

# Water Scarcity & Health in Urban Africa

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*Water is the cornerstone of public health. Yet many people living in Africa's cities face serious challenges obtaining an adequate supply of clean water. This situation, which poses significant public health concerns, promises only to grow in magnitude in the coming years as rapid urbanization and climate change meet head-on to further constrain urban water provision. This essay explores the relationship between water supply and health in urban Africa through the lens of water scarcity and health as political relationships as much as environmental or technical phenomena. By bringing infectious diseases like cholera and chronic ailments like kidney disease into the same frame of analysis, this essay also directs attention beyond the overwhelming public health focus on microbial contamination to emergent forms of water-related illness and injury that proceed unchecked.*

In 2014, as global attention was focused on the Ebola epidemic escalating in Guinea, Liberia, and Sierra Leone, residents of Accra, Ghana, found themselves facing an older and more familiar foe. In June of that year, a ten-year-old girl was brought to the Ussher Polyclinic with severe diarrhea, which was soon confirmed by laboratory tests to be positive for cholera. Soon another case was confirmed: a fifty-three-year-old man who presented at Maamobi Polyclinic in a different neighborhood of Accra.<sup>1</sup> By August, as the epidemic reached its peak, Ghanaian authorities reported fifty-four confirmed cholera deaths in the city with hundreds of new cases each day, stressing the health system.<sup>2</sup> Meanwhile, commuters, traders, and other travelers carried the disease beyond the metropole and cases were detected throughout much of the country and beyond its borders.<sup>3</sup> By the time the outbreak was finally contained in January 2015, nearly 29,000 cases and 243 deaths had been recorded.

According to Ghanaian public health experts, the index cases for the epidemic were in neighborhoods they described as “unhygienic and unclean,” with reliance on public latrines and open defecation in some places.<sup>4</sup> Experts from the Disease Surveillance Department of the Ghanaian Health Service who went to investigate found that “the water supply system in these areas also had visible leakages in the pipes suggesting possible water contamination, since there was evidence of vis-

ible disposal of untreated sewage into open drains.”<sup>5</sup> Lacking proper drainage, sewage and other refuse were dumped into the sea and gutters. “Continuous water supply was another major problem in these areas. They mostly depend on the sachet water as the safest source of drinking water.”<sup>6</sup> Ghanaian epidemiologists established that those with cholera had been six times more likely to have drunk sachet water – that is, water packaged in 500 milliliter plastic pouches by private sellers and purchased on the street – than those without the disease.<sup>7</sup> It was only many weeks into the outbreak, when the government finally succeeded in providing safe water and toilets, that the epidemic began to subside.

A decade prior to the 2014 cholera outbreak in Ghana, anthropologist Sherine Hamdy sat in a dialysis ward in Tanta, Egypt’s fifth-largest city. She was there researching an epidemic of a different nature, though one also related to dirty water. Tanta’s dialysis patients were suffering from chronic kidney failure, the visible tip of a broad epidemic of kidney disease. For those lying tethered to the machines, dialysis was exhausting and time-consuming, but it was also iatrogenic. In the clinics where Hamdy worked, between 70 and 80 percent of patients had contracted Hepatitis C via the dialysis machines. Patients in these clinics blamed toxic drinking water and contaminated food for their ailments. They pointed to the dumping of pesticides and chemical runoff into the Nile.<sup>8</sup> This was an etiology echoed in the popular press, in which many authors pointed to the government’s failure to properly regulate, monitor, and control industrial pollution, resulting in high rates of heavy metal and chemical contamination and attendant disease.<sup>9</sup> Indeed, some of the worst offenders were government-owned firms.<sup>10</sup>

These two epidemics begin to suggest the scope and contours of the relationship between water and well-being in urban Africa. Water is the cornerstone of public health. Yet many people living in Africa’s cities face serious challenges obtaining an adequate supply of clean water. This situation, which poses significant public health concerns, promises only to grow in magnitude in the coming years as rapid urbanization and climate change meet head-on to further constrain urban water provision.

