HEALTH SERVICE PROVISION IN GHANA

Assessing Facility Capacity and Costs of Care

ACCESS, BOTTLENECKS, COSTS, AND QUITY

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This report was prepared by the Institute for Health Metrics and Evaluation (IHME) in collaboration with Ghana's Ministry of Health, the Ghana Health Service (GHS), the Ghana UNICEF office, and UNICEF. This work is intended to help policymakers understand the costs of health service delivery and health facility performance in Ghana. The numbers may change following peer review.

Citation: Institute for Health Metrics and Evaluation (IHME). *Health Service Provision in Ghana: Assessing Facility Capacity and Costs of Care*. Seattle, WA: IHME, 2015.

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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 Ghana, please contact IHME:

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About this report

Health Service Provision in Ghana: Assessing Facility Capacity and Costs of Care provides a comprehensive yet detailed assessment of health facility performance in Ghana, including facility capacity for service delivery and costs of care. This report provides expanded results from the preliminary findings presented at the Ghana Health Summit in April 2013. A preliminary policy report was disseminated at that time, titled *Access, Bottlenecks, Costs, and Equity: Assessing Health System Performance and Barriers to Care in Ghana*. Results from 2013 have not changed; rather, researchers have now completed analyses on facility levels of efficiency and costs of care, which were not available at the time of the 2013 Ghana Health Summit. This report includes the results from the 2013 publication, as well as the additional analyses mentioned above.

Findings presented in this report were produced through the ABCE project in Ghana, which aims to collate and generate the evidence base for improving the cost-effectiveness and equity of health systems. 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. Data collection in Ghana also was supported by UNICEF.

The ABCE project is a collaborative study with IHME, Ghana's Ministry of Health (MOH), the Ghana Health Service (GHS), Ghana UNICEF office, and UNICEF. At IHME, Christopher Murray, Emmanuela Gakidou, Michael Hanlon, Santosh Kumar, Kelsey Moore, and Annie Haakenstad had key roles in the project. At the MOH, the project was led by Kwakye Kontor. Evelyn Ansah, Ivy Osei, and Bertha Garshong served as the ABCE project leads for GHS. At the Ghana UNICEF office, the project was led by Anirban Chatterjee, who was the in-country principal investigator (PI), and Jane Mwangi. Data collection was conducted by a team of research associates from GHS. Analyses were jointly conducted by several researchers at GHS and IHME, including Roy Burstein, Brendan DeCenso (now of RTI International), Kristen Delwiche, Laura Di Giorgio, Samuel Masters (now of UNC-Chapel Hill), Allen Roberts, and Alexandra Wollum. This report was written by Nancy Fullman of IHME.

Acknowledgments

The ABCE project in Ghana is a collaboration between the Ghana MOH, GHS, the Ghana UNICEF office, UNICEF, and IHME at the University of Washington in the United States. We are most grateful to these organizations, especially for their willingness to facilitate data access and provide crucial content knowledge. Additional survey input and cooperation were provided by the Clinton Health Access Initiative (CHAI) and Instituto Nacional de Salud Pública.

We especially thank all of the health facilities and their staff, who generously gave of their time and facilitated the sharing of the facility data that made this study possible. We are also most appreciative of the patients who participated in this work, as they, too, were giving of their time and kindly willing to share their experiences with the field research team.

The quantity and quality of the data collected for the ABCE project in Ghana are a direct reflection of the dedicated field team. It is because of their months of hard work, traveling from facility to facility and interviewing staff and patients, that we are able to present these findings today. We are immensely grateful to the ABCE Ghana field team.

A number of IHME research fellows contributed to data collection and verification in Ghana. We appreciate the work of Miriam Alvarado (now of Chronic Disease Research Centre of Barbados), David Chou (now of Columbia University), Michael Freeman, and Thomas Roberts (now of Stanford University).

At IHME, we wish to thank Kelsey Moore, Annie Haakenstad, and Aubrey Levine for managing the project; Ellen Squires for data support; Patricia Kiyono for managing the production of this report; Adrienne Chew and Kate Muller for editorial support; and Dawn Shepard for graphic design.

Funding for this research came from the Bill & Melinda Gates Foundation. UNICEF provided financial support for facility data collection in Ghana.

Acronyms

3TC	Lamivudine
ABCE	Access, Bottlenecks, Costs, and Equity
ACT	Artemisinin-based combination therapy
AIDS	Acquired immunodeficiency syndrome
AL	Artemether-lumefantrine
ARV	Antiretroviral (drug)
AS+AQ	Artesunate-amodiaquine
AZT/ZDV	Zidovudine
CHAI	Clinton Health Access Initiative
CHPS	Community-based health planning and services
CMS	Central Medical Stores
C&C	Cash and carry
DAH	Development assistance for health
DEA	Data Envelopment Analysis
DCPN	Disease Control Priorities Network
DHMT	District Health Management Team
DHS	Demographic and Health Survey
EFV	Efavirenz
ELISA	Enzyme-linked immunosorbent assay
GDP	Gross Domestic Product
GHS	Ghana Health Service
GOG	Government of Ghana
HIV	Human immunodeficiency virus

IGF	Internally generated funds
IHME	Institute for Health Metrics and Evaluation
IPTp	Intermittent preventive therapy during pregnancy
LMIC	Lower-middle-income country
MICS	Multiple Indicator Cluster Survey
MOH	Ministry of Health
MMR	Maternal mortality ratio
NCD	Non-communicable disease
NHIA	National Health Insurance Authority
NHIS	National Health Insurance Scheme
NVP	Nevirapine
RDT	Rapid diagnostic test
RMS	Regional Medical Stores
TDF	Tenofovir
UNICEF	The United Nations Children's Fund
VAT	Value-added tax

Terms and definitions

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 given by providers).

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

District sampling frame: the list of districts from which the ABCE district sample was drawn.

Efficiency: a measure that reflects the degree to which health facilities are maximizing the use of available resources 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 Ministry of Health (MOH) Needs Assessment.

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 and births 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 = 10.9 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.

Facility types in Ghana[1]

Regional referral hospitals: hospitals that provide more specialized care and the next level of referral for more complicated cases, in addition to general inpatient care, outpatient services, laboratory care, and surgeries.

Public hospitals: district hospitals that serve geographically defined areas and are considered first referral facilities, providing a range of clinical services, including emergency services, inpatient care, laboratory testing, and surgeries.

Health centers: health facilities that provide basic curative and preventive services, as well as reproductive health services. Polyclinics, which are larger and tend to offer more services, were considered health centers for the ABCE project in Ghana. These facilities are considered Ghana's main point of contact for primary care services.

Community-based health planning and services (CHPS): a clearly defined area within a subdistrict wherein a community health officer provides community-based health services, including home visits to clients residing in the CHPS zone. Established in 2003, the CHPS program focuses on providing health services to Ghana's rural areas. For the ABCE project in Ghana, reproductive and child health facilities were also grouped with CHPS.

Maternity clinics: health facilities that focus on providing reproductive and family planning services.

Pharmacies: health facilities that dispense drugs and operate separately from associated hospitals or clinics.

[1] Descriptions of Ghana health facilities came from Saleh et al. 2012 and Couttolenc 2012.

Executive summary

Ghana's Ministry of Health (MOH) states that its vision is "creating wealth through health" for all Ghanaians through proactive policies that support improved health and vitality. Ghana 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 results in minimal costs for individuals in need of treatment. The implementation and expansion of the National Health Insurance Scheme (NHIS) exemplifies how Ghana has sought to improve health service provision countrywide. 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 Ghana'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 influence optimal health service delivery.

Led by Ghana's Ministry of Health (MOH), the Ghana Health Service (GHS), the Ghana UNICEF office, UNICEF, and the Institute for Health Metrics and Evaluation (IHME), the ABCE project in Ghana 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. Further, these results will likely inform the ongoing debates and policy decisions concerning the enduring financial viability of NHIS.

The main topical areas covered in *Health Service Provision in Ghana: Assessing Facility Capacity and Costs of Care* include assessing facility-reported capacity for care and quantifying the services actually provided by facilities and the efficiency with which they operate; and tracking facility expenditures and the costs associated with different types of service provision.

Whenever possible, we link findings from the ABCE project to Ghana's stated 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 Ghana.

Key findings include the following:

Facility capacity for service production

Ghana saw average facility staffing numbers grow, while non-medical personnel composed a majority of facility employees

- In health facilities across Ghana, the average number of personnel grew from 49 in 2007 to 82 in 2011, representing a 69% increase. Growth was most dramatic in public hospitals, where average staffing rose from 86 in 2007 to 170 in 2011, followed by private clinics (growing from 15 to 27) and maternity clinics (where average staff increased from six to 11).

- The types of personnel found working in different types of facilities varied widely. On average, non-medical personnel made up at least 35% of staff. Doctors or medical assistants were most present in private clinics, making up 12% of personnel in those facilities, on average. Regional referral hospitals and public hospitals reported about 9% and 4%, respectively, of their staff as doctors or medical assistants.

Pharmaceutical procurement sources varied by facility type and ownership

- Facilities largely obtained pharmaceuticals from a mixture of private and public sources. The majority of surveyed private clinics, maternity clinics, and pharmacies reported obtaining all drugs from only private sources. Hospitals generally procured pharmaceuticals from a combination of suppliers, with over 70% indicating that they used both private and public sources

to acquire essential medicines. Health centers were the only platform type for which at least half of facilities reported using only public sources, such as Central Medical Stores (CMS), for drug procurement.

