

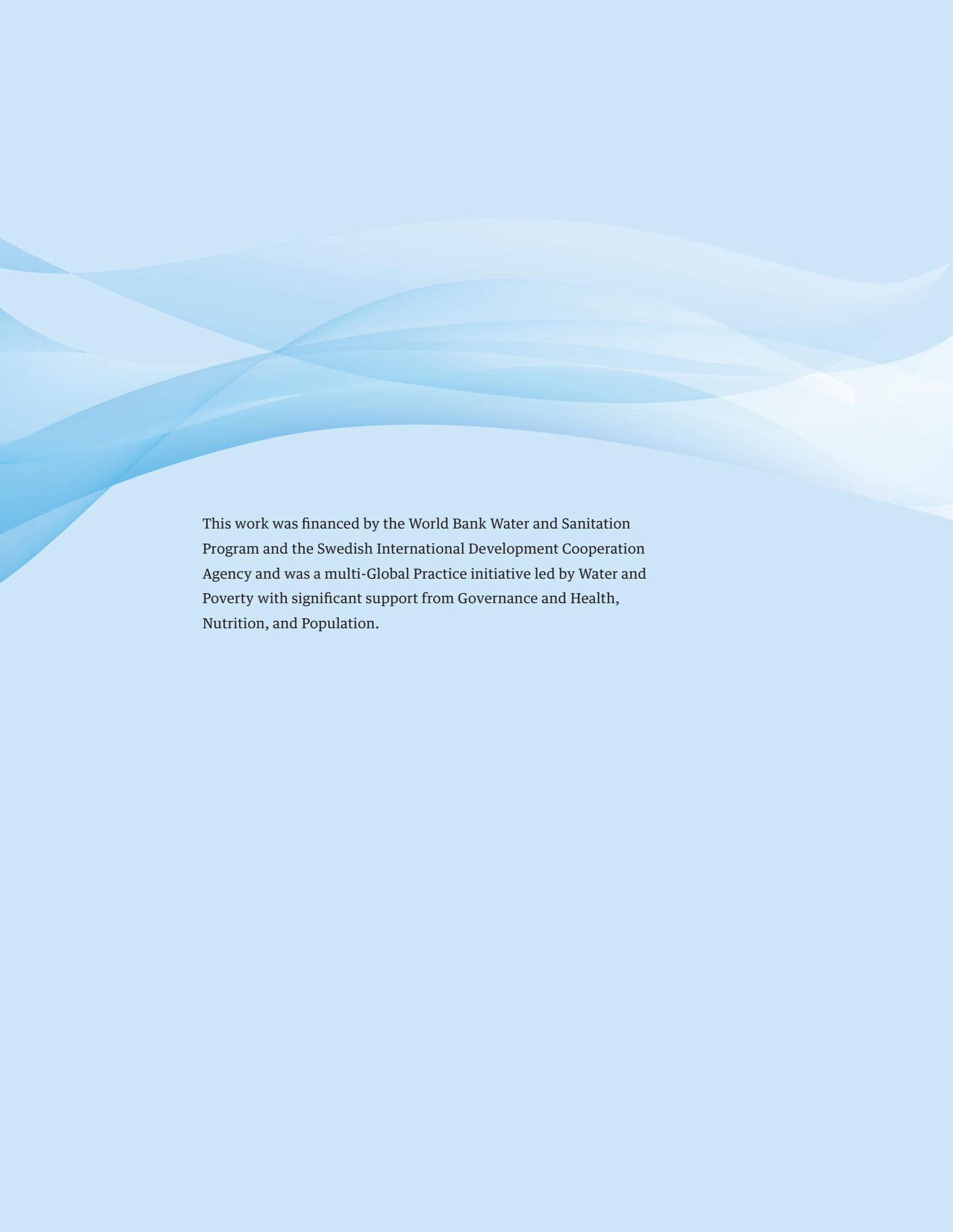


WASH
Poverty Diagnostic | SERIES

Looking Beyond Government-Led Delivery of Water Supply and Sanitation Services

The Market Choices and Practices of Haiti's Most Vulnerable People





This work was financed by the World Bank Water and Sanitation Program and the Swedish International Development Cooperation Agency and was a multi-Global Practice initiative led by Water and Poverty with significant support from Governance and Health, Nutrition, and Population.

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Cover design: Bill Praguski, Critical Stages LLC.

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Acknowledgments

The WASH Poverty Diagnostic for the Republic of Haiti (P150705) is led by Emilie Perge (Economist, Poverty Global Practice), Zael Sanz Uriarte (Water and Sanitation Specialist, Water Global Practice), and Christian Jacobsen (Senior Water and Sanitation Specialist, Water Global Practice).

The team includes Helene Grandvoinet (Lead Governance Specialist, Governance Global Practice), Anil Silwal (Consultant), Katja Vinha (Consultant), Ian Ross at Oxford Policy Management, Pierre-Yves Rochat (Consultant), Beatrice Mosello (Consultant), Rosemary Rop (Consultant), Gina Fleurantin (Consultant), and Felipe Jacome (Consultant).

The team would like to thank the Government of the Republic of Haiti for its support, in particular the National Directorate for Drinking Water and Sanitation (DINEPA) and the Observation Unit on Poverty and Social Exclusion (UOPES). The team is particularly grateful to all Haitian individuals who participated in the interviews and focus-group discussions.

The team is grateful for feedback and discussions with Pierre-Xavier Bonneau (Program Leader SD, Haiti), David Michaud (Practice Manager, Water Global Practice), Oscar Calvo-Gonzalez (Practice Manager, Poverty Global Practice), Craig Kullmann (Senior Water Supply and Sanitation Specialist, Water Global Practice), Emmanuel Skoufias (Lead Economist, Poverty Global Practice), Vivek Srivastava (Lead Public Sector Development Specialist, Governance Global Practice), Jean-Martin Brault (Senior Water and Sanitation Specialist, Water Global Practice), Luis Andres (Lead Economist, Water Global Practice), and Kinnon Scott (Senior Economist, Poverty Global Practice). The team also thanks Berenice Flores (Consultant, Water Global Practice), Carolina Delgadillo (Program Assistant, Water Global Practice), and Eunice Flores (Program Assistant, Water Global Practice) for their support.

The peer-reviewers for the Quality Enhancement Review (QER) stage of this work were: Sergio Olivieri (Senior Economist, Poverty Global Practice), Glenn Pearce-Oroz (Lead Water Supply and Sanitation Specialist, Water Global Practice), and Abel Bove (Governance Specialist, Governance Global Practice). Eleonora Cavagnero (Senior Economist, Health Global Practice) gave additional comments at the completion stage.

Executive Summary

Poverty in Haiti remains endemic. Haiti is the poorest country in the Latin America and Caribbean region and among the poorest in the world. Its growth performance over the past four decades has been very low, averaging 1 percent per year, with gross domestic product (GDP) per capita falling by 0.7 percent a year on average between 1971 and 2013. As a result, the overall poverty headcount in 2012 was about 58.5 percent of the population and extreme poverty 23.8 percent,¹ meaning that almost 6.3 out of 10.4 million Haitians could not meet their basic overall needs and 2.5 million cannot even cover their food needs. Furthermore, with a Gini coefficient of 0.6, Haiti's income inequality ranks the highest in the region and among the most unequal in the world.

Poor macroeconomic performance and a limited fiscal space restrict government expenditures on public goods. Despite recent improvements in tax collection, Haiti collects less domestic revenue than comparable countries in the region. Of tax revenue, much comes from indirect taxes that affect consumers independent of their income level. In the absence of sufficient public expenditures, the private sector has become the main provider of basic services, placing a substantial financial burden on households and delivering achievements closely linked with income. Nongovernmental organizations (NGOs) are responsible for about 50 percent of total health expenditures, which for the most part are dedicated to deliver primary health-care services. In Education, NGOs or private for-profit institutions run over 80 percent of all primary and secondary schools.

Drinking water supply and sanitation (WSS) services are no exception to this trend. Financial resources channeled to the WSS sector fall short of what is needed. In 2014, budget transfers and tariff revenues directed to the WSS sector accounted for US\$69 million, equivalent to 0.8 percent of GDP (in comparison, fuel subsidies accounted for 2 percent of GDP during said year). Because of insufficient public investments and poor quality of government-led WSS services, the percentage of Haitians who resorted to the private sector for drinking water increased from 10.9 to 25.8 percent between 2006 and 2012. In urban areas, this percentage was even higher: 57.1 percent in the Port-au-Prince metropolitan area in 2012 and 45.5 percent in other cities of the country.

The Haiti WASH Poverty Diagnostic seeks to inform how to maximize the socioeconomic impact of the scarce fiscal resources channeled to the sector. The study assesses the linkages between improved access to water supply, sanitation, and hygiene (WASH) services, poverty, and health outcomes. The diagnostic also provides convincing evidence of the linkages between improved access to WSS and other dimensions affecting the adequate development of children in Haiti, with a focus on stunting.

The diagnostic also analyzes the functioning of WSS markets to identify ways to ensure that services delivered by the private sector are both of good quality and affordable. In particular, it focuses on water supply and fecal waste collection, transportation, and treatment services in the Port-au-Prince metropolitan area. This is the largest and most sophisticated WSS market in Haiti, although not the fastest growing. Understanding how this market functions may aid stakeholders in addressing issues and opportunities that may arise in other urban areas in the future, and in structuring successful public-private partnerships to serve rural communities.

Poverty, Vulnerability to Shocks, and Health: How Is Haiti Faring?

Poverty and extreme poverty are significantly higher in rural areas and in departments far from the capital city of Port-au-Prince than in urban centers. In 2012, 75 percent of rural Haitians were poor, and 40 percent were extremely poor. In that same year, 67 percent of the nation's poor and 83 percent of its extremely poor resided in rural areas. The departments of Nord-Ouest, Nord-Est, and Grand'Anse were particularly affected: 80 percent of their populations were poor.

Rural poor seeking a better life in cities face a harsh reality. The endemic poverty, lack of access to basic services, and limited job options seen in rural areas have prompted many Haitians to migrate to urban areas in search of job opportunities and a better quality of life. Between 1970 and 2014, the share of the urban population grew from 20 to 58 percent of Haiti's total population. The nation's cities have struggled with this rapid growth; migrants from rural areas often encounter poverty, unemployment, political and social marginalization, and limited access to services.

A million Haitians now living above the poverty line are vulnerable to falling back into poverty because of shocks. A typical Haitian household faces multiple shocks each year—among them hurricanes, floods, disease, death, and unemployment and other economic shocks. For more than 60 percent of Haitian households, health shocks are the most severe shocks to negatively impact their income, keeping the poor in a poverty trap and pushing vulnerable Haitians into poverty.

Therefore, improving access to WASH services could significantly contribute to alleviating poverty and the vulnerability of the Haitian population. Diarrhea and stunting are important issues affecting infants and children in Haiti and impairing cognitive function and long-term productivity. Such health outcomes are conditioned by access to improved WASH, among other factors.

Water Supply, Sanitation, and Hygiene: How Do They Correlate with Poverty?

A decline in access to improved drinking water over the past 25 years hit the poorest hardest. Although the percentage of Haitians who rely on surface water for drinking decreased from 17 to 3 percent between 1990 and 2015, access to improved drinking water sources decreased by 4 percentage points (that is, the share of the population with improved or piped water declined from 62 to 58 percent). During the same period access to improved water sources among the rural bottom 40 (B40) decreased by 7 percent.

Gains in access to improved sanitation were unequally distributed, with access to improved sanitation decreasing among the B40. Between 1990 and 2015 the percentage of people practicing open defecation dropped from 48 percent to 19 percent, and the share of the population with access to improved sanitation facilities increased by 10 percentage points at the national level, 8 percentage points in rural areas, and 1 percentage point in cities. However, during the same period, access to improved sanitation increased just by 1 percentage point among the rural B40 and decreased by 3 points for the urban B40. The increase in access to improved sanitation facilities in rural areas is mainly due to a sharp reduction in the size of the rural population owing to urbanization.

The number of rural households with access to improved water sources and sanitation facilities has been declining in absolute terms, suggesting that infrastructure is collapsing. Access to piped water on premises and access to other improved water sources is increasing for the rural

top 20 (T20)—most of which live in small towns that can be served through piped schemes—but decreases for the rest of the rural population, many of which live in disperse and small communities. Likewise, access to improved sanitation remained stagnant among the rural B40 both in relative and absolute terms.

Urban water utilities are struggling to cope with urban population growth. However, the decrease of the share of the urban population using piped water to satisfy their drinking water needs is also due to the lack of trust on the quality of water delivered by the public sector. In 2012, around 55 percent of the Port-au-Prince metropolitan population had access to the public water network but just 28 percent used this water source as the main source of drinking water. During that year, 67 percent of the overall metropolitan population and 59 percent of the B40 had recourse to the private sector to satisfy their drinking water needs, domestic water needs or both. Households report not using public water for drinking because they fear that public water is of low quality.

Access to improved WSS in institutions and public spaces is poor. In 2011, 41 percent of primary schools and 30 percent of secondary schools had access to water, and 53 percent of secondary schools had toilets. In 2013, 79 percent of health centers offered their patients access to improved water and 46 percent offered toilets. In the Grand’Anse, Nord-Ouest, and Sud-Est departments, less than 30 percent of health centers had sanitation facilities. In the 36 communes with the highest incidence of cholera, just 44 percent of the 187 existing health centers had access to an improved water source; 40 percent of the centers routinely suffered severe water shortages.

WASH Services and Health: How Can Interventions Improve Health Outcomes?

The rural poor suffer most from cholera and other waterborne diseases. Diarrhea is the third-leading cause of death among children under five, and the annual burden of enteric diseases² associated with inadequate or unsafe WASH services is 13,278 DALYs³ per 100,000 children—about three-quarters of Haiti’s estimated burden of enteric disease. Nationally, the WASH-related diarrheal burden borne by the poorest quintile is about 2.7 times greater than that of the richest quintile. Cholera—a major concern in Haiti in the aftermath of the 2010 earthquake—is twice more likely to strike poor households than richer ones.

Access to improved WSS services is critical to preventing diarrheal diseases and improving nutrition. Among children with similar diets and care, those with access to improved services have better nutritional outcomes than those without. In addition, although children from all quintiles are equally likely to suffer from diarrhea, children without access to improved services are much more likely to die from it. Investing in WSS and hygiene, therefore, could lower the mortality risk for children. The positive health impacts of WASH investments are likely to be highest in the Artibonite, Nord, and Grand’Anse departments. These are the departments where a greater reduction of enteric disease risk could be achieved among children under five if every household with unimproved water and sanitation gained access to improved water and sanitation services.

Hygiene and community-level environmental conditions affect health outcomes as much as households’ access to water and sanitation. This is evident from the persistence of cholera in households with access to piped water and by the even distribution of diarrheal disease prevalence across quintiles. Disparities in improved community-level sanitation coverage are noticeable just between the highest quintile and the rest of the population in urban areas, and between the two highest quintiles and all others in rural areas. Regarding hygiene practices, half of households in the lowest two quintiles reported treating their water. Fifty-nine percent of the poor had handwashing facilities in their dwellings in 2012, although more than half of these facilities did not have water. Only a quarter of the B40 used soap or detergent to wash their hands.

Government-Led Water and Sanitation Services: What Are the Challenges?

The quality of government-led water supply services is low. A substantial proportion of rural water systems managed by local water committees (Comité d'Approvisionnement en Eau Potable et Assainissement [CAEPA]) are not operational, and less than 10 percent are equipped with chlorination devices. The services delivered by urban water operating centers (centres techniques d'exploitation [CTE]), part of the National Directorate for Drinking Water and Sanitation (Direction Nationale de l'Eau Potable et de l'Assainissement [DINEPA]), are also poor. In the Port-au-Prince metropolitan area, for example, the CTE's clients are serviced 26 hours a week on average, and 20 percent of water-quality test results do not meet applicable standards.

Public water supply is far from being financially sustainable, even in urban areas. Nineteen of Haiti's 24 CTE⁴ do not generate enough revenue to cover their operating costs, let alone preventive maintenance. Neglect of preventive maintenance translates into a further deterioration of the quality of service and an increased need for investments in corrective maintenance, resulting in an inefficient use of scarce fiscal resources. The CTE of the Port-au-Prince metropolitan area, which has been receiving technical and financial support from the donor community, only recently managed to cover its staff costs with tariff revenues. Its billed volume represents just 39 percent of its total production, and just 44 percent of the bills it sends are paid.

Dependency on donor financing makes public WSS highly vulnerable to the continued availability of donor resources. In fiscal year 2015, tariffs and transfers from the national treasury respectively covered just 20 percent and 3 percent of DINEPA's expenditures, 53 percent of which corresponded to operating expenditures and 47 percent to investments. In other words, the donor community finances all WSS investments and 30 percent of the sector operating expenditures.

Utilities prioritize service delivery to the most profitable clients to improve their financial situation, to the detriment of the poorest residential consumers. In Port-au-Prince, only 14 percent of the volume of water distributed (15,000 cubic meters per day [m³/day]) reaches disadvantaged neighborhoods (equivalent to 15 liters per person per day [lppd]), where the population is serviced by poorly managed public kiosks and stand post. In comparison, 42,000 m³/day are distributed to other residential areas (equivalent to 35 lpd) and 14,000 m³/day are sold to industrial and major commercial establishments.

Responses from the Private Sector: How Do Markets for Water Supply and Sanitation Work?

In this context, the private sector has developed a very profitable urban water market and an incipient market for the removal of fecal waste. It is estimated that the metropolitan water market in 2016—including water for both residential and commercial consumption—was worth US\$66.3 million. Forty-seven percent of this value came in sales of untreated water delivered by truck, 30 percent in sales of bagged water, 13 percent in sales from private kiosks, and just 10 percent in sales by the water utility. The metropolitan market for fecal sludge management is evaluated to be worth US\$7.3 million. Revenues generated by the treatment facility run by the regional bureau of water and sanitation (*Office Régional de l'Eau Potable et de l'Assainissement* [OREPA]) OREPA Ouest represent less than 1 percent of the market value.

Despite prohibitive prices, 59 percent of the metropolitan B40 resort to the private sector for drinking water, for water for other household needs, or both. Moreover, while around 55 percent of the metropolitan B40 had access to the public water network, just 38 percent used it for

drinking purposes. The metropolitan poor lacking access to piped water usually buy water treated by reverse osmosis⁵ (RO) and sold by private water kiosks to satisfy their drinking water needs; and untreated water from the Cul-de-Sac aquifer distributed by trucking companies (which is often resold to neighbors by households possessing a tank or cistern) for other domestic purposes. RO-treated water and truck water are on average 27 and 10 times more expensive than the water distributed by the utility, respectively. In 2012, the average metropolitan household dedicated 15 percent of its total expenditures to water—an extraordinarily high percentage.

A few big companies dominate the water market while a myriad of small retailers adapt. Three major companies supply more than 75 percent of the RO-treated water sold in private kiosks. These kiosks—there are about two thousand of them in Port-au-Prince—are franchised by water-treatment companies, with the revenues shared 50:50. The bagged-water market is also very concentrated, with an atomized distribution. Bagging companies sell to wholesalers who sell on to large or small retailers, and finally to street-sellers. It is estimated that the livelihood of approximately 24,500 families in Port-au-Prince depends on the water market (that is, around 4.4 percent of the population in the metropolitan area), despite the fact that just 830 people are employed by the utility.

Demand for pit-emptying and fecal waste transportation services is low and provided exclusively by the private sector. Although all households in the Port-au-Prince metropolitan area rely on non-network sanitation, with about 6 percent of households practicing open defecation, only 5.4 percent of the latrines in low-income areas have ever been emptied. In most cases, households report that their latrines have never filled up. When they do fill up, households often prefer to dig a new pit because it is cheaper than paying an emptier or because emptiers cannot get access to the existing pit.

One company dominates the fecal waste removal market and offers services to the richest, while the poor must do without services. Various manual, mechanical, and hybrid service options are available to consumers. Service quality depends to a large degree on consumers' willingness and ability to pay. In Port-au-Prince, although seven trucking companies regularly discharge wastewater or sludge in DINEPA's treatment facilities, one dominates the market. These providers serve rich households and institutional clients. Manual emptying is a cheaper option but remains unaffordable for the poorest. Both mechanical and manual emptiers illegally dump fecal waste outside the Morne-à-Cabrit treatment facility. An NGO is piloting a container-based sanitation management model covering the entire chain of fecal sludge management. This management could be a good solution to serve the urban poor.

DINEPA interprets its regulatory role to its strictest definition and lacks resources to operationalize it. Most DINEPA officials seem to believe that the regulatory authority of the institution is limited to water service providers managing piped systems. This narrow interpretation of the water law is mainly because DINEPA is still de facto an executing agency and an operator of WSS infrastructure. At the same time, it shares regulatory responsibilities over private WSS service providers with the Ministry of Public Health and Population (Ministère de la Santé Publique et de la Population [MSPP]), the Ministry of Environment (Ministère de l'Environnement [MDE]), the Ministry of Commerce and Industry (Ministère du Commerce et de l'Industrie [MCI]), and local governments. In practice, none of these authorities, including municipal governments, is active in sanitation or has the capacity or resources to operationalize these responsibilities.

Priorities and Recommendations

The Haiti WASH Poverty Diagnostic concludes that there is an urgency to shift the paradigm of how the Haitian government operates in the WASH sector. Between 2006 and 2012, the situation with respect to access to WASH has not improved and even worsened in some areas. Reaching SDG 6 by 2030 requires an adaptation on how WASH interventions and investments

are implemented. The Haiti WASH Poverty Diagnostic offers three entry points to maximize the socioeconomic impact of the scarce fiscal resources channeled to the WSS sector:

1. *Improve the geographical targeting and increase the public funding channeled to areas where WSS are crucially needed.*
 - a. *Dedicate greater efforts to improving access to WASH services in dispersed rural communities in which access to improved water and sanitation is actually decreasing (both in relative and absolute terms), poverty levels and the burden of waterborne diseases are high, and nutritional outcomes are low.*
 - b. *Prioritize geographical areas and communities where WASH initiatives are likely to have the greatest effect on reducing the risk of enteric diseases.*
2. *Work across sectors to improve health outcomes of WASH interventions.*
 - a. *Adopt communitywide approaches for all WSS and hygiene-related interventions, focusing not only on increasing access to improved water and sanitation facilities at the household level, but also on improving environmental health conditions and providing access to safely managed WASH services in public spaces and institutions.*
 - b. *Develop WASH investments as part of multidimensional interventions to maximize health and nutritional outcomes, which depend as much on WASH variables as they do on other factors related to diet, parental care, and access to health care.*
3. *Recognize and take advantage of the predominance of the private sector in WSS service delivery in urban areas, adjusting the role of State accordingly. This requires a coordinated effort of multiple public institutions, spanning beyond the water sector.*
 - a. *MSPP could focus on developing a water-quality-control system, building on the interest of large water companies facing unfair competition from smaller players applying lax water-quality standards.*
 - b. *MCI could promote competition among large water companies and help water retailers develop collective bargaining mechanisms to purchase bulk water to bring down water price.*
 - c. *DINEPA could transform its organizational culture, since today many of its officials see private water service providers more as competitors than as entities to be regulated. In addition, sector governance and regulation responsibilities could be separated from infrastructure development and management responsibilities.*
 - d. *CTE could adopt public-private partnership (PPP) approaches for the development of more water-loading stations across the city to reduce transportation costs and water prices. CTE could analyze the possibility of adopting PPP approaches with local companies to improve utility efficiency.*
 - e. *OREPA could enter into direct agreements with large institutional and commercial currently served by fecal waste trucking companies for the payment of the tipping fees. This in turn could (a) facilitate the control of illegal dumping activities, (b) eliminate an important economic disincentive affecting the willingness of service providers to properly dispose collected fecal waste, and (c) allow DINEPA to introduce cross-subsidies to make fecal sludge management services more affordable for the poor.*

- f. OREPA could also collaborate with NGOs running container-based sanitation management models covering the entire fecal sludge service chain. This management model has been proven successful in similar contexts like Nairobi (Kenya) and Dar-es-Salaam (Tanzania) and may offer a good solution to serve the urban poor. Coupling their composting facility with fecal waste treatment plants run by OREPA may help to achieve sustainability.

Notes

1. Throughout this report, “poverty” refers to the national definition; a household is deemed poor if household consumption per capita is lower than Haitian gourde (HTG) 81 per day (2011 purchasing power parity of US\$3.64), and extremely poor if consumption is lower than HTG 42 per day (2011 purchasing power parity of US\$1.86).
2. Enteric diseases are diseases of the intestine caused by any infection. These diseases are typically caused by pathogens such as *Campylobacter*, *Salmonella*, and *E. coli*. and enteric diseases are characterized by diarrhea, abdominal discomfort, nausea and vomiting, and anorexia.
3. The disability-adjusted life year (DALY) is a measure of the overall disease burden, expressed as the number of years lost due to ill health, disability, or early death.
4. There are 25 CTE in Haiti but one of these is not functioning; 24 CTE were retained for the present study.
5. Reverse osmosis (RO) is a water purification technology that uses a semipermeable membrane to remove ions, molecules, and larger particles from drinking water. RO systems have very high effectiveness in removing protozoa, bacteria viruses, and common chemical contaminants.

Abbreviations

AEPA	sanitation and drinking water distribution (<i>adduction d'eau potable et d'assainissement</i>)
B20	bottom 20 (lowest income quintile of population)
B40	bottom 40 (two lowest income quintiles of population)
BMI	body mass index
CAEPA	community-based organizations local water committees (<i>comité d'approvisionnement en eau potable et assainissement</i>)
CDC	Centers for Disease Control and Prevention (United States)
CIAT	Inter-Ministerial Committee for Territorial Development (<i>Comité Interministériel d'Aménagement du Territoire</i>)
CLTS	community-led total sanitation
CTE	urban water operating center (<i>centre technique d'exploitation</i>)
CTE RMPP	Port-au-Prince metropolitan water utility (<i>centre technique d'exploitation de la région métropolitaine de Port-au-Prince</i>)
DALY	disability-adjusted life year
DGI	General Direction of Taxes (<i>Direction Générale des Impôts</i>)
DHS	Demographic Health Survey
DINEPA	National Directorate for Drinking Water and Sanitation (<i>Direction Nationale de l'Eau Potable et de l'Assainissement</i>)
ECVMAS	Post-Earthquake Survey of Household Living Conditions (<i>Enquête sur les Conditions de Vie des Ménages Après le Séisme</i>)
EMMUS	Mortality, Morbidity and Service Usage Survey (<i>Enquête Mortalité, Morbidité et Utilisation des Services</i>)
FGD	focus group discussion
FSM	fecal sludge management
GDP	gross domestic product
IDB	Inter-American Development Bank
IDP	Internally displaced person
HTG	Haitian gourde

IHSI	Haitian Institute for Statistics and Informatics (<i>Institut Haitien de Statistique et d'Informatique</i>)
JMP	Joint Monitoring Programme
lpd	liter per person per day
MARNDR	Ministry of Agriculture, Natural Resources and Rural Development (<i>Ministère de l'Agriculture, des Ressources Naturelles et du Développement Rural</i>)
MCI	Ministry of Commerce and Industry (<i>Ministère du Commerce et de l'Industrie</i>)
MDE	Ministry of Environment (<i>Ministère de l'Environnement</i>)
MDG	Millennium Development Goal
MEF	Ministry of Economy and Finance (<i>Ministère de l'Economie et des Finances</i>)
MENFP	Ministry of Education (<i>Ministère de l'Education Nationale et de la Formation Professionnelle</i>)
MINUSTAH	United Nations Stabilization Mission in Haiti (<i>Mission des Nations Unies pour la Stabilisation d'Haiti</i>)
MSP	Ministry of Population and Public Health (<i>Ministère de la Santé Publique et de la Population</i>)
MTPTC	Ministry of Public Works, Transport and Communication (<i>Ministère des Travaux Publics, du Transport, et de la Communication</i>)
m ³ /day	cubic meters per day
NGO	nongovernmental organization
OREPA	regional bureau of water and sanitation (<i>office régional de l'eau potable et de l'assainissement</i>)
PPPs	public-private partnerships
PRM	poverty risk model
RMPP	Port-au-Prince metropolitan area (<i>région métropolitaine de Port-au-Prince</i>)
RO	reverse osmosis
SAEP	drinking water supply system (<i>système d'alimentation en eau potable</i>)
SDG	Sustainable Development Goal
T20	top 20 (highest wealth quintile of population)
TEPAC	community water and sanitation technicians
TDS	turbidity and total dissolved solids
TEPAC	community water and sanitation technicians (<i>techniciens en eau potable et assainissement communaux</i>)

UNICEF	United Nations Children's Fund
UOPES	Observation Unit on Poverty and Social Exclusion (<i>Unité d'Observation de la Pauvreté et de l'Exclusion Sociale</i>)
URD	rural development units (<i>unités rurales de développement</i>)
WASH	water supply, sanitation, and hygiene
WHO	World Health Organization
WSS	water supply and sanitation

Chapter 1

Introduction

Background and Context

Poverty in Haiti remains endemic. Haiti is the poorest country in the Latin America and Caribbean region and among the poorest in the world. Haiti's growth performance over the past four decades has been very low, averaging about 1 percent per year, with gross domestic product (GDP) per capita falling by 0.7 percent a year on average between 1971 and 2013. As a result, the overall poverty headcount in 2012 was 58.5 percent of the population and extreme poverty 23.8 percent,⁴ meaning that almost 6.3 million Haitians could not meet their basic needs and 2.5 million could not even cover their food needs. Furthermore, with a Gini coefficient of 0.6, Haiti has the highest income inequality in the region and ranks among the world's most unequal countries.

Poor macroeconomic performance and a limited fiscal space restrict government spending on public goods. Despite recent improvements in tax collection, Haiti collects less domestic revenue than comparable countries in the Latin America and Caribbean region. Of tax revenues, much comes from indirect taxes that affect consumers independent of their income level. Public spending on health, education, and social protection amounts to 5 percent of GDP, below comparator countries, limiting the government's ability to offer equal opportunities to its citizens.

In the absence of sufficient public resources, the private sector becomes the main provider of basic services, placing a substantial financial burden on households and delivering achievements closely linked with income. Nongovernmental organizations (NGOs) are responsible for about 50 percent of total health expenditures, which for the most part are dedicated to deliver primary health-care services. In Education, NGOs or private for-profit institutions run over 80 percent of all primary and secondary schools.

Drinking water and sanitation services are no exception to this trend. Financial resources channeled to the water supply and sanitation (WSS) sector fall short of what is needed. In 2014, budget transfers to the WSS sector and National Directorate for Drinking Water and Sanitation's (DINEPA) tariff revenues accounted for US\$69 million, equivalent to 0.8 percent of GDP. In comparison, fuel subsidies accounted for 2 percent of GDP in 2014. Moreover, provision of public water is far from sustainable; in urban areas, utility sales cover just 74 percent of operating costs on average. Because of insufficient public investments and poor quality of government-led WSS service provision, the percentage of Haitians who resorted to the private sector for drinking water increased from 10.9 to 25.8 percent between 2006 and 2012. In urban areas, this percentage was even higher: 57.1 percent in the Port-au-Prince metropolitan area in 2012, and 45.5 percent in the country's other cities.

Objectives of the Haiti WASH Poverty Diagnostic

The Haiti WASH Poverty Diagnostic seeks to inform how to maximize the socioeconomic impact of the scarce fiscal resources channeled to the sector. For this, the study assesses the linkages between improved access to WASH services, poverty, and health outcomes. The diagnostic also provides convincing evidence of the linkages between improved access to WASH services and variables affecting the adequate development of children in Haiti, with a particular focus on stunting.

The diagnostic also analyzes the functioning of the WSS markets to identify ways to ensure that services delivered by the private sector are of good quality and affordable. Focusing on the metropolitan area of Port-au-Prince, the diagnostic sheds light on the functioning of its water supply and fecal waste collection, transportation, and treatment services' markets. Port-au-Prince has the largest and most sophisticated WSS market in Haiti, although not the fastest growing. Therefore, understanding how this market functions may aid stakeholders in addressing issues and opportunities that arise in other urban markets in the future, and in structuring successful public-private partnerships to serve rural communities.

Sources of Data

The diagnostic benefitted from multiple sources of quantitative and qualitative data from primary and secondary sources.² Specifically, the following data sources were used:

Quantitative Data

- *Enquête sur les Conditions de Vie des Ménages après le Séisme* (Post-Earthquake Survey of Household Living Conditions [ECVMAS]) collected in 2012. This nationally representative household survey of more than 5,000 households contains data on issues such as consumption, livelihoods, shocks, and access to basic services. The dataset has allowed Haiti to compute two poverty lines: HTG 81.7 (US\$2.41 purchasing power parity 2005) for moderate poverty and HTG 41.6 (US\$1.23 purchasing power parity 2005) for extreme poverty. These lines were calculated using the cost of basic needs (Backiny-Yetna and Marzo 2014). Poverty is estimated using these lines and a consumption aggregate.
- *Enquête Mortalité, Morbidité et Utilisation des Services* (Mortality, Morbidity and Service Usage Survey [EMMUS]) focuses primarily on the demographic and health aspects of adult women and children. EMMUS (2012) was conducted between January and June 2012 in 13,181 households. In two-thirds of the sample households, women aged 15–49 and men aged 15–59 answered to an individual-level questionnaire.

Administrative Data and Qualitative Information

- *Study on public perceptions of WASH undertaken by the Projet en Eau Potable et Assainissement en Milieu Rural Durable (Sustainable Rural Water and Sanitation Project [EPARD])* in July 2016 in the 12 communes of 4 arrondissements (districts) in the Centre department. The objective of this qualitative assessment was to provide contextual and qualitative insight on the WASH situation in a sample of communes and localities participating in the EPARD. The data were collected through focus group discussions with male and female villagers and with boys and girls at school. The study team also made a physical assessment of water and sanitation services in public schools, markets, and health centers. The team observed water sources, sanitation facilities, hygiene behavior, and waste disposal practices.
- *Market and institutional analysis of the Port-au-Prince WSS market*. Qualitative data were collected between December 2015 and November 2016 through focus group discussions and semi-structured interviews with WSS users and providers in the Port-au-Prince metropolitan area. This analysis also draws on administrative information from the metropolitan water utility and previous studies on the different WSS service delivery chains servicing the metropolitan population. The objectives of this qualitative study were to characterize the access levels, quality, and affordability of WSS services and the supply side of the WSS market.

