

4

Environmental injustice in North Carolina's hog industry: Lessons learned from community-driven participatory research and the “people’s professor”

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A vignette of life in hog country

Imagine a house. This house may have been owned by your family for generations or is one that you worked very hard to purchase. Now imagine that, unbeknownst to you, an industrial hog operation¹ with over 5,000 hogs and a football field-sized waste pit containing hog feces and urine has been permitted by the state government to be built across the street. The odor is overwhelming. You taste it in your food and smell it on your clothes and furniture. Worried about the waste overflowing when it rains, you learn that the state-sanctioned solution to manage these pits is to spray the feces on nearby fields using mechanized sprinkler systems. You look from your window in dread as fecal mist floats onto your property, saturating your line-dried clothes, your car, and your house. You close all the windows to protect yourself, even though it's beautiful outside.

Matters become worse when you notice a dumpster covered in flies and vultures at the entrance to the hog operation. A garbage truck speeds down your street, stops and picks up the dumpster, and dumps its contents into the back. Large, bloated hog corpses heave out, their liquefied viscera and rot splattering down the sides of the box and into the street. As the truck pulls away, you notice the same liquid spilling out from the bottom, marking a continued and discernable path along the road and into the distance. All you want to do is work in

your garden and enjoy the sunshine, but the smell of decomposing flesh mingles with smell of hog feces, causing you to gag and retreat into your home. You feel angry and depressed.

You think about selling your house, but the proximity and smell of the hog operation causes your property value to drop. The barbecues you once loved are impossible due to swarms of flies, and your children can't play outside because it's too hard to breathe. Your own asthma worsens. You call everyone you can think of about the smell, the waste sprayers, the boxes full of dead hogs, and the damage to your home. You talk to your town and local representatives. You call the governmental agency responsible for permitting and regulating the hog operation. You call the police. You call the local health department. You call everyone associated with the operation, but to no avail. Few return your calls, and even fewer provide solutions. That evening, you're confronted in the grocery store parking lot by strangers who advise you to "not make trouble for yourself." You find out later that one of the government officials you spoke to about the smell shared your phone number and name with the owner of the industrial hog operation.

You're scared, but also angry at being ignored, marginalized, and betrayed by institutions responsible for your protection and health. You notice that these operations are not commonly located in predominantly wealthy, white communities, and more and more hog operations appear with legal permission in low-income communities and communities of color, including your own. One day, you hear about a local community group that is conducting research on the potential impacts of industrial hog production on public health. You attend one of their monthly meetings and are inspired by their stories and objectives. They want to monitor the air for toxic gases and document your experiences with the industry. Even though you are afraid of more retaliation, you invite the community group to your home to set up an air monitor in your yard. Finally, you have the opportunity to collect evidence that may explain why you are sick. For now, only your neighbors believe you. But soon, all of that will change.

Introduction and background

This vignette represents an amalgam of real-life stories told to, and witnessed by, the authors of this chapter, embodying the collective experiences of community members pursuing dignified lives and livelihoods at the epicenter of industrial pork production in the United States. Tucked away in rural eastern North Carolina (NC), Duplin and Sampson Counties have the highest density of hogs in the United States, with 2.0 and 1.9 million hogs, respectively (USDA

and NCDACS 2018). Close to half of the population in both counties are people of color (26% black and 23% Hispanic in Duplin; 27% black and 20% Hispanic in Sampson). Additionally, an estimated 20% of the population in both counties lives below the federally designated poverty line (US Census Bureau 2018).

What may be more important than these social demographics, however, is the role state government has played in legitimizing the disproportionate concentration of industrial hog operations (IHOs) in low-income communities and communities of color. The North Carolina Department of Environmental Quality (NCDEQ) has legally permitted IHOs in these communities for decades, despite myriad and rigorous scientific research demonstrating its hazardous public and environmental health impacts. To interpret this permitting as anything other than government-sanctioned violence and racial capitalism ignores the racist history of the NC “Black Belt” (Robinson 1997). The Black Belt is a geopolitical region expanding across several states in the southeastern United States, with large present-day African American populations living in areas with centuries-long histories of slave- and plantation-based economies. The modern-day siting of hog operations and their waste in these same communities demonstrates the continued necropolitical power leveraged by the NC government and industry to deem who deserves, or does not deserve, to live a healthful life (Mbembé and Meintjes 2003).