**T**he African continent has been urbanizing rapidly – a process that shows no signs of slowing. The sheer number of city dwellers has risen steadily over the past several decades as has the number and size of cities. In 2015, Dakar was home to as many people as the entire nation of Senegal had been only a half-century earlier.<sup>11</sup> By 2015, an estimated 567 million Africans – more than half the total population of the continent – were urbanites. Demographers project that within the next three decades, nearly one billion additional people will reside in Africa’s cities.<sup>12</sup> Meanwhile, changing rainfall patterns and rising temperatures contribute to the challenge of providing adequate water for these rapidly growing populations. Already the number of cities with unreliable water supply and

chronic shortages is rising. Water is a primary human need, yet it can carry microbial pathogens like cholera, typhoid, or *E. coli*, or be contaminated with pesticides, heavy metals, industrial chemicals, or other toxins, resulting in substantial bodily harm.

The experience of water-associated disease or injury is bleak. Diarrhea can be shameful, especially for people who must share communal toilets or who have no choice but open defecation. It can also be terrifying. Watching a child grow listless with dehydration. Feeling the water squeezed out of one's body at an alarming rate. Listen to how Mr. Madida, who suffered with cholera during an epidemic in South Africa in 2000, recalls that experience: "The hair still stands on its end and you feel the blood rush through all parts of the body each time when one thinks about that situation."<sup>13</sup> Kidney disease, bladder cancer, and liver disease are no less frightening and no more comfortable; they just grind a person down in a different way over a longer period of agony, asking families to marshal different resources to care for their people.

A few preliminary figures help sketch the disturbing extent of these experiences. Tainted water is responsible for a significant amount of morbidity and mortality among urban Africans. Severe diarrheal disease accounts for some 600,000 deaths a year in sub-Saharan Africa, the majority of which afflict children and the elderly.<sup>14</sup> It is the third-leading cause of disease and death among African children under the age of five, a situation that public health authorities have long understood as an expression of the quality of water and sanitation.<sup>15</sup> Diarrheal disease is an umbrella term for disease caused by a range of waterborne pathogens including cholera, typhoid, amoebiasis, giardiasis, rotavirus, and *E. coli*. Other endemic waterborne afflictions include Hepatitis A and schistosomiasis, for which 11.7 million people in Africa were treated in 2008.<sup>16</sup> Schistosomiasis has historically been seen as a rural affliction, as Jennifer Derr documents in her contribution to this issue of *Dædalus*.<sup>17</sup> Yet in recent years, "rapid and disordered urbanization" has seen an expansion of the disease in urban areas.<sup>18</sup> Meanwhile, Tanta was not unique. A recent review names chronic kidney disease as a "substantial health burden" on the continent.<sup>19</sup> African epidemiologists note both rising rates of bladder cancer as well as an ongoing shift from the prevalence of subtypes caused by chronic schistosomiasis to those fostered by exposure to industrial chemicals.<sup>20</sup>

The current epidemiological moment is a complex one. On the one hand, African cities are grappling with outbreaks of cholera and typhoid, endemic diarrheal disease, and other problems that arise from inadequate or broken water and sanitation systems, as happened in Accra in 2014. On the other hand, there are rising rates of debilitating disease and injury that are associated with chemical pollution, heavy metal poisoning, and other side effects of industrial water contamination like we saw in Tanta. This division is a false one. Health effects are tentacular and cascading. Chronic kidney disease can lead to Hepatitis C via dialysis as

witnessed in Tanta. Repeated bouts of childhood diarrhea can exacerbate chronic malnutrition. The money spent purchasing water cannot be spent on necessary medications. The money spent purchasing medications for water-related disease cannot be spent purchasing nutritious food or adequate shelter. And as these two epidemics illustrate, the divide between urban and rural is porous. The city and its hinterland cannot be fully separated. Accra's cholera outbreak was quickly carried upcountry. Tanta's dialysis ward gathered poor patients from rural communities beyond Tanta to lie on machines next to factory workers from the city. Rural water pollution from the industrial use of chemical fertilizer moves up the Nile to Cairo. Even if city dwellers are drinking properly treated water, fish, grain, and vegetables laden with heavy metals and chemical pollutants harvested from downstream irrigation channels are carried to Cairene markets.