- *Study on the financial sustainability of the institutional structure of the Haitian WSS sector.* This study, undertaken between June 2016 and March 2017, collected and analyzed financial and accounting data from the National Directorate for Drinking Water and Sanitation DINEPA, the 24 urban water operating centers (centres techniques d'exploitation [CTE]), and a sample of 25 local water committees (CAEPA). The objective of this study was to inform a financial strategy for the WSS sector.
- *Recensement scolaire.* This primary and secondary school census was developed in 2011 by the Ministry of Education (Ministère de l'Éducation Nationale et de la Formation Professionnelle [MENFP]). Directors of public and private schools were interviewed in March–April 2010. The census included information on WASH infrastructure.
- *Évaluation de la Prestation des Services de Soins de Santé.* This assessment of the services provided in Haitian health centers was developed by the Ministry of Population and Public Health (Ministère de la Santé Publique et de la Population [MSPP]) in 2013. Managers and staff of all health centers registered with MSPP—both public and private—were interviewed. The information gathered included information on the WSS infrastructure in health centers.

Notes

1. Throughout this report, “poverty” refers to the national definition; a household is deemed poor if household consumption per capita is lower than Haitian gourde (HTG) 81 per day (2011 purchasing power parity of US\$3.64), and extremely poor if consumption is lower than HTG 42 per day (2011 purchasing power parity of US\$1.86).
2. More information is available in appendix A.

Reference

Backiny-Yetna, P., and F. Marzo. 2014. “Poverty in Haiti: Methodological Note on the Aggregate of Consumption Using ECVMAS 2012.” World Bank, Washington, DC.

Chapter 2

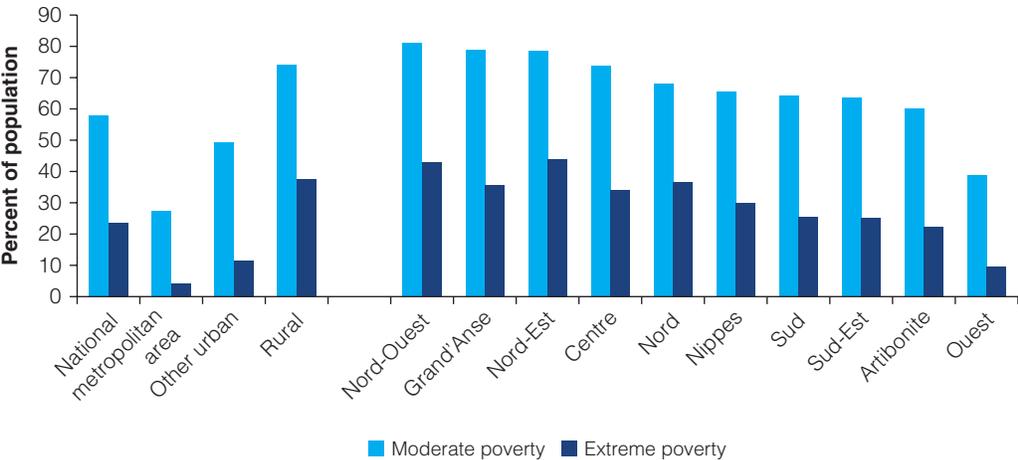
Poverty, Vulnerability, and Health in Haiti

Haiti remains the poorest country in the Western Hemisphere despite the progress made since the early 2000s. The country's average per capita income is comparable to that of the countries of Sub-Saharan Africa. Using the Human Development Index, Haiti ranks 163 (out of 187, with a score of 0.493 in 2015), a rank significantly lower than that of other countries in the region, such as the Dominican Republic (99), Bolivia (118), Guatemala (125), and Honduras (130). Despite recent progress in reducing monetary poverty, about 58.5 percent of Haiti's 10.4 million people still live below the national poverty line, with 23.8 percent living in extreme poverty (figure 2.1).¹

Inequality, too, remains high. Inequality of both income and assets is among the highest in the world, with a GINI coefficient of 0.6. The richest 20 percent of Haitians account for more than 64 percent of the total income in the country; the poorest 20 percent for just 1 percent. Access to basic services is low and characterized by important inequalities, with urban areas being better served than rural ones.

Rural areas are particularly affected by poverty. In 2012, 75 percent of rural Haitians were poor, and 40 percent were extremely poor (figure 2.1). Viewed in a complementary way, 67 percent of the poor and 83 percent of the extreme poor reside in rural areas (World Bank 2014a). Outside of the department of Ouest, poverty and extreme poverty rates in all departments are above 60 and 23 percent, respectively. The departments of Nord-Ouest, Nord-Est, and Grand'Anse are particularly affected by poverty: 80 percent of their populations are poor (figure 2.1).

Figure 2.1: Poverty and Extreme Poverty—National, by Region and Department, 2012



Source: Calculation from ECVMAS 2012.
 Note: ECVMAS = Post-Earthquake Survey of Household Living Conditions.

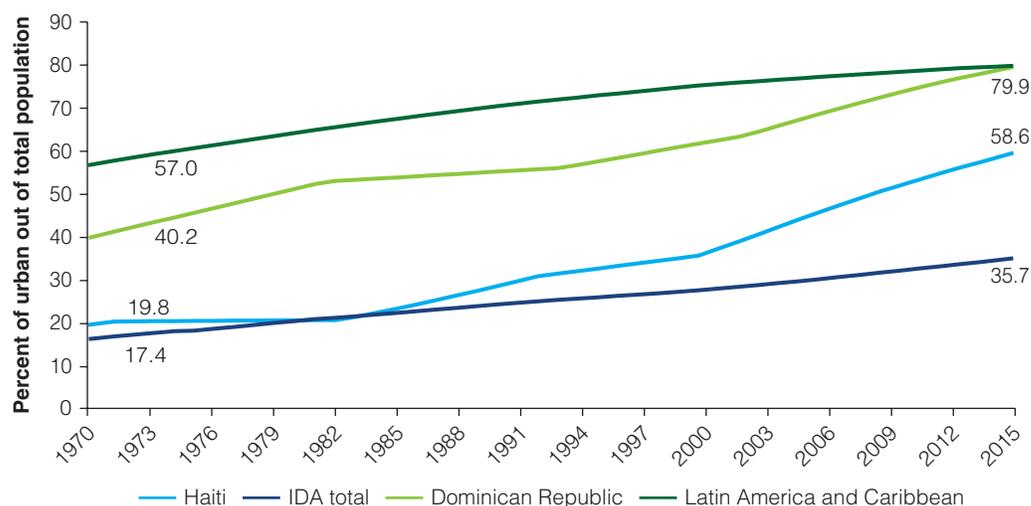
The hardship of rural life pushes households to migrate to urban areas. Most of the rural poor rely solely on low-return agriculture for their livelihood with farming representing between 48 and 59 percent of the total income of all poor rural households (World Bank 2014a). Although engaging in a nonfarm activity in rural areas reduces the probability of being poor by 10 percentage points, such activities are not well developed (World Bank 2014a). Rural poverty, lack of access to basic services, and limited job options push households to migrate from rural to urban areas, as people seek better economic opportunities and better services.

Urbanization is increasing although unemployment afflicts the urban poor and violence results from social exclusion. Between 1970 and 2014, the urban population grew from 20 percent of the total population to 58 percent of the total population (figure 2.2).² Rapid migration to urban neighborhoods is associated with poverty, unemployment, political and social marginalization, limited access to services, and weak governance. Not surprisingly, among all urban residents, the poor are more likely to be unemployed than the better-off (47 percent versus 36 percent) (Scot and Rodella 2016).

Transfers and remittances make up an important share of household income both for urban and rural households. Remittances from abroad are largely an urban phenomenon, with 35 percent of urban households receiving them, against 20 percent of rural households. Domestic monetary transfers are received by both urban and rural households, while nonmonetary transfers (transfers of property and in-kind transfers) are slightly higher in urban areas. Private transfers of all types represent 13 percent of household income in rural areas and 20 percent in urban areas. Extremely poor households, however, derive close to 50 percent of their income from private transfers (World Bank 2014a).

Gender gaps in education and in participation in the labor market remain hard to close. Literacy rates differ by gender: 73.6 percent of adult women can read and write, compared with 78.8 percent of adult men (World Bank 2014b). The gender gap in labor market participation is about 18 percentage points, with 66 percent of men working compared with 48 percent of women. The female unemployment rate in urban areas is close to 50 percent, against 30 percent for men (Scot and Rodella 2016). The latter gap is closely related to traditional gender roles, which assign the core responsibility for household chores to women.

Figure 2.2: Urbanization in Haiti, 1970–2014



Source: WDI based on UN and World Urbanization Projects.
 Note: IDA = International Development Association.

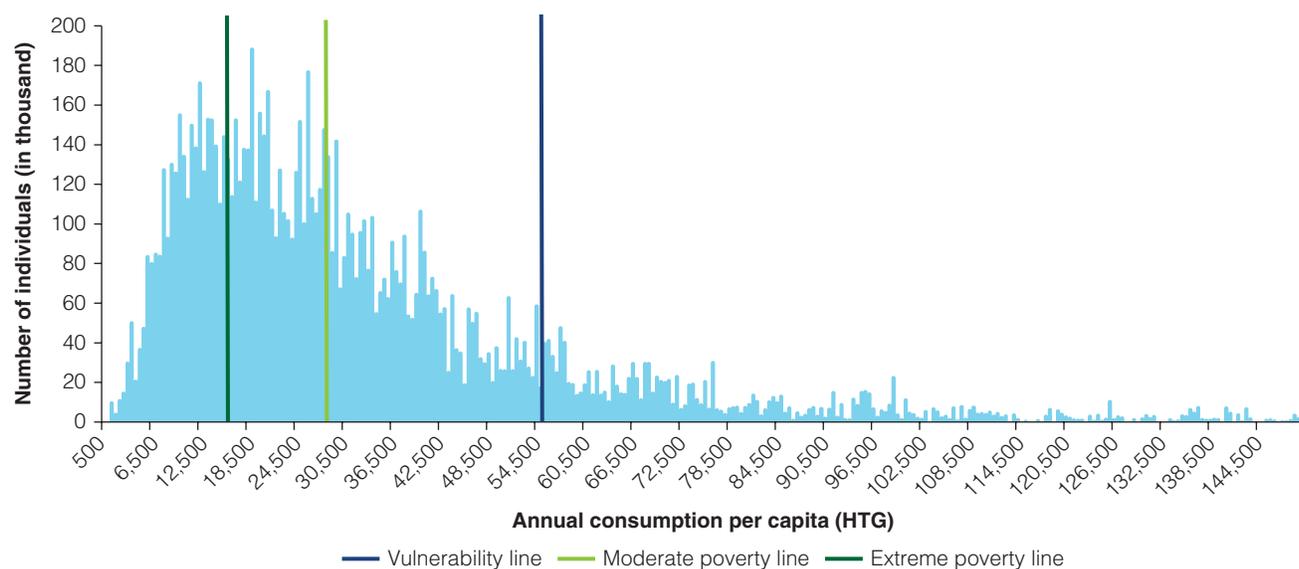
A million Haitians now living above the poverty line are vulnerable to shocks that could push them below it. A typical Haitian household faces multiple shocks each year—among them hurricanes, floods, disease, death, unemployment, and other economic shocks. In 2012, almost 30 percent of the Haitian population were considered vulnerable to poverty; 85 percent of the population (9 million Haitians) were either poor or at risk of falling into poverty³ (figure 2.3). The poor risk falling further into poverty. Poor households are more likely to incur shocks of various kinds than are “resilient” households and less likely to escape shocks.⁴ Just 4 percent of poor households are free of shocks in a given year, whereas 16 percent of resilient households can be so described. A 20 percent reduction in household consumption (such as might occur in the wake of a natural disaster) could push a million people into poverty and 2.5 million into extreme poverty (World Bank 2014a).

The poor have very limited means to cope with shocks. Haitian households in general have very little access to insurance and credit markets. To cope with shocks, they obtain monetary or in-kind support from family and friends, sell assets, or take their children out of school. The poor, of course, are even more constrained in dealing with shocks, and their coping strategies often have long-term negative effects, such as depleting savings, alienating friends, or lowering their food supply (World Bank 2014a).

Health shocks are the most common challenge for the Haitian population. Fifty percent of the poor and of the vulnerable Haitians face health-related shocks, against 43 percent of the resilient population. Households with children are the most likely to be hit by a health shock, compared to households without children. For more than 60 percent of Haitian households, health shocks are the most severe shocks to negatively impact their income, keeping the poor population in a poverty trap (World Bank 2014a).

Despite some progress in recent years, Haiti’s health outcomes remain well below the regional average. Between 1990 and 2013, the nation’s maternal mortality ratio fell from 670 to 380 deaths per 100,000 births (a reduction of 43 percent). This rate is lower than that for low-income countries as a whole (450 per 100,000 births) but higher than the average for Latin America and the Caribbean (68 deaths per 100,000 births).⁵ The infant mortality rate

Figure 2.3: Vulnerability to Poverty, 2012



Source: Computations using ECVMAS 2012 data.

Note: ECVMAS = Post-Earthquake Survey of Household Living Conditions; HTG = Haitian gourde.

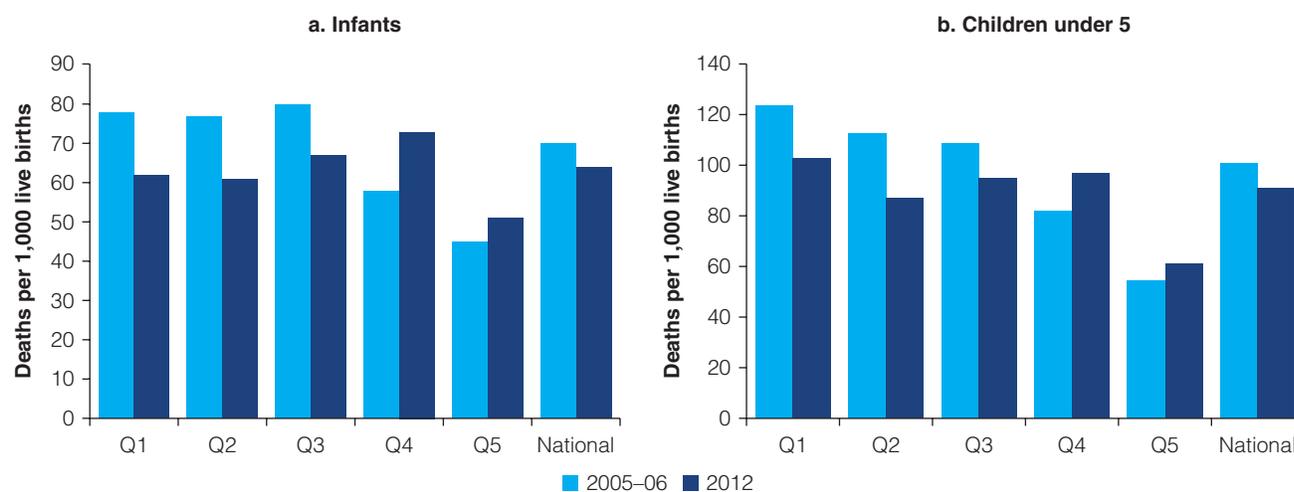
decreased by 45 percent (from 100 to 54 deaths per 1,000 live births), while the under-5 mortality rate dropped by 50 percent (from 144 to 72 per 1,000 live births). These results, too, are comparable to those of other low-income countries but greater than the regional averages.

The poor suffer most from health issues. Between 2005–06 and 2012, child mortality in the lowest wealth quintiles dropped sharply (figure 2.4). It increased in the highest quintiles, but this is probably because the 2010 earthquake mainly affected the metropolitan area, where households tend to be wealthier than in the rest of the country. In general, however, health outcomes remain very unequal. The under-5 mortality rate is 67 percent greater for the poorest households than it is for the richest.

Poverty in Haiti is not limited to monetary poverty but covers many dimensions. Six in ten households are “multidimensionally” poor—that is, they lack access to at least three of the seven basic components of well-being: education for children and adults, improved sanitation, clean water, reliable energy, decent housing, and food security. Adult literacy remains low—at 77.5 percent, it is above the average for low-income countries but below that of the region (World Bank 2014a). School enrollment increased in the past decade, but 10 percent of all children aged 6–14 do not attend school; 87 percent of children from poor households were in school, compared with 96 percent of non-poor children. Access to electricity remains limited to rich urban households; 91 percent of rural households and 75 percent of the urban poor lack electricity.

Improving access to basic services and infrastructure, including water and sanitation, is necessary to reduce poverty in Haiti. Further progress in reducing poverty will require, in addition to economic growth, a concerted focus on increasing the capacity of the poor and the vulnerable to accumulate and use assets, in particular human capital, to generate income and build resilience. Because clean water and good sanitation have such a marked effect on education and health outcomes, continued efforts must be made to improve access to, and the quality of, water and sanitation infrastructure, particularly in rural areas.

Figure 2.4: Mortality Rates in Infants and Children under Five, per Quintile, 2005–06 and 2012



Source: Calculations using EMMUS 2005–06, 2012, data.
 Note: EMMUS = Mortality, Morbidity and Service Usage Survey; Q = quintile.

Notes

1. In Haiti, the welfare aggregate used to measure poverty is a comprehensive consumption aggregate including food and nonfood components. Extreme poverty declined from 31 to 24 percent between 2000 and 2012, and there have been some gains in access to education (World Bank 2014a).
2. In 2015, the population in the metropolitan area of Port-au-Prince was estimated at 2.6 million inhabitants. http://www.ihsi.ht/pdf/projection/Estimat_PopTotal_18ans_Menag2015.pdf
3. The vulnerability line is set so that households have a 10 percent probability of falling into poverty, and this line is equal to the predicted consumption associated with that upper bound of vulnerability, that is, HTG 150/day/person (US\$ 6.65 purchasing power parity of 2011).
4. Households are considered resilient when they are non-poor and non-vulnerable, that is, when their total consumption is above the poverty line and their per capita expenditures are no more than 20 percent above the line (World Bank 2014a). On average, the poor can be affected by three shocks per year compared to 2.5 shocks for resilient households.
5. World Bank computations using WHO (2016) and Demographic and Health Surveys ([DHS] hereafter referred to as EMMUS data) for 2000, 2005–06, and 2012 (<http://www.dhsprogram.com/>).

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Chapter 3

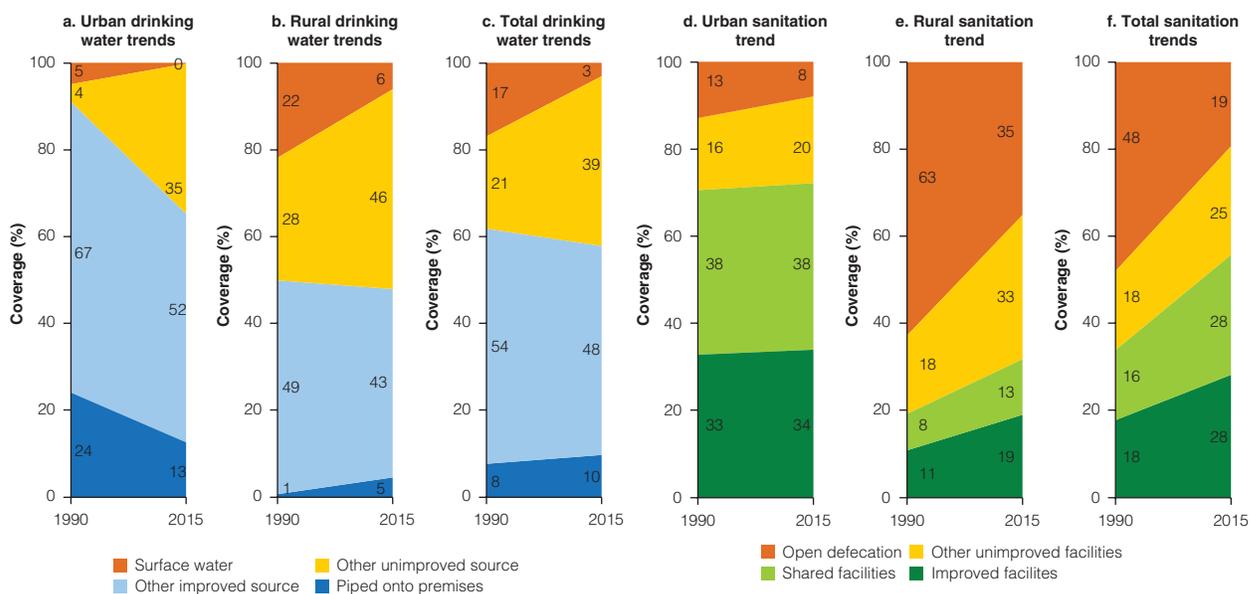
Water Supply, Sanitation, and Hygiene in Haiti

Unless there is a shift in the paradigm of how the Government operates in the WASH sector, Haiti will not meet Sustainable Development Goal (SDG) 6. SDG 6 endeavors to “ensure availability and sustainable management of water and sanitation for all.” Access is to be universal (all exposures and settings including households, schools, health centers, workplaces); reliably available close to home; and affordable, with payment for services not presenting a barrier to access or preventing people from meeting other basic human needs. The next two sections will show why Haiti may have trouble reaching this goal by 2030.

Access to Water Supply and Sanitation at the Household Level

Haiti has failed to meet the Millennium Development Goals (MDGs) for water and sanitation. Access to improved drinking water sources has been continuously declining and access to improved sanitation facilities remains stagnant at 33–34 percent since 1990 (figure 3.1). The adopted MDGs called for halving, by 2015, the proportion of people without access to improved sources of drinking water and sanitation facilities (objective 7c of the MDGs). For Haiti, this meant that by 2015, 76 percent of the population would have had access to improved drinking water and 85 percent to improved sanitation facilities (UNICEF 2010).

Figure 3.1: Progress Experienced in Access to Drinking Water and Sanitation, 1990–2015



Source: UNICEF and WHO Joint Monitoring Programme (JMP).
 Note: UNICEF = United Nations Children’s Fund; WHO = World Health Organization.

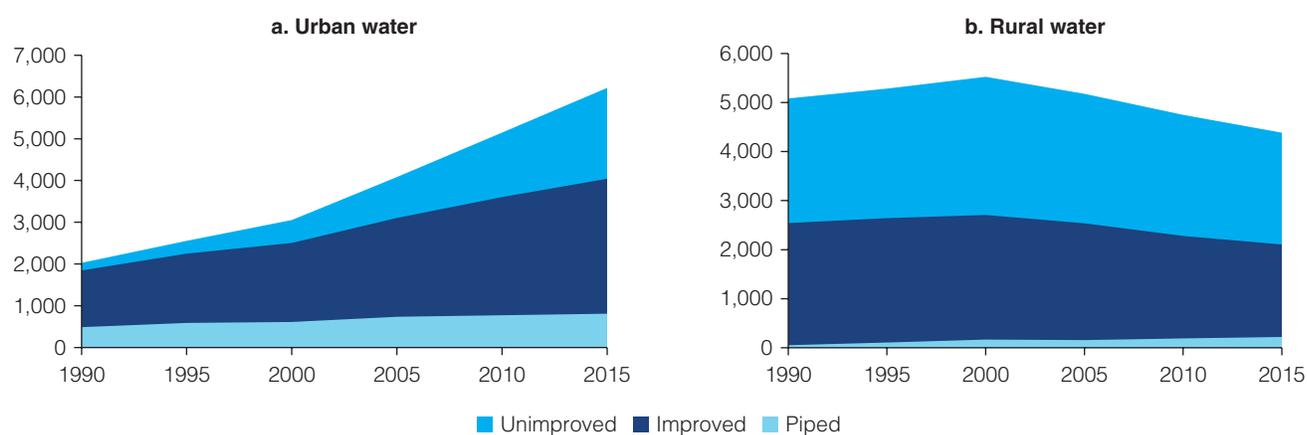
The decline in access to improved drinking water sources over the last 25 years hit the poorest—and the rural poor in particular—the hardest. According to the estimates of the Joint Monitoring Programme (JMP),⁴ although the percentage of Haitians who relied on surface water to satisfy their drinking water needs decreased from 17 to 3 percent between 1990 and 2015, access to improved drinking water sources decreased by 4 percentage points (62 to 58 percent with improved or piped water). During the same period access to improved water sources among the rural bottom 40 (B40) decreased by 7 percentage points from 41 to 37 percent of the B40 (figure 3.6). The number of urban residents with access to improved water sources has been steadily growing since the 90s, but not fast enough to offset population growth. In rural areas, access to improved water is decreasing in relative and absolute terms, despite the sharp reduction of the rural population size. This suggests the collapse of rural water infrastructure (figure 3.2).

Gains in access to improved sanitation were unequally distributed, with access to improved sanitation decreasing among the B40. Between 1990 and 2015 the percentage of people practicing open defecation dropped from 48 to 19 percent, and the share of the population with access to improved sanitation facilities increased by 10 percentage points at the national level (18–28 percent), 8 points in rural areas, and 1 point in cities (figure 3.1). During the same period, access to improved sanitation increased just 1 percentage point among the rural B40 and decreased 3 percentage points for the urban B40. In absolute numbers, access to improved sanitation slightly increased in urban areas but not as fast as the population. In rural areas, access to improved sanitation did not increase in absolute terms, although the share of households with access to improved sanitation increased due to rural migration (figure 3.3).

The Grand’Anse and Artibonite departments are notable for their low rates of access to piped water and improved sanitation facilities (see figure 3.4). In 2012, just 18 percent of the population of Grand’Anse and 21 percent of Artibonite had access to piped water (not necessarily on premises), and just 14 and 18 percent, respectively, had access to improved sanitation at the household level (see figure 3.5). The Centre department had also very low levels of access to improved water sources, even considering bottled water and sales from water companies (more on this below). The Grand’Anse, Centre, and Nippes departments have high rates of open defecation (50, 43, and 37 percent, respectively, in 2012).

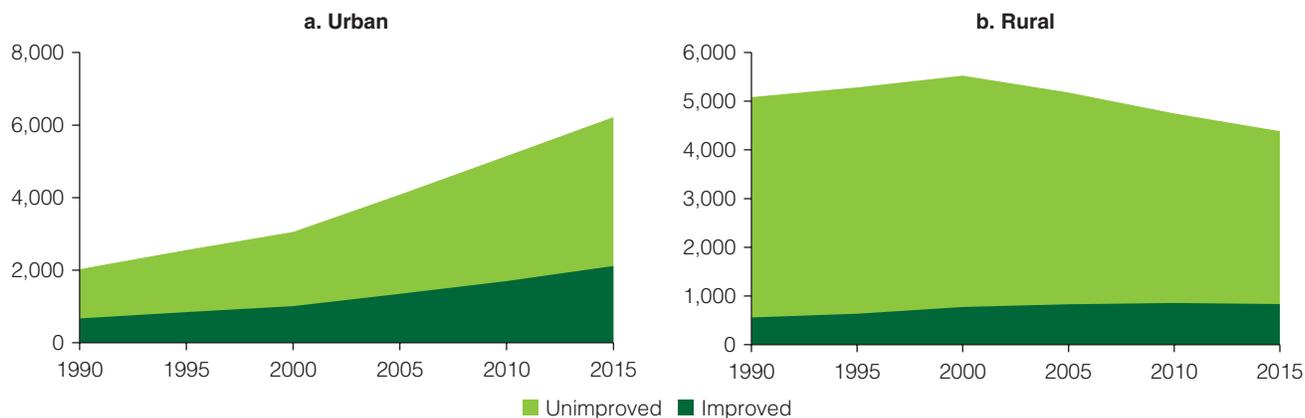
The increased share of the rural population enjoying piped water on premises mainly involves the richest households. According to the JMP, access rates to piped water on premises remained

Figure 3.2: Access to Water, 1990–2015 (Thousands of People)



Source: Computations using JMP estimates.
Note: JMP = Joint Monitoring Programme.

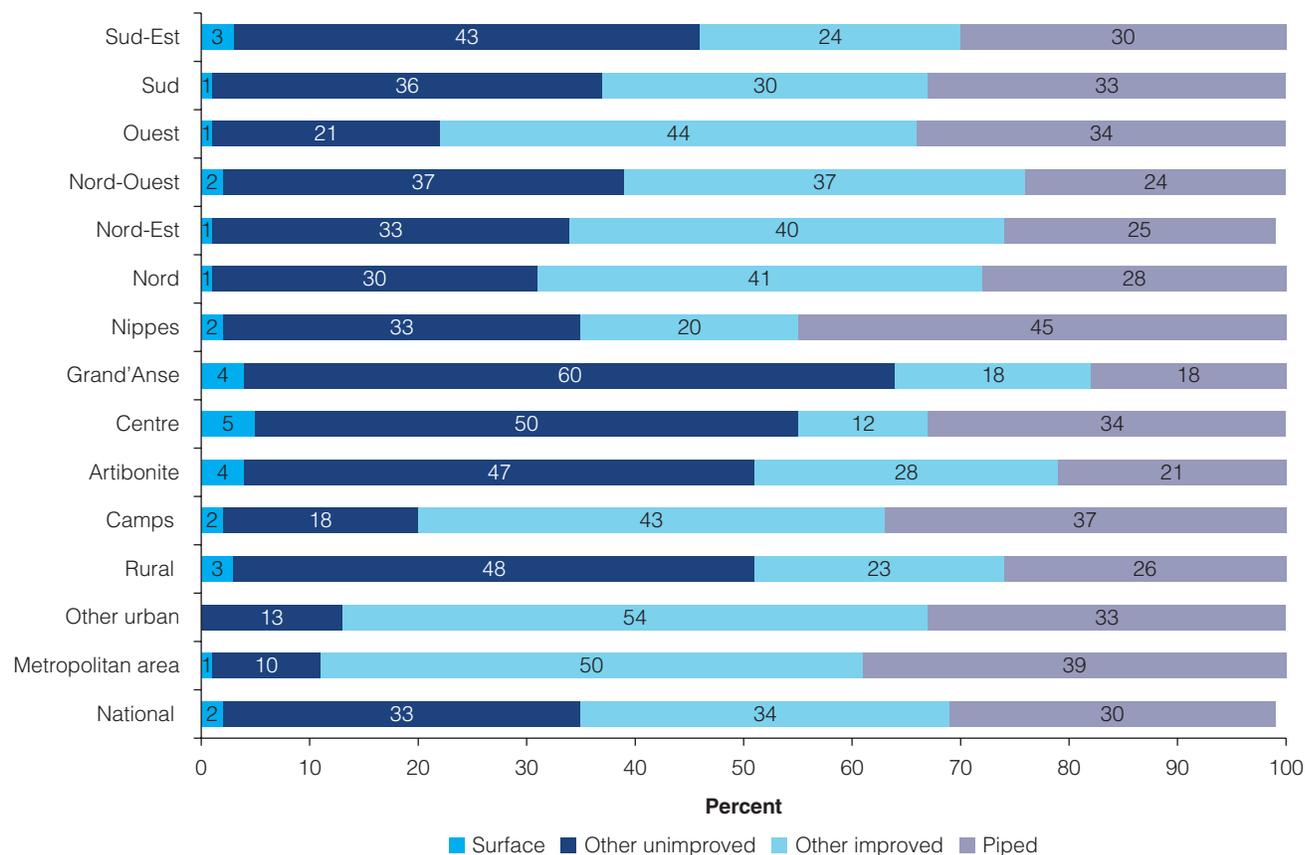
Figure 3.3: Access to Sanitation, 1990–2015 (Thousands of People)



Source: Computations using JMP estimates.
 Note: JMP = Joint Monitoring Programme.

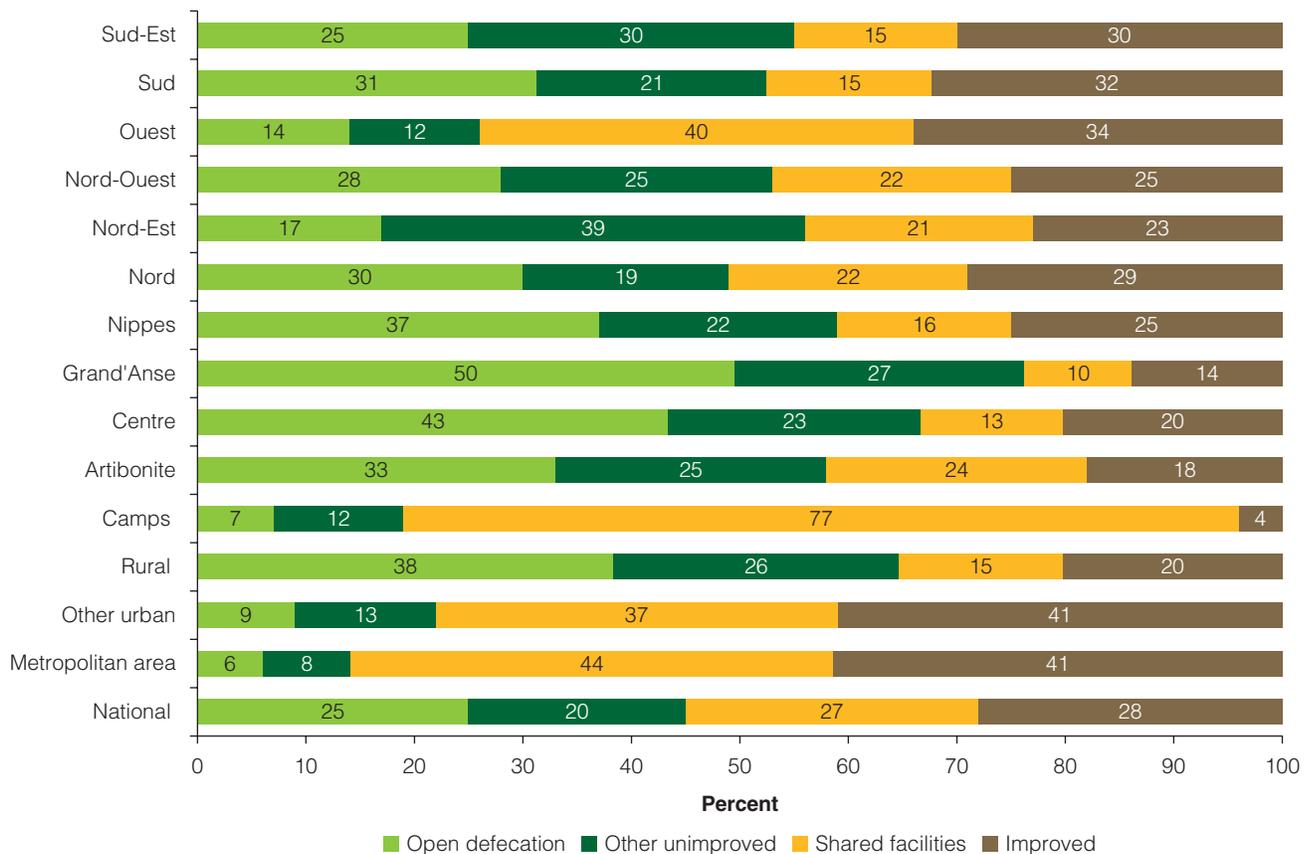
stable between 1995 and 2012 among the rural B40, while it increased from 7 to 15 percent among the richest quintile of rural residents (T20). The immense majority of the rural poor rely on unimproved water sources, mainly unprotected springs (figure 3.6, top). With respect to sanitation, although the reduction in open defecation is observed across all quintiles, half of the poor still lack access to sanitation facilities of any kind (figure 3.6, bottom) and 30 percent

Figure 3.4: Access to Water, by Department and Type of Water Source



Source: Calculations using EMMUS 2012 data. Bottled water and sales from a water company considered as improved.
 Note: EMMUS = Mortality, Morbidity and Service Usage Survey.