Environmental justice can be defined as “equal access to a healthful environment, regardless of race, ethnicity, or income” (Guidry et al. 2018, 324). The modern environmental justice (EJ) movement began in Warren County, NC in response to the siting of a hazardous waste landfill in a rural African American community, and it continues today with industrial animal production in Duplin and Sampson Counties (Guidry et al. 2018). This chapter will explore the work of Dr. Steve Wing, an epidemiologist at the University of North Carolina who devoted his life to conducting community-driven participatory research (CDPR) on environmental justice issues in North Carolina until his untimely death in 2016 (Guidry 2017). Steve understood the political and historical entanglements of EJ and worked in equitable collaboration with community partners to enumerate and scientifically validate environmental injustice, including environmental racism, perpetuated by the NC government and transnational, multibillion-dollar livestock industries.

Steve was known by his collaborators as the “people’s professor,” a moniker that evokes his dedication to elevating community voices in public health and legal action by critically confronting corporate influence on scientific knowledge production and environmental management. This chapter is dedicated to his memory and aims to build on the important lessons embedded within the community-driven participatory research that he conducted in partnership with

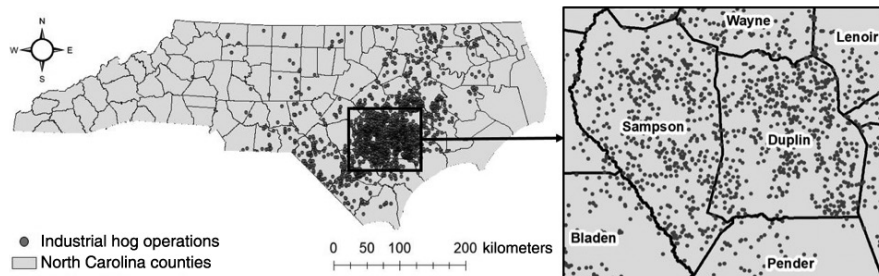
communities. It is presented in three parts. In the first section, we examine the expansion, impact, and political influence of IHOs in eastern NC. In the second section, we unpack particularly influential CDPR projects on environmental justice and the NC hog industry to elucidate how researchers and communities can work in concert to generate rigorous and objective systems of inquiry that do not rely on exploitative methodologies. In the third section, we present explicit lessons learned from these CDPR studies for use by academics and community-based organizations (CBO) to improve and sustain their partnerships.

This chapter is written from the perspectives and experiences of seasoned community organizers and academic researchers deeply involved in environmental justice work in the American South. Our authors represent a group of community-academic partners from the Rural Empowerment Association for Community Help (REACH), the North Carolina Environmental Justice Network (NCEJN), and the University of North Carolina at Chapel Hill (UNC).

History and structure of North Carolina industrial hog operations

Hog production in North Carolina is a multibillion-dollar industry and a critical piece of the state's economy and culture. Historically, family farms across the state raised small hog herds (< 25 hogs) on open pasture and sold the meat directly at local markets (Furuseth 1997; Thompson 2000). However, in the 1980s, the hog industry abruptly shifted to a vertically integrated, industrial-scale production model, where industry-owned hogs are raised in confinement at high density (> 250 hogs) in IHOs, otherwise known as concentrated animal feeding operations (CAFOs) (Wing et al. 2002). As a result of the state's rapid agro-industrialization, NC is currently the second-highest producer of hogs in the United States and is home to over 2,000 IHOs and 9 million hogs (USDA and NCDACS 2018) (see Figure 4.1).

This rapid agro-industrialization was facilitated in part by the election of pork industry affiliates to local and state governments. Wendell Murphy, an agricultural lobbyist and pork producer, served for 10 years in the NC General Assembly, where he pushed forth laws (known as "Murphy's laws") that benefited IHOs at the expense of community and environmental health (Sill et al. 1995). These "right to farm" laws ensured that IHOs, despite documented impacts on health, were exempt from taxation, "environmental regulations, zoning laws, labor regulations, and nuisance suits" (Ladd and Edward 2002). The systematic passing of pro-IHO legislation has secured the long-standing stronghold of the hog industry, strategically undermining local communities fighting for improved



4.1 Industrial hog operations sited in eastern North Carolina. The figure was created using Esri® ArcGIS® software version 10.3.1. The industrial hog operation locations were provided by the Environmental Working Group and Waterkeeper Alliance (Environmental Working Group & Waterkeeper Alliance, 2016).

operational practices and against industry expansion (Julius L. Chambers Center for Civil Rights, 2018).

