HEALTH SERVICE PROVISION IN KENYA

Assessing Facility Capacity, Costs of Care, and Patient Perspectives

ACCESS, BOTTLENECKS, COSTS, AND QUITY

IHME INSTITUTE FOR HEALTH METRICS AND EVALUATION
UNIVERSITY OF WASHINGTON

AAH ACTION AFRICA HELP INTERNATIONAL

This report was prepared by the Institute for Health Metrics and Evaluation (IHME) in collaboration with Action Africa Help-International (AAH-I). This work is intended to help policymakers understand the costs of health service delivery, facility-based characteristics of antiretroviral therapy (ART) programs, and health facility performance in Kenya. The numbers may change following peer review. The contents of this publication may not be reproduced in whole or in part without permission from IHME.

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AAH ACTION AFRICA HELP INTERNATIONAL

About AAH-I

Action Africa Help-International (AAH-I) is an international non-governmental organization based in Nairobi, Kenya. AAH-I supports livelihood-challenged communities in Eastern and Southern Africa to sustainably improve their well-being and standard of living. With country programs in Kenya, Somalia, South Sudan, Uganda, and Zambia, AAH-I has over 20 years' experience working with communities in conflict and post-conflict situations. More recently, AAH-I has expanded its activities to work with other marginalized communities, including pastoralists and urban-slum dwellers.

About IHME

The Institute for Health Metrics and Evaluation (IHME) is an independent global health research center at the University of Washington that provides rigorous and comparable measurement of the world's most important health problems and evaluates the strategies used to address them. IHME makes this information freely available so that policymakers have the evidence they need to make informed decisions about how to allocate resources to best improve population health.

To express interest in collaborating or request further information on the Access, Bottlenecks, Costs, and Equity (ABCE) project in Kenya, please contact IHME:

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About this report

Health Service Provision in Kenya: Assessing Facility Capacity, Costs of Care, and Patient Perspectives provides a comprehensive yet detailed assessment of health facility performance in Kenya, including facility capacity for service delivery, costs of care, and patient perspectives on the services they received. This report also has a special focus on facility-based antiretroviral therapy (ART) programs, measuring trends in ART initiation characteristics and capturing experiences reported by patients seeking HIV services. Findings presented in this report were produced through the ABCE project in Kenya, which aims to collate and generate the evidence base for improving the cost-effectiveness and equity of health systems. Comparisons of facility-level findings, which were found in the original printing of this report in June 2014, will be available at a later date. The ABCE project is funded through the Disease Control Priorities Network (DCPN), which is a multiyear grant from the Bill & Melinda Gates Foundation to comprehensively estimate the costs and cost-effectiveness of a range of health interventions and delivery platforms. A separate grant from the Bill & Melinda Gates Foundation funded the ART-specific component of the ABCE project in Kenya.

The ABCE project is a collaborative project between IHME and Action Africa Help-International (AAH-I). At IHME, Christopher Murray, Kelsey Moore, Emmanuela Gakidou, Michael Hanlon, Herbert Duber, Santosh Kumar, Anne Gasasira, Thomas Odeny (now of University of Washington's Department of Epidemiology and KEMRI), and Emelda Okiro (now of KEMRI-Wellcome Trust) had key roles in the project. At AAH-I, the project was led by Caroline Kisia, who was the in-country principal investigator (PI), and Pamela Njuguna, who served as the research coordinator. They received further support at AAH-I from Ann Thuo, Dinah Nioroge, and Umar Baba. Data collection was conducted by a team of 24 research associates, largely from AAH-I. Analyses were jointly conducted by several researchers at AAH-I and IHME, including Benjamin Brooks, Roy Burstein, Ruben Conner, Emily Dansereau, Brendan DeCenso (now of RTI International), Laura Di Giorgio, Grégoire Lurton, Samuel Masters (now of UNC-Chapel Hill), Allen Roberts, and Alexandra Wollum. This report was written by Nancy Fullman of IHME.

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Acronyms

AAH-I	Action Africa Help-International
ABCE	Access, Bottlenecks, Costs, and Equity
ACT	Artemisinin-based combination therapy
AIDS	Acquired immunodeficiency syndrome
ANC	Antenatal care
ART	Antiretroviral therapy
ARV	Antiretroviral (drug)
AZT	Zidovudine (a type of antiretroviral)
BMI	Body mass index
CD4	Cluster of differentiation 4 (cells that fight infection)
CHAI	Clinton Health Access Initiative
d4T	Stavudine (a type of antiretroviral)
DCPN	Disease Control Priorities Network
DEA	Data Envelopment Analysis
DHMT	District Health Management Team
DHS	Demographic and Health Survey
ECG	Electrocardiography
EML	Essential Medicines List
EmOC	Emergency obstetric care
GBD	Global Burden of Disease
GHDx	Global Health Data Exchange
HIV	Human immunodeficiency virus
IHME	Institute for Health Metrics and Evaluation
IMCI	Integrated management of childhood illness
IPTp	Intermittent preventive therapy (during pregnancy)
KEPH	Kenya Essential Package for Health
KHSSP	*Kenya Health Sector Strategic and Investment Plan, 2012–2018*
KIHBS	Kenya Integrated Household Budget Survey

KNBS	Kenya National Bureau of Statistics
Kshs	Kenyan shillings
LRI	Lower respiratory infection
MOH	Ministry of Health
MOMS	Ministry of Medical Services
MOPHS	Ministry of Public Health and Sanitation
NACC	National AIDS Control Council
NASCOP	National AIDS and STI Control Programme
NCD	Non-communicable disease
NGO	Non-governmental organization
NHSSP II	*National Health Sector Strategic Plan of Kenya, 2005–2010*
PEPFAR	US President's Emergency Plan for AIDS Relief
PMTCT	Prevention of mother-to-child transmission of HIV
SARA	Service Availability and Readiness Assessment
SP	Sulfadoxine/pyrimethamine (Fansidar)
RDT	Rapid diagnostic test
TDF	Tenofovir (a type of antiretroviral)
USD	US dollar
VCT	Voluntary counseling and testing
WHO	World Health Organization

Terms and definitions

CD4 cell count: a measure of the number of CD4 cells/mm^3. CD4 cell counts are used to classify stages of HIV or AIDS, with lower levels indicating more advanced progression of the disease.

Constraint: a factor that facilitates or hinders the provision of or access to health services. Constraints exist as both "supply-side," or the capacity of a health facility to provide services, and "demand-side," or patient-based factors that affect health-seeking behaviors (e.g., distance to the nearest health facility, perceived quality of care received by providers).

County sampling frame: the list of counties from which the ABCE county sample was drawn.

Data Envelopment Analysis (DEA): an econometric analytic approach used to estimate the efficiency levels of health facilities.

Efficiency: a measure that reflects the degree to which health facilities are maximizing the use of the resources available in producing services.

Facility sampling frame: the list of health facilities from which the ABCE sample was drawn. This list was based on a 2011 facility inventory published by the Ministry of Health (MOH) of Kenya.

Inpatient bed-days: the total number of days spent in a facility by an admitted patient. This statistic reflects the duration of an inpatient visit rather than simply its occurrence.

Inpatient visit: a visit in which a patient has been admitted to a facility. An inpatient visit generally involves at least one night spent at the facility, but the metric of a visit does not reflect the duration of stay.

Inputs: tangible items that are needed to provide health services, including facility infrastructure and utilities, medical supplies and equipment, and personnel.

Outpatient equivalent visits: different measures of patient visits, such as inpatient bed-days and births, scaled to equal a comparable number of outpatient visits. This approach to standardizing patient visits is informed by weights generated through Data Envelopment Analysis (DEA), capturing the use of facility resources to produce inpatient bed-days, births, and antiretroviral therapy (ART) visits relative to the production of an outpatient visit. Conversion to outpatient equivalent visits varied by facility, but on average, we estimated the following:

- 1 inpatient bed-day = 3.8 outpatient visits
- 1 birth = 9.4 outpatient visits
- 1 ART visit = 1.7 outpatient visits

Outpatient visit: a visit at which a patient receives care at a facility without being admitted (excluding patients presenting for ART services).

Outputs: volumes of services provided, patients seen, and procedures conducted, including outpatient and inpatient care, ART visits, laboratory and diagnostic tests, and medications.

Platform: a channel or mechanism by which health services are delivered.

User fee: a monetary payment made at a facility in exchange for medical services.

Viral load: a measure of the amount of HIV in a blood sample (copies of HIV ribonucleic acid per milliliter [RNA/mL] of plasma). Viral load is used to measure infection severity and monitor response to treatment.

Health facility types in Kenya[1]

National hospitals: These hospitals are intended to serve all Kenyans and act as referral centers for lower-level hospitals. They offer a full range of specialized services; sophisticated diagnostic, therapeutic, and rehabilitative services; and training and research services for issues of national importance.

Provincial hospitals: These hospitals act as the intermediary between national referral hospitals and district-level hospitals, overseeing the implementation of health policy at the district level and coordinating district health activities. Also known as secondary hospitals, these facilities also provide specialized care.

District and sub-district hospitals: Also known as primary hospitals, these hospitals serve as the main referral center for health centers and offer a range of services, including outpatient care; maternity services; inpatient services; emergency surgery; blood transfusion; laboratory; and consultative services in support of community-based programs.

Maternity homes: Also known as nursing homes, these private facilities largely focus on maternity services and outpatient services. Maternity homes are typically managed by a nurse.

Health centers: These facilities are intended to serve as the country's main primary care centers, offering a range of preventive and curative services. While health centers and dispensaries often share similar primary care functions, health centers are generally staffed by a larger number of skilled health personnel than the staffs found at dispensaries.

Dispensaries: These facilities are intended to serve as the first point of contact between communities and Kenya's health system and offer a spectrum of preventive health and curative services.

Clinics: These private facilities largely provide curative services. They are typically operated by one medical professional.

[1] Descriptions of Kenyan health facilities came from multiple sources (MOMs and MOPHs 2012, NCAPD et al. 2011).

Executive summary

Kenya's Ministry of Health (MOH) states that its vision is to support "an efficient and high quality health care system that is accessible, equitable, and affordable for every Kenyan." Kenya and development partners have invested in bringing this mission to reality, striving to extend health services to the country's most rural populations and to ensure that quality medical care, such as antiretroviral therapy (ART) services for HIV-positive patients, results in minimal costs for individuals in need of treatment. However, until recently, it has been less of a priority to critically consider the full range of factors that contribute to or hinder the achievement of Kenya's overarching health goals.

Since its inception in 2011, the Access, Bottlenecks, Costs, and Equity (ABCE) project has sought to comprehensively identify what and how components of health service provision – access to services, bottlenecks in delivery, costs of care, and equity in care received – affect health system performance in several countries. Through the ABCE project, multiple sources of data, including facility surveys and patient exit interviews, are linked together to provide a nuanced picture of how facility-based factors (supply-side) and patient perspectives (demand-side) influence optimal health service delivery.

Led by Action Africa Help-International (AAH-I) and the Institute for Health Metrics and Evaluation (IHME), the ABCE project in Kenya is uniquely positioned to inform the evidence base for understanding the country's drivers of health care access and costs of care. Derived from a nationally representative sample of over 200 facilities, the findings presented in this report provide local governments, international agencies, and development partners alike with actionable information that can help identify areas of success and targets for improving health service provision.

The main topical areas covered in *Health Service Provision in Kenya: Assessing Facility Capacity, Costs of Care, and Patient Perspectives* move from assessing facility-reported capacity for care to quantifying the services actually provided by facilities and the efficiency with which they operate; tracking facility expenditures and the costs associated with different types of service provision; comparing patient perspectives of the care they received across types of facilities; and focusing on HIV-related care.

These findings directly align with Kenya's emphasis on providing comprehensive health services throughout the lifespan, from the newborn to the elderly, as well as the Kenya Health Policy objectives outlined by Kenya Vision 2030. Whenever possible, we link findings from the ABCE project to these health service priorities. It is with this information that we strive to provide the most relevant and actionable information for health system programming and resource allocation in Kenya.

Key findings include the following:

Facility capacity for service provision

Most facilities provided key health services, ranging from immunizations to HIV/AIDS care

- Facilities in Kenya generally reported fairly high availability of key services, especially among those that were not highly specialized (i.e., maternity homes) or at the lowest level of care and were private or owned by a non-governmental organization (NGO) (i.e., private dispensaries and clinics). Of these facilities, 96% featured a formal immunization program, 92% offered antenatal care (ANC), 90% provided HIV/AIDS care, and 82% had routine delivery services in 2012. Further, 91% of facilities, including pharmacies, stocked artemisinin-based combination therapies (ACTs), which is the first-line treatment for malaria. These findings reflect the successful expansion of a subset of the Kenya Essential Package for Health (KEPH).

Gaps in service capacity were identified between reported and functional capacity to provide care

- A service capacity gap emerged for the majority of health facilities and across several types of services. Many facilities reported providing a given service but then lacked the full capacity to properly deliver that service, such as lacking functional equipment or stocking out of medications. With antenatal care, for example, only

12% of all facilities reported having the full stock of medications, tests, and medical equipment recommended for ANC provision. This gap was particularly striking among health centers and dispensaries, as none of these primary care facilities were fully equipped to provide ANC. For both public and privately owned facilities, inadequate stocking of insulin and lacking ultrasound machines were the main constraints to being fully equipped to provide ANC.

- The case management of malaria further illustrates the spectrum of service capacity in Kenya. All national and provincial hospitals had both ACTs and malaria diagnostics (i.e., laboratory testing or rapid-diagnostic tests [RDTs]), and at least 90% of public and private health centers reported concurrent malaria diagnostic and treatment capacity. This finding indicates that a large proportion of Kenyan health facilities were equipped to provide parasitological testing prior to prescribing ACTs for malaria. However, 15% of dispensaries, both public and private, and private clinics lacked ACTs, suggesting that ACT stock-outs may not be uncommon among these platforms.

Hospitals and private facilities showed high functionality and availability of physical capital, but gaps remained, especially for primary care facilities in the public sector

- All hospitals, maternity homes, private health centers, private dispensaries, and private clinics had functional connections to the country's energy grid, and nearly all of these facilities reported access to piped water (97%). A small portion of public health centers and public dispensaries were not connected to the energy grid (13%), and slightly more did not have piped water (14%).
- This divide was further accentuated for access to improved sanitation. All national, provincial, and private hospitals had a flush toilet, whereas 33% of district and sub-district hospitals only had a covered pit latrine as their main waste system. Less than half of public health centers and dispensaries featured a flush toilet, and while most of them provided covered pit latrines, a portion were still serviced by uncovered pit latrines, especially in rural areas.
- Outside of hospitals, the availability of transportation was fairly low, especially in the public sector. Less than 20% of public health centers and dispensaries reported access to any four-wheeled vehicle, whereas 60% of private health centers and just over 30% of private dispensaries and clinics had a four-wheeled vehicle. The majority of public and private health centers had facility-based access to a phone, which could facilitate the referral of emergent patients or complex cases to higher levels of care. However, very few public dispensaries had any type of communication system, which could make the transfer of patients in emergency situations at these facilities laden with delays and complications.

Availability of recommended equipment and pharmaceuticals was moderately high, but varied within facility types

- Based on World Health Organization (WHO) equipment guidelines, we found that facilities carried an average of 77% of the equipment recommended for their level of care. National and provincial hospitals far exceeded district and sub-district hospitals, with the former carrying an average of 90% of recommended equipment while a number of district and sub-district hospitals had less than 70%. Public and private health centers stocked a similar average of the recommended equipment, 83% and 85%, respectively, but equipment availability diverged among public and private dispensaries and clinics. At this level of care in the private sector, facilities stocked an average of 79% of the recommended supplies, whereas public dispensaries reported an average of 60%, ranging from 23% to 85%.
- Most facilities stocked at least 50% of the pharmaceuticals recommended for their level of care by Kenya's Essential Medicines List (EML), but there was a wide range of medication availability across and within facility types. National and provincial hospitals carried an average of 83% of their recommended pharmaceuticals, whereas public dispensaries averaged 57% of the medications. Public dispensaries showed one of the broadest spectrums in pharmaceutical availability, ranging from 4% to 77%.
- Minor differences were found in both equipment and pharmaceutical stocks across facilities located in urban and rural areas. Rural district and sub-district hospitals generally lagged behind their urban counterparts in carrying recommended equipment, and public dispensaries in rural localities often stocked far fewer EML pharmaceuticals than those found in urban areas. At the same time, the within-platform range was generally much larger than what was observed across urban and rural facilities,

illustrating the discrepancies that existed between the average facility and the lowest-performing ones.

- Our findings further highlight the frequently observed divide between a given facility's reported capacity for service provision and its functional readiness to fully provide the care patients need.

Facilities showed higher capacity for treating infectious diseases than non-communicable diseases

- Across platforms, facilities were generally more prepared to diagnose and treat infectious diseases than a subset of non-communicable diseases (NCDs) and injuries. Facilities showed the highest capacity for managing lower respiratory infections (LRIs), HIV/AIDS, and malaria; by contrast, primary care facilities carried less than half of the recommended medical equipment and medications to properly administer care for ischemic heart disease. This finding was particularly pronounced among public health centers and dispensaries. The provision gap across platforms widened with decreasing levels of care: national and provincial hospitals stocked an average of 92% of necessary supplies for infectious diseases and 87% for NCDs (a difference of five percentage points), whereas public health centers carried an average of 54% of infectious disease medical supplies and 27% for NCDs (a difference of 27 percentage points).
- Much of these gaps in NCD care likely stemmed from pronounced deficiencies in medical equipment for NCDs. Only 27% of hospitals had an electrocardiography (ECG) machine, which provides vital diagnostic information for ischemic heart disease. More than half of public health centers and dispensaries did not have the lab equipment required to test blood glucose, which is needed to diagnose diabetes and monitor blood sugar levels. At the same time, 68% of private health centers, dispensaries, and clinics provided such lab equipment for blood glucose testing. This suggests that primary care facilities in the public sector remained largely unprepared to address Kenya's rising rates of diabetes, which more than doubled between 1990 and 2010.

Non-medical staff and nurses composed a majority of personnel, and more urban facilities achieved staffing targets than rural ones

- In terms of human resources for health, nurses often constituted the largest portion of most publicly owned facilities' total staff. Among privately owned facilities, non-medical staff accounted for 31% to 47% of average personnel composition. Across facilities, an average of 63% of personnel were considered skilled medical staff.
- Based on staffing targets stipulated for a subset of platforms, two national hospitals, five district hospitals, and 15 public health centers in the ABCE sample reached national staffing targets. In general, a greater number of rural facilities fell below staffing targets for their level of care than urban facilities.
- These results may suggest relatively poor performance in achieving recommended personnel numbers, but it is important to note that these staffing guidelines did not consider a facility's patient volume and the types of health services provided. It is possible that staffing guidelines may be more meaningful if both facility type and production levels are considered for target setting.

Facility production of health services

ART patient volumes quickly increased at primary care facilities; other patient visits were more variable over time

- Between 2007 and 2011, trends in outpatient and inpatient visits across most facility types were fairly consistent, recording gradual, if any, growth in total volume over time; private hospitals were one of the clear exceptions, documenting rising outpatient and inpatient visits from 2010 to 2011.
- While ART visits remained relatively constant at publicly owned hospitals, public health centers and private facilities documented a 109% and 93% increase, respectively, in ART visits between 2007 and 2011. This growth in ART services among these facilities is particularly notable given that public health centers and private facilities documented minimal changes in staffing numbers and facility expenditures, excluding costs of antiretrovirals (ARVs), during the same time span.

Medical staff in most facilities experienced low patient volumes each day

- Across facility types, there was a wide range in the total patient volume per medical staff and per day. Using the metric of "outpatient equivalent visits," for which inpatient bed-days, births, and ART visits were scaled to equal a comparable number of outpatient visits, we found that facilities averaged seven visits per medical staff per day in 2011, ranging from 4.7 visits at private hospitals to 13.2

at public dispensaries. This finding suggests that, despite perceived staffing shortages, most medical personnel in Kenya, especially those working in urban areas, treated a somewhat small number of patients each day.

Facilities showed capacity for larger patient volumes given observed resources

- In generating estimates of facility-based efficiency, or the alignment of facility resources with the number of patients seen or services produced, we found a wide range between the facilities with the lowest and highest levels of efficiency across platforms, especially among primary care facilities in the private sector. Most of these platforms had multiple facilities with efficiency scores lower than 20% but also featured at least one facility with an efficiency score of 100%. For public facilities, average efficiency scores increased along with levels of care, with public dispensaries posting an average of 46% and national and provincial hospitals having an average of 75%.
- At the same time, over 60% of facilities had an efficiency score below 50%, indicating that they had considerable room to expand service production given their observed human resources and physical infrastructure. This finding implies that human resources for health may not be the primary constraint to increasing patient volumes at many facilities. Future work on pinpointing specific factors that heighten or hinder facility efficiency and how efficiency is related to the actual quality of service provision should be considered.
- On average, facilities that provided ART services had much higher efficiency scores (51%) than those found across all facilities (41%). This is not an unexpected finding, given that Kenya saw an increase in ART patient visits without a corresponding rise in medical personnel at many primary care facilities. At the same time, this finding still suggests that medical personnel, on average, were not seeing a large number of patients each day.

Kenya recorded higher levels of efficiency than most other ABCE countries in sub-Saharan Africa

- Across all facilities in Kenya, we estimated an average efficiency score of 41% for 2011. This level was slightly lower than average efficiency scores found for Zambia (42%) and far exceeded average efficiency levels computed for Uganda (31%) and Ghana (27%). Ten percent of Kenyan facilities operated at high levels of efficiency (80% or higher) in 2011. Conversely, only 5% of facilities in Uganda and Ghana were performing at similarly high levels of efficiency.
- Given the observed resources at facilities, we estimated that Kenya could produce an additional 12 visits per medical staff per day, in terms of outpatient equivalent visits. In general, primary care facilities showed higher levels of potential service expansion than hospitals, with public dispensaries demonstrating the largest potential for growth. In comparison with a subset of other countries involved in the ABCE project, Kenya either had similar or much lower levels of potential service expansion. By contrast, we estimated that facilities in Ghana could increase service provision by more than four-fold, rising from an average of four outpatient equivalent visits per medical staff per day to 17.
- In combination, these findings indicate that many facilities in Kenya could increase service provision, given observed resources, and that the factors related to higher levels of facility efficiency could be easily ascertained from the country's own subset of highly efficient facilities. At the same time, it is critical to consider the expansion of services within the context of gaps in medical equipment and pharmaceuticals, especially at lower levels of care; otherwise, the successful escalation of service provision may not have the desired impact on overarching health goals in Kenya.

ART patient volumes could moderately increase given facility resources, especially for district and sub-district hospitals

- With a focus on ART service production, we estimated that, given observed facility resources, Kenya had the potential to increase its average annual ART patient volume by 69%, adding an average of 3,499 ART visits per facility. In Kenya, district and sub-district hospitals would largely drive the majority of growth in ART volumes, as we estimated that these facilities could each increase average annual ART visits by 105%. Notably, national and provincial hospitals that provided ART in the ABCE sample were found be operating close to maximum capacity (an average efficiency score of 95%). These findings suggest that many facilities, especially those at lower levels of care, are positioned to support Kenya's goal of providing universal access to HIV/AIDS treatment and care.
- This potential expansion of ART services has substantial implications for the capacity of Kenya's health system, allowing a subset of platforms to further scale up

enrollment of new ART patients at minimal added cost, and perhaps most importantly, to provide ongoing ART care to the growing ranks of long-term ART patients. Ongoing work on identifying the linkages between facility efficiency and related ART patient outcomes is crucial.

- Expanded ART service provision was also projected for Uganda and Zambia, but at different magnitudes than what was estimated for Kenya. Health facilities in Kenya had an average of 5,070 ART visits in 2011, which was lower than the average patient volumes recorded in Uganda and Zambia. This finding likely captures both the ART patient need in Kenya, relative to Uganda and Zambia, and the responsiveness of the country's health system to scaling up HIV/AIDS care.

Costs of care

- Average facility expenditures, excluding the costs of ARVs, remained relatively stable between 2007 and 2011. Spending on personnel accounted for the vast majority of annual expenditures across facility types; private dispensaries and clinics were the clear exception, with infrastructure and utilities accounting for the largest portion of annual spending at these facilities.

Average facility costs per patient markedly varied across facility types

- Across and within facility types, the average facility cost per patient visit varied substantially in 2011. An outpatient visit was generally the least expensive output to produce for most facilities, but national and provincial hospitals averaged lower costs per ART patient seen, excluding the costs of ARVs, compared to an outpatient visit. The average facility cost per outpatient visit ranged from 342 Kenyan shillings (Kshs)[2] ($4)[3] per outpatient visit at public dispensaries to 2,825 Kshs ($34) at national and provincial hospitals. Births accounted for the highest facility cost per visit for all facilities, ranging from an average of 1,403 Kshs ($17) at public dispensaries to 18,382 Kshs ($221) at national and provincial hospitals.

Kenya had the highest average facility costs per inpatient bed-day compared to other ABCE countries in sub-Saharan Africa

- In comparison with Ghana, Uganda, and Zambia, the average facility cost per patient in Kenya varied, with Kenya being on the lower end for ART visits (867 Kshs [$10]) but on the higher end of average facility costs per outpatient visit (814 Kshs [$10]) and birth (8,812 Kshs [$106]). The average cost per inpatient bed-day was the highest in Kenya (3,432 Kshs [$41]); however, Ghana and Uganda also recorded average facility costs of $41 per inpatient bed-day (3,383 Kshs and 3,404 Kshs, respectively).

Projected annual facility costs per ART patient varied in parallel with rising levels of the health system and ownership

- Across facility types, the average facility cost per ART visit, excluding ARVs, varied, ranging from 695 Kshs ($8) per visit at private facilities to 1,224 Kshs ($15) at national and provincial hospitals. On average, the projected annual facility cost of treating a new ART patient, inclusive of ARVs, ranged between 14,350 Kshs ($173) at public health centers to 20,940 Kshs ($252) at national and provincial hospitals. Once an ART patient was considered an established patient, projected total annual costs, inclusive of ARVs, dropped by approximately 20% across facility types.

Facility-based ART costs were largely driven by ARVs, and visit costs were lower for established patients

- The facility cost of ARVs accounted for a large proportion of projected annual costs across platforms and patient types, but still ranged from 61% of projected annual facility costs for new patients at district and sub-district hospitals to 76% of projected annual costs for established patients at private facilities. The annual visit cost of ART patients incurred by facilities for established patients was roughly one-third the cost of new ART patients, largely driven by the lower frequency of visits and tests compared to new patients and not by the cost of the ARVs.

- These findings suggest that facilities should view annual ARV costs per ART patient, irrespective of their status as a new or established patient, as more stable over time, which has significant program and policy implications for the continued expansion of ART services in Kenya, especially with the implementation of WHO's new initiation eligibility guidelines.

2 All Kenyan shillings (Kshs) in this report are reported in 2011 Kshs and were adjusted for inflation.

3 All US dollar (USD) figures in this report were estimated based on the 2011 exchange rate of 1 USD ($) equaling 83 Kshs.

Projected annual ART costs were generally lower for Kenyan facilities in comparison with a subset of other ABCE countries

- In 2011, Kenyan facilities had a slightly higher projected annual cost per ART patient, excluding ARVs (5,031 Kshs [$61]), than Uganda (4,734 Kshs [$57]), but they were much lower than in Zambia (8,591 Kshs [$104]). With ARV costs included, Kenyan facilities had the lowest projected annual cost per ART patient (16,167 Kshs [$195]), marginally less than Ugandan facilities (16,646 Kshs [$201]). ARV costs accounted for a larger proportion of annual facility ART expenditures in Kenya (69%) than in Zambia (60%), but were less than what was estimated for Uganda (72%).
- These findings are particularly important for ART program financing, as funding for ARVs and non-drug facility services often originate from different sources.

Patient perspectives

Most non-HIV patients had medical expenses, whereas few ART patients reported paying for care

- Among patients not seeking HIV services, the majority experienced some kind of medical expense associated with their facility visit. Aligning with Kenya's 10/20 policy, 75% of patients spent no more than 20 Kshs in user and registration fees at public health centers, and 61% of patients presenting at public dispensaries paid a maximum of 10 Kshs on user and registration fees. At the same time, several public health centers and dispensaries had patients reporting user and registration fees exceeding the 10/20 policy's payment structure for these platforms.
- Very few patients seeking HIV care reported medical expenses (less than 4%), reflecting Kenya's prioritization of providing ART services at minimal cost to patients. Nearly all patients who had medical expenses presented at private facilities. This finding suggests that the country's policy of providing free ART care at public hospitals and public health centers has been broadly adopted and enforced.
- Over half of non-HIV patients seeking care at national and provincial hospitals, private hospitals, and maternity homes reported incurring both medical and transportation expenses. On the other hand, the majority of patients presenting at primary care facilities, both public and private, did not report paying for transportation.

Most patients spent less than one hour traveling to facilities, whereas wait times for care varied more

- Across platforms, 84% of non-HIV patients traveled no more than an hour to seek care. This finding was fairly consistent across facility types, ranging from 75% of patients traveling for an hour or less to national and provincial hospitals to 93% at private dispensaries and clinics. On the other hand, wait times at facilities differed substantially for public and private facilities. More than 90% of non-HIV patients who sought care at private facilities, ranging from private hospitals to private clinics, received care within an hour; at public facilities, 71% of non-HIV patients reported similar wait times. Over 20% of patients presenting at national and provincial hospitals waited more than two hours before seeing a provider, and 10% of patients seeking care at district and sub-district hospitals, as well as public health centers, reported comparably long wait times.
- A similar trend was observed for ART patients, though slightly fewer traveled for an hour or less for care (72%). Wait times for ART patients mirrored that of non-HIV patients, with 90% of ART patients who sought care at private facilities receiving care within an hour and 60% of ART patients waiting a similar amount of time at public facilities. Notably, just under 20% of ART patients reported waiting more than two hours for care across all public platforms.