Figure 3.5: Access to Sanitation, by Department and Type of Sanitation Facility



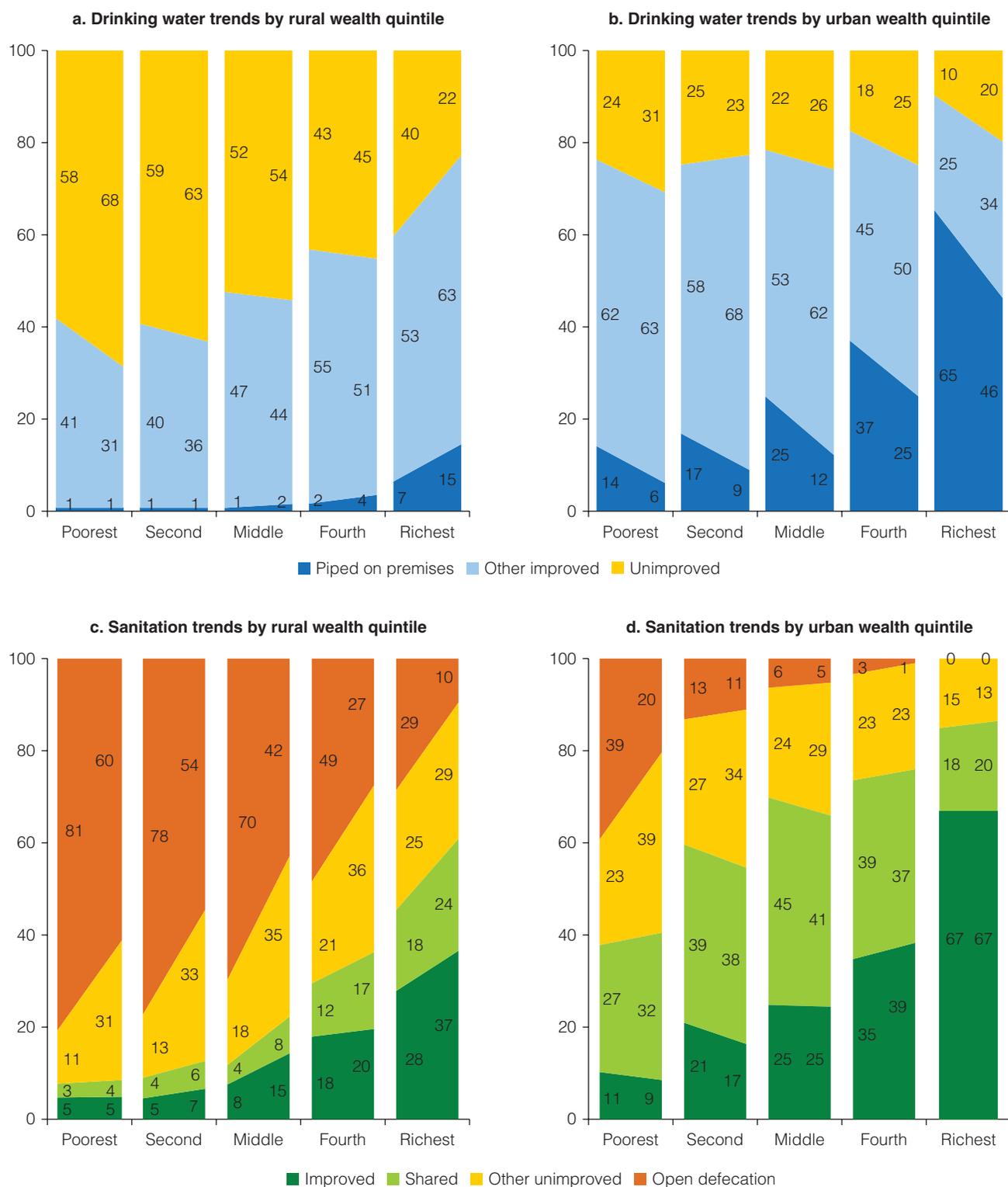
Source: Calculations using EMMUS 2012 data.
 Note: EMMUS = Mortality, Morbidity and Service Usage Survey.

rely on unimproved facilities. This suggests that when it comes to rural areas, government efforts to improve service delivery focused on small towns and larger rural localities, where the population can be served by piped schemes and the economic activity is concentrated.

The decrease in the share of the urban households using improved water sources to satisfy their drinking water needs is not just due to the difficulties face by sector authorities to cope with population growth, but also a question of preference and choices of the population. In 2012, around 55 percent of the metropolitan population had access to the public water network, either through private household connections or through public kiosks and stand posts (figure 3.7). However, just 52 percent of the people with access to the utility water, used it as the main source of drinking water (figure 3.7). Utility water is largely used for other domestic purposes, probably owing to the low prices charged by the utility compared with the prices charged by other service providers. Households report not using public water for drinking because they fear it is of low quality.

The private sector has taken advantage of the lack of government response capacity and the increased demand for improved water services triggered by the cholera outbreak. According to EMMUS, the percentage of Haitians that resorted to the private sector to satisfy their drinking needs increased between 2006 and 2012 from 10.9 to 25.8 percent. In urban areas, this figure was even higher: 57.1 percent for the Port-au-Prince metropolitan area (Port-au-Prince hereafter) and 45.5 percent for the rest of the cities (figure 3.8). This includes bottled and bagged water, trucked water, and treated water sold by private companies.

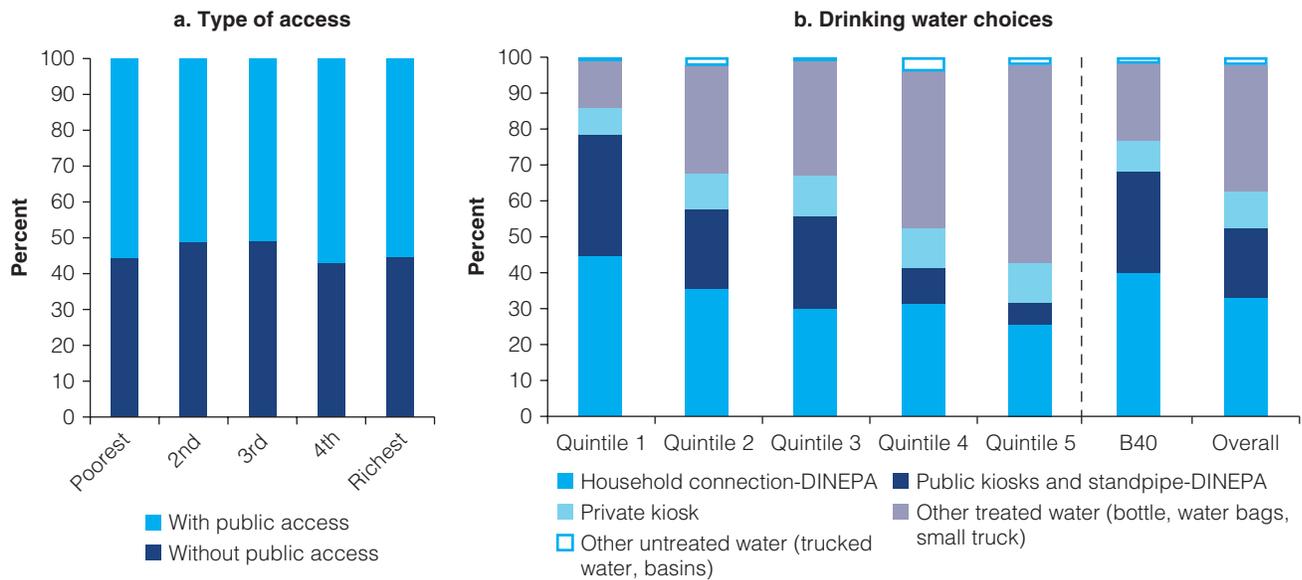
Figure 3.6: Progress in Access to Drinking Water and Sanitation by Type of Access as Defined by the MDGs, Geographical Area, and Wealth Quintile, 1995–2012



Source: UNICEF and WHO Joint Monitoring Programme (JMP).

Note: MDG = Millennium Development Goal; UNICEF = United Nations Children's Fund; WHO = World Health Organization.

Figure 3.7: Likelihood of Access to the Port-au-Prince Public Water Network and Drinking Water Choices among the Population with Access, by Wealth Quintile

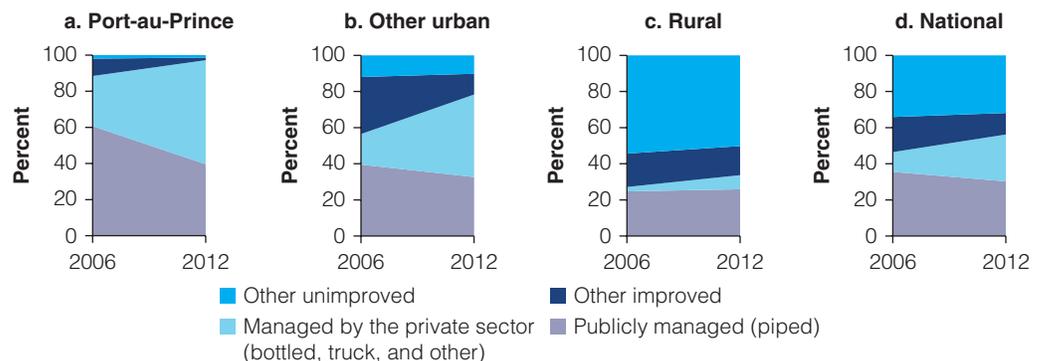


Source: Calculations using ECVMAS 2012 data.

Note: B40 = bottom 40 percent; DINEPA = National Directorate for Drinking Water and Sanitation; ECVMAS = Post-Earthquake Survey of Household Living Conditions.

The share of the private sector in the water market is significant in economic terms. In 2012, the average Haitian household spent US\$48.23 on water, and just US\$8.86 of that was used to pay a water bill to the water utility (centre techniques d'exploitation [CTE]) or the local water committee (CAEPA) (figure 3.9). The poor in Haiti spend 4 percent of their total consumption on water—about HTG 124 per year per capita (about US\$3 in 2012).² The largest water expenditures across all households are on bottled and bagged water—on average the poor spend HTG 56 per year on these. In Port-au-Prince, water expenditures represent a very important share of household expenditures (15 percent, HTG 520 per capita per year). Sales from water trucks and of bottled and bagged water represent 8 and 5 percent, respectively, of that spending. In rural areas, the poor spend only 0.5 percent of their total expenditures on such products. In 2012, overall household water expenditures in the Port-au-Prince metro area were HTG 2.5 billion (approx. US\$57.5 million), out of which 18 percent went to the utility, 41 percent to water bottling and bagging companies, and 40 percent to water trucks and private water kiosks.

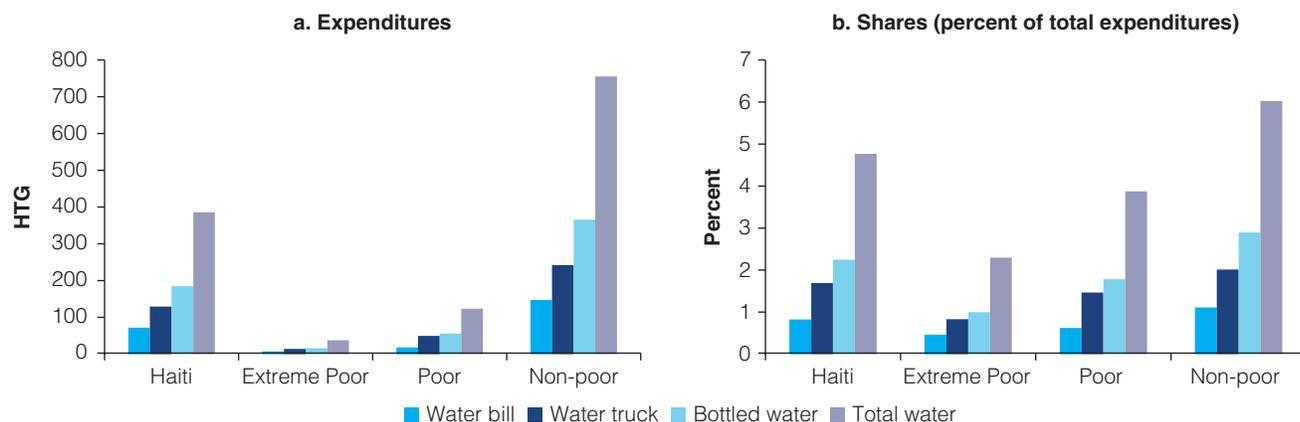
Figure 3.8: Access to Water, by Type of Management and Geographical Area



Source: Calculations using EMMUS 2012 data.

Note: EMMUS = Mortality, Morbidity and Service Usage Survey.

Figure 3.9: Water Expenditures, by Poverty Status, 2012



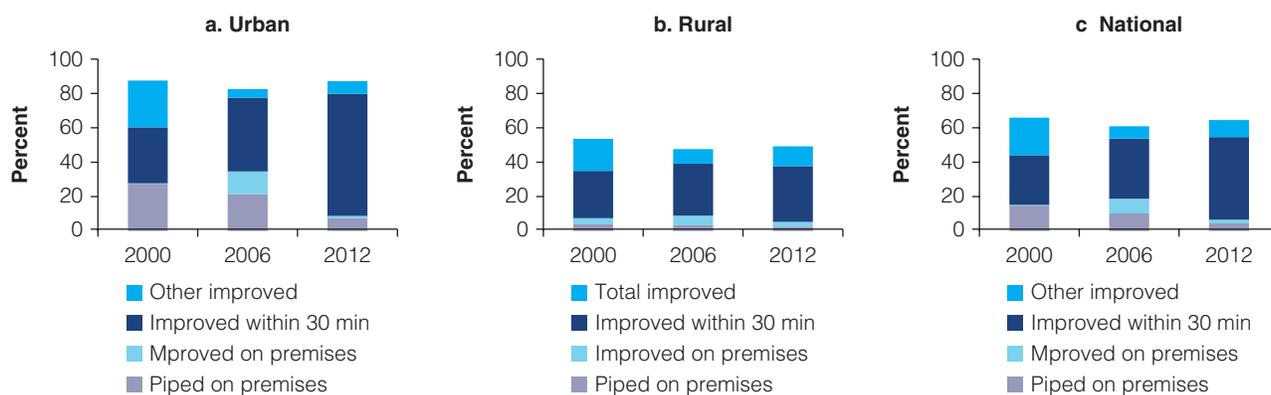
Source: Calculations using ECVMAS 2012 data.

Note: These average values include households with no expenditures on these categories. ECVMAS = Post-Earthquake Survey of Household Living Conditions; HTG = Haitian gourde.

Even considering bottled water and sales from water companies as improved sources of water, access to such sources has stagnated in the past years. Figure 3.9 suggests that 50 percent of the urban population with access to the public water distribution network prefers to drink bottled water, bagged water, or water sold in private water kiosks than utility water. On the other hand, the JMP proposes considering bottle water as an improved source of water when the secondary source of water used for other domestic purposes is “improved” as per the classical definition. Taking these two facts into consideration, figure 3.10 captures trends on access to improved water sources when bottled and bagged water, as well as water sold in private kiosks, is considered as improved. As shown below, even with this more flexible definition, access to improved water sources has decreased since 2000.

The poor spend a lot of time fetching water, but less than they used to. Although the share of the population that had access to an improved source of water within 30 minutes walking time increased from 44.1 to 54.1 percent between 2000 and 2012, the number of households with access to improved water on premises decreased from 15.2 to 6.6 percent during the same

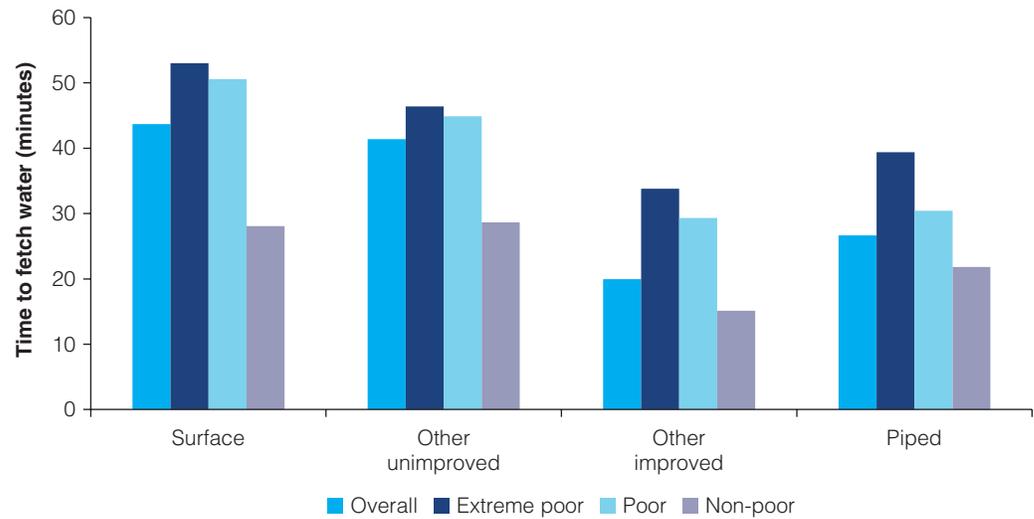
Figure 3.10: Access to Improved Water Sources in Percentage of Population, 2002, 2006, and 2012



Source: Computation based on EMMUS 2000, 2006, and 2012.

Note: EMMUS = Mortality, Morbidity and Service Usage Survey.

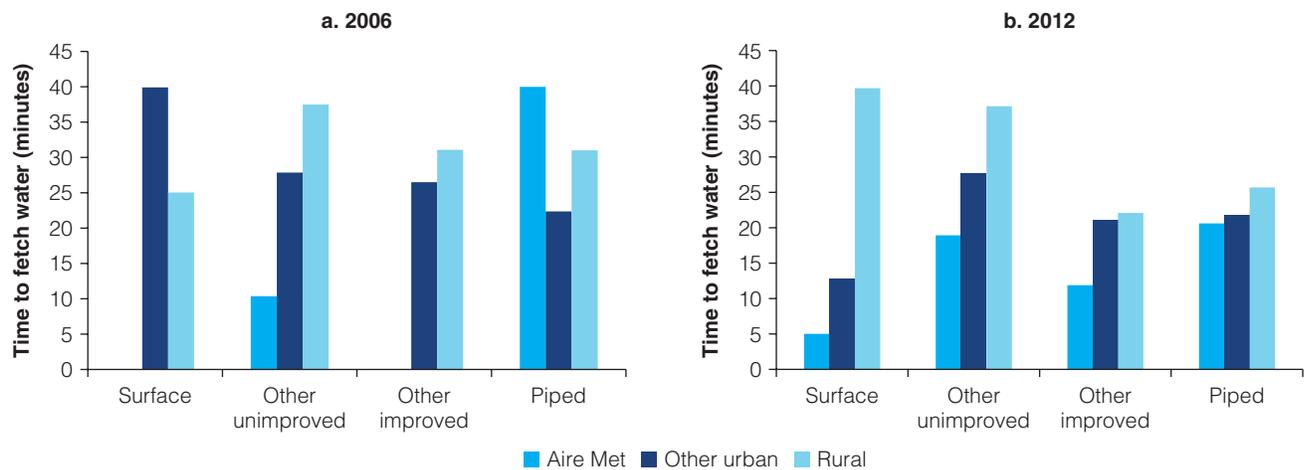
Figure 3.11: Water Fetching Time, by Type of Water Source and Socioeconomic Level



Source: Calculations using ECVMAS 2012 data.
 Note: Piped here represents piped water off-premises.

period (figure 3.10). In 2012, poor households reliant on surface water spent an average of 50 minutes a day obtaining it; those reliant on other sources of unimproved water spent 45 minutes (figure 3.11). Households with access to improved sources spent less than 30 minutes obtaining water, but time spent obtaining water from pipes was high for the poor across all regions although decreasing since 2006 (figure 3.12). More than one-third of households with access to piped water spend more than 30 minutes a day collecting it. According to the Sustainable Development Goals, water access that consumes so much time is considered as unimproved.

Figure 3.12: Water Fetching Time, by Type of Water Source and Geographical Area, 2006 and 2012



Source: Calculations using EMMUS 2006 and 2012 data.
 Note: EMMUS = Mortality, Morbidity and Service Usage Survey.

Community-Level Environmental Health Conditions and WSS in Public Spaces

Hygiene and community-level environmental conditions affect health outcomes as much as the type of access to water supply and sanitation (WSS) at the household level. This is made evident by the high persistence of cholera in households with access to piped water and by the even distribution of diarrhea persistence across quintiles.

Hygiene practices, water treatment, handwashing, and safe disposal of child stools have improved but remained problematic. Half of the households in the bottom 40 percent of the income distribution reported treating water (usually with bleach, up from about 20 percent in 2006); 70 percent reported using a purifier. Most poor households using water from unprotected wells or springs appeared to combine these two types of water treatment in 2012. Fifty-nine percent of the poor had handwashing facilities in their dwellings in 2012, although more than half of these facilities did not have water. In addition, only a quarter of the B40 used soap or a detergent to wash their hands. The poor are not disposing of their children's stools safely; 38 percent of households in the B40 disposed of these safely in toilets. The remainder left the children's stools in the open, in their household trash, or down the drain.

Economic constraints, cultural beliefs, and limited access to WASH facilities outside of households hinder the adoption of improved hygiene practices. This is one of the findings of a qualitative research recently undertaken by Rop and others (2016) in some of the communes with the highest cholera incidence rates, where a large share of the population—despite being well informed about the causes, transmission, prevention, and treatment of cholera—is not engaging in adequate hygiene practices. Box 3.1 summarizes the key findings of research on this problem.

Both the poor and the rich in Haiti face poor environmental health conditions. Figure 3.13 shows the probability density functions for community-level access to improved water and sanitation for urban and rural households with under-five children by wealth quintile. For community-level improved sanitation coverage, disparities are evident just for the T20 compared with the rest of the population. For community-level improved water access,

Box 3.1: Barriers to Adopting Improved Hygiene Practices in the Centre Department

Men, women, and children in Haiti can easily describe the ways cholera is transmitted, and how it can be prevented by washing hands before eating, using safe water, safely handling food, and using a toilet to dispose of feces. In an interview with 6- to 7-year-old boys and girls at the Ecole Nationale d'Oreste Zarnor in Thomonde, for example, the children said, "We know it can kill somebody. We know about diarrhea. You need to wash your hands to remove microbes. Treat your water with Aquatab water before drinking it. Use the toilet very well."

Superstition and fatalism that cholera cannot be controlled because of extraneous forces is widespread, hindering the adoption of adequate sanitation practices. Many adults are confused about the way the disease is spread. For example, men from

box continues next page

Box 3.1: Continued

Saut d'Eau suggested that “the wind can carry cholera.” Some women were fatalistic, saying, “Someone can do everything—wash hands, use a toilet, treat water—but still catch cholera.” In the words of a woman from Boucan Carré “You can't avoid cholera.” A community representative of Maissade believed that because cholera had different outcomes on different people, it was controlled by supernatural phenomena (“How do you explain two people contracting the disease at the same time, arriving at the same time to the hospital—then one dies and the other lives? There is something abnormal.”).

Covering food and washing hands (when soap was available) were seen as the easiest methods for preventing cholera; building a latrine was considered the hardest. Treating water with Aquatabs/Klorine and boiling water fell in the middle of the easy-to-hard continuum, since they require resources for implementation (money to purchase chlorine and fuel to boil water). Building a latrine was considered to be the most effective mechanism to prevent cholera.

Traditional beliefs on water quality continue to influence attitudes about safe water management. Some people seem to resist water treatment practices because of its taste and perceived negative health effects. Some adults in Maissade expressed the view that one should use unsafe water to build immunity; others believed that chlorine upsets the stomach and shrinks the intestines. “Our previous generations didn't get sick from drinking from the river, so we shouldn't either,” expressed one person. Some people believe that water can be treated with lime juice (although acidity above a certain pH does kill *vibrio cholerae* bacteria, its effectiveness is uncertain).

The cost of cooking fuel for boiling water is viewed as prohibitive, as is the need to transfer the boiled water into another container, which one may not have, and which may itself be contaminated. Boiling water was generally viewed as inconvenient and inefficient, and not done unless someone was ill and on doctor's instructions, or for infants.

Improved toilet construction is perceived as highly effective but difficult and costly, and there is some resistance to unimproved toilets. One opinion leader in Boucan Carré referred to unimproved pit latrines as “*kay rat ak ravet*” (houses for rats and cockroaches); another said he was afraid to stand on the rotting planks of wood covering the pit. A leader in Boucan Carré referred to the need for a properly constructed and standardized structure for a toilet. Many community members also took a dim view of toilet solutions that did not respond to their taste or that were untested. One woman said she did not like to squat into a small hole (Haitian toilets have raised seats) and preferred to go to the fields.

Access to safe water, hygiene, and sanitation facilities diminishes substantially outside the home. Even in communities receiving safe water from protected sources and

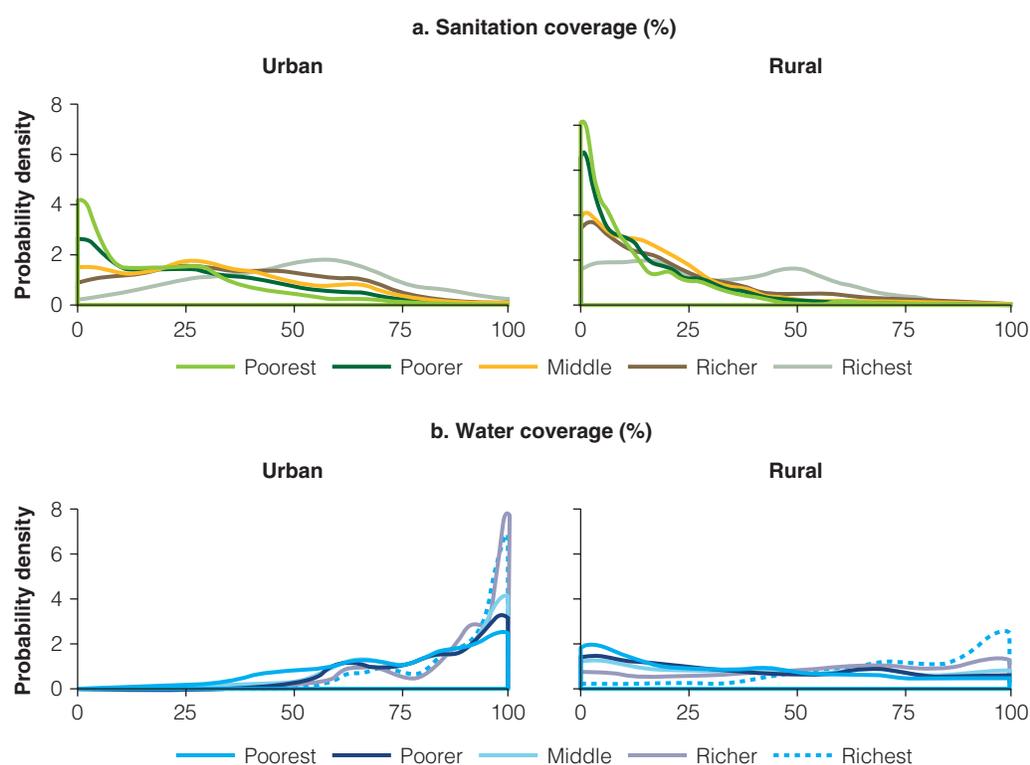
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Box 3.1: Continued

pumps, most people resort to unsafe sources in the course of their daily activities outside the home, such as for agriculture, in schools, and in the market. Men reported drinking water from rivers or streams while working in the fields. Women in Mirebalais, Boc Banic, and Thomonde reported using water from streams or other unsafe sources while working in the market.

Source: Rop and others 2016.

Figure 3.13: Rates of Community Improved Sanitation and Water Coverage, by Wealth Quintile



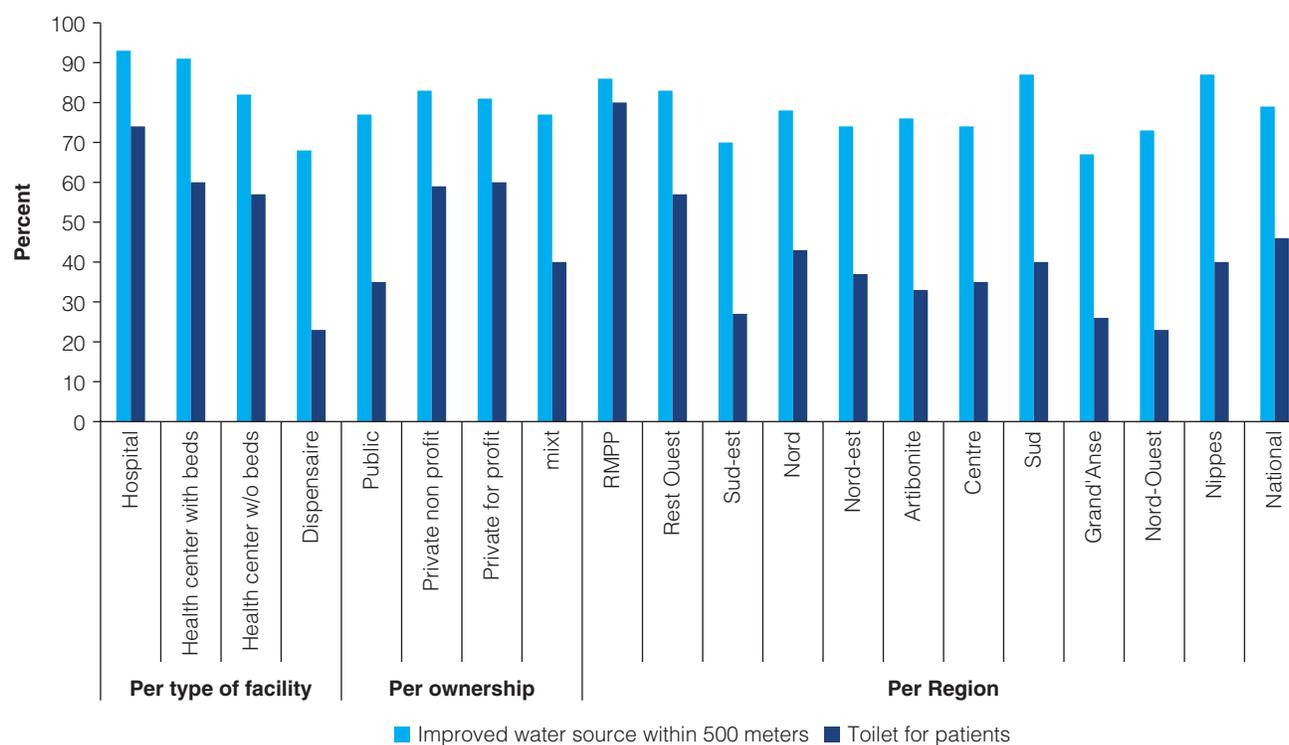
Source: According to IDB data.

Note: These curves show the probability a community has x% of households with access to improved water/sanitation coverage. IDB = Inter-American Development Bank.

disparities between the T40 and the B60 percent are evident in rural areas; in urban areas the differences are small.

In 2013, 79 percent of health centers gave their patients access to improved water; and only 46 percent offered toilets (MSPP 2013) (figure 3.14). In the Grand'Anse, Nord-Ouest, and Sud-Est departments less than 30 percent of health centers had sanitation facilities. In the 36 communes with the highest incidence of cholera, the situation was even worse:

Figure 3.14: Health Centers with Access to Improved Water Sources and Sanitation Facilities



Source: MSPP 2013.

Note: RMPP = Port-au-Prince metropolitan water area.

just 44 percent of the 187 existing health centers had access to an improved water source within 500 meters; and 40 percent of the centers routinely suffered severe water shortages. Moreover, although 93 percent of the health centers in these 36 communes claimed to have a functioning latrine for patients, 21 percent of those latrines were unimproved. In 4.3 percent of the health centers, sharp medical waste was disposed of in the latrine pit.

Markets in rural areas have limited WASH facilities. One of the challenges of markets is the sheer size of the crowds, combined with inadequate sanitation, water, and handwashing facilities. In addition, poor solid waste management, the absence of any public health inspection and enforcement of safe food hygiene practices, and high temperatures that can speed the multiplication of bacteria, compound this challenge.

