agencies designed them primarily to reduce transmission of infection through worker protection.

Ultimately, there are no federal regulations for tracking healthcare waste, which complicates identifying which, and how much, healthcare industries disproportionately burden communities with any associated environmental exposures. The Medical Waste Tracking Act of 1988 (MWTa)³² followed RCRA’s “cradle-to-grave” approach to waste regulation, where EPA specifically tracked RMW from generation to disposal.³³ Motivated by several incidents of healthcare waste washing ashore in waterways and oceans in the late 1980’s, it mandated enforceable standards (that is, standards with penalties) for separating, packing, storing, and labeling RMW with recordkeeping of amounts and types of RMW.³⁴ However, EPA implemented the MWTa in only a handful of states and it expired after two years.³⁵

In 1990, Congress commissioned a report by the Government Accountability Office (GAO) to assess selected states’ infectious medical waste regulatory programs and the status of EPA’s implementation of the MWTa.³⁶ The report yielded six recommendations for EPA to reconsider various health waste management practices, and it considered five of the six recommendations “closed and not implemented,” stating, “EPA does not anticipate having a regulatory role in medical waste management[,]” without indicating which agencies should have this responsibility.³⁷

EPA addressed one of the 1990 GAO recommendations by developing the Clean Air Act’s Hospital Medical Infectious Waste Incinerator

³¹ U.S. DEPT. OF TRANSP., MANAGING SOLID WASTE CONTAMINATED WITH A CATEGORY A INFECTIOUS SUBSTANCE 1 (2022), <https://perma.cc/76KP-YXR7>; see also 49 C.F.R. § 173.134(a)(1)(i) (defining Category A infectious substances).

³² 42 U.S.C. §§ 6992–6992k (2018).

³³ See *id.* § 6992b (requiring EPA to regulate the tracking of medical waste “from the generator to the disposal facility”); See also *Medical Waste*, U.S. ENV’T PROT. AGENCY, <https://perma.cc/KK55-GJCX> (last visited Apr. 7, 2023) [hereinafter EPA] (describing the motivation for passing the MWTa).

³⁴ See MWTa §§ 6992b, 6992d (outlining a program requiring the “segregation of waste at the point of generation,” the “placement of the waste in containers that will protect waste handlers and the public from exposure,” and “appropriate labeling of containers of the waste” with civil and criminal penalties for noncompliance).

³⁵ EPA, *supra* note 33 (“[T]he regulations for this two-year program went into effect on June 24, 1989 in four states - New York, New Jersey, Connecticut, and Rhode Island and Puerto Rico. The regulations expired on June 21, 1991.”).

³⁶ U.S. GEN. ACCT. OFF., MEDICAL WASTE REGULATION: HEALTH AND ENVIRONMENTAL RISKS NEED TO BE FULLY ASSESSED 2 (1990), <https://perma.cc/9CSY-88RK>.

³⁷ *Id.* at 48–49; *Medical Waste Regulation: Health and Environmental Risks Need to Be Fully Assessed*, U.S. GEN. ACCT. OFF. (Apr. 10, 1990), <https://perma.cc/ST5M-5EPJ>.

(HMIWI) standards.³⁸ Through the HMIWI standards, EPA considers impacts for communities where the healthcare industry incinerates waste by regulating emissions.³⁹ The healthcare industry incinerated more than 90% of U.S. healthcare waste prior to the implementation of these standards in 1997,⁴⁰ a process which may contribute to ambient air pollution as a major source of “dioxins, furans, and particulate matter.”⁴¹

Most states have developed laws pertaining to RMW (some patterned after the MWTA), and these vary in their stringency, definitions of RMW, and requirements. For example, while some states require registration for medical waste generators, most states do not.⁴² Additionally, only a few states set timeframes for how long RMW can be stored before disposal.⁴³ A federal repository of state laws does not exist, but the Healthcare Environmental Resource Center does have an EPA-endorsed map that links to each state’s RMW policies, although some are outdated.⁴⁴ Similarly, many healthcare waste industry websites (for example, PureWay and SharpsCompliance, Inc.) have links to each state’s related policies to support hospital administrators who use their services to maintain compliance within and across states.⁴⁵ In 1990, EPA commissioned and funded—and with the Council of State Governments prepared—the Model Guidelines for State Medical Waste Management;

³⁸ *Hospital, Medical, and Infectious Waste Incinerators (HMIWI): New Source Performance Standards (NSPS), Emission Guidelines, and Federal Plan Regulations*, U.S. ENV’T PROT. AGENCY (Dec. 30, 2022), <https://perma.cc/XH74-M2YM>; 42 U.S.C. § 7429 (2018).

³⁹ See EPA, *supra* note 33 (“In August of 1997, EPA promulgated regulations creating stringent emission standards for medical waste incinerators due to significant concerns over detrimental air quality affecting human health.”).

⁴⁰ *Id.*

⁴¹ WHO: *Health-Care Waste*, *supra* note 16.

⁴² Compare N.J. ADMIN. CODE § 7:26-3A.8(a) (2016) (“Any person that generated regulated medical waste in this State shall register with the Department as a regulated medical waste generator”) with *Special Waste Management*, NEV. DIV. OF ENV’T PROT., <https://perma.cc/2ZVT-TP53> (last visited Apr. 7, 2023) (“If medical waste has been treated by incineration, autoclaving or an alternative method approved by the solid waste management authority, it can be managed as ordinary solid waste with no special requirements.”).

⁴³ For example, Arizona provides a timeline for storage of medical waste, stating time limits between the collection of the waste of the disposal, dependent upon whether the waste is putrescible and refrigerated. See ARIZ. ADMIN. CODE § R18-13-1408(C) (2021). On the other hand, Connecticut regulates the conditions and areas in which medical waste can be stored but does not provide a timeline. See CONN. AGENCIES REGS. § 22a-209-15(c) (2015).