Today, the few multinational corporations that dominate NC industrial hog production are Smithfield Foods, Inc. (owned by WH Group) and its subsidiary, Murphy-Brown LLC, and Prestage Farms, Inc. These large, vertically integrated companies operate across their supply chains, hiring local contract growers (i.e., farmers) to raise industry-owned hogs on growers' land. The companies control everything from growth to slaughter, as well as product delivery to grocery stores (Wing 2002). Growers sign contracts, which specify guidelines regarding the animal husbandry practices that they must implement – for instance, antibiotic administration via feed. These contracts can require growers to make large investments to build and staff their operations (MacDonald and McBride 2009). Because the growers do not own the animals, and often do not receive financial or legal support from the overseeing company for issues related to waste management, they can face financial instability and feel like “indentured servants” (Braun and Braun 1998; Farmers’ Legal Action Group 2003). As Larry Cooper from REACH explains:

The contract growers are between a rock and a hard place due to the strategy of the “powers that be.” They have to jump when they are told to jump, the “powers that be” control their destiny. That strategy pits the contract grower against people like us and similar organizations because they feel we stand in their way of making a living. They don’t understand our true purpose and as a result they fear us. We are not anti-hogs, we simply want things done the right way; that’s all. (Interview, 2018)

To further understand the impacts of industrialization and associated contracts, it is important to understand the architecture of typical North Carolina

IHOs, which consist of confinement barns, waste lagoons, and waste sprayfields. Confinement barns are designed to raise hundreds to thousands of hogs in densely packed pens. To reduce accumulation of harmful gases from hog excrement as well as animal overheating, barns are often ventilated by exhaust fans or rooftop chimneys. Barn floors consist of tightly spaced metal slats for drainage of hog waste, which is then funneled to uncovered, outdoor cesspools called “lagoons.” Hog lagoons can be as large as a football field, depending on the number and life stage of the hogs. The purpose of lagoons is to treat waste via anaerobic decomposition; however, these lagoons cannot effectively contain and treat the waste without stringent maintenance and monitoring (Wing et al. 2000; EarthJustice 2014).

Therein lies an important stipulation of industrial livestock contracts that contributes to the degradation of community and environmental health: the growers’ responsibility for the treatment and storage of waste. Corporations legally own the animals but contract growers own the animal waste, limiting corporate liability associated with regulatory compliance related to waste management (Wing 2002; Farmers’ Legal Action Group 2003). Contract growers, especially poultry growers, are at risk of becoming indebted to the industry (RAFI-USA 2017) and often do not have the financial capacity to install advanced treatment systems, such as those used for the treatment of human waste. Therefore, the majority of contract growers use the most affordable (e.g., lagoon/sprayfield system), as opposed to the most protective, waste management systems.

At an industrial magnitude, hog waste is a major source of greenhouse gases, pathogenic microbes, and nutrient pollution (Cole et al. 2000). The existing precarity of communities living near IHOs is only further complicated by the increased occurrence and intensity of hurricanes, including Hurricanes Floyd (1999), Matthew (2016), and Florence (2018). Uncovered lagoons contain millions of gallons of waste and are vulnerable to overflow during heavy rain events, potentially contaminating nearby environments, as well as ground and surface waters (Wing et al. 2002). To prevent this, it is standard practice to periodically remove waste and apply it to crop sprayfields as a fertilizer using high-powered, mechanized sprinkler systems. This practice is dependent upon soil infiltration, which can lead to contamination of surface and groundwater in regions with high water tables like the NC coastal plain (Guidry et al. 2018). As a regulatory tool, the NCDEQ requires IHOs to apply for waste disposal permits, which track the cover crop of sprayfields and the frequency of spraying to assess nutrient balance and prevent environmental contamination (Christenson and Serre 2017). However, these permits do not require microbial analysis of waste prior to spraying, nor do they require public notice in the case of a potentially harmful discharge event (EarthJustice 2014).