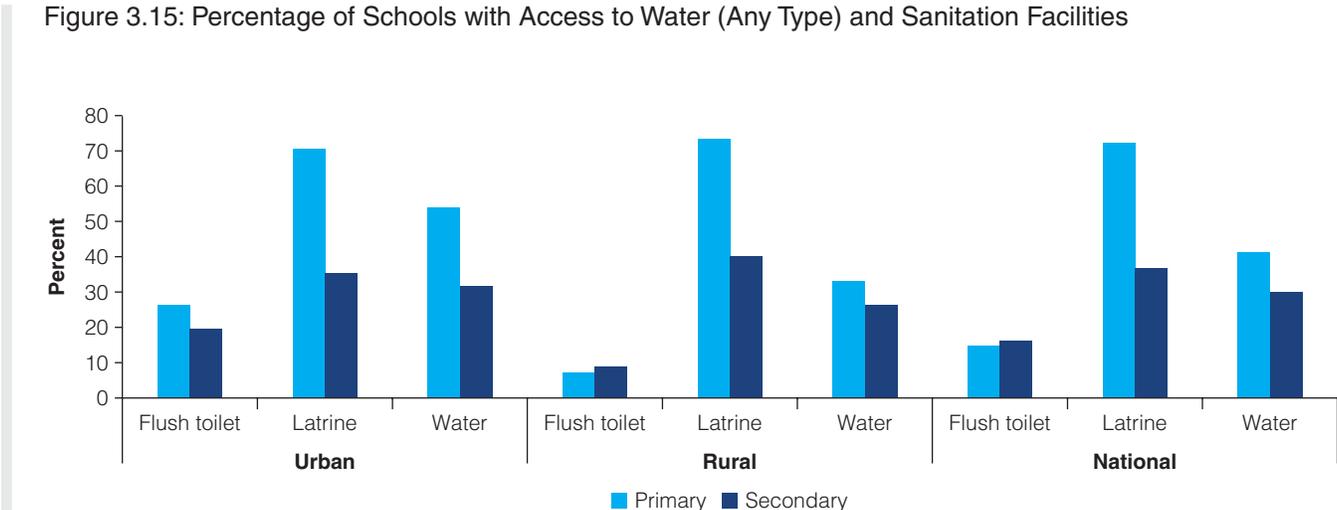
Recent research has revealed poor management of hygiene and sanitation facilities in markets in the cholera hotspots of the Centre department. According to Rop and others (2016), when water was available, individuals used it freely and wastefully from faulty taps. Vendors sold water when it was unavailable from DINEPA, but it was unclear to Rop's team where the vendors obtained this water. Surface water from nearby streams is used to supplement the water needs of market traders. In many of the markets visited by Rop's team, toilet facilities had been destroyed, torn down or looted, without any attempt to replace them. Only in the largest surveyed markets was there a systematic approach to operation and maintenance of the existing toilets, with a caretaker and a pay-to-use system.

In smaller markets, toilets were cleaned only on occasion or on weekly market days. However, traders reported that toilets were often used on nonmarket days and that the users failed to use them responsibly. In Maissade, traders demanded shower facilities, which the authorities installed. However, these ended up being used for defecation as well, because the toilets were inadequate. Women expressed particular dissatisfaction with the management of these facilities. None of the markets' toilet facilities were accessible for persons with disabilities. In nine out of ten markets visited, there were no dedicated handwashing stations outside the toilets and traders had to store water and soap at their stalls to wash their hands.

In 2011, just 41 percent of primary schools and 30 percent of secondary schools had access to water (MENFP 2011). In schools in the Centre department that lacked access to water, Rop's team observed that directors would send students to collect water from nearby streams up to three times a day or several times a week. They also sent cooks to water points off site, especially to ensure water for the school meals. Children would purchase drinking water in plastic bags at the price of HTG 5 or carry it in bottles from home. The girls from Ecole Nationale de François Capois in Maissade said simply, "There is no water in school; we get water from a nearby pond." The directors of the visited schools that were connected to a community system informed Rop and her team that their water was provided without a fee but was unreliable.

Although 87 percent of primary schools had sanitation facilities, just 53 percent of secondary schools had them (figure 3.15). Having sanitation facilities, however, did not guarantee their use. During field visits to schools in the centre department, Rop and others (2016) observed that in most of them, the ratio of toilets to students was very low, resulting in long lines to use the toilets and encouraging open defecation. In addition, their research revealed that if children perceived the toilets to be very dirty, or if there were no doors to provide privacy, children would regularly use the field or defecate behind the toilet structure. Usually the toilet was not connected to a septic tank to empty sludge, and there were no clear strategies in place on how to remove sludge. Even when schools had invested in toilets for students, these facilities were often closed for lack of water. In addition, the toilets were often too high for 6- to 7-year-olds, which led smaller children to defecate in front of the toilet because they could not position themselves to use the toilet.

Figure 3.15: Percentage of Schools with Access to Water (Any Type) and Sanitation Facilities



Source: 2011 School census.

Notes

1. The JMP is a mechanism established by the United Nations Children’s Fund (UNICEF) and the World Health Organization (WHO) to monitor the progress made by countries in achieving objective 7c of the MDGs, using a standard methodology that allows comparisons between countries and over time.
2. This is computed using the exchange rate of HTG 41.6 per U.S. dollar (a rate also used in the 2014 Poverty Assessment published as World Bank [2014a]), and HTG 5 per Haitian dollar.

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Chapter 4

Improving Health Outcomes through WASH Interventions

Poverty perpetuates itself and is often transmitted from one generation to the next, with early childhood development outcomes found to be a key transmitter. Poor health and nutritional status in utero and in the early years of a child's life have been found to influence directly one's likelihood to remain poor over time (Bird and Higgins 2011). The incidence of stunting, which is associated with impaired cognitive function, could affect children's future economic productivity and welfare (Victora and others 2008; Daelmans and others 2017). This chapter offers evidence of the importance of water supply and sanitation (WSS) services and good hygiene in determining the nutritional and health outcomes of Haitian children, and considers how investments in water supply, sanitation, and hygiene (WASH) interventions could affect these outcomes.

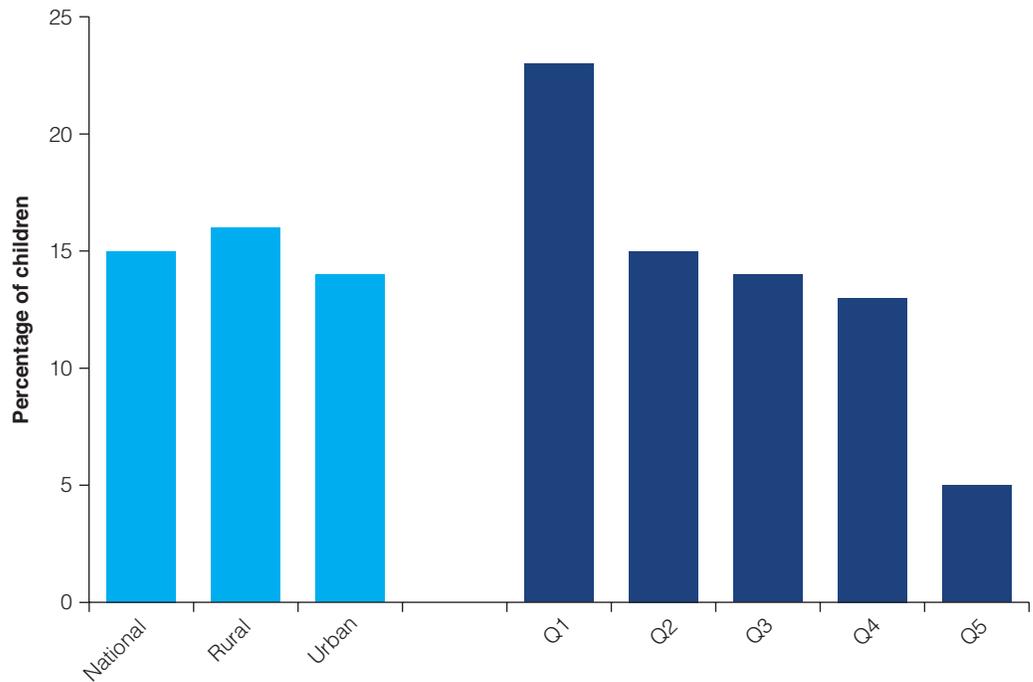
Nutritional Benefits of Investing in Water Supply, Sanitation, and Hygiene

Children from poor households are twice as likely to be affected by malnutrition. Between 2000 and 2012, the proportion of children under five who were stunted fell by 31 percent (from 28 to 21 percent), and the proportion who were underweight fell by 18 percent (from 13 to 11 percent).¹ However, Haiti has a much higher rate than the average for the Latin America and Caribbean region, where 7 percent of children under five are stunted and 1.9 percent are underweight. In addition, the rate of stunting among babies (aged 0–23 months) remains high; 15 percent suffer from malnutrition (figure 4.1). Malnutrition disproportionately affects children from poorer households.

Malnutrition has multiple causes, which reinforce one another and affect dietary intakes and the occurrence of diseases leading to a low height-for-age score. Children with adequate food and adequate access to WSS services, health care, and parental care have better nutritional outcomes than other children (World Bank 2013; United Nations Children's Fund [UNICEF] 2015). Based on UNICEF's framework of analysis (see figure 4.2 and appendix C.1–C.3), Skoufias (2016) developed a methodology to identify correlations with and synergies among these underlying causes of malnutrition using descriptive and regression analysis. Vinha (2016) applied this methodology to help understand malnutrition in Haiti, using EMMUS 2012 data and the definitions of adequate food, health care, and parental care indicated below:

- *Adequate food.* For children under the age of six months, exclusive breastfeeding. For children 6–23 months, an adequate dietary diversity score (DDS) and meal frequency.
- *Adequate environment/WASH services.* Access to improved water sources (piped water on premises, public tap or stand post, tube well, borewell, protected spring, rainwater, bottled water, and water from a sales company) and access to improved sanitation (flush toilet, a ventilated improved pit latrine, a pit latrine with slab, or a composting toilet).
- *Adequate health care.* Prenatal and postnatal checkups, immunization, and sufficient intake of vitamin A.
- *Adequate parental care.* Early breastfeeding, appropriate breastfeeding, complementary feedings, and mother's age at first pregnancy.

Figure 4.1: Stunting in Children 0–23 months, by Region and Welfare Quintile, 2012

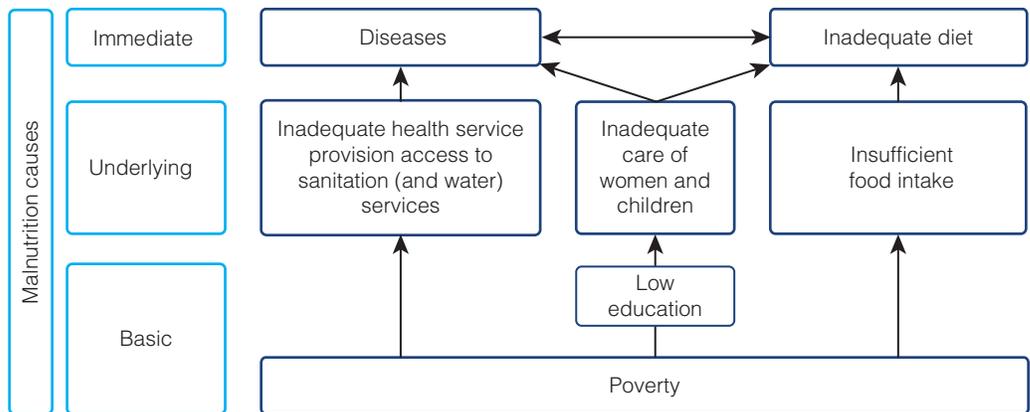


Source: Calculations using EMMUS 2012.

Note: EMMUS = Mortality, Morbidity and Service Usage Survey; Q = quintile.

The level of adequacy in the different nutrition underlying factors is very low. Half of children under 2 years old in Haiti are exposed to inadequate food, inadequate parental care, inadequate environment/WASH, and inadequate health care (although one or more component of each factor may be present). Fifty-nine percent of these children are in the B40 segment of the population (figure 4.3 panel c). The dimension with the lowest attainment is WASH, with only 3 percent of the poorest children having access to improved drinking water, improved sanitation,

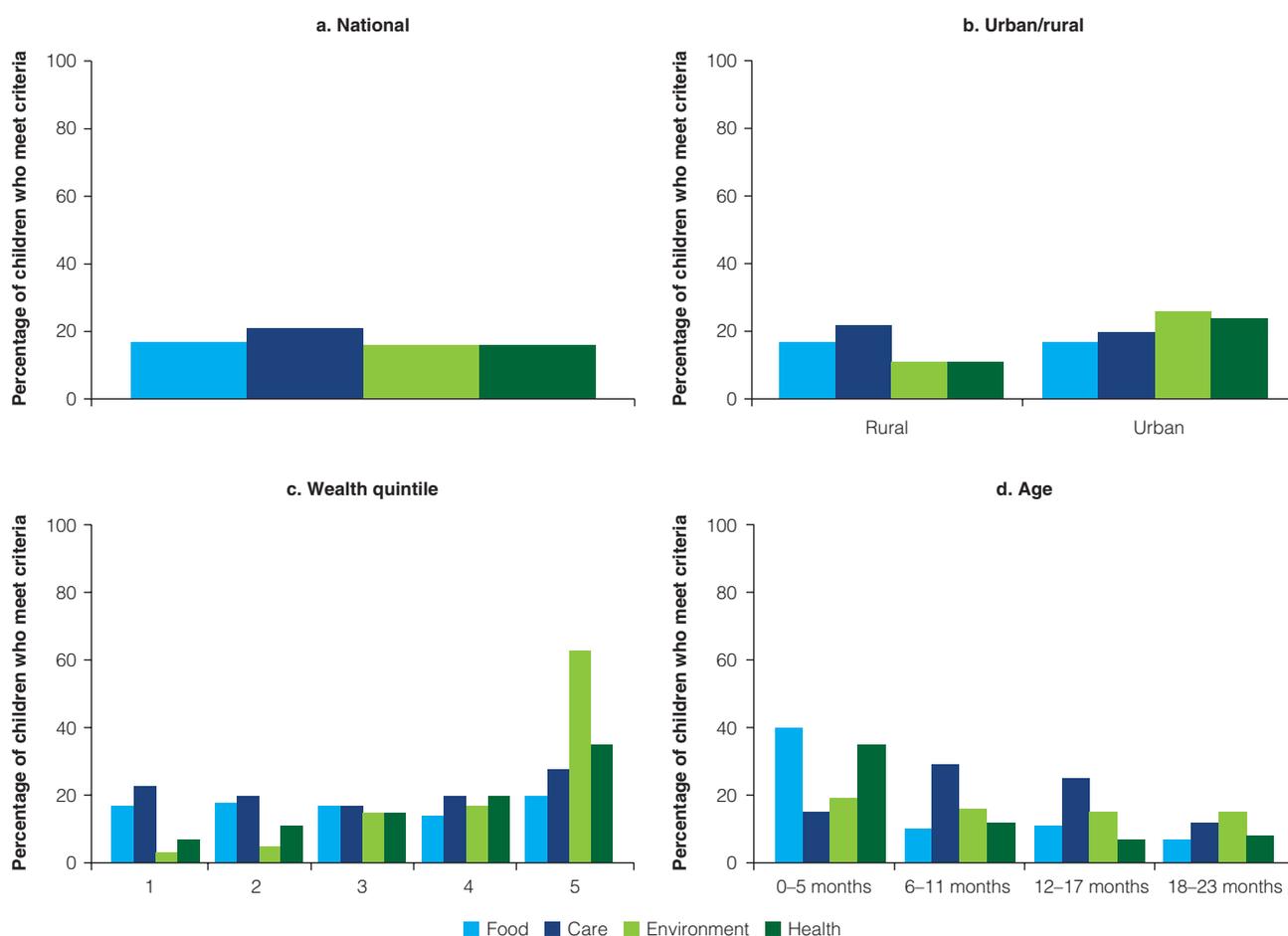
Figure 4.2: UNICEF’s Framework of Analysis



Source: Adapted from the UNICEF Conceptual Framework for child malnutrition.

Note: UNICEF = United Nations Children’s Fund.

Figure 4.3: Adequacy Status of Factors Underlying Malnutrition, by Region, Wealth Quintile, and Age



Source: Vinha 2016.

adequate handwashing practices, and adequate disposal of child’s feces. Poor children have 13–37 percent less access to WASH services than non-poor children and 9–15 percent less access to health care (appendix C). The only measure on which they do not perform worse than children from non-poor households is personal care, which probably reflects a higher rate of breastfeeding.

Among children with similar diets and care, children with access to improved WSS are significantly less likely to be stunted than children without such access. Everything else equal, children with access to adequate WSS are 0.331 standard deviations taller than children without such access (0.439 standard deviations taller in urban areas) (Vinha 2016). The dimension most strongly associated with height is access to adequate health care: children with access to adequate health care are on average 0.703 standard deviations taller than children without such access. The result is driven by rural areas, where the correlation between adequate health care and height for age is 0.897 standard deviations. At the national level and for urban children, the correlation becomes stronger when access to adequate health care is accompanied by access to adequate WSS (0.743 and 0.457 standard deviations, respectively) or by access to adequate WSS and adequate food (0.931 and 1.627 standard deviations, respectively).

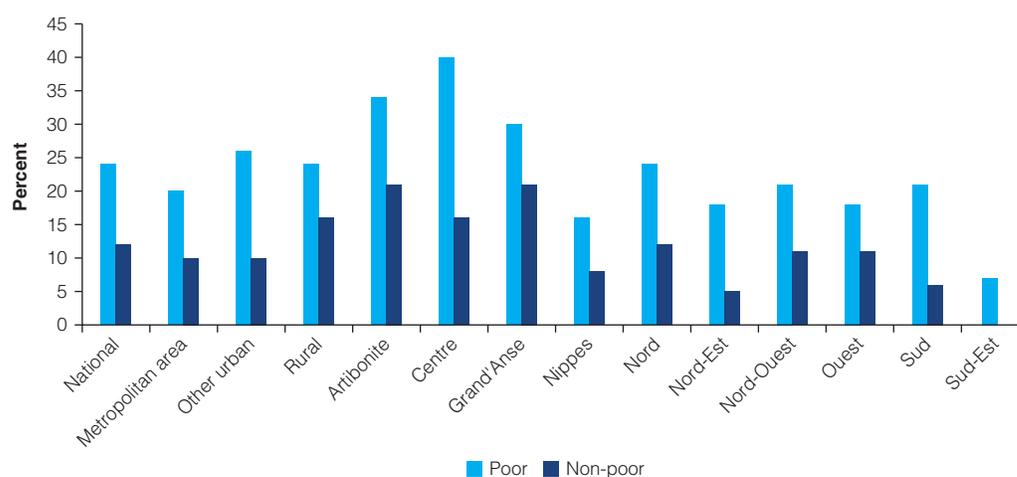
Quantifying the Health Benefits of Improved Household Water Supply and Sanitation

Cholera—a major concern in Haiti in the aftermath of the 2010 earthquake—is most likely to strike rural and poor urban households. Between 2010 and 2012, 19 percent of all Haitian households had someone infected with cholera (figure 4.4).² This rate was twice as high for poor households (24 percent) than for non-poor households (12 percent). In all departments, it was twice as high in rural areas (24 percent) than in cities (12 percent).

Diarrhea is the third leading cause of death in children under five years old in Haiti, accounting for 10.4 percent of all deaths in this age group (Humphrey 2009). Even though the under-five mortality rate has fallen by half since 1990, it remains very high—69 deaths per 1,000 live births, or nearly four times the regional average (UNICEF 2015). In 2012, the incidence of diarrhea among children under five was 21 percent at the national level, the same level as for the B40 (figure 4.5). This even distribution across quintiles, along with the high incidence of child diarrhea in households with access to piped water; and the fact no synergies were identified among WASH and other malnutrition underlying factors analyzed by Vinha; suggest that hygiene practices and community-level environmental health conditions influence health outcomes as much as the quality of WASH services at the household level.

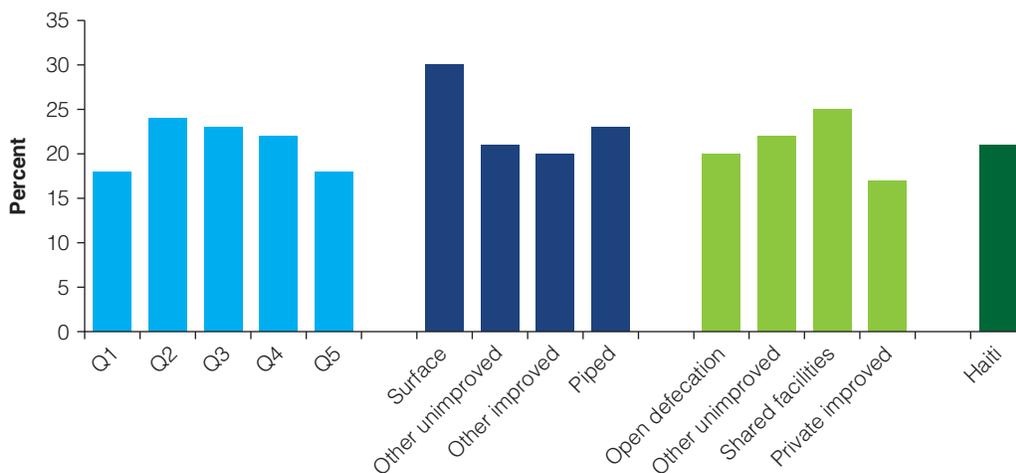
The annual burden of enteric diseases associated with inadequate WASH services and practices is 13,278 DALYs³ per 100,000 children, about three-quarters of the entire enteric disease burden estimated for Haiti (figure 4.6). The burden is disproportionately borne by poorer children and children in vulnerable geographic areas. Nationally, the WASH-related enteric burden for the poorest quintile is about 2.7 times greater than for the richest quintile; it is lower among urban populations than rural populations. The burden on the poorest children is twice as high as the burden on the richest children in both urban and rural communities.

Figure 4.4: Households with At Least One Member Sick with Cholera, by Department, 2010–12



Source: Calculations using EMMUS 2012 data.
 Note: EMMUS = Mortality, Morbidity and Service Usage Survey.

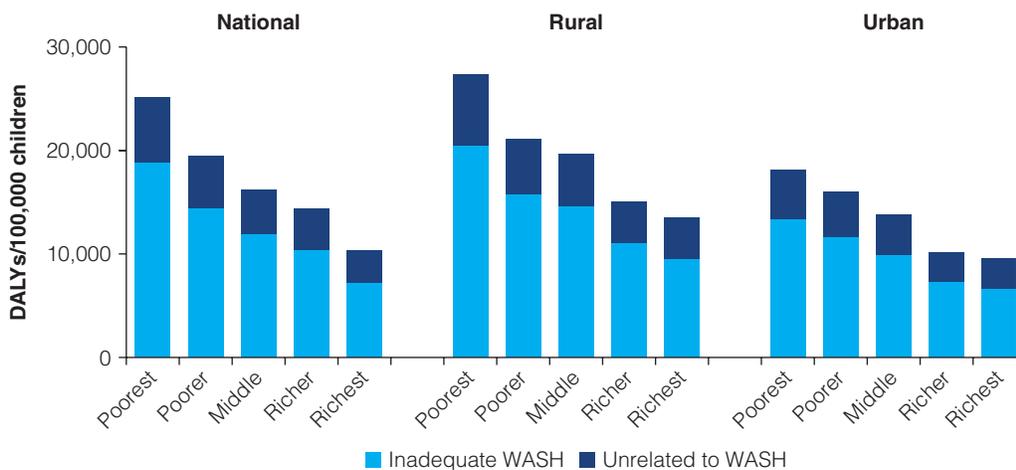
Figure 4.5: Incidence of Diarrhea among Children under Five, by Socioeconomic Level and Type of Drinking Water and Sanitation, Haiti



Source: Calculations using EMMUS 2012 data.
 Note: EMMUS = Mortality, Morbidity and Service Usage Survey; Q = quintile.

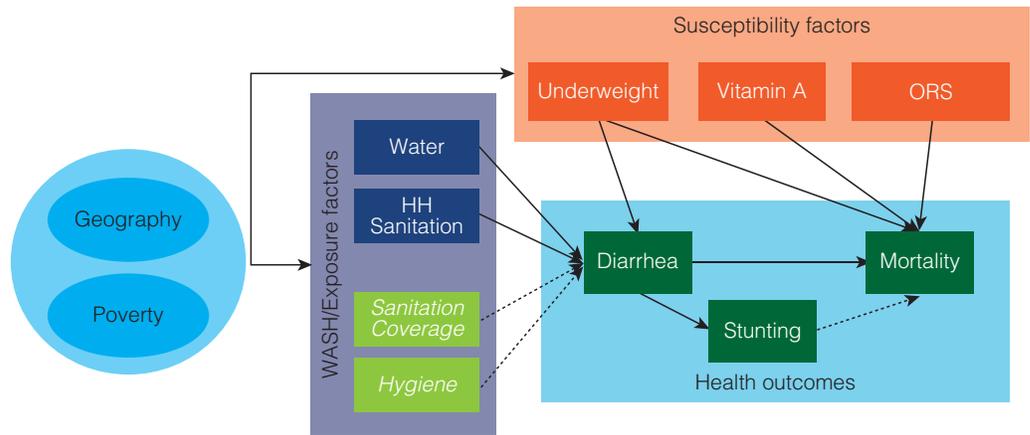
WASH and environmental health conditions determine exposure to enteric diseases, while nutritional status and access to adequate health care drive the susceptibility to and severity of the disease. Rheingans and others (2016) developed a poverty risk model (PRM; see appendix D), aiming to help understand the risk distribution of enteric diseases and inform the design and targeting of health care social development, and WASH interventions (figure 4.7). According to this analysis, enteric disease risk is negatively associated with wealth.

Figure 4.6: Total and WASH-Related Burden of Enteric Diseases, by Region and Wealth Quintile



Source: Rheingans and others 2016.
 Note: DALY = disability-adjusted life year; WASH = water supply, sanitation, and hygiene.

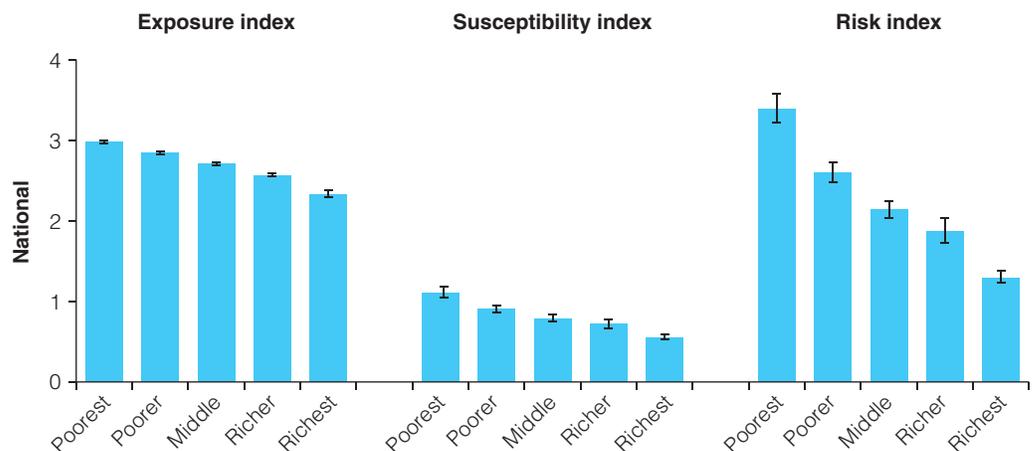
Figure 4.7: Conceptual Framework of the Poverty Risk Model



Source: Rheingans and others 2016.
 Note: HH = household; ORS = oral rehydration salts.

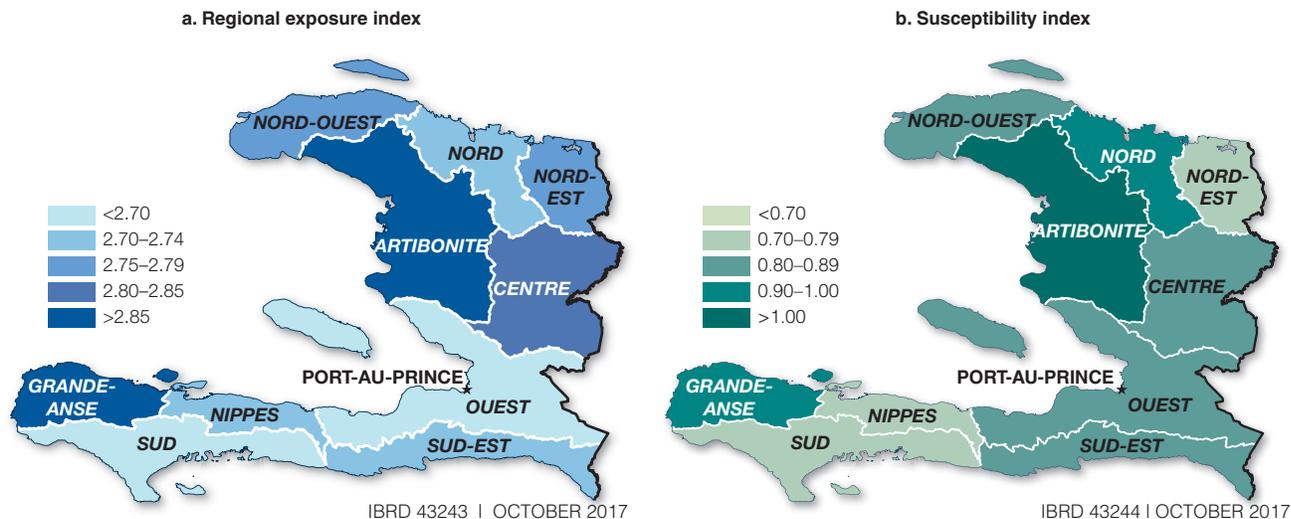
Although diarrhea affects poor and wealthier children alike, the mortality risk for children from the poorest households is 2.4 times higher than for children in richer households. The poorest are also more likely to live in households with higher exposure risk (figure 4.8). Children in poor households have higher susceptibility and risk than children in rich households, with the B40 having 50 percent of the cumulative share of susceptibility and risk. In urban and rural settings, the poorest (bottom 20 [B20]) children have twice the susceptibility and 2.4 times the risk as compared to the richest (T20). The rural B20 have twice the risk of the richest rural children, while the urban B20 have 2.4 times the risk of the urban T20. Forty percent of children with the highest risk bear approximately 70 percent of the risk, and this is similar in urban and rural settings. Susceptibility and exposure indexes vary greatly across geographical areas and are greatest in Grand'Anse and Artibonite (map 4.1). Children in the B40 have high

Figure 4.8: Enteric Diseases, Exposure, Susceptibility, and Risk Indexes for Children under Five, by Quintile



Source: Rheingans and others 2016.
 Note: Exposure index includes WASH-related elements that influence the risk of diarrheal disease while susceptibility index addresses individual risk factors, such as underweight, vitamin A, and oral rehydration therapy (ORT). The y-axis is a scalar for the indexes.

Map 4.1: Regional Exposure Index and Susceptibility Index, by Department

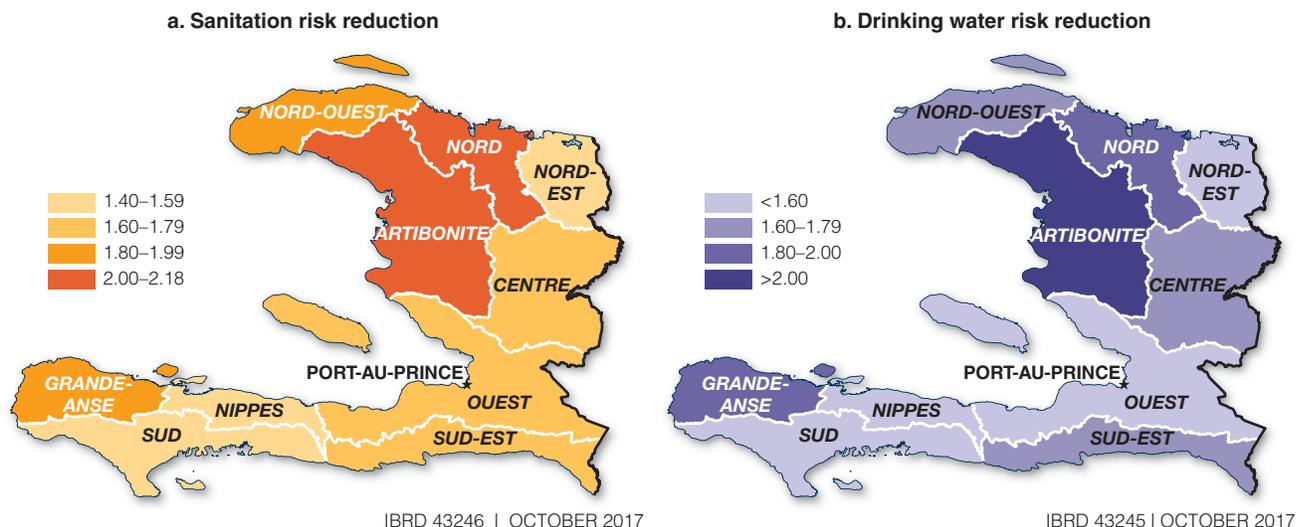


Source: Rheingans and others 2016.

exposure indexes (>2.80), but the index varies only modestly across regions. In 7 out of 10 regions, children from the B40 have the highest susceptibility indexes (>0.90) (map D.1).

Investing in improved WSS access in certain regions of Haiti could reduce the enteric disease risk index by two points. Map 4.2 shows the reduction of disease risk that could be achieved among children under five in each department if every household with unimproved water and sanitation was provided with improved access to water (map 4.2 panel b) and sanitation (map 4.2 panel a). If all households were provided with improved water access, Artibonite would experience the greatest reduction in risk for children under five (a reduction in the risk index value of >2.00), followed closely by Nord and Grand’Anse (>1.80 risk reduction). These three departments would also enjoy the largest reductions in risk from improvements in sanitation.

Map 4.2: Potential Enteric Disease Risk Reduction Associated with Improved Access to Sanitation and Drinking Water, by Department



Source: Rheingans and others 2016.

Notes

1. Underweight is defined as having a body mass index of less than 18.5. Stunting is defined as having a height-to-age score that is more than two standard deviations from the mean.
2. In appendix B, we give determinants of the likelihood a household had at least one member affected with cholera.
3. The disability-adjusted life year (DALY) is a measure of the overall disease burden, expressed as the number of years lost due to ill health, disability, or early death.