⁴⁴ *State-by-State Regulated Medical Waste Resource Locator*, HEALTHCARE ENV’T RES. CTR., <https://perma.cc/3R6S-2A7E> (last visited Apr. 7, 2023); see also *Where Are the Management Standards for Hazardous Waste Pharmaceuticals and Amendment to the PO75 Listing for Nicotine in Effect*, U.S. ENV’T PROT. AGENCY (Feb. 27, 2023), <https://perma.cc/5ZV9-54TR> (showing the same map as Healthcare Environmental Resource Center depicting everywhere Management standards are in effect).

⁴⁵ To view such resources, see *State Regulation Resources*, PUREWAY, <https://perma.cc/RE6X-LDSR> (last visited Apr. 6, 2023); *Regulatory Compliance*, SHARPS COMPLIANCE, INC., <https://perma.cc/KF43-TFZE> (last visited Apr. 6, 2023) (showing “The Hub” which provides password-protected access to all state registration and policies).

however, being from 1990, these model guidelines do not reflect current trends in science, policy, or technology.⁴⁶

Relatedly, there is also no limit on transporting healthcare waste from a state with more stringent regulations to one with more lax regulations, which may lead some states and municipalities to take on more waste in exchange for economic revenue.⁴⁷ Historically, this has meant that the healthcare industry placed a large portion of waste in communities that are already overburdened with incinerators, landfills, or other cumulative environmental risks, where cheaper land and fewer regulations perpetuate disproportionate impacts.⁴⁸ Environmental protections in the United States, including the HMIWI standards, have long failed to account for these cumulative impacts.⁴⁹

B. Producing and Managing Single-Use and Medical Waste Plastics

The healthcare industry generates a lot of MWP, medical equipment (for example, tubing and blood sample tubes) and PPE (for example, gloves, N95 masks, plastic face shields, and Class II surgical gowns) that are disposable by design.⁵⁰ In addition to the generation of more single-

⁴⁶ COUNCIL OF STATE GOV'TS, MODEL GUIDELINES FOR STATE MEDICAL WASTE MGMT. (1992) [hereinafter MODEL GUIDELINES], <https://perma.cc/SRR6-AH5N>.

⁴⁷ Michele Okoh, *Shining Light on COVID-19 Medical Waste*, 46 ADMIN. & REGUL. L. NEWS, Fall 2020, at 4, 4.

⁴⁸ Paul Mohai & Robin Saha, *Racial Inequality in the Distribution of Hazardous Waste: A National-Level Reassessment*, 54 SOC. PROBS. 343, 345 (2007); COMM'N FOR RACIAL JUST.: UNITED CHURCH OF CHRIST, TOXIC WASTES & RACE IN THE UNITED STATES: A NATIONAL REPORT ON THE RACIAL AND SOCIO-ECONOMIC CHARACTERISTICS OF COMMUNITIES WITH HAZARDOUS WASTE SITES xii (1987), <https://perma.cc/5YZD-XDDG> (reporting on the relationship between locations of sites containing hazardous waste and the racial and socio-economic characteristics of those communities in proximity to those sites); U.S. GEN. ACCT. OFF., SITING OF HAZARDOUS WASTE LANDFILLS & THEIR CORRELATION WITH RACIAL & ECON. STATUS OF SURROUNDING COMMUNITIES 3, app. 1 (1983); Robert D. Bullard, *Dumping in Dixie: Race, Class, & Env't Quality*, CTR. FOR INT'L EARTH SCIENCE INFO. NETWORK, <https://perma.cc/CR5B-REFX> (last visited Apr. 7, 2023) (reproducing chapter 2 of Robert D. Bullard's book).

⁴⁹ See Charles Lee, *A Game Changer in The Making? Lessons From States Advancing Environmental Justice Through Mapping & Cumulative Impact Strategies*, 50 ENV'T L. REP. 10203, 10205 (2020) (noting that federal agencies have been largely ineffective at accounting for disproportionate impacts in their decision-making processes); see also NAT. RSCH. COUNCIL, WASTE INCINERATION & PUB. HEALTH 232 (2000) (discussing the tendency of regulatory standards to focus on a single source of pollution, a single chemical, the environment, or public health exclusively, without consideration of cumulative socioeconomic impacts).

⁵⁰ Chantelle Rizan, Frances Mortimer, Rachel Stancliffe, & Mahmood F. Bhutta, *Plastics in Healthcare: Time for a Re-Evaluation*, 113 J. ROYAL SOC'Y MED. 49, 49 (2020); Blessy Joseph, Jemy James, Nadakumar Kalarikkal, & Sabu Thomas, *Recycling of Medical Plastics*, 4 ADVANCED INDUS. & ENG'G POLYMER RSCH. 199, 200 (2021). The COVID-19 pandemic only exacerbated this, causing a sharp uptick in MWP all over the world. See, e.g., Joana C. Prata, Ana L.P. Silva, Tony R. Walker, Armando C. Duarte, & Teresa Rocha-Santos, *COVID-19 Pandemic Repercussions on the Use and Management of Plastics*, 54 ENV'T. SCI. TECH. 7760, 7760–61 (2020) (according to the WHO, healthcare professionals need as many as eighty-nine million masks, seventy-six million gloves, and 1.6 million

use PPE and municipal solid waste (MSW) during the COVID-19 pandemic, disposable, ‘over the counter’ community antibody and diagnostic tests have become a part of life for millions, and may be increasingly available during future infectious disease outbreaks.⁵¹ Although these single-use and MWP items help sustain life, are often mandated, and protect the healthcare workforce from contracting infections such as SARS-CoV-2, they can also harm human life with major environmental health and justice implications. To begin, frontline industry manufacturers (at the front end) and incinerators and landfills (at the back end) carry the burden of related pollution emissions and discharges, unsafe noise, or harmful odors that significantly reduce quality of life. Also, with the ongoing increases in fossil fuel-manufactured single-use and MWPs, there are more carbon dioxide and methane emissions, leading to further climate disruption.