Facility stocks and stock-out patterns for antimalarials and HIV drugs differed by level of care

- At least some type of artemisinin-based combination therapy (ACT) was in stock in all hospitals, health centers, and maternity clinics. Most facilities did not experience ACT stock-outs during the previous quarter. Aside from hospitals, however, facilities less consistently stocked both ACTs and malaria diagnostics at the same time. Of the two types of ACTs stocked in Ghana, availability of artemether-lumefantrine (AL, or Coartem) tended to be higher than artesunate-amodiaquine (AS+AQ).
- Fansidar, which is the main drug for intermittent preventive therapy during pregnancy (IPTp), was also widely available across most platforms, particularly among public hospitals (100%), health centers (98%), and maternity clinics (94%). Relative to other platform types, community-based health planning and services (CHPS) and pharmacies generally reported lower availability of ACTs and Fansidar at the time of survey.
- Hospitals in Ghana stocked a variety of antiretroviral drugs (ARVs), with 60% of regional referral hospitals reporting stocks of all first-line drugs when they were visited. Nonetheless, ARV stock-outs were not uncommon, with 30% of regional referral hospitals reporting recent stock-outs of at least one ARV.

Presence of temperature monitoring chart was likely to help with effective storage of vaccines

- Twenty-five percent of facilities that reported routine vaccine storage kept immunization stores outside of the recommended range (i.e., colder than 2° C or warmer than 8° C). Among the facilities that kept a temperature monitoring chart and stored vaccines, 90% of facilities maintained proper thermal conditions for vaccine storage. By contrast, 56% of facilities that stored vaccines outside the recommended temperature range did not have a chart.

Facility production of health services

Patient volumes increased at private clinics, while other platforms generally showed more gradual growth

- Between 2007 and 2011, most facility types recorded gradual growth in both outpatient and inpatient volumes; private clinics were the clear exception, documenting particularly rapid increases in outpatient and inpatient visits. This finding contrasts with previous reports of quickly escalating patient volumes, resulting from heightened NHIS affiliation, across all facility types.

Medical staff in many facilities experienced relatively low patient volumes each day

- Across facility types, there was a moderate range in the total patient volume per medical staff and per day. Using the metric of "outpatient equivalent visits," for which inpatient bed-days and births were scaled to equal a comparable number of outpatient visits, we found that facilities averaged four visits per medical staff per day in 2011, ranging from 2.2 visits at CHPS to 6.8 visits at maternity clinics. This finding suggests that, despite perceived staffing shortages and reports of growing patient volumes, most medical personnel in Ghana 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 lowest and highest levels of efficiency across platforms, especially among primary care facilities in the public sector. For each of these platforms, the majority of facilities had efficiency scores below 20%, but at least one facility had an efficiency score of 100%. Hospitals showed higher levels of efficiency, with an average efficiency score of 50% at regional referral hospitals and 57% at public hospitals.
- Over 80% of facilities had an efficiency score below 50%, indicating 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, a major concern for the ongoing support of NHIS. 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.

Ghana recorded lower levels of efficiency than other ABCE countries in sub-Saharan Africa

- Across all facilities in Ghana, we estimated an average efficiency score of 27% for 2011. This level was moderately lower than the average efficiency score found for Uganda (31%) and was well below average efficiency levels computed for Kenya (41%) and Zambia (42%).
- Given the observed resources at facilities, we estimated that Ghana could produce an additional 13 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 CHPS and maternity clinics demonstrating the largest potential for growth. In comparison with a subset of other countries involved in the ABCE project, Ghana had higher levels of potential service expansion.
- In combination, these findings indicate that many facilities in Ghana could increase service provision, given observed resources, and that the factors related to higher levels of facility efficiency could be ascertained from the country's own subset of highly efficient facilities. At the same time, it is critical to consider these potential expansions of services within the context of gaps in medical equipment and pharmaceuticals, as well as financial factors related to timely NHIS provider reimbursements. Otherwise, any escalation of service provision may not have the desired – or sustained – impact on overarching health goals in Ghana.

Costs of care

Facility expenditures increased since 2007, with personnel expenses accounting for the bulk of facility spending

- Average expenditure at the health facility level grew 38%, from 818,420 cedi[2] ($511,513)[3] in 2007 to 1,130,154 cedi ($706,346) in 2011. Most of this growth appears to be driven by increases in service and personnel expenditures. Regional referral hospitals and public hospitals spent the most among health facility types. Private clinics documented the strongest growth between 2007 and 2011.
- Examining the breakdown in spending among administration, personnel, service provision, and investment expenditure categories revealed that personnel expenses made up the bulk of spending at the facility level. After pharmacies, private clinics spent the most on service provision (typically made up mostly of pharmaceuticals) as a proportion of expenditure. CHPS and health centers allocated the smallest share of their spending to the services category.

Facility funding from Ghana's NHIS increased, in tandem with overall growth of facility revenues

- Across the different platform types surveyed, funds from the Government of Ghana (GOG) made up 44% of funding in 2011. NHIS, at 33% of total revenues, contributed the next-largest proportion of funds, a considerable rise from 19% in 2007. This result aligns with the documented expansion of NHIS; however, it may be an underestimate of 2011 NHIS-backed revenues given widespread reports of delays in provider reimbursements.
- Annual average revenue at the facility level increased 30% between 2007 and 2011. This growth largely kept pace with expenditures, although average revenue was consistently higher than expenditures in regional referral hospitals and public hospitals during this period. Funding sources were quite variable across different facility types: CHPS and health centers reported that the majority of funds were GOG-based (more than 70%), while NHIS accounted for more than half of total funding for private clinics and maternity clinics.

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. The average facility cost per outpatient visit ranged from 14 cedi ($4) per outpatient visit at maternity clinics to 33 cedi ($10) at regional referral hospitals. Births accounted for the highest facility cost per visit for all facilities, ranging from an average of 120 cedi ($38) at maternity clinics to 445 cedi ($139) at regional referral hospitals. All fees associated with delivery have been covered by NHIS since 2008, so the relatively high facility costs per birth have substantial financial implications for Ghana's nationwide insurance program.

[2] All Ghanaian cedi in this report are reported in 2011 cedi 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 1.60 cedi.

- Future analyses are needed to determine the relationship between service production costs at health facilities and quality of care these facilities provide, as spending more on health services is not inherently indicative of how well services are delivered.

Ghana generally had higher average facility costs compared to other ABCE countries in sub-Saharan Africa

- In comparison with Kenya, Uganda, and Zambia, the average facility cost per patient in Ghana was generally higher, especially for average facility costs per birth. Ghana had slightly lower average costs per inpatient bed-day (62 cedi [$39]) than those found in Kenya and Uganda (both 66 cedi [$41]).

With its multidimensional assessment of health service provision, findings from the ABCE project in Ghana provide an in-depth examination of health facility capacity and costs associated with providing care. Ghana'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 equitably providing cost-effective interventions throughout Ghana.

Introduction

The performance of a country's health system ultimately shapes its population's health outcomes experienced, 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 (Dieleman et al. 2014, IHME 2014), the financial vitality of Ghana's National Health Insurance Scheme (NHIS) has been questioned (Addae-Korankye 2013, UHCC 2013), and the Government of Ghana (GOG) has prioritized expanding many health programs (MOH 2011), 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 Ghana, the multipronged, multipartner ABCE project has taken place in six other countries (Colombia, Kenya, 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. 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. 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.

Ghana's Ministry of Health (MOH), the Ghana Health Service (GHS), the Ghana UNICEF office, UNICEF, and the Institute for Health Metrics and Evaluation (IHME) compose the core team for the ABCE project in Ghana, and they received vital support and inputs from the Clinton Health Access Initiative (CHAI) and Instituto Nacional de Salud Pública 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 Ghanaian health facilities to create a large and fine-grained database of facility attributes and capacity. By capturing this range of facility indicators, 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 Ghana'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 Ghana.

As the second-most populous country in West Africa (GSS 2012), Ghana has in many ways reached a development and health crossroads: in 2010, Ghana was reclassified as a lower-middle-income country (LMIC), a result of the country's strong economic growth in recent years (Saleh 2012). Ghana has also posted improved health outcomes and overall health achievement for its population, recording a 40% reduction in child mortality between 1990 and 2013 (Wang et al. 2014).

At the same time, Ghana is experiencing unprecedented changes in its demography, disease burdens, demand for health services, and costs of delivering care (Saleh 2012). Non-communicable diseases (NCDs) account for an increasing portion of Ghana's overall disease burden (Murray et al. 2012), and these conditions are usually more costly and complicated to treat than infectious diseases. This kind of epidemiological shift can quickly upend a country's health gains if facilities and health personnel are not properly equipped to manage NCDs.

Ghana's health system is composed of a variety of facility types and affiliations, ranging from government-owned to private facilities. Approximately one-third of Ghana's health facilities are operated under private ownership, and a 2008 McKinsey study indicated that more than 50% of health service provision in Ghana is delivered by the private sector. However, consistently collected information on private sector performance and delivery mechanisms is sparse at best. Data on medical supplies, expenditures, and interventions provided from private facilities are not routinely captured or included in Ghana's health information systems (Saleh 2012), and thus service delivery successes and challenges experienced by Ghana's private sector are not easily ascertained.

Health service use has increased since the roll-out of the NHIS, which formally began in 2005, but reports indicate that wealthier individuals are more frequent users of health insurance than the country's underprivileged populations. Among five Accra localities surveyed in 2011, 56% of respondents from the top two wealth quintiles were registered with NHIS, whereas only 38% of individuals from the lower three wealth quintiles reported NHIS affiliation (MICS 2012). Further, as more Ghanaians enroll and remain affiliated with NHIS, the country faces heightened concerns about adequately financing the nationwide insurance system over time (Addae-Korankye 2013).

The country's health system is financed by four main sources: (1) the GOG; (2) internally generated funds (IGF), which are either generated by the district government or allocated by the GOG, and consist of revenues from the NHIS and "cash and carry" (C&C); (3) development assistance for health (DAH), with much of development partner funding channeled through the central budgeting process; and (4) out-of-pocket expenditures made by households. It is likely that at least some of these financing sources and mechanisms have changed over the last decade, especially in light of the decentralization of health service provision in Ghana and national health insurance reform (see the box on the following page for recent policies and initiatives in Ghana).