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Chapter 5

The Challenges of Government-Led Water and Sanitation Service Delivery

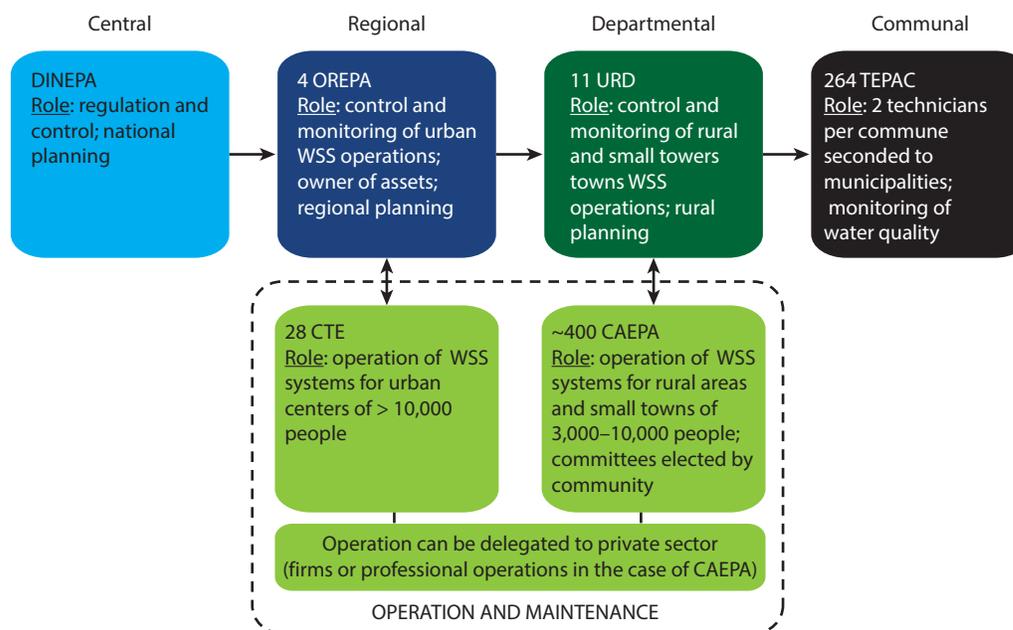
Quality and Financial Sustainability of Government-Led Service Delivery

The National Directorate for Drinking Water and Sanitation (Direction Nationale de l'Eau Potable et de l'Assainissement [DINEPA]) is Haiti's governance body, regulatory institution, executing agency, and water supply and sanitation (WSS) service provider. In 2009, Haiti promulgated a new water law and a WSS sector reform strategy for the reorganization and decentralization of the sector. The law created DINEPA—whose main responsibilities at the conclusion of the decentralization process would be policy formulation, sector coordination, and regulation—and allowed for the creation of regional agencies of DINEPA called regional bureaus of water and sanitation (offices régionaux de l'eau potable et de l'assainissement [OREPA]). Their main responsibility would be to support the community-based organizations (local water committees [CAEPA]) running rural WSS systems through rural development units (URD) and the community water and sanitation technicians (techniciens en eau potable et assainissement communaux [TEPAC]). Today DINEPA, the four OREPA, the URD (one per province), and the TEPAC (two per *commune*⁴) are in place (figure 5.1). However, the deconcentration process remains incomplete. OREPA and URD still lack the required capacities, and are neither technically nor financially autonomous. The central DINEPA is still focused on delivering infrastructure projects.

The quality of government-led water supply services is low in both urban and rural areas. The dispersed rural population is served through water points equipped with hand pumps and small towns through about 440 piped water systems (système d'alimentation en eau potable [SAEP]), which are mainly gravity fed and supplied by spring catchments. Water from the SAEP is delivered through standpipes in areas with scattered populations and through water kiosks and household connections in small towns.² Many of these water systems are managed by poorly performing CAEPA, which collect insufficient funds for operation and routine maintenance, in most cases because of a lack of professionalization. A substantial proportion of water systems are not operational, and less than 10 percent are equipped with chlorination devices (table 5.1).³ In urban centers with populations of more than 10,000, WASH services are provided by 24 urban water operating centers (centres techniques d'exploitation [CTE]),⁴ also part of DINEPA. Their performance is low.

CAEPA and CTE do not provide sanitation services. DINEPA replaced the organizations that led the Haitian water sector before the promulgation of the 2009 Framework Law: the Autonomous Metropolitan Center for Drinking Water (Centrale Autonome Métropolitaine d'Eau Potable) and the National Drinking Water Service (Service National d'Eau Potable). These organizations were responsible for providing drinking water services; they had no experience in sanitation. DINEPA assumed this new responsibility, creating a Sanitation Directorate, the highest level in its organizational structure. However, this directorate was equipped with just four professionals at the central office.

Figure 5.1: Institutional Structure of the Haitian WSS Sector



Note: CAEPA = local water committees; CTE = urban water operating center; DINEPA = National Directorate for Drinking Water and Sanitation; OREPA = regional bureau of water and sanitation; SAEP = drinking water supply system; TEPAC = sanitation technicians; URD = rural development units; WSS = water supply and sanitation.

Table 5.1: Kiosks and Standpipes Servicing Rural Areas of Haiti

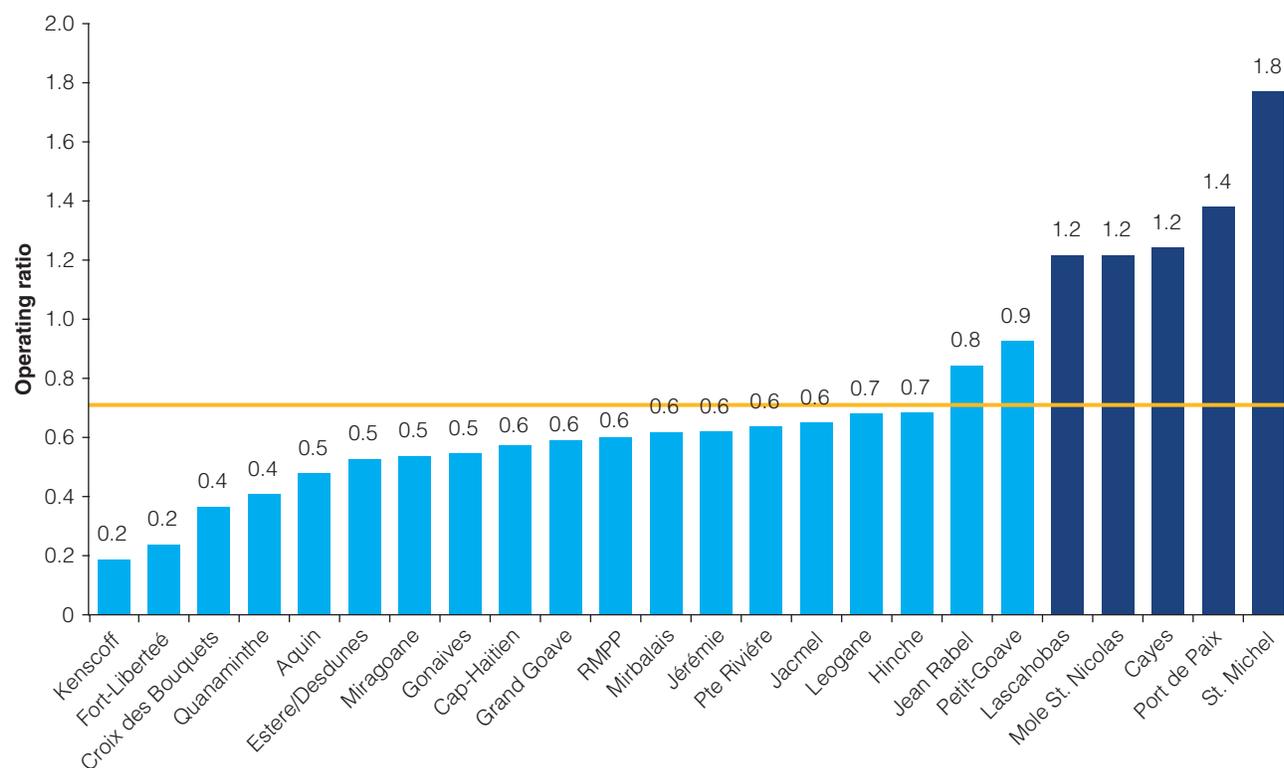
Department	Kiosks in SAEP			Standpipes			Number of private connections
	Total	Operational	Percent	Total	Operational	Percent	
Artibonite	258	120	46.5	299	211	70.6	11,201
Centre	78	46	59.0	216	109	50.5	4,093
Grand'Anse	88	36	40.9	51	32	62.7	1,727
Nippes	64	44	68.8	144	97	67.4	2,258
Nord	99	37	37.4	258	125	48.4	7,261
Nord-Est	34	22	64.7	89	48	53.9	1,631
Nord-Ouest	78	50	64.1	233	149	63.9	4,072
Ouest	141	85	60.3	151	75	49.7	3,643
Sud	189	75	39.7	640	353	55.2	13,199
Sud-Est	67	46	68.7	185	125	67.6	1,549
Total	1,096	561	51.2	2,266	1,324	58.4	50,634

Source: DINEPA 2016.

Note: DINEPA = National Directorate for Drinking Water and Sanitation; SAEP = drinking water supply system.

Water supply service delivery is far from being financially sustainable, even in urban areas. Sales exceed operating costs in just 5 of the 24 CTE, and the overall sales-to-operating cost ratio was 74 percent (figure 5.2). The CTE's annual consolidated operating deficit in fiscal year 2015/16 was HTG 167 million (about US\$3 million). It reflects inefficiencies (in FY 2014/15 the average number of CTE staff per 1,000 connections was 10.8), low tariffs, and poor

Figure 5.2: CTE Operating Ratios, Fiscal Year 2015/16



Source: Hamade and others 2016.

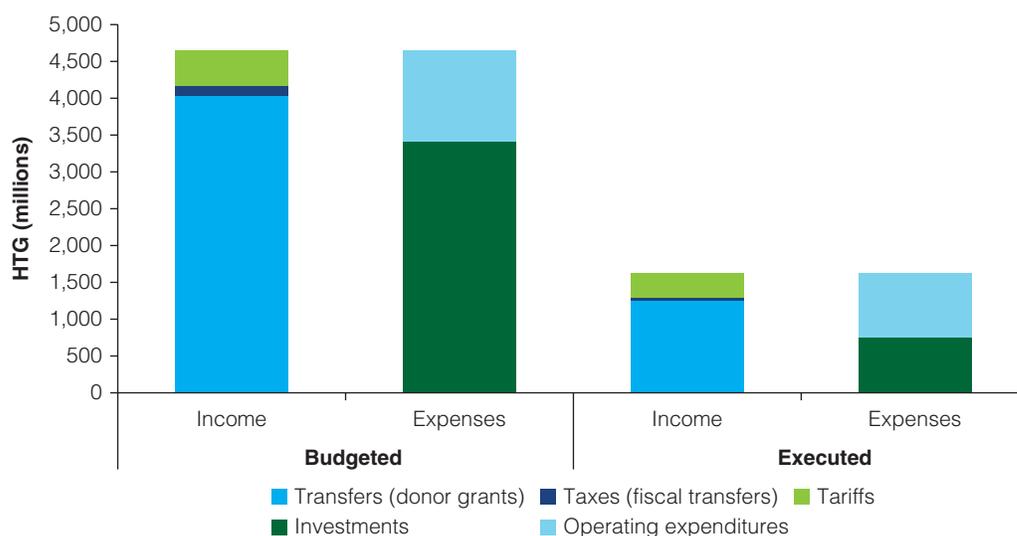
Note: Orange horizontal line represents the average CTE operating ratio. CTE = urban water operating center; RMPP = Port-au-Prince metropolitan area.

commercial practices (according to the Plan Stratégique Sectoriel, only about a third of clients pay their bills regularly).

Fiscal allocations made for WSS infrastructure investments have been historically low. During the past decade, the government expanded capital expenditures significantly, from 4.1 percent of GDP in 2005 to 13.5 percent in 2014. The expansion did not benefit the WSS sector, however. Financial flows to the sector between 2009 and 2015 totaled about US\$325 million, according to DINEPA (2016). In fiscal year 2014/15, total public WSS investments were US\$44.3 million, accounting for 63.5 percent of the overall DINEPA budget. These flows fall short of investment needs. According to recent estimates (World Bank 2014), providing universal access to improved water sources in only those 20 communes with the highest incidence of cholera (there are 145 communes across the country) would have required an investment of US\$123 million between 2014 and 2017.

Heavy dependency on donor financing makes WSS investments highly vulnerable to the availability of these resources. According to DINEPA (2016), between 2009 and 2015, 99 percent of transfers received by the sector were donor grants; just 1 percent were transfers from the national treasury (figure 5.3). Although fiscal transfers are currently a bit larger, they represent just 3.1 percent of DINEPA's overall budget and 2.7 percent of its investments. However, the long-term availability of financial resources could be considered a secondary problem, since DINEPA is currently unable to execute the scarce financial resources allocated to the sector. In fiscal year 2014/15 DINEPA executed 34 percent of total budgeted resources, and 22 percent of the expected investments.

Figure 5.3: DINEPA's Budgeted and Executed Incomes and Expenses, Fiscal Year 2014/15



Source: Hamade and others 2016.

Note: DINEPA = National Directorate for Drinking Water and Sanitation; HTG = Haitian gourde.

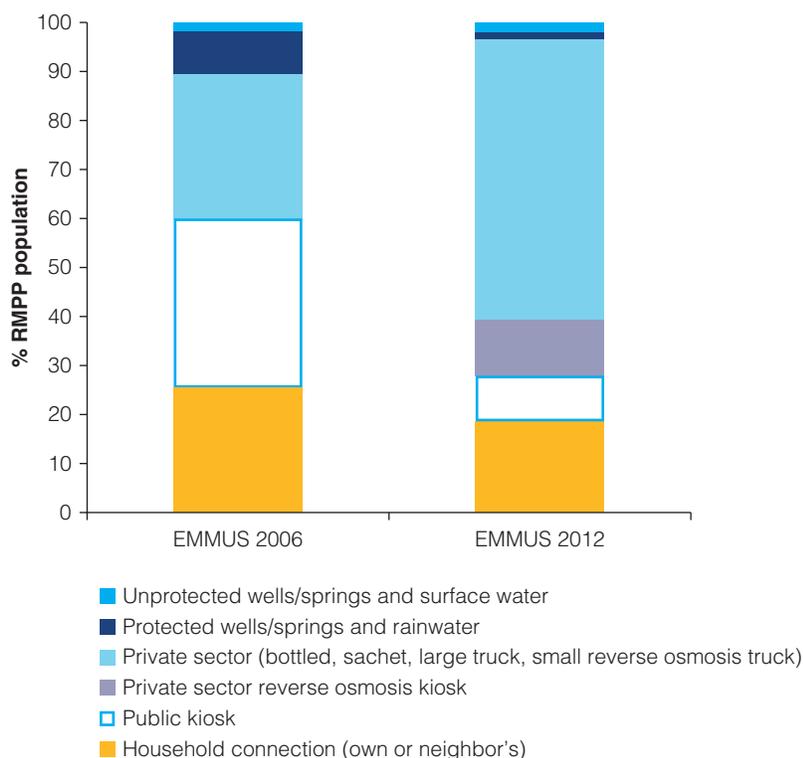
Failing to Cope with Urban Population Growth: The Case of Utility of Port-au-Prince

In Port-au-Prince, the collapse of the water distribution network that followed the earthquake and the thirst for safe water triggered by the cholera epidemic boosted demand for private water services. The share of the metropolitan population drinking water from the public network dropped from 60 percent in 2006 to 28 percent in 2012, while the use of private sources of drinking water⁵ increased from 30 percent to 68 percent (figure 5.4).⁶ However, as discussed further below, this drastic change in the metropolitan water market landscape did not come along with the required changes in sector policy instruments and regulations.

The number of people drinking the water distributed by the public utility is today significantly lower than before the earthquake. Nonetheless, CTE in the Port-au-Prince metropolitan area (région métropolitaine de Port-au-Prince [RMPP]) were struggling to cope with population growth long before 2010: the share of Port-au-Prince's households that used a household tap fell from 32 percent in 1994 to 25 percent by 2006 and 18 percent in 2010, following the earthquake (figure 5.5). In absolute terms, the connected population remained more or less constant during this 20-year period, during which the population more than doubled. However, by 2012 more than half of households using a domestic connection were using a neighbor's connection, so the true number of private connections had decreased by even more than shown in figure 5.5.

The sharp reduction of the number of clients served by public kiosks and fountains also highlights shortcomings in the management model adopted by the CTE to serve the poorest. The public kiosk model saw some success and scaled up rapidly in the late 1990s, thanks to the support of GRET, a French NGO, starting in 1995 (figure 5.5). These kiosks are predominantly in "disadvantaged areas," the poorer neighborhoods of the city. The new model was pay-per-use standpipes and kiosks, supplied through the public water network, and managed by local water committees (*komités dlo*). Between 1995 and 2000, 50 committees were established in Port-au-Prince. Figure 5.1 shows that by 2006, 35 percent

Figure 5.4: Main Sources of Drinking Water in the Port-au-Prince Metropolitan Area, 2006 and 2012



Source: Calculations using EMMUS 2006 and 2012.

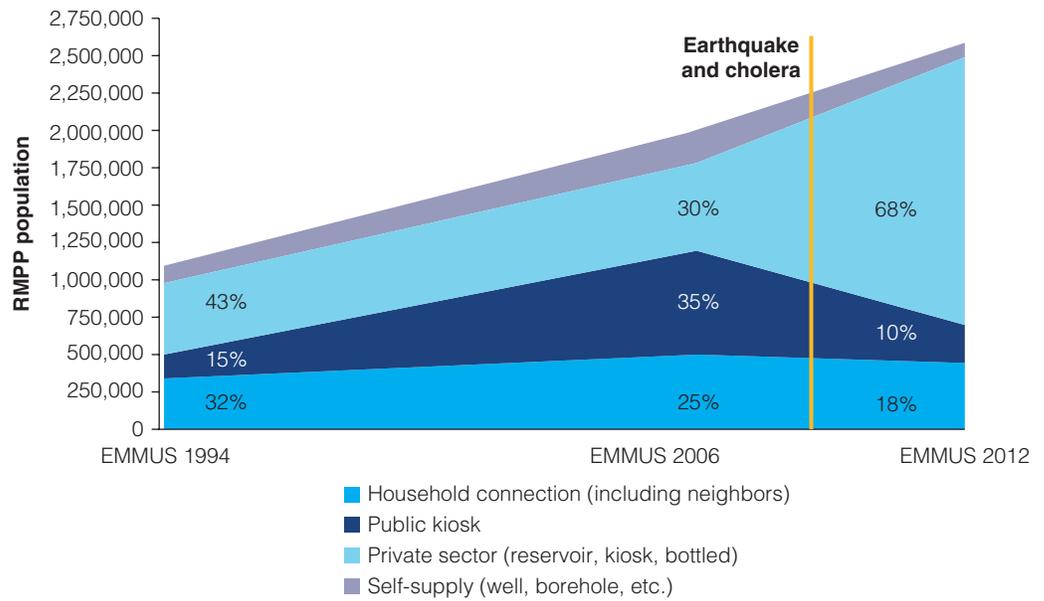
Note: EMMUS = Mortality, Morbidity and Service Usage Survey; RMPP = Port-au-Prince metropolitan area.

of the population (approximately 700,000 people) were using public kiosks for drinking water. It is possible that, at their height, close to 1 million people relied on public kiosks for water for domestic purposes. However, by 2012, only 18 percent (approximately 450,000) were using water from public kiosks for domestic purposes and 11 percent were using them for drinking purposes. In short, the number of people using public kiosks (for any purpose) probably halved between 2006 and 2012.

Service continuity has always been problematic for CTE RMPP, forcing its consumers to look for alternatives even when they have a connection. Clients are serviced 26 hours a week on average (Egis 2013). This low level of service is a consequence of its low production capacity (about 161,000 cubic meters [m³]/day, that is, approximately 62 liters per person per day), which has not increased significantly over the last 20 years, and high water losses, which are estimated to account for 35 percent of the produced volume. Commercial losses, which include illegal connections, are even higher, and as a result total unbilled water in 2012 accounted for 83 percent of withdrawn water volume. Moreover, just 70 percent of invoiced water sales are paid.

The CTE is prioritizing the enhancement of service delivery to more profitable nondomestic clients to improve its financial situation. In 2015, the CTE's billed volume represented just 39 percent of total production. Given that the recovery rate was 54 percent, just 21 percent of produced volume was paid for. Public kiosks represented only 1.3 percent of CTE's billing in 2015 (according to IDB data). However, CTE appears to have prioritized the richer residential areas and nondomestic clients, who provide its most commercially viable services. Just 14 percent of the distributed volume (15,000 m³/day) reaches the disadvantaged neighborhoods (equivalent to 15 liters per person per day [lpd], according to IDB data); 42,000 m³/day are

Figure 5.5: Share of the Port-au-Prince Population, by Source of Drinking Water Used, 1994, 2006, and 2012

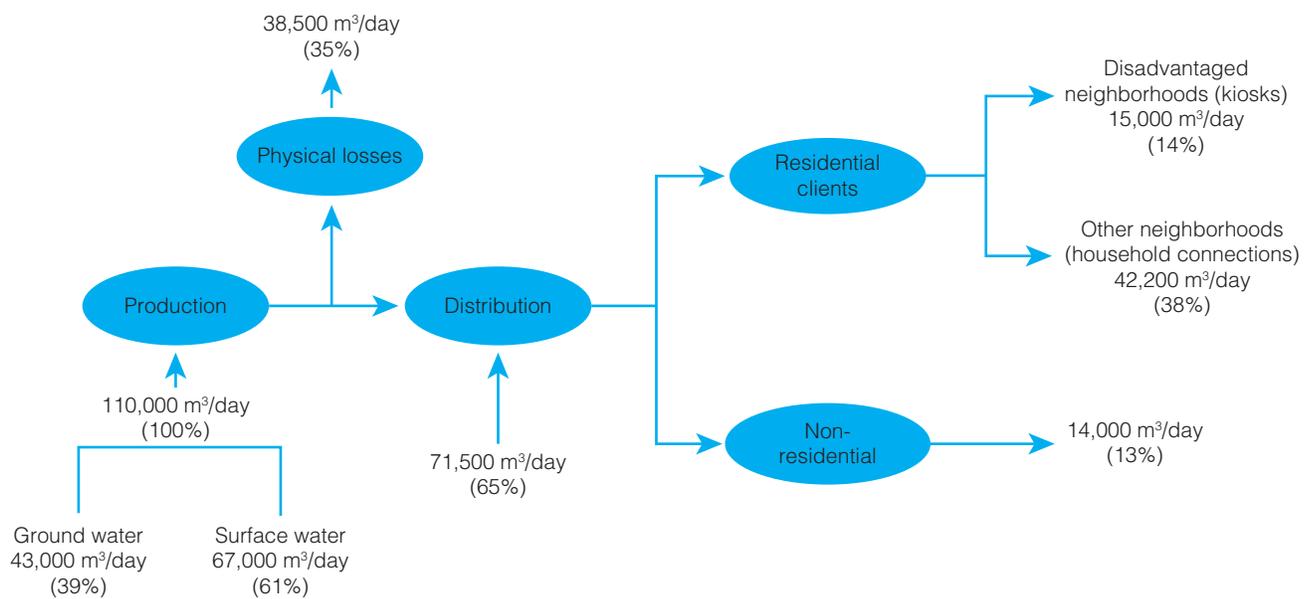


Source: Calculations using EMMUS data and population estimates from the Haitian Institute of Statistics and Informatics.
 Note: EMMUS = Mortality, Morbidity and Service Usage Survey; RMPP = Port-au-Prince metropolitan area.

distributed to other residential areas (equivalent to 35 lpd), and 14,000 m³/day are sold to industrial and major commercial establishments (figure 5.6).

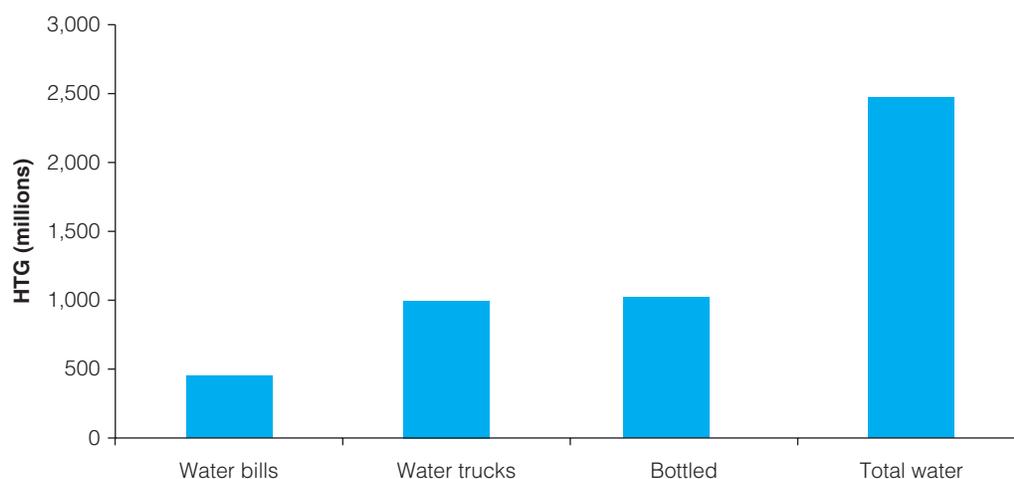
The CTE's share in the metropolitan domestic water market in 2012 was less than 20 percent. The average metropolitan household spent US\$113 on water in 2012, according to calculations based on data from the 2012 ECVMAS. Total domestic water expenditures were

Figure 5.6: Water Flows Managed by CTE RMPP, 2015



Source: IDB data.
 Note: CTE RMPP = Port-au-Prince metropolitan water utility; IDB = Inter-American Development Bank.

Figure 5.7: Accumulated Household Water Expenditures, by Source of Water, Port-au-Prince, 2012



Source: Calculations using data from ECVMAS 2012 (values in HTG million; HTG 41.6 = US\$1).

Note: HTG = Haitian gourde.

US\$60.3 million, out of which just US\$11.1 million (18 percent) corresponded to payments of water bills (figure 5.7). This share is even lower if one looks at industrial and commercial water users in the city, as discussed in the following section.

According to the CTE's 2016–21 business plan, there will still be significant room in the medium and long term for the private sector in the metropolitan water market, particularly to serve the poor. According to this plan, the number of domestic connections would rise from 46,000 in 2015 to 88,000 in 2021, while the number of functional public water kiosks would increase from 185 to 250. In the best-case scenario, the number of households served by the public utility would increase by 142,000 connections between 2012 and 2021 while the total number of households in the metropolitan area will increase by 101,000 during the same period. The market for private sector providers would thus shrink by about 10 percent, which could translate into increased competition among service providers if the ambitious CTE's business goals are achieved.

Notes

1. A *commune* is the second-lowest administrative level, equivalent to a municipality.
2. Standpipes (*fontaines*) distribute water for free; kiosks sell water.
3. DINEPA's performance-monitoring system, which monitors roughly half of the SAEP, estimates that 41 percent of standpipes and 45 percent of kiosks are not operational.
4. Twenty-five CTE exist, but one is not functioning.
5. The term *private sector* refers here to all services that are not public (connections and public kiosks) or self-supplied (wells, springs), such as private kiosks, reservoirs, and sellers of bagged water.
6. Significant population movements took place during this period, with an exodus accompanying the initial disaster followed by a return once the humanitarian response scaled up. In 2012, several hundred thousand people were still living in camps for internally displaced people (ECVMAS 2012 put the figure at 390,000). The EMMUS data analyzed in this study relate exclusively to the noncamp population.

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Chapter 6

The Response of the Private Sector: The Case of the Port-au-Prince Metropolitan Area

As explained, the private sector has taken advantage of the lack of government response capacity and the increased demand for improved water services triggered by the cholera outbreak, particularly in fast-growing urban areas. According to *Enquête Mortalité, Morbidité et Utilisation des Services* (Haiti Mortality, Morbidity and Service Usage Survey [EMMUS]), the percentage of Haitians who resorted to the private sector to satisfy their drinking needs increased from 10.9 to 25.8 percent between 2006 and 2012. In urban areas, this figure was even higher: 57.1 percent for the Port-au-Prince metropolitan area and 45.5 percent in all other cities (figure 3.7). This includes bottled and bagged water, trucked water, and treated water sold by private companies.

The Water and Sanitation Sector Reform Strategy calls for a greater collaboration with the private sector for water supply and sanitation (WSS) service delivery. However, when it comes to drinking water supply, the steps taken so far to articulate this collaboration have focused on the delegation of management responsibilities of piped networks to the private sector rather than on improving the quality and affordability of the water provided by the private sector to a quarter of the population through existing service delivery mechanisms. On the other hand, the recently promulgated National Sanitation Strategy calls for focusing government efforts on creating the enabling environment for the private sector to satisfy an increased demand for safely managed sanitation services. Particularly, the strategy suggests moving away from subsidies toward a market-based approach in which the DINEPA would focus on (a) triggering demand for safely managed sanitation services, (b) strengthening the capacity of the private sector to satisfy this increased demand, and (c) collaborating with other relevant authorities to create the legal and regulatory framework for this new sanitation market. These three pillars of the strategy are referred to as the “education, services, and laws triade.” However, progress in the implementation of the strategy have been mainly in the domain of demand creation for improved sanitation facilities, and not for safely managed pit emptying and fecal waste treatment services (designated hereto as fecal sludge management services, or fecal sludge management [FSM] services).

The following subsections help to understand private WSS service delivery in Haiti, bringing some light on the functioning of the Port-au-Prince water supply and FSM services markets. The Port-au-Prince metropolitan area has the largest and most sophisticated WSS market in Haiti, but not the fastest growing; the market in other cities of the country is booming. Therefore, by understanding this phenomenon in the capital, we may anticipate issues and opportunities to arise in other urban areas in the future. Although the market is smaller in rural areas than in urban areas, due to a lower concentration of potential demand, lower incomes, and greater access to free (and in many cases unimproved) water sources, by understanding private water and sanitation businesses we may be better prepared to structure successful public-private partnership schemes to serve rural communities.

The Metropolitan Water Market

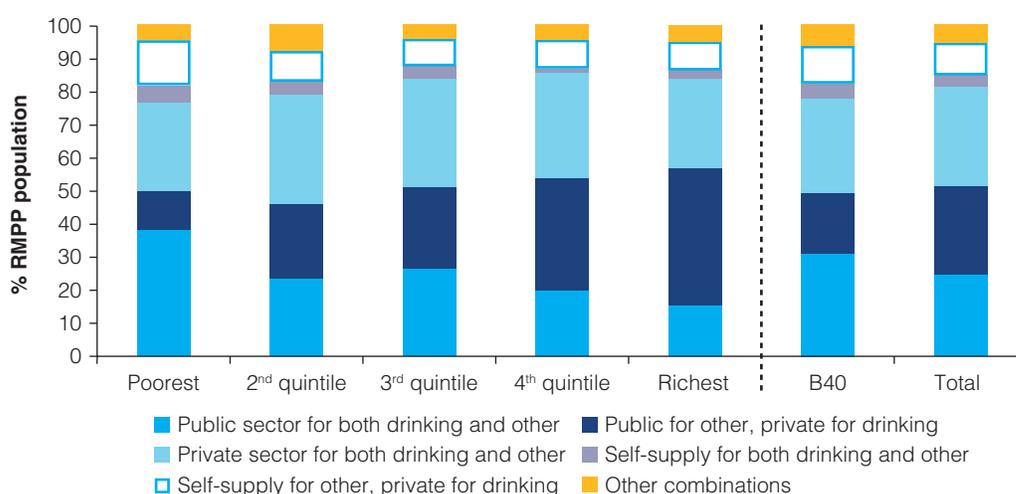
The Household Water Mix: Alternatives and Choices Made by the Metropolitan Poor

Although around half of the metropolitan population have access to the public water network, less than a third use it for drinking purposes. Findings from focus group discussions (FGDs) undertaken in 2016 as part of this study suggest that almost all households with access to utility water—either through a private household connection, through a neighbor, or a public kiosk or standpipe—use this source of water for drinking, other domestic purposes, or both. This seems to be due to the low price charged by the metropolitan water utility (CTE RMPP) as compared to the price of other service providers. Considering this finding while interpreting ECVMAS data, around 55 percent of the metropolitan population had access to the water network in 2012, although just 28 percent used the utility as the main source of water for drinking purposes (figure 6.1). According to FGDs, the difference between access to utility water and drinking consumption rates seems to be due to the perceived quality of water.

Households’ “water mix” is associated with wealth. In Port-au-Prince, poorer households are much more likely to use the public sector (domestic connections and public kiosks) for both drinking water and other domestic uses (figure 6.1). Conversely, richer households are far more likely to use a private water service for drinking water and the public network for other domestic purposes. However, even though use of the public network by poorer households is relatively high, the per capita volumes delivered to disadvantaged areas are low; quality is poor and service intermittently low.

Use of the private sector is common, with 67 percent of Port-au-Prince’s population and 59 percent of the B40 using it for either drinking, domestic purposes, or both (figure 6.2). While this is a remarkable penetration, the private sector still has market share to capture amongst the poorest quintile, if their prices become more competitive and the utility service does not improve.

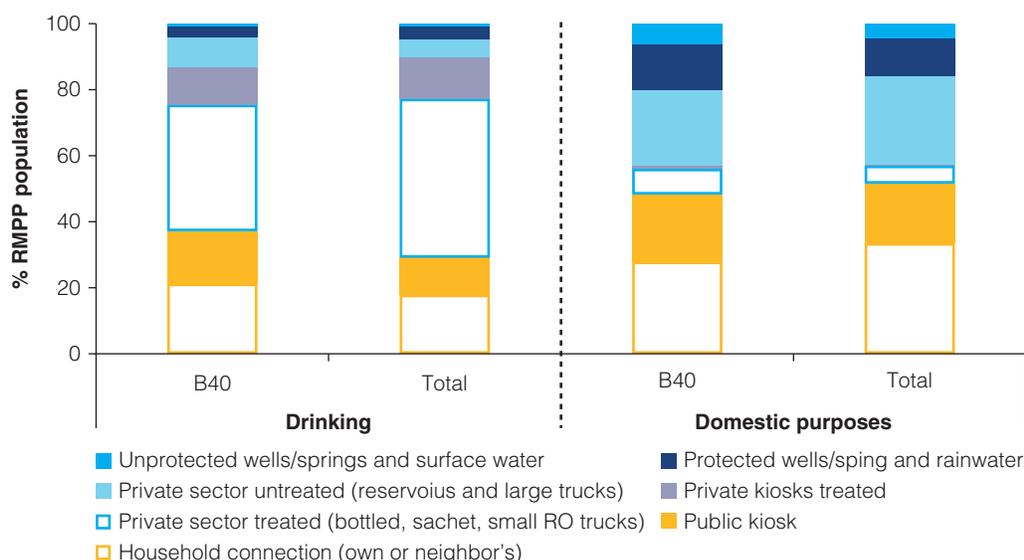
Figure 6.1: Prevalent Household “Water Mix” Decisions across Consumption Quintiles



Source: Computations using EMMUS 2012.