Some single-use and MWPs are RMW but many are not. In the late 2000s and early 2010s, several studies began to outline related issues of inadequate waste segregation. One systematic review reported that up to 90% of “red bag waste” (that is, RMW) was not hazardous or infectious.⁵² Other researchers reported that 40% of operating room waste was simply non-hazardous packing material, and up to 60% of operating room waste was recyclable.⁵³ According to the international NGO Health Care Without Harm, these activities are responsible for producing about one-third of waste in healthcare facilities with operating rooms in the United States and Canada; additionally, two-thirds of that waste is RMW.⁵⁴ In 2019, a survey across four Mayo Clinic campuses found that, of the 524 operating room staff and clinicians who participated, nearly 57% were unclear on which items were recyclable.⁵⁵ In fact, studies suggest that as much as 80% of waste is uncontaminated and accumulated prior to a patient entering the operating room, and thus could be directed towards

goggles each month); Mohamed Ben Haddad, Gabriel De-la-Torre, Mohamed Rida Abelouah, Sara Hajji, & Aicha Ait Alla, *Personal Protective Equipment (PPE) Pollution Associated with the COVID-19 Pandemic Along the Coastline of Agadir, Morocco*, 798 SCI. TOTAL ENV'T, Dec. 2021, at 1, 2 (reviewing a study of single-use PPE pollution on Moroccan beaches, noting that an estimated 1.56 billion facemasks ended up in the ocean in 2020); Jiří Jaromír Klemeš, Yee Van Fan, Raymond R. Tran, & Peng Jiang, *Minimizing the Present and Future Plastic Waste, Energy & Environmental Footprints Related to COVID-19*, 127 RENEWABLE & SUSTAINABLE ENERGY REV., Jul. 2020, at 1, 2 (explaining that in China, “the generation of medical waste [during the pandemic] increased sharply (+370%) in Hubei Province, with a high proportion of plastics.”).

⁵¹ Nam K. Tran, Samer Albahra, Hooman Rashidi, & Larissa May, *Innovations in Infectious Disease Testing: Leveraging COVID-19 Pandemic Technologies for the Future*, CLINICAL BIOCHEMISTRY, Jan. 2022, at 1, 2.

⁵² Gifty Kwakye, Gabriel A. Brat, & Martin A. Makary, *Green Surgical Practices for Health Care*, 146 JAMA SURGERY 131, 133 (2011).

⁵³ Solomon Azouz, Piper Boyll, Marco Swanson, Nikki Castel, Terry Maffi, & Alanna M. Rebecca, *Managing Barriers to Recycling in the Operating Room*, 217 AM. J. SURGERY 634, 634 (2019).

⁵⁴ *Waste Management*, HEALTH CARE WITHOUT HARM, <https://perma.cc/LAC5-E95D> (last visited Apr. 8, 2023).

⁵⁵ Azouz et al., *supra* note 53, at 634, 636.

non-hazardous waste or recycling streams.⁵⁶ However, the World Health Organization (WHO) reports that 30% of healthcare facilities globally do not have the infrastructure to segregate waste.⁵⁷ Further, during the COVID-19 pandemic, many healthcare facilities considered and deemed all healthcare waste infectious RMW even though much of it was in fact not; studies have since revealed that SARS-CoV-2's primary transmission route is airborne, not dermal.⁵⁸

C. Assessing Healthcare Waste-Streams and Public Health Impacts as a Matter of Environmental Racism

For generations, environmental racism has underlain the general management and siting of waste in the United States and the shipping of waste to lower-income nations.⁵⁹ In 1979, a group of Black homeowners in Houston, Texas formed the Northeast Community Action Group and used legal tactics to cease the placement of a sanitary landfill in their neighborhood.⁶⁰ Even though their lawsuit⁶¹ failed to stop development of the landfill, it raised awareness about the potential health effects of waste management and siting.⁶² In 1982, protests further galvanized the environmental justice movement when residents of Warren County, North Carolina fought against the state dumping 60,000 tons of Polychlorinated biphenyl (PCB)-contaminated soil in their community.⁶³ The United Church of Christ led a historic analysis of hazardous waste

⁵⁶ Maya A Babu, Angela K. Dalenberg, Glen Goodsell, Amanda B. Holloway, Marcia M. Belau, & Michael J. Link, *Greening the Operating Room: Results of a Scalable Initiative to Reduce Waste and Recover Supply Costs*, CONGRESS OF NEUROLOGICAL SURGEONS (Oct. 2018), <https://perma.cc/8Z73-HAGJ>; Camila R Guetter, Barbara J. Williams, Eliza Slama, Amanda Arrington, Marion C. Henry, Mecker G. Möller, Janet Elizabeth Tuttle-Newhall, Sharon Stein, & Marie Crandall, *Greening the Operating Room*, 216 AM. J. SURGERY 683, 684–86 (2018).

⁵⁷ WHO: GLOBAL ANALYSIS, *supra* note 14, at 4.

⁵⁸ WORLD HEALTH ORG., WATER, SANITATION, HYGIENE & WASTE MANAGEMENT FOR SARS-COV-2, THE VIRUS THAT CAUSES COVID-19 1–2, 5–6 (2020), <https://perma.cc/VG9U-6FHZ>.

⁵⁹ Mohai & Saha, *supra* note 48, at 344–46; COMM'N FOR RACIAL JUST.: UNITED CHURCH OF CHRIST, *supra* note 48, at xi–xv; U.S. GEN. ACCT. OFF., *supra* note 48, at 2–3, app. 1, 3, 5, 7; Bullard, *supra* note 48; THE NEW SCHOOL: TISHMAN ENV'T & DESIGN CTR., U.S. MUNICIPAL SOLID WASTE INCINERATORS: AN INDUSTRY IN DECLINE 4 (2019) [hereinafter THE NEW SCHOOL], <https://perma.cc/ZB86-BU7U>.