Among its neighbors, Ghana enjoys a higher gross domestic product (GDP) per capita and spends approximately 5% of GDP on health, which is average for the region. According to a recent World Bank report, for what the country spends, Ghana records fewer health gains and less than optimal health system performance in several areas (Saleh 2012). The same report documents fewer physicians and health workers per capita than countries with similar health spending patterns. In Ghana, overall shortages in health personnel, as well as the inequitable distribution of human resources for health between urban and rural areas, have been viewed as primary factors underlying health financing and health system equity challenges (Asante and Zwi 2009).

Largely driven by Ghana's substantial investments in improving its health system, the country's health landscape has substantially changed over the last two decades. New and more effective drugs are available to treat diseases like malaria, and these medicines are accompanied by new policies that regulate their use. A greater diversity of health facilities is available to more patients, even in the hardest-to-reach areas of Ghana, and overall access to health services is likely to be improving through the gradual expansion of NHIS. At the same time, greater health system access does not inherently translate into greater use of services, nor does it equate to greater quality of care for all populations. With the context of Ghana's dynamic health system in mind, the ABCE project aims to link its analyses and results to informing priority policy and program areas, such as health system financing, personnel trends, and overall service capacity in health facilities.

Findings are organized to provide an in-depth examination of health facility capacity across different platforms, specifically covering topics on human resources capacity, patient volumes, services and pharmaceuticals provided, and financial trends over time. As an addition to the 2013 preliminary report (IHME 2013), results concerning facility-based efficiencies and costs associated with service provision are presented for the first time.

A selection of health initiatives and policies in Ghana from the last decade

National Health Insurance Scheme (NHIS)

- Ghana passed legislation for NHIS in 2003 and 2004 in an effort to achieve universal health care coverage for all citizens.
- NHIS implementation started in 2005 and is managed by the National Health Insurance Authority (NHIA).
- NHIS targets Ghana's most vulnerable populations and aims to alleviate their financial burdens by abolishing user fees and dedicating substantial national revenue to fund the scheme.
- NHIS has been financed through a range of funding sources (a combination of governmental allocations, payroll taxes, subsidized premiums for informal sector workers, and value-added tax [VAT] levies). This kind of funding diversity was originally viewed as a stable financing approach to NHIS, but the slow uptake of NHIS affiliation among non-exempt individuals, among other factors, has led to a rising deficit in NHIS revenues (UHCC 2013).
- In 2012, NHIS enrollment apparently covered 35% of Ghana's population (UHCC 2013), but consistently measured information on NHIS trends and demographic characteristics of enrollees is scarce (Witter and Garshong 2009).

Community-based Health Planning and Services (CHPS)

- The CHPS program was established in 2003, originally as a local "close-to-client" health service delivery model that sought to reach rural and remote populations (Nyonator et al. 2005).
- Ghana has heavily invested in building new and expanding current CHPS zones for traditionally hard-to-reach populations. From 2005 to 2009, the number of CHPS increased from 15 to 376. By 2013, the goal was to have 1,162 functional CHPS countrywide (Saleh 2012).

Free maternal health care

- Historically, Ghana has had high rates of maternal mortality, with a maternal mortality ratio (MMR) largely exceeding 400 maternal deaths per 100,000 live births between 1993 and 2005 (Kassebaum et al. 2014).
- In an effort to increase the number of women seeking skilled birth attendants or attending facilities to deliver, Ghana introduced a national health policy to waive all delivery fees for pregnant women in 2004 (MOH 2004).
- Through this program, all costs associated with intrapartum care have been covered in all public and private facilities, initially by debt relief and then health insurance starting in 2008 (Witter et al. 2009).

Malaria drug policies (MOH 2009)

- In response to increasing treatment failure of chloroquine, Ghana instituted a new national policy designating artesunate-amodiaquine (AS+AQ), an artemisinin-based combination therapy (ACT), as the first-line drug against uncomplicated malaria in 2005.
- Chloroquine and artemisinin-based monotherapies were supposed to be discontinued soon after ACT policy enactment.
- Sulfadoxine-pyrimethamine (Fansidar) should be used only for intermittent preventative treatment during pregnancy (IPTp).
- Quinine ought to be used only as a second-line or second-option antimalarial drug, or for pregnant women during their first trimester.

HIV/AIDS drug policies (Ampofo 2009)

- Recommended first-line antiretroviral drugs (ARVs) include zidovudine (AZT/ZDV), lamivudine (3TC), nevirapine (NVP), efavirenz (EFV), and tenofovir (TDF). Different combinations are recommended based on symptom profiles and contraindications.
- Fixed-dose combinations of ARVs, rather than single-dose drugs provided in combination, are recommended for improved adherence.

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 what patients pay for care.

Equity

Numerous factors can influence the ways in which populations interact with ahealth 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 most manifest themselves.

ABCE study design

For the ABCE project in Ghana, 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 through a comprehensive facility survey administered to a nationally representative sample of health facilities in Ghana (the ABCE Facility Survey). District Health Management Teams (DHMTs) received a modified version of the ABCE Facility Survey.

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/ghana.

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 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 Ghana, we used a two-step stratified random sampling process. Districts, from which facilities would be drawn, were grouped by Ghana's 10 regions. Each district was designated rural or urban based on classification from the 2011 Multiple Indicator Cluster Survey (MICS). We followed the 2011 MICS sampling approach by including 168 of Ghana's 170 districts. One rural and one urban district were randomly selected from each region. In addition, from the regions of Greater Accra and Ashanti, Accra Metropolitan Area and Kumasi were deliberately added to the district selection process, resulting in 22 total districts (12 urban and 10 rural) included in the ABCE sampling process.

The second step, which entailed sampling facilities from each selected district, took place across the range of platforms identified in Ghana. For the ABCE project, a "platform" was defined as a channel or mechanism by which health services are delivered. In Ghana, sampled health facilities included teaching hospitals, regional referral hospitals, hospitals, health centers, CHPS, maternity clinics, pharmacies, and drugstores, as well as DHMTs. The facility sampling frame used for the ABCE project originated from the 2011 MOH Needs Assessment.

A total of 22 districts were selected through the district sampling frame, and 273 facilities (including DHMTs) from those districts were randomly selected through the facility sampling frame (Figure 1):

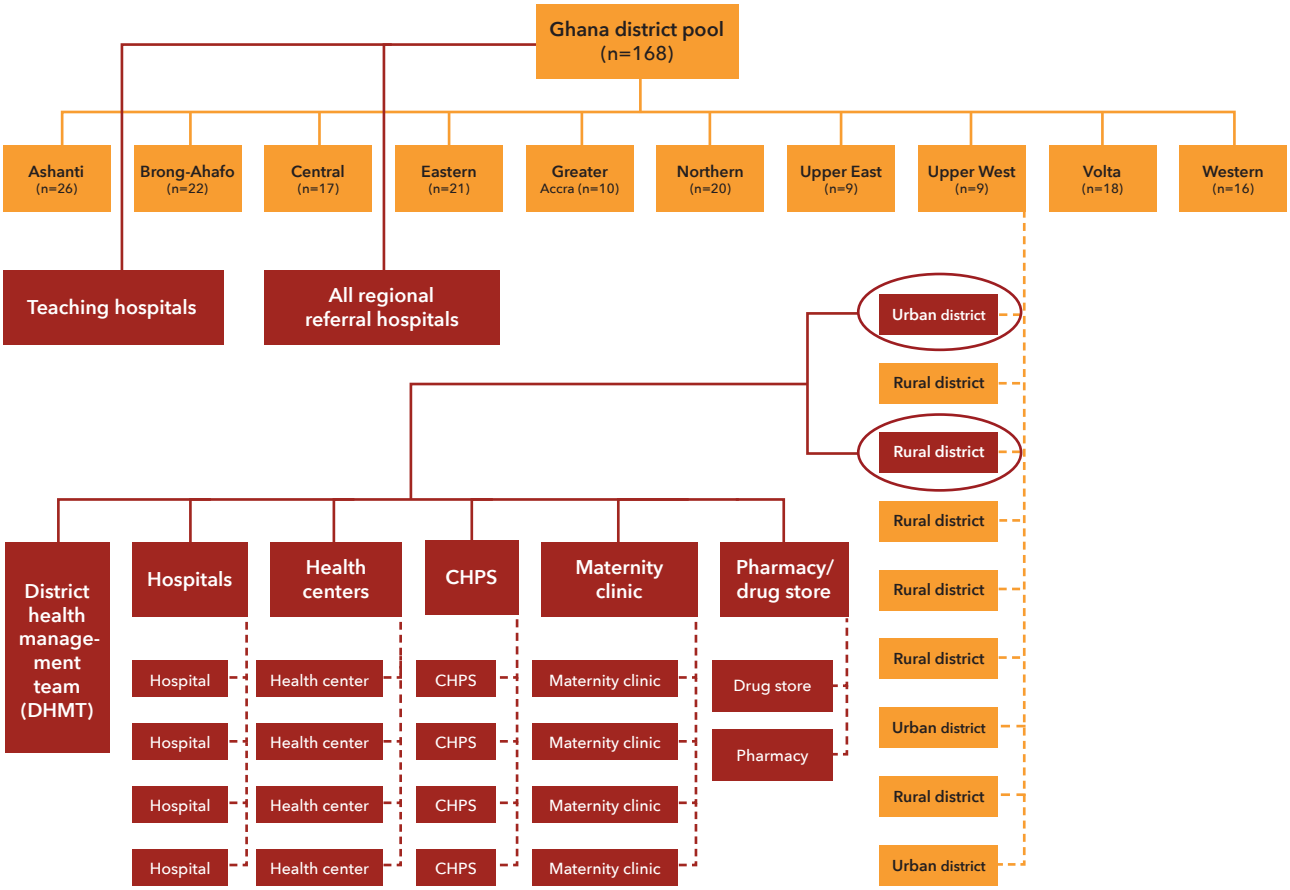
- Up to four hospitals.
- Up to four health centers.
- Up to four CHPS.
- Up to four maternity clinics.
- Up to two pharmacies or drugs stores, with a preference for one of each if possible.