Note: EMMUS = Mortality, Morbidity and Service Usage Survey; RMPP = Port-au-Prince metropolitan area.

Figure 6.2: Detailed Data on Water Choices, Citywide and for the Bottom 40



Source: Estimations based on ECVMAS 2012.

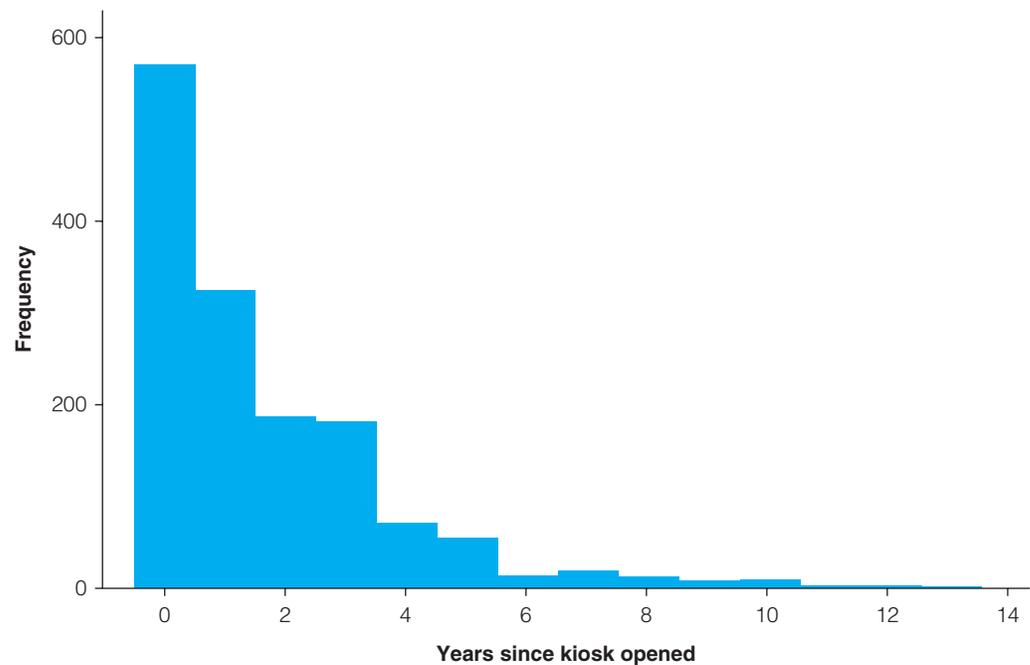
Note: B40 = bottom 40 percent; ECVMAS = Post-Earthquake Survey of Household Living Conditions; RMPP = Port-au-Prince metropolitan area; RO = reverse osmosis.

Privately managed kiosks selling water treated by reverse osmosis (RO) are the most common source of drinking water for poor households that have no access to the utility water network. To access the service, customers bring their own 5-gallon *bokit* (bucket), which the kiosk manager fills for about HTG 5 (US\$0.08) per gallon.¹ About 300,000 people used these private kiosks as their main drinking water source in 2012. This figure should be well above 600,000, as suggested by the increase in kiosk numbers and the discontinuation of RO-treated water producers' delivery of water directly to final consumers.² According to a study by the U.S. Centers for Disease Control and Prevention (CDC) in 2013, 45 percent of the 1,340 private kiosks surveyed started operating during the previous year (figure 6.3).³ This indicates that demand for safer drinking water sources boomed after the earthquake. As part of this study, the CDC examined the water quality in the kiosks. It found that 100 percent of the samples collected from distribution trucks ($n = 12$) and 91 percent of samples collected in kiosks ($n = 757$) were free of *E. coli* contamination. Turbidity and total dissolved solids (TDS) were also at acceptable levels, as per the World Health Organization (WHO) standards, and pH seemed to be slightly lower.

Sachets are the other main treated water option used by the B40, with bottled water also used on occasion. Small bags of RO-treated water are available from an estimated 6,000 street sellers and from small shops. They sell for HTG 1–2 (US\$0.02–0.03) per bag, making them both affordable and the most expensive option on a per-liter basis (discussed further below). Participants in FGDs reported that many households use bags as their primary drinking water source; survey data are not sufficiently disaggregated to estimate the number of users. Bottled water is available from shops in various sizes but is rarely used by the B40. Tests undertaken for this study reveal that bagged water is of good quality.⁴

Underground water distributed by tankers and resold at private reservoirs is the main source of water for domestic purposes for households not connected to the utility network. These reservoirs are underground storage basins to which people can bring their 5-liter *bokit* and fill it for around HTG 7 (US\$0.11) from the owner-manager. Such managers are typically middle-class households who can afford to get such a reservoir installed and to pay the lumpy cost of having it refilled by a large truck. Estimates for this study suggest that there are about 12,500 reservoirs used for reselling (while there were only 185 public kiosks in 2015). The water is

Figure 6.3: Average Age of Private Kiosks, 2013



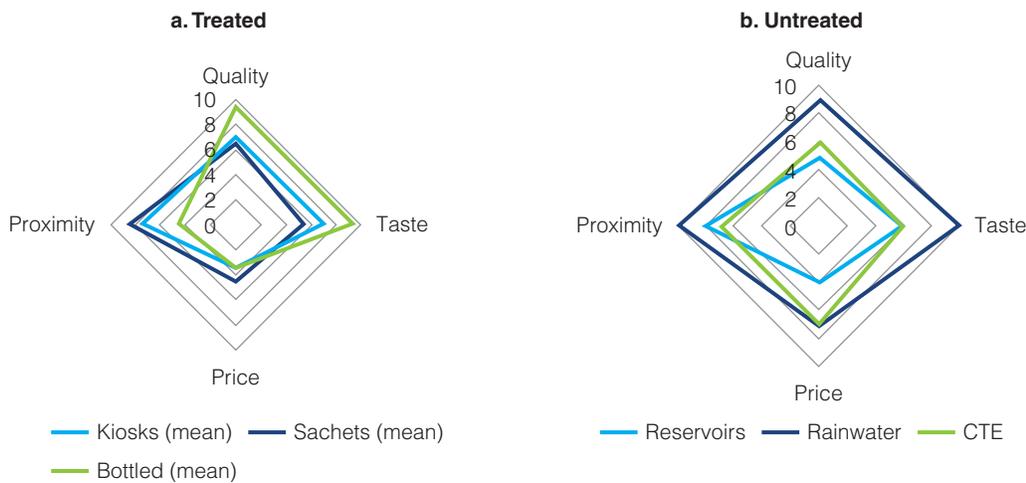
Source: CDC 2013.

perceived as low quality by focus-group participants, has high TDS concentrations, and is commercialized untreated. For this reason, its purchasers who number around 700,000 primarily use it for domestic purposes. Nonetheless, some 170,000 people did use this as their primary drinking water source in 2012, usually after adding chlorine or something similar, though this number may have fallen by now as the private kiosk system has expanded.

Other options include rainwater harvesting, self-supply solutions, and purchases from resellers of network water obtained from illegal connections. Rainwater harvesting is a common seasonal practice, usually achieved by leaving buckets outside rather than capturing the rainwater via roofs. As rainwater is not available during the dry season, demand for and prices of private water services increase. Illegal connections to the network are an important challenge for the utility. The utility estimated that 27,760 illegal household connections could be regularized between 2012 and 2016, which would represent 84 percent of the legal connections existing at the start of the period. Illegal connections exist throughout the network; they are more common in gang-dominated areas, such as Martissant, where the utility and police are powerless to act. Illegal connections near broken pipes can access water directly from the street. Entrepreneurial individuals also come with pickup trucks to fill a small tank installed in the back.

FGDs reveal that there are various determinants of a household's decision about which services to use. Radar charts show how female participants scored various service options in terms of the quality, taste, proximity, and price of the water supply (figure 6.4). Rainwater is clearly the first preference, given that it is free, tastes good, and can be harvested on-plot. Among treated water options, bottled water is rated highly for quality but considered expensive; people in the B40 use it only for sick children. Kiosks come next in terms of quality and taste, with bags third. Water bags are perceived to be easier to access and cheaper. In fact, on a per-liter basis, bags are more expensive than other options (figure 6.5). The public network is

Figure 6.4: Scoring of Service Options on Key Parameters by Female Focus Group Participants

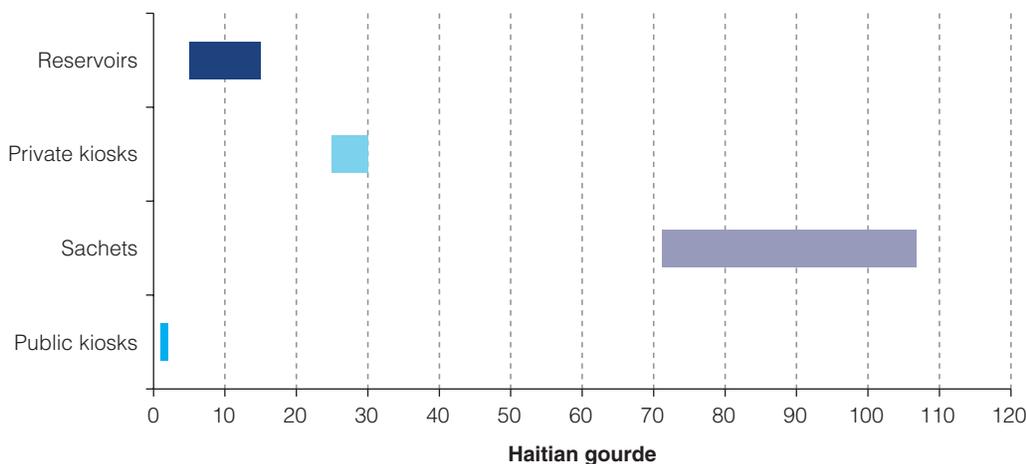


Source: Oxford Policy Management 2017.
Note: CTE = urban water operating center.

considered cheap, but of low quality. Nonetheless, it is important to recognize that it scores higher than reservoirs for quality and price, and the same on taste. This implies that people would rather have network water than reservoir water if it was available in their area when needed.

Households without access to CTE’s network dedicate between 50 and 70 percent of their water expenditures to nondrinking domestic water uses. This approximate share of water expenditures, estimated based on the analysis of ECVMAS data and information gathered through FGDs, varies seasonally as rainwater is harvested by the population and prices offered by private water service providers decrease during the rainy season. This, along with the fact that in 2012 the average metropolitan household dedicated US\$113.2 to purchase water—that is 9.8 percent of total annual household expenditures—highlights the importance of working on improving affordability of the main water sources employed for both water uses.

Figure 6.5: Twenty-Liter Bokit Price per Source of Water

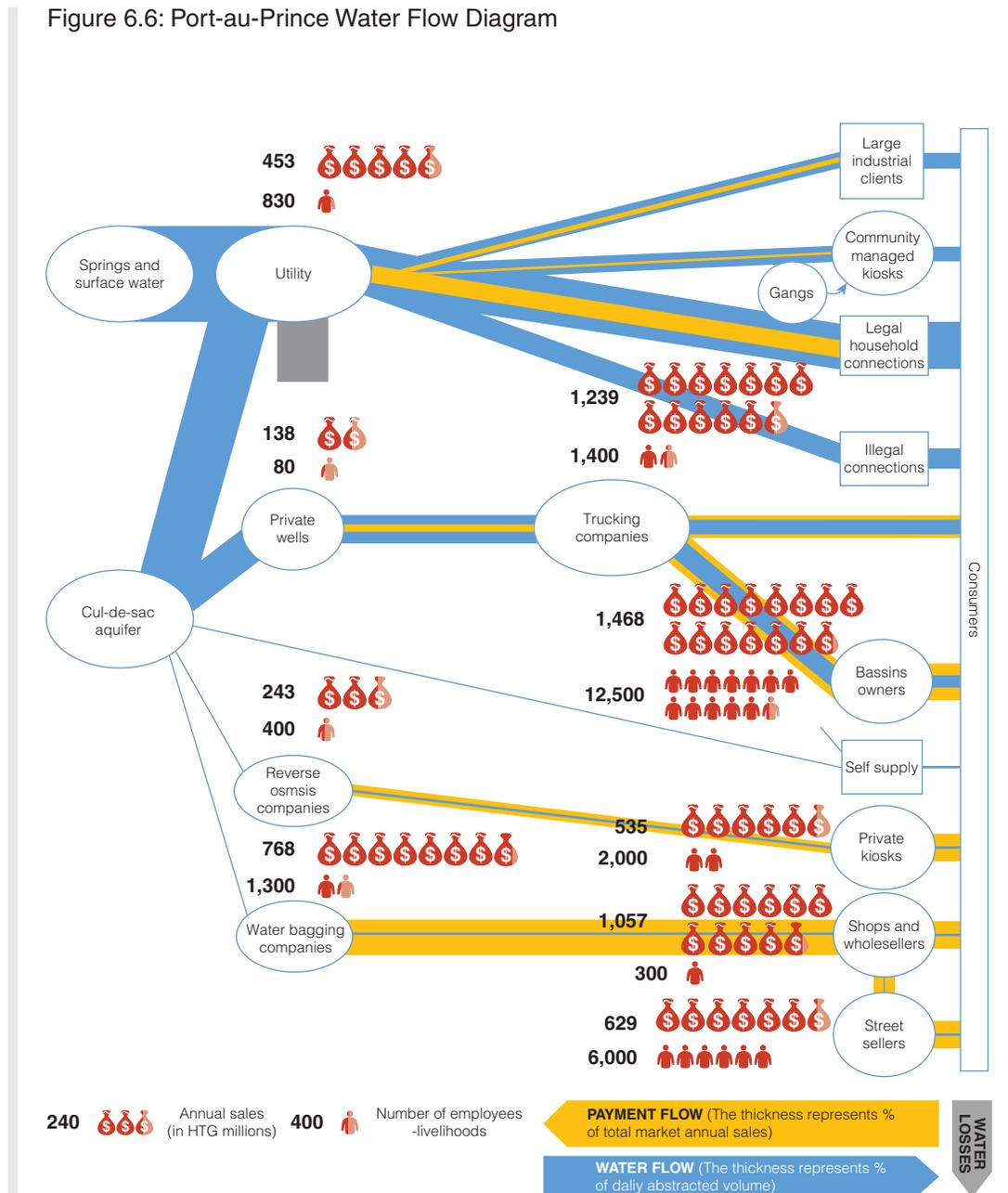


Source: Oxford Policy Management 2017.

Understanding Alternative Service-Delivery Chains

Although the share of CTE in the metropolitan water market is relatively small both in terms of sales and number of clients, the utility withdraws and distributes three times more water than the private sector. Figure 6.6 illustrates estimates of water volumes distributed, revenue generated, and people employed by the stakeholders managing each of the links of the different water service-delivery chains. These estimates were developed based on secondary data information gathered through interviews with service providers and consumers. According to these estimates, the volume of water distributed daily by the CTE and private service providers in Port-au-Prince is 77,000 m³ and 25,000 m³ respectively. However, estimated 2016 annual CTE sales represented just 36 percent of total market sales, excluding bottled water: US\$19,705,944 (revenue figure is significantly lower, since recovery ratio is

Figure 6.6: Port-au-Prince Water Flow Diagram



Note: HTG = Haitian gourde.

around 56 percent) versus US\$34,015,873. The livelihood of around 24,500 families in Port-au-Prince depends on the water market, that is, around 4.4 percent of the population in the metropolitan area, while the utility employs only 830 people.

Most of Port-au-Prince’s water service providers rely on the same overexploited aquifer. About 60 percent of CTE RMPP’s daily water abstractions (110,000 m³) comes from springs, with the remaining 40 percent coming from the Cul-de-Sac aquifer. This is the same aquifer where almost all the private water providers servicing Port-au-Prince have their production works. Likewise, those households relying on self-supply are mostly in the communities on the Plaine where groundwater is relatively accessible by shallow wells with hand pumps. Finally, also farmers preestablished in the area and the majority of large industries in Port-au-Prince running self-supply systems abstract water from the Cul-de-Sac aquifer. Consequently, this aquifer is experiencing a major saline intrusion—salinity levels have increased in a 10-year period.

There are 18 private pumping stations in the Cul-de-Sac area that are servicing water trucks. Filling a 12 m³ tanker at a pumping station costs HTG 200 (US\$3.20). Annual sales are estimated at HTG 138 million (US\$2.2 million), the equivalent of average production of 23,000 m³/day, although abstractions during the dry season could be up to two times higher than during the rainy periods. Sixteen of these pumping stations are located in the Tabarre and Cite-Soleil; they withdraw water from the Cul-de-Sac aquifer. Two smaller pumping stations are located 750 meters above sea level in Delmas, in the area of Pétion-Ville. The pumping capacities of these installations range are 900–10,800 m³ per day. The stations operate seven days a week and employ three to six operators each. With the exception of the two small pumping stations in Delmas, which are owned by entrepreneurs who also run a water tanker distribution business, all pumping stations are open to any tanker. After a period during which DINEPA and Oxfam collaborated with the owners of the pumping stations and chlorinated all water sold free of charge, untreated water is again being distributed from these installations.

Water tankers deliver water to final consumers and water resellers. The number of trucks in circulation is about 700. On average, tankers make two deliveries a day in the rainy season and five in the dry season. The market is highly fragmented, without consolidated companies operating large fleets. Nevertheless, price competition appears very limited. Delivery prices vary by neighborhood but are fairly uniform across service providers (see table 6.1). The average price of a 12 m³ tanker is HTG 1,800. The fragmentation of this market segment stands in contrast to the kiosk and bagged-water markets, probably because trucks sell raw untreated water mainly for domestic purposes and so require no brand to inspire confidence in its quality.

Reservoir resellers in Port-au-Prince (which number an estimated 11,000–14,000) account for about 60 percent of total volume of water distributed by trucking companies (23,000 m³).

Table 6.1: Trucked Water Prices per Neighborhood

	Min. distance and price (HTG)	Max. distance and price (HTG)
Plaine	1,250	2,000
Tabarre	1,500	1,750
Delmas	1,500	2,000
Downtown	1,500	2,000
Freres	1,750	2,000
Petion-Ville	2,500	3,000
Carrefour	1,500	2,500

Source: Oxford Policy Management 2017.

Note: HTG = Haitian gourde.

The price charged by these resellers for a *bokit* is generally constant within a local area during a season. However, it can vary greatly between areas and seasons, ranging from HTG 5 to HTG 10 (US\$0.08–0.16) for most of the year but reaching HTG 15 (US\$0.24) in the dry season in remote areas. The estimated annual aggregated sales of all trucking companies and reservoirs owners is HTG 1.14 billion (US\$18.1 million).

Three major companies supply more than 75 percent of the RO-treated water that is sold in private water kiosks. The larger companies, which serve kiosks in all four communes integrating the metropolitan area, treat pumped groundwater by RO and use their own trucks to distribute water to private kiosks. These bear the name and branding of the RO companies, but are franchised to the owner of the building. For the installation of a new kiosk, the future owner approaches a producer to negotiate water delivery arrangements, but all commercial risks rest with the franchisee. The latter constructs the kiosks at its own cost (construction costs range from HTG 50,000–250,000) and purchases all the equipment and associated installation services from the franchisor for around US\$1,200. No authorization is required and the whole process may take only 10 days. The norm is to split the revenue from the sale price equally—for example, a *bokit* typically costs HTG 5 (US\$0.08) of which the franchisee and truck company each take HTG 2.5 (US\$0.04).

Five smaller producers hold an additional 15 percent of the private kiosk market, and 59 microproducers share the remaining 9 percent. These microproducers usually treat water on-site and purchase bulk water from a tanker or get it from the CTE network. Since larger players focus on upstream segments of the market and franchise distribution, and franchisees are not engaged in any type of collective action, these small producers have been able to survive so far. The RO water delivery trucks are far smaller than the bulk water trucks mentioned above, with tanks typically a third of the size. This allows them to enter narrow streets in poorer neighborhoods. The estimated daily volume and annual value of water commercialized through private kiosks is 1,000 m³/day and HTG 290 million (US\$4.6 million).

The bagged-water production market is also very concentrated, but its distribution is atomized. Similar to the kiosk service chain, a company treats pumped groundwater by RO, but then packages it into plastic bags of about 0.3 liters. These are sold to wholesalers in sacks of 60 bags, who sell them on to large or small retailers, and finally to street sellers. As with the kiosk chain, the company does not manage the frontline sales operation. Sachets are quite a popular means of quenching one's thirst while out in the street, and can be bought from a street seller at any crossroad, or from small shops. As with the kiosk market, there are three dominant companies capturing 75 percent of the market (one alone with 40–50 percent). Thereafter 10–15 smaller companies share 20 percent, operating at the level of specific zones or districts, and around 30 microenterprises take the rest.

Despite the similarities with the private kiosk segment of the market, none of the large or small companies working in each of these two segments are actually active on both (just some microproducers). Wholesalers and retailers do not place orders with the bagging companies. Drivers of the delivery trucks play the role of commercial agents: they look for clients and are paid based on the number of units sold. The estimated equivalent daily volume of water bags sold commercialized through private kiosks is 800 m³/day.

The Operating Environment of Private Water Service Providers

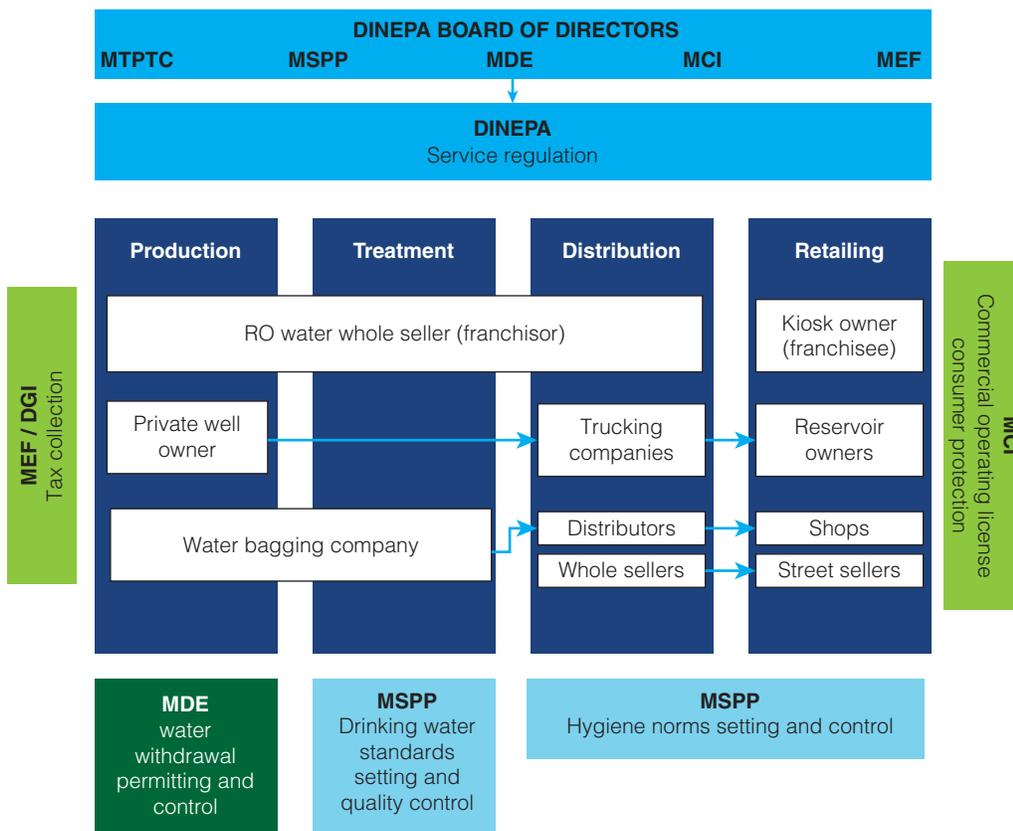
There is little price competition among players operating in each of the links of the different service-delivery chains. Large bulk sellers of RO-treated water pact prices and focus on competing based on quality and branding strategies. Market leading franchisors set retail kiosk prices and the other players follow. In September 2016, there was a published agreement between the four biggest kiosk companies to raise the sale price from HTG 5 to HTG 7 (US\$0.08–0.11) per gallon. The letter goes on to explain that this is due to “the devaluation of the gourde, the increase in the cost of living and operating costs.” The agreement also fixes

the wholesale sale price (to franchise kiosk owners) at HTG 3.50 per gallon. In this context, the companies compete more on branding related to water quality and taste. On the other hand, as explained above, trucked water prices vary by neighborhood but are uniform across suppliers. Furthermore, existing relationships with suppliers dominate. Few reservoir owners call different truck companies to get a better price, even though in theory they could turn the fragmentation to their advantage.

Most DINEPA officials seem to believe that the regulatory authority of the institution is limited to water service providers managing piped systems. Article 6 of the 2009 Framework Water Law gives DINEPA the following capacities and responsibilities (among others): (a) developing national water and sanitation policies; (b) regulating the provision of WSS services; (c) approving tariff schemes proposed by the operators of the “sanitation and drinking water distribution systems” (*Adduction d’Eau Potable et Assainissement* [AEPA] systems); (d) granting operating permits to private operators of AEPA systems; and (e) approving concession contracts for the management of AEPA systems. All these provisions seem to suggest an authority over all types of WSS service providers. However, many DINEPA officials seem to interpret the AEPA as piped-water distribution systems.

This narrow interpretation of the water law is mainly because DINEPA is still de facto an executing agency and an operator of WSS infrastructure. The Water Sector Reform Strategy calls for mainstreaming the domestic private sector in WSS service delivery (figure 6.7). It also draws a

Figure 6.7: Relationships among Stakeholders with Responsibilities for or Interest in the Port-au-Prince WSS Market



Note: DGI = General Direction of Taxes; DINEPA = National Directorate for Drinking Water and Sanitation; MCI = Ministry of Industry and Commerce; MDE = Ministry of Environment; MEF = Ministry of Economy and Finance; MSPP = Ministry of Population and Public Health; MTPTC = Ministry of Public Works, Transport and Communication; RO = reverse osmosis; WSS = water supply and sanitation.

road map for the decentralization of the sector, according to which DINEPA shall progressively disengage from infrastructure construction and operation responsibilities, and retain a normative and regulatory role. Construction and operation activities should be dealt with by the OREPA and the CTE, which should pass from being deconcentrated DINEPA departments to autonomous decentralized agencies. However, this transformation is far from complete.

Because CTE are still part of DINEPA's organic structure, many DINEPA officials see private water service providers more as competitors than as entities to be regulated. As a result, collaboration with the private sector has been very limited. Rare collaboration took place in the framework of the emergency response triggered after the earthquake and the cholera outbreak. During this period, government authorities contracted tankers to deliver water to camps for internally displaced persons (IDPs), collaborated with Oxfam to chlorinate water distributed from private water wells, and subsidized RO-water sold at private kiosks.

The Ministry of Health (MSPP) and DINEPA are jointly responsible for quality standards for drinking water. According to the 2006 decree (Article 3), the MSPP is responsible for “establishing and monitoring the application of sanitary standards for drinking water.” The 2009 Framework Water Law (Article 6) makes DINEPA responsible for “establishing norms and regulations regarding drinking water quality and sanitation.” In practice, there has been very little coordination between the two institutions in regulation.

Although the MSPP is formally responsible for controlling water quality, the Ministry of Industry and Commerce (MCI) carried out the most comprehensive water quality control campaign. The only recent effort by the MSPP in water quality control was the survey of Port-au-Prince's water kiosks conducted in 2013 with the CDC's support. DINEPA has a system in place (called SISKLOR) to measure the presence of chlorine residue in water (a proxy of water quality), but it is used only to monitor rural piped-water systems. The CTE RMPP controls the quality of the water it distributes, but it does not interact with private water suppliers operating in the metropolitan area. Between 2012 and 2014 the MCI, through its Directorate for Quality Control and Consumer Protection, inspected various private companies in the bottled water, bagged water, and kiosk markets. It assessed chemical and bacteriological quality and the hygiene of production and treatment processes. The rationale for this involvement is that water companies are engaged in commercial activities licensed by the MCI and that the ministry is therefore responsible for their surveillance.

The largest water-bagging and bottling companies claim to be in favor of stricter water quality regulations. On the occasion of a quality control campaign undertaken by the national authorities in 2013, the financial manager of Culligan, a leading water-bottling company, declared to be in favor of tighter controls to fight unfair competition from smaller informal producers: “We are making a great effort to ensure the best quality for our product, while others commercialize water of dubious quality using our brand” (Le Nouvelliste 2013).

However, these same companies have boycotted environmental regulations in the past. To fight pollution from plastic waste, there was a short-lived crackdown in 2012, banning the sale and use of polyethylene bags. The detention by the police of two drivers from a bagged-water firm led to an anti-government demonstration by factory workers worried that their jobs were at risk. The associated interventions of companies also put pressure on the government. “This measure taken by the government could force us to close our factories, and make over 1,000 people lose their jobs,” said back the then-president of SOTRESA, one of the major water bagging companies (Le Nouvelliste 2012). The ban was later shelved as unworkable.

Groundwater management responsibilities were transferred from the Ministry of Agriculture (MARNDR) to the Ministry of Environment (MDE) in 2006. The 1974 law made the MARNDR responsible for managing national water resources, including groundwater, and therefore for granting well drilling and water abstraction permits. In 2006, these competences were formally

transferred to the MDE,⁵ although in practice little has been done by MDE in this domain so far (figure 6.3). Through its National Water Resources Service, the MARNDR continues to intervene on water resources issues, and major water producers (such as pumping stations) report that they have authorization from the MARNDR. The reality is that neither the MARNDR nor the MDE has the capacity to enforce these laws or manage a permits system.

Coordination across institutions and stakeholders is weak. The Water Law calls for DINEPA's board of directors to include representatives from the Ministry of Public Works, the MSPP, the MDE, the Ministry of Finance, the Ministry of the Interior, and the private sector (through a representative nominated by the Chamber of Commerce). This platform, which is supposed to meet monthly and has responsibility for approving policies, regulations, and activities proposed by DINEPA, could have helped improve coordination across relevant stakeholders and boosted collaboration to regulate and sustain private water service providers. Unfortunately, it was never established.

Fecal Waste Management in the Metropolitan Area

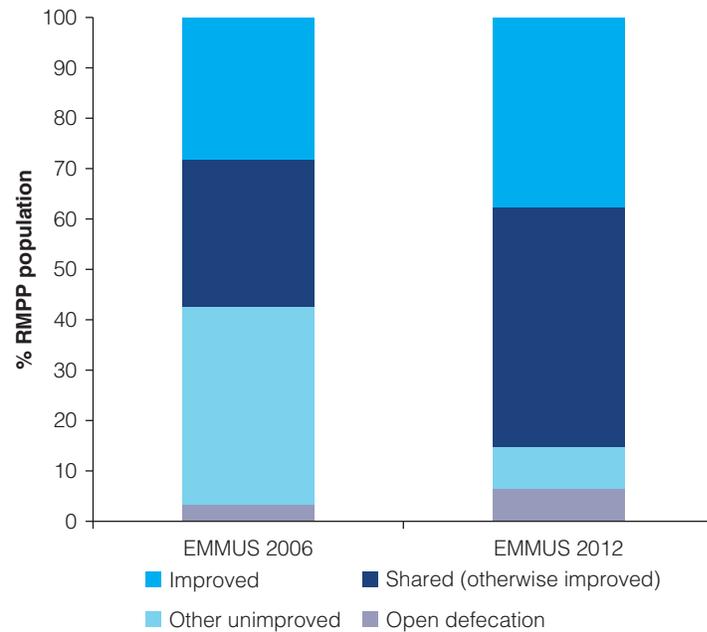
Unlike in the water supply sector, DINEPA officials' vision for the sanitation sector focuses on collaborating with the private sector. DINEPA's recently formulated National Sanitation Strategy proposes moving away from subsidies toward a market-based approach. Under this strategy, DINEPA focuses on (a) triggering demand for safely managed sanitation services, (b) strengthening the capacity of the private sector to satisfy this increased demand, and (c) collaborating with other relevant authorities in the creation of a legal and regulatory framework for this new sanitation market. These are the three pillars of the strategy, which are also referred to as the "Education, Services, and Laws Triade."

Almost all households in Port-au-Prince rely on non-network sanitation, with about 6 percent practising open defecation. There is no centralized sewer network. A small number of people benefit from an NGO-led pilot condominium sewer project, and in some hilly areas the contents of toilets are discharged untreated to ravines via a pipe.⁶ According to EMMUS data, in 2012, 33.5 percent of the population had access to flushed toilets, 41 percent to improved toilets, and 44 percent to shared toilets (figure 6.8). As with water, care must be taken in interpretation of these data since there were still 400,000 people living in camps at that time (around 15 percent of the city's population). This different set of data suggests a slight increase in open defecation between 2006 and 2012 as well as an increase in use of private improved facilities. However, the use of shared facilities (of an infrastructure type which would otherwise be termed "improved") also increased substantially.⁷ These trends seem to be consistent with the findings of a recent survey undertaken by the Inter-American Development Bank (IDB 2017), according to which in 2016, 84 percent of the population of selected low-income areas of Port-au-Prince⁸ had access to a toilet and 46 percent shared one.

Poorer households in Port-au-Prince are more likely to practice open defecation and to have unimproved latrines. Levels of sharing are highest among the poor, with only 14 percent of the B40 using an improved type of latrine not shared with other households (figure 6.9). Furthermore, sector professionals report that even "improved" latrine designs are often poorly constructed and do not meet sanitary minimums (presence of flies, difficult to clean, broken slabs, and so on). Concrete pedestals constructed ad hoc are far more common than standardized slabs, though ceramic pans are available in hardware stores. Those who install latrines are typically informal handymen known to the household, rather than those who specialize in toilets.