Patients gave high ratings for facility providers and slightly lower ratings of facility-based qualities

- Across platforms, patients were generally quite satisfied with their overall facility experience. In examining particular components of visit satisfaction, patients gave high ratings of their interactions with staff and providers, but often gave relatively lower marks for facility characteristics, especially for spaciousness and wait time. Ratings of facility cleanliness were generally the exception, with patients often rating cleanliness and privacy as high as their interactions with facility staff.
- Notably, privately owned facilities generally received higher ratings than public facilities. This was particularly evident among hospitals and health centers.

A focus on HIV-related care: facility-based provision of ART services

Rapid expansion of ART services took place at public health centers and private facilities

- Kenya experienced uneven growth in ART patient volumes across platforms between 2007 and 2011. Public hospitals recorded minimal changes in average ART visits during this time, whereas public health centers and private facilities saw substantial increases in annual ART visits from 2007 to 2011. However, these platforms still averaged fewer than 2,000 ART visits per facility in 2011, while national and provincial hospitals recorded an average of over 25,000 ART visits per facility that year.

Initiating ART on d4T-based regimens quickly dropped, while TDF prescription rates increased

- Between 2008 and 2012, Kenya had rapidly decreasing prescription rates of stavudine (d4T)-based regimens at ART initiation, suggesting that the country's phase-out of d4T has been successful since its policy change. The proportion of ART initiates who began therapy on a tenofovir (TDF)-based regimen escalated, increasing from 3% in 2008 to 45% in 2012.

Progress was observed in initiating ART patients at earlier stages of disease progression

- In comparison with 2008, a greater proportion of ART patients initiated at lower stages of disease and at higher CD4 cell counts in 2012, with the latter rising 55%, from a median of 155 cells/mm^3 in 2008 to 241 cells/mm^3 in 2012. Nonetheless, this level of CD4 was well below the initiation threshold of 350 cells/mm^3 set by Kenya's clinical guidelines. Further, 42% of ART initiates began therapy with a CD4 cell count less than 200 cells/mm^3 in 2012, suggesting that a large portion of HIV-positive individuals did not seek care until they were symptomatic. Assessing these clinical characteristics with more recent data is critical for evaluating the uptake of the new WHO eligibility guidelines.

More improvement is needed in collecting ART patient clinical information

- The availability of patient clinical information at ART initiation steadily improved from 2008 to 2012; in 2012, however, 27% of ART initiates still did not receive a CD4 cell count when they began treatment. Some progress was seen in recording any clinical information during their second year of therapy, but not at the frequency specified by national guidelines. Less than 1% of patients had a record of their viral load, which is the most direct measure of treatment response. To optimally respond to ART patient needs, the ongoing collection of patient clinical data must be improved.

ART retention rates varied by initiation characteristics and facility type

- After 12 months of treatment, 70% of ART patients in the ABCE sample were retained in care. Among patients initiating ART in 2011, 78% who began treatment at WHO stage 1 or 2 were retained in care 12 months later, whereas only 42% who initiated at WHO stage 4 were retained in care. Twelve-month retention rates varied across facilities for ART patients initiating in 2011, ranging from 18% to 89%, with public hospitals showing slightly higher average retention rates than public health centers and private facilities.

A focus on HIV-related care: facility-based provision of ART services, continued

Facility costs for ART patients varied by levels of care, with ARVs accounting for largest proportion of costs

- The average facility cost per ART patient visit, excluding ARVs, was 867 Kshs ($10) in 2011, ranging from 695 Kshs ($8) at private facilities to 1,224 Kshs ($15) at national and provincial hospitals. On average, the projected annual facility cost per ART patient, without including ARV costs, was 5,031 Kshs ($61), but varied from 3,066 ($37) for established ART patients at private facilities to 7,971 Kshs ($96) for new ART patients at district and sub-district hospitals. ARVs contributed to a major portion of facility ART costs, resulting in an average of 16,167 Kshs ($195) per ART patient, inclusive of ARV costs, each year. On average, ARVs accounted for 69% of annual facility costs for ART.

ART patients reported overall satisfaction with services but had long wait times for care

- Among patients seeking HIV care at public facilities, almost all ART patients experienced no medical expenses, reflecting Kenya's national policy to provide ART services free of charge at public hospitals and public health centers. However, a large proportion of ART patients incurred transportation expenses associated with their visit, which may be associated with traveling long distances to receive care.
- Across platforms, the majority of ART patients spent more time waiting for health services than traveling to receive them. Overall, ART patients were quite satisfied with the care they received, particularly at private facilities. However, public hospitals had some of the lowest ratings, especially for wait time and spaciousness.

With its multidimensional assessment of health service provision, findings from the ABCE project in Kenya provide an in-depth examination of health facility capacity, costs associated with seeking care, and how patients view their interactions with the health system. Kenya's health provision landscape was remarkably heterogeneous across facility types, location, and ownership, and it is likely to continue evolving over time. This highlights the need for continuous and timely assessment of health service delivery, which is critical for identifying areas of successful implementation and quickly responding to service disparities or faltering performance. Expanded analyses would also allow for an even clearer picture of the trends and drivers of facility capacity, efficiencies, and costs of care. With regularly collected and analyzed data, capturing information from health facilities, recipients of care, policymakers, and program managers can yield the evidence base to make informed decisions for achieving optimal health system performance and the equitable provision of cost-effective interventions throughout Kenya.

Introduction

The performance of a country's health system ultimately shapes the health outcomes experienced by its population, influencing the ease or difficulty with which individuals can seek care and facilities can address their needs. At a time when international aid is plateauing (IHME 2014a) and the government of Kenya has prioritized expanding many health programs (MOH 2005, MOMS and MOPHS 2012), identifying health system efficiencies and promoting the delivery of cost-effective interventions has become increasingly important.

Assessing health system performance is crucial to optimal policymaking and resource allocation; however, due to the multidimensionality of health system functions (Murray and Frenk 2000), comprehensive and detailed assessment seldom occurs. Rigorously measuring what factors are contributing to or hindering health system performance – access to services, bottlenecks in service delivery, costs of care, and equity in service provision throughout a country – provides crucial information for improving service delivery and population health outcomes.

The Access, Bottlenecks, Costs, and Equity (ABCE) project was launched in 2011 to address these gaps in information. In addition to Kenya, the multipronged, multipartner ABCE project has taken place in six other countries (Colombia, Ghana, Lebanon, Uganda, Zambia, and six states in India), with the goal of rigorously assessing the drivers of health service delivery across a range of settings and health systems. In 2015, the ABCE project will be implemented in two additional countries, Bangladesh and Mozambique. For a subset of these countries, including Kenya, additional work has been conducted to quantify components of facility-based HIV/AIDS programming. The ABCE project strives to answer these critical questions facing policymakers and health stakeholders in each country:

- What health services are provided, and where are they available?
- How much does it cost to produce health services?
- Who is receiving these health services?
- What are the largest barriers to accessing care and who is most affected?

Findings from each country's ABCE work will provide actionable data to inform their own policymaking processes and needs. Further, ongoing cross-country analyses will likely yield more global insights into health service delivery and costs of health care. These nine countries have been purposively selected for the overarching ABCE project as they capture the diversity of health system structures, composition of providers (public and private), and disease burden profiles. In selecting the countries for which antiretroviral therapy (ART) programs were also assessed, we sought to represent a range of ART-specific delivery mechanisms. The ABCE project contributes to the global evidence base on the costs of and capacity for health service provision, aiming to develop data-driven and flexible policy tools that can be adapted to the particular demands of governments, development partners, and international agencies.

Action Africa Help-International (AAH-I) and the Institute for Health Metrics and Evaluation (IHME) compose the core team for the ABCE project in Kenya, and they received vital support and inputs from the Ministry of Medical Services (MOMS) and the Ministry of Public Health and Sanitation (MOPHS) to execute multiple phases of data collection, analysis, and interpretation. The core team harnessed information from distinct but linkable sources of data, drawing from a nationally representative sample of Kenyan health facilities to create a large and fine-grained database of facility attributes and capacity, patient characteristics and outcomes, and measures related to ART programs. By capturing the interactions between facility characteristics and patient perceptions of care in Kenya, we have been able to piece together what factors drive or hinder optimal and equitable service provision in rigorous, data-driven ways.

We focus on the facility because health facilities are the main points through which most individuals interact with Kenya's health system or receive care. Understanding the capacities and efficiencies within and across different types of health facilities unveils the differences in health system performance at the level most critical to patients – the facility level. We believe this information is immensely valuable to governments and development partners, particularly for decisions on budget allocations. By having data on what

factors are related to high facility performance and improved health outcomes, policymakers and development partners can then support evidence-driven proposals and fund the replication of these strategies at facilities throughout Kenya. This gap in, and corresponding need for, health facility knowledge is exemplified by Kenya's experiences with HIV/AIDS.

HIV/AIDS remains a leading cause of premature mortality and illness in the country, although Kenya reached its epidemic peak for HIV/AIDS mortality in the 2000s (Ortblad et al. 2013). A monumental investment has been made in tackling HIV/AIDS in Kenya, with $2.5 billion dedicated to HIV/AIDS efforts in the country between 1990 and 2011 (Dieleman et al. 2014). The new World Health Organization (WHO) guidelines stipulating that individuals with HIV should start ART at much earlier stages of disease progression (WHO 2013a) are an example of changing ART eligibility guidelines that, in combination with the reality of ART patients living longer, have contributed to growing levels of unmet ART needs (NACC and NASCOP 2012). Kenya rapidly scaled up its facility-based ART programs over the last decade (NACC and NASCOP 2012), but patient needs still exceed the supply of service provision. Kenya aims to provide universal access to HIV/AIDS prevention, care, and treatment (NACC 2009), further widening the universe of patients needing ART and HIV services.

Prior to the ABCE project, minimal information had been comprehensively collected on what facility factors were related to improved outcomes for ART patients in Kenya (Rosen et al. 2007). By sampling a broad range of facility types with ART programs and collecting a range of patient outcome information (e.g., CD4 cell counts, program retention rates), we now have the data to better ascertain facility determinants of ART outcomes under routine conditions.

The ABCE project in Kenya has sought to generate the evidence base for improving the cost-effectiveness and equity of health service provision, as these are priorities of the Kenya MOMS and MOPHS. In this report, we examine facility capacity across platforms, as well as the efficiencies and costs associated with service provision for each type of facility. Based on patient exit interviews, we consider the factors that affect patient perceptions of and experiences with Kenya's health system. We also link ART program attributes to patient outcomes, ultimately providing a continuum of information on supply-side (facility) and demand-side (patient) constraints related to ART program costs and effectiveness. By considering a range of supply-side factors and demand-side components that influence health service delivery, we have constructed a rigorously comprehensive yet fine-grained and nuanced understanding of what helps and hinders the receipt of health services through facilities in Kenya.

The results discussed in this report are far from exhaustive; rather, they align with identified priorities for health service provision, address explicit goals set forth by national strategic plans, and aim to answer questions about the costs and equity of health care delivery in Kenya.

Findings are organized in the following manner:

Health facility characteristics and performance

This section provides an in-depth examination of health facility capacity across different platforms, specifically covering topics on human resource capacity, facility-based infrastructure and equipment, health service availability, patient volume, facility-based efficiencies, costs associated with service provision, and demand-side factors of health service delivery as captured by patient exit interviews.

Performance of health facility-based ART programs

This section provides an in-depth examination of ART program characteristics and outcomes across facility types, including drug regimens provided and variability of patient retention by platform. Results on ART service costs and efficiencies are also covered.

Access, Bottlenecks, Costs, and Equity

Access

Health services cannot benefit populations if they cannot be accessed; thus, measuring which elements are driving improved access to – or hindering contact with – health facilities is critical. Travel time to facilities, user fees, and cultural preferences are examples of factors that can affect access to health systems.

Bottlenecks

Mere access to health facilities and the services they provide is not sufficient for the delivery of care to populations. People who seek health services may experience supply-side limitations, such as medicine stock-outs, that prevent the receipt of proper care upon arriving at a facility.

Costs

What health services cost can translate into very different financial burdens for consumers and providers of such care. Thus, the ABCE project measures these costs at several levels, quantifying what facilities spend to provide services and patients pay for care.

Equity

Numerous factors can influence the ways in which populations interact with a health system, often either facilitating easier and more frequent use of health services or obstructing the relative ease and frequency with which an individual can use those same services. It is not enough to know how much it costs to scale up a given set of services; it is also necessary to understand the costs of such a scale-up for specific populations and across a host of population-related factors (e.g., distance to health facilities). These factors can often determine whether hard-to-reach populations receive the health services they need. Through the ABCE project, a main objective is to pinpoint which factors affect the access to and use of health services, as well as where and how much these factors manifest themselves.

ABCE study design

For the ABCE project in Kenya, we collected any relevant data that already existed in the country's health system and conducted primary data collection as needed. Primary data collection took place with two complementary approaches:

1. A comprehensive facility survey administered to a nationally representative sample of health facilities in Kenya (the ABCE Facility Survey).
2. Interviews with patients as they exited sampled facilities.

District Health Management Teams (DHMTs) received a modified version of the ABCE Facility Survey. For a subset of facilities that provided ART services, an ART-specific module was also included in the facility survey and the research team extracted clinical records from the charts of HIV-positive patients. Additional exit interviews were conducted for patients seeking HIV services.

Here we provide an overview of the ABCE study design and primary data collection mechanisms. All ABCE datasets and survey instruments are available online at http://www.healthdata.org/dcpn/kenya.

ABCE Facility Survey

Through the ABCE Facility Survey, direct data collection was conducted from a representative sample of health service platforms and captured information on the following indicators:

- **Inputs:** the availability of tangible items that are needed to provide health services, including infrastructure and utilities, medical supplies and equipment, personnel, and non-medical services.
- **Finances:** expenses incurred, including spending on infrastructure and administration, medical supplies and equipment, and personnel. Facility funding from different sources (e.g., government, development partners) and revenue from service provision were also captured.
- **Outputs:** volume of services and procedures produced, including outpatient and inpatient care, emergency care, laboratory and diagnostic tests, and pharmaceuticals dispensed.
- **Supply-side constraints and bottlenecks:** factors that affected the ease or difficulty with which patients received services they sought, including bed availability, pharmaceutical availability and stock-outs, cold-chain capacity, personnel capacity, and service availability.

Table 1 provides more information on the specific indicators included in the ABCE Facility Survey.

The questions included in the survey given to DHMTs were similar to those in the ABCE Facility Survey, but it was a truncated version. Table 2 details the indicators in the DHMT Survey.

Sample design. To construct a nationally representative sample of health facilities in Kenya, we used a two-step stratified random sampling process. Counties, from which facilities would be drawn, were grouped into 27 unique categories based on their average malnutrition rates (three categories: low [less than 20% prevalence of malnutrition], middle [20% to 30% prevalence], and high [greater than 30% prevalence of malnutrition]); health expenditures (three categories: poor [less than 20 Kenyan shillings (Kshs) per capita], middle [20 to 30 Kshs per capita], wealthy [more than 30 Kshs per capita]); and population density (three categories: rural, semi-dense, and dense). County-level estimates of malnutrition were derived from the 2005–2006 Kenya Integrated Household Budget Survey (KIHBS). Health expenditure data were collected from the Kenya National Bureau of Statistics (KNBS) for the fiscal years of 2008/2009 and 2009/2010. Population density was determined from the 2009 census (KNBS 2010). One county was randomly selected from each malnutrition-health expenditures-population category that was populated; Nairobi and Mombasa were automatically included, in addition to the randomly selected counties, due to their size and relevance to Kenya's health service provision. Although 27 county categories were originally created, only 16 unique categories were populated by counties from the county sampling frame.

The second step, which entailed sampling facilities from each selected county, took place across the range of platforms identified in Kenya. For the ABCE project, a "platform" was defined as a channel or mechanism by which health

TABLE 1 Modules included in the ABCE Facility Survey in Kenya

SURVEY MODULE	SURVEY CATEGORY	KEY INDICATORS AND VARIABLES
Module 1: Facility finances and inputs	Inputs	Input funding sources and maintenance information Availability and functionality of medical and non-medical equipment
	Finances	Salary/wages, benefits, and allowances record information Total expenses for infrastructure and utilities; medical supplies and equipment; pharmaceuticals; administration and training; non-medical services, personnel (salaries and wages, benefits, allowances) Performance and performance-based financing questions
	Revenues	User fees; total revenue and source
	Personnel characteristics	Total personnel; volunteer and externally funded personnel; personnel dedicated to HIV/AIDS-specific services Funding sources of personnel; education and training of medical personnel Health services provided and their staffing; administrative and support services and their staffing
Module 2: Facility management and direct observation	Facility management and infrastructure characteristics	Characteristics of patient rooms; electricity, water, and sanitation; facility meeting characteristics Guideline observation
	Direct observation	Latitude, longitude, and elevation of facility Facility hours, characteristics, and location; waiting and examination room characteristics
Module 3: Lab-based consumables, equipment, and capacity	Facility capacity	Lab-based tests available
	Medical consumables and equipment	Lab-based medical consumables and supplies available
Module 4: Pharmaceuticals	Facility capacity	Pharmacy information; cold chain characteristics and supplies
	Pharmacy-based medical consumables and equipment	Drug kit information; buffer stock information Essential pharmaceutical availability, prices, and stock-out information Pharmaceutical ordering system; pharmaceuticals ordered, received, and costs to patients
Module 5: ART pharmaceuticals	Pharmacy-based ART consumables and equipment	Essential ART availability, prices, and stock-out information ART pharmaceutical ordering system; pharmaceuticals ordered, received, and costs to patients
Module 6: General medical consumables, equipment, and capacity	Medical consumables and equipment	Availability and functionality of medical furniture, equipment, and supplies Inventory of procedures for sterilization, sharp items, and infectious waste Inventory of personnel
Module 7: Facility outputs	Facility capacity	Referral and emergency referral infrastructure
	General service provision	Inpatient care and visits; outpatient care and visits; home or outreach visits Care and visits for specific conditions, including emergency visits and HIV care Vaccinations administered Laboratory and diagnostic tests

Note: Indicators for finances, personnel, and outputs reflect the past five fiscal years (2007 to 2011); all other indicators reflect the status at the time of survey.

TABLE 2 Indicators included in the DHMT Survey in Kenya

SURVEY MODULE	SURVEY CATEGORY	KEY INDICATORS AND VARIABLES
DHMT finances and inputs	Finances	Salary/wages, benefits, and allowances Total expenses for infrastructure and utilities; medical supplies and equipment; pharmaceuticals; administration and training; non-medical services, personnel (salaries and wages, benefits, allowances) DHMT-specific program expenses: immunization campaigns, promotional campaigns, medical trainings
	Revenues	Total revenue and source
	Personnel characteristics	Total personnel
DHMT direct observation	Latitude, longitude, and elevation of the DHMT	
Additional information on sampled facilities within the district, as reported by the DHMT	Finances	Financial summary for sampled facilities
	Personnel characteristics	Total personnel at sampled facilities

services are delivered. In Kenya, sampled health facilities included national hospitals, provincial hospitals, district hospitals, sub-district hospitals, maternity homes, health centers, dispensaries, clinics, voluntary counseling and testing (VCT) centers, and pharmacies, as well as DHMTs. The facility sampling frame used for the ABCE project originated from the 2011 Ministry of Health (MOH) facility inventory.

A total of 18 counties were selected through the county sampling frame, and 253 facilities (excluding DHMTs) from those counties were randomly selected through the facility sampling frame:

- Up to three hospitals within the selected county, purposefully including any national hospitals.
- Up to three health centers.
- Up to three maternity homes.
- Up to two clinics, irrespective of their provision of ART.
- One clinic that offers ART.
- One dispensary, irrespective of its provision of ART.
- One dispensary that offers ART; if none existed in the county, an additional dispensary was sampled.
- Up to two pharmacies.
- Up to one VCT center.
- All training institutions within the selected county.

Within each selected county, we also included the DHMT in our sample. All national or provincial hospitals were included in the final facility sample, irrespective of their location. This means that six additional counties were included in the final ABCE sample as some national and provincial hospitals were located in a non-sampled county. However, no other facilities were selected from these non-sampled counties, as they were not drawn from the county sampling frame. Figure 1 depicts this two-step sampling process used in Kenya.

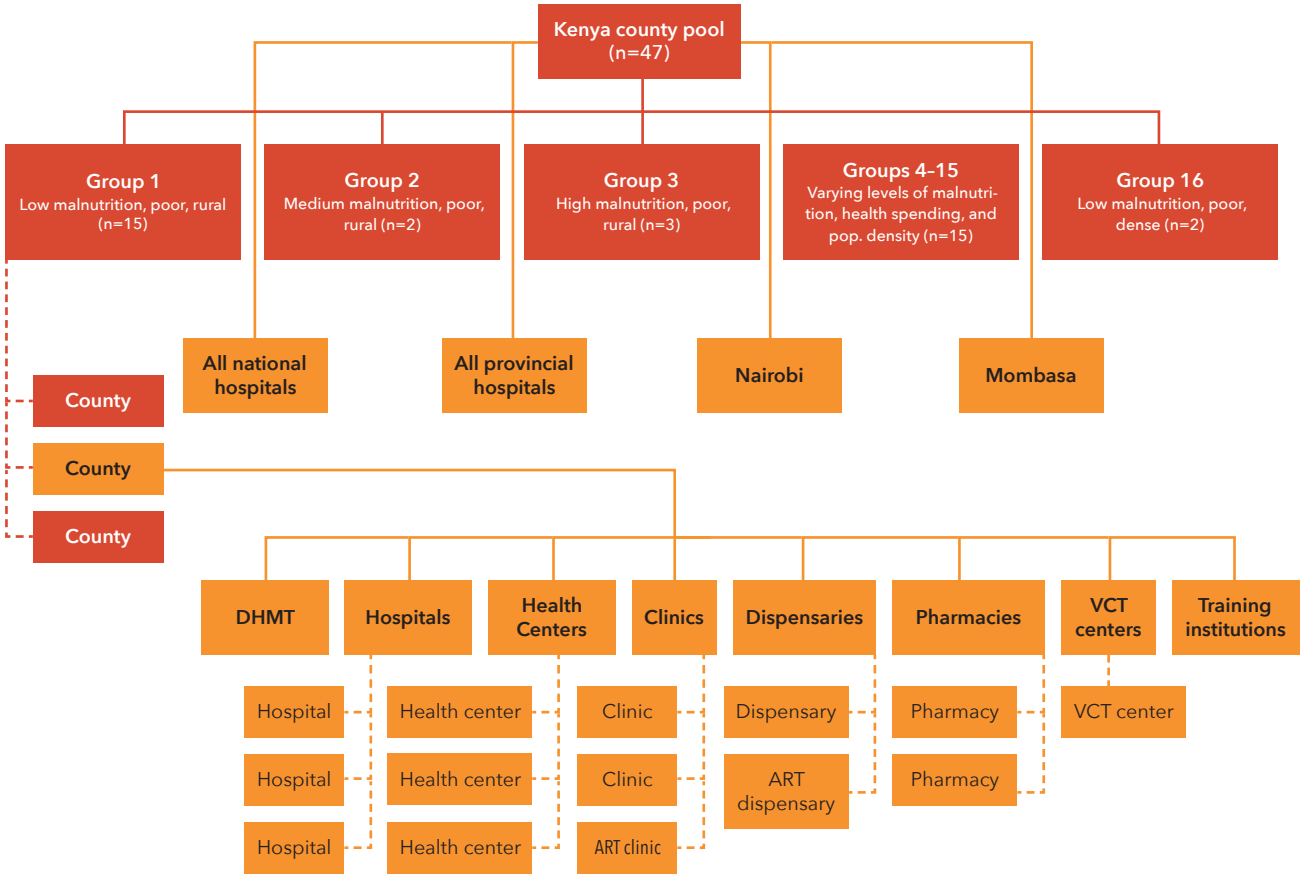
In the results that follow, national and provincial hospitals are grouped together, unless otherwise indicated, as are district and sub-district hospitals. Based on facility reports in the ABCE Facility Survey and consultation from the ABCE field team in Kenya, we grouped facilities owned by non-governmental organizations (NGOs) with privately owned facilities. For this report, we note if findings are presented separately for private and NGO-owned facilities.

ART module and clinical chart extraction. Of the facilities offering ART services that were selected for ABCE Facility Survey implementation, we randomly sampled 60 facilities to receive an additional survey module that collected information on facility-level ART program characteristics, service provision, and costs. This ART-focused module was administered alongside the ABCE Facility Survey at these facilities.

Table 3 provides more information on the specific indicators included in the ART module.

For a subsample of these facilities with ART services, information from up to 250 clinical records for ART patients was extracted. Inclusion criteria permitted the use of records

FIGURE 1 Sampling strategy for the ABCE project in Kenya



Note: Boxes that are red reflect groups considered for the county sampling frame. Counties that are orange represent those selected through this county sampling process. Solid lines indicate inclusion from the previous sampling step, while dashed lines indicate that a random selection of counties or facilities took place.

TABLE 3 ART indicators collected in the ABCE Facility Survey in Kenya

SURVEY MODULE	SURVEY CATEGORY	KEY INDICATORS AND VARIABLES
Module 1	Facility capacity	Essential HIV/AIDS-specific pharmaceutical availability and stock-out information
		HIV-related outreach care and prevention services
		HIV care dedicated personnel
Module 3	General service provision	HIV-related medical consumables and care available
		HIV-related tests and services available
		ART services
		HIV-related laboratory and diagnostic tests
Module 7	Service provision	HIV outpatient care
		ART initiations; pre-ART and ART patient visits
		Prevention of mother-to-child transmission (PMTCT) services
		Male circumcision services
		HIV testing and counseling

for patients aged 18 years or older who had initiated ART treatment between six and 60 months before the date on which chart data were collected. All patient identifiers were removed, and access to the secure database with patient chart data was limited to specific research team members.

Table 4 details the types of data extracted from clinical charts and electronic record databases. Over 15,000 charts were ultimately extracted across facilities in the ABCE sample.

Patient Exit Interview Survey

Based on a subset of sampled facilities, a maximum of 30 patients or attendants of patients were interviewed per facility. Among facilities that offered ART services, an additional 30 patient exit interviews were conducted in an effort to capture information from patients who had specifically sought HIV care (a total of 60 patient exit interviews). Patient selection was based on a convenience sample.

The main purpose of the Patient Exit Interview Survey was to collect information on patient perceptions of the health services they received and other aspects of their facility visit (e.g., travel time to facility, costs incurred during the facility visit). This information fed into quantifying the "demand-side" constraints to receiving care (as opposed to the facility-based, "supply-side" constraints and bottlenecks measured by the ABCE Facility Survey).

The questions asked in the Patient Exit Interview Survey were organized into five main categories:

- Expectations for the facility.
- Circumstances of and reasons for the particular facility visit.
- Time and costs associated with the facility visit.
- Satisfaction with services.
- Patient demographic information (e.g., educational attainment).

Table 5 provides more information on the specific questions included in the Patient Exit Interview Survey.

TABLE 4 Indicators extracted from clinical charts of HIV-positive patients currently enrolled in ART

SURVEY MODULE	SURVEY CATEGORY	KEY INDICATORS AND VARIABLES
Clinical chart extraction	Patient information	Age, sex, height, weight
		Care entry point (i.e., PMTCT, VCT)
		Other demographic information
	ART initiation	Pre-ART and ART initiation date
	Care information	Tests conducted, results, and corresponding dates
		ART regimen information
		Opportunistic infections
	Patient outcomes	Alive and retained in care, lost to follow-up, transferred, deceased
		Adherence to treatment, treatment failure

TABLE 5 Types of questions included in the Patient Exit Interview Survey in Kenya

SURVEY CATEGORY	TYPES OF KEY QUESTIONS AND RESPONSE OPTIONS
Direct observation of patient	Sex of patient and/or patient's attendant
Direct interview with patient	Scaled-response demographic questions (e.g., level of education attained)
	Scaled-response satisfaction scores (e.g., satisfaction with facility cleanliness: (1) very bad; (2) bad; (3) average; (4) good; (5) very good)
	Open-ended questions for circumstances and reasons for facility visit, as well as visit characteristics (e.g., travel time to facility)
	Reporting costs associated with facility visit (user fees, medications, transportation, tests, other), with an answer of "yes" prompting follow-up questions pertaining to amount

Eligibility for participation in the exit interviews was determined by age (whether the patient was 18 years or older or, if younger than 18 years old, was accompanied by an attendant that met the age requirement) and responsiveness (whether the patient or attendant was able to respond to questions). All data collected through patient exit interviews were kept confidential.

Patients who reported seeking HIV services during their facility visit were then asked about the types of HIV services sought (e.g., counseling, testing, routine check-up, report collection) and their ART status. If a patient indicated that they were currently enrolled in ART, they were asked an additional set of questions to gather ART-specific information, including the following:

- Length of time enrolled in ART.
- State of health since ART initiation.
- Whether HIV appointments had ever been missed, and if so, why.
- Ease with which ART drugs were obtained.
- Health complications related to ART regimen.
- Side-effects or consequences experienced since ART initiation (e.g., ability to work, social engagement).

Over 4,200 patients were interviewed as part of the ABCE project in Kenya.