⁶⁰ Robert D. Bullard, Glenn S. Johnson, Denae W. King, & Sheri L. Smith, *People on the Frontline of Environmental Assault*, in UNDERPRIVILEGED SCHOOL CHILDREN & THE ASSAULT ON DIGNITY: POLICY CHALLENGES AND RESISTANCE 19, 19 (Julia Hall ed., 2014).

⁶¹ *Bean v. Sw. Waste Mgmt., Inc.*, 482 F.Supp. 673 (S.D. Tex. 1979).

⁶² *See id.* at 674–75 (denying Plaintiff's motions for a preliminary injunction and temporary restraining order challenging the Texas Department of Health's decision to permit a waste facility); Lauren J. Young, *10 Questions with the Father of Environmental Justice*, SCI. FRIDAY (Apr. 22, 2021), <https://perma.cc/8MP7-Y4YX>.

⁶³ Jacob Thompson, *We Birthed the Movement: The Warren County PCB Landfill Protests, 1978–1982*, UNC CHAPEL HILL LIBR. (Aug. 18, 2022), <https://perma.cc/UD6Q-W2AY>.

siting in 1987 and a subsequent independent study in 2007.⁶⁴ These reports confirmed that race predicted hazardous waste siting in the United States above and beyond one's income.⁶⁵ As of 2019, there were seventy-three municipal solid waste incinerators in the United States, 79% of which were located in low-income communities or communities of color.⁶⁶ In Michigan, for example, six of the state's eight hazardous waste facilities are located in Wayne County, a majority-Black county in one of the most segregated regions in the nation, with nearly 70% of this waste coming from outside the state.⁶⁷

Much of the healthcare waste from hospital and clinical settings moves off-site and thus contributes to exposures and impacts for those living near incinerators and landfills across the United States, in both urban and rural communities. Rather than health equity, the availability of affordable land has often determined waste facility siting and expansion decisions, perpetuating co-location of environmental exposures through a system of environmental racism.⁶⁸ A systematic review of studies from 2002–2017 on the health impacts of waste incineration identified sixty-one papers reporting on adverse outcomes.⁶⁹ This included thirty-four papers reporting exposure to elevated levels of known pollutants, and nine papers for each of the following outcomes: increased risk of developing neoplasia; correlation with adverse reproductive outcomes; and a link to hypertension, reduced lung function, and other diseases.⁷⁰ Another systematic review led to close examination of twenty-nine studies assessing health effects associated with proximity to landfills, incinerators, and dumpsites or open burning sites.⁷¹ It found that residing near landfills was associated with increased risk of mortality, respiratory diseases, and negative mental health effects, and that living near any type of MSW site was associated with increased risk

⁶⁴ COMM'N FOR RACIAL JUST.: UNITED CHURCH OF CHRIST, *supra* note 48; COMM'N FOR RACIAL JUST.: UNITED CHURCH OF CHRIST, TOXIC WASTES & RACE AT TWENTY 1987–2007: A REPORT PREPARED FOR THE UNITED CHURCH OF CHRIST JUSTICE & WITNESS MINISTRIES (2007).

⁶⁵ COMM'N FOR RACIAL JUST.: UNITED CHURCH OF CHRIST, *supra* note 48, at xiii (“Race proved to be the most significant among variables tested in association with the location of commercial hazardous waste facilities.”); Mohai & Saha, *supra* note 48, at 361 (explaining that race remains a significant factor in hazardous waste siting, even after controlling for socioeconomic class).

⁶⁶ THE NEW SCHOOL, *supra* note 59, at 4.

⁶⁷ Brian Allnutt, *Did Michigan Violate Civil Rights Law with Its Permit to US Ecology?*, PLANET DETROIT (Sept. 11, 2020), <https://perma.cc/F4FL-7TMB>.

⁶⁸ Mohai & Saha, *supra* note 48, at 345; Bullard, *supra* note 48.

⁶⁹ Peter W. Tait, James Brew, Angelina Che, Adam Costanzo, Andrew Danyluk, Meg Davis, Ahmed Khalaf, Kathryn McMahon, Alastair Watson, Kristen Rowcliff, & Devin Bowles, *The Health Impacts of Waste Incineration: A Systematic Review*, 44 AUST. & N.Z. J. PUB. HEALTH 40, 42 (2020).

⁷⁰ *Id.*

⁷¹ Giovanni Vinti, Valerie Bauza, Thomas Clasen, Kate Medlicott, Terry Tudor, Christian Zurbrügg, & Mentire Vaccari, *Municipal Solid Waste Management and Adverse Health Outcomes: A Systematic Review.*, 18 INT J ENV'T RES. & PUB. HEALTH, Apr. 2021, at 8, 19.

of adverse birth and neonatal outcomes.⁷² There was not always extensive evidence, however, and major gaps in the scientific literature remain. Data about RMW and overall healthcare waste amounts, types, and fate could lead to better understanding and help address the healthcare industry's contributions to environmental injustice.

The role of medical and public health professionals is relevant in addressing healthcare waste as an issue of health equity. Increasingly, medical and other health professional programs are integrating climate change into curricula, and some are beginning to acknowledge waste as a contributor.⁷³ The Association for Medical Education in Europe, the American Medical Association, the Australian Medical Association, and the World Medical Association have all called on medical professionals to recognize their role in addressing the climate crisis.⁷⁴ Yet in spite of this, few appear to explicitly recognize climate or environmental justice implications of our healthcare systems in policy and position statements. The U.S. Call to Action on Climate, Health, and Equity: A Policy Action Agenda, with signatories including APHA, the Academic Pediatric Association, Physicians for Social Responsibility and the American Medical Student Association, as well as nearly 100 other health-affiliated organizations, draws particular attention to environmental justice.⁷⁵ Additional attention to healthcare waste will further help to achieve these goals. As the accrediting body for healthcare organizations, The Joint Commission's environmental standards focus on ensuring safe handling of RMW with no attention to where that waste eventually goes.⁷⁶ These standards have substantial reach as they apply to approximately 78% of U.S. hospitals.⁷⁷ Ultimately, medical communities have not fully recognized the need for assessment and oversight of healthcare waste to achieve health equity.