TABLE 1 Modules included in the ABCE Facility Survey in Ghana

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; sources of funding Total expenses for infrastructure and utilities; medical supplies and equipment; pharmaceuticals; administration and training; non-medical services; personnel (salaries and wages, benefits, allowances); investments Performance and performance-based financing questions
	Revenues	User fees; total revenue and source
	Personnel characteristics	Total personnel; volunteer, directly, and externally funded personnel; personnel dedicated to HIV/AIDS-specific services; hours worked by staff category Funding sources of personnel; education and training of medical and non-medical personnel; performance and performance-based financing 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	Facility hours, characteristics of patient rooms, and beds; 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: 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 6: 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 Maternal care and in-facility deliveries Malaria and tuberculosis diagnoses and patient care

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.

FIGURE 1 Sampling strategy for the ABCE project in Ghana



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

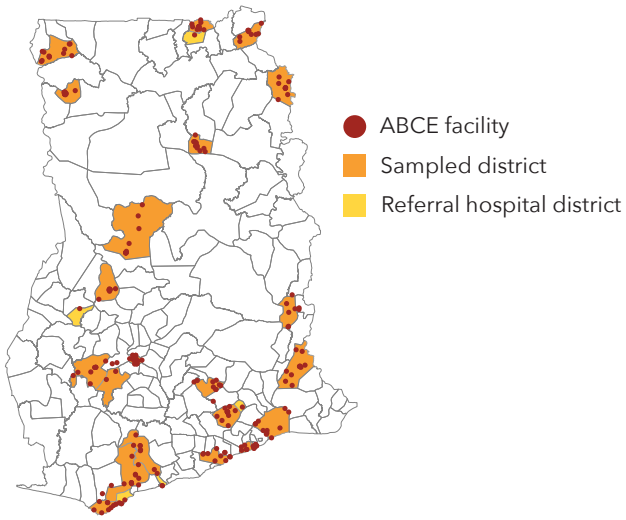
TABLE 2 Indicators included in the DHMT Survey in Ghana

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 each county, as reported by the DHMT	Finances	Financial summary for sampled facilities
	Personnel characteristics	Total personnel at sampled facilities

TABLE 3 Facility sample, by platform, for the ABCE project in Ghana

FACILITY TYPE	ORIGINAL SAMPLE	FINAL SAMPLE	RESPONSE RATE
Hospitals	42	29	69%
Health centers	83	73	88%
Maternity clinics	27	16	59%
CHPS	55	65	118%
Pharmacies	44	37	84%
District health management teams (DHMTs)	22	20	91%
TOTAL FACILITIES	**273**	**240**	**88%**

FIGURE 2 Districts and facilities sampled for the ABCE project in Ghana



REGION	FACILITIES	PERCENT OF FINAL SAMPLE
Ashanti	30	13%
Brong-Ahafo	20	8%
Central	24	10%
Eastern	25	10%
Greater Accra	25	10%
Northern	23	10%
Upper East	23	10%
Upper West	25	10%
Volta	21	7%
Western	24	10%
Total	**254**	**100%**

Within each selected district, we also included the DHMT in our sample. All teaching and regional referral hospitals were included in the final facility sample. In the results that follow, teaching and regional referral hospitals are grouped together.

Data collection for the ABCE project in Ghana

Data collection took place between June and October 2012. Prior to survey implementation, GHS and IHME hosted a one-week training workshop for 36 research associates, where they received extensive training on the electronic data collection software (DatStat), the survey instruments, the Ghanaian 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, GHS, 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 districts and facilities sampled for the ABCE project in Ghana. Table 3 provides information on final facility samples. In cases when facilities reported a different platform classification than what was recorded in the 2011 MOH Needs Assessment, we deferred to the classification reported by facility representatives in the ABCE Facility Survey.

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

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 Ghana consider how to expand health system coverage and functions within constrained budgets.

Using the ABCE Ghana facility sample (Table 3), we analyzed four key drivers of health service provision at facilities:

- Facility-based resources (e.g., human resources 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.
- 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 Ghana, highlighting areas of high performance and areas for improvement.

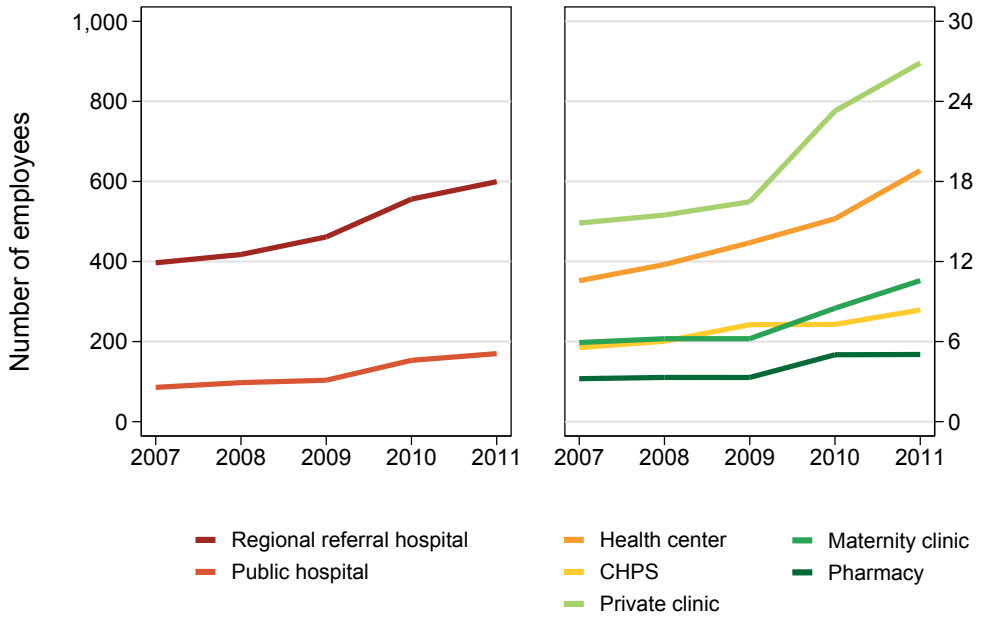
Results are generally presented in terms of averages across health facility types in Ghana. For some topics, findings for hospitals, health centers, and CHPS are highlighted, as these groups of platforms – hospitals and the main public providers of primary care – represent each end of Ghana's health system and corresponding service provision.

Personnel and outputs

Human resources for health

Overall, the average number of personnel in health facilities grew in Ghana, rising from 49 in 2007 to 82 in 2011 (a 69% increase). By platform, personnel growth was far more variable (Figure 3). Public hospitals recorded the

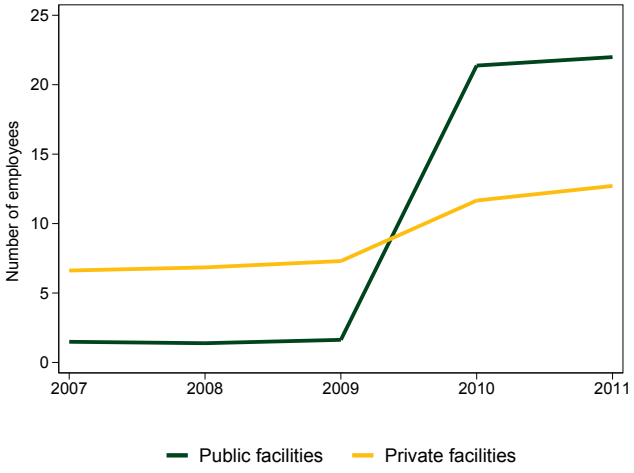
FIGURE 3 Average number of facility personnel, by platform, 2007–2011



most growth in average staff numbers, increasing from an average of 86 employees in 2007 to 170 in 2011 (a 98% increase). Private clinics reported the next-largest staff expansion, from an average of 15 employees in 2007 to 27 in 2011, an increase of 81%. Average pharmacy staff numbers remained around three to five between 2007 and 2011. Regional referral hospitals recorded a 51% increase in average facility employees between 2007 and 2011, from 397 to 599; however, the largest staffing jump took place between 2009 and 2010 for regional referral hospitals, with a 20% increase in average number of personnel.

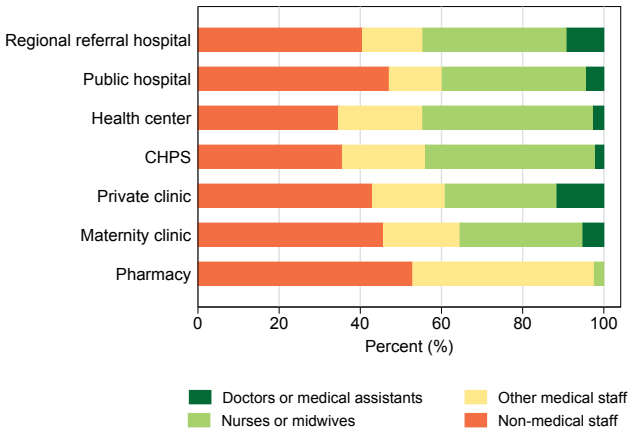
The average number of internally funded personnel in private facilities gradually increased from 2007 to 2011, from seven to 13 (Figure 4). However, the average number of internally funded personnel in public facilities increased substantially between 2009 and 2011, rising from an average of about two in 2009 to 22 in 2011.

FIGURE 4 Average number of internally funded personnel, by facility ownership, 2007–2011



Some personnel composition trends emerged upon disaggregating types across platforms for 2011 (Figure 5). For the most part, non-medical personnel accounted for the largest portion of health facility personnel. In CHPS and pharmacies, 36% and 53% of all personnel were non-medical, respectively. On average, nurses or midwives accounted for the second-highest proportion of personnel in public health facilities, composing approximately 35% of staff in regional referral hospitals and 42% in health centers. Other medical personnel composed an average of 45% of pharmacy-based personnel, such as pharmacists and lab technicians, but generally contributed to about 13% to 21% of staff in the other platforms. Doctors or medical assistants were most prevalent in private clinics, contributing to 12% of personnel on average. Regional referral hospitals and public hospitals reported 9% and 4%, respectively, of their staff as doctors or medical assistants.