Data collection for the ABCE project in Kenya

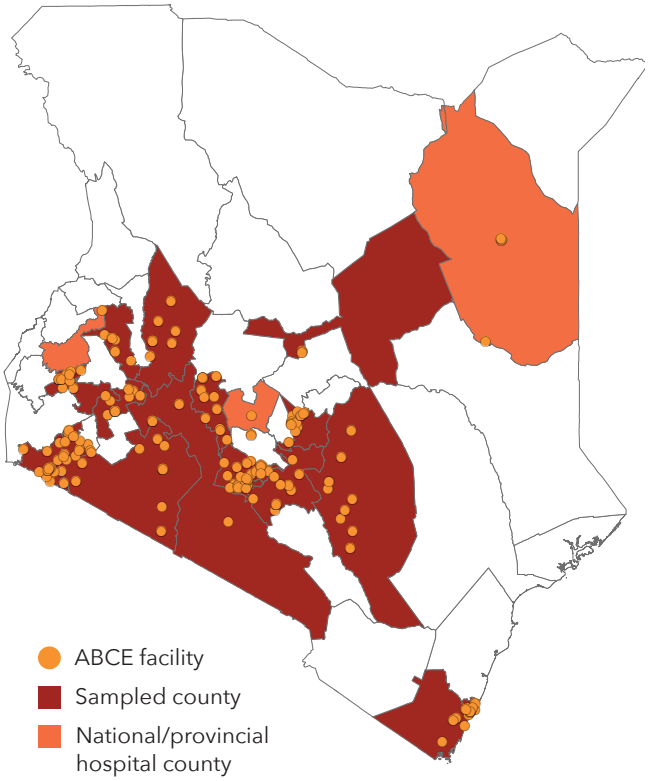
Data collection took place between April and November 2012. Prior to survey implementation, AAH-I and IHME hosted a one-week training workshop for 24 research associates, where they received extensive training on the electronic data collection software (DatStat), the survey instruments, the Kenyan health system's organization, and interviewing techniques. Following this workshop, a one-week pilot of all survey instruments took place at health facilities outside the ABCE sample. Ongoing training occurred on an as-needed basis throughout the course of data collection.

All collected data went through a thorough verification process between IHME, AAH-I, and the ABCE field team. Following data collection, the data were methodically cleaned and re-verified, and securely stored in databases hosted at IHME.

Figure 2 displays the counties and facilities sampled for the ABCE project in Kenya. Table 6 provides information on the final facility sample. The final sample of hospitals included 11 national and provincial hospitals, 27 district and sub-district hospitals, and 17 private hospitals. In cases when facilities reported a different platform classification than what was recorded in the 2011 MOH facility inventory, we deferred to the classification reported by facility representatives in the ABCE Facility Survey.

Data and corresponding instruments from the ABCE project in Kenya can be found online through IHME's Global Health Data Exchange (GHDx): http://ghdx.healthdata.org.

FIGURE 2 Counties and facilities sampled for the ABCE project in Kenya



COUNTY	FACILITIES	PERCENT OF FINAL SAMPLE
Baringo	12	5%
Embu	16	6%
Garissa	1	< 1%
Gucha	2	1%
Isiolo	4	2%
Kakamega	1	< 1%
Kericho	14	6%
Kiambu	21	8%
Kisii	18	7%
Kisumu	1	< 1%
Kitui	14	6%
Kwale	8	3%
Machakos	16	6%
Migori	22	9%
Mombasa	23	9%
Murang'a	1	< 1%
Nairobi	23	9%
Nakuru	1	< 1%
Narok	12	5%
Nyandarua	16	6%
Nyeri	1	< 1%
Uasin Gishu	6	2%
Vihiga	15	6%
Wajir	6	2%
Total	**254**	**100%**

TABLE 6 Facility sample, by platform, for the ABCE project in Kenya

FACILITY TYPE	FINAL SAMPLE
National and provincial hospitals	11
District and sub-district hospitals	27
Private hospitals	17
Maternity homes	17
Health centers	53
Clinics	18
Dispensaries	34
VCT centers	10
Pharmacies or drug stores	17
District health management teams (DHMTs)	50
TOTAL FACILITIES	**254**

Main findings
Health facility profiles

The delivery of facility-based health services requires a complex combination of resources, ranging from personnel to physical infrastructure, that vary in their relative importance and cost to facilities. Determining what factors support the provision of services at lower costs and higher levels of efficiency at health facilities is critical information for policymakers, especially as countries like Kenya consider how to expand health system coverage and functions within constrained budgets.

Using the ABCE Kenya facility sample (Table 6), we analyzed five key drivers of health service provision at facilities:

- Facility-based resources (e.g., human resources, infrastructure and equipment, and pharmaceuticals), which are often referred to as facility inputs.
- Patient volumes and services provided at facilities (e.g., outpatient visits, inpatient bed-days), which are also known as facility outputs.
- Patient-reported experiences and their reported costs of care, capturing "demand-side" factors of health service delivery.
- Facility alignment of resources and service production, which reflects efficiency.
- Facility expenditures and production costs for service delivery.

These components build upon each other to create a comprehensive understanding of health facilities in Kenya, highlighting areas of high performance and areas for improvement.

Facility capacity and characteristics

Service availability

Across and within platforms in Kenya (Figure 3), several notable findings emerged for facility-based health service provision. National and provincial hospitals reported providing a wide range of services, including surgical services, internal medicine, and specialty services such as emergency obstetric care (EmOC) and anesthesiology. District and sub-district hospitals generally offered fewer services than private hospitals, with private hospitals more closely resembling national and provincial hospitals in their reported availability of services. Across types, all hospitals reported providing antenatal care (ANC) and routine birthing services, and the vast majority of hospitals had formal immunization programs (98%, with only one tertiary hospital reporting that it did not host an immunization program), HIV/AIDS care (96%), pediatric services (93%), and EmOC (78%). Over 80% of all facilities provided HIV/AIDS services, but availability was more varied at lower levels of care, from 95% of public health centers to 47% of maternity homes reporting that they had HIV/AIDS services. Public health centers generally had higher levels of service availability than their private counterparts, but a greater proportion of private health centers reported more specialized care than public health centers, such as accident and emergency units (40% versus 21%, respectively). A similar finding emerged in comparing public dispensaries with private dispensaries and clinics.

As part of *Kenya's Second National Health Sector Strategic Plan (NHSSP II), 2005–2010*, the Kenya Essential Package for Health (KEPH) was reformulated into focusing on six distinct stages of the human life-cycle: pregnancy, delivery, and the newborn child (up to 2 weeks of age); early childhood (3 weeks to 5 years); late childhood (6 to 12 years); adolescence (13 to 24 years); adulthood (25 to 59 years); and elderly (60 years and older) (MOH 2005). While the services included in Figure 3 are far from exhaustive, they help represent service areas of success and for improvement in the Kenyan health system.

In general, facilities showed a fairly high availability of a subset of priority services for early childhood, as well as pregnancy, delivery, and the newborn child. Excluding private dispensaries and clinics, 93% of facilities reported providing ANC. Routine delivery services were available at 85% of facilities, excluding all dispensaries and clinics. About 90% of facilities reported hosting a formal immunization program, with public and private health centers showing the highest availability among non-hospital facilities, at 97% and 93%, respectively.

For the older life-cycle stages, greater heterogeneity in service availability emerged. HIV/AIDS services were highly prevalent, but health education outreach and family planning, services of high priority for late childhood

FIGURE 3 Availability of services in health facilities, by platform, 2012

	NATIONAL/ PROVINCIAL HOSPITAL	DISTRICT/ SUB-DISTRICT HOSPITAL	PRIVATE HOSPITAL	MATERNITY HOME	PUBLIC HEALTH CENTER	PRIVATE HEALTH CENTER	PUBLIC DISPENSARY	PRIVATE DISPENSARY/ CLINIC
Pharmacy	100	100	00	94	100	100	92	88
Immunization program	91	100	100	88	97	93	88	65
Antenatal care	100	100	100	94	97	80	81	65
Routine delivery services	100	100	100	94	87	67	54	42
HIV/AIDS care	100	100	88	47	95	73	77	50
Pediatric	91	96	88	76	74	60	77	65
Surgery, general	100	85	88	71	45	47	38	27
Emergency obstetric care	100	74	82	53	53	33	27	35
Medical ward	100	85	88	76	39	47	0	8
Nutrition	100	74	71	12	76	33	42	31
Internal medicine	91	52	59	29	45	73	31	50
Family planning	73	63	53	29	68	47	58	8
Pediatric ward	91	67	82	59	26	33	0	4
Health education outreach	55	44	41	12	61	53	42	12
Accident and emergency unit	91	41	59	29	21	40	15	23
Obstetric ward	91	56	76	35	29	20	0	8
Outreach services	64	33	47	12	61	53	38	4
Laboratory	100	48	76	24	18	13	0	8
Tuberculosis and other respiratory diseases	82	52	59	29	29	20	0	4
Anesthesiology	100	30	65	35	0	0	4	8
Diagnostic/medical imaging	100	37	65	18	5	7	0	8
Surgical ward	91	30	76	35	0	7	0	0
Eye care	91	37	47	6	13	7	4	19
Newborn nursery	91	37	47	18	5	13	0	8
Physical therapy and rehabilitation	100	44	47	12	0	0	0	0
Dentistry	91	48	35	18	3	0	0	8
Occupational therapy	91	48	29	6	8	0	0	0
Morgue	91	33	41	6	0	7	0	0
Orthopedic	91	33	29	0	3	7	0	0
Surgery, orthopedic	91	22	35	12	0	0	0	0
Blood donor center	91	19	18	6	0	0	0	0
Psychiatric	73	26	18	6	0	0	0	4
Chemotherapy	64	4	18	0	0	0	0	4
Surgery, cardiovascular	55	4	24	0	0	0	0	0
Surgery, neurological	55	4	18	0	0	0	0	0

LOWEST AVAILABILITY — HIGHEST AVAILABILITY

Note: All values represent the percentage of facilities, by platform, that reported offering a given service at least one day during a typical week. One tertiary hospital was excluded from this figure due to its highly specialized services and types of care.

and adolescence (MOH 2005), were much less available at lower levels of care. Adults and the elderly require a spectrum of health services, as they can often experience both acute conditions (e.g., accidents, pneumonia) and more chronic diseases (e.g., diabetes, cancer). While the majority of hospitals reported providing internal medicine services, far fewer primary care facilities, especially those in the public sector, offered such care. The availability of accident and emergency units declined in parallel with decreasing levels of care, and this trend was particularly pronounced among public facilities; at the same time, 59% of private hospitals and 40% of private health centers in the ABCE sample offered emergency care. Outside of national and provincial hospitals, very few facilities provided the services that specifically concern elderly health needs, such as eye care (19% of facilities, excluding national and provincial hospitals) and orthopedic services (10% of facilities, excluding national and provincial hospitals).

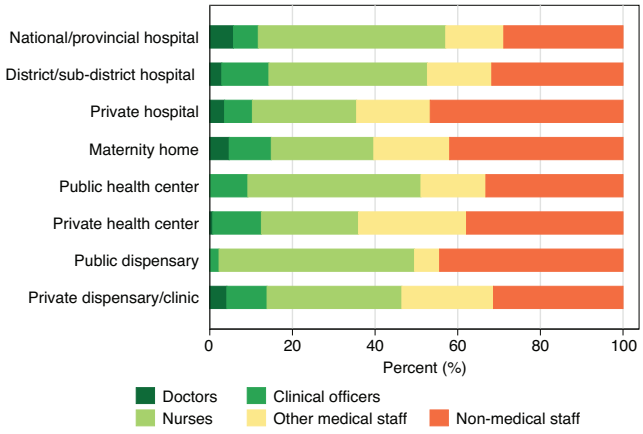
Differences in service availability across platforms were not unexpected, as the Kenyan health system is deliberately structured to have varying levels of care, from national hospitals to dispensaries (MOH 2005, MOMS and MOPHS 2012). However, substantial variation was found within facility types, reflecting potential gaps in achieving or maintaining facility capacity requirements outlined in Kenya's strategic health plans (MOH 2005, MOMS and MOPH 2012). For example, the *NHSSP II* set a goal of having 100% of hospitals providing EmOC by 2010. Based on the ABCE sample, we found that 18% of private hospitals and 26% of district and sub-district hospitals reported not offering EmOC in 2012.

These findings illustrate some of the areas wherein service-provision gaps appear to exist, especially across the lifespan and the KEPH. In the next sections, we delve into the factors that likely affect the availability of these services across platforms.

Human resources for health

Kenya has long viewed the challenge of medical staffing as a high priority, especially in terms of having enough skilled personnel at given levels of care and ensuring their equitable distribution to both urban and rural areas (MOH 2005, MOMS and MOPHS 2009, MOMS and MOPHS 2012). A facility's staff size and composition can directly affect the types of services it can effectively provide. Kenya has documented imbalances in staffing numbers in the past, with some hospitals featuring an overabundance of nurses while many primary care facilities remained severely understaffed by skilled medical personnel (MOH 2005).

FIGURE 4 Composition of facility personnel, by platform, 2011

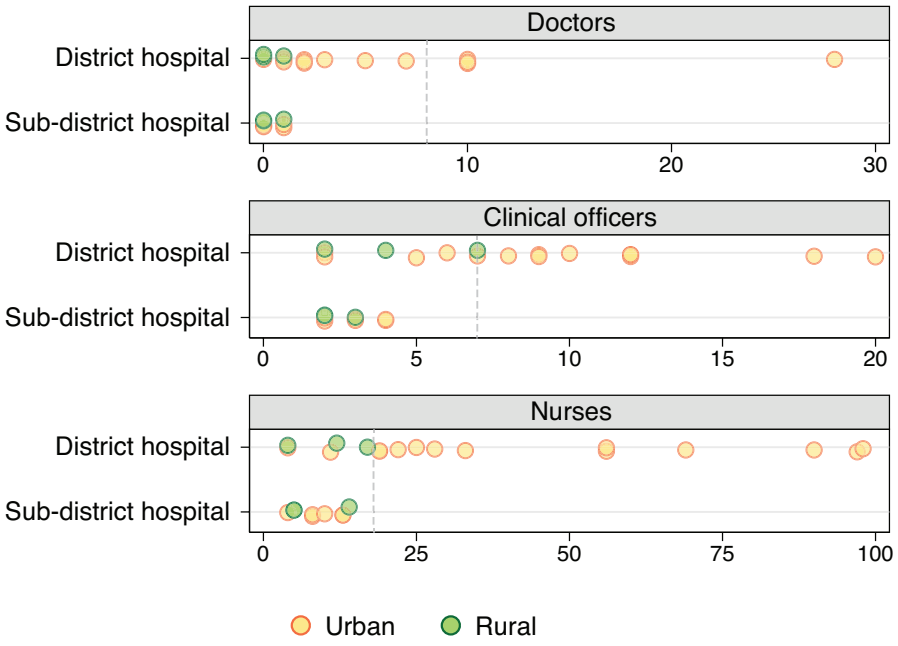


Based on the ABCE sample, we found substantial heterogeneity across facility types (Figure 4). For some platforms, non-medical staff accounted for the largest proportion of personnel (e.g., 42% at maternity homes and 47% at private hospitals), whereas nurses were the most common staff type at other platforms (e.g., 45% at national and provincial hospitals and 47% at public dispensaries). At the other end of the spectrum, doctors and clinical officers averaged less than 20% of facility staff across all platforms, with the highest among maternity homes (15%) and the lowest at public dispensaries (2%). Private health centers, dispensaries, and clinics had a relatively high proportion of other medical staff (24%), which included personnel such as lab technicians and pharmacists.

The *Kenya Health Sector Strategic & Investment Plan (KHSSP), 2012–2018* set forth national targets for staffing by platform (MOMS and MOPHS 2012), such that county-level hospitals (also known as district and sub-district hospitals) should have eight doctors, five clinical officers, and 19 nurses; and primary care facilities (health centers) should have two clinical officers and seven nurses. Based on facilities in the ABCE sample, achievement of these staffing targets varied by platform and facility location. Among district and sub-district hospitals (Figure 5), several urban district hospitals far exceeded the recommended number of doctors and clinical officers, but no rural hospitals met this target. Several urban district and sub-district hospitals had over 50 nurses on staff in 2011, more than three times the number of recommended nurses for this level of care.

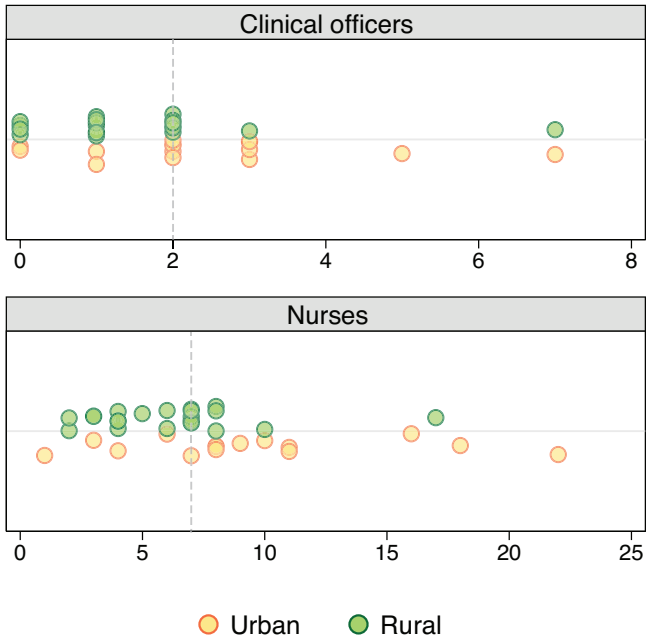
In comparison with district and sub-district hospitals, a greater proportion of public health centers, irrespective of location, achieved the targets for clinical officers (53%)

FIGURE 5 District and sub-district hospital achievement of staffing goals for doctors, clinical officers, and nurses, 2011



Note: Each circle represents a facility's number of staff. The gray dotted line reflects the staffing target for doctors, clinical officers, and nurses for district and sub-district hospitals in Kenya. One district hospital was omitted from this figure due to its substantially larger number of medical personnel (18 doctors, 41 clinical officers, and 125 nurses).

FIGURE 6 Public health center achievement of staffing goals for clinical officers and nurses, 2011



Note: Each circle represents a public health center's number of staff. The gray dotted line reflects the staffing target for clinical officers and nurses for public health centers in Kenya.

and nurses (61%) set forth by the *KHSSP 2012–2018* (MOMS and MOPHS 2012) (Figure 6). Nonetheless, more rural public health centers fell below the nursing target than public health centers located in urban areas.

Five district hospitals and 15 public health centers achieved all staffing targets outlined in the *KHSSP 2012–2018*. Two national hospitals in the ABCE sample met their staffing targets, which were having 90 doctors, 45 clinical officers, and 195 nurses. Over 20% of district hospitals fell below the recommended personnel numbers for their level of care; notably, half of these facilities were in rural areas.

In isolation, some of these results, especially for rural hospitals, may be cause for concern. However, facility staffing numbers are less meaningful without considering a facility's overall patient volume and production of specific services. For instance, if a facility mostly offers services that do not require a doctor's administration, failing to achieve the doctor staffing target may be less important than having too few nurses. Further, some facilities may have much smaller patient volumes than others, and thus "achieving" staffing targets could leave them with an excess of personnel given patient loads. While an overstaffed facility has a different set of challenges than an understaffed one, each reflects a poor alignment of facility resources and patient needs. To better understand bottlenecks in service delivery and areas to improve costs, it is important to assess a facility's capacity (inputs) in the context of its patient volume and services (outputs).

The Kenyan MOH has emphasized the importance of deploying staff in relation to facility "levels of service outputs" in the past (MOH 2005), and we further explore these findings in the "Efficiency and costs" section. As part of the ABCE project in Kenya, we compare levels of facility-based staffing with the production of different types of health services. In this report, we primarily focus on the delivery of health services by skilled medical personnel, which include

FIGURE 7 Availability of physical capital, by platform, 2012

Note: Availability of physical capital was determined by facility ownership or status on the day of visit. All values represent the percentage of facilities, by platform, that had a given type of physical capital.

doctors, clinical officers, nurses, and other medical staff (e.g., lab technicians, pharmacists). It is possible that non-medical staff also contribute to service provision, especially at lower levels of care, but the ABCE project in Kenya is not currently positioned to analyze these scenarios.

Infrastructure and equipment

Health service provision depends on the availability of adequate facility infrastructure, equipment, and supplies (physical capital). In this report, we focus on four essential components of physical capital: power supply, water and sanitation, transportation, and medical equipment, with the latter composed of laboratory, imaging, and other medical equipment. Figure 7 illustrates the range of physical capital, excluding medical equipment, available across platforms.

Power supply. Access to a functional electrical supply varied across platforms. All hospitals, irrespective of level and ownership, had functional electrical connections to the energy grid. Further, all maternity homes, private health centers, and private dispensaries and clinics were connected to the energy grid. Slightly fewer public primary care facilities had functional electricity, with 88% of facilities connected to the energy grid and 2% using a generator. Kenya experiences electricity outages with some frequency, especially in rural areas, and having a generator can be as important as having access to the energy grid in the first place. Across platforms, 36% of facilities with functional electricity also had a generator. One sub-district hospital and one NGO-owned health center reported solely relying on a generator for power. Inadequate access to consistent electric power has substantial implications for health service provision, particularly for the effective storage of medications, vaccines, and blood samples. These findings reflect progress in expanding energy access throughout Kenya (a 2010 survey found that one in every four facilities had regular electricity or featured a generator [NCAPD et al. 2011]), but also highlight the ongoing need to address gaps in functional power among primary care facilities in rural areas.

Water and sanitation. National, provincial, and private hospitals, as well as maternity homes and private health centers, had the highest availability of improved water and sanitation sources, with 100% of these facilities having functional piped water and sewer infrastructure (with flush toilets). In the public sector, improved water and sanitation became less available in parallel with lower levels of care. Of district and sub-district hospitals, 93% had functional piped water and 67% had sewer infrastructure. Notably, 33% of these hospitals had covered pit latrines as their main waste system. Over 80% of public health centers and public dispensaries had functional piped water, but less than half of them featured flush toilets. The majority of public health centers and public dispensaries provided covered pit latrines, but a few were still serviced by uncovered pit latrines, especially those in rural areas (4% of public health centers and 11% of dispensaries), indicating elevated public health risks for these facilities and their surrounding communities. Hand disinfectant was broadly available across platforms as a supplementary sanitation method. Only one public dispensary reported lacking access to water and not having hand disinfectant available at the time of visit.

These findings show a mixture of notable gains and ongoing needs for facility-based water sources and sanitation practices. A 2010 survey indicated that less than half of facilities had regular access to a water source (NCAPD et al. 2011). Based on the ABCE sample, 92% of all health facilities had piped water in 2012, reflecting that there may have been recent improvement in water infrastructure. On the other hand, a portion of primary care facilities still lacked improved sanitation on their premises. This finding was particularly pronounced in rural areas, indicating that discrepancies in basic infrastructure remain between Kenya's more urban and hard-to-reach populations.

Transportation and communication. Facility-based transportation and modes of communication varied across platforms. In general, the availability of any kind of vehicle substantially decreased down the levels of the health system. Notably, the proportion of privately owned primary care facilities (private health centers, dispensaries, and clinics) with any vehicle (44%) far exceeded the proportion of public primary care facilities with comparable transportation capacity (25%). Outside of national and provincial hospitals, the majority of all other facilities did not have emergency transportation, which means transferring patients under emergency circumstances from these facilities could be fraught with delays and possible complications. This transportation gap and the coordination of transport might be further exacerbated by the relatively low availability of phones, personal or facility-owned, at many lower-level facilities, especially dispensaries. At the same time, the availability of phones was much higher at Kenyan health centers, both public and private, than comparably sized primary care facilities surveyed in other sub-Saharan African countries from the ABCE project (IHME 2014b, IHME 2014c). The availability of a functional computer at primary care facilities was much lower than what was observed at hospitals and maternity homes, suggesting that computer-based recordkeeping and surveillance at lower levels of

care may be relatively uncommon. Internet connectivity was not assessed, but the field research team reported inconsistent internet access in some rural areas of Kenya.

These results echo the priorities outlined in the *NHSSP II*, where ambitions were clearly noted to strengthen the country's referral system, particularly the public sector's transport system (MOH 2005). While the availability of facility-based modes of communication was moderately high, the fairly low access to transportation outside of Kenya's largest hospitals could continue to hinder the country's capacity to optimally respond to emergent health needs.

Equipment. For three main types of facility equipment – medical, lab, and imaging – clear differences emerge across levels of health service provision, with Figure 8 summarizing the availability of functional equipment by platform. Across platforms, the vast majority of facilities had the medical equipment, such as blood pressure cuffs, stethoscopes, and scales, to perform basic medical exams. This finding shows progress in basic equipment availability at primary care facilities, as a 2008 strategic plan outlined concerns about the "general lack of basic medical equipment to support service delivery" at these lower levels of care (MOPHS 2008).

In general, hospitals had greater availability of more specialized medical equipment than lower levels of care. However, even Kenya's largest hospitals experienced equipment gaps, with 45% of national and provincial hospitals lacking an electrocardiography (ECG) machine. Outside of these facilities, ECGs were quite rare (e.g., only 7% of district and sub-district hospitals had an ECG), suggesting that the Kenyan health system is inadequately positioned to address its rising rates of non-communicable diseases (NCDs) (Murray et al. 2012). This service gap is further demonstrated by the relatively low availability of lab equipment to test blood sugar (via glucometers) at health centers and dispensaries, particularly in the public sector (42% had glucometers and test strips). Microscopes and corresponding components were most prevalent among all facilities, excluding public dispensaries, but additional testing capacity was generally limited outside of tertiary hospitals (national and provincial hospitals). For instance, 48% of district and sub-district hospitals had a hematology counter and only one-third of them had a blood chemistry analyzer. The availability of radiological imaging equipment was largely limited to hospitals, but their availability remained relatively low. Ultrasound was only available at 39% of hospitals and maternity homes, indicating that many higher levels of care may not be able to provide adequate diagnostic imaging services.

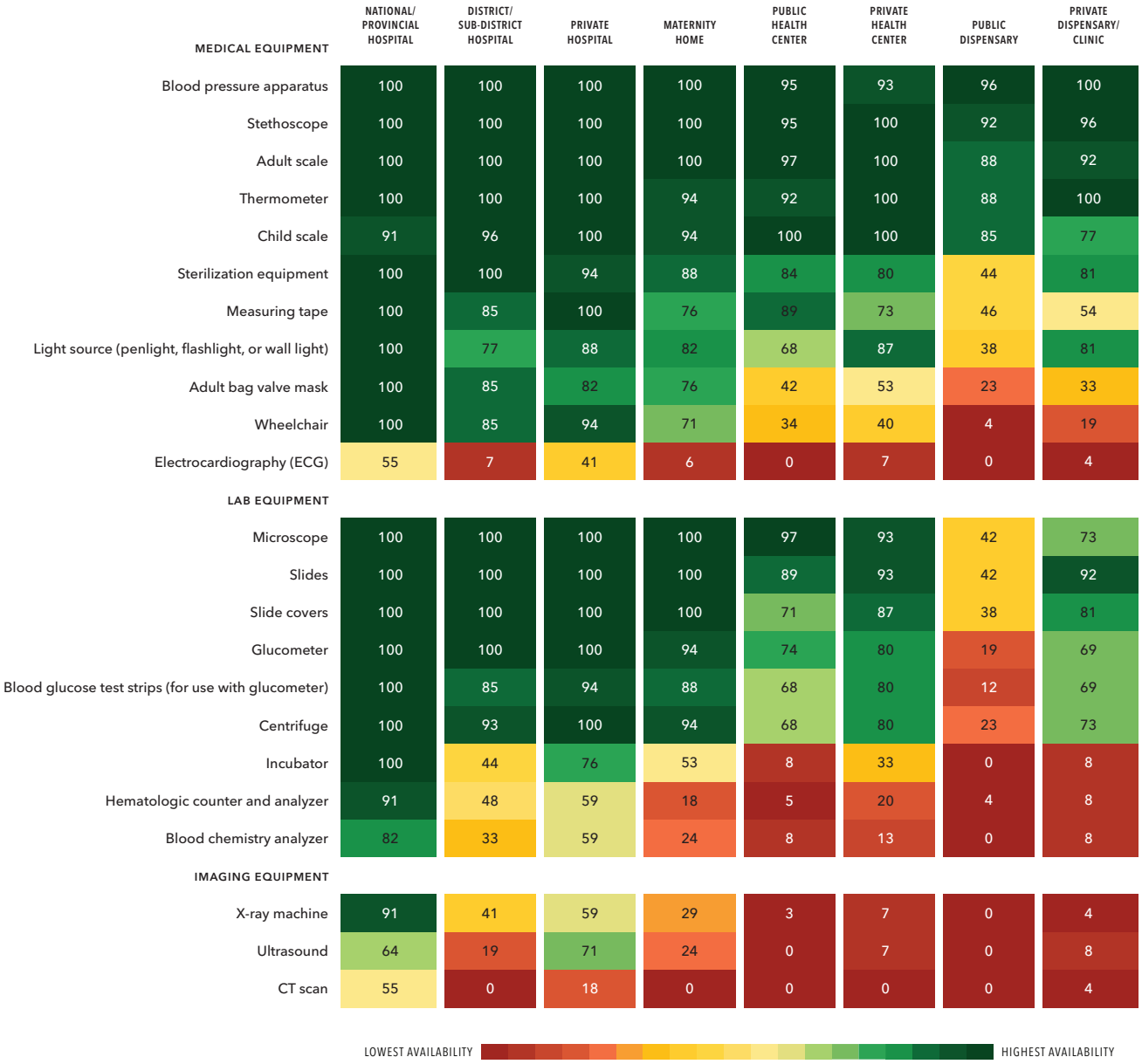
Overall, these findings demonstrate gradual improvements in equipping primary care facilities with basic medical equipment in Kenya, as well as the continued challenge of ensuring that these facilities carry the supplies they need to provide a full range of services.