This essay explores the relationship between water supply and health in urban Africa through the lens of water scarcity and health as political relationships as much as environmental or technical phenomena. Anthropologist Nikhil Anand describes a kind of urban "belonging enabled by social and material claims made to the city's water infrastructure" that he calls "hydraulic citizenship."<sup>21</sup> South African scholars Michela Marcatelli and Bram Buscher use the term "liquid violence" to describe the biopolitical condition in which "some people are systematically left without sufficient water."<sup>22</sup> This biopolitical formulation is helpful for thinking about water and health together. Liquid violence flows through social and economic hierarchies, distributing water upward and cascading harm to those at the bottom. Water shortages plague cities like Kinshasa, Democratic Republic of the Congo, located on the banks of one of the world's largest rivers, or Harare, Zimbabwe, where, as Muchaparara Musemwa shows in this issue, once robust water infrastructure has fallen into disarray, undermining any sense that water distribution is a straightforward expression of supply. Meanwhile, as climate change directly challenges supply in cities like Cape Town, South Africa, Gaborone, Botswana, or Dar es Salaam, Tanzania, the health effects of scarcity are not evenly distributed. Across the continent, wealthy, middle-class, and poor urbanites consume water at radically different scales, with negative health outcomes concentrated among the poor and working class. By bringing infectious disease like cholera and chronic ailments like kidney disease into the same frame of analysis, this essay also directs attention beyond the overwhelming public health focus on microbial contamination to emergent forms of water-related illness and injury that proceed unchecked. Just as Derr shows how endemic schistosomiasis became the assumed cost of development in mid-twentieth-century Egypt, in the twenty-first century, we might say the same for kidney disease and cancer. Africa is an enormous and diverse continent, and this discussion does not pretend to be comprehensive, but instead maps the contours of a complex situation affecting hundreds of millions of people.

Water distribution is a political phenomenon. It is shaped through technical practice and operates within environmental limits, but the choices over whether and where to lay and maintain pipes as well as regulations governing pollution and their enforcement are determined by political and economic interests. Among residents of African cities, not everyone experiences political recognition through the pipes; the burden of water-related illness falls disproportionately on poor and working-class people. Liquid violence manifests in the fact that some people live in a state of chronic water shortage, even as others in their same cities do not. As several authors in this issue elucidate, the causes of these inequities are complex and varied.<sup>23</sup> They range from mismanagement to corruption to budgetary and political pressures around cost recovery to the ongoing infrastructural legacies of colonial-era segregation and the technical challenges posed by the rapid growth of informal settlements sited some distance from the water mains. These dynamics are exacerbated by global climate change and pollution, which threaten water supply, a situation that promises to increase in the coming years.

Urban agglomerations on the continent range in scale from megacities with populations in the several millions like Lagos, Kinshasa, or Cairo to smaller secondary cities like Bulawayo, Kumasi, or Kisumu. Spontaneous growth means that many cities are over-spilling their administrative boundaries with peri-urban settlements emerging apace, sometimes engulfing previously rural villages. Across the urban landscape, cities draw from a range of water sources from rivers and dams to springs and wells, and residents rely on an array of procurement options that are determined by available infrastructure and service provision. In any African city, there are residents with piped water and indoor plumbing, and hotels with swimming pools, as well as people who must queue to collect or purchase water in small quantities for carefully rationed domestic use. Meanwhile, decades of urbanization have outstripped formal planning and service provision even as older infrastructure has fallen into disrepair.