The proximity of IHO lagoons and sprayfields to neighboring homes and communities is striking. There are 4,145 swine lagoons in NC, with 37 lagoons located within half a mile of a school, 136 within half a mile of a public water well, and 170 within the state's 100-year flood plain (Environmental Working Group & Waterkeeper Alliance 2016). Due to the high density and proximity of IHOs to communities, the public can be exposed to hog waste via spray aerosolization, lagoon leachate, and lagoon overflow. Further, harmful gases and malodor can be generated via spraying of hog waste, off-gassing of lagoons, and use of barn exhaust fans, leading to increased stress (Horton et al. 2009) and potential negative impacts on respiratory health and neurological function (Schinasi et al. 2011; Kilburn 2012).

Residents living close to industrial hog operations have frequently expressed incredulity at the actions of the corporations. For example, as Devon Hall of REACH recalled: "One time, a friend said, 'How could another Christian do to a fellow Christian what Murphy Brown is doing to the community?'" (interview, 2018). In 2014, after decades of organizing and research to illuminate these issues, NCEJN, REACH, and the Waterkeeper Alliance filed a Title VI complaint against the NC Department of Environmental Quality for:

issuing a general permit that allows industrial swine facilities in NC to operate with grossly inadequate and outdated systems of controlling animal waste and little provision for government oversight, which has an unjustified disproportionate impact on the basis of race and national origin against African Americans, Latinos and Native Americans in violation of Title VI of the Civil Rights Act of 1964. (EarthJustice 2014)

This case is revolutionary and represents a major success for the EJ movement, as it is only the second time in the history of the US Environmental Protection Agency where disproportionate impact was confirmed and a settlement agreement was signed, proving discriminatory practices by the government to benefit industry (Julius L. Chambers Center for Civil Rights 2018). This work could not have been done without the scientific knowledge produced by NC community groups partnering with Steve Wing and others. The following sections will focus on Wing's legacy and lessons learned from scientific research rooted in community power.

Community-driven participatory research (CDPR) and the “people’s professor”

Though the Title VI complaint was submitted in 2014, this work truly began in the 1980s when CBOs, with members including authors of this chapter, began to resist the rapid expansion of IHOs in low-income communities of color in eastern NC. The Concerned Citizens of Tillery (CCT), NCEJN, and REACH were among the first organizations to expose environmental injustice and environmental racism in the NC hog industry through political mobilization and organizing tactics, including advocacy, empowerment, education, direct action, litigation, and finally, community-driven participatory research.

In the 1990s, Steve Wing began attending community meetings held by the Concerned Citizens of Tillery, a CBO in Halifax County that “promotes social justice and self-determination for rural African American communities” (Wing et al. 2008a), to learn about industrial animal production from the perspective of neighboring communities. There, he met Gary Grant (CCT), A. Nan Freeland (CCT; NC Central University), and Naeema Muhammad (Black Workers for Justice), with whom he would later form the NCEJN (Guidry 2017). Steve listened carefully and documented the human health concerns raised by the community at these meetings. For the next two decades, Wing conducted scientifically rigorous research on issues related to industrial animal production in collaboration with community partners. His groundbreaking work inspired generations of researchers and activists and continues through his collaborators and students. Reflecting on the depth of his influence, Naeema Muhammad of NCEJN stated: “Steve Wing was the greatest researcher to ever walk the halls of any university” (interview, 2018). Wing was particularly admired for inspiring people to use community-driven research as a tool for change, while simultaneously recognizing its limitations. For example, Devon Hall of REACH recalls a particularly insightful conversation: “Steve Wing once said to me, ‘I don’t know if this research will do you any good.’ And something lit up inside me – it will. Just knowing, getting the data, learning what we are being exposed to ... I can learn how to protect myself. I can give that information to someone else ... because knowledge is power” (interview, 2018). The following section attempts to synthesize the key findings of the research conducted by impacted communities alongside Steve Wing and his mentees, and to provide lessons learned from their work at the forefront of the environmental justice movement.

In 2000, Wing, in collaboration with CCT, conducted one of the first community-driven participatory research (CDPR) studies to address community concerns about hog industry practices and siting. The specific objective of

the study was to assess the “extent to which hog CAFOs are located disproportionately in communities with high levels of poverty, high proportions of non-white persons, and high percentages of households dependent on well water” (Wing et al. 2000). The study showed that hog CAFOs are disproportionately located in low-income communities and communities of color across the state. The results validated community member observations and provided scientific data and informative maps to support their claims of systemic environmental injustice and racism. This work became the antecedent for a very influential CDPR study called “Community Health Effects of Industrial Hog Operations,” or CHEIHO.