FIGURE 5 Average percent of personnel type, by platform, 2011



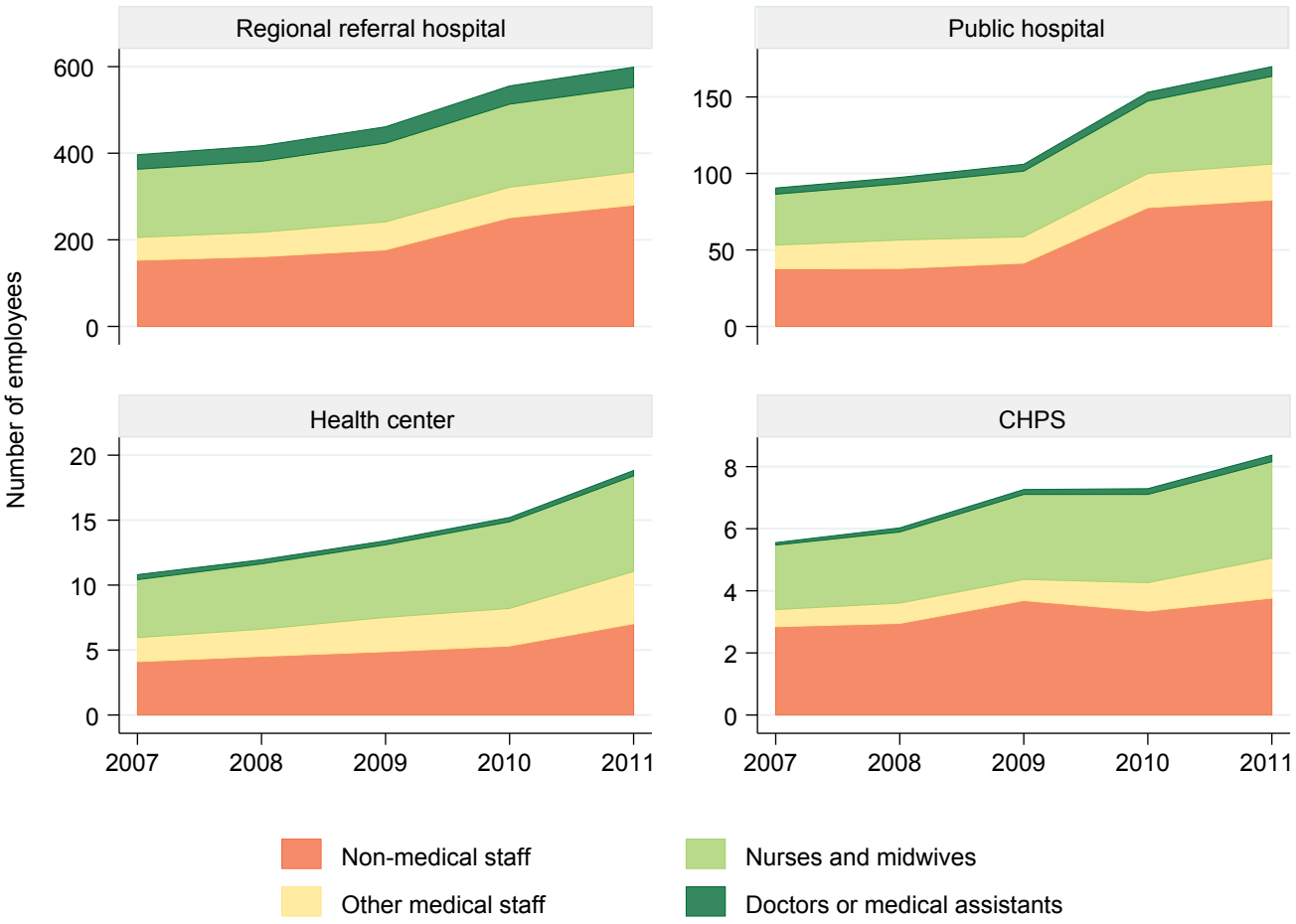
Breaking down personnel trends from 2007 to 2011, Figure 6 shows the relative variability in staffing types over time in hospitals, health centers, and CHPS. In regional referral hospitals, personnel composition remained relatively unchanged, with non-medical personal generally accounting for nearly 40% of all staff and only slightly increasing between 2009 and 2010. The average number of nurses or midwives at regional referral hospitals grew by 24% between 2007 and 2011.

At public hospitals, the average proportion of personnel that were nurses or midwives remained somewhat constant from 2007 to 2011, largely ranging between 30% and 40% during this time. The average number of non-medical personnel at public hospitals more than doubled between 2007 and 2011, rising from an average of 38 employees to 83.

Among health centers, staffing growth accelerated after 2009, with an average of five additional facility staff gained between 2009 and 2011. The number of nurses or midwives at these facilities increased 65% from 2007 to 2011, rising from an average of four nurses in 2007 to seven in 2011.

For CHPS, the greatest personnel increases were recorded among nurses and midwives, with facilities adding, on average, one additional nurse or midwife between 2007 and 2011. Staff growth was also documented for non-medical personnel, again averaging one additional non-medical employee in CHPS in 2011 compared to 2007.

FIGURE 6 Average number and types of personnel, for a subset of platforms, 2007-2011



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. Further, to properly fill health service needs and prepare for future demands, Ghana's facilities and NHIS need to consistently document trends in patient visits.

Figure 7 illustrates the trends in average outpatient volume across platforms and over time. In Ghana, the number of outpatient visits experienced by regional referral hospitals far exceeded outpatient volumes recorded at other facilities. In general, most platforms experienced steady, gradual increases in outpatient visits between 2007 and 2011; private clinics were an exception, recording a 92% increase in average outpatient visits during this time.

Figure 8 depicts the trends in average inpatient visits across platforms. On average, all facility types showed increasing average inpatient visits between 2007 and 2011, ranging from a 44% rise at regional referral hospitals to a 65% increase at private clinics during this time.

Service provision and pharmaceuticals

Being able to diagnose ailments and effectively treat them is a basic, yet crucial, indicator of a health facility's capacity to optimally serve its patients and their health needs. In this report, results are focused around facility capacity to diagnose and treat high-burden infectious diseases, such as malaria and HIV/AIDS, as well as proxies for preventive services (e.g., vaccine storage capacity).