Some two-thirds of urban Africans reside in informal settlements where municipal infrastructure has deteriorated or is lacking altogether, and where the costs of purchasing water are paradoxically higher than in more affluent neighborhoods.<sup>24</sup> Spontaneous population growth is especially concentrated in these underserved areas. For example, in the Kenyan capital of Nairobi, the UN estimates that informal settlements account for 75 percent of urban growth.<sup>25</sup> These neighborhoods are the most challenged in terms of water access in a city where “84 percent of higher and middle income households have access to a piped water connection,” compared to only 36 percent of households in low-income neighborhoods.<sup>26</sup> Local water activists remind us that informal is a political designation, a manifestation of hydraulic citizenship as much as one marking the age of a particular neighborhood, and that the problems of liquid violence are long-standing. The Mathare Social Justice Center contends that:

By being marked as “informal,” and intentionally maintained like this, our home areas, particularly those called “slums,” are largely neglected by the government through the denial of basic rights and infrastructure. Even though, for example, Mathare has been around for close to 100 years, there is still no sufficient piped water infrastructure, or adequate housing and sanitation provisions.<sup>27</sup>

Development experts had long recognized access to “improved water” – provided through systems that protect it from contamination, making it safe for drinking and other uses – as a cornerstone of public health and poverty alleviation. African governments and their international partners metricize improved water access as an index of economic and social development. Over the past half-century, various strategies and policy trends have been tried to increase access, resulting in a complex and diverse patchwork of policy and infrastructure across African cities. Municipal water systems have expanded in some cities. In others, like Harare or Kinshasa, they have broken down or contracted, sometimes with disastrous effects.<sup>28</sup>

The first decade or so of the twenty-first century saw an extensive push for the liberalization of water services in many African cities. This rendered water an “economic good” under a policy vision that emphasized cost recovery for utilities.<sup>29</sup> Yet improved financing for water utilities did not necessarily result in an increase in coverage among low-income consumers.<sup>30</sup> Activists and community groups in some cities rejected further commercialization of water and popular protest succeeded in derailing outright privatization, as in the case of South Africa described later in this essay.<sup>31</sup> In some cities, public-private partnerships were set up. But private companies often concentrated service in wealthier neighborhoods, where they could expect better returns.<sup>32</sup> In yet other sites, there are community partnerships with publicly run utilities. For example, in Lilongwe, Malawi, a Water Users Association model was developed in 2006, based on “‘partnerships of necessity’ among overstretched, cash-starved [Water Boards], water-bill delinquent and poor peri-urban communities, and key NGOs in the water sector.” In this arrangement, the water boards license the community-based water users’ associations to operate the communal water kiosks. The water boards supply the water and provide technical assistance. This program resulted in gains in water supply, improved maintenance, and better financial management.<sup>33</sup>

Across this array of arrangements in cities throughout the continent, even in sites with improvement in shortages and service, interruptions continue to plague systems for improved water procurement. One woman in Lilongwe, Malawi, described to researchers an experience common to many in cities across the continent.

I wake up very early in the morning, sometimes around 5 am. Because some days I have to wait a long time at the kiosk, for up to 1 hour, before it is my turn to fetch wa-

ter. Sometimes I wait for that long and I still come home without water because the water stopped flowing or it was time for the water kiosk attendant to close the kiosk.<sup>34</sup>

Even when improved water is theoretically available, many people find themselves relying, in part, on unimproved sources.