III. EVIDENCE-BASED STRATEGIES TO ADDRESS THE PROBLEM

Ongoing improvements to procurement and waste management in hospitals and other large clinical settings could help to reduce production of petroleum-based single-use MWP and alleviate harmful downstream

⁷² *Id.* at 19–20.

⁷³ See, e.g., SanYuMay Tun & Theresa Martin, *Education for Sustainable Healthcare: A Curriculum for the UK*, MED. SCH. COUNCIL 1, 5 (2022), <https://perma.cc/6Y2G-3SSB> (discussing the need to incorporate climate change into medical school curricula).

⁷⁴ Emily Shaw, et. al., *AMEE Consensus Statement: Planetary Health & Education for Sustainable Healthcare*, 43 MED. TCHR. 272, 274 (2021).

⁷⁵ CLIMATE HEALTH ACTION, *supra* note 5 (listing all organizations that have signed the call to action).

⁷⁶ *Life Safety & Environment of Care Document List and Review Tool*, THE JOINT COMMISSION (Jan. 1, 2021), <https://perma.cc/HU43-84QM> (detailing the Joint Commission's standard for how hospitals manage risks related to hazardous materials and waste is embodied in EC.02.02.01, which omits any instruction regarding where waste eventually goes).

⁷⁷ *Why Do Hospitals Get Accredited by The Joint Commission?*, R1RCM (Sept. 15, 2016), <https://perma.cc/UVG3-HQKS>.

incineration and landfill practices that disproportionately affect low-income communities and communities of color in the United States. Leading organizations, such as Health Care Without Harm and Practice Greenhealth, have long advocated for reduction with frameworks such as “rethink, reduce, reuse, recycle, dispose,” and specific, evidence-based strategies continue to emerge that make it possible to move away from “dispose” and towards “rethink” and “reduce.”⁷⁸ For example, the Ronald Reagan University of California, Los Angeles Medical Center piloted a switch from single-use to reusable surgical gowns, which are ultimately thicker, offer more protection against infectious disease transmission, and “diverted 297 tons of waste from the landfills” from 2011–2015.⁷⁹ Today, healthcare facilities increasingly use reusable surgical gowns but they are still not commonplace.⁸⁰ The WHO’s 2022 report, *Global Analysis of Healthcare Waste in the Context of COVID-19*, spells out the following strategies for reducing PPE-related waste that hospitals are piloting across the world: (1) compostable face masks; (2) recycling of surgical masks; and (3) repurposing used medical masks as construction materials.⁸¹ Also, several autoclaving techniques allow hospitals to treat RMW on-site, avoiding community transmission during handling, enabling the waste to be handled as MSW rather than RMW, and reducing overall waste weight.⁸² Of course, many waste reduction approaches are already routine in healthcare settings, such as small, color-coded, and labeled medical waste containers, to avoid mixing waste types.

Many large hospitals have sustainability coordinators, committees, offices, or senior leadership focused on environmental programming, or they hold membership with organizations providing technical assistance, communities of practice, and inspiration (such as Practice Greenhealth).⁸³ This work may or may not emphasize waste issues. Some major healthcare systems are leading the way by addressing waste through larger sustainability, carbon neutrality, or Leadership in Energy and

⁷⁸ HEALTH CARE WITHOUT HARM, *supra* note 54.

⁷⁹ Natalie Baker, Rebecca Brommley-Dulfano, Joshua Chan, Anshal Gupta, Luciana Herman, Navami Jain, Anita Lowe Taylor, Jonathan Lu, Jaspreet Pannu, Lisa Patel, & Mary Prunicki, *COVID-19 Solutions Are Climate Solutions: Lessons from Reusable*, 8 FRONTIERS IN PUB. HEALTH, 2020, at 1, 1–2, 5.

⁸⁰ *Id.* at 2–3 (finding “widespread use” of reusable gowns at numerous medical sites, but 80% of hospitals still use disposable gowns).

⁸¹ WHO: GLOBAL ANALYSIS, *supra* note 14, at 19–20.

⁸² Sharath Kumar Anand, Lauren G. Culver, & Joseph Maroon, *Green Operating Room—Current Standards and Insights from a Large North American Medical Center*, 157 JAMA SURGERY 465, 465–66 (2022).

⁸³ See generally Tonya Boone, *Creating a Culture of Sustainability: Leadership, Coordination, Performance Measurement Decisions in Healthcare*, HEALTH CARE RSCH. COLLABORATIVE (2012), <https://perma.cc/NX3G-MKBC> (examining several large hospitals and finding sustainability coordinators, committees, offices, and senior leadership dedicated to sustainability and finding that others partnered with organizations that provide assistance to hospitals and groups engaging in sustainable projects, while inspiring other departments to follow suit).