FIGURE 7 Average outpatient visits, by platform, 2007–2011

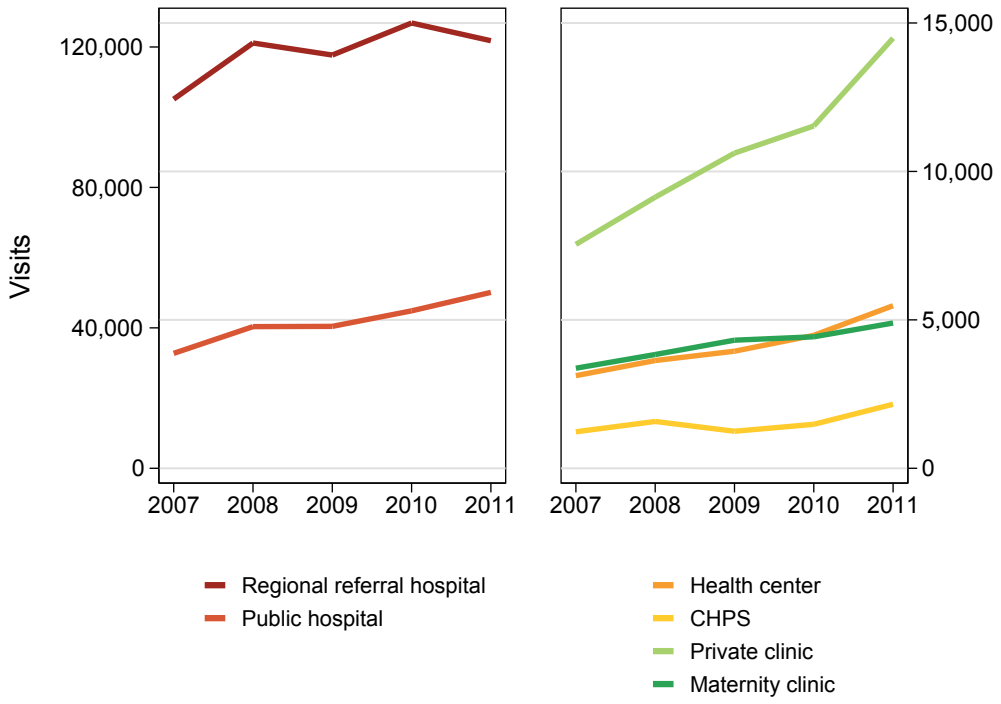


FIGURE 8 Average inpatient visits, by platform, 2007–2011

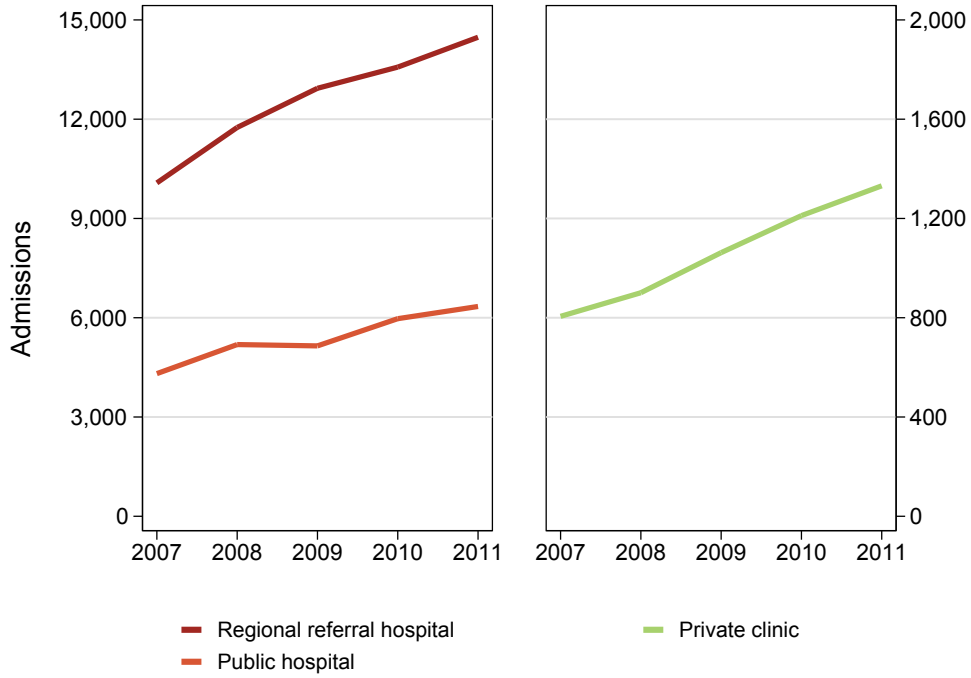
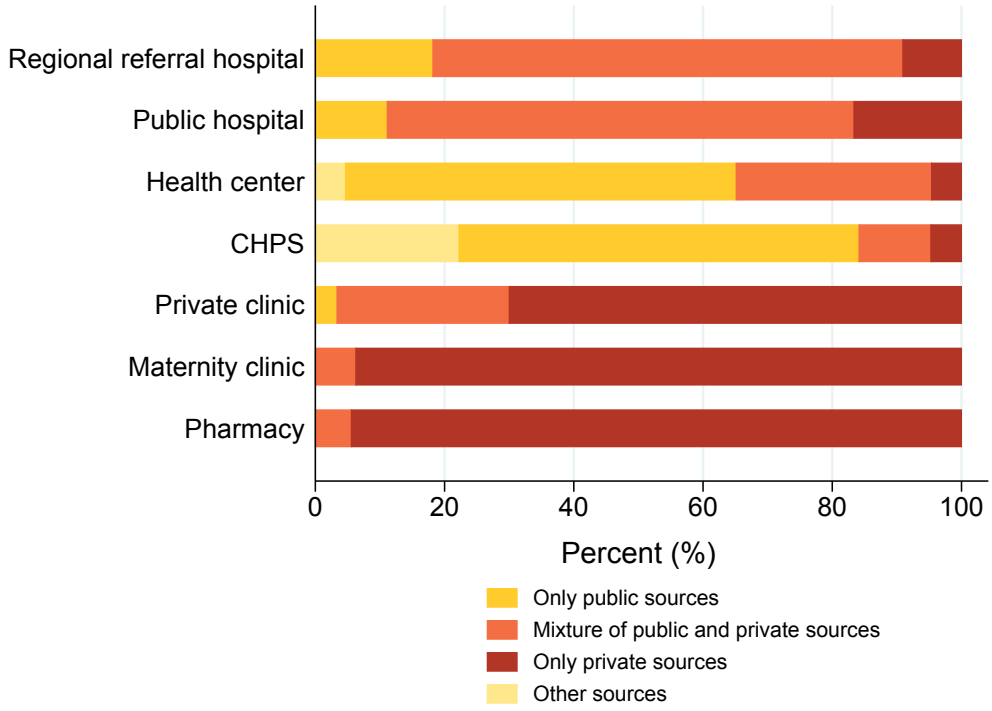


FIGURE 9 Average drug procurement source, by platform, 2011



Drug procurement sources

In Ghana, pharmaceuticals are procured through two main sources: public venues, such as the Central Medical Stores (CMS) and Regional Medical Stores (RMS), and private companies. For the ABCE project in Ghana, procurement information was collected for a subset of drugs stocked by facilities.

As depicted in Figure 9, preferred sources for purchasing essential medicines varied by platform type. For hospitals, the majority of facilities acquired drugs from a combination of sources, with 73% of regional referral hospitals and 72% of public hospitals procuring pharmaceuticals through both public and private sources. Among primary care facilities in the public sector, CMS or RMS provided all drugs at just over half of public health centers and 34% of CHPS. Over 90% of maternity clinics and pharmacies reported procuring all of their essential medicine stocks from private sources, while 70% of private clinics indicated the same. Notably, some percentage of facilities across platforms reported acquiring at least some pharmaceuticals through the private sector.

Malaria treatment and prevention

ACTs have served as the first-line antimalarial for uncomplicated *Plasmodium falciparum* malaria in Ghana since 2005 (Koram et al. 2005, MOH 2009). As demonstrated by Figure 10, overall ACT availability largely led – or at least equaled – the availability of other antimalarials across platform types when health facilities were visited for the ABCE project. These visits took place between June and September 2012. At least some type of ACT was in stock at 100% of hospitals, health centers, and maternity clinics at the time of facility visits.

Fansidar, which is the main drug for IPTp, also registered high availability across most platforms, especially public hospitals (100%), health centers (98%), and maternity clinics (94%). Serving as a second-line drug or option for complicated malaria, quinine was widely available in regional referral hospitals and public hospitals (both 100%), as well as health centers (84%). Relative to other platform types, CHPS and pharmacies generally had lower availability of ACTs, Fansidar, and quinine. In spite of malaria policies that called for its discontinuation (MOH 2009), chloroquine remained in stock in several facilities.

The types of ACTs available varied by platform (Figure 11). In both types of hospitals, about 90% of facilities carried both artemether-lumefantrine (AL) and artesunate-amodiaquine (AS+AQ), leaving about 10% of hospitals only carrying AL. CHPS and pharmacies showed

FIGURE 10 Availability of antimalarials for the previous quarter, by platform, 2012

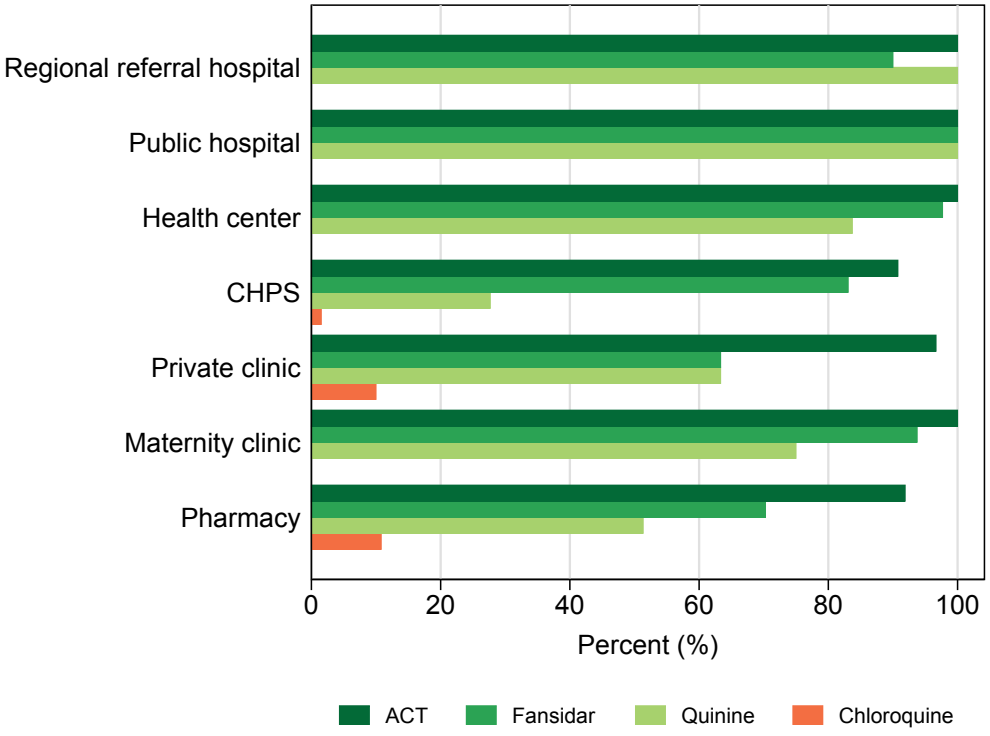
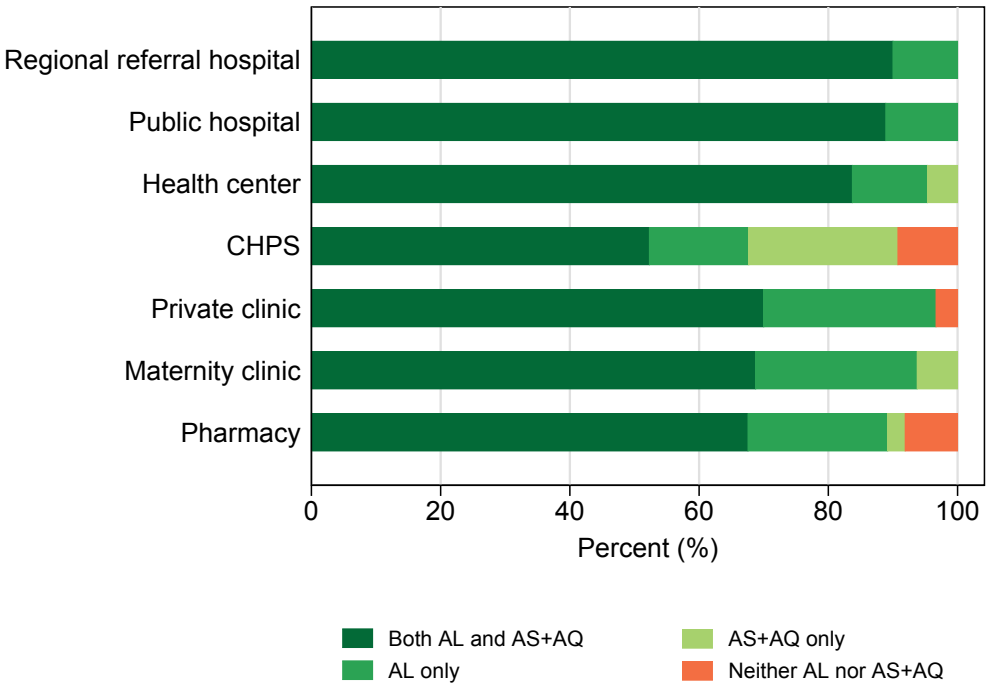


FIGURE 11 Availability of ACTs for the previous quarter, by platform, 2012



some compositional differences in ACT stocks, with 52% and 68% of facilities, respectively, providing both ACT options. For CHPS, 23% stocked only AS+AQ and 15% only had AL, whereas in pharmacies, 3% stocked only AS+AQ and 22% reported having only AL.