Between 1990 and 2015, access to improved water in sub-Saharan African cities increased from 83 to 87 percent. Yet 94 percent of the richest quintile enjoyed access compared to only 64 percent of the poorest quintile.<sup>35</sup> In 2017, the World Bank narrowed the criteria for safe water, changing the standard from improved to specifically piped water. Yet in 2017, only 61 percent of all people in sub-Saharan African cities had access to piped water. Moreover, analysts caution that these numbers are likely inflated. First, they are calculated by geographic proximity to an improved source and fail to account for many factors that constrain access, like extensive wait times (of several hours) at water points or irregular supply.<sup>36</sup> According to African Utility corporations, nearly one-fifth of public standpipes are broken, though independent estimates put the figure at 58 percent.<sup>37</sup> Even those with a piped connection usually have intermittent flow into their taps. Second, piped water is not necessarily safe to consume. When tested at the point of collection, microbial contamination was often found in improved water sources.<sup>38</sup> And even if potable at collection, water quality begins to degrade or may become contaminated during transport and storage in open containers. Yet unreliable water connections cause people to store quantities of water for times when the taps are dry. Meanwhile, testing remains rare for heavy metals, chemicals, and other nonmicrobial industrial contaminants, like those that Tanta's dialysis patients suspect as having damaged their kidneys. Still many African cities rely on "high vulnerability" aquifers.<sup>39</sup>

In any given city, residents may get their water from multiple sources. Municipal water systems are fragmented and partially privatized, with services arising ad hoc, and require people to combine strategies and modes of procurement and use. A water utility may officially provide water free to residential consumers, but be plagued with broken pipes, power blackouts, and other problems that require people to find other sources. As Matthew Bender documents in this issue, "multiple sourcing" is a crucial and long-standing strategy for households in Dar es Salaam.<sup>40</sup> There, as in many African cities, a single household might at various times send daughters to queue at a municipal tap for bulk water collection, collect rainwater in cisterns, and buy bottled water from a neighborhood vendor for drinking. Development scholar Florent Bédécarrats and colleagues give a sense of the heterogenous hydroscape that has developed as formal municipal services have fallen into disrepair or failed to keep pace with urban growth and a mosaic of improvisational initiatives emerges.

The gaps left by the main water utility have led to an increase in the number of alternative operators, both formal and informal. . . . These systems can be private or com-

munity-managed. They may depend on a third-party operator for their raw water or produce it independently. . . . Examples of this are the small-scale private operators in Maputo that provide water to their neighborhoods via “spaghetti” networks: flexible polyethylene pipes laid directly on the ground and fed from 40 m deep boreholes. . . . In Kisumu, Kenya, water supply to slums is ensured by associations. In Ouagadougou, the national public utility delegates the service for informal settlements to small operators.<sup>41</sup>

**T**his complex situation is difficult to fully apprehend. Mapping the scope and scale of both water access and illness are challenging and indeed self-referential. Epidemiological systems are uneven and stretched on the continent. Much disease goes unreported, as do many deaths. An epidemic of cholera like that described in Accra in 2014, given the acute and terrifying nature of the disease and its potentially rapid spread, draws the attention of the health service and its counting apparatus. Yet most of the estimated 1.4 million cholera cases in Africa each year go unreported, posing a problem for epidemiological surveillance.<sup>42</sup> Epidemiologists report that in 2017, there were 739,5000 cases of typhoid in Eastern Africa, and that sub-Saharan Africa accounts for 12 percent of typhoid globally. But these figures do not correspond to actual human beings diagnosed with typhoid, since many countries do not actively surveil the disease.<sup>43</sup> And for those who do, they most likely do not see all cases.

The figures for much water-related infections therefore, like those for childhood diarrhea, are necessarily generated through multifactorial models. These models use small cohort studies, as well as data on water and sanitation, to project cases of diarrhea or typhoid.<sup>44</sup> This is not to say that they should not be taken quite seriously. It is clear that the problems associated with waterborne pathogens are present and pressing. The smaller localized studies are telling. In 2006, the Chadian Department of Health surveyed residents of the capital N’ djamena. Among households surveyed, they found only 61 percent of households had access to improved water, and that 27 percent of children under the age of five had suffered from diarrhea in the two weeks prior to being surveyed. Among babies six to eleven months, that figure rose to 40 percent.<sup>45</sup> But scaling up to large population data requires multifactorial modeling. Therefore, when access to improved water increases, rates of diarrhea and typhoid decrease, regardless of what may actually happen on the ground. Meanwhile, data on water and sanitation are often partial and open to manipulation or misinterpretation. As noted above, the presence of a standpipe does not necessarily mean that the standpipe is functioning. Thus, the figures have to be understood as political technologies in their own right.