Despite the prevalence of latrines, demand for pit-emptying and fecal waste hauling and treatment services is low, particularly among the poorest. According to a 2016 survey by the IDB, only 5.4 percent of the latrines in low-income areas have ever been emptied. The latrine pits

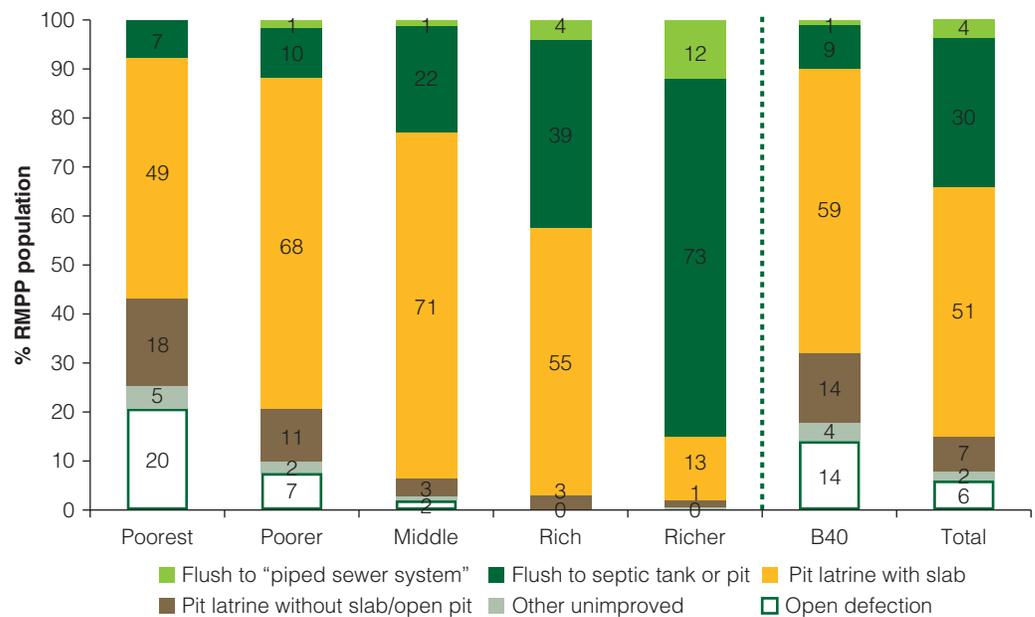
Figure 6.8: Trends in Use of Sanitation in Port-au-Prince between 2006 and 2012



Source: Calculations using EMMUS 2006 and 2012 data.

Note: EMMUS = Mortality, Morbidity and Service Usage Survey; RMPP = Port-au-Prince metropolitan area.

Figure 6.9: Use of Sanitation in Port-au-Prince, by Wealth Quintile, 2012



Source: Computations with EMMUS 2012.

Note: B40 = bottom 40 percent; EMMUS = Mortality, Morbidity and Service Usage Survey; RMPP = Port-au-Prince metropolitan area.

of 2.3 percent of households in these areas filled up at some point in time and were replaced by a new one; 0.6 percent of households just stopped using their latrines when the latrine filled up. The remaining 91.7 percent declared that their pits had never filled up so far. Interviews and FGDs indicate that households often prefer to dig a new pit because it is cheaper than paying an emptier or because emptiers cannot get access to the pit. Where the soil type permits, households tend to dig deep pits, which may rarely fill up, because waste leaches into the soil. In other soil types, pits cannot be emptied because the soil around them would collapse. Sector professionals reported that the majority of septic tanks are designed so that the sludge and effluent flows out and is never accumulated. Whatever the reason, the fact that most pits and septic tanks are not regularly emptied poses a significant health risk, since most sanitation facilities are poorly constructed and Port-au-Prince sits on the Cul-de-Sac aquifer, the main source of water of the metropolitan population.

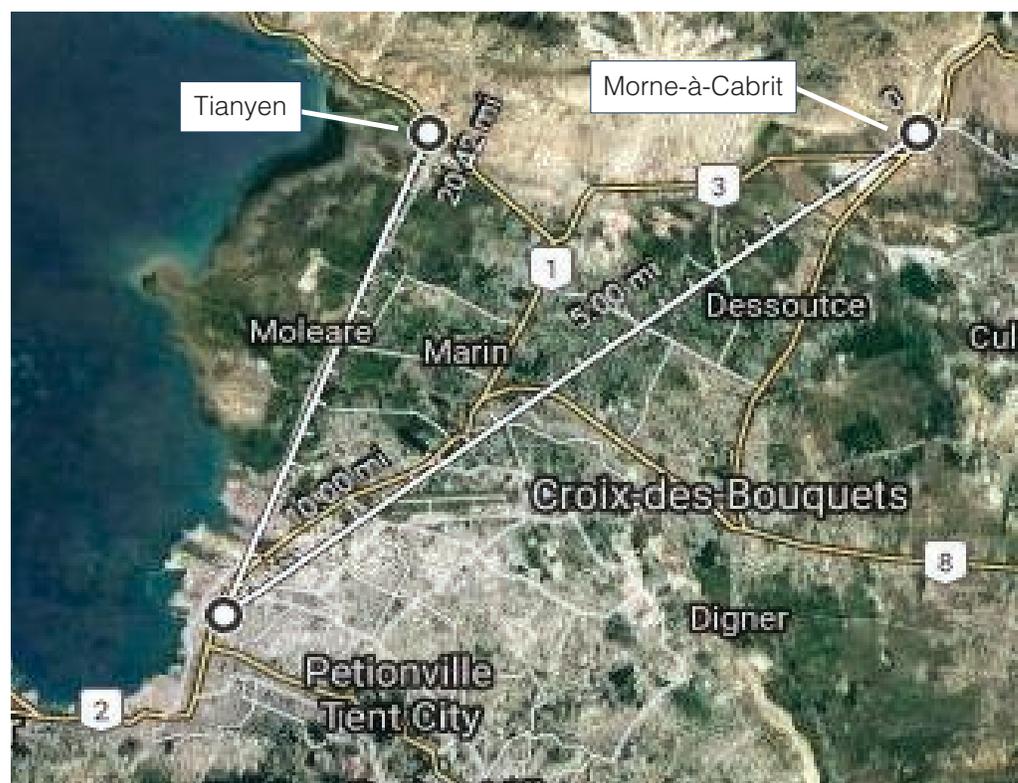
The fact that a large proportion of facilities are shared and that about half of households in Haiti rent (USAID 2011) hinders demand for emptying services. About half of households whose pit had not filled plan to ask their landlords to arrange and pay for emptying it when the time comes (IDB 2017). In two visited compounds of about 20 households where residents shared a single-pit latrine, the residents defecated in buckets and dumped the contents in a hole because the latrine pit was full, but the residents had been unable to collect funds to empty it (IDB 2017).

Fecal waste collection, hauling, and disposal services are provided almost exclusively by the private sector. They provide various manual, mechanical, and hybrid service options, based on the accessibility of the plot, perceptions of service quality, and willingness and ability to pay. According to an analysis of OREPA data, seven private companies deposited septage or sludge⁹ in their treatment facilities between October 2015 and April 2016. One of these companies dominates the market. These providers serve both households (typically the richer end of the market, which have septic tanks) as well as institutional clients. Households with pit latrines tend to be poorer and are more likely to use manual emptiers, of which there are about 20 teams operating in Port-au-Prince. Manual emptying normally represents a cheaper option, depending on the circumstances. It is also the only technically viable alternative for many households due to the thickness of the fecal sludge that accumulates in non-flushed sanitation facilities and issues related to accessibility. The domestic market is therefore divided into market segments (mechanical and manual) based more or less on wealth as well as geographical and other factors. The institutional market is serviced mainly by mechanical companies.

DINEPA manages the Morne-à-Cabrit septage and fecal sludge treatment plant through OREPA Ouest. OREPA are deconcentrated structures of DINEPA for specific territories, each administered by a Regional Director reporting to the Director General of DINEPA. The Morne-à-Cabrit plant, about 20 kilometers (km) from the city center, was built in September 2011 and comprises a series of settlement ponds. A second plant at Titanyen to the north of the city (also managed by OREPA Ouest) opened in May 2012 but closed again in November 2013. It is presently closed pending some works, still unfunded (map 6.1). Each truck arriving at the station must be registered with OREPA beforehand, and its volume must be measured. Access to Morne-à-Cabrit was originally free; in September 2013, OREPA introduced dumping fees, which were applied retroactively. That decision is still causing conflict with the truck companies, who refuse to pay fees for the period before December 2013. For fees related to subsequent periods, companies pay dumping fees monthly. Fees are HTG 35 (US\$0.55) per drum (usually sludge manually emptied coming from pit latrines) and HTG 70 (US\$1.11) per cubic meter discharged from a vacuum tanker (usually septage collected from septic tanks and cesspools).

Figure 6.10 represents fecal waste flows managed in a given year by the different stakeholders of the FSM services markets. It also captures: (a) Relationships among these stakeholders; (b) Flows of waste that are directly dumped into the open by households and FSM service providers;

Map 6.1: Location of the Tianyen and Morne-à-Cabrit Fecal Waste Treatment Plants



Source: Google Earth.

(c) Payments made or received by each of the stakeholders for the services received/provided; (d) Their annual turnover, and (e) The people they employ and livelihoods that depend on the revenues generated at each of the links of the different FSM service-delivery chains. Each of these chains is described in detail in the following sections.

Mechanical Emptying: Servicing Institutional and Commercial Clients

The first company providing mechanical pit emptying services started operating in Port-au-Prince in 1994 by servicing the United Nations (UN) mission in Haiti. Since then, the market size has steadily grown as has the number of companies. However, as discussed below, the market boomed after the earthquake and then contracted again after the closure of the camps for IDPs. Typically, mechanical emptying is associated with septic tanks, and companies own a fleet of vacuum trucks appropriate for fairly liquid waste. However, some companies also carry out manual emptying and so also have the “haulage”-type trucks for carrying drums of sludge.

The sector boomed after the earthquake, as the government and development partners managing IDPs demanded FSM services. Latrines were often built hastily and with the large number of users, they began filling up quickly and agencies contracted private truck companies to empty them. Around three companies existed beforehand, but new ones formed to take advantage of the rising demand—10 or more companies were operating in the years after the earthquake. Pre-2011, there was only one place to legally dump the resulting septage and/or

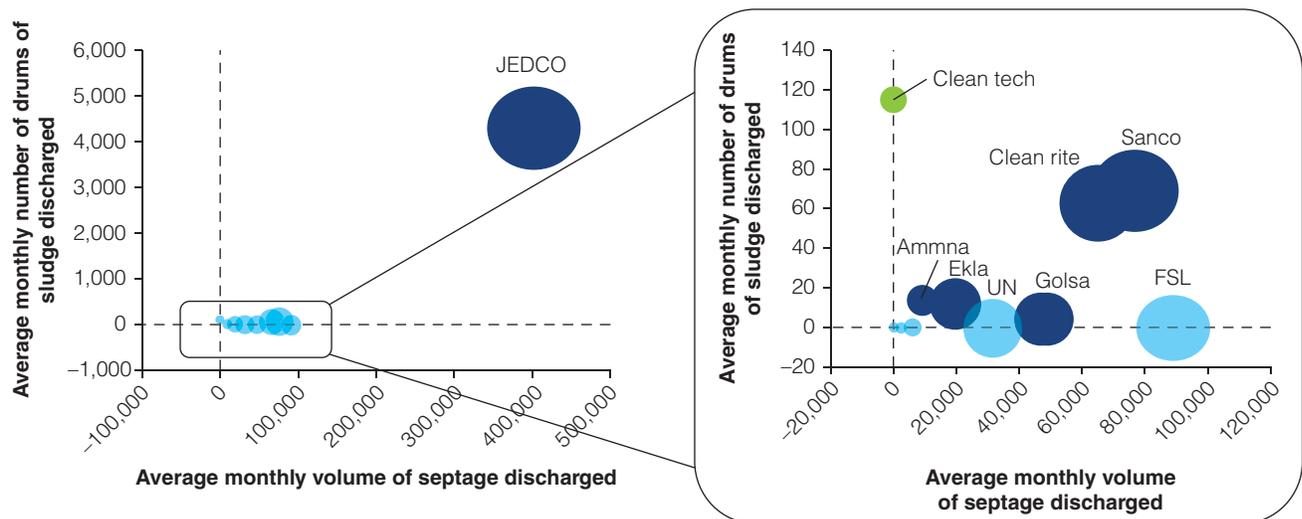
companies had greatly reduced their number of visits and two of them seemed to have ceased activities. The demand from camps, and the significant profits they offered given weak supply at that time, had therefore created a bubble. One company interviewed for this study reported significantly reducing their tariffs between 2013 and 2016 to remain competitive. In combination with reduced demand, such price competition is likely one factor in the shrinking of the number of providers.¹⁰

However, it is unlikely that the sharp reduction of fecal waste volumes discharged in the Morne-à-Cabrit facility is exclusively due to the lower demand from aid partners. According to OREPA Ouest data accessed between December 2013 and February 2014, approximately 19,000 m³ of were discharged in the mentioned treatment facility, that is, an average of 6,333 m³ per month, while the average registered during the October 2015–April 2016 period was 3,220 m³. This difference can be explained in part by the closure of many camps, as hypothesized by most of those interviewed. While the volume generated would have slightly remained stable or increased during the period, arguably the camp population mostly resettled in new areas such as Canaan (where 200,000 people now live) and so their latrines are unlikely to have filled in such a short time. One other potential factor is that truck companies could be increasingly dumping illegally. This is plausible given the tighter competitive environment described above.

Large companies accuse small ones of circumventing regulations to be more competitive, while these claim that their larger rivals enjoy privileged links to win public contracts. Indeed, all sector stakeholders suggest that illegal dumping happens, mostly in rivers and vacant land, and one of the companies is the market leader by far, mainly due to its contract to serve prisons. Figure 6.11 shows the volumes of septage and fecal sludge discharged at Morne-à-Cabrit. The left-hand part shows the broad scale, whereas the right-hand part zooms in on smaller providers. It shows that some companies specialize in septage (light blue bubbles) and others in fecal sludge (green), but some do both (dark blue). Institutional owners of trucks (for example, the UN) are also shown.

Their main business is emptying septic tanks and cesspools with vacuum trucks, but they also subcontract manual empties to serve non-flush or poor flush sanitation solutions.

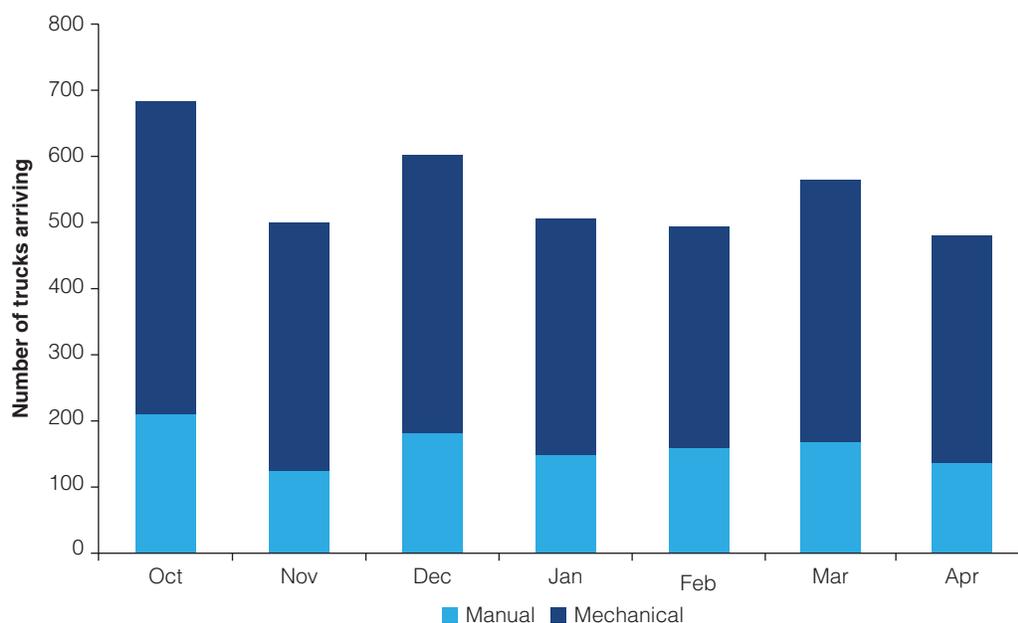
Figure 6.11: Average Monthly Volumes of Septage and Fecal Sludge Discharges per Company in Morne-à-Cabrit



Source: OREPA Ouest.

Note: FSL = Fondation Soleil Leve; OREPA = regional bureau of water and sanitation; UN = United Nations.

Figure 6.12: Number of Trucks Arriving at Treatment Plant, by Month and Type



Source: OREPA Ouest.

Note: OREPA = regional bureau of water and sanitation.

These companies are also now operating dump trucks that can carry drums of sludge. For the latter they work with manual emptiers, either through a team contracted over a period of time, or through occasional collaboration with the local base of bayakous in the area they are working in. However, there is no consistent model. These collaborations allow the truck companies to obtain a market share they would otherwise not be able to gain, due to difficulties of either physical access with trucks or difficulties related to the characteristics of the sludge (for example, solid waste or thick sludge which their pumps could not handle). The contract for emptying the pit latrines at public prisons is a large source of the fecal sludge arriving in drums at the Morne-à-Cabrit treatment plant.

Although most of the volume discharged at Morne-à-Cabrit corresponds to septage collected by vacuum trucks, 90 percent of the biological load comes from drum discharges. As shown in figure 6.11 and in figure 6.12, manually emptied pits account for around 22.4 percent of the volume discharged and 27.3 percent of the trucks arriving to the treatment facility. However, due to the high concentration of this sludge and the fact that Morne-à-Cabrit was designed to treat waste transported with vacuum tankers, today it is close to its treatment capacity despite being able to handle significantly larger volumes.

Despite the increased competition, services provided by these companies are still unaffordable for the majority of the population. Because a number of factors determine price (accessibility, pit/tank size, and so on), it is difficult to provide an average cost of vacuum truck emptying, but it typically ranges between HTG 10,000–20,000 (US\$160–320). In addition, there is a non-refundable inspection fee of HTG 250–1,000 (US\$4–16), depending on the location. This visit is to establish technical conditions (for example, the thickness of the sludge, presence of solid waste) and provide a full quote to the customer (who pays in advance, if accepting the quote), assuming an approximate total cost of around HTG 15,000 (US\$240).

Manual Emptying: Stigmatized and Unaffordable for the Poorest

Bayakous is the word used to designate workers who manually empty the latrines. This term is stigmatizing (used to talk about “them”) and not a category of self-identification. The sludge is either transferred into a new pit dug on-site, or into a 200 liter drum that is transported off-site. The determinants of this choice are whether there is space for another pit, and whether the terrain allows the *bayakous* to carry heavy drums away in carts (not possible in hilly areas) or gain access by truck. In most cases, if the sludge is transported off-site it would be dumped into a ravine, the sea, or open ground. If transferred to a truck hired for the purpose (see below), it is more likely to be taken to the Morne-à-Cabrit treatment plant.

Bayakous work in teams, groups of workers (known as bases) often focus on a specific point of the city. The Association of Manual Emptiers suggests that about 20 bases operate in the Port-au-Prince metropolitan area. The base in Delmas 19 has been operating since 1990 and has eight members.

Pit emptying is rarely a full-time job. A base may also carry out other activities, such as construction. Some *bayakous* are seasonal migrants, who return to rural areas for half the year during the farming season. It is common for bases not to own their equipment (drums, buckets, wheelbarrows, and so on) outright, but to rent it for the night once they confirm a job.

Manual emptying is a stigmatized and, to some extent an illegal, occupation. Most workers therefore keep their identities hidden from their neighbors and families, work away from their neighborhoods, and work at night, making them vulnerable to gangs. *Bayakous* interviewed by Viva Rio in 2010 reported the need to bribe the people who control the site of disposal, referred to as the area’s “chiefs.” Although clients appreciate the services provided by the *bayakous*—and prefer them to mechanical emptiers, because they can remove solid waste and denser sludge—many FGD participants complained that *bayakous* were “bluffers” and took advantage of the dark to leave their jobs half done. Because of this stigmatization, and despite the efforts of certain non-governmental organizations (NGOs) to help them establish an association, the *bayakous*’ collective action is minimal and weak.

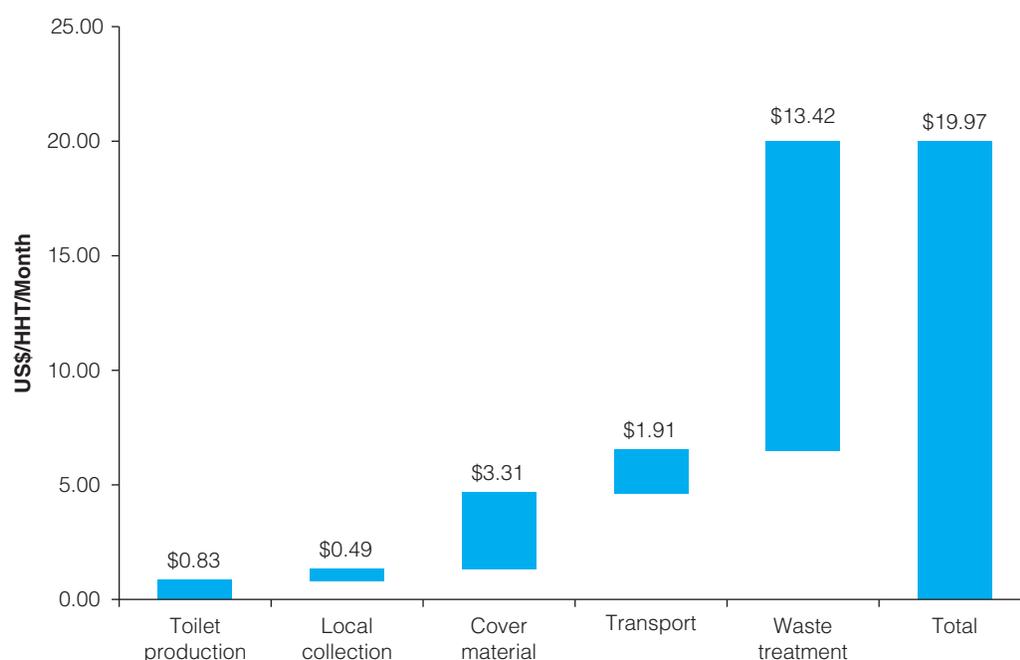
Bayakous interviewed stated that their workload had been steadily decreasing because of the reduced opportunities in IDP camps. As with the truck companies, the camps represented a significant source of demand. There is some evidence that consolidation occurred during the camp period—for example, NGOs running camps tended to have a relationship with a single base and gave them protective equipment. At least one of these has grown into a more formal company, which has about 20 *bayakous* on its books and two trucks. During the postcamp period, formal and informal collaborations between manual/mechanical emptiers were formed.

Bayakous’ charge significantly less than mechanical emptiers, but their services are still unaffordable for the poorest. Prices vary significantly, ranging from HTG 7,500 (US\$120) for an average pit requiring three drums (about 15 percent of the monthly expenditures of a B40 household) to HTG 25,000 for a huge pit requiring nine drums (US\$400). Very small pits are common in some areas (for example, Tokyo), for which the price might be as low as HTG 3,000 (US\$50). The above prices are for reburial in a new pit on-plot. Using *bayakous* is cheaper than a mechanical emptier, but in reality, most households have no choice—a truck would not be able to access their compound, or would not be able to suck up the thicker kind of sludge accumulating in a pit latrine over many years.

A Potential Solution for the Poor: The EkoLakay Business Model

The NGO Soil has piloted a new business model in Port-au-Prince covering all of the links in the FSM service-delivery chain, from collection to reuse of the fecal waste. It started the EkoLakay (“eco-home”) scheme in 2012, to develop a sustainable and commercially viable

Figure 6.13: Monthly EkoLakay Service Costs per Household Toilet



Source: Soil.
 Note: HHT = household toilet.

solution for fecal waste management. EkoLakay urine diversion toilets are rented to households. Soil collects the waste weekly, hauling it to a treatment facility and transforming it into compost. It first deployed the initiative in Cap Haïtien (600 clients). It now also has 120 clients in Port-au-Prince, and it is negotiating the development of a treatment site at the Titanyen plant.

The approach makes FSM services more affordable. The monthly fee of US\$4–5 represents about 0.5 percent of the average urban household’s monthly expenditure. The fact that the service can be paid for monthly is a benefit; other solutions require large up-front costs. EkoLakay’s approach also overcomes several barriers that often hinder sanitation service delivery in disadvantaged neighborhoods, such as accessibility, lack of space, and the lack of qualified service providers.

However, Soil’s business model is not yet fully financially sustainable. The monthly fee covers promotional costs, installation and maintenance costs, toilet amortization, and fecal waste cover material (figure 6.13). However, although the commercialization of compost could potentially cover the costs of transporting collected waste from transfer stations to the composting facility, it would not cover treatment expenditures. Other challenges include the collection of monthly payments, the management of client databases, the identification of customers, and the need to increase the number of customers per area to reduce average operational costs.

Public Sector Collaboration with the Fecal Sludge Management Services Industry

DINEPA has started working on the three fronts of the sanitation strategy—demand creation, service improvement, and regulation—but progress is still limited because of lack of

resources. DINEPA's Sanitation Directorate team comprises just four professionals at the central office. Until very recently there were no staff at the OREPA specialized in sanitation, and the Sanitation Directorate had very limited control or influence over the deconcentrated staff, which formally responded to the Directorate of Regional Operations and informally to the staff in the Technical Directorate that managed donor-funded investment projects in the concerned regions. The exception is OREPA Ouest, the first deconcentrated structure operating a fecal waste treatment facility.

Demand creation activities have focused mainly on triggering demand for sanitation infrastructure in rural areas, and not that much in cities for safely managed FSM services. Experiences in Haiti in the field of sanitation demand creation consist on a relatively large initiative aimed at changing social norms using the community-led total sanitation (CLTS) methodology,⁴¹ and small-scale sanitation marketing initiatives led by different NGOs in different contexts.

DINEPA's efforts to sustain FSM service improvements are also limited and received with suspicion by the private sector. Mechanical emptying companies have limited interaction with DINEPA, in contrast to the level of engagement of international agencies and NGOs. Their main relationship with the state is with OREPA Ouest when using Morne-à-Cabrit, although relations with it are currently strained because of disputes over retroactively imposed fees discussed above. In the field of manual emptying, DINEPA's involvement was limited to participation in several initiatives undertaken in the first years after the cholera outbreak in collaboration with international NGOs aimed at building technical capacity and improving at-work health and safety practices and equipment used by *bayakous*. Those initiatives ended in 2015.

DINEPA, the MSPP, the MDE, and local governments share regulatory responsibilities for sanitation and fecal sludge management. According to the 2006 Presidential Decree on Environmental Management, the development and implementation of urban and sanitation development plans are the responsibility of municipal governments. The MDE is responsible for granting waste discharge permits, developing wastewater treatment standards, and monitoring the contamination of water bodies. The MDE, the MSPP, the MCI, and the MARNDR are jointly responsible for developing strategies, norms, and regulations for the management, handling, and treatment of hazardous wastes. In practice, none of these authorities, including municipal governments, is active in sanitation or has the capacity or resources to operationalize these responsibilities. The most active institution in the sanitation sector is DINEPA, which, according to the 2009 Water Law, is responsible for regulating the provision of sanitation services.

DINEPA is trying to provoke a greater and more coordinated effort of concerned authorities in the field of sanitation. The fact that DINEPA's board of directors (where all the above-mentioned authorities are supposed to be represented) has not been established hinders greater coordination among concerned institutions. Also, not having DINEPA directly represented in the Inter-Ministerial Committee for Territorial Development (Comité Interministériel d'Aménagement du Territoire [CIAT])—a very active institutional coordination platform at the highest level with competences over environmental issues—diminishes the visibility of the sanitation agenda at the political level. Despite these challenges, officials from the Sanitation Directorate of DINEPA recently managed to sign a memorandum of understanding with MSPP and MDE. The agreement, which identifies several actions to be implemented during 2016–21 to move the sanitation agenda forward, is structured around three pillars: (a) clarifying roles and responsibilities and coordinating institutional leadership in the sanitation sector; (b) developing and deconcentrating responsibilities over sanitation, giving a greater role to the OREPA and the private sector; and (c) spurring greater involvement of local governments in sanitation, by transferring the management of fecal waste treatment facilities to local governments (while infrastructure remains the property of the central government). Progress on these fronts has not yet occurred.

In this context, FSM services remain virtually unregulated. In theory, emptying practices are governed by certain rules established through the “referential technique”⁴² and

several protocols issued by DINEPA.¹³ In practice, these regulations are not implemented. Sanctions for offenders are not clear or applied. No strategies or guidelines are in place for identifying and sanctioning illegal dumping. The 2012 DINEPA guidelines on the organization of FSM services recognize both manual and mechanical practices, provided they are carried out by “recognized professionals.” FSM service providers are supposed to be approved by DINEPA, and the list of approved professionals published. Neither practice is in place.

Notes

1. Major RO-water bulk sellers agreed to raise the price to HTG 7 in September 2016.
2. RO water used to be sold from small trucks, which often plied the streets playing music. In the 2008–12 period, the RO companies started franchising kiosks to sell water from a permanent base. The small trucks now perform a delivery function rather than a user interface.
3. <http://whconference.unc.edu/files/2014/11/patrick.pdf>.
4. The water contained in 17 bags were tested for *E. coli* content. All test results were negative. pH and conductivity (a proxy of water salinity) levels were within acceptable levels as per WHO drinking water standards.
5. Article 118 of the Presidential Decree on “Environmental Management and Regulation of Citizens Behaviors for Sustainable Development,” enacted on January 26, 2006.
6. This could partially explain the response given by some of the respondents of the 2012 EMMUS survey, according to which the toilets of 4 percent of the metropolitan population flush to a piped sewer system.
7. Not much weight should be put on the comparison because of the effects of the earthquake—other EMMUS (2012) data confirm that those living in camps were more likely to be from the lower strata of society. It is possible that large numbers of unimproved latrines were abandoned or destroyed or that a relatively high proportion of people previously using those facilities were living in camps in 2012. The state of reconstruction in 2012 could have led to a particularly high degree of sharing at that time. Most likely a combination of these could be driving the relative increase in “improved” and “shared.”
8. The communes of Port-au-Prince and Carrefour.
9. Septage is fecal waste discharged by flush toilets into septic tanks and cesspools, while fecal sludge usually comes from dry latrines but also settles in septic tanks. Being septage more liquid and closer to wastewater; and fecal sludge more solid with higher concentrations of BOD, the handling and treatment of these two types of fecal waste differ significantly
10. Some of the companies do not focus all of their activity on emptying but offer other services such as garbage collection, renting of mobile toilets, and so on. The market leader, for example, reports that emptying activities represents only 70–75 percent of their revenue.
11. CLTS, or community-led total sanitation, as promoted by the UNICEF is an approach to achieve sustained behavioral change in mainly rural people by a process of “triggering,” leading to spontaneous and long-term abandonment of open defecation practices. The EPARD project builds on such an approach.
12. “Technical Directive 2.5.2 DIT1. Manual Emptying of Sanitation Facilities” and “Technical Directive 2.5.3 DIT1. Mechanical Emptying of Sanitation Facilities.”
13. Protocol for NGOs and private enterprises emptying and disposing fecal waste, 2010.

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Chapter 7

Conclusions and Recommendations

Haiti still faces severe challenges in its efforts to reduce poverty. Poverty remains high; in 2012, 58.5 percent of Haitians were poor, and 24.5 percent were extremely poor. Most of the poor (67 percent) live in rural areas. These rural poor households face multiple shocks (hurricanes, floods, disease, and unemployment) for which they have very limited coping strategies. Further progress in reducing poverty and vulnerability will require, in addition to economic growth, a concerted effort to increase the capacity of the poor and the vulnerable to accumulate and use assets, to generate income, and to build resilience. Historically, migration to urban areas has been the first response of rural households seeking to escape poverty, but it, too, is associated with poverty, unemployment, political and social marginalization, and limited access to services.

Access to water supply, sanitation, and hygiene (WASH) services in Haiti remains low, unequal, and declining. Access to improved WASH services is below the 2015 targets of Millennium Development Goal 7, which are 76 percent for water and 85 percent for sanitation. In 2015, 52 percent of Haiti's population had access to improved or piped water and 28 percent to improved sanitation. The poorest have even less access to improved water (37 percent of the B40 in 2015), and this figure has been decreasing over time (from 41 percent in 1990). Similarly, between 1990 and 2015, access to improved sanitation increased just 1 percentage point among the rural B40—and it dropped 3 percentage points for the urban B40.

The poor, who suffer the most from these conditions, could improve their health outcomes with increased investments in WASH. Nationally, the WASH-related diarrheal burden for the poorest quintile is about 2.7 times greater than for the richest quintile. Cholera—a major concern in Haiti in the aftermath of the 2010 earthquake—is two times more likely to strike poor households than richer ones.

Public expenditures in drinking water supply are insufficient and do not benefit the most in need. Access to improved water sources is decreasing in rural areas both in relative and absolute terms. Meanwhile urban water utilities have been struggling to cope with population growth and—in order to improve their weak financial situation— they have been prioritizing service delivery to more profitable non-domestic clients. In Port-au-Prince for example, only 14 percent of the volume of water distributed reaches the densely populated poor neighborhoods, translating into a volume of 15 liters of water per person per day (lpd) compared with 35 lpd in wealthier neighborhoods.

Government involvement in the provision of sanitation services is very limited, and focused in the operation of the few fecal sludge treatment facilities that exist in the country. Sanitation facilities' construction services and fecal waste collection, transportation and disposal services are exclusively provided by the private sector with very limited supervision and control from government authorities. However, the key constraint in the sanitation market is the lack of households' demand for pit and septic tank emptying services.