Measuring the availability of individual pieces of equipment sheds light on specific deficits, but assessing a health facility's full stock of necessary or recommended equipment provides a more precise understanding of a facility's service capacity. We used the WHO's Service Availability and Readiness Assessment (SARA) survey as our guideline for what types of equipment should be available in hospitals (40 specific items) and primary care facilities (26 specific items), which are health centers and dispensaries in Kenya (WHO 2013b). Figure 9 illustrates the distribution of SARA scores across platforms. On average, national and provincial hospitals carried 91% of the recommended equipment items, district and sub-district hospitals had 72%, and private hospitals featured 84%. Notably, maternity homes, facilities focused on providing maternity care, averaged a similar level of equipment availability to that observed for district and sub-district hospitals, which are supposed to provide a broader range of hospital-based services. Of Kenya's primary care facilities, private facilities generally had a higher availability of recommended equipment (81%) than their public counterparts (73%). Among hospitals, rural facilities generally had a lower availability of recommended equipment, whereas the relationship between facility location and SARA score was not as clearly pronounced among lower levels of care. However, a greater proportion of rural facilities generally fell below the platform average for equipment availability.

Pharmaceuticals

The ABCE Facility Survey collected data on a wide range of different medications in an effort to measure facility capacity to treat and prevent a broad spectrum of conditions. Specifically, over 20 combinations of antiretrovirals (ARVs) and 50 non-ARV medications were included in the facility survey. About 90% of the non-ARV medications were drawn from Kenya's 2010 Essential Medicines List (EML), which recommends the pharmaceuticals that each level of public-sector facility should carry (MOMS and MOPHS 2010). Since a large proportion of Kenyans seek care from private and NGO-owned facilities (Barnes et al. 2010), we viewed comparing the relative EML capacity of these facilities as informative, if not important to further understanding what kind of medications patients can expect to be available at facilities of different ownership.

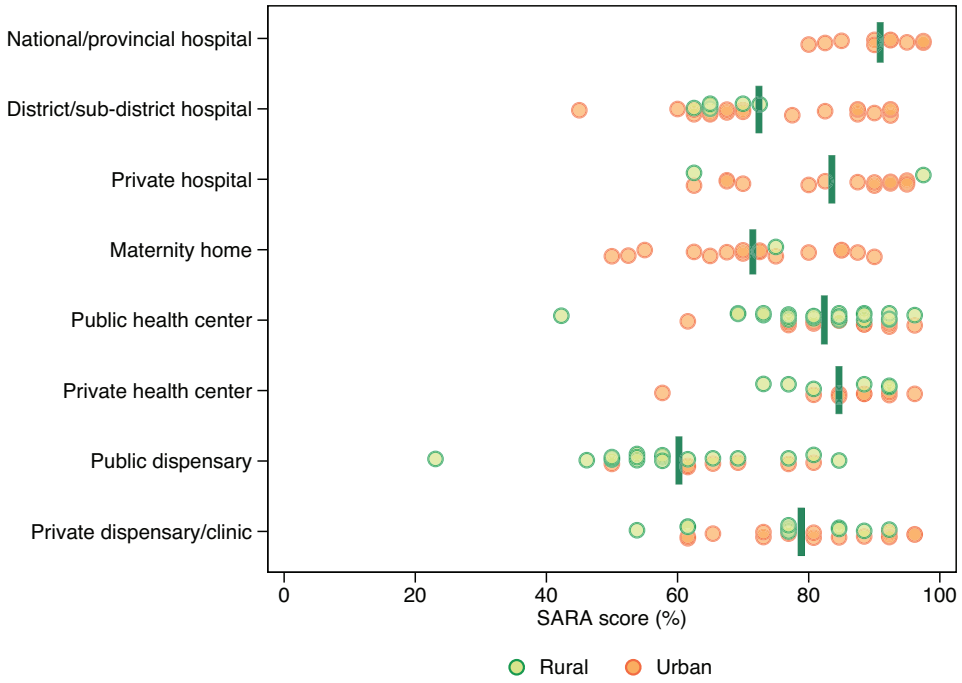
FIGURE 8 Availability of functional equipment, by platform, 2012



Note: Availability of a particular piece of equipment was determined based on facility ownership on the day of visit. Data on the number of items present in a facility were not collected. All values represent the percentage of facilities, by platform, that had a given piece of equipment.

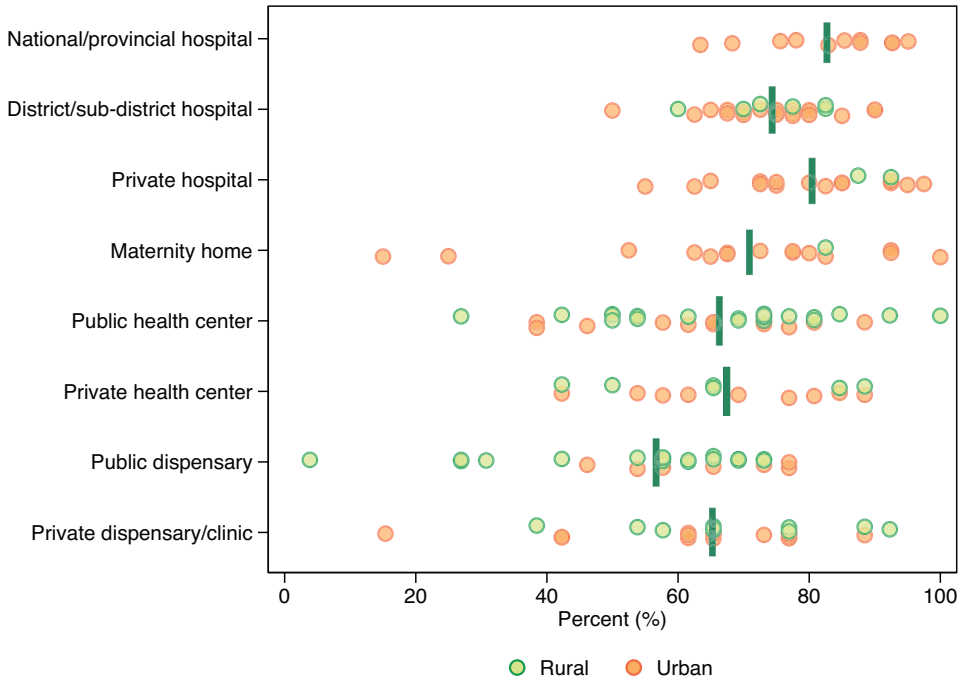
On average, most facilities across platforms stocked at least 50% of the pharmaceuticals recommended by the EML for their service level (Figure 10), but facilities at all levels of care appear to experience gaps in their pharmaceutical stocks, especially among the lower levels. National and provincial hospitals stocked an average of 83% of recommended pharmaceuticals (34 out of 41), and district and sub-district hospitals had 74% (30 out of 40). Public health centers and private health centers carried a comparable number of recommended pharmaceuticals, about 65% of the 26 recommended EML pharmaceuticals. Relatively minimal differences were found in pharmaceutical stocks across facilities located in urban and rural areas; in fact, rural facilities showed the highest availability of EML pharmaceuticals for public health centers (one facility had 100% of EML pharmaceuticals) and private dispensaries and clinics (one

FIGURE 9 Facility SARA scores for recommended equipment, by platform, 2012



Note: Each circle represents a facility's SARA score in 2012. The vertical line represents the average SARA score across all facilities within a given platform.

FIGURE 10 Facility stocking of EML pharmaceuticals, by platform, 2012



Note: Each circle represents the proportion of EML pharmaceuticals in 2012. The vertical line represents the average proportion of EML pharmaceuticals stocked across all facilities within a given platform. Private hospitals, maternity homes, private health centers, and private dispensaries and clinics were included in this figure to compare their relative availability of pharmaceuticals recommended for the public sector. However, it is important to note that these recommendations are not explicitly applicable to these facilities.

NGO-owned dispensary had 92% of EML pharmaceuticals). At the same time, the within-platform range in performance illustrates the discrepancies that exist between the average facility and the lowest-performing ones among public health centers and dispensaries. One public health center and one public dispensary carried 27% and 4% of the recommended EML pharmaceuticals, respectively.

Based on the ABCE sample in Kenya, we find marked heterogeneity in the availability of physical capital, medical equipment, and pharmaceuticals across and within platforms. The functional capacity of a facility relies on several components, ranging from more basic infrastructure such as electricity to an adequate stock of multiple pharmaceuticals and diagnostics. Further work on comprehensively linking facility-based resources to the production of health services and the quality of services received is needed.

Service provision: a focus on pharmaceuticals and facility capacity

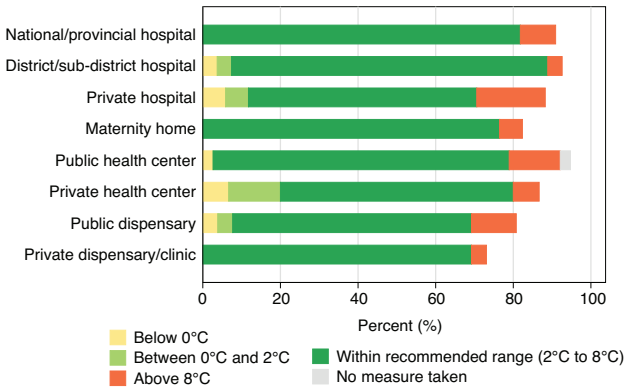
The ABCE Facility Survey collected data on a wide range and large number of different medications in an effort to capture facility capacity to treat and prevent a broad spectrum of conditions. Further, for the production of any given health service, a health facility requires a complex combination of the basic infrastructure, equipment, and pharmaceuticals, with personnel who are adequately trained to administer necessary clinical assessments, tests, and medications. Thus, it is important to consider this intersection of facility resources to best understand facility capacity for care. In this report, we further examined facility capacity for a subset of specific services (immunization, ANC, routine deliveries, and general surgery), as well as case management of specific diseases (lower respiratory infections [LRIs], HIV/AIDS, malaria, meningitis, diabetes, injuries, and ischemic heart disease). We focused on these interventions as they are examples of (1) high-priority health areas for the Kenyan health system, such as ensuring high access to health services for the life-cycle cohort of pregnancy and the newborn (MOH 2005, MOMS and MOPHS 2012) and ensuring parasitological confirmation of malaria cases (MOPHS 2009); and (2) emerging health concerns that affect individuals throughout their lifespan, such as NCDs, and the country's capacity to diagnose and treat them. Similar assessments could easily be extended to other interventions and services.

For these analyses of service provision, we only included facilities that reported providing the specific service, excluding facilities that were potentially supposed to provide a given service but did not report providing it in the ABCE Facility Survey. Thus, our findings reflect more of a service capacity "ceiling" across platforms, as we are not reporting on the facilities that likely should provide a given service but have indicated otherwise on the ABCE Facility Survey.

Immunization services. Several factors affect a facility's capacity to provide immunization services, including having an adequate supply of vaccines, effective storage capacity, and personnel specifically trained in vaccine administration. Many vaccines require sustained cold-chain integrity, which makes monitoring and maintaining the proper storage temperature critical. In fact, Kenya has prioritized increasing cold-chain capacity in its most recent immunization plan, both for existing vaccines and to qualify for the receipt of new immunizations (MOPHS 2011). As part of the ABCE Facility Survey, we measured the storage temperature of all facilities that provided routine immunizations, and of those, we found that about 17% had refrigerators operating outside the recommended temperature range (2°C to 8°C) (WHO 2006). Of these facilities with improper storage temperatures, we found that a greater proportion had a storage temperature above the optimal range than below it (Figure 11); in fact, some proportion of facilities across all platforms had storage temperatures exceeding 8°C. Private hospitals and private health centers had the greatest proportion of facilities with storage temperatures outside of the recommended range (33% and 31%, respectively), whereas only 5% of private dispensaries and clinics had refrigerators operating above 8°C.

Access to functional electricity did not seem to be related to improper storage temperatures, as hospitals and

FIGURE 11 Vaccine storage temperature range, by platform, 2012

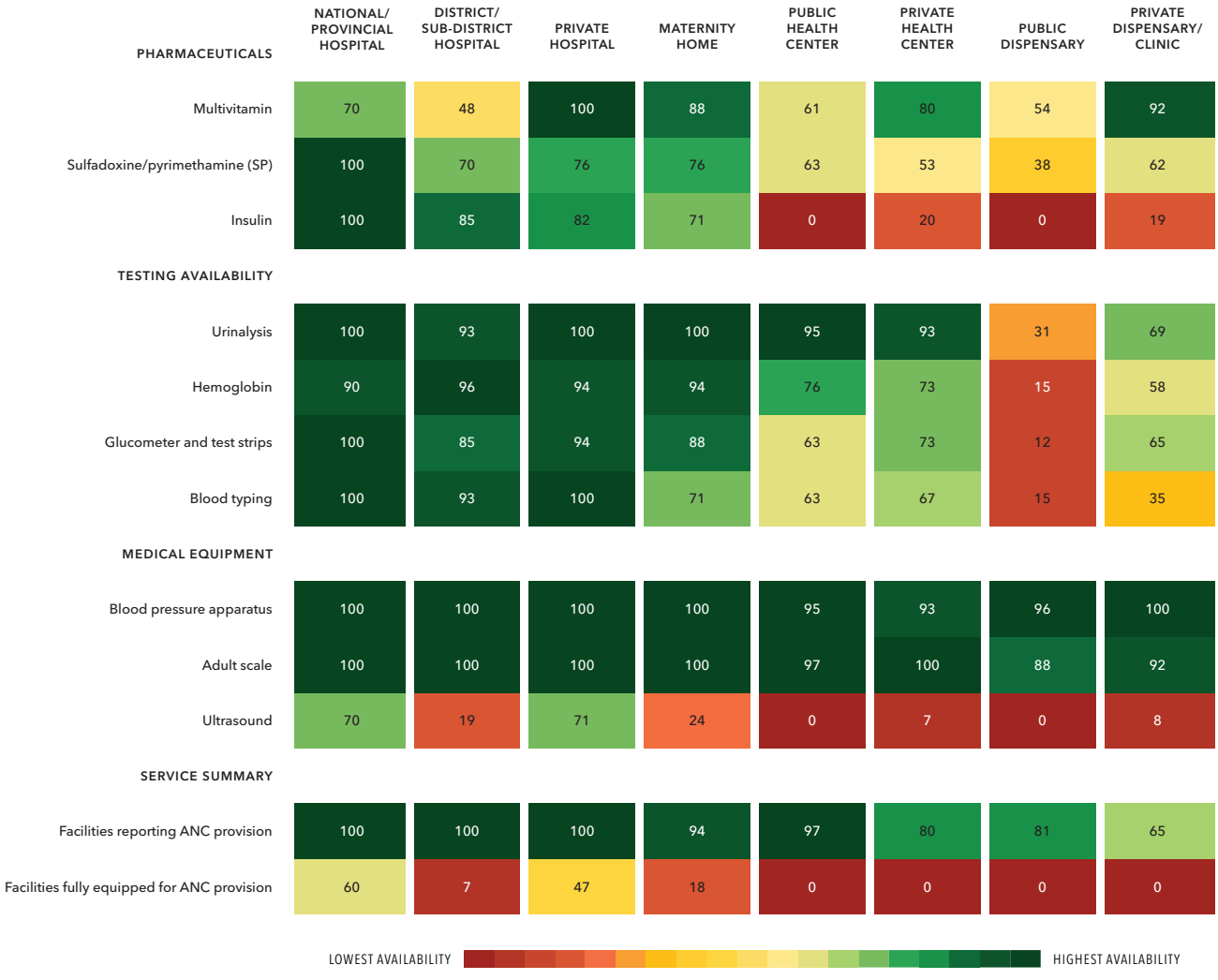


Note: The length of each bar represents the proportion of facilities that reported carrying vaccines (e.g., 95% of public health centers indicated that they stored vaccines).

private facilities generally had the highest rates of energy grid connections. Although a greater proportion of facilities experienced storage temperatures exceeding the recommended range than those that recorded readings below, a few platforms saw a larger portion of facilities with refrigerator temperatures below 2°C than above 8°C (8% of district and sub-district hospitals and 23% of private health centers). Freezing vaccines can be as detrimental as storing them at temperatures above the recommended range, and further investigation into what factors may be contributing to these findings is warranted.

Antenatal care services. In the 2008–2009 Kenya Demographic and Health Survey (DHS), it was estimated that over 90% of women of reproductive age had at least one ANC visit during pregnancy (KNBS and ICF Macro 2010). While this high level of ANC visits is noteworthy, it does not reflect what services were actually provided at each visit, nor does it capture the quality of care received. Through the ABCE Facility Survey, we estimated what proportion of facilities stocked the range of pharmaceuticals, tests, and medical equipment to conduct a routine ANC visit. It is important to note that this combination of medications and equipment was not exhaustive but represented a number of relevant supplies necessary for the provision of ANC.

FIGURE 12 Availability of pharmaceuticals and functional equipment to perform routine ANC visits, by platform, 2012



Note: Availability of a given ANC item was determined by its availability at a facility on the day of visit. All values represent the percentage of facilities, by platform, that had the given ANC item. The service summary section compares the total percentage of facilities reporting that they provided ANC services with the total percentage of facilities that carried all of the recommended pharmaceuticals and functional equipment to provide ANC services.

As shown in Figure 12, hospitals generally had higher availability of the items needed for ANC than health centers. Outside of hospitals, facility capacity to perform important testing, such as blood typing, remained fairly low. Medication for the intermittent preventive treatment of malaria during pregnancy (IPTp) was moderately available outside of national and provincial hospitals, but only 55% of health centers and dispensaries stocked sulfadoxine/pyrimethamine (SP). Few facilities beyond hospitals were equipped to manage non-communicable conditions such as gestational diabetes, especially in the public sector: 42% of public health centers and dispensaries had the testing capacity for blood glucose, and none of these facilities stocked insulin. Relatively inexpensive medical equipment, such as scales and blood pressure equipment, were largely available across platforms, but relatively few facilities had ultrasound, especially among lower levels of care.

Across the levels of care, we found a widening gap between facility-reported capacity for ANC provision and the fraction of the facilities fully equipped to deliver ANC care. This service-capacity gap meant that many facilities, especially at lower levels of care, reported providing ANC but then lacked at least some of the functional equipment or were stocked out of the medications needed to optimally address the range of patient needs during an ANC visit. Across all facilities, 89% reported providing ANC services, but only 12% had the full stock of medications, tests, and equipment recommended for the optimal provision of care. National and provincial hospitals showed the smallest discrepancy, with 100% of facilities reporting that they provided ANC and 60% being fully equipped to provide optimal care. Stocking multivitamins and having an ultrasound machine were factors that hindered being fully equipped for ANC at these hospitals. The widest divergence was found at public health centers with 97% of these facilities indicating that they provided ANC services and no facilities having the full range of pharmaceuticals, tests, and medical equipment for ANC provision. Lacking insulin stocks and ultrasound prevented all public health centers from being considered fully equipped for ANC. These findings do not suggest that these platforms are entirely unable to provide adequate ANC services; it simply means that the vast majority of primary care facilities did not have the recommended pharmaceuticals, diagnostics, and medical equipment for ANC.

Routine delivery services. In order to optimally support delivery needs, facilities should stock a full range of pharmaceuticals, medical equipment, tests, and delivery-specific equipment (Nyamtema et al. 2011, Wall et al. 2010). As demonstrated in Figure 13, substantial disparities exist in terms of availability of equipment and medications among facilities that provide birthing services. Pharmaceuticals to treat hypertension, diabetes, and severe pain were often unavailable, even among lower-level hospitals and maternity homes. Medical equipment was largely available among hospitals and maternity homes, but considerable equipment deficits were observed at health centers, especially in the public sector. Delivery-specific equipment, such as forceps and neonatal bag valve masks, was notably lacking across all platforms; even 30% of national and provincial hospitals lacked forceps. This finding is cause for concern, as not having access to adequate delivery equipment can affect both maternal and neonatal outcomes at all levels of care (Nyamtema et al. 2011, Wall et al. 2010). Again, we found a substantial gap between the proportion of facilities, across platforms, that reported providing routine delivery services and those that were fully equipped for their provision.

General surgery services. Among facilities that reported providing general surgery services (58% of all facilities in our sample), national and provincial hospitals had the highest surgery capacities, followed by private hospitals (Figure 14). Public health centers demonstrated lower capacity, with 53% of facilities that reported providing surgical services lacking a scalpel and 44% lacking an adult bag valve mask. Intubation equipment was available at all national and provincial hospitals, but far fewer district and sub-district hospitals (68%), private hospitals (80%), and maternity homes (58%) had this crucial surgical equipment. This equipment gap suggests that many facilities could face significant limitations in performing surgeries that would typically require general anesthesia. Across all platforms, we found that substantially fewer facilities were fully equipped to optimally perform general surgery (13%) than the proportion that reported offering general surgery services (58%). For most hospitals, this service-capacity gap would have been smaller if a greater proportion of them stocked morphine (47% lacked this pain medicine) and could properly test for serum electrolytes (53% did not have the necessary laboratory equipment). Notably, private hospitals documented had one of the smaller service-capacity gaps for general surgery, with 88% of facilities reporting that they provided these services and 40% of all private hospitals being fully equipped for surgical services (a 48 percentage point difference).

It is also crucial to consider the human resources available to perform surgical procedures, as assembling an adequate surgical team is likely to affect patient outcomes. Excluding one tertiary hospital due to its size, hospitals

FIGURE 13 Availability of pharmaceuticals and functional equipment to perform routine delivery services, by platform, 2012

Note: Availability of a given delivery item was determined by its availability at a facility on the day of visit. All values represent the percentage of facilities, by platform, that had the given delivery item. The service summary section compares the total percentage of facilities reporting that they provided routine delivery services with the total percentage of facilities that carried all of the recommended pharmaceuticals and functional equipment to provide routine delivery services.

FIGURE 14 Availability of pharmaceuticals and functional equipment to perform general surgery services, by platform, 2012

Note: Availability of a given surgery item was determined by its availability at a facility on the day of visit. All values represent the percentage of facilities, by platform, that had the given surgery item. The service summary section compares the total percentage of facilities reporting that they provided general surgery services with the total percentage of facilities that carried all of the recommended pharmaceuticals and functional equipment to provide general surgery services.

from the ABCE sample that reported providing general surgery services had an average of 11 doctors, 12 clinical officers, and 78 nurses. We did not capture data on anesthesiologists or anesthesiology assistants, but future work on assessing surgical capacity at health facilities should collect this information.

Disease-specific services. Based on findings from the Global Burden of Diseases, Injuries, and Risk Factors Study 2010 (GBD 2010), we identified a subset of conditions that accounted for the most early death and disability in Kenya for 2010: HIV/AIDS (leading cause); LRIs (second-leading cause); malaria (third-leading cause); meningitis (ninth-leading cause); and injuries (12th-leading cause) (Murray et al. 2012). Further, we included two conditions that are rapidly causing more health loss in Kenya, as measured by the escalation of disease burden between 1990 and 2010: diabetes (a 107% increase) and ischemic heart disease (a 40% increase) (Murray et al. 2012).

Figure 15 shows the range in facility capacity to optimally diagnose and treat these diseases. For these analyses, we present the average percentage of medical supplies (which include pharmaceuticals and equipment) that facilities stocked at the time of visit. Across all platforms, facilities had the greatest capacity to diagnose and treat LRIs, which is most dependent on stocking antibiotics. Availability of HIV/AIDS and malaria services remained fairly high in hospitals, but was lower among public health centers and dispensaries. Private facilities generally had much higher levels of disease-specific service capacity, and this finding was particularly pronounced among lower levels of care. Irrespective of platform type, facilities were generally least equipped to fully manage ischemic heart disease.

Public health centers and dispensaries averaged less than 30% of the supplies needed to provide disease-specific services for NCDs; perhaps surprisingly, however, a substantial portion still lacked the full capacity to address some of Kenya's most prevalent infectious diseases. Public health centers and dispensaries had an average of 51% of the necessary supplies for comprehensive malaria services and lacked an average of nearly 70% of items for

FIGURE 15 Facility capacity to provide disease-specific services, by platform, 2012

Note: Availability of the medical supplies for disease-specific services was determined by their availability at a facility on the day of visit. All values represent the average percentage of supplies, by platform, that facilities carried at the time of visit. The service summary section compares the average percentage of supplies found at facilities to address a subset of infectious diseases (LRIs, HIV/AIDS, malaria, and meningitis) with the average percentage of supplies found at facilities to address a subset of NCDs (diabetes and ischemic heart disease) and injuries.

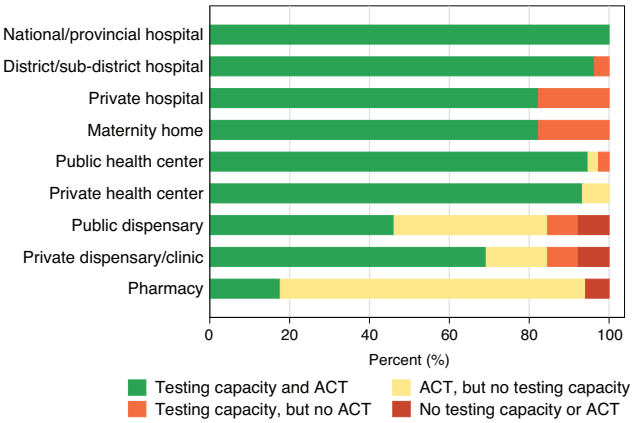
meningitis care. These public health centers and dispensaries are intended to serve as the core of the country's primary health care delivery system in the public sector, but such service provision may be hindered if these facilities are not equipped to properly handle the illnesses most commonly experienced by Kenyans.

These findings have implications for the country's policy for and ongoing implementation of integrated management of childhood illness (IMCI), a health practice wherein health workers at primary care facilities provide diagnostic and treatment options for malaria, pneumonia (or LRIs), and diarrheal disease (MOH 2005, Mullei et al. 2008). The success of IMCI hinges on having the full set of medical supplies to ascertain whether an otherwise vague symptom – fever – is due to malaria or an LRI, and to then treat the ailment accordingly. If primary care facilities struggle to stock the pharmaceuticals and diagnostics needed for IMCI implementation, the proper use of these supplies may be negatively affected.

A more nuanced examination of the components underlying disease-specific services can identify constraints to care. For example, Kenya's malaria strategic plan for 2009 to 2017 stipulated that all suspected cases of malaria (i.e., individuals presenting with a fever) receive parasitological testing prior to receiving a first-line antimalarial for treatment at health facilities by 2013 (MOPHS 2009). Thus, optimal case management hinges on the concurrent availability of both malaria treatment and diagnostics in facilities. Figure 16 shows the range of this concurrent availability at the time of facility visit in 2012. Among national and provincial hospitals, 100% of facilities reported having both proper malaria diagnostic equipment (i.e., laboratory testing or rapid-diagnostic tests [RDTs]) and artemisinin-based combination therapies (ACTs) in stock. Notably, public and private health centers posted some of the next-highest rates of concurrent testing and treatment capacity, at 95% and 93%, respectively. Further down the levels of care, fewer facilities had concurrent malaria diagnostic and treatment capacity, with 69% of private dispensaries and clinics, 46% of public dispensaries, and 18% of pharmacies stocking both at the time of visit. Of all the platforms, dispensaries and clinics, irrespective of ownership, recorded the highest proportion of facilities that lacked both malaria diagnostics and ACTs (8%).

All hospitals and maternity homes had the capacity for diagnosing malaria, which likely reflects the successful uptake of Kenya's policy for parasitological confirmation of malaria cases (MOPHS 2009). However, nearly 20% of private hospitals and maternity homes did not have ACTs at the time of visit, suggesting that ACT stock-outs may not be uncommon among these platforms. Among health centers and dispensaries, a greater proportion of facilities had ACTs but lacked malaria diagnostics (15%) than the opposite (having RDTs or microscopes but stocking out of ACTs [5%]). This finding implies that the malaria testing capacity of primary care facilities may require further strengthening.

FIGURE 16 Facility capacity to test for and treat malaria, by platform, 2012



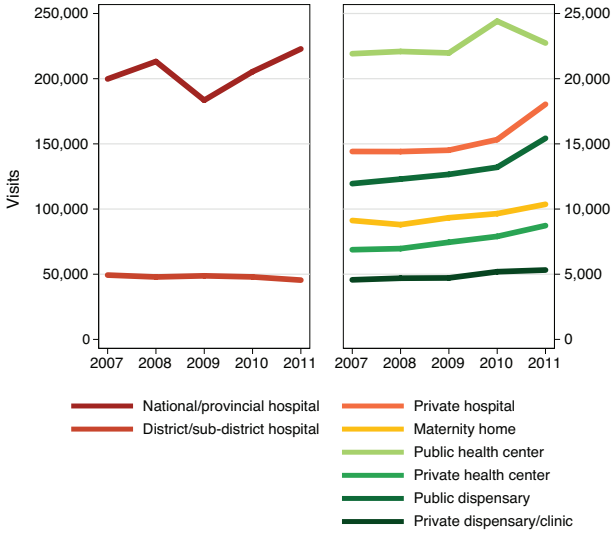
Note: The availability of ACTs and malaria testing capacity was determined by whether a facility carried each at the time of visit.

Quinine is the first-line treatment for severe malaria in Kenya (MOPHS and MOMS 2010), and we found that 84% of facilities, including pharmacies, carried quinine at the time of visit. Over 90% of hospitals and maternity homes stocked quinine, while public dispensaries reported the lowest availability (69%). Across facilities, including pharmacies, 79% stocked both ACTs and quinine, reflecting their capacity to treat the full range of malaria cases, from uncomplicated to severe, respectively.

Facility outputs

Measuring a facility's patient volume and the number of services delivered, which are known as outputs, is critical to understanding how facility resources align with patient demand for care. Figure 17 illustrates the trends in average outpatient volume across platforms and over time. In Kenya, the number of outpatient visits experienced by national and provincial hospitals far exceeded outpatient volumes recorded anywhere else. Public health centers recorded much higher outpatient visits over time than their equivalents in the private sector. In general, most platforms experienced relatively unchanged levels of outpatient visits between 2007 and 2011. Nonetheless, private hospitals

FIGURE 17 Average number of outpatient visits, by platform, 2007–2011



and public dispensaries did record increases in outpatient visits between 2010 and 2011.