Beyond infectious ailments, the situation grows far more opaque. There are enormous gaps in knowledge about the scope and scale of urban water-related

illness and injury. A historical association of waterborne disease with microbial contamination has meant inattention to the relationship between water supply and the new epidemiology of cancer, kidney disease, and other chronic, if deadly, ailments on the rise in urban Africa.<sup>46</sup> These problems are more difficult but no less urgent to trace. Kidney disease cannot solely be attributed to exposure to polluted water; it is also, for example, related to rising rates of diabetes and hypertension. But recent studies have shown that although these comorbidities are the most common risks associated with chronic kidney disease “in middle-income and high-income countries,” in low-income contexts like much of urban Africa, “environmental and occupational exposure to pollutants remain common causes of kidney disease.”<sup>47</sup> Yet many studies of kidney disease in Africa fail to acknowledge the question of environmental and occupational exposures, much less take up these factors as an object of study.<sup>48</sup> One group of epidemiologists mapping the rising tide of kidney disease on the continent points to this problem: “Larger-scale epidemiological studies are needed to examine many potential but currently unmeasured urban risk factors including contaminated water supplies.”<sup>49</sup>

Nor should one imagine chronic kidney disease the only pathology associated with pesticide, chemical, and heavy metal contamination of the water supply. Bladder and other cancers, liver disease, neurological damage, Parkinson’s disease, and congenital abnormalities are all associated with consumption of industrially contaminated water. People who experience these forms of contamination may correctly suspect and theorize their relationship to injury, as Sherine Hamdy found in Tanta’s dialysis ward.<sup>50</sup> Yet epidemiological surveillance and the associated clinical and laboratory capacity necessary for accounting for these conditions and tracing levels of contamination have not kept pace with pollution, masking the extent of injury and obscuring culpability.

**W**ithin this unstable archipelago of service provision, many people, particularly those living in informal settlements, find themselves facing difficult decisions with serious secondary health effects. Imagine having to choose between purchasing clean water or using untreated water from a river or shallow well in order to save that money for rent. Imagine caring for children with repeated bouts of acute diarrhea while also having to queue two hours to procure the water necessary to bathe and otherwise clean up after them. Water scarcity threatens hygiene, which carries serious negative health consequences. The same neighborhoods that lack regular water access are often those that also lack adequate sanitation. Even so, sanitation is less easily purchased as a stopgap solution than water.

A look at packaged water helps to elucidate the negative secondary health effects of water scarcity. Bottled water, tanker trucks, and sachet water are all considered improved sources, and are increasingly important sources of drinking wa-

ter. As supply interruptions increase due to water shortages and aging infrastructure, and as people move into neighborhoods that lack adequate water, a market in packaged water has stepped into the breach. In Ghana in 2008, a government study found that while 16.8 percent of urban households relied on packaged water as their primary source of drinking water, within a decade, this had risen to 53.6 percent.<sup>51</sup> Yet as Accra's cholera epidemic makes clear, even improved water, like that purchased in sealed plastic sachets, can carry deadly pathogens. Recent studies of sachet water samples have found *E. coli*, fecal coliforms, protozoa, salmonella, and other pathogens.<sup>52</sup> Even when safe to drink, packaged water carries secondary health effects. One study reported that water sachets, along with similar bags used for ice cream, contribute 85 percent of the 270 tons of plastic waste produced in Ghana each day. "The accumulation of plastic clogs water drainage pathways and exacerbates flood conditions in low-lying neighborhoods. For many low-income neighborhoods, flooded drains ultimately lead to increased risk of exposure to untreated sewage, animal waste, and runoff from urban agriculture."<sup>53</sup>