Environmental Design (LEED) certification planning processes, entailing largescale organizational shifts. The healthcare organization Kaiser Permanente has a history of leadership focused on environmental stewardship, and it has launched various recycling and environmental procurement programs to meet the goal of carbon neutrality it set in 2016—and subsequently met in 2020.⁸⁴ As part of this plan, it set a goal of recycling, reusing, or composting 100% of its nonhazardous and nonmedical waste by 2025.⁸⁵ In 2020, it reported collecting “400 tons of medical devices for reprocessing,” and “more than 45,900 tons of waste for recycling, reuse, or composting.”⁸⁶ For example, the healthcare organization Atrium Health has: (1) committed to “achieve carbon neutrality by 2025;” (2) reduced annual energy consumption by 30%, compared to 2012; and (3) signed the Health Care Sector Pledge on June 30, 2022.⁸⁷

Further, there are economic incentives that may support the healthcare industry towards improved waste reduction. Over a decade ago, the Commonwealth Fund studied hospital programs that centered energy conservation and waste reduction and estimated that, if expanded to all U.S. hospitals, the programs could save the healthcare system \$15 billion over ten years.⁸⁸ Practice Greenhealth conducted a survey of 331 hospitals and found that initiatives to reduce waste in operating room facilities saved them, on average, \$100,000 and nearly \$72.4 million total in 2019.⁸⁹ Representing nearly 20% of the U.S. Gross Domestic Product, the healthcare industry has purchasing power to shift industry practices, and environmentally preferable purchasing programs have long effectively reduced costs while reducing waste.⁹⁰ The Healthcare Environmental Resource Center informs hospitals that if RMW is more than 15% of their total waste, there is likely much room for cost-savings, given that hospitals may pay up to ten times the cost to process RMW

⁸⁴ *The Road to Carbon Neutral*, KAISER PERMANENTE, <https://perma.cc/CD67-CJ5D> (last visited Apr. 8, 2023) (outlining the timeline of Kaiser’s work towards becoming carbon neutral).

⁸⁵ *Waste Reduction*, KAISER PERMANENTE, <https://perma.cc/H8BF-SX3Q> (last visited Apr. 8, 2023).

⁸⁶ *Id.*

⁸⁷ *See, e.g., Environmental Stability*, ATRIUM HEALTH, <https://perma.cc/3JYH-9TP6> (last visited Jun. 14, 2023) (discussing the commitments that Atrium Health has made over the past decade to create a “healthier environment . . . [and to] build a path to greater sustainability.”).

⁸⁸ Susan Kaplan, Blair Sadler, Kevin Little, Calvin Franz, & Peter Orris, *Can Sustainable Hospitals Help Bend the Healthcare Curve?*, 29 THE COMMONWEALTH FUND, Nov. 2012, at 1, 2.

⁸⁹ *2020 Sustainability Report*, PRACTICE GREENHEALTH, <https://perma.cc/ALF3-U3XS> (last visited Apr. 8, 2023).

⁹⁰ *NHE Fact Sheet*, CTR. FOR MEDICARE & MEDICAID SERV., <https://perma.cc/2XXY-KB33> (last visited Apr. 8, 2023); Barb Kaiser, Patrick D. Eagan, & Hollie Shaner, *Solutions to Health Care Waste: Life-Cycle Thinking and “Green” Purchasing*, 109 ENV’T HEALTH PERSP. 205, 205–06 (2001).

compared to their solid waste.⁹¹ Additional cost-benefit analyses, circular economy studies (that is, how to design for durability, reuse, remanufacturing, and recycling), and health impact assessments may help inform administrative and financial decision-making at varying scales.

Even with increasing options for sustainable practices, massive amounts of healthcare waste will remain a global reality and likely a threat to environmental health and justice, given historic patterns. To truly address downstream environmental impacts of healthcare, some governments have recognized the need to track and report environmental metrics by healthcare systems, sometimes including waste-related metrics. In a cohort study of forty-nine large U.S. healthcare organizations, researchers found that the healthcare delivery sector has long lagged in sustainability reporting compared to other U.S. sectors.⁹² Another study noted that while some U.S. healthcare organizations are leading in environmental stewardship (for example, Kaiser Permanente), most fall short in moving beyond basic corporate social responsibility and climate risk disclosure reporting.⁹³ The study directed readers to a potential model: England's National Health System's (NHS) Sustainable Health Dashboard.⁹⁴ The dashboard "provides performance data for every NHS provider, clinical commissioning group, and region in England on a range of indicators in the domains of governance; carbon; resources, water, and waste; air pollution; plastics; and adaptation."⁹⁵ Although less comprehensive than the NHS, many other countries, or provincial and state governments, also make efforts to generate data needed to make evidence-based healthcare waste management decisions. For instance, in Victoria, Australia, state government funding policy mandates that all public health services report specific environmental impact measures annually, including energy use, greenhouse gas emissions, water use, and waste generation.⁹⁶

Even though the U.S. healthcare system is radically different from most other nations, policymakers could design similar federal reporting policies, which would be an opportunity to consider and develop strategies to alleviate environmental injustice impacts. For instance, the Affordable Care Act (ACA)⁹⁷ called on non-profit, tax-exempt hospitals to begin assessing and addressing social determinants of health in the

⁹¹ *Reducing Regulated Medical Waste*, HEALTHCARE ENV'T RES. CTR., <https://perma.cc/A2MC-BJWJ> (last visited Apr. 6, 2023).

⁹² Emily Senay & Philip J. Landrigan, *Assessment of Environmental Sustainability & Corporate Social Responsibility Reporting by Large Health Care Organizations*, JAMA NETWORK OPEN, Aug. 2018, at 1, 6.

⁹³ Martin Hensher & Forbes McGain, *Health Care Sustainability Metrics: Building A Safer, Low-Carbon Health System*, 39 HEALTH AFF. 2080, 2084–85 (2020).

⁹⁴ *Id.* at 2082.

⁹⁵ *Id.*

⁹⁶ VICTORIAN GOV'T, PUB. ENV'T REPORTING GUIDELINES: GUIDANCE FOR VICTORIAN PUB. HEALTHCARE SERVS. 13 (2017), <https://perma.cc/G7QD-28KD>.