Figure 18 depicts the trends in average inpatient visits across platforms. Referral hospitals and private hospitals recorded gradual increases in average inpatient visits between 2007 and 2011, whereas the other platforms showed more stagnated trends for inpatient visits. In terms of inpatient outputs, the patient volumes of maternity homes appeared to be more similar to those of health centers than private hospitals.

Among sampled facilities that provided ART services, we found that average ART visits remained fairly constant among hospitals between 2007 and 2011, but visits increased rapidly at health centers and private facilities (Figure 19). This finding corresponds with Kenya's continued expansion of ART services, especially after support of ARVs and corresponding treatment programs from the US President's Emergency Plan for AIDS Relief (PEPFAR) started in 2004 (PEPFAR 2014).

Overall, we found that facilities increased their average number of ART visits by 22%, from 4,042 in 2007 to 4,950 2011. Although national and provincial hospitals accounted for the majority of ART visits over time, the growth in overall ART visits was largely driven by public health centers. These facilities recorded a 109% increase in ART visits between 2007 and 2011, providing an average of 967 ART visits in 2007 and 2,019 in 2011. The decline in visits between 2007 and 2008 at public health centers and private facilities is likely to be a facility recordkeeping issue rather than a true decline. Average ART visits remained more stable among district and sub-district hospitals over time.

Inpatient visits generally entail more service demands than outpatient visits, including ongoing occupancy of facility resources such as beds. In Figure 20, bed occupancy rates are displayed for all facilities reporting inpatient services in 2011. A facility's occupancy rate was calculated by dividing the number of reported inpatient bed-days for 2011 by the number of beds within a facility, multiplied by 365 (days). Hospitals generally had higher occupancy rates than health centers, with most national and provincial

FIGURE 18 Average number of inpatient visits, by platform, 2007–2011

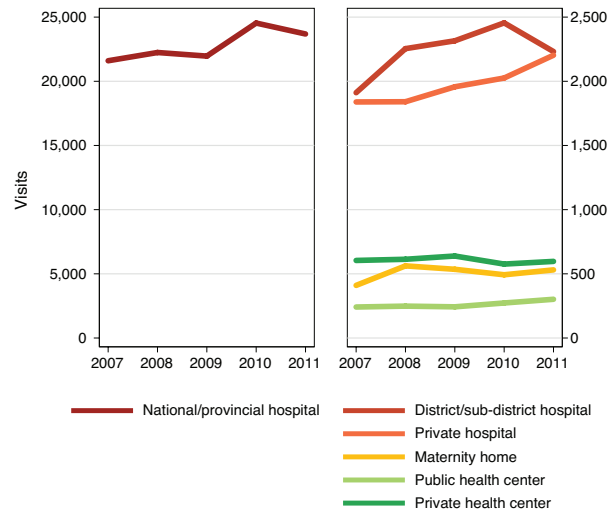


FIGURE 19 Average number of ART visits, by platform, 2007–2011

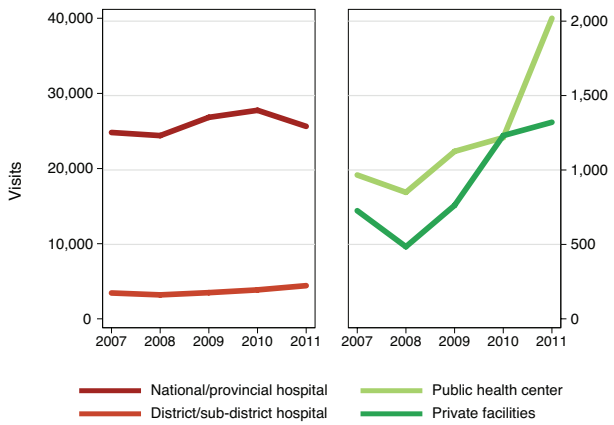
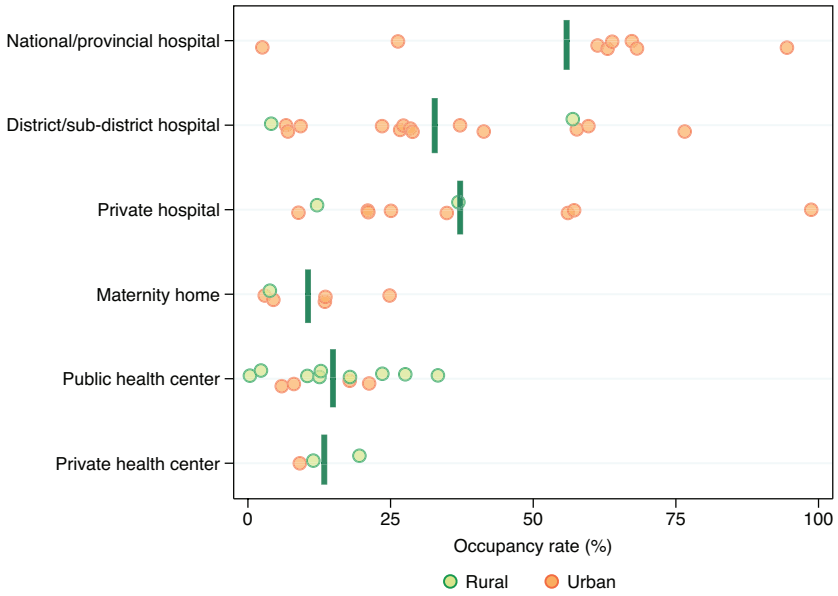


FIGURE 20 Facility occupancy rates across platforms, 2011



Note: Each circle represents a facility's occupancy rate in 2011. The vertical line represents the average occupancy rate across all facilities within a given platform. These averages were computed without one facility that had an occupancy rate exceeding 100%.

hospitals recording occupancy rates exceeding 60% and health centers, irrespective of ownership, hovering around 15% to 20%. Private hospitals had similar occupancy rates to those of public hospitals. Across platforms, urban facilities showed slightly higher occupancy rates than their rural counterparts; however, a rural public health center and a rural private health center had the highest occupancy rates for their facility type. Of the health centers in the ABCE sample, 60% reported providing inpatient services. One facility had an occupancy rate exceeding 100%. It possible that this facility was admitting more patients than the number of available beds offered.

It is important to note that the ABCE Facility Survey did not capture information on the length of inpatient stays, which can affect occupancy rates and their interpretation. This is a key indicator to monitor and include in future work.

Patient perspectives

A facility's availability of and capacity to deliver services is only half of the health care provision equation; the other half depends upon patients seeking those health services. Many factors can affect patients' decisions to seek care, ranging from associated visit costs to how patients view the care they receive. These "demand-side" constraints can be more quantifiable (e.g., distance from facility) or intangible (e.g., perceived respectfulness of the health care provider), but each can have the same impact on whether patients seek care at particular facilities or have contact with the health system at all.

Using data collected from the Patient Exit Interview Surveys, we examined the characteristics of patients who presented at health facilities and their perspectives on the care they received. Table 7 provides an overview of the interviewed patients who were not seeking HIV-related care; perspectives provided by patients seeking HIV care will be covered later in this report. The majority of patients were women and were younger than 30 years old, and most of the patients, or their caregivers if patients were younger than 18 years old, had attained at least a primary education. Across platforms, patient composition was generally comparable. However, a greater proportion of interviewed patients at hospitals had attained a post-primary education (63%) than patients presenting at health centers (50%).

Out-of-pocket expenditures

Cost-sharing and determining how much patients should pay for services have been considerably debated in Kenya over the last two decades (Collins et al. 1996, Chuma et al. 2009). While most encounters with the Kenyan health system result in some type of medical expense, the country has made policy decisions to decrease or eliminate registration and user fees at a subset of facilities and for certain types of patients. In 2004, the MOH reduced user fees at

TABLE 7 Characteristics of patients interviewed after seeking non-HIV care at facilities, 2012

CHARACTERISTIC	NATIONAL/ PROVINCIAL HOSPITAL	DISTRICT/ SUB-DISTRICT HOSPITAL	PRIVATE HOSPITAL	MATERNITY HOME	PUBLIC HEALTH CENTER	PRIVATE HEALTH CENTER	PUBLIC DISPENSARY	PRIVATE/ DISPENSARY CLINIC	ALL FACILITIES
Total patient sample	**231**	**649**	**246**	**187**	**865**	**247**	**509**	**329**	**3,263**
Percent female	46%	59%	55%	60%	63%	63%	60%	61%	59%
Educational attainment									
None or pre-primary	3%	12%	2%	4%	7%	9%	15%	3%	8%
Primary	19%	37%	20%	29%	43%	40%	46%	27%	36%
Post-primary	79%	51%	78%	67%	50%	50%	39%	71%	56%
Patient age (years)									
≤ 5	9%	21%	11%	17%	16%	28%	19%	16%	17%
6–17	4%	4%	3%	2%	4%	2%	4%	4%	4%
18–29	32%	31%	33%	35%	39%	38%	34%	41%	35%
30–39	27%	23%	27%	27%	23%	19%	21%	22%	23%
40–49	19%	12%	15%	13%	10%	6%	12%	9%	11%
≥ 50	10%	9%	11%	6%	8%	7%	11%	8%	9%
Self-reported overall health									
Poor	8%	9%	14%	9%	6%	2%	8%	10%	8%
Fair	30%	28%	28%	31%	29%	24%	31%	29%	29%
Good	49%	49%	42%	35%	48%	52%	46%	42%	47%
Very good	10%	13%	14%	20%	13%	18%	12%	16%	14%
Excellent	3%	2%	2%	5%	4%	4%	3%	4%	3%
Self-rated urgency of visit									
Not urgent	61%	43%	54%	48%	35%	43%	37%	40%	42%
Somewhat	29%	39%	31%	35%	46%	39%	48%	40%	41%
Very	10%	17%	15%	17%	18%	19%	16%	19%	17%

Note: Educational attainment refers to the patient's level of education or the attendant's educational attainment if the interviewed patient was younger than 18 years old.

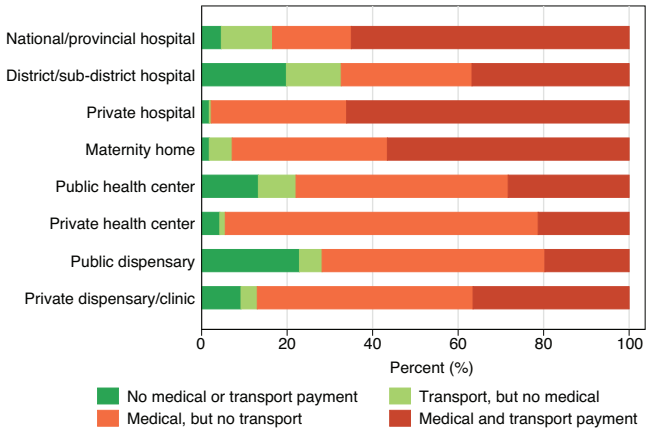
public dispensaries and public health centers to 10 Kshs and 20 Kshs, respectively, which has been known as the "10/20 policy" (MOH 2005). Further, some patients, such as children under the age of 5 years and individuals seeking care for malaria or tuberculosis, are exempt under the 10/20 policy, and registration fees are supposed to be waived for the poor (Chuma et al. 2009).

Patient reports from the facilities in the ABCE sample indicate the highest proportion of patients who did not experience medical expenses were found at district and sub-district hospitals (33%), public health centers (22%), and public dispensaries (28%). As shown in Figure 21, the vast majority of patients reported some kind of medical expense associated with their visit, ranging from 67% at district and sub-district hospitals to 98% at private hospitals.

Many patients presenting at facilities experienced the additional financial burden of transportation costs. Across all national and provincial hospitals, 77% of patients reported incurring a transport-related cost prior to receiving care. This finding may be explained by patients traveling long distances to access specialty care at these facilities. At public health centers, 36% of patients reported transportation costs

associated with their visit. This finding is not surprising, especially since many facilities serve large catchment areas and patients are generally expected to cover their own transportation costs when they seek health services.

FIGURE 21 Patient expenses associated with facility visit, by platform, 2012



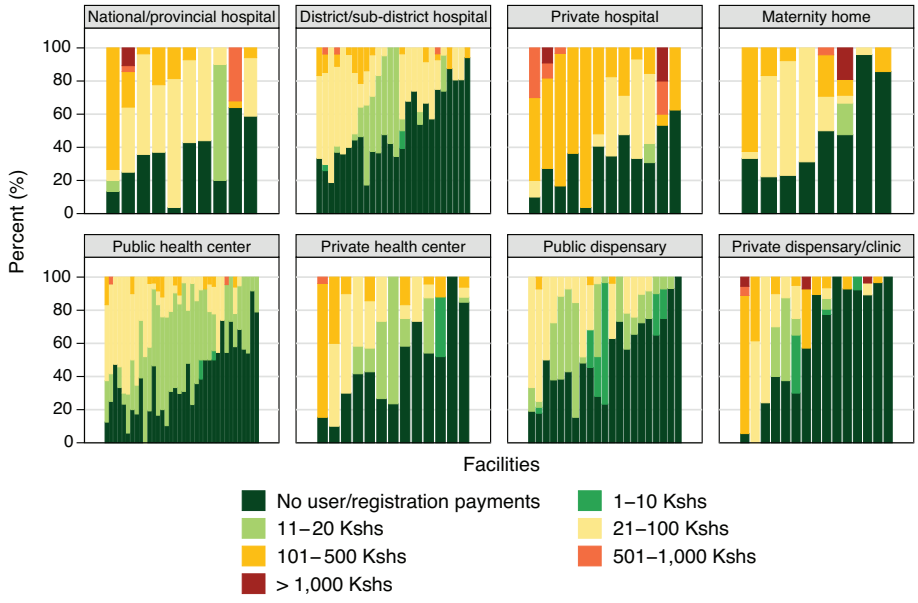
Note: Patients are grouped in mutually exclusive categories of expenses associated with their facility visits. The sum of the light green and red portions of each bar represents the percentage of patients who experienced any kind of transportation expense, irrespective of medical expenses. The sum of the orange and red portions of each bar represents the percentage of patients who experienced any kind of medical expense, irrespective of transportation expenses.

Over 63% of patients receiving services at national and provincial hospitals, private hospitals, and maternity homes reported incurring both medical and transportation expenses. Public dispensaries and private health centers had the lowest proportion of patients who paid for medical services and transportation, at about 20% at each platform.

Figure 22 depicts the proportion of patients who reported paying differing levels of user and registration fees across platforms. The majority of patients who presented at public health centers spent 20 Kshs or less on user and registration fees (75%), corresponding with Kenya's 10/20 policy. In fact, at five public health centers, all patients reported paying less than 20 Kshs in user and registration fees. On the other hand, 22% of public health centers had at least half of their patients reporting that they paid more than 20 Kshs in user and registration fees. For instance, about 70% of patients paid over 20 Kshs at two public health centers.

At public dispensaries, 52% of patients reported having no user or registration payments, and 61% indicated that they paid no more than 10 Kshs for user and registration fees. All patients at one public dispensary reported no user or registration fees, and 97% of patients at another public dispensary indicated that they spent no more than 10 Kshs on these fees. Nonetheless, 39% of patients across public dispensaries spent more than 10 Kshs on user and registration fees, with over 80% of patients reporting that they paid at least 11 Kshs in user and registration fees at two public

FIGURE 22 Levels of medical expenses incurred by patients not seeking HIV services, by platform, 2012



Note: Each bar represents a facility and the proportion of patients who paid different levels of medical expenses.

FIGURE 23 Patient travel times to facilities, by platform, 2012

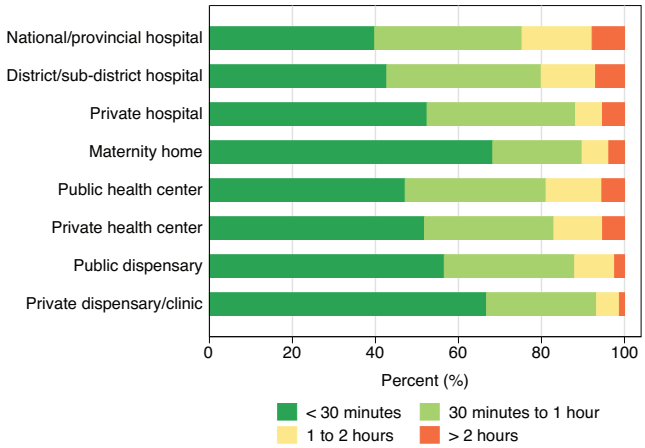
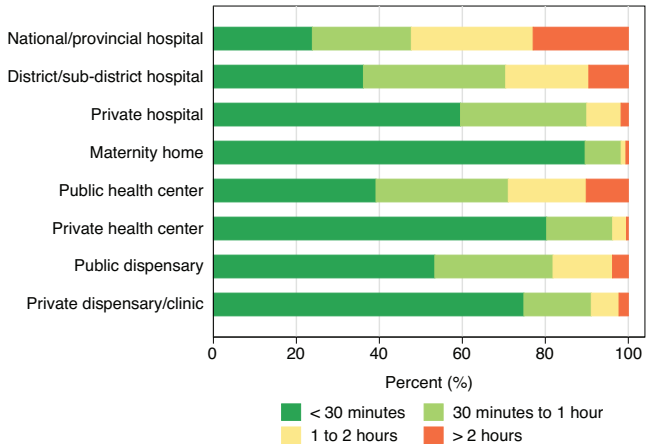


FIGURE 24 Patient wait times at facilities, by platform, 2012



dispensaries. Notably, there were three public dispensaries at which patients reported spending between 101 and 500 Kshs on user and registration fees.

These findings are not novel, as a 2007 study found that many facilities in Kwale and Makueni were not adhering to the 10/20 policy (Chuma et al. 2009), but the persistence of patients paying higher user and registration fees than what is set forth in the 10/20 policy warrants further attention.

Travel and wait times

The amount of time patients spend traveling to facilities and then waiting for services can substantially affect health care-seeking behaviors. Among interviewed patients, we found that travel times (Figure 23) and wait times (Figure 24) differed moderately by platforms, with wait times being much more variable than travel times. It is important to note that patients only reported on the time spent traveling to facilities, not the time needed for round-trip visits.

Overall, 84% of patients reported spending less than an hour traveling to the facility at which they sought care. This was particularly pronounced at maternity homes and private dispensaries and clinics, at which over 60% of patients at each indicated that they spent less than 30 minutes traveling to facilities. The greatest proportion of patients who spent at least an hour traveling to facilities were found at national and provincial hospitals (25%), which is not surprising given that many patients will travel far distances to receive the specialized care offered at these hospitals.

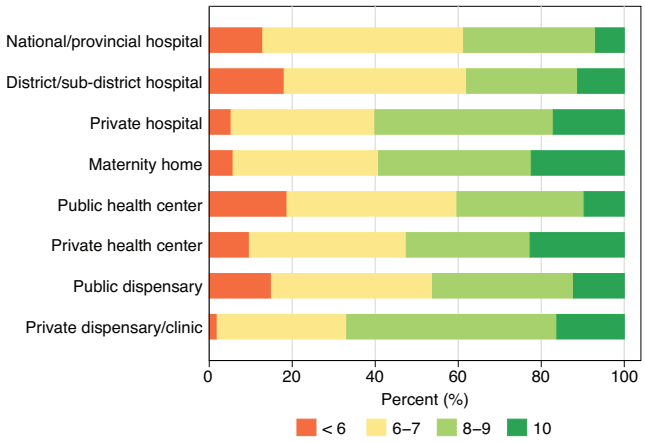
For a given platform, patients who went to urban facilities appeared to spend less time traveling than patients who received care at rural facilities. This finding is not unexpected, as the closest hospital for many patients, particularly those in rural areas, is often far away. Further, patients traveling on roads outside of urban centers may experience poor road conditions, especially during the rainy season, which can significantly extend travel times, even to facilities that are relatively close.

In terms of wait time at facilities, 78% patients reported receiving care within an hour's time; however, wait times vastly differed across platforms, with 90% of patients waiting less than 30 minutes at maternity homes and 24% of patients spending the same amount of time waiting for care at national and provincial hospitals. Many more patients waited less than an hour at private health centers, dispensaries, and clinics (93%) than patients who sought care at public health centers and dispensaries (75%). The largest proportion of patients reported spending more than two hours waiting for care at national and provincial hospitals (23%), district and sub-district hospitals (10%), and public health centers (10%).

Patient satisfaction with care. Overall, interviewed patients gave high ratings for the care they received across platforms (Figure 25). A greater proportion of patients at private dispensaries and clinics reported very high ratings (8 or higher out of 10) than other platforms, but not overwhelmingly so. Notably, relatively few patients rated their facility experience as less than a 6 out of 10 at private hospitals (5%), maternity homes (6%), and private dispensaries and clinics (2%), while nearly 20% of patients who sought care at public health centers gave a facility rating less than 6 out of 10. We did not find different ratings among patients who reported that their facility visit was urgent; however, we may not have interviewed patients presenting at the

highest levels of urgency, as interviews were only conducted with patients who were discharged from care or were capable of leaving the facility.

FIGURE 25 Patient ratings of facilities, by platform, 2012



Note: Facility ratings were reported along a scale of 0 to 10, with 0 as the worst facility possible and 10 as the best facility possible.

Figure 26 provides a more in-depth examination of patient ratings of facility characteristics and visit experiences. Overall, private hospitals, maternity homes, and private dispensaries and clinics had higher average ratings across all visit indicators. Patients generally gave higher average ratings for staff interactions across platforms than the average scores associated with facility characteristics. However, patients generally gave high ratings of facility cleanliness and privacy, especially at private and NGO-owned facilities. This contrast was most evident among public health centers and dispensaries, with patients reporting relatively low ratings for wait time (an average of 3.1 out of 5) and spaciousness (an average of 3.3 out of 5) and relatively high ratings for the respectfulness of the medical provider and non-medical staff (an average of 4.3 and 4.2 out of 5, respectively). National and provincial hospitals had the lowest rating of wait time, at 2.5 out of 5, which is not unexpected given that 23% of patients who sought care at these facilities reported waiting more than two hours to receive care.

FIGURE 26 Average patient ratings of facility visit indicators, by platform, 2012

	NATIONAL/ PROVINCIAL HOSPITAL	DISTRICT/ SUB-DISTRICT HOSPITAL	PRIVATE HOSPITAL	MATERNITY HOME	PUBLIC HEALTH CENTER	PRIVATE HEALTH CENTER	PUBLIC DISPENSARY	PRIVATE DISPENSARY/ CLINIC
Overall rating	**7.1**	**7.0**	**7.9**	**7.9**	**7.1**	**7.7**	**7.2**	**8.0**
STAFF INTERACTIONS								
Non-medical staff respectfulness	4.1	4.1	4.4	4.4	4.2	4.3	4.2	4.5
Medical provider respectfulness	4.1	4.2	4.4	4.3	4.2	4.3	4.3	4.4
Clarity of provider explanations	4.1	4.0	4.4	4.3	4.1	4.1	4.1	4.4
Time to ask questions	4.1	3.9	4.3	4.1	4.0	4.1	4.1	4.4
FACILITY CHARACTERISTICS								
Cleanliness	4.1	3.8	4.3	4.3	3.9	4.2	4.0	4.2
Privacy	4.0	4.0	4.5	4.2	4.0	4.1	4.0	4.2
Spaciousness	3.3	3.5	3.5	3.5	3.2	3.8	3.5	3.5
Wait time	2.5	2.9	3.6	4.0	3.0	4.0	3.2	3.9

LOWEST RATINGS — HIGHEST RATINGS

Note: Overall ratings are on a scale of 0 to 10, with 0 as the worst facility possible and 10 as the best facility possible. Average ratings of staff interactions and facility characteristics are on a scale of 1 to 5, with 1 being "very bad" and 5 being "very good."

Efficiency and costs

The costs of health service provision and the efficiency with which care is delivered by health facilities go hand-in-hand. An efficient health facility is one in which facility resources (e.g., beds, personnel) are used at full capacity, producing a high volume of patient visits and services without straining its resources. Conversely, an inefficient health facility is one wherein resources are not fully maximized, leaving usable beds empty or medical staff seeing very few patients per day.

Analytical approach

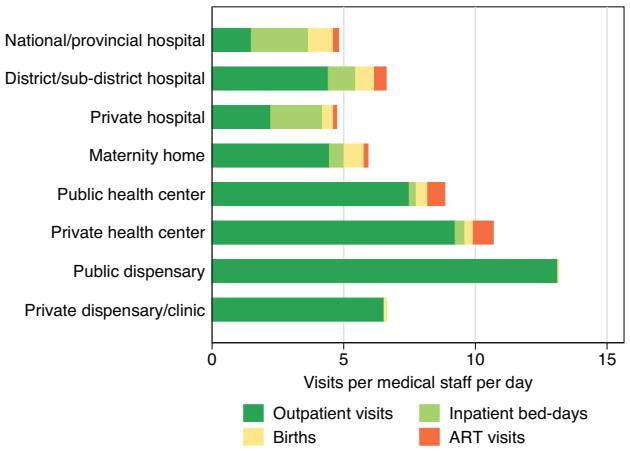
We used an analytical technique known as Data Envelopment Analysis (DEA) to assess the relationship between facility inputs and outputs (Di Giorgio et al. 2014). Based on this analysis, an efficiency score was estimated for each facility, capturing a facility's use of its resources, such as current staffing (i.e., doctors, clinical officers, nurses, and other medical staff) and the availability of capital inputs (e.g., facility beds) to produce care. Service provision was categorized into four groups: outpatient visits, inpatient bed-days, births, and ART visits. Efficiency scores ranged from 0% to 100%, with a score of 100% indicating that a facility achieved the highest level of production, relative to comparably sized facilities in the ABCE sample.

Recognizing that each type of visit requires a different amount of facility resources (e.g., on average, an inpatient bed-day uses more resources and more complex types of equipment and services than an outpatient visit), we applied weights generated through DEA to rescale each facility's mixture of outputs to "outpatient equivalent visits." All outputs were scaled to equal a comparable number of outpatient visits, creating a standard metric across facilities with different levels of service production. The conversion to outpatient equivalent visits varied by facility; on average, however, we estimated that one inpatient bed-day was equivalent to 3.8 outpatient visits; one birth was equivalent to 9.4 outpatient visits; and one ART visit was equivalent to 1.7 outpatient visits. As a result, a hospital reporting high levels of inpatient bed-days could be appropriately compared to a health center that largely produced outpatient visits.

Efficiency

Both across and within platforms, we found a sizeable range in health-service production and efficiency scores among Kenyan health facilities. In terms of total visits, the average number of outpatient equivalent visits experienced by each facility's medical staff per day ranged from just under five visits at national, provincial, and private hospitals to just over 13 visits at public dispensaries (Figure 27). Across all platforms, facilities averaged seven visits per medical staff per day in 2011. Notably, public primary care facilities recorded a greater number of outpatient equivalent visits per medical staff per day (an average of 10.4) than private primary care facilities (8.6 visits per medical staff per day).

FIGURE 27 Range and composition of average output production across platforms, 2011

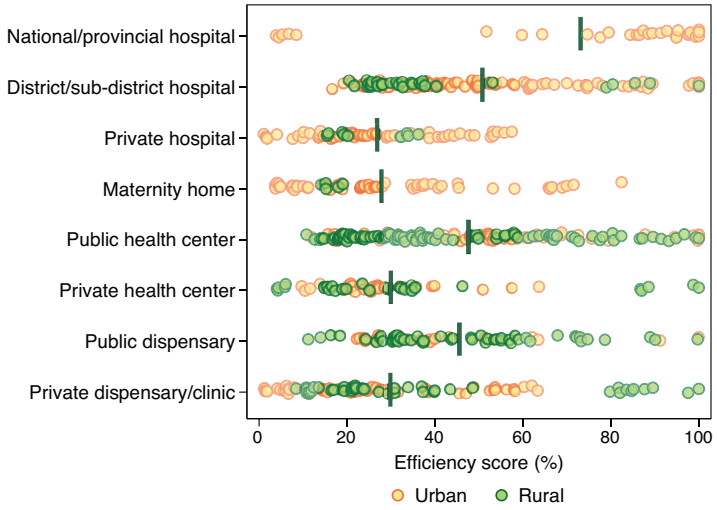


Note: All visits are reported in outpatient equivalent visits estimated at the facility level. Conversion to outpatient equivalent visits varied across facilities; on average, one inpatient bed-day was equivalent to 3.8 outpatient visits, one birth was equivalent to 9.4 outpatient visits, and one ART visit was equivalent to 1.7 outpatient visits. There were five public dispensaries and three private dispensaries and clinics that reported providing ART, but they were not included in this figure; in 2011, each facility type averaged 0.7 ART visits per medical staff per day, as measured in outpatient equivalent visits.

Beyond total volume, output composition varied across platforms. As expected, outpatient visits accounted for the overwhelming majority of the patients seen per medical staff per day at health centers and dispensaries. However, outpatients also contributed to most of the visits recorded at district and sub-district hospitals, as well as maternity homes, which was less expected. Private health centers saw the largest volume of ART-specific visits, measured in outpatient equivalent visits, averaging 0.8 visits per medical staff per day; private dispensaries and clinics, as well as public dispensaries, had the next-highest volumes. For inpatient bed-days, as reported in outpatient equivalent visits, national and provincial hospitals had the highest outputs per medical staff per day (2.2), with inpatient bed-days accounting for the largest proportion of each of these platforms' total output volume.