The CHEIHO study investigated health outcomes and quality of life factors associated with exposure to CAFO-related air pollutants, while simultaneously sharing scientific knowledge with participants and promoting social and environmental justice (Wing et al. 2008a). The CCT recruited 102 participants who lived within 1.5 miles (2.4 kilometers) of an IHO from 16 communities to participate in a 2-week sampling effort. A trailer containing air monitors and weather tracking devices was set up in participant neighborhoods to conduct real-time monitoring, including assessment of pollutants and environmental factors like particulate matter, hydrogen sulfide, temperature, wind speed, humidity, and rainfall. Simultaneously, participants were asked to categorically rate the strength of odor outside their homes (on a scale of 1 to 9), record any respiratory issues, and take blood pressure and lung function measurements. Finally, semi-structured interviews were conducted before and after the study to gauge participants’ quality of life perception before and after IHO expansion as well as during the data collection process (Wing et al. 2008a).

This study was groundbreaking in its design and scientific assessment of physiological and psychological impacts of malodor. The community led the design and recruitment and provided valuable knowledge on regional sociopolitical dynamics, including the hog industry’s intimidation tactics. Participants’ concerns, comfort, trust, and anonymity were explicitly prioritized within the design, such as holding training sessions at participants’ homes, churches, and other local venues as opposed to research institutions. At these sessions, food, childcare, and educational brochures were provided and community organizers were available to “bridge cultural divides by translating technical data collection concepts into meaningful local language” (Wing et al. 2008a).

A rich and unique data set was created, and several important community-driven questions about the impacts of IHO air pollution on health and well-being were addressed. The CHEIHO study results found prevalent odor in the region on half of the study days, in concert with high concentrations of PM10 in the air (Wing et al. 2008b). Results found it was common for participants to change

their daily activity and have increased self-reported stress in response to malodor (Tajik et al. 2008; Horton et al. 2009). Results also showed that increased hydrogen sulfide gas exposure (a biomarker for hog waste) was associated with elevated blood pressure of participants (Wing et al. 2013). Interestingly, increasing industry awareness of the study impacted the data collection process using the mobile trailers. Several participants reported suspicions that IHO operators learned of the trailers' purpose and temporarily changed their practices, potentially reducing odor during the study period (Wing et al. 2008a).

The CHEIHO database is still in use today. Steve's students and colleagues continue to analyze CHEIHO data as well as create new research on emerging questions in partnership with CBOs. For example, Steve's students – the authors of this chapter among them – have collaborated with REACH to investigate the emergence of antibiotic-resistant bacteria within IHOs related to the industry's administration of antibiotics to hogs for growth promotion, disease prevention, and disease treatment. This work has shown that antibiotic-resistant, livestock-adapted bacteria are present on North Carolina IHOs and have the potential to spread from hogs to IHO workers, community residents, and to the environment (Rinsky et al. 2013; Hatcher et al. 2016a, 2016b; Davis et al. 2018). Additionally, this research has shed light on the need for improved working conditions and workplace protections for IHO workers. Some of this work was later cited in the 2014 Title VI Civil Rights Act complaint filed by CBOs against the NCDEQ.

Additional studies that were inspired by Steve Wing's work on North Carolina IHOs have investigated (1) environmental racism in the Mississippi hog industry (Wilson et al. 2002), (2) hydrogen sulfide exposure in children attending school near NC IHOs (Guidry et al. 2016), and (3) presence of fecal indicator bacteria and pig-specific microbial fecal markers downstream proximal to IHOs (Heaney et al. 2015). For more information, the *North Carolina Medical Journal* provides a comprehensive summary of the pollutants and health impacts that are associated with IHOs, as documented by Wing and community partners, his mentees, and other researchers from North Carolina and beyond (Guidry et al. 2018). Notably, in a 2016 interview, Steve reflected on the extensive body of research that has been conducted by the community over multiple decades, posing that: "The evidence of impact is so overwhelming that we don't need more research. We need action to protect people and the environment" (Wing, interview in Robinson 2016).