Any assessment of the health impact of packaged water must take into account the burden its cost places on households that already face difficult choices in providing for basic needs. Due to the patchwork and ad hoc nature of services, water pricing is regressive in many cities, costing poor people much more than their wealthy neighbors. Water from private vendors is much more expensive than provided by formal utilities, yet it is the poor who must rely most heavily on this market. In the small Nigerian city of Yenagoa, environmental scholars Odafivwotu Ohwo and Abel Abatuto found that households "spent an average of N4,500 (\$22.60) per month" buying water from private vendors. This was approximately one-quarter of the monthly minimum wage.<sup>54</sup> In a different study in Lagos, Ohwo documents how consumers in poor neighborhoods, which are further from the water mains, pay as much as four times the price for water as those in wealthy neighborhoods.<sup>55</sup> In the Malawian capital, Lilongwe, residents of informal settlements pay "at least twice as much for water as those in high-income urban neighborhoods."<sup>56</sup> In Nairobi, consumers pay ten times as much for vendor-delivered water than for water piped into private homes.<sup>57</sup>

Poor households have very little elasticity in their budgets. Even a subtle rise in the price of water, whether packaged or delivered by other means, has the potential to create scarcity among the poor with cascading negative health effects, while often failing to discipline the consumption habits of those with money to spare. Consider, for example, the case of South Africa, where access to water is enshrined as a human right in the constitution, where the legacy of apartheid continues to structure differential access to water, and where social movements demanding water underscore that poor people understand clearly the place of hydraulic citizenship in the politics of water scarcity and distribution.<sup>58</sup> In the 2000s, as part of the implementation of the 1998 Water Act, new policies shifted from flat-rate

charges to metered billing. Utilities disconnected many township customers who were in arrears, and water utilities began installing prepaid water meters, which would shut off taps until payments were made. These measures focused on cost recovery from and rationalizing use by poor Black communities, rather than progressive policies that would recover costs from and rationalize or even limit ongoing excessive water consumption in wealthy, predominantly White households or commercial endeavors.

In 2000, authorities in rural KwaZulu-Natal, South Africa, introduced a fee for water, causing impoverished residents who lacked coins for the metered tap to turn instead to unimproved water sources. A cholera epidemic soon emerged and spread. Within eight months, hospitals, clinics, and rehydration centers had treated more than 82,000 cases.<sup>59</sup> By the time it was over, 265 people had died.<sup>60</sup> In the epidemic's wake, the government began a free basic water policy that gave each household a guaranteed minimum of 6 kiloliters of water a month, above which they would have to pay. Yet as researchers from South Africa's Municipal Services Project point out, this policy was not enough to prevent a water-associated typhoid outbreak in 2005 in the peri-urban town of Delmas, just outside the industrial belt of the East Rand. There, poorly managed sanitation affected water quality. These researchers also found that in rural KwaZulu-Natal, many people were still living with continuing cycles of water-related disease due to cost and service interruptions. In some cases, the free basic minimum was only intermittently provided.<sup>61</sup>

Township residents protested the meters and, in 2008, in the Phiri neighborhood of Soweto, a group of activist residents took the city of Johannesburg to court, arguing that the policy violated their constitutional rights. The case was won, and then reversed on appeal, though in its wake, the city of Johannesburg raised the monthly minimum per household. But for purposes of this discussion, the examples brought by the plaintiffs suggest the extent of secondary effects. In the most tragic case, two children burned to death in their shack as neighbors bailed water from a ditch because they were unable to coax water from the meter, which had shut off for lack of credit. Another plaintiff explained that she cared for a relative with AIDS who was stricken with diarrhea. After the installation of the meter, she could not afford enough water to properly bathe her patient and launder her bed linens and clothing, an impossible situation.<sup>62</sup>