In estimating efficiency scores for all facilities, two main findings emerged. First, efficiency scores were relatively low across all health facilities, with 66% of facilities scoring 50% or lower in 2011. Second, the range between the facilities with highest and lowest efficiency scores was quite

FIGURE 28 Range of efficiency scores, by platform, 2007–2011



Note: Each circle represents a facility's efficiency score for a given year between 2007 and 2011. The vertical line represents the average efficiency score across all facilities and years within a given platform.

large within platforms, particularly at each end of the health system (tertiary hospitals and dispensaries). This finding suggests that a substantial performance gap may exist between the average facility and facilities with the highest efficiency scores. Figure 28 depicts this range of facility efficiency scores across platforms.

Larger facilities (national and provincial hospitals) generally had higher efficiency scores than smaller facilities (health centers), but there was considerable overlap at each end of the efficiency spectrum. For instance, district and sub-district hospitals averaged a similar efficiency score (51%) to that estimated across public health centers (48%). Except for private hospitals and maternity homes, multiple facilities within each platform recorded an efficiency score of 100%. On the other hand, multiple facilities, especially among private hospitals and private dispensaries and clinics, had efficiency scores close to 0%. Notably, a greater proportion of urban hospitals appeared to have higher efficiency scores than rural hospitals, whereas rural dispensaries and clinics generally had higher efficiency scores than their urban equivalents. For example, rural private dispensaries and clinics averaged an efficiency score of 37%, with a range of 8% to 100%, and urban private dispensaries and clinics scored an average of 25%, ranging from 1% to 63%.

Table 8 compares facility characteristics of the "most efficient" facilities (those that ranked among the top 10% of efficiency scores across all years) to the "least efficient" facilities (those that ranked among the lowest 10%) by platform. Some factors appear to be related to higher efficiency scores across platforms (facilities with higher levels of outputs generally have higher efficiency scores; facilities with more beds had higher efficiency scores), but few characteristics were truly universal. The private health centers with the lowest efficiency scores, for example, averaged many more beds than the private health centers with the highest efficiency scores. National and provincial hospitals with the highest efficiency scores averaged larger volumes of inpatient bed-days than the least efficient, while district and sub-district hospitals with the lowest efficiency scores averaged nearly twice the number of inpatient bed-days than those with the highest scores. National and provincial hospitals with the highest efficiency scores also averaged more skilled medical personnel per facility than those with the lowest efficiency scores, whereas the opposite was true among private health centers and dispensaries. In sum, the efficiency with which health facilities operate in Kenya is likely affected by several factors, including but certainly not limited to facility-based capital and patient volumes.

As shown in Figure 28, a large portion of health facilities in Kenya had low efficiency scores. Given observed levels of facility-based resources (beds and personnel), it would appear that many facilities had the capacity to handle much larger patient volumes than they reported. Figure 29 displays this gap in potential efficiency performance across platforms, depicting the possible gains in total service provision that could be achieved if every facility in the ABCE sample operated at optimal efficiency.

We found that all types of facilities could expand their outputs substantially given their observed resources. Based on our analyses, the lowest levels of care, especially

dispensaries, had the greatest potential for increasing service provision without expanding current resources. Overall, based on our estimation of efficiency, a large portion of Kenyan health facilities could increase the volume of patients seen and services provided with the resources available to them. This finding has been documented by past studies, for which a portion of Kenyan public health centers and district hospitals showed varying levels of inefficiency (Kirigia et al. 2002, Kirigia et al. 2004). At the same time, many reports and policy documents emphasize that pronounced

TABLE 8 Facility characteristics across efficiency score performance, by platform, 2011

	NATIONAL/ PROVINCIAL HOSPITAL		DISTRICT/ SUB-DISTRICT HOSPITAL		PRIVATE HOSPITAL		MATERNITY HOME		PUBLIC HEALTH CENTER		PRIVATE HEALTH CENTER		PUBLIC DISPENSARY		PRIVATE DISPENSARY/ CLINIC	
INDICATOR	**TOP 10%**	**LOWEST 10%**	**TOP 10%**	**LOWEST 10%**	**TOP 10%**	**LOWEST 10%**	**TOP 10%**	**LOWEST 10%**	**TOP 10%**	**LOWEST 10%**	**TOP 10%**	**LOWEST 10%**	**TOP 10%**	**LOWEST 10%**	**TOP 10%**	**LOWEST 10%**
Average efficiency score	**100**	**7**	**96**	**20**	**57**	**6**	**76**	**5**	**82**	**19**	**81**	**10**	**63**	**15**	**79**	**5**
Average outputs																
Outpatient visits	231,853	9,400	100,712	36,030	34,279	3,358	22,834	2,847	47,374	8,175	25,641	4,661	13,829	7,874	7,281	960
Inpatient bed-days	128,861	368	5,813	10,259	18,820	N/A	205	N/A	109	219	N/A	1	N/A	N/A	N/A	N/A
Births	5,838	N/A	1,067	1,051	514	55	919	27	240	158	42	16	N/A	N/A	N/A	61
ART visits	76,762	N/A	1,156	1,616	N/A	9	N/A	N/A	895	62	N/A	N/A	N/A	N/A	N/A	N/A
Total outputs	443,314	9,768	106,810	45,535	55,827	3,418	25,065	2,875	48,056	8,449	26,790	4,669	13,829	7,874	8,019	981
Average inputs																
Beds	457	30	25	113	106	30	18	24	5	7	2	15	N/A	N/A	N/A	4
Doctors	55	8	2	4	3	2	1	1	0	0	0	1	0	0	0	0
Nurses	276	47	17	50	34	7	4	4	9	5	2	3	2	2	1	2
Other medical staff	92	25	9	18	9	3	3	2	2	4	2	3	1	2	0	1
Non-medical staff	102	45	11	31	41	16	6	12	7	3	3	4	2	4	0	4
Total number of facilities	**1**	**1**	**3**	**3**	**2**	**2**	**2**	**2**	**4**	**4**	**2**	**2**	**2**	**2**	**2**	**3**

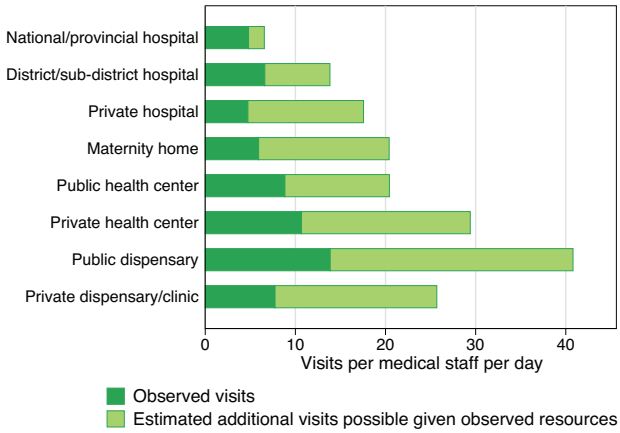
Note: "N/A" under outputs indicates that the facility or facilities reported that they did not provide a given service or insufficient data were available. For births, "N/A" was applied if the facility reported zero births over the last five years. For beds, "N/A" reflects that the facility or facilities did not offer inpatient services. If a facility indicated that they did not provide a given service, it was not included in calculating the average number of annual outputs for that service.

TABLE 9 Average efficiency scores and estimated additional outpatient equivalent visits, given observed facility resources, by country

INDICATOR	KENYA	GHANA	UGANDA	ZAMBIA
Average efficiency score, across platforms	41%	27%	31%	42%
Average observed outpatient equivalent visits per medical staff per day	7	4	5	8
Average estimated additional visits given observed facility resources	12	13	16	13

Note: All visits are reported in outpatient equivalent visits estimated at the facility level. Conversion to outpatient equivalent visits varied across facilities; on average, one inpatient bed-day was equivalent to 3.8 outpatient visits, one birth was equivalent to 9.4 outpatient visits, and one ART visit was equivalent to 1.7 outpatient visits.

FIGURE 29 Observed and estimated additional visits that could be produced given observed facility resources, 2011



Note: All visits are reported in outpatient equivalent visits estimated at the facility level. Conversion to outpatient equivalent visits varied across facilities; on average, one inpatient bed-day was equivalent to 3.8 outpatient visits, one birth was equivalent to 9.4 outpatient visits, and one ART visit was equivalent to 1.7 outpatient visits. Using outpatient equivalent visits, we estimated the average additional visits facilities could have produced, given observed inputs, in 2011.

deficiencies in human resources for health exist in Kenya (MOMS and MOPHS 2012), such that "significant [human resources for health] will be required to meet the demand" for health services (Chankova et al. 2006). Our results suggest otherwise, as most facilities in the ABCE sample had the potential to bolster service production given their reported staffing of skilled personnel and physical capital.

Compared to the other sub-Saharan African countries currently included in the ABCE project, we found that, on average, Kenya performed at similar or higher levels of efficiency (Table 9). In Kenya, the average efficiency score across all facilities was 41% in 2011, which was slightly lower than the average score for Zambia (42%). Kenya's average efficiency score across facilities was much higher than Uganda's (31%) and Ghana's (27%). Kenya featured one of the higher percentages of facilities operating at high levels of efficiency, with 10% of all facilities recording an efficiency score of 80% or higher in 2011. By comparison, 14% of Zambian, 5% of Ugandan, and 5% of Ghanaian health facilities performed at a similar level.

Under a scenario in which all facilities operated as efficiently as the most efficient facilities in the ABCE sample, we estimated that facilities in Kenya could add an average of 12 visits per medical staff per day, as measured in outpatient equivalent visits. We found similar results for Zambia, while Ghana and Uganda demonstrated even greater potential for service expansion.

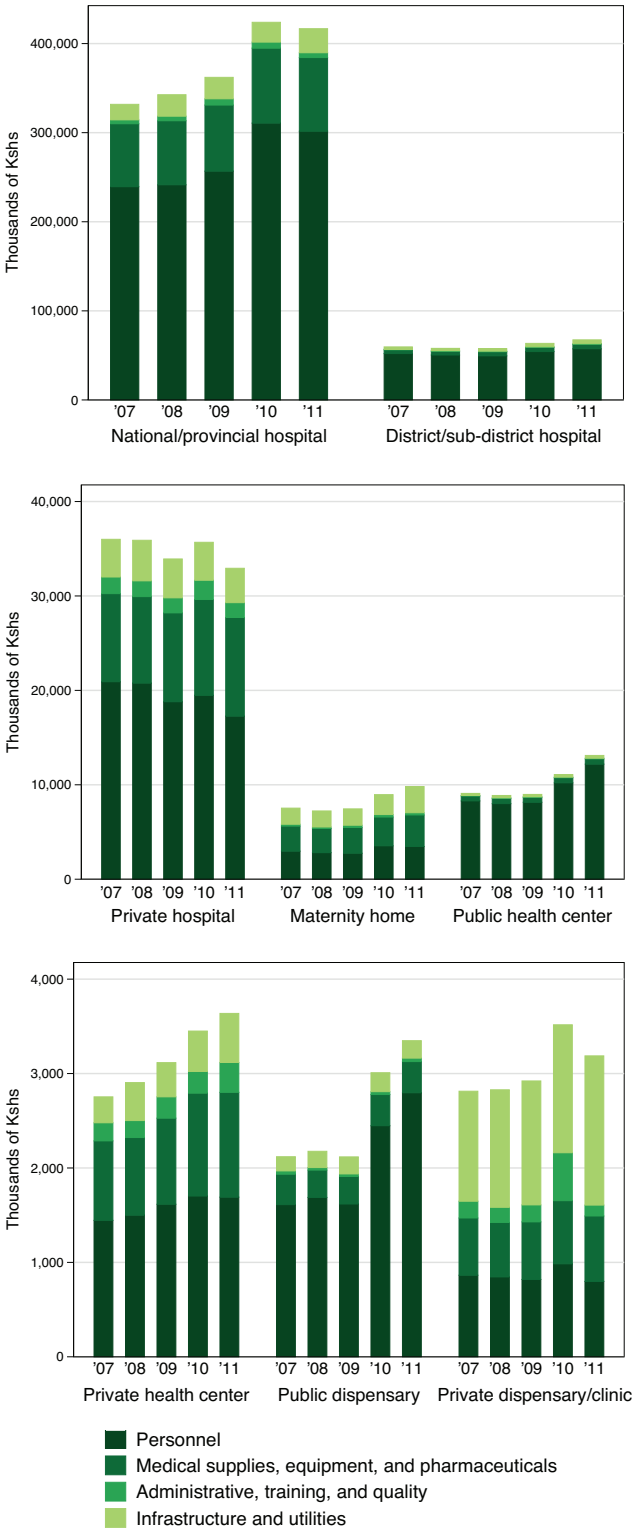
These findings provide a data-driven understanding of facility capacity and how health facilities have used their resources in Kenya; at the same time, they are not without limitations. Efficiency scores quantify the relationship between what a facility has and what it produces, but these measures do not fully explain where inefficiencies originate, why a given facility scores higher than another, or what levels of efficiency are truly ideal. It is conceivable that always operating at full capacity could actually have negative effects on service provision, such as longer wait times, high rates of staff burnout and turnover, and compromised quality of care. These factors, as well as less tangible characteristics such as facility management, are all important drivers of health service provision, and future work should also assess these factors alongside measures of efficiency.

Costs of care

In terms of annual total expenditures, trends in average facility spending varied by platform between 2007 and 2011 (Figure 30). National and provincial hospitals, as well as private health centers, recorded slightly higher levels of average expenditures in 2011 than in 2007, which appeared to be driven by increased spending on personnel and medical supplies (excluding ARVs), respectively. Public dispensaries showed a substantial rise in average expenditures between 2010 and 2011, which was largely attributable to heightened spending on personnel. At the same time, other platforms, district and sub-district hospitals and private hospitals, experienced minimal changes in average annual spending between 2007 and 2011. On average, private dispensaries and clinics spent more funds on infrastructure and utilities than any other platform.

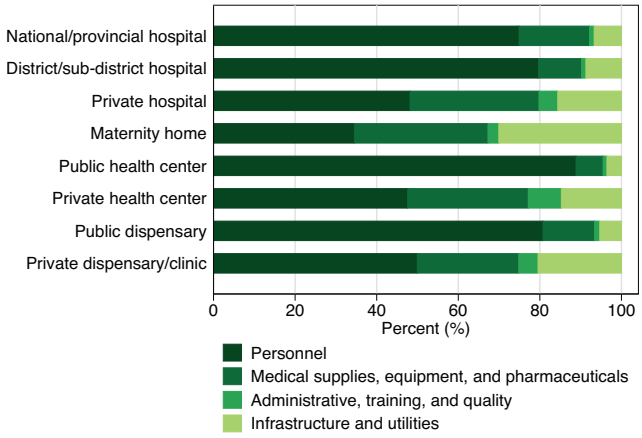
Figure 31 shows the average composition of expenditure types across platforms for 2011. Notably, public facilities spent a much greater proportion of their total expenditures on personnel than private facilities (i.e., 73% at national and provincial hospitals; 78% at district and sub-district hospitals; 88% at public health centers; 80% at public dispensaries). On the other hand, expenditures on medical supplies and infrastructure generally accounted for the largest proportion of private facilities' total spending in 2011 (e.g., maternity homes spent an average of 27% of their total budgets on infrastructure and utilities; medical supplies, equipment, and pharmaceuticals contributed to an average of 29% of total expenditures at private hospitals). It is important to note that expenditures on medical supplies and pharmaceuticals excluded the costs of ARVs.

FIGURE 30 Average total expenditure and type of expenditure across platforms, 2007–2011



Note: Expenditures on ARVs were not included for the average annual estimates of facility spending on medical supplies, equipment, and pharmaceuticals.

FIGURE 31 Average percentage of expenditure type across platforms, 2011



Note: Expenditures on ARVs were not included for estimates of facility spending on medical supplies, equipment, and pharmaceuticals.

On average, spending on administration and training accounted for no more than 10% across platforms, with the highest at 8% among private health centers and the lowest at 1% for public health centers.

Costs by visit type and services provided. To estimate the costs of service provision, we used information generated through DEA to determine expenditures for each of the four types of facility output (outpatient visits, inpatient bed-days, births, and ART visits) and then divided output-specific spending by the number of outputs produced by a facility. This measure of facility-level cost per output accounts for the "costs of inefficiency," as we used reports of actual expenditures rather than proposed costs. All cost data were adjusted for inflation and are presented in 2011 Kshs. All US dollar estimates were based on the 2011 exchange rate of 83 Kshs per $1.

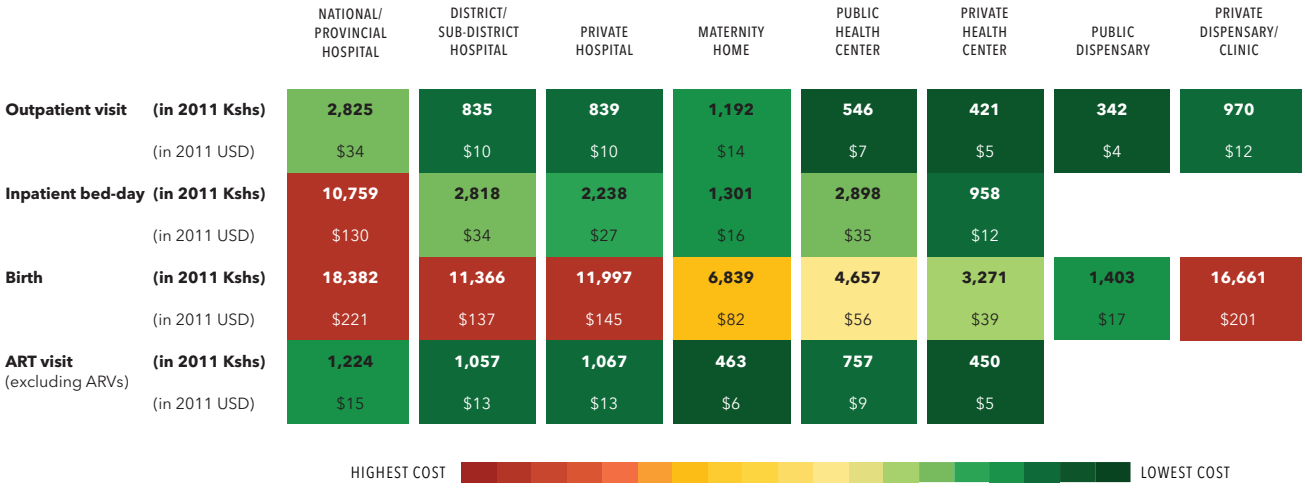
As illustrated by Figure 32, outpatient visits cost the least to provide across a subset of platforms, especially at public dispensaries (342 Kshs [$4]), whereas ART visits, excluding the costs of ARVs, were the least expensive to produce at certain facility types (e.g., at national and provincial hospitals, the average facility cost per ART visit was 1,224 Kshs [$15], while the average outpatient visit cost was 2,825 Kshs [$34]). Across all platforms, births were the most expensive output for facilities to produce; however, the average cost per birth ranged from 1,403 Kshs ($17) at public dispensaries to 18,382 Kshs ($221) at national and provincial hospitals. The latter spent the most per patient visit across all services they provided, while public dispensaries generally produced the least expensive services across visit types; the exception was the average facility cost per ART

visit, excluding ARVs, which was lowest at private health centers (450 Kshs [$5]). Notably, public health centers averaged the second-most expensive provision of inpatient bed-days (2,898 [$35]), exceeding the average cost per inpatient bed-day estimated for both private hospitals (2,238 Kshs [$27]) and private health centers (958 Kshs [$12]).

In comparison with Ghana, Uganda, and Zambia, the average cost per patient in Kenya varied (Table 10). For the average cost per inpatient bed-day, Kenya recorded the highest average facility cost per bed-day, at 3,432 Kshs [$41]), slightly exceeding the average found at Ugandan and Ghanaian facilities (3,404 Kshs [$41] and 3,383 Kshs [$41], respectively). On the other end of the cost spectrum, the average facility cost per ART visit in Kenya, excluding the costs of ARVs, was nearly the least expensive across countries (867 Kshs [$10]), just following Uganda (816 Kshs [$10]). The average facility costs per outpatient visit and birth at Kenyan facilities were on the higher end, registering just below Ghana for each of these output types.

Figure 33 compares the average percentage of total expenditure among facilities that provided ART services with those that did not in 2011. Of the facilities that did not provide ART services, an average of 92% of all expenditures were allocated to outpatient care. This finding likely reflects the large volume of outpatients that these facilities experienced. Among facilities that provided ART services,

FIGURE 32 Average facility cost per visit, across output types and by platform, 2011



Note: The cost of an ART visit excludes costs of ARVs (but includes other medications) provided to the patient. All cost estimates are in 2011 Kshs, with 83 Kshs equaling 1 USD. There were five public dispensaries and three private dispensaries and clinics that reported providing ART, but they were not included in this figure. In 2011, their average cost per ART patient, excluding ARVs, was 847 Kshs ($10) and 221 Kshs ($3), respectively.

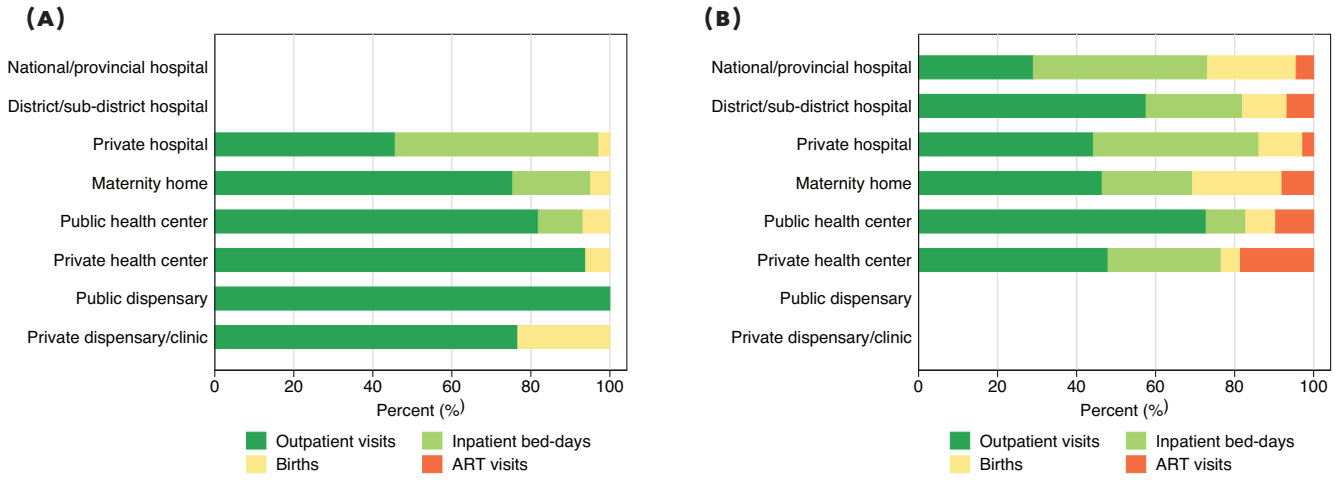
TABLE 10 Average facility cost per visit across output types, for a subset of ABCE countries, 2011

OUTPUT TYPE		KENYA	GHANA	UGANDA	ZAMBIA*
Average cost per outpatient visit	**(in 2011 Kshs)** (in 2011 USD)	**814** $10	**1,207** $15	**702** $8	**721** $9
Average cost per inpatient bed-day	**(in 2011 Kshs)** (in 2011 USD)	**3,432** $41	**3,383** $41	**3,404** $41	**1,726** $21
Average cost per birth	**(in 2011 Kshs)** (in 2011 USD)	**8,812** $106	**11,965** $144	**6,232** $75	**5,222** $63
Average cost per ART visit (excluding ARVs)	**(in 2011 Kshs)** (in 2011 USD)	**867** $10	**1,625** $20	**816** $10	**1,481** $18

* The last year of financial data collected in Zambia was 2010, so we collated information from the costs of each output type we observed at facilities from 2006 to 2010 and estimated costs for 2011 at the facility level. We then converted the average cost per visit into 2011 USD to correspond with the financial data collected for Ghana, Kenya, and Uganda.

Note: The lowest average cost per output type is highlighted in green, and the highest average cost per output type is highlighted in red. The cost of an ART visit excludes the cost of ARVs (but includes other medications) provided to the patient. All cost estimates are in 2011 Kshs, with 83 Kshs equaling 1 USD.

FIGURE 33 Average percentage of total expenditures, by platform, for (A) facilities that did not provide ART services, and (B) facilities that provided ART services, 2011



Note: The cost of an ART visit excludes the cost of ARVs provided to the patient. All district and sub-district hospitals in the ABCE facility sample provided ART services in 2011. One private clinic reported providing inpatient services and one national hospital indicated that it did not provide ART in 2011; both of these facilities were omitted from this figure. The private clinic spent 50% on outpatient visits, 32% on inpatient bed-days, and 18% on births in 2011. The national hospital spent 14% of its total expenditures on inpatient bed-days and 86% on outpatient visits. For the five public dispensaries that offered ART, their average spending was 77% on outpatient visits, 22% on ART visits, and 1% on births. For the three private dispensaries and clinics that had ART, an average of 53% of total expenditures was allocated to outpatient visits, 45% to ART visits, and 4% to births.

outpatient spending still accounted for the largest proportion of expenditures for public health centers and public dispensaries, but expenditure composition was much more diverse for hospitals. At national and provincial hospitals, inpatient bed-days accounted for a larger proportion of total expenditures than outpatient spending. ART visits contributed to an average of 23% at private health centers. At primary care facilities that provided ART, an average of 8% of spending was allocated to births.

Main findings
Facility-based ART services

Since 2000, HIV/AIDS has been the underlying cause of least 15% of the early death and disability experienced by Kenyans (Murray et al. 2012), prompting the country to significantly expand its HIV/AIDS-specific services over the last two decades. Nonetheless, unmet need remains high, and the patient population requiring ART continues to grow as HIV-attributable mortality declines and treatment eligibility changes (NASCOP 2011, WHO 2013a). At a time when international aid for HIV/AIDS programs is no longer escalating (IHME 2014a), it is becoming increasingly important to understand what components of facility-based ART programs are associated with better outcomes at lower costs. In this section, we draw from multiple sources of data to provide a thorough assessment of facilities that provide ART. We present on the following:

- Facility characteristics, as measured by the ART module in the ABCE Facility Survey.
- A review of charts for patients who initiated ART between 2008 and 2012, as measured by clinical chart extractions.
- Facility effectiveness of monitoring patients.
- Patient outcomes, such as program retention, as measured by clinical chart extractions.
- Reported experiences and costs of care by ART patients, capturing "demand-side" factors of health system performance.
- Linkages between the cost and efficiency of ART services and patient characteristics, outcomes, and satisfaction.

It is worth noting that we combined all privately owned facilities, from private hospitals to private dispensaries and clinics, into one facility category for this section. There were too few private facilities in the ABCE sample to appropriately analyze data for each platform individually.

Facility capacity and characteristics

Table 11 provides an overview of the sampled facilities that provide ART services. The final sample included 51 facilities from 19 counties, and featured a good mixture of facilities based on ownership, urbanicity, and platform type. These facilities saw an average of 1,763 ART patients in 2011. On average, these facilities had offered ART services for six years.

In terms of services offered, PMTCT and HIV testing and counseling were nearly universal among the sampled facilities; however, one provincial hospital did not have PMTCT. Nutritional supplementation programs were much more common among hospitals and private facilities (97% reported having these programs) than public health centers (74%). A greater proportion of national and provincial hospitals offered male circumcision services (67%) than public health centers (35%), which may be related to the availability of personnel with enough training to perform the procedure. All private facilities offered outreach services (94%), far exceeding the proportion of district and sub-district hospitals, as well as public health centers, that provided this service (52% and 59%, respectively). Details of what exactly outreach services entail are not as clear, but this finding has potential implications for the mechanisms by which facilities reach patients and promote earlier ART initiation, treatment adherence, and prevention efforts.

Patient characteristics

Among the ART patients for whom chart information was extracted (Table 12), 61% were female and 54% were married. The median patient age was 37 years old, and 66% of patients began ART between 2010 and 2012.

Patient drug regimens over time. Between 2008 and 2012, there was a very rapid transition away from d4T-based drug regimens and toward those with a tenofovir (TDF)-based regimen in both hospitals and health centers (Figure 34). This trend is explained by a change in WHO's and Kenya's national guidelines, which stipulated the phase-out of d4T-based regimens for adult patients initiating ART since 2010 (WHO 2010, NASCOP 2011). In 2008, 73% of patients initiated ART with a d4T-based therapy; by 2012, only 8% of patients began ART on d4T. Conversely, the proportion of patients starting ART on a TDF regimen quickly escalated between 2008 and 2012, from 3% in 2008 to 45% in 2012.