Lessons learned from CDPR and the “people’s professor”

By considering the history and philosophy of their disciplines, practicing researchers can increase the rigor, objectivity, and social responsibility of environmental health science. Steve Wing (Wing 2003)

As awareness of EJ grows and is applied outside the United States, it is important to pay homage to its lineage in NC and recognize the breadth of lessons still to be learned from the community organizing and CDPR conducted there. The following section presents a selection of lessons learned from the extensive body of CDPR studies described above. These lessons were derived from a series of reflective group interviews conducted by KD Brown and Sarah Rhodes with Devon Hall, Larry Cooper, and Naeema Muhammad (all authors of this chapter). We intersperse our lessons learned with selected quotes from our conversations. It is our hope that these lessons can be operationalized by academic researchers interested in becoming involved with CDPR and by CBOs who may be interested in pursuing scientific research as an education and organizing tool. [Table 4.1](#) at the end of the section sums up the lessons learned.

1. *Promote research equity*

Academic researchers are trained to become “experts” in their field. A side effect of this pedagogy is the creation of a hierarchy of power, where academia is the keeper of knowledge and the public is a naive entity in need of education. In the context of this work, this style of pedagogy generates dangerous narratives about EJ communities that focus on victimization rather than honoring community triumph and capacity in the face of oppression. Research is often posed as a “capacity-building” tool within impacted communities, obscuring their self-determination and autonomy. The implicit hierarchy of academic knowledge production must be deconstructed in order to conduct equitable, community-driven research. If researchers are not members of the impacted community, they do not have requisite expertise and should defer to community partners as experts of their own lived experiences. CDPR studies are often only possible through partnership with community members who have deep roots in the study community or region. The power of the community must be acknowledged and venerated, just as the privilege of academic researchers and institutions must be challenged in order to establish a partnership based in equity and respect.

Researchers, don't come in and say "this is what we're going to do." You need to come in with a draft to discuss and edit together with the community. Devon Hall, REACH (interview, 2018)

2. Engage in participatory research design and budgeting

Impacted community members should be involved in every step of the research process, from the drafting of research questions and project plans to report-backs of research results. Further, it is important to adequately compensate community members for their involvement in research. However, research funding is often temporary and should not be the primary source of funding for CBOs, as this often strips them of their capacity to engage in other organizing. Collectively writing grants is very welcome, but the ultimate goal should be to ensure that CBOs have financial autonomy apart from research funding. Participatory budgeting at the nascent stages of grant writing is exceptionally important to sustainable collaborations.

3. Respect non-research objectives of community partners

Academic researchers must be careful not to demand too much time of CBOs. These organizations have other priorities that are equal to, if not more important than, research. Similarly, CBOs should set clear boundaries for researchers regarding the amount of time and personnel they can dedicate. Research should always be driven by, protective of, and relevant to communities and their objectives. Academics must iteratively ask themselves "Can my research influence or be used in legal action, organizing, education, or policy efforts?" If not, rethink your approach by directly consulting with your community partners on how to better align your work with theirs. Remember, scientific research is important, but should remain secondary to CBOs' empowerment and mobilization efforts.

4. Acknowledge historic mistreatment of communities of color by research institutions

Mistrust of research institutions can be pervasive in EJ communities, as academia has a long history of systemic discrimination and subjugation of communities of color (Wing et al. 2008a). Researchers must respectfully accept when people decline or cease involvement in research. Informed consent and data confidentiality procedures must be clearly defined and provided verbally and in writing, as the participants' lives and livelihoods may be threatened if their involvement is discovered. If extra protection is needed, researchers should

apply for a Certificate of Confidentiality administered by the US Department of Health and Human Services, or a similar entity in their home country. This is especially relevant to our work in North Carolina, as the pork industry yielded influence over the governing body of Steve Wing's academic institution, subpoenaing his work to demand he turn over de-identified participant records to attorneys representing the Pork Council, potentially endangering his research participants (Wing 2002).

5. Acknowledge the impact and limitations of research studies

It is important to stress that absence of scientific evidence does not mean that health impacts are not being experienced or are not meaningful. It is necessary to explain and understand the limitations and impact of research from both sides, as results do not always align with publishing goals or community experiences of chronic illness. In addition, one must contextualize and iteratively reflect on the social and political implications of research, as science is limited in its capacity to enumerate lived experiences and trauma but powerful in its ability to discredit them.