Stocking ACTs is merely half of the malaria treatment equation; maintaining these stocks and avoiding stock-outs are also needed if health facilities are to consistently have the capacity to effectively treat the disease (Figure 12). All hospitals and nearly all private clinics reported stocking AL without any facilities also reporting AL stock-outs over the last quarter. CHPS had the greatest percentage of facilities with AL stock-outs (19%), as well as the lowest proportion of facilities that had AL available (68%); given that more CHPS (75%) reported AS+AQ in stock at the time of facility visit than AL, and slightly fewer CHPS recorded AS+AQ stock-outs in the last quarter (17%), it is possible that AS+AQ is a preferred ACT among this platform type. With CHPS as the exception, more facilities across platform types reported stocking AL than AS+AQ; further, all platforms reported some degree of AS+AQ stock-outs during the last quarter. At least 8% of facilities from each platform type recorded stock-outs of AS+AQ last quarter, with 21% of pharmacies experiencing AS+AQ stock-outs. Private clinics and pharmacies posted the lowest proportion of facilities stocking AS+AQ, at 70% each.

The capacity of a health facility to both diagnose and treat malaria affects optimal case management. Substantial variability in concurrent malaria diagnostic and treatment availability was found across platforms (Figure 13). In both hospital types, 100% of facilities reporting having both proper malaria diagnostic equipment (i.e., laboratory testing or rapid-diagnostic tests [RDTs]) and ACTs on the facility visit date. Beyond hospitals, private clinics posted the next highest percentage of having concurrent testing and treating capacity (77%), leaving 20% of private clinics with ACTs but no malaria diagnostic capacity, and 3% with malaria testing but no ACTs. CHPS and pharmacies reported substantially lower rates of having concurrent malaria diagnostic and treatment capacities, 23% and 3%, respectively. CHPS and pharmacies recorded a similar proportion of facilities lacking concurrent malaria diagnostic capacity and treatment (8% and 9%, respectively). Nearly 90% of pharmacies only carried ACTs without accompanying diagnostic tools, whereas stocking ACTs without diagnostic tools was found in 68% of CHPS and 47% of health centers. In comparison to most other platforms, fewer primary health care centers (i.e., CHPS and health centers) reported having the capacity to provide concurrent malaria testing and treatment at the time of visit.

FIGURE 12 Availability of ACTs and ACT stock-outs for the previous quarter, by platform, 2012

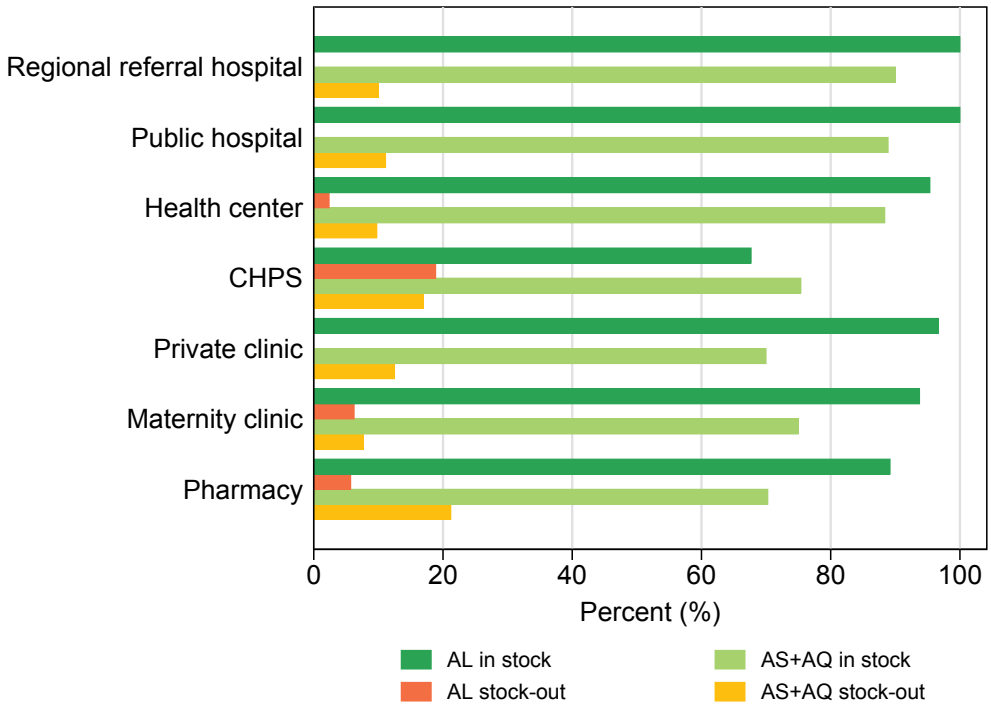
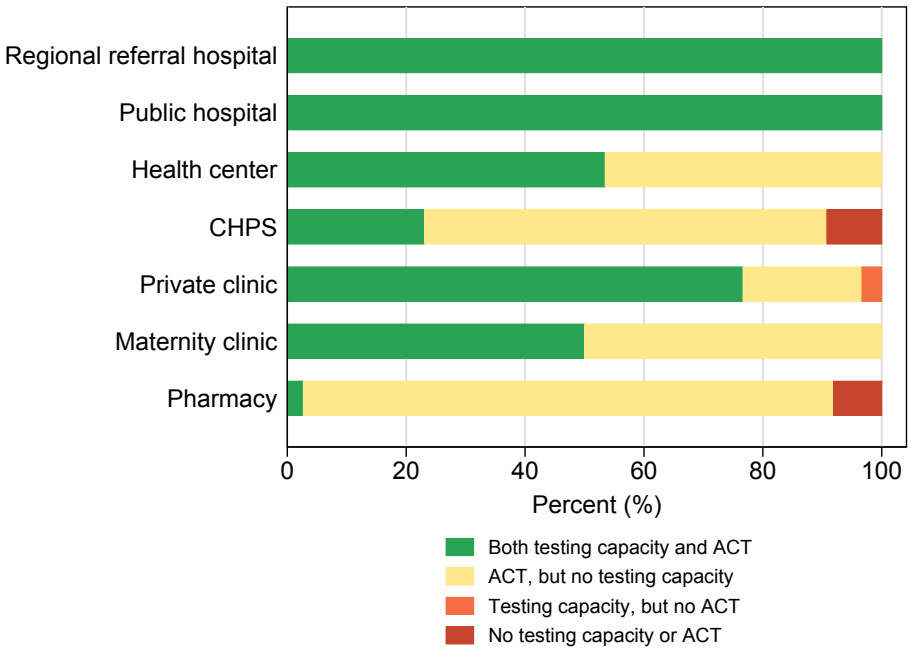


FIGURE 13 Capacity to test for and treat malaria, by platform, 2012



HIV/AIDS treatment

Only two types of platforms – regional referral hospitals and public hospitals – carried ARVs (Figure 14). Of regional referral hospitals, 100% reported stocks of TDF, NVP, and 3TC, and 80% of facilities stocked EFV and AZT/ZDV. Fewer public hospitals stocked each ARV than regional referral hospitals, with 93% of facilities carrying TDF; 86% with NVP; and 71% that stock 3TC, EFV, or AZT/ZDV.

Except for regional referral hospital stocks of 3TC, all facilities experienced some kind of ARV stock-out during the last quarter (Figure 15). At regional referral hospitals, stock-outs of TDF, NVP, and EFV occurred in 20% of facilities for each drug, whereas 30% experienced stock-outs of AZT/ZDV. At public hospitals, fewer facilities stocked out of TDF or NVP (12%), whereas 29% of these hospitals ran out of EFV during the last quarter. Unlike regional referral hospitals, 22% of public hospitals experienced stock-outs of 3TC.

FIGURE 14 ARV availability for the previous quarter, by platform, 2012

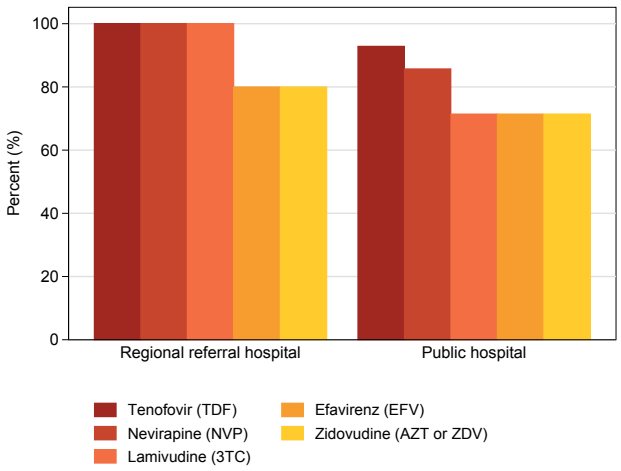
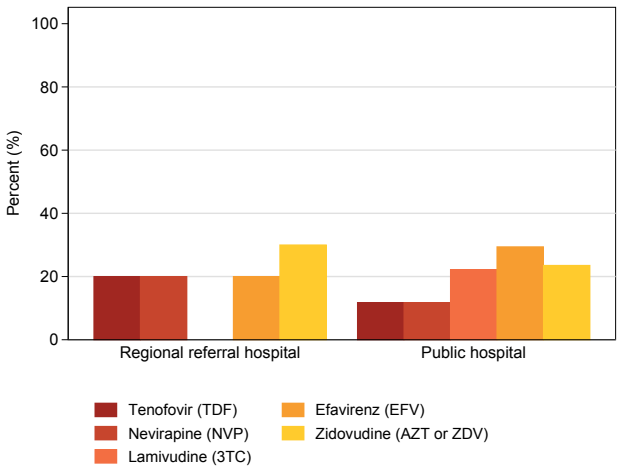


FIGURE 15 ARV stock-outs for the previous quarter, by platform, 2012



In Ghana, recommended first-line ARV therapies generally consist of a combination of three out of five first-line ARVs (TDF, NVP, 3TC, EFV, and AZT/ZDV) (Ampofo 2009). Thus, one measure of a facility's ability to provide first-line ARV treatment is whether the facility stocks all five ARVs that compose first-line treatment recommendations. Sixty percent of regional referral hospitals had all five ARVs in stock at the time of the facility visit, whereas 33% of public hospitals had all five ARVs when the facilities were visited.