The lack of government supervision and low competition among private actors raises questions about quality of service and affordability to the poorest. In 2012, 25.8 percent of Haitians relied on the private sector to satisfy their drinking water needs. In urban areas, this percentage was

even higher: 57.1 percent in the Port-au-Prince and 45.5 percent in other cities. Moreover, in Port-au-Prince, 59 percent of the poorest 40 percent had to resort to the private sector for drinking water, water for other domestic purposes. Overall, poor households spent 4 percent of their budget on water—15 percent in urban areas.

The analysis above evidences the urgent need for shifting the paradigm of how the Haitian government operates in the WASH sector. Three entry points can be identified to maximize the socioeconomic impact of the scarce fiscal resources channeled to the water supply and sanitation (WSS) sector: (a) improving the geographical targeting and increase the public funding channeled to areas where WSS are crucially needed; (b) working across sectors to improve health outcomes of WASH interventions; and (c) recognizing the predominance of the private sector in WSS service delivery in urban areas, adjusting the role of State accordingly.

Improve the Geographical Targeting and Increase the Public Funding Channeled to Areas where WSS Are Crucially Needed

The National Directorate for Drinking Water and Sanitation (Direction Nationale de l'Eau Potable et de l'Assainissement [DINEPA]), could dedicate greater efforts to improving access to WASH services in dispersed rural communities. DINEPA's investment portfolio focuses almost exclusively on urban areas and small towns (i.e., concentrated rural areas). As a consequence, access to piped water on premises and to other improved water sources is increasing for the top quintile of rural residents (T20), most of whom live in small towns that can be served through piped schemes—but it is decreasing for the rest of the rural population. Moreover, the fact that access to improved water sources in rural areas is decreasing in absolute terms suggests that the drinking water infrastructure is collapsing in small and dispersed rural communities. Likewise, access to improved sanitation has remained stagnant among the bottom 40 percent of rural residents, both in relative and absolute terms. Unsurprisingly, the incidence of cholera and the burden of WASH-related enteric diseases is significantly higher among the poor and rural population, as compared to non-poor and urban residents.

Positive health outcomes of WASH investments are likely to be higher in the Artibonite, Nord, and Grand'Anse departments. This are the departments where, according to the analysis of 2012 EMMUS data undertook, a greater reduction of enteric disease risk could be achieved among children under five if every household with unimproved water and sanitation were to gain improved access.

Work across Sectors to Improve Health Outcomes of WASH Interventions

To maximize their health and economic impact, WASH investments could be integrated into multidimensional interventions. While WASH access and practices determine susceptibility to diarrheal diseases, other factors, such as nutritional status and access to health care, determine their severity. In turn, access to WASH, health care, and parental care also influence nutritional outcomes. Given these reciprocal influences, WASH investments could be developed as part of multidimensional interventions and prioritized in light of the chains of correlations at work.

Cholera eradication will require comprehensive community-wide approaches of WASH interventions. Hygiene and community-level environmental conditions affect health outcomes as much as the type of access to water and sanitation at the household level. This is evidenced by the high persistence of cholera in households with access to piped water and by the even distribution of diarrheal disease across quintiles.

The adoption of multidimensional and community-wide approaches would require to reactivate intersectoral coordination platforms and give direct voice in them to DINEPA. The fact that DINEPA's statutory board of directors—where ministries of public health and population (MSPP), the environment (MDE), commerce and industry (MCI), and agriculture (MARNDR), and other relevant institutions are supposed to be represented—has not been established hinders greater coordination among concerned institutions. Also, not having DINEPA directly represented in the country's Inter-Ministerial Committee for Territorial Development (Comité Interministériel d'Aménagement du Territoire [CIAT]) diminishes the visibility of the sanitation agenda at the political level. Having a closer and more effective institutional coordination across sectors is also key to allow for a successful collaboration with private WSS service providers, since regulatory responsibilities are shared between DINEPA, the previously mentioned authorities, and local governments.

Recognize and Take Advantage of the Predominance of the Private Sector in WSS Service Delivery in Urban Areas, Adjusting the Role of State Accordingly

In the medium term WSS sector policies for urban areas could focus on improving utilities' service quality and financial sustainability and on sustaining private WSS service provision, ensuring its quality and improving affordability. Continue expanding utilities' water distribution networks and client base would only deteriorate the financial situation of the urban water operating centers (centres techniques d'exploitation [CTE]), the majority of which—19 out of 24—do not generate enough revenue to cover operating costs, let alone provide for preventive maintenance. Neglect of preventive maintenance translates into a further deterioration of the quality of service and an increased need for investments in corrective maintenance, resulting in an inefficient use of scarce fiscal resources. On the other hand, the share of the private sector in the urban WSS market has been rapidly increasing over the years, and the number of people relying on it to satisfy their domestic water needs—poor and non-poor alike—is likely to continue increasing. This, however, could be seen as an opportunity, since sector authorities could take advantage of the private sector's installed capacity to serve the urban population to allocate greater resources to rural areas.

An effective collaboration with the private sector requires a coordinated effort from multiple public institutions. Private WSS service providers are not only subject to the standards and regulations set by DINEPA, but also by those of the MSPP, MDE, and MCI, as well as of municipal governments.

MSPP could focus on developing a water-quality-control system, building on the interest of large water companies facing unfair competition from smaller players applying lax water-quality standards. Sales of private suppliers of drinking water are fueled by the demand for safe water triggered by the cholera outbreak. Therefore, large water companies compete based on quality and branding. On the other hand, some small producers take advantage of the reputation built by large companies, illegally using their brands to commercialize the water they produce with laxer quality controls. Moreover, recent quality control surveys evidenced that although bulk suppliers of water treated by reverse osmosis (RO) meet applicable sanitary standards, 10 percent of the water they distribute becomes contaminated at the point of sale. In this context, as they have expressed in the past, large water companies may be concerned enough about avoiding reputational risks to support—perhaps even financially—the introduction of a transparent system to control and certify water quality.

DINEPA and the MCI could collaborate to promote competition among large water producers. Large bulk suppliers of RO-treated water set prices and the margins of franchised kiosk owners. While MCI efforts to control the quality of commercialized water are commendable, its efforts

are limited to encourage more competition in this market. MCI could draw on DINEPA's technical expertise for this endeavor.

Helping water retailers (that is, owners of reservoirs and private kiosks) to develop collective bargaining mechanisms to purchase bulk water may help bring down the water price. Structuring public-private partnerships (PPPs) to develop water-loading stations in different areas of the city could reduce the prices of trucked water, which are driven mainly by transportation costs. These loading stations could be fed by wells or by the CTE network.

An effective collaboration with the private sector would also require a DINEPA to change its organizational culture and an effective separation of WSS sector governance and WSS infrastructure development and operation responsibilities. DINEPA—that is still de facto an executing agency and an operator of WSS infrastructure—is paying very little attention to its WSS sector governance and service regulation responsibilities. Also, because CTE remain part of DINEPA's organic structure, many DINEPA officials see private water service providers more as competitors than as entities to be regulated. Therefore, the need for collaboration between the public and private sectors makes more urgent the separation of sector governance and WSS infrastructure development and management responsibilities. This could be done effectively by moving forward the ongoing sector deconcentration strategy, transferring the latter functions to the regional water and sanitation bureaus (OREPA) and increasing their autonomy, as currently contemplated by the Water Law. This could also help to solve the issue of sector absorption capacity.

DINEPA could analyze the possibility of adopting PPPs approaches with local companies to improve utility performance, particularly in the water production and treatment processes in which the local private sector has demonstrated its know-how. The Port-au-Prince CTE could draw on the RO franchising experience to improve the management of public kiosks.

Illegal dumping of fecal waste and resistance to pay the tipping fees of OREPA may be reduced by having the OREPA enter into direct agreements with large polluters, since today the immense majority of fecal waste collected by service providers comes from commercial and institutional clients. If these large clients were to pay tipping fees to the OREPA, DINEPA could introduce cross-subsidies to make fecal sludge management services more affordable for the poor.

Container-based sanitation management models covering the entire fecal sludge management chain may be a good solution for the urban poor, and they have proven successful in similar context as if sustainability is achieved. Support to create demand for this type of solutions, co-financing investment costs, and coupling composting and fecal waste treatment facilities may help to achieve sustainability. Container based sanitation management schemes are successfully been implemented with certain scale in Nairobi (Kenya) and Dar-es-Salaam (Tanzania).

Appendix A

Data and Methods

Quantitative Data

The datasets used in this diagnostic are the 2012 *Enquête sur les Conditions de Vie des Ménages Après le Séisme* (Post-Earthquake Survey of Household Living Conditions [ECVMAS]), the latest available household data in Haiti, and the 2012 *Enquête Mortalité, Morbidité et Utilisation des Services* (Mortality, Morbidity, and Service Usage Survey [EMMUS]). The 2012 ECVMAS contains rich information on household consumption expenditures that allow us to identify poor households. The EMMUS 2012 contains rich information on the health and nutrition of respondents but does not contain data on household consumption, without which we cannot identify poor households.

To synthesize information from both datasets, we use survey-to-survey imputation. This econometric technique allows us to exploit the strengths of different datasets by bridging them using a set of variables available in both datasets (Newhouse and others 2014; Stifel and Christiaensen 2007; Kijima and Lanjouw 2003). We followed three steps in implementing this methodology:

1. *Identify variables for predicting consumption.* We first compiled a set of variables that predict consumption well and are available in both surveys. Careful attention was paid to ensure that the variables have a similar distribution in both surveys. A t-test was conducted to test whether the mean values of a given variable are equal for the two distributions.
2. *Estimate a model of consumption using the ECVMAS data.* We then estimated a model of consumption for the ECVMAS. We checked that the magnitude and direction of the coefficients made intuitive sense. An improvement to this table may be to drop some variables to reduce multicollinearity and the standard error of the prediction.
3. *Identify poor households in the EMMUS data using predicted consumption.* We then predicted consumption in the ECVMAS (for comparison with actual consumption) and subsequently in the EMMUS (for identifying poor households). The distribution of predicted consumption had slightly narrower tails than the distribution of actual consumption, suggesting that the predicted extreme poverty rate (18.8 percent) is slightly lower than the actual level (23.8 percent).

Once poor households were identified in the EMMUS data, we compared health, nutrition, and demographic characteristics of the poor and the non-poor or across the consumption distribution.

Qualitative Data

Rural evidence comes from a qualitative survey undertaken in the Centre department in July 2016. The Centre department consists of 4 *arrondissements* (districts) and 12 *communes*. The Hinche *arrondissement* includes Hinche (the capital of the department), Cerca-Cavajal, Maissade, and Thomonde. The Cerca la Source *arrondissement* includes Cerca la Source and Thomassique.

The Lascahobas *arrondissement* includes Lascahobas, Savanette, and Belladere. The Mirebalais *arrondissement* includes Mirebalais, Boucan-Carre, and Saut d'Eau.

The objective of this qualitative assessment was to provide contextual and qualitative insight on the water supply, sanitation, and hygiene (WASH) situation in a sample of beneficiary communes and localities of the Sustainable Rural Water and Sanitation Project (Projet en Eau Potable et Assainissement en milieu Rural Durable [EPARD]). Specifically, the assessment sought to:

- Assess WASH access, quality, reliability, costs, coping mechanisms, safety, information flows, cholera burden, satisfaction, and recommendations for improving service delivery.
- Deepen the National Directorate for Drinking Water and Sanitation's (Direction Nationale de l'Eau Potable et de l'Assainissement [DINEPA]) knowledge, and inform future practice of managing the community incidence of cholera, WASH access, WASH management, and hygiene.
- Analyze how gender may interact with other sociocultural and economic factors to make women, men, boys, and girls vulnerable to cholera in differing ways.
- Assess social capital and whether or how it is likely to influence community-led sanitation and hygiene-promotion initiatives.

Focus group discussions were implemented to gather the opinions, perceptions, values, and ideas of communities in the Centre department. To facilitate the discussions, the community water and sanitation technicians (TEPAC) used participatory tools such as community maps, F-diagrams, daily activity profiles, timelines, and trends.

In each of the intervention areas, focus groups were held with communities as follows:

- Mixed groups of male and female opinion leaders and religious leaders;
- Adult women at the community level (all ages, lower income, vulnerable);
- Adult men at the community level (all ages, lower income, vulnerable);
- Adolescent girls and boys in local schools.

The team held key informant interviews with:

- People with disabilities (mixed ages, mixed disabilities) at community level;
- People who had, or had had cholera, or had cared for a person with cholera;
- DINEPA staff, including representatives of drinking water supply and sanitation committees (CAEPA);
- Representatives from the Ministry of Health and Population;
- Heads of schools and health centers and market representative.

The team also made a physical assessment of water and sanitation services in public schools, markets, and health centers. The team observed water sources, sanitation facilities, hygiene behavior, and waste disposal practices. To assess the quality and quantity of school WASH practices, in particular, the team sampled 10 public primary schools. A standardized checklist was developed and used to report on facilities.

Data on WSS Market in Port-au-Prince comes from primary data collection through focus-group discussions and semi-structured interviews of key informants. The objectives of this data

collection were to: (a) characterize access, quality and affordability of water supply, and sanitation services enjoyed by the population; and (b) to characterize the supply side of WSS market.

These characterizations should, at least, consider the following variables:

- *Sanitation services—demand side*
 - Who are they (where are they located, what is their socioeconomic level, what are the characteristics of the onsite sanitation facilities they use, what is the kind of housing, etc.)?¹
 - How many are they (market size)?
 - Who uses the facilities?
 - How do they manage graywater?
 - How is their onsite sanitation facility (type, volume of pit/septic tank, accessibility, etc.)?
 - How do they select their service provider? Do they have a preferred one?
 - Do they contact more than one service provider to compare?
 - How and based on which criteria do they make a selection?
 - Who in the household decides who to contract and when?
 - How do they find them?
 - How much do they pay?
 - What is their level of satisfaction with the service received?
 - What are the factors determining this level of satisfaction and their relative importance?
 - How often do they contract these services?
 - How do they manage?
- *Sanitation services—supply side*
 - Number, type, and characteristics of service providers (mechanical or manual, size, number of employees, characteristics of the equipment used, market share, degree of formality);
 - Associativity and level and type of competition;
 - Segments of the market served and reasons for serving those and not others;
 - Pricing strategies, operating costs and estimated profit;
 - Promotion strategies and place where services are offered;
 - Other services and products offered;

- Degree of professionalization and expertise;
- Fecal sludge discharge points and practices;
- Barriers encountered and factors affecting the ability and willingness of service providers to safely manage and dispose fecal sludge;
- Affordability and quality of services;
- Business development perspectives;
- Needs for support and capacity building;
- Potential incentives to improve service quality and the safeness of fecal sludge management and disposal practices.
- *Drinking water supply services—demand side*
 - What is the type of access the different segments of the population enjoy (piped into premises, public stand post, private kiosk, “sachets d’eau,” analysis stratified per location, socioeconomic level, gender, vulnerability group, and other relevant variables)?
 - Who is in charge of fetching water and how much time they expend?
 - How do they select their service provider? Do they have a preferred one?
 - How and based on which criteria do they make a selection?
 - How much do they pay?
 - What is their level of satisfaction with the service received?
 - What are the factors determining this level of satisfaction and their relative importance?
- *Drinking water supply services*
 - Number, type, and characteristics of service providers (trucking and kiosks, size, number of employees, characteristics of the equipment used, market share, degree of formality);
 - Associativity and level and type of competition;
 - Pricing strategies, operating costs and estimated profit;
 - Promotion strategies and place where services are offered;
 - Other services and products offered;
 - Degree of professionalization and expertise;
 - Affordability and quality of services;
 - Water quality;
 - Needs for support and capacity building;

- Business development perspectives;
- The capacity and interest of preservice providers to engage in water supply service delivery in a small town and play the role of the “professional operator” in charge of running the SAEP.

To undertake this analysis it is expected that the Firm will gather primary data and information through the conduction of interviews with key stakeholders, focus group discussions with citizens, and fecal sludge quality tests.

Note

1. This should look not only at households but at business and institutions.

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Appendix B

Correlates of Cholera and Diarrhea in Haiti

Table B.1: Regression Results on Correlates of Diarrhea and Cholera in Haiti

Item	Diarrhea			Cholera		
	(1)	(2)	(3)	(1)	(2)	(3)
<i>Water</i>						
Surface	0		0	0		0
Other unimproved	-0.068*		-0.06	0.003		0.014
Other improved	-0.070*		-0.06	-0.069***		-0.042*
Piped	-0.046		-0.038	-0.043*		-0.021
<i>Sanitation</i>						
Open defecation		0	0		0	0
Other unimproved		0.032**	0.031**		-0.037***	-0.019**
Shared facilities		0.018	0.016		-0.042***	-0.027**
Improved		-0.026	-0.027		-0.062***	-0.041***
<i>Household characteristics</i>						
Household size	-0.014	-0.014	-0.015*	0.049***	0.050***	0.047***
Household size, squared	0.001***	0.001***	0.001***	-0.001***	-0.001***	-0.001**
Household head is female	0.013	0.014	0.014	0.006	0.005	0.009
Age of household head	-0.001	-0.001	-0.001	-0.001***	-0.001***	-0.001***
Household head has no education	0.013	0.013	0.012	0.016*	0.014*	0.016**
Number of children of age 5–14	-0.011	-0.011	-0.011	-0.020***	-0.020***	-0.019***
Number of children of age 15–64	0.002	0.003	0.004	-0.020***	-0.019***	-0.019***
Number of children of age 64+	0.009	0.011	0.013	0	0.001	0.001
Household has at least one infant <1 year	0.031***	0.030***	0.031***	-0.01	-0.01	-0.009
Household has at least one child <15 years	0.112***	0.113***	0.115***	-0.024**	-0.025**	-0.023**

table continues next page

Table B.1: Continued

Item	Diarrhea			Cholera		
	(1)	(2)	(3)	(1)	(2)	(3)
<i>Access to basic services</i>						
Household has access to electricity	0.001	0.003	-0.001	0.002	-0.002	-0.008
Household cooks with charcoal	-0.014	-0.011	-0.012	-0.011	-0.012	-0.017
Household cooks with modern fuel	-0.019	-0.014	-0.015	-0.023	-0.026	-0.027
Household doesn't cook	-0.284	-0.296	-0.28	-0.01	-0.01	-0.017
<i>Housing and assets</i>						
Precarious wall	-0.006	-0.009	-0.009	-0.011	-0.009	-0.018**
Precarious roof	0.032*	0.028	0.022	0.011	0.011	0.009
Precarious floor	-0.002	-0.004	-0.012	0.060***	0.056***	0.030***
Number of rooms used by household	0.002	0.002	0.002	0	0.002	0.001
Household owns a television	-0.033*	-0.033*	-0.028	-0.031***	-0.034***	-0.033***
Household owns a radio	-0.018	-0.018	-0.020*	-0.023***	-0.020***	-0.020***
Household owns a mobile phone	-0.018	-0.017	-0.015	-0.009	-0.009	-0.002
Household owns a landline	0.015	0.017	0.016	-0.002	-0.002	0
Household owns a fridge	-0.027	-0.025	-0.022	-0.031**	-0.030*	-0.024
Household owns a computer	-0.021	-0.018	-0.016	0.002	0.002	0.004
Household has access to Internet	0.02	0.022	0.027	-0.008	-0.009	-0.009
Household owns a bicycle	0.032	0.032	0.031	-0.004	-0.004	-0.003
Household owns a motorcycle	0.027	0.03	0.027	-0.011	-0.01	-0.006
Household owns a car	-0.037	-0.029	-0.031	-0.018	-0.018	-0.018
<i>Location</i>						
Metropolitan	0	0	0	0	0	0
Town	-0.070***	-0.067***	-0.063**	0.003	-0.002	-0.024
Rural	-0.094***	-0.089***	-0.081***	-0.024*	-0.02	-0.038**
Camp	-0.035	-0.034	-0.025	-0.069***	-0.069***	-0.040**
Constant	0.303***	0.227***	0.292***	0.147***	0.138***	0.244***
Observations	6,084	6,084	6,084	12,084	12,084	12,084
R-squared	0.014	0.015	0.019	0.058	0.056	0.086

Note: Table shows results of ordinary least squares estimation using 2012 EMMUS data. Diarrhea estimates are computed for children less than 5 years old. Cholera estimates are for all household members. EMMUS = Mortality, Morbidity and Service Usage Survey.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix C

UNICEF Framework of Analysis of Malnutrition

The United Nations Children's Fund (UNICEF) framework classifies the causes of malnutrition into three categories: immediate causes, underlying causes, and basic causes. Identifying the immediate causes of malnutrition (disease or inadequate dietary intake) is useful for guiding policy actions, especially in situations of crisis. However, disease and inadequate dietary intake are the result of a variety of interrelated underlying factors. In this framework, the underlying causes of malnutrition are grouped into four clusters: inadequate household food security, inadequate care and feeding practices, unhealthy household environment, and inadequate health services. The basic causes summarize the social, cultural, economic, and political context and the prevailing inequalities in the distribution of resources in the society. Given that the underlying causes are the manifestation of the basic causes, we focus on the former. However, any policy to improve nutritional outcomes needs to address inequalities or shortcomings in the basic causes.

Access to Adequate Food Security

The ideal measure encompasses three broad factors:

- The availability of food, measured by the supply of food at the national (or regional) level, based on agricultural production and the food trade balance relative to the country's size
- Household- and individual-specific access to available food, measured by choices households make depending on their income and the prices of food at local markets and the intrahousehold distribution of food
- The quality of the food choices made by the household, measuring whether or not the diet and cooking methods provide all the necessary micro- and macronutrients needed for healthy growth

Access to Adequate Care

This dimension measures the ability of the primary caregiver to provide a safe and appropriate environment for the child to grow and develop. The measure is based on six features of the child's caregivers:

- Knowledge, practices, and beliefs regarding childcare
- Health and nutritional status
- Mental health, stress level, and self-confidence
- Autonomy and control of resources

- Workload and time constraints
- Social support received from family and community

Access to Adequate Environment

This dimension measures the child's exposure to pathogens in the physical environment in which he or she lives. The measure is based on adjusted definitions adopted by the World Health Organization (WHO)/UNICEF Joint Monitoring Programme (JMP) and as part of monitoring the Sustainable Development Goals. It includes components on:

- Access to improved drinking water
- Access to improved sanitation
- Adequate handwashing practices
- Adequate disposal of child's feces

Given that it is not only the child's home environment but also the neighborhood that affects the degree of exposure to pathogens, communitywide access to improved sanitation is explored.

Access to Adequate Health Care

This dimension measures the child's access to skilled medical care, which helps reduce the effects of illness and prevents health issues, especially those linked with malnutrition, such as diarrheal diseases. The measure encompasses the availability and use of health care services for prenatal, birth, and postnatal care.

To explore the relative importance of the nutrition dimensions and any potential synergies among the four underlying factors and nutritional outcomes, we used a simple regression model to summarize the differences in the mean height-for-age among children with access to one or more of the four nutritional dimensions. The analysis is purely descriptive, quantifying the correlation between height for age Z-scores and simultaneous access to adequate levels in more than one of the nutrition dimensions (Skoufias 2015). We estimated the following econometric specification:

$$HAZ_i = \alpha + \sum_{j=1}^4 \beta_j A_j + \sum_{j=1}^4 \sum_{k=j+1}^4 \gamma_{jk} (A_j * A_k) + \sum_{j=1}^4 \sum_{k=j+1}^4 \sum_{m=j+2}^4 \gamma_{jkm} (A_j * A_k * A_m) + \gamma_{1234} (A_1 * A_2 * A_3 * A_4) + \varepsilon_i$$

where HAZ_i is the height-for-age Z-score for child i , and A_j denotes access to the four adequacies, for each child i . A_1 equals 1 when the household is adequate in food and 0 otherwise. A_2 equals 1 when the household is adequate in environment and 0 otherwise. A_3 equals 1 when the household is adequate in health and 0 otherwise. A_4 equals 1 when the household is adequate in care and 0 otherwise. No additional control variables are used in the regression, because the objective is simply to compare mean values in height-for-age among children in different subgroups, defined by the extent to which they have access to one or more of the pillars.

Table C.1: Factors of Malnutrition in Haiti, 2012
Percent

Factor	Component	Definition	National	Urban	Rural	Q1	Q2
Food adequacy	Dietary diversity score	Minimum established if children consume at least four of the seven groups of food (grains, roots, and tubers; legumes and nuts; dairy products; flesh foods, including organ meats; eggs; Vitamin A-rich fruits and vegetables, including orange and yellow vegetables; and other fruits).	29	32	27	26	28
	Meal frequency	Breastfed children 6–8 months fed at least twice in the past 24 hours; breastfed children 9–23 months fed at least three times. Non-breastfed children (6–23 months) fed four times in the past 24 hours.	34	35	34	32	32
Environment adequacy	Improved water	Piped into dwelling, yard, or plot; from public tap, standpipe, tubewell, or borewell; or from a protected well, spring, or rainwater.	60	85	46	23	43
	Basic water	Any improved source within a 30-minute round trip from the dwelling.	50	78	34	13	29
	Safely managed water	Water piped to premises.	8	14	5	0	2
	Improved sanitation	Access to flush toilet, ventilated improved pit latrine, pit latrine with slab, or composing toilet. Sanitation facilities are not shared.	20	28	16	7	13
	Community-level sanitation	At least 75 of households in child's locality have access to adequate sanitation.	0	1	0	0	0

table continues next page

Table C.1: Continued

Factor	Component	Definition	National	Urban	Rural	Q1	Q2
	Disposal of feces	Adequate if child's feces are disposed of in a toilet or latrine.	21	27	17	14	14
	Hand-washing facilities	Adequate if survey enumerator verified existence of hand-washing station with water and soap.	17	23	14	7	10
Health care adequacy	Prenatal care	At least four prenatal visits.	65	73	60	51	56
	Postnatal care	Single medical visit should have taken place in first 2 months of birth.	59	70	53	44	49
	Immunization	BCG (at birth); DPT/pentavalent (at 2, 4, and 5 months); measles (at 9 months); and oral polio (at 2, 4, and 5 months), with a 3-month leeway in immunization compliance.	33	40	29	24	28
	Vitamin A	Vitamin A supplementation every 6 months for children 6 months or older.	56	63	52	52	53
Care adequacy	Initiation of breastfeeding	Breastfeeding initiated within 1 hour of birth.	60	57	61	66	56
	Age-appropriate breastfeeding	Children under 6 months of age exclusively breastfed; all children 6–23 months of age breastfed.	62	57	65	68	67
	Complementary feedings	Commence at 6 months of age; all children 6–8 months should be introduced to soft, semi-soft, and solid foods.	87	82	90	90	85
	Mother's age at first birth	At least 20.	58	63	55	53	56

Source: Vinha 2016.

Note: Based on data from EMMUS 2012. EMMUS = Mortality, Morbidity and Service Usage Survey.

Table C.2: Percent of Children in Haiti with Adequate Food, Care, Environment, and Health Care, 2012

Factor	National	Bottom 40%	Top 60%
None	50	59	42
Food	9	10	7
Care	11	14	9
Environment	7	2	12
Health care	7	6	8
Food and care	4	5	3
Food and environment	1	0	1
Food and health care	2	2	2
Care and environment	2	1	4
Care and health care	1	0	2
Environment and health care	3	0	5
Food, care, and environment	1	0	1
Food, care, and health care	1	1	2
Care, environment, and health care	0	0	1
Food, environment, and health care	1	0	1
All four	0	0	1

Source: Vinha 2016.

Note: Based on data from EMMUS 2012. EMMUS = Mortality, Morbidity and Service Usage Survey.

Table C.3: Factors of Stunting in Haitian Children 0–23 Months

Item	National	Rural	Urban	Bottom 40%	Top 60%
Adequate food	0.129	0.166	0.036	0.29	-0.077
Adequate care	0.125	0.114	0.18	0.056	0.236
Adequate WASH	0.331**	0.208	0.439**	-0.275	0.335**
Adequate health care	0.703***	0.897***	0.384	0.604	0.708**
Adequate in food and care	0.268	0.163	0.905**	0.249	0.327
Adequate in food and WASH	0.108	0.252	-0.05	0.024	0.039
Adequate in food and health care	0.398	0.294	0.438	0.29	0.477
Adequate in care and WASH	0.088	0.015	0.093	-0.36	0.129
Adequate in care and health care	0.303	0.196	0.47	0.508	0.17
Adequate in WASH and health care	0.743***	1.127***	0.457*	-0.229	0.707***
Adequate in food, care, and WASH	-0.154	-0.244	-0.022	-2.117	-0.002
Adequate in food, care, and health care	0.132	0.208	0.035	0.264	-0.004

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Table C.3: Continued

Item	National	Rural	Urban	Bottom 40%	Top 60%
Adequate in care, WASH, and health care	-0.618	-2.112***	-0.052		-0.723
Adequate in food, WASH, and health care	0.931**	0.405***	1.627***		0.827*
Adequate in all four	0.3	1.158***	-1.499		0.196
Constant	-0.722***	-0.748***	-0.657***	-0.803	-0.618***
Observations	1,651	1,143	508	869	782
R-squared	0.025	0.034	0.033	0.017	0.037

Source: Vinha 2016.

Note: Tables shows results of ordinary least squares regression using 2012 EMMUS data. Bottom 40% and top 60% were computed using wealth index in EMMUS data. EMMUS = Mortality, Morbidity and Service Usage Survey; WASH = water supply, sanitation, and hygiene.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

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Appendix D

WASH Poverty Risks Model (WASH-PRM)

The WASH poverty risk model (WASH-PRM) assesses patterns of disease risk across economic and geographic subpopulations by combining rigorous estimates of the effects of exposure and susceptibility factors on disease with country-specific data on the distribution of these risk factors (Rheingans and others 2016). The primary purpose of the model is to describe how diverse and interrelated risk factors may contribute to the way in which the national diarrheal disease burden is distributed across subpopulation groups (for example, between wealth quintiles). These descriptions are both quantitative (by economic group and setting) and spatial in nature. Understanding of the codistribution of these risk factors is used to identify the most consequential factors or combination of factors that require intervention.

The conceptual framework for the WASH-PRM combines key exposure factors and susceptibility factors that are most relevant to diarrhea. Exposure factors include WASH-related elements that influence the risk of diarrheal disease. Relative risks for individual exposure risk factors are combined into a single exposure index. Susceptibility factors address individual risk factors, such as underweight, vitamin A, and oral rehydration therapy. Quantitative risk estimates for each factor are combined into a single susceptibility index.

Relative risk is a concept commonly used in public health and epidemiology to quantify how a particular risk factor may increase or decrease the risk of a specific health outcome. A relative risk less than 1 means a factor is protective; a relative risk greater than 1 means a factor increases the risk.

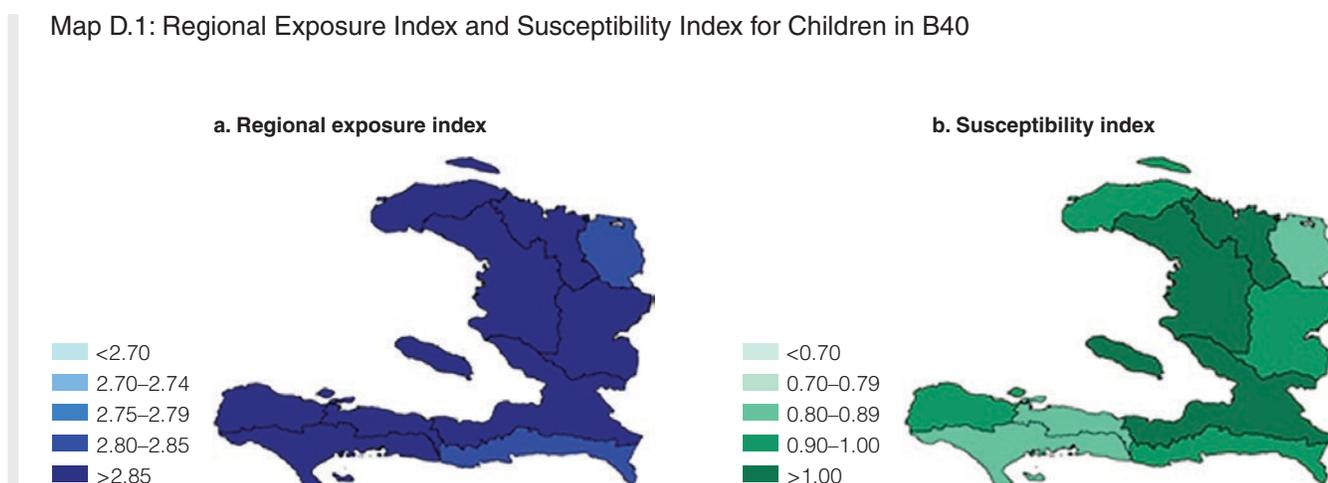
The WASH risk index combines quantitative information on household WASH and health to quantify the relative risk of adverse child health outcomes as a result of inadequate WASH practices (table D.1). The index, calculated at the level of the child, combines information on the child's household WASH characteristics, individual health vulnerabilities, and the relative risk associated with each factor. The relative risks for each factor are multiplied to develop the cumulative risk index. The weight of each is based on the evidence in the literature. The combined relative risk scores are broken into an exposure index (with the WASH variables) and a susceptibility index (with the health-related factors).

Table D.1: Relative Risks Associated with Various Water and Sanitation Scenarios

Scenario	Relative risk for water	Relative risk for sanitation	Combined relative risks
1: No improved water access, no improved sanitation access	1.00 (A)	1.00 (A)	1.00
2: Improved off-plot water access, no improved sanitation access	0.89 (B)	1.00 (A)	0.89
3: No improved water access, improved sanitation access	1.00 (A)	0.84 (B)	0.84
4: Improved off-plot water access, improved sanitation access	0.89 (B)	0.84 (B)	0.75
5: Improved on-premises water access, improved sanitation access	0.77 (C)	0.84 (B)	0.65
6: Improved on-premises water access, sewered sanitation	0.77 (C)	0.31 (C)	0.24

Note: Relative risk values are from Wolf and others 2014.

Map D.1: Regional Exposure Index and Susceptibility Index for Children in B40



Source: Rheingans and others 2016.

References

- Rheingans, R., K. H. Bagamian, J. D. Anderson, S. J. Ryan, L. A. Laytner, K. McNamara, M. P. Amaya, J. Watson, and O. Cumming. 2016. "Poverty Risk Model Assessment: Haiti." Background paper for the Haiti WASH Poverty Diagnostic. World Bank, Washington, DC.
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