6. Establish trust and prioritize community comfort

Academic researchers and CBOs must work together to ensure community members feel safe, as they may be at risk of intimidation and economic retaliation for their participation in research. Creating a culture of trust and comfort can come in many forms, including providing extensive information about plans for anonymization and secured storage of personally identifiable data, such as names and phone numbers. Academics must prioritize and acknowledge the working schedules of their community partners and research participants, adjusting their own needs to meet the needs of their collaborators. Further, it is important for researchers to provide culturally appropriate food (check in with your partners) and services, such as babysitting, at meetings. Finally, the spaces in which meetings are held are incredibly important. Workshops and meetings led by academics are often designed to impress and comfort their peers, not their community partners. Fancy hotels and conference centers may be intimidating, inaccessible, and unwelcoming to attendees who do not benefit from institutional privilege. If there is a meeting venue located within the community, use it.

This is white privilege at its best. Furthermore, I'm not trying to be nobody's token. You bringing me out to all of this eloquence and I'm working with communities who are dying every day.
Naeema Muhammad, NCEJN (interview, 2018)

7. Cultivate an inclusive language base

An inclusive and intentional language base must be cultivated and shared in order to move forward as an intersectional collective of environmental justice researchers. Language that is not accessible or that is dominated by acronyms is useless outside of an academic context. Institutional language, both private and public, comes from a place of top-down privilege and is potentially violent for marginalized communities. Consequently, researchers must be very intentional in how they speak about environmental justice issues and to whom they speak.

Yeah, I have a PhD. It stands for Poor, Hungry, and Determined. Larry Cooper, REACH (interview, 2018)

8. Support and respect the formation of community review boards

After years of conducting research alongside academic institutions, REACH established a community review board composed of community leaders that meets to determine whether becoming involved with new research studies will serve the community's needs. These community review boards are essential to ensuring that community groups do not become involved in exploitative research that does not support their broader mission and organizing objectives.

Conclusion

This chapter celebrates EJ communities who have triumphed over state-sanctioned environmental injustice. When the North Carolina government failed to conduct rigorous surveillance of industrial pollution and document associated health burdens, the community produced their own knowledge. This extensive body of CDPR was operationalized in increased organizing efforts and litigation to hold the government and industry accountable. The resulting Title VI and nuisance complaints have far-reaching implications for other extractive industries benefiting from the “post-truth” era where scientific evidence is silenced. EJ communities will continue to face new challenges, including climate change and the growing waste crisis. Steve Wing's legacy provides a framework to address burgeoning environmental health issues through equitable, extramural science that elevates community power and resistance to oppression, influencing both the local and global environmental justice movement. Reflexive in our approach, we build on Wing's call for the need for community-driven *action* as well as *research*. Moving forward, we are dedicated to creating accessible

Table 4.1 Lessons learned from community-driven participatory research conducted in North Carolina.

Lesson	Example
Promote research equity	Community members are experts, not victims, and should be treated as such by academic allies.
Engage in participatory research design and budgeting	Community members should co-direct the entirety of the research process, from grant writing to research report-backs.
Respect the non-research objectives of community partners	Research studies should facilitate, not eliminate, a CBO's capacity for other critical organizing efforts.
Acknowledge the historic mistreatment of communities of color by research institutions	Researchers must clearly define informed consent and remain transparent about the ways in which they benefit from institutionalized racism.
Acknowledge the impact and limitations of research studies.	Research findings do not always align with community members' experiences. It is important to note that absence of scientific evidence does not equate to evidence of absence of health impacts.
Establish trust and prioritize community comfort	Academics should take time to learn culturally appropriate language and conduct research in spaces where community members feel safe.
Cultivate an inclusive language base	Terms such as "community-driven research" can be used in place of "citizen science" to maximize inclusivity.
Support and respect the formation of community review boards	CBOs can create community review boards composed of community leaders who determine whether research will serve the community's needs.

research summary materials for use in education and empowerment efforts and are taking the lead from youth, women, LGBTQIA2S+ (lesbian, gay, bisexual, transgender, queer and/or questioning, intersex, asexual, two-spirit, etc.) community, and other under-represented voices in the EJ movement. We continue to learn new lessons each day from impacted community members, animal operation workers, contract growers, and other partners. United, we face the enduring and ever-changing issues of environmental injustice and environmental racism in North Carolina as we work collectively to build a just future.

Note

- 1 A "hog" is a type of pig. By definition, hogs are domestic pigs bred to be heavier for use in pork production (Wikipedia 2020). Thus, "industrial hog production" in North Carolina is comparable to what may be referred to as "industrial pig production" or "industrial pig

farming” in other regions of the world; however, the North Carolina industry is distinct due to the high density of production and environmental injustice concerns associated with it.

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