Even when a basic minimum is provided, commodification shifts the moral economy of water, further undermining an ethos of care and collective responsibility among neighbors. Take, for example, the findings of a study conducted in Khayelitsha, a large township in Cape Town, where shack dwellers live among formal dwellings. Approximately two-thirds of households have access to piped water either inside the home or at a tap in the yard. Researchers found that residents became unwilling to share water with neighbors once they had their own

tap. When researchers asked shack dwellers about asking for water from neighbors when the communal tap was broken or dry, many expressed discomfort and some cited past conflicts. One woman said, “she can only ask for very small amounts of water, because there is general sense in the community that payment for water will commence in the near future.” Another noted, “It is not easy, but we still ask because we need the water. Maybe we go ask them with a bucket, but you cannot ask for a lot or more than a bucket. . . . They say they pay for the water. They rent this water so you must come with a small bucket to pour water in for you.”<sup>63</sup> This kind of erosion of resource-sharing among neighbors further strains already fragile safety nets upon which people rely in times of illness. Such nets are especially important in contexts where chronic illnesses like HIV/AIDS or chronic kidney disease require sustained caregiving over many weeks, months, and even years.

The metering and pricing policies were not enough to prevent a water shortage crisis in Cape Town in 2018, as several years of severe drought steadily drained and ultimately threatened to collapse the city’s water supply. This culminated in a municipal crisis, with a looming threat of a “Day Zero” when the water would cease. Severe use restrictions were put in place, and water consumption dropped significantly. Yet as anthropologist Steve Robins shows, wealthier residents were able to drill wells and boreholes to supplement their supply, while poor and working-class residents could not. Antiprivatization activists in the city had long pointed to inequities of consumption, suggesting the poor were hardly the cause of water scarcity. Researchers from the University of Cape Town found that to be the case: “in 2017, informal settlements had used a mere 4.7 per cent of the total water available, compared to middle-class suburbs, which accounted for roughly 70 per cent of domestic water used.”<sup>64</sup>

**A**s this essay has described, urban water scarcity is a complex phenomenon encompassing environmental, technical, political, and economic arrangements, which concentrate illness and harm among the poor and working class. Looking ahead, anthropogenic climate change threatens to increase the number of people in Africa’s cities vulnerable to the cascading health effects of water scarcity. Cape Town’s experience reminds us that these vulnerabilities will not be equally distributed. Across the continent, many cities find surface water supply challenged by an escalating drought cycle and increasing temperatures that accelerate evaporation, as happened in Cape Town. Though the rains have returned to southwest Africa and the dams are currently full, scientists caution this is a temporary reprieve and predict the drought cycle to return, part of a projected trend of a “drying sub-Saharan Africa.”<sup>65</sup> Anthropogenic changes are complex, as is the relationship between urbanization and climate change. Escalating drought cycles drive rural families from the land and into the cities, part of the tide of ur-

banization and the growth of informal settlements. Urbanization, in turn, means more people are consuming water, increasing demand and pressuring supply.

Urbanization is also terraforming in ways that negatively affect supply. In cities that rely primarily on groundwater, as former farmland and bush are cleared for dense settlement, groundwater recharge is slowed.<sup>66</sup> But water scarcity cannot only be understood by a simple turn to quantity. Unchecked industrial contamination of aquifers and rivers also threatens water supply over the long term. In the mining area of Johannesburg, for example, many of the aquifers are “clogged up with acid mine drainage,” rendering them unusable.<sup>67</sup> In Thiaroye on the Dakar peninsula, nitrate from septic systems has polluted the shallow aquifer, which is tapped for drinking water.<sup>68</sup> In Kisumu, anti-inflammatory, antibiotic, and psychiatric drugs, as well as the antiretroviral nevirapine, are now present in ground water.<sup>69</sup> Across the African urban landscape, while the threat of diarrheal disease remains high, the damaged kidney may be a sentinel for another source of water scarcity: anthropogenic pollution.

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#### ENDNOTES

- <sup>1</sup> Kennedy Ohene-Adjei, Ernest Kenu, Delia Akosua Bando, et al., “Epidemiological Link of a Major Cholera Outbreak in Greater Accra Region of Ghana, 2014,” *BMC Public Health* 17 (11) (2017), <https://bmcpublihealth.biomedcentral.com/articles/10.1186/s12889-017-4803-9>.
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