TDF regimens are generally associated with higher patient tolerance and are considered more convenient than zidovudine (AZT)-based therapies due to TDF's delivery

TABLE 11 Characteristics of facilities that provide ART, by platform, 2012

INDICATOR	NATIONAL/PROVINCIAL HOSPITAL	DISTRICT/ SUB-DISTRICT HOSPITAL	PUBLIC HEALTH CENTER	PRIVATE FACILITIES	ALL FACILTIES
Number of facilities	**6**	**21**	**19**	**5**	**51**
Location					
Rural	0%	5%	63%	40%	29%
Semi-urban	0%	71%	26%	60%	45%
Urban	100%	24%	11%	0%	25%
HIV services					
Male circumcision	67%	43%	35%	50%	44%
PMTCT	83%	95%	100%	75%	94%
HIV testing and counseling	100%	95%	100%	100%	98%
Nutrition supplements for HIV-positive patients	100%	95%	74%	100%	88%
Outreach services	83%	52%	59%	100%	63%
Staff and guidelines					
Nurse-led care	33%	43%	33%	75%	41%
HIV guidelines	83%	24%	11%	40%	27%
General HIV training offered in last year	100%	14%	11%	40%	25%
HIV testing and counseling training offered in last year	100%	95%	95%	100%	96%

TABLE 12 Characteristics of ART patients at initiation, by platform, 2007–2012

CHARACTERISTIC	NATIONAL/PROVINCIAL HOSPITAL	DISTRICT/ SUB-DISTRICT HOSPITAL	PUBLIC HEALTH CENTER	PRIVATE FACILITIES	ALL FACILTIES
Number of charts	**2,583**	**9,222**	**3,428**	**620**	**15,853**
Percent female	63%	68%	64%	66%	66%
Median age (years)	37	37	37	37	37
Ever married	49%	54%	58%	58%	54%
Year of ART initiation					
2007	13%	6%	2%	3%	6%
2008	22%	19%	13%	16%	18%
2009	18%	20%	18%	20%	20%
2010	19%	26%	22%	27%	24%
2011	23%	24%	35%	27%	26%
2012	5%	4%	9%	7%	5%

FIGURE 34 ART regimen at initiation, 2008–2012

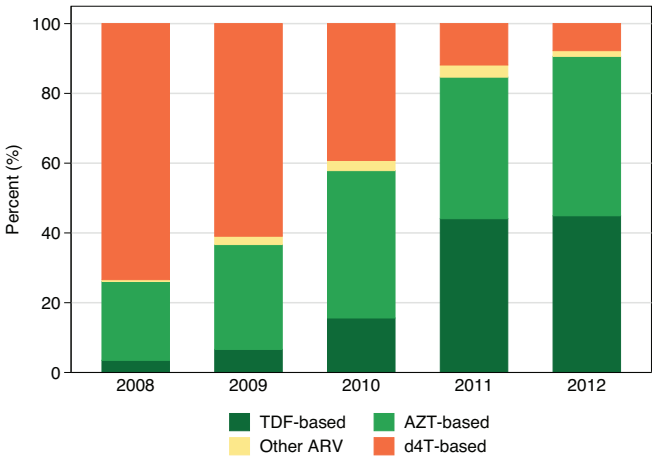
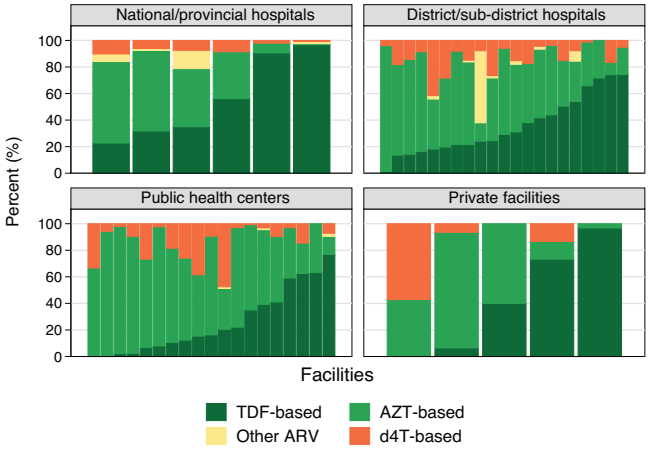


FIGURE 35 ART regimen at initiation, by facility, 2011–2012



Note: Each bar represents a facility and the proportion of patients who initiated ART on a given regimen in 2011 to 2012.

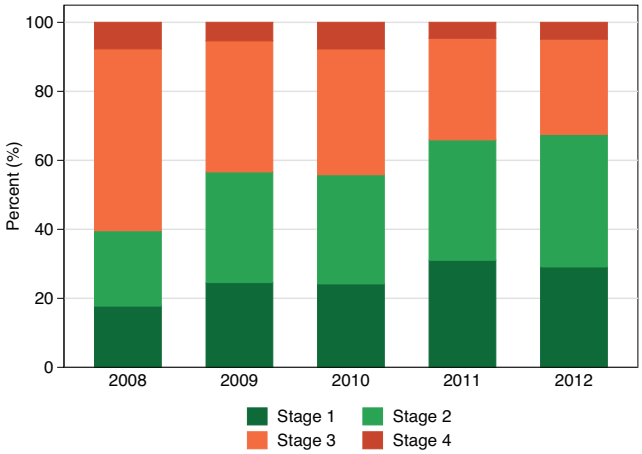
as a single, daily combination pill. However, TDF tends to be more expensive than AZT, which is an important consideration given Kenya's growing patient population and declining donor funding.

It is important to note that we found substantial variation in TDF prescription practices across facilities (Figure 35). In 2011 and 2012, prescription rates of TDF at ART initiation ranged from 0% to 97%. Aside from a few facilities, health centers appeared to have lower TDF prescription rates than hospitals and some private facilities; this finding is not surprising given the costs associated with TDF-based therapies. At the same time, a few facilities still initiated a portion of ART patients on d4T-based regimens in 2011 and 2012 (e.g., 47% at one public health center and 57% at an NGO-owned health center). Further examination of why these facilities were prescribing d4T to ART initiates is warranted.

Clinical characteristics. Between 2008 and 2012, there was steady shift toward earlier initiation of ART based on changes in WHO and national treatment guidelines (NASCOP 2011, WHO 2013a). In 2008, 40% of patients initiating ART were classified as WHO stage 1 or 2, but this increased to 68% initiating at the same stages in 2012 (Figure 36). Nonetheless, a portion of Kenyan patients still began ART fairly late in disease progression in 2012, with 32% starting treatment at stage 3 or 4.

Further, we observed substantial variation in WHO stage at ART initiation across facilities (Figure 37). In general, a greater proportion of ART patients began treatment at stage 1 or 2 at public health centers (73%) than national and provincial hospitals (63%), as well as district and sub-district hospitals (69%). However, one health center had 85% of ART patients initiating at stage 1 or stage 2 in 2011 and 2012. Other facilities with high rates of stage 1 and stage 2 ART initiates in 2011 and 2012 included one sub-district hospital

FIGURE 36 WHO stage at initiation, 2008–2012



Note: WHO staging classifies HIV disease progression on the basis on clinical characteristics rather than biological measures, such as CD4 cell count and viral load assessments, and is often used in resource-constrained settings.

A summary of WHO clinical staging guidelines is below:

- Stage 1: patients are largely asymptomatic but usually experience persistently large or swollen lymph nodes.
- Stage 2: patients experience moderate levels of unexplained weight loss, recurrent respiratory infections, and often report a range of other moderate ailments (e.g., skin infections, oral ulcerations).
- Stage 3: patients have severe levels of unexplained weight loss, chronic diarrhea, anemia, persistent fever, or acute infections and ailments (e.g., pulmonary tuberculosis).
- Stage 4: patients experience HIV wasting syndrome, recurrent pneumonia, or a multitude of severe infections and organ dysfunction (e.g., HIV-associated cardiomyopathy).

(84%), one public health center (82%), and one private dispensary (80%). On the other end of the spectrum, 85% of ART initiates at an NGO-owned health center started treatment at stage 3, and 78% of patients initiated ART at stage 3 at a public health center. It is important to assess more recent data to determine whether more shifts in ART initiation and WHO staging have occurred since ABCE clinical chart extraction in 2012.

There also was a gradual trend toward initiating ART at higher CD4 cell count levels, as illustrated by Figure 38. In 2008, 60% of patients began ART with a CD4 cell count lower than 200 cells/mm3, whereas 42% of patients initiated ART with a CD4 cell count under 200 cells/mm^3 in 2012. From 2008 to 2012, median CD4 cell count at initiation increased by 55%, from 155 cells/mm^3 in 2008 to 241 cells/mm^3 in 2012. Nevertheless, this level of CD4 remained well below the 350 cells/mm^3 initiation threshold set by Kenya's guidelines in 2011 (NASCOP 2011). This finding suggests that the majority of HIV-positive individuals are seeking care once they are symptomatic. Further, consistently between 2008 and 2012, about 20% of patients initiated ART with a CD4 cell count lower than 50 cells/mm^3. This lack of progress in identifying HIV-positive individuals well before CD4 cell counts drop to such low levels warrants further attention.

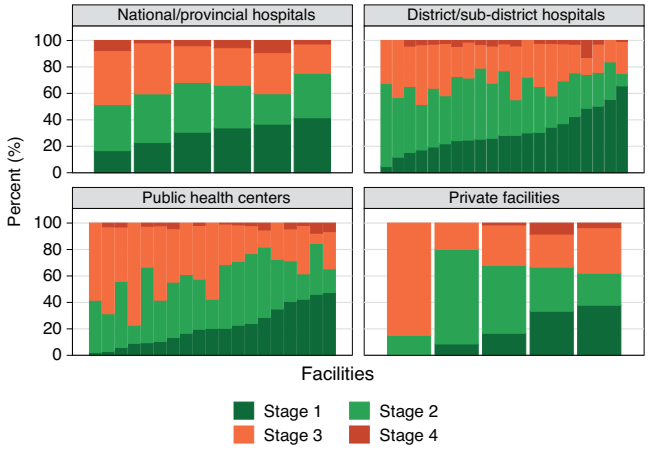
Availability of clinical information for monitoring patients

The ability to risk-stratify patients at the time of ART initiation based on CD4 cell count, WHO stage, and body mass index (BMI) is critical for determining the need for and prioritization of more intensive care. Unfortunately, it is not uncommon for patients to lack these measures at ART initiation and during the course of treatment. As shown by Table 13, 27% of ART patients did not have CD4 cell counts recorded at initiation and 5% were not assigned a WHO stage in 2012. Of concern, only 27% of initiating ART patients had their height recorded in 2012. Measuring a patient's height is relatively easy and low cost, yet this information was not routinely obtained. Data on height and weight are essential for computing BMI, which can be an early predictor of poor outcomes when it is below 16.5 (van der Sande et al. 2004).

It is important to note, however, that testing rates remained stable or increased over time, which suggests that recordkeeping has increased in parallel with rising ART patient volumes. Records of viral load, which is the most direct measure of an ART patient's response to therapy, were available for less than 1% of our patient sample.

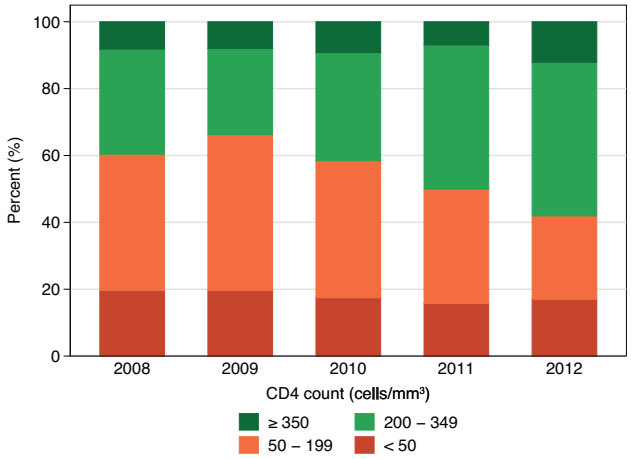
After ART initiation, patients infrequently received follow-up measures of CD4 cell counts. Among patients who began ART in 2010 and remained in care for at least two years, only 52% received a follow-up CD4 test during their second year of treatment; this finding is cause for concern given Kenya's national guidelines that call for CD4 testing for ART patients every six months (NASCOP 2011). At the same time, there have been gradual improvements to the frequency of CD4 follow-up tests over time, with a 13% increase in second-year testing between cohorts initiating in 2008 and 2010. In sum, there has been progress in obtaining and storing ART patient clinical information, but more improvement is needed to optimally track outcomes and respond to patient needs.

FIGURE 37 WHO stage at initiation, by facility, 2011–2012



Note: Each bar represents a facility and the proportion of patients who initiated at a given WHO stage in 2011 and 2012.

FIGURE 38 CD4 cell count at initiation, 2008–2012



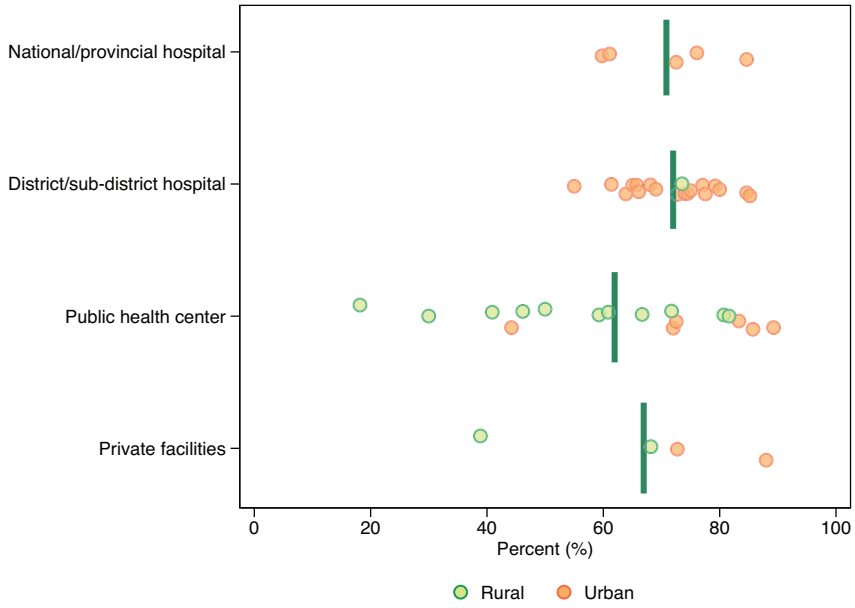
Note: These trends in CD4 cell counts reflect levels found for ART patients who had a CD4 measure at initiation (67% of patient charts across all years).

TABLE 13 Facility availability of patient clinical information, by initiation year, 2008–2012

INDICATOR	2008	2009	2010	2011	2012
Recorded at initiation*					
CD4 cell count	54%	61%	65%	65%	73%
WHO stage	88%	86%	89%	93%	95%
Weight	88%	93%	92%	93%	99%
Height	20%	23%	27%	27%	27%
Recorded during second year of treatment**					
CD4 cell count	46%	51%	52%	N/A	N/A
Weight	86%	87%	95%	N/A	N/A

* Three months prior to and one month after ART initiation. ** Between 13 and 24 months after ART initiation.

FIGURE 39 ART patient 12-month retention rates across platforms, 2011



Note: Each circle represents a facility's average 12-month retention rate of ART patients in 2011. The vertical line represents the average retention rate across all facilities within a given platform.

Patient outcomes

After 12 months of treatment, 70% of patients in our facility sample were retained in care. This retention rate is comparable to published cohort data (NACC and NASCOP 2012, Fox and Rosen 2010, Rosen et al. 2007). However, we may still have some degree of selection bias among our facility sample. We sought to retrieve all available ART patient charts, but it is possible that many facilities discarded records for deceased or defaulted ART patients. This possibility makes it challenging to accurately assess the effectiveness of a facility's ART provision.

Nonetheless, patients in our sample who initiated ART at WHO stage 4 showed much lower program retention rates at 12 months (42% among patients initiating in 2011) than patients who began treatment at WHO stage 1 or 2 (78%), which is consistent with previous studies (Lawn et al. 2008, Mugisha et al. 2014). This finding reflects the importance of diagnosing HIV early and starting treatment before symptoms are present. Retention rates varied substantially across facilities, ranging from 18% to 89% (Figure 39), but this finding may more accurately reflect recordkeeping practices than patient outcomes.

Patient perspectives

In addition to patients who did not seek HIV-specific care, we conducted the Patient Exit Interview Survey with 1,029 patients who sought HIV services and reported current enrollment in ART. Their demographic profiles were very similar to the interviewed non-ART patients, with the majority of patients being female (63%) and having attained at least a primary education (93%) (Table 14).

Out-of-pocket expenditures. Among ART patients interviewed, only 3% reported any medical expenses associated with their facility visit. Nearly all of these expenses were incurred at private facilities (Figure 40). These findings align with Kenya's national policy of providing free ART care at public hospitals and public health centers since 2006 (NACC 2009). In fact, about 2% of ART patients who received care at these facilities incurred medical expenses, whereas 8% of patients seeking care at private facilities paid for medical services. By comparison, more than 52% of ART patients experienced transportation expenses, especially at national and provincial hospitals (70%).

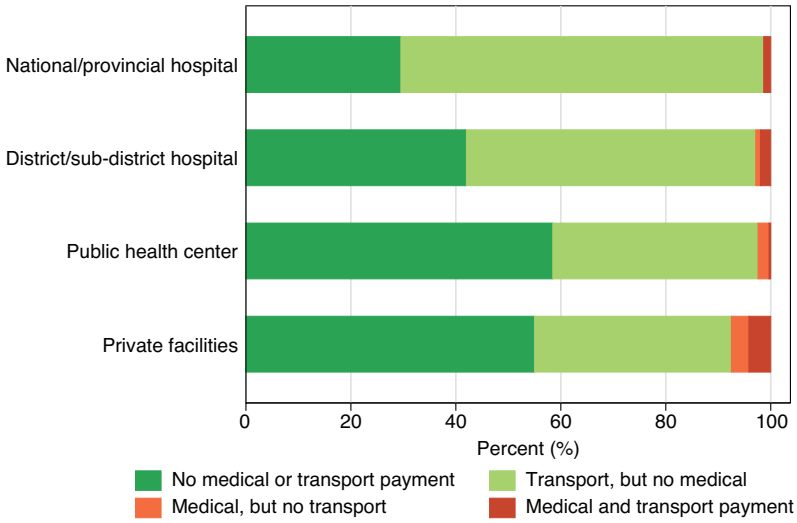
Among ART patients seeking care at private facilities, 4% reported incurring both medical and transportation

TABLE 14 Characteristics of patients who sought HIV care, reported current enrollment in ART, and were interviewed after receiving care at facilities, 2012

CHARACTERISTIC	NATIONAL/PROVINCIAL HOSPITAL	DISTRICT/ SUB-DISTRICT HOSPITAL	PUBLIC HEALTH CENTER	PRIVATE FACILITIES	ALL FACILTIES
Total patient sample	**149**	**460**	**297**	**123**	**1,029**
Percent female	60%	63%	64%	64%	63%
Educational attainment					
None or pre-primary	3%	10%	4%	7%	7%
Primary	36%	53%	57%	52%	52%
Post-primary	61%	36%	39%	41%	41%
Patient age (years)					
≤ 5	1%	2%	0%	0%	1%
6–17	11%	3%	1%	2%	3%
18–29	21%	19%	17%	21%	19%
30–39	36%	38%	45%	43%	40%
40–49	21%	24%	23%	26%	23%
≥ 50	11%	15%	14%	7%	13%
Self-reported overall health					
Poor	5%	3%	3%	2%	3%
Fair	17%	25%	18%	20%	21%
Good	46%	56%	60%	63%	56%
Very good	26%	14%	15%	15%	16%
Excellent	7%	3%	4%	2%	3%
Self-rated urgency of visit					
Not urgent	40%	32%	24%	19%	29%
Somewhat	37%	37%	51%	52%	43%
Very	23%	31%	25%	29%	28%

Note: Educational attainment refers to the patient's level of education or the attendant's educational attainment if the interviewed patient was younger than 18 years old.

FIGURE 40 ART patient expenses associated with facility visit, by platform, 2012



Note: Patients are grouped in mutually exclusive categories of expenses associated with their facility visits. The sum of the light green and red portions of each bar represents the percentage of patients who incurred any kind of transportation expense, irrespective of medical expenses. The sum of the orange and red portions of each bar represents the percentage of patients who incurred any kind of medical expenses, irrespective of transportation expenses.

expenses. Only 1% of patients presenting at public hospitals and public health centers indicated that they paid medical and transportation expenses; most of these patients sought care at one district hospital in Coast Province.

Travel and wait times. Of patients seeking ART services, 9% reported traveling more than two hours to the facility at which they received care (Figure 41). The majority of these patients who traveled more than two hours were seeking care at public hospitals. Transit times for ART patients were fairly comparable across facility types, with 68% to 76% of ART patients spending no more than an hour traveling to receive care for each platform.

By contrast, patient wait times across platforms varied much more (Figure 42). Ninety percent of ART patients presenting at private facilities waited no more than an hour, with over 50% of them receiving care within 30 minutes. Conversely, 55% of ART patients at national and provincial hospitals waited at least an hour before seeing their provider, with 21% waiting more than two hours. ART patients seeking care at public health centers and district and sub-district hospitals experienced very similar wait times.

Patient satisfaction with care. Similar to the experiences reported by non-ART patients, patients seeking ART services generally gave high ratings of the facility-based

FIGURE 41 ART patient travel times to facilities, by platform, 2012

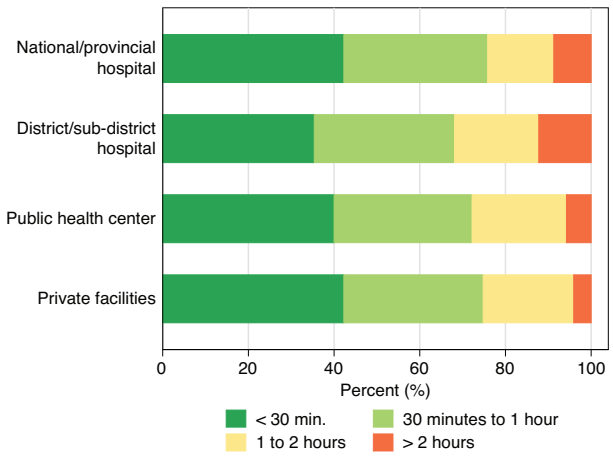


FIGURE 42 ART patient wait times at facilities, by platform, 2012

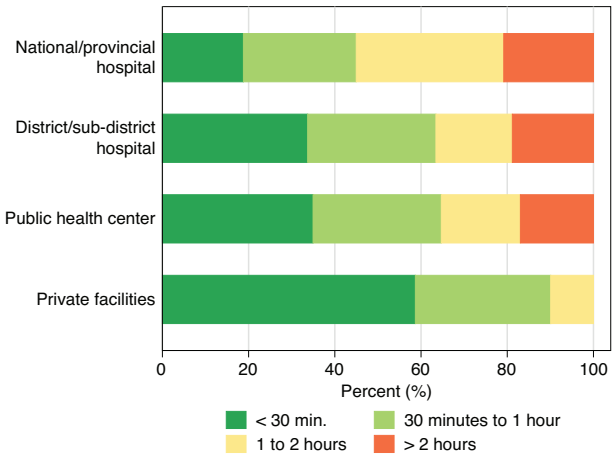
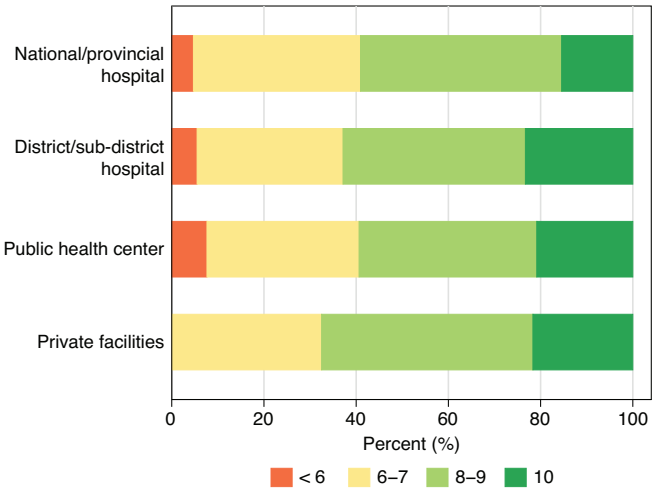


FIGURE 43 ART patient ratings of facilities, by platform, 2012



Note: Facility ratings were reported along a scale of 0 to 10, with 0 as the worst facility possible and 10 as the best facility possible.

care they received (Figure 43). Over 60% of ART patients gave at least an average rating of 8 out of a possible 10 or higher. Notably, the proportion of ART patients who gave such high ratings was quite consistent across platforms, with the most variable ratings occurring among the proportion of patients who gave facility ratings less than a 6 out of 10 (none at private facilities and 7% at public health centers). By contrast, non-HIV patients reported much more variable ratings across platforms.

In general, ART patients gave higher ratings (8.0) than non-ART patients (7.4). This finding may not be surprising, given the resources that often support ART programs at facilities as well as the likely alignment of patient expectations for care (receipt of ARTs) with the services they actually receive. Patients who present at facilities for less specific reasons (e.g., a fever) may be less satisfied with the care they receive if treatment does not align as well with their expectations (e.g., not receiving antimalarials for fever treatment, despite a negative test for malaria).

FIGURE 44 Average ART patient ratings of facility visit indicators, by platform, 2012

	NATIONAL/ PROVINCIAL HOSPITAL	DISTRICT/ SUB-DISTRICT HOSPITAL	PUBLIC HEALTH CENTER	PRIVATE FACILITIES
Overall rating	**7.9**	**8.0**	**8.0**	**8.2**
STAFF INTERACTIONS				
Non-medical staff respectfulness	4.4	4.4	4.3	4.4
Medical provider respectfulness	4.4	4.4	4.5	4.5
Clarity of provider explanations	4.2	4.2	4.2	4.4
Time to ask questions	4.2	4.1	4.2	4.4
FACILITY CHARACTERISTICS				
Cleanliness	4.2	4.0	4.0	4.3
Privacy	4.1	4.1	4.1	4.3
Spaciousness	3.6	3.4	3.5	3.5
Wait time	2.7	3.0	3.1	3.7

LOWEST RATINGS — HIGHEST RATINGS

Note: Overall ratings are on a scale of 0 to 10, with 0 as the worst facility possible and 10 as the best facility possible. Average ratings of staff interactions and facility characteristics are on a scale of 1 to 5, with 1 being "very bad" and 5 being "very good."

Across facility types, ART patients gave an average rating of at least "good" or higher for facility spaciousness, cleanliness, and all indicators for staff interactions (Figure 44). These ratings were similar, if not slightly higher, than the ratings given by non-ART patients. Average ratings of wait times were generally lower among ART patients, falling to or below a rating of "moderate" across most platforms. Private facilities averaged higher ratings than the other platforms across all dimensions of care, with the greatest disparities recorded for facility characteristics (and wait time, in particular).

Efficiency and costs

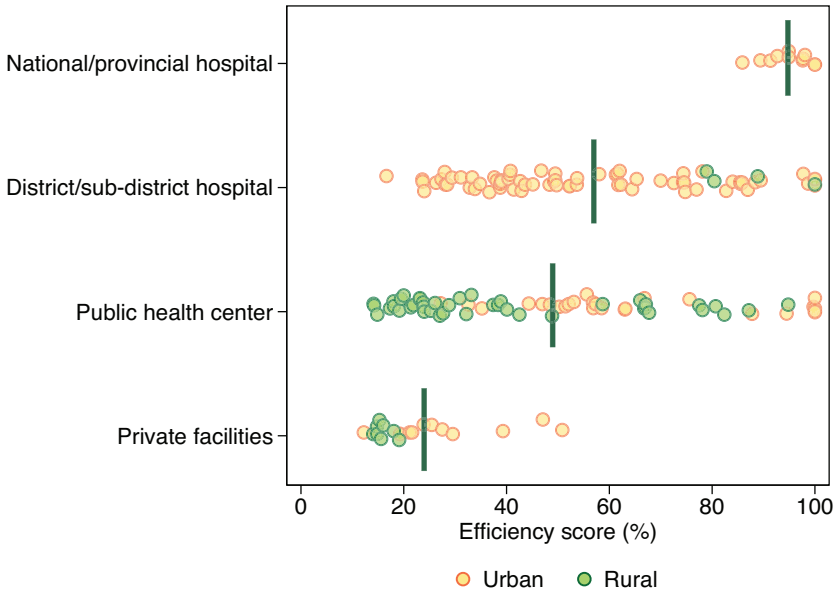
Efficiency

In this section, we focus only on the facilities that reported providing ART services. These facilities were included in the previous section on efficiency, but due to the continued scale-up of ART provision in Kenya and the perceived burden of ART programs on facility resources (Chen et al. 2004, Yu et al. 2008), it is of policy relevance to consider the efficiency levels of this subset of facilities (Figure 45).

We found that facility efficiency was not significantly related to patient retention rates. Across platforms, urban facilities generally had higher efficiency scores than their rural equivalents. This was most evident at public health centers and private facilities, for which the majority of rural facilities fell below the platform averages of 49% and 24%, respectively. However, the opposite finding emerged for district and sub-district hospitals, for which all rural facilities had efficiency scores exceeding 79%. District and sub-district hospitals in urban areas posted efficiency scores at both extremes, ranging from 17% to 100%.

In computing average efficiency scores by platform for facilities with ART services, we found that they were often higher than the average scores estimated for all sampled facilities. For instance, the average efficiency score for national and provincial hospitals with ART services was 95%, whereas the average score for all national and provincial

FIGURE 45 Range of efficiency scores for facilities providing ART services, by platform, 2007–2011



Note: Each circle represents a facility's efficiency score for a given year between 2007 and 2011. The vertical line represents the average efficiency score across all facilities that provide ART services within a given platform.

hospitals, irrespective of ART provision, was 73%. Across all facilities that provided ART in Kenya, we estimated that their average efficiency score was 51% in 2011, whereas an efficiency score of 41% was computed for all facilities in the ABCE sample, irrespective of their provision of ART.