⁹⁷ 42 U.S.C. §§18001–18121 (2018).

communities they serve through required Community Health Needs Assessments (CHNA).⁹⁸ Some scholars have bemoaned CHNAs as a missed opportunity for addressing environmental issues and preparing for climate change.⁹⁹ CHNAs may not currently be the appropriate mechanism for assessing healthcare waste impacts, as they focus on the community defined by geographic area and target populations served.¹⁰⁰ If the healthcare industry sends waste across state lines, for instance, this would be beyond the CHNA's required scope. However, requirements could extend to account for this issue. Many federal policies—with EPA oversight—charge states with managing regulation, data collection, and enforcement of industry to uphold the Clean Air Act,¹⁰¹ Clean Water Act,¹⁰² and RCRA, for instance.¹⁰³ Although these policies have failed in many ways to address environmental injustice, new policies are under consideration that may be relevant, such as Justice40, which ensures that “40 percent of the overall benefits [of certain Federal investments] flow to disadvantaged communities” that have been “marginalized and overburdened by pollution.”¹⁰⁴ Through these policies, databases such as EJScreen and the Climate and Economic Justice Screening Tool make much of this data publicly available.¹⁰⁵ In the United States, there is evidence that policies and tracking tools are possible and could be helpful for documenting and addressing healthcare waste in efforts to curb environmental injustice.¹⁰⁶

IV. OPPOSING ARGUMENTS AND EVIDENCE

Admittedly, many of these evidence-based solutions for waste reduction have tradeoffs. For instance, in efforts to reduce RMW, healthcare facilities must balance the benefits and costs of using large amounts of chemical disinfectants that may also have environmental

⁹⁸ Patient Protection and Affordable Care Act, Pub. L. No. 111-148, 124 Stat. 119, 856 (2010).

⁹⁹ See, e.g., Warren G. Lavey, *Hospitals Should Help Communities Prepare for Climate Change*, 106 AM. J. PUB. HEALTH 1952, 1952 (2016) (arguing that “too few hospitals help mitigate and adapt to the local health impacts of climate change.”).

¹⁰⁰ Additional Requirements for Charitable Hospitals; Community Health Needs Assessments for Charitable Hospitals; Requirement of a Section 4959 Excise Tax Return and Time for Filing the Return, 79 Fed. Reg. 78,954, 78,962 (Dec. 31, 2014).

¹⁰¹ 42 U.S.C. §§ 7401–7671q (2018).

¹⁰² Federal Water Pollution Control Act, 33 U.S.C. §§ 1251–1388 (2018).

¹⁰³ *State Oversight Resources & Guidance Documents*, ENV'T PROT. AGENCY (Mar. 13, 2023), <https://perma.cc/DTP7-6EDY>.

¹⁰⁴ Tackling the Climate Crisis at Home and Abroad, Exec. Order. No. 14008, 86 Fed. Reg. 7,619, 7,629, 7,631–32 (Feb. 1, 2021).

¹⁰⁵ *EJScreen: Environmental Justice Screening and Mapping Tool*, U.S. ENV'T PROT. AGENCY (Jan. 30, 2023), <https://perma.cc/5V8R-EDE5>; *Climate and Economic Justice Screening Tool*, COUNCIL ON ENV'T QUALITY (Nov. 22, 2022), <https://perma.cc/U2F5-44XJ>.

¹⁰⁶ See Okoh, *supra* note 47, at 4–5.

health implications.¹⁰⁷ Leadership or accrediting bodies must approve many strategies as cost-effective, and such strategies may also raise liability issues when shifting from single-use towards reuse of materials, such as PPE.¹⁰⁸ Recycling, rather than disposal, may still have major implications for global environmental health and justice associated with its transporting, processing, and siting, because the U.S. healthcare industry often transfers waste to other countries.¹⁰⁹ As a review of medical waste management explained:

[U]ntil recently a significant portion of the world's recycled plastic, paper and scrap metal have been exported to China. Up to 70% of the world's plastic waste alone was exported to China and Hong Kong in 2016. However, recently China has put a ban on such waste imports causing a global panic around where else to divert the increasing volumes of recyclable waste, raising the question of sustainability of recycling after all.¹¹⁰

Policymakers and activists cannot abandon sustainability efforts towards environmental justice; however, there must be research that considers health impacts of these decisions holistically, alongside costs and benefits, to inform programs and policies.

Given that healthcare in the United States is largely private, and thus profit-oriented, many industry leaders may argue that the costs of shifting towards environmentally just practices is too high. Small healthcare systems, especially those serving rural communities and providing care to the uninsured, may not be able to implement major environmental changes because of cost or lack of expertise. Increased costs for meeting any new recycling, segregation, or handling requirements, or shifting to new purchasing models, may lead healthcare providers to shift added costs to patients. Evidence suggests this does not need to be the case. Decreasing RMW through improved segregation can mean fewer processing costs and reduced air emissions.¹¹¹ Many cost-saving programs do exist, and they show that increasing the already high cost of healthcare for patients may not be necessary.¹¹²

¹⁰⁷ Elisabetta Carraro, Silvia Bonetta, C. Bwetino, Eugenio Lorenzi, & Sa. Bonetta, *Hospital Effluents Management: Chemical, Physical, Microbiological Risks & Legislation in Different Countries*, 168 J. ENV'T MGMT., Mar. 2016, at 185, 189.

¹⁰⁸ Andrea J. MacNeill, Harriet Hopf, Aman Khanuja, Saed Alixamir, Melissa Bilec, Matthew J. Ecklman, Lyndon Hernandez, Forbes McGain, Kari Simonsen, Cassandra Thiel, Steven Young, Robert Lagasse & Jodi D. Sherman, *Transforming the Medical Device Industry: Road Map to a Circular Economy*, 39 HEALTH AFF. 2088, 2091 (2020).

¹⁰⁹ Amy L. Brooks, Shunli Wang, & Jenna R. Jambeck, *The Chinese Import Ban & its Impact on Global Plastic Waste Trade*, SCI. ADVANCE, June 2018, at 1, 3–5.

¹¹⁰ Kerstin H. Wyssusek, Maggie T. Keys, & André A.J. van Zundert, *Operating Room Greening Initiatives – The Old, the New, and the Way Forward; A Narrative Review*, 37 WASTE MGMT. & RSCH. 3, 11 (2019) (internal citations omitted).

¹¹¹ Anand et al., *supra* note 82, at 465–66.

¹¹² *Id.* at 466 (listing no and low-cost alternatives that have successfully resulted in dramatic reductions of RMW).

Opponents may also suggest that the disproportionate adverse health impacts of healthcare waste on communities of color and low-income communities is inconclusive, as there is not a national system to track the transport and disposal (landfill or incineration) of healthcare waste or RMW specifically. Of the seventy-three MSW incinerators operating in the United States, 79% are located in communities of color and low-income communities with more than half of them (forty-four and forty-eight, respectively) in communities where the population is at least 25% people of color and 25% of the population is below the federal poverty line.¹¹³ For decades, countless studies have shown similar inequitable siting patterns for landfills and hazardous waste sites, suggesting these patterns have held steady or worsened.¹¹⁴ Also, communities surrounding landfills and incinerators experience adverse health effects.¹¹⁵ Federal policy has never truly confronted the environmental racism embedded in waste management, healthcare, or otherwise.

V. CONCLUSION: ACTION STEPS

Because healthcare waste in the United States is a matter of environmental health and justice, a coordinated policy effort is needed. Public health experts anticipate the United States may be entering a “pandemic age;” thus, intersecting issues of infectious disease, healthcare waste management, and climate change require assessment and policy intervention.¹¹⁶ APHA offers these recommendations:

1. Federal lawmakers must increase oversight of healthcare waste, because current state-by-state policies likely perpetuate environmental justice issues. To begin, Congress should hold hearings and call for a GAO report to outline challenges and opportunities for environmental protections with respect to healthcare waste, including a much-needed comparative, evaluative scan of existing state-by-state policies.
2. Based on lessons learned from other federal policies and state management of healthcare waste, Congress should establish new policies after completing the GAO report. This could entail an updated version of the MWTAA, an amendment to RCRA, and new requirements within the ACA’s Community Health Needs Assessments process to address healthcare waste. Policy is needed

¹¹³ THE NEW SCHOOL, *supra* note 59, at 15, n.93.

¹¹⁴ Okoh, *supra* note 47, at 4; Mohai & Saha, *supra* note 48, at 346; COMM’N FOR RACIAL JUST.: UNITED CHURCH OF CHRIST, *supra* note 48, xiv; U.S. GEN. ACCT. OFF., *supra* note 48, at 3–4; ROBERT D. BULLARD, DUMPING IN DIXIE: RACE, CLASS, & ENV’T QUALITY 2–4 (3rd ed. 2000).

¹¹⁵ Tait et al., *supra* note 69, at 43–45 (providing examples of diseases people who live in these areas face); Vinti et al., *supra* note 71, at 2.

¹¹⁶ David M. Morens & Anthony S. Fauci, *Emerging Pandemic Diseases: How We Got to COVID-19*, 182 CELL 1077, 1077 (2020).

to delineate federal definitions of RMW and call on EPA to establish a tracking system to easily understand who is transporting healthcare waste (RMW and MSW) within and across state lines, U.S. territories, and Tribal lands, and out of the United States. EPA should make healthcare waste tracking data available in tools including EJScreen and the Climate and Economic Justice Screening Tool. This would allow communities, agencies, and scholars to understand the social, economic, and health implications of this waste and inform and compel strategies to address disparities.

3. Federal or state lawmakers should establish policies that require healthcare systems to prioritize environmental health and justice through adequate staffing, resources, training, and capacity for sustainability initiatives that reduce healthcare waste and propose solutions from generation to segregation to siting. Policies should also include protections for workers that handle healthcare waste.
4. EPA should revisit the Model Guidelines for State Medical Waste Management and generate updated guidelines based on lessons from state policies and evidence of cost-effective sustainability programs that have emerged over the last several decades, with intentional consideration of environmental justice impacts of healthcare waste.¹¹⁷ EPA's technical assistance or grant opportunities could better help to continually identify and improve upon such models. In doing so, EPA should consult with diverse stakeholders within the healthcare and waste industry, state agencies, and the environmental justice movement.
5. The Joint Commission should extend its environmental standards for site accreditation by requiring waste audits to assess the type, amount, and fate of healthcare waste for each facility. Site accreditation should also include review of protection measures in place for workers who handle healthcare waste.
6. With increased integration of climate change-related curricula in medical and other health professional training programs, as well as a move from leading health-related professional associations to call on their members to act on climate change, instructors in clinical training programs must more explicitly acknowledge local and global climate and environmental justice to increase awareness across the healthcare workforce of waste issues in a deepened commitment to doing no harm.
7. Scholars should conduct health impact assessments, cost-benefit analyses, and circular economy research with healthcare systems

¹¹⁷ See generally, MODEL GUIDELINES, *supra* note 46 (presenting a set of voluntary guidelines for the management of medical wastes).

and communities to identify cost-effective, feasible solutions to reducing use of single-use and MWP and moving towards environmentally preferred purchasing. These studies could assess environmental justice impacts related to different waste management strategies (for example, sterilization and reuse, on-site sterilization before landfilling, and incineration) or the potential economic and environmental health impacts of closing landfills or incinerators. They could also account for healthcare trade-offs (for example, infection risks, unintended effects of recycling process, and elevated costs), as well as the downstream impacts of healthcare waste, and consider metrics relevant to fence-line communities in the United States and beyond.

8. Finally, reduction of healthcare waste and increased tracking alone will not fully eliminate the longstanding burden of waste (healthcare and otherwise) on low-income communities and communities of color in the United States. Federal initiatives designed to address environmental racism, such as Justice40, must prioritize funding towards mitigation of cumulative exposures and impacts moving forward, reparation for harms, and investment in amenities to support well-being for communities fence-line to various waste management practices.