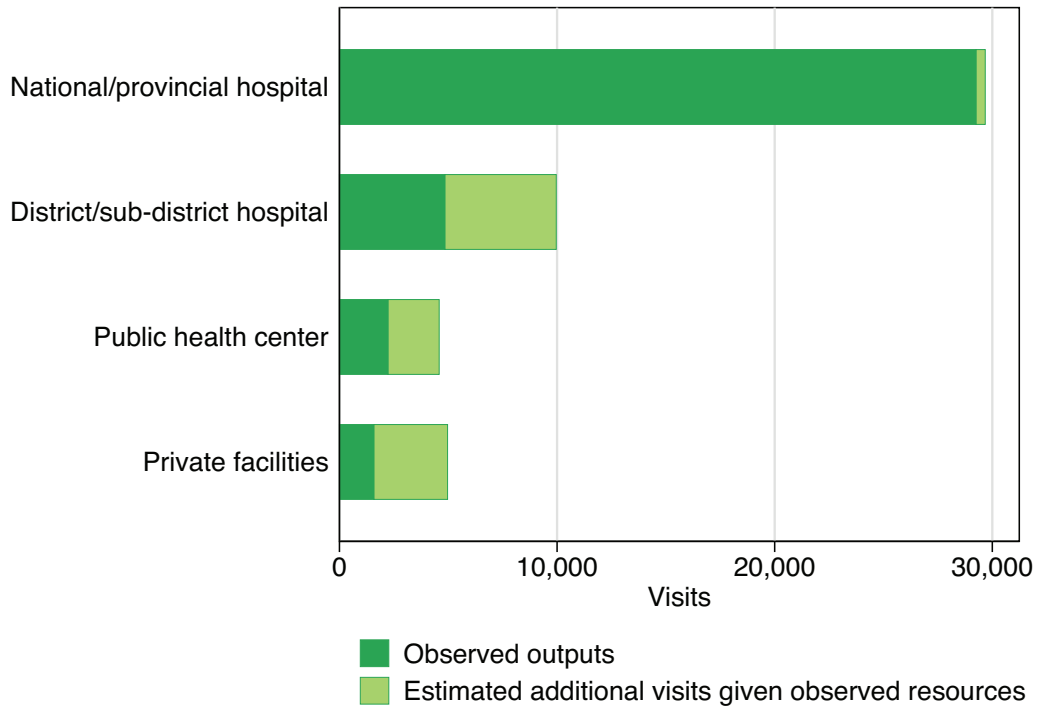
Given their observed levels of facility-based resources, it would appear that a portion of facilities have the capacity to serve much larger ART patient volumes than they currently do. Figure 46 shows this gap in potential efficiency performance across platforms, illustrating the possible gains in patient volumes that could be produced if facilities with ART operated as efficiently as those with the highest efficiency scores. We estimated that all platforms could increase annual ART visits, with some platforms revealing much more capacity for expansion than others (i.e., private facilities).

It is important to note that absolute magnitude of expansion greatly varied between public and private facilities. Although we estimated that private facilities could potentially increase their annual ART visits by 213% given their current resources, the absolute number of gained ART visits remains around 3,400 per year per facility. By comparison, we determined that district and sub-district hospitals could increase ART volumes by "only" 105%, but this gain would translate to an average of more than 5,000 ART visits each year per hospital. As a result, it is necessary to consider both relative and absolute facility capacity when assessing potential for service expansion.

These findings may be a reflection of many factors that we have not analyzed, including a poor distribution of personnel and facility resources, lower demand for ART services than anticipated, or inadequate stocking of essential supplies, namely ARVs. Nonetheless, these results suggest that staffing of ART facilities does not appear to be a major constraint to service provision and that the expansion of services, particularly with lowered CD4 thresholds for ART initiation (NASCOP 2011, WHO 2013a), may be feasible without incurring additional personnel costs.

Similar to Kenya, we found that Uganda and Zambia also showed substantial potential for ART service provision given the facility resources observed through the ABCE project (Table 15). If all facilities, across platform and ownership, elevated their efficiency levels such that their patient volumes more closely aligned with the number of available medical staff and beds, we estimated an average increase of 69% in annual ART visits in Kenya (an average gain of 3,499 visits per facility), a 55% rise in Uganda (an average gain of 6,367 ART visits per facility), and a 117% increase in Zambia (an average gain of 9,063 ART visits per facility).

FIGURE 46 Estimated potential annual ART visits given observed facility inputs, by platform, 2011



Health facilities in Kenya saw an average of 5,070 ART patients in 2011, which was lower than the average patient volumes observed for both Uganda and Zambia. These findings, in combination, likely reflect both the volume of HIV-positive patients requiring care in Kenya and the country's responsiveness to scaling up ART services.

This potential expansion of ART services, at minimal added cost to facilities, has substantial implications for the capacity of Kenya's health system to expand enrollment of new ART patients, and perhaps most importantly, to provide ongoing ART care to the growing ranks of long-term ART patients. Further, this finding is of particular relevance to Kenya's goal of providing universal access to HIV/AIDS treatment and prevention (NACC 2009, NACC and NASCOP 2012).

Costs of care

ART programs are expensive, and it is important to systematically determine the annual costs per ART patient for planning purposes. Factors that may affect ART costs by facility include staffing numbers and composition, availability of testing, and facility efficiency. Further, costs of ART care per patient may decrease as patients accrue more years of treatment, as more established patients require less frequent facility visits.

Analytical approach. Our analysis for projecting costs of ART care used four streams of data:

1 The average cost per ART visit, excluding ARVs, calculated from the ABCE sample;

2 The average number of annual visits observed for new and established ART patients in 2011, as extracted from clinical charts;

3 The ARV regimens of ART patients in 2011 extracted from clinical charts; and

4 The ceiling ARV prices published by the Clinton Health Access Initiative (CHAI) in 2011 (CHAI 2011).

Based on facility data collected through the ABCE Facility Survey and ART patient data extracted from clinical charts, we estimated the average cost per ART visit, excluding the cost of ARVs, for 2011. We then multiplied the average visit cost by the average number of annual visits observed for new and established ART patients across platforms in 2011.

Using the ART patient data extracted from clinical charts, we calculated the relative proportion of ART patients who were prescribed TDF-, d4T-, and AZT-based regimens. We then applied the ceiling prices for each ARV published by CHAI for 2011 to the mix of ARV regimens observed in the ABCE sample (CHAI 2011). These estimates of ARV costs were then added to the estimated visit costs to arrive at our projected total annual ART costs for established and new patients.

Table 16 details projected ART costs by patient type (new and established) and across platforms. We found that average facility cost per visit, excluding ARVs, substantially varied across platforms, from 695 Kshs ($8) at private facilities to 1,224 ($15) at national and provincial hospitals.

In general, we estimated that ARVs account for a large portion of projected annual costs, but the proportion varied across patient types and platforms. For example, to treat a new ART patient for one year, we estimated that the cost of ARVs accounted for 61% of projected total treatment costs at district and sub-district hospitals, compared to 74% of total projected treatment costs at private facilities. The proportion of total costs that are accounted for by ARVs is a bit higher for established patients, ranging from 65% at district and sub-district hospitals to 76% at private facilities. This finding is not surprising since it is the frequency of visits, not ARV dosing needs, that generally changes the most for established patients. However, its implications are significant, as it highlights the importance of capturing both visit and ARV costs across patient types for resource planning. After patients had been enrolled in ART for at

TABLE 15 Average efficiency scores and estimated additional ART visits given observed facility resources, by country

ART INDICATOR	KENYA	UGANDA	ZAMBIA
Average efficiency score for facilities that provide ART services	51%	49%	49%
Average annual ART visits, observed	5,070	11,632	7,727
Average additional ART visits, estimated based on observed facility resources	3,499	6,367	9,063
Estimated percent gain in ART patient visits	69%	55%	117%

least one year, for example, the projected annual visit cost per ART patient dropped by about 30%, largely due to the less frequent visit schedule for established patients. Since the cost of ARVs stayed more or less constant over years of treatment, the projected total annual cost per ART patient declined by 18% to 24% as patients moved from being new patients to being established patients.

In sum, our findings suggest that for planning purposes, projected annual ARV costs per ART patient can be viewed as more stable over time, whereas the visit costs associated with ART services are found to be much lower for established patients than for new patients; as a result, ART programs that have a higher proportion of established patients may appear to have lower total costs compared to programs that have a larger proportion of new patients.

In comparison with Uganda and Zambia (Table 17), we projected that average ART patient costs were either comparable or lower in Kenya. Across platforms and facility ownership, the average facility cost per ART visit in Uganda, excluding the costs of ARVs, was slightly lower (816 Kshs [$10]) than the average ART visit in Kenya (867 Kshs [$10]); however, the average ART visit, excluding the costs of ARVs, was much more expensive in Zambia (1,481 Kshs [$18]).

In terms of annual projections, we estimated that the average annual facility cost per ART patient, excluding the cost of ARVs, ranged from 4,734 Kshs in Uganda ($57) to 8,591 Kshs in Zambia ($104); this finding was based on the average number of annual ART patient visits observed in Kenya and Uganda (5.8 visits), and then applying this average to Zambia. In Kenya, the average annual facility cost per ART patient, excluding the cost of ARVs, was on the lower end, at 5,031 Kshs ($61). When projected ARV costs were included in our estimates, we found that the differences in projected annual costs per ART patient across countries decreased. Kenyan facilities had the lowest projected total annual cost (16,167 Kshs per ART patient, per year, or $195), with Uganda following closely behind at just over 16,646 Kshs ($201). Zambian facilities had the highest projected total annual cost (21,448 Kshs per ART patient, or $258).

Our results suggest that the projected costs of ARVs account for a higher proportion of total ART costs at facilities in Kenya and Uganda (69% and 72%, respectively) than in Zambia (60%). Funding for ARV and non-ARV components of ART programs can originate from different sources, with the former often supported by international donors in the past. With shifting financing structures (e.g., the Global

TABLE 16 Projected facility costs, by ART patient type and platform, for 2011

INDICATOR		NATIONAL/PROVINCIAL HOSPITAL	DISTRICT/SUB-DISTRICT HOSPITAL	PUBLIC HEALTH CENTER	PRIVATE FACILITIES
Average cost per visit (excluding ARVs)	**(in 2011 Kshs)** (in 2011 USD)	**1,224** $15	**1,057** $13	**757** $9	**695** $8
New ART patients					
Average number of annual visits		5.9	7.5	5.6	6.2
Projected annual visit costs	**(in 2011 Kshs)** (in 2011 USD)	**7,255** $87	**7,971** $96	**4,257** $51	**4,330** $52
Projected annual total costs* (including ARVs)	**(in 2011 Kshs)** (in 2011 USD)	**20,940** $252	**20,420** $246	**14,350** $173	**16,812** $203
Established ART patients					
Average number of annual visits		3.7	5.2	4.2	4.4
Projected annual visit costs	**(in 2011 Kshs)** (in 2011 USD)	**4,548** $55	**5,487** $66	**3,195** $38	**3,066** $37
Projected annual total costs* (including ARVs)	**(in 2011 Kshs)** (in 2011 USD)	**16,648** $201	**15,650** $189	**11,808** $142	**12,817** $154

* ARV costs were projected based on the drug regimens observed through the ABCE sample and by multiplying these values by the ceiling prices for each ARV published by CHAI for 2011 (CHAI 2011).

Note: Established ART patients are patients who have been on ART for a minimum of one year. All cost estimates are in 2011 Kshs, with 83 Kshs equaling 1 USD.

TABLE 17 Projected annual facility costs per ART patient, across a subset of ABCE countries, for 2011

INDICATOR		KENYA	UGANDA	ZAMBIA*
Average cost per ART visit (excluding ARVs)	**(in 2011 Kshs)** (in 2011 USD)	**867** $10	**816** $10	**1,481** $18
Average number of annual ART visits per patient		5.8	5.8	5.8**
Projected annual cost per patient (excluding ARVs)	**(in 2011 Kshs)** (in 2011 USD)	**5,031** $61	**4,734** $57	**8,591** $104
Projected annual cost of ARVs	**(in 2011 Kshs)** (in 2011 USD)	**11,136** $134	**11,912** $144	**12,857** $155
Projected annual cost per patient (including ARVs)	**(in 2011 Kshs)** (in 2011 USD)	**16,167** $195	**16,646** $201	**21,448** $258

* The last year of financial data collected in Zambia was 2010, so we collated information about the costs of each output type we observed at facilities from 2006 to 2010 and estimated costs for 2011 at the facility level. We then converted the average cost per visit into 2011 USD to correspond with the financial data collected for Kenya and Uganda.
** We had insufficient data to estimate the average number of ART visits patients had in 2011 for Zambia. As a result, we used the average number of annual ART visits observed in 2011, across both new and established patients in Kenya and Uganda, for Zambia.

Note: ARV costs were projected based on the drug regimens observed for each country in the ABCE project and multiplying these values by the ceiling prices for each ARV published by CHAI for 2011 (CHAI 2011). All cost projections are in 2011 Kshs, with 83 Kshs equaling 1 USD.

Fund to Fight AIDS, Tuberculosis and Malaria's new funding model) and the flat-lining levels of international aid (Dieleman et al. 2014), it is increasingly important to pinpoint which components of ART programs may be affected by an evolving funding landscape.

Conclusions and policy implications

To achieve its mission of "accelerating attainment of health goals" (MOMS and MOPHS 2012), Kenya has strived to enact policies and implement programs that promote greater access to health services, support the delivery of cost-effective interventions, and equitably provide high-quality care throughout the country. Our findings show that these goals are ambitious but attainable, if the country focuses on rigorously measuring health facility performance and costs of services across and within levels of care, and if it can align the different dimensions of health service provision to support optimal health system performance.

Facility capacity for service provision

Optimal health service delivery is linked to facility capacity to deliver the services needed – and demanded – by individuals. If a health system has the appropriate balance of skilled staff and supplies to meet the health needs of its population, then a strong foundation exists to support the delivery of cost-effective and equitable services. The availability of a subset of health services, such as immunization, ANC, and HIV/AIDS care, was generally high across facility types in Kenya. Such broad access reflects the prioritization – and execution – of expanding these services throughout the country. Further, the results point to the successful implementation of health service components across the lifespan, ranging from pregnancy to adulthood.

The widespread availability of both malaria diagnostics and first-line treatment exemplifies this achievement. With over 70% of facilities having both the capacity to test for and treat malaria with an ACT (92% excluding dispensaries, clinics, and pharmacies), Kenya has set the groundwork for ensuring that every case of malaria is parasitologically confirmed, as specified in its malaria program targets (MOPHS 2009).

At the same time, substantial gaps in reported service availability and the actual capacity to provide those services emerged. While over 80% of all facilities indicated that they provided ANC services, far fewer facilities had the full stock of medical supplies and pharmaceuticals needed to optimally provide ANC. Of the facilities that reported storing vaccines, nearly 20% had temperature readings outside of the recommended range for vaccine storage.

Kenya has indicated a strong interest in expanding IMCI (MOH 2005a, Mullei et al. 2008), especially to more rural and hard-to-reach populations, but the success of such integrated care depends on having access to the full set of diagnostics and medications to distinguish one febrile illness from another and to treat them accordingly. On average, less than half of the supplies needed for optimal case management of malaria, LRIs, and meningitis were available at public health centers and public dispensaries, which often serve as the base for IMCI needs for communities.

These findings are not novel (NCAPD et al. 2011), but their persistence among facilities and across service types is cause for concern. Closing this service-delivery gap and bolstering the effective provision of health care warrants further policy consideration, particularly as Kenya debates strategies to achieve universal health coverage.

The MOPHS has prioritized addressing deficiencies in facility-based physical capital (MOPHS 2008), and based on the ABCE sample, we found that the vast majority of facilities had access to functional electricity and piped water, even among lower levels of care. This clearly reflects Kenya's investments in improving facility infrastructure (MOH 2005, MOPHS 2008). However, less progress was observed for improved sanitation among primary care facilities in the public sector, as a portion of public health centers and public dispensaries did not have access to a flush toilet or covered pit latrine. Outside of hospitals and privately owned facilities, the availability of transportation was fairly low, which could negatively affect the transfer of patients in emergency situations to higher levels of care.

Based on WHO equipment guidelines (WHO 2013b), national and provincial hospitals generally featured a high availability of the equipment recommended for their level of care (91%). Public and private health centers stocked a comparable percentage of recommended equipment for primary care facilities, an average of 83%, but the range of equipment stocks was quite wide across these facilities (41% to 96%). The *KHSSP 2012–2018* set forth a goal that 70% of all facilities would be "equipped as per norms" by 2018 (MOMS and MOPHS 2012), and although this target includes components beyond that of WHO SARA

standards, our findings indicate that many health facilities are positioned well to reach this goal in terms of carrying functional equipment.

Similar findings emerged for pharmaceutical availability, based on the 2010 EML (MOMS and MOPHS 2010), such that national and provincial hospitals averaged stocking 83% of the recommended medications, and public primary care facilities demonstrated a wide spectrum in pharmaceutical availability (4% to 100%), particularly public dispensaries. In combination, these findings indicate that marked discrepancies in facility stocking of medical supplies exist at the level of primary care service provision. Equity is a stated value of the *KHSSP 2012–2018* (MOMS and MOPHS 2012), and these results further emphasize the growing need to address some of the gaps observed among facilities focused on primary care, especially in the public sector.

Kenya increasingly grapples with the health burdens associated with NCDs (Murray et al. 2012), and the country's primary care system, especially in the public sector, remains largely unprepared to properly diagnose and treat these conditions. Across all platforms, facilities generally demonstrated the highest capacity for managing LRIs, HIV/AIDS, and malaria, but primary care facilities in the public sector carried less than one-third of the recommended medical equipment and pharmaceuticals to properly provide care for a subset of NCDs and injuries. In comparison with most communicable conditions, NCDs and related risk factors require much more sophisticated equipment and medications to optimally diagnose and treat (e.g., ECG machines that provide diagnostic information for ischemic heart disease), and far fewer facilities had the capacity to properly manage these conditions (e.g., 27% of hospitals had an ECG machine). Further, about 40% of public health centers and public dispensaries had the capacity to test levels of blood sugar, whereas 68% of private health centers, dispensaries, and clinics stocked glucometers and test strips. This finding suggests that primary care facilities in the public sector likely face challenges in addressing the country's burgeoning diabetes burden (Murray et al. 2012).

Across publicly owned facilities, nurses were generally the most prevalent type of staff, whereas non-medical personnel accounted for at least one-third of a facility's average staff. About 60% of facility employees were considered skilled medical personnel. We found that a portion of facilities employed the number and mixture of medical personnel recommended by the *KHSSP 2012–2018* (MOMS and MOPHS 2012). While we found some exceptions, urban facilities largely had higher levels of skilled medical personnel than their rural counterparts. Kenya has long viewed staffing its rural facilities as an important challenge to overcome (MOH 2005, MOMS and MOPHS 2009, MOMS and MOPHS 2012), and our findings reinforce the continued need to address the equitable distribution of human resources for health across the country.

Facility production of health services

With ART visits at primary care facilities as the clear exception, average patient volumes generally remained steady between 2007 and 2011 across most platforms. Shortages in human resources and overcrowding of facilities are viewed as widespread in Kenya (Chankova et al. 2006, MOMS and MOPHS 2012), but we found that most facilities averaged fewer than seven visits per medical staff each day in 2011. These seven visits are observed in outpatient equivalent visits, which means that many health personnel may see even fewer patients per day given that inpatient and ART visits equate to multiple outpatient visits. Outpatients largely accounted for the greatest proportion of daily visits per medical staff, while each medical staff generally provided about one ART visit per day.

Efficiency scores reflect the relationship between facility-based resources and the facility's total patient volume each year. Based on the ABCE sample, the average health facility in Kenya had an efficiency score of 41%. With this information, we estimated that facilities could substantially increase the number of patients seen and services provided each year – by an average of 12 additional outpatient equivalent visits – based on their observed levels of medical personnel and resources in 2011.

While these findings generally contrast with more prevalent views of health facility capacity in Kenya, we found that a subset of facilities, particular in rural areas, were operating close to or at maximum capacity given their observed resources and patient volumes. It is quite possible that these facilities may be considered understaffed or can supply fewer beds than patient demands require. Nonetheless, based on the ABCE sample, these conditions were more often the exception than the rule, with the vast majority of facilities seeing fewer patients than their resources could potentially support.

The policy implications of these efficiency results are both numerous and diverse, and they should be viewed with a few caveats. A given facility's efficiency score captures the relationship between observed patient volume and facility-based resources (personnel and beds), but it does not reflect the expediency with which patients are seen

(e.g., some facilities with the highest efficiency scores had a high proportion of patients waiting at least two hours before receiving care); the optimal provision of services (e.g., one sub-district hospital had a very high efficiency score but only stocked 73% of the recommended pharmaceuticals for hospitals); and demand for the care received. These are all critical components of health service delivery, and they should be thoroughly considered alongside measures of efficiency. On the other hand, quantifying facility-based levels of efficiency provides a data-driven, rather than strictly anecdotal, understanding of how much Kenyan health facilities could potentially expand service provision without necessarily increasing personnel or bed capacity in parallel.

In harnessing the wealth of data collected in other countries in sub-Saharan Africa, we found that Ghana, Uganda, and Zambia also demonstrated substantial potential for service expansion. In Kenya, the average facility efficiency score was comparable to that of Zambia and far exceeded efficiency scores estimated for Uganda and Ghana. This finding suggests that Kenya has already shown comparatively higher levels of service delivery than the other sub-Saharan African countries included in the ABCE project. With 10% of all Kenyan facilities operating with an efficiency score of 80% or higher in 2011, contrasting with the 5% of comparably efficient facilities identified in Ghana and Uganda, it is possible that other countries could learn from Kenya's system of highly efficient facilities.

Similarly, we projected that Kenya could increase annual ART patient volumes, given observed facility resources, potentially expanding ART visits by an average of 69% if facilities operated at optimal efficiency levels. This suggests that further progress toward universal access to HIV/AIDS treatment and care, a goal of the National AIDS Control Council (NACC), could be achieved with observed facility resources. Expanded ART service provision was also projected for Uganda and Zambia, suggesting that all three countries had the physical capacity to receive many more new ART initiates and continue to provide care for established patients without necessarily straining resources. However, we estimated that the magnitude of potential ART expansion was much higher in Zambia; this may reflect the need and demand for ART services in Kenya, as well as the country's responsiveness in providing an already substantial volume of ART care.

These findings are particularly relevant to ongoing policy debates in Kenya and other countries with high burdens of HIV/AIDS, as there is substantial concern about whether health systems can accommodate an anticipated influx of newly eligible ART patients per the updated WHO guidelines. At the same time, more work is needed to pinpoint the relationship between the potential for increased service provision and the quality of care provided in such expansion scenarios.

Costs of care

Average facility costs per patient visit differed substantially across platforms and types of visit. Outpatient and ART visits, excluding the cost of ARVs, were generally the least expensive, but their average costs varied widely across platforms. For example, the average facility cost of an outpatient visit at a national or provincial hospital was over three times as high as an outpatient visit at a private hospital. Births were by far the most expensive output to produce across all platforms, incurring a minimum of four times the cost of the average outpatient visit. Identifying these differences in patient costs is critical for isolating areas to improve cost-effectiveness and expand less costly services, especially for hard-to-reach populations.

In comparison with Ghana, Uganda, and Zambia, the average cost per patient generally varied in Kenya; however, Kenya posted the highest average cost per inpatient bed-day, at just over 3,400 Kshs ($41) per day. These results offer insights into each country's health financing landscape, a key component to health system performance, in terms of cost to facilities and service production across outputs. While these costs do not reflect the quality of care received or the specific services provided for each visit, they enable a compelling comparison of overall health care expenses across these countries. Future studies should aim to capture information on the quality of services provided, as it is a critical indicator of the likely impact of care on patient outcomes.

Patient perspectives

Reflecting Kenya's priority of reducing cost barriers to primary care with its 10/20 policy (Chuma et al. 2009), the majority of interviewed patients reported paying the proper user and registration fees, or no fee at all, at public health centers and dispensaries. Even fewer instances of medical expenses were found among ART patients, which again aligns with the country's national policies. We found that very few ART patients who sought care from publicly owned health centers and hospitals reported medical fees, which likely illustrates Kenya's successful implementation and provision of ART services at no cost to patients in the public sector.

Across services sought (HIV and non-HIV), a greater proportion of patients experienced wait times exceeding two hours than the percentage of patients who spent the same

time traveling to receive care. Past studies point to staffing shortages as the main driver of extended wait times at facilities (Okwero et al. 2011), but staffing levels observed in the ABCE sample suggest it is unlikely that inadequate human resources were the main driver of reported long wait times. Further investigation into the facility factors contributing to delays in patient care is warranted, especially as these constraints may affect overall service production. We also observed a notable divide in wait times across public and private facilities, with far more patients receiving care within 30 minutes at private facilities, across levels of care, than their public equivalents.

Overall, Kenyan patients, both those seeking HIV services and those who were not, gave high ratings of their facility experience; notably, ART patients generally reported higher overall ratings than non-HIV patients. Patients rated interactions with facility staff and their providers quite highly, regularly providing higher ratings for characteristics of facility staff than the characteristics of the health facility itself. The clear exception was facility cleanliness, for which patients largely gave high ratings, especially those who sought care at private facilities. Facility wait times and spaciousness received the lowest ratings across facility types, but there was no clear relationship between patients' ratings and the amount of time they spent waiting for care. The high ratings of facility staff may be related to Kenya's efforts to improve the training and retention of medical staff (MOMS and MOPHS 2009). Conversely, the relatively lower ratings of facility-based qualities could reflect some of the deficiencies in facility infrastructure and physical capital we observed in the ABCE sample.

At present, it is not clear which factors are most salient to patient decision-making and care-seeking behaviors (e.g., whether having to pay a user fee and having to wait for two hours before receiving free care are equivalent trade-offs). Additional work on pinpointing these demand-side drivers of accessing health services is needed, especially as governments consider the range of policy options for increasing coverage of care.

Facility-based provision of ART services

To meet the demands of the ongoing HIV/AIDS burden in Kenya, the country's health system must find ways to optimize in terms of capacity, efficiency, and cost. The country can work to replicate some of the successes it has seen in some aspects of HIV care to meet the challenges it has seen in other areas. Since formally stipulating the phase-out of d4T-based ART regimens in 2010, Kenya has shown a rapid shift away from d4T prescriptions at initiation toward those with a TDF backbone, a significant success. Similarly, from 2008 to 2012, Kenya documented progress in initiating ART patients at earlier stages of disease progression, both in terms of WHO staging and CD4 cell count levels. However, a portion of patients in 2012 still began treatment well after they started to experience symptoms. It is possible that more recent progress has been made, especially with the adoption of new ART eligibility guidelines, but further assessment is needed.

As ART patient volumes continue to rise, especially at lower levels of care, it is increasingly important for Kenya to improve its monitoring of patient clinical data. The country demonstrated improvement in collecting patient data at initiation between 2008 and 2012, but too many ART patients still did not receive measures of their CD4 cell counts at initiation in 2012. Further, very few patients received viral load measurements after their first year of ART, which could make the prompt identification of treatment failure very challenging. Greater investment in ART patient record-keeping and data collection ought to be considered.

While facilities that provided ART services generally had higher efficiency scores than those that did not, we still found that some facilities could potentially expand service provision given their observed levels of staffing and beds. This was particularly evident among district and sub-district hospitals and public health centers located in rural areas. These findings suggest that rising demand for ART services, resulting from HIV-positive patients living longer and lower eligibility requirements for ART initiation (WHO 2013a), could likely be met at most facilities in Kenya without significantly straining their facility-based resources.

Under a fully efficient scenario of ART service provision, we estimated that facilities in Kenya could provide more than 5,000 additional ART visits per year given the facility-based resources observed in 2011. These estimated potential gains could increase the observed number of ART visits by 69%, with minimal additional costs to facilities in terms of personnel and beds. We also estimated substantial gains in ART patient volumes in Uganda and Zambia, but they were projected to expand services at a lower and higher magnitude, respectively. Further work on identifying the specific factors contributing to or hindering facility efficiency and assessing the quality of care received under a range of efficiency conditions should be conducted.

In estimating annual costs per ART patient across facility types, three main findings surfaced. First, ARVs accounted for a large proportion of total annual ART costs, ranging from 61% to 74% of total costs for new ART patients and up to 76% of total costs for established patients. Second,

average annual facility costs, both including and excluding the costs of ARVs, declined after ART patients became established (i.e., had been enrolled in an ART program for at least one year). This result was consistent across platforms, indicating that facilities should anticipate lower expenditures on ART if their program composition shifts toward more established ART patients. Third, while overall costs of ART services decreased with established patients, reductions in spending were more associated with visit costs, while ARV expenditures remained more stable.

These findings highlight the importance of considering overall cost and cost composition of ART patients across facility types. Further, they imply that spending on ARVs should be viewed as a more stable cost over time, whereas non-drug spending may be more variable at facilities, especially if the ratio of new to established ART patients shifts toward the latter. At a time when international funding for HIV/AIDS treatment is stagnating or declining in Kenya (Dieleman et al. 2014), considering more sustainable and diverse financing mechanisms for ARVs is likely to become increasingly critical.

Drawing from the global ABCE project, we found that the average cost per ART visit in Kenya, excluding the costs of ARVs, was slightly higher than the equivalent visit in Uganda and much lower than in Zambia. Average annual costs per ART patient in Kenya, both with and without ARVs, were generally comparable to those found in Uganda and much lower than cost estimates for Zambia; however, the cost of ARVs accounted for a higher proportion of the total annual cost per patient in Kenya (69%) than in Zambia (60%). These findings indicate that the sustained financing of ARVs will remain a high priority in Kenya, as their costs drive a large portion of ART expenses. Further, Kenya could be more affected by potential shifts in donor funding of ARVs than other countries. Identifying the particular components of non-ARV costs for ART programs that are contributing to or impeding the cost-effective provision of HIV/AIDS care in Kenya should be of high priority for future work.

Summary

The ABCE project was designed to provide policymakers and funders with new insights into health systems to drive improvements. We hope these findings will not only prove useful to policymaking in Kenya, but also inform global efforts to address factors that hinder the delivery of or access to health services. It is with this type of information that the individual building blocks of health system performance, and their critical interactions with each other, can be strengthened. More efforts like the ABCE project in Kenya are needed to continue many of the positive trends highlighted in this report and to overcome the challenges identified. Analyses that take into account a broader set of the country's facilities would undoubtedly provide an even clearer picture of levels and trends in capacity, efficiency, and cost. Continued monitoring of the strength and efficiency of service provision is critical for optimal health system performance and the equitable provision of cost-effective interventions throughout Kenya.

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