Diagnostic capacity for a subset of infectious diseases

In order to optimally treat two of the most burdensome infectious diseases in Ghana (malaria and HIV/AIDS), a proper diagnosis of the disease is needed. Not surprisingly, diagnostic capacity varied across platform types (Figure 16). Among hospitals, 100% of facilities had malaria testing available, and at least 90% of facilities reported HIV/AIDS testing. Availability of malaria diagnostics generally exceeded HIV testing, except at CHPS and maternity clinics. At these facilities, HIV/AIDS testing was available at 29% and 69% of facilities, respectively; by contrast, 23% of CHPS and 50% of maternity clinics had malaria testing.

Effective vaccine storage capacity

Since cold-chain integrity is a major determinant of immunization outcomes, monitoring and maintaining the proper storage temperature is critical. Having a temperature-monitoring chart at facilities storing vaccines aids in the regular maintenance of cold-chain integrity by providing a time series record of storage temperatures. However, not all health facilities have these monitoring systems, even if they routinely store vaccines. Among the facilities reporting routine vaccine storage (61% of all facilities), only 64% of these facilities had monitoring charts accompanying storage equipment. Disaggregated by platform, health facilities that report routine vaccine storage varied in terms of storing vaccines within a proper temperature range (2° to 8° C) (WHO 2006) (Figure 17).

Ninety percent of regional referral hospitals had a temperature-monitoring chart and were storing vaccines in the proper temperature range (as directly observed in facilities). Of the CHPS with routine vaccine storage, most CHPS facilities were storing vaccines in the desired temperature range, accompanied by a monitoring chart (80%). Twenty-five percent of private clinics that routinely stored vaccines had a monitoring chart and temperature within range at the time of the survey, whereas the majority of pharmacies reporting routine storage did not meet temperature standards and lacked a monitoring chart.

FIGURE 16 Diagnostic testing availability for malaria and HIV/AIDS, by platform, 2012

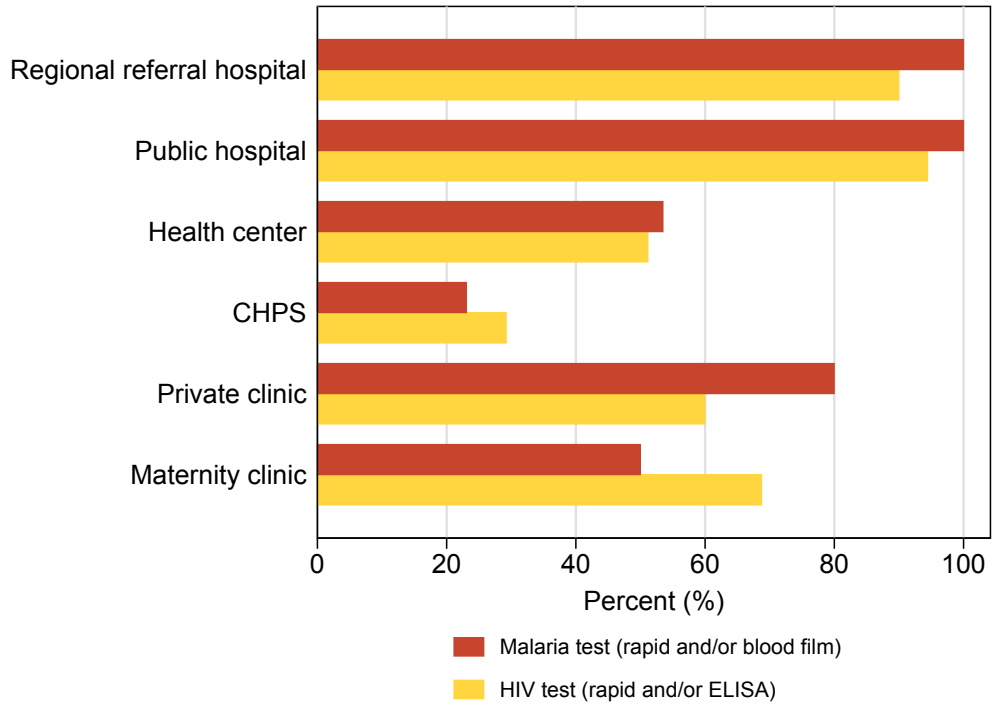
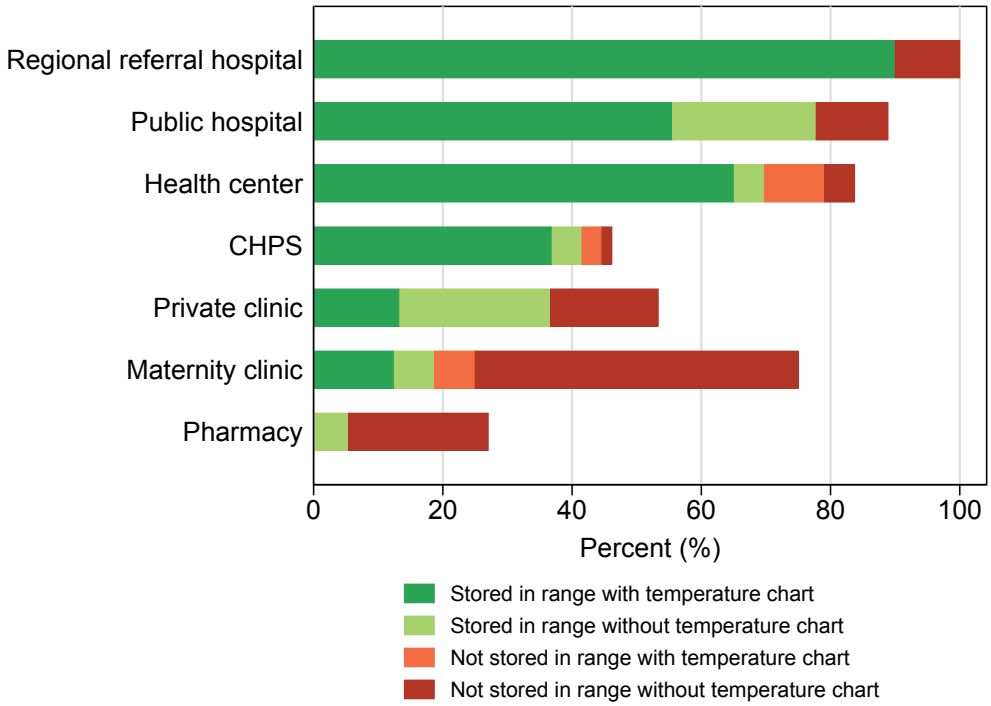


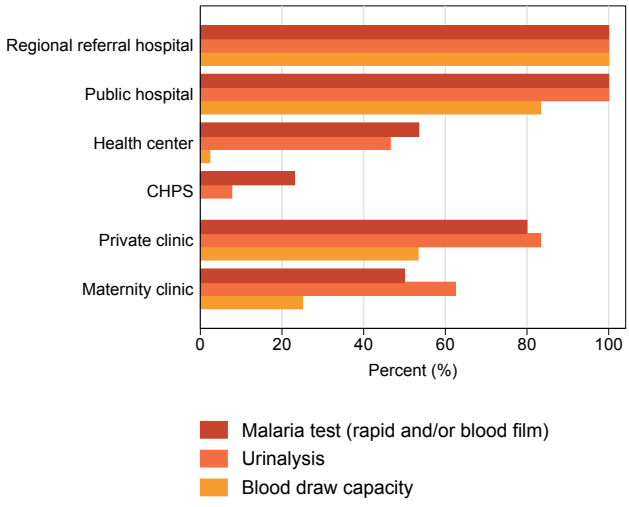
FIGURE 17 Vaccine storage capacity and monitoring efficacy, by platform, 2012



Laboratory testing availability

Laboratory-based diagnostic capacity varied across facility types (Figure 18). In this report, blood draw capacity was defined as a facility having a serum electrolyte test available for use on the visit date. In both types of hospitals, 100% of facilities reported the capacity for malaria testing and urinalysis. All regional referral hospitals reported blood draw capacity, whereas 83% of public hospitals reported the same capacity. CHPS featured the lowest laboratory capacity, which generally reflects the platform type's infrastructure and organization. Malaria testing was the most widely available test for CHPS facilities (23%), though it is likely that this is supported by RDTs rather than microscopy. Private clinics reported a high percentage of facilities (at least 80%) with the capacity for malaria testing and urinalysis. Among the laboratory tests assessed for the present report, the greatest proportion of maternity clinics provided urinalysis (63%), followed by malaria testing (50%) and blood draws (25%). No sampled pharmacies reported laboratory-based diagnostics or tests.

FIGURE 18 Laboratory equipment availability for the previous quarter, by platform, 2012



Trends in facility expenditures and revenues

A health system's financial environment, in many ways, dictates how – or potentially, if – health services are provided. Consistent revenue flows, as well as spending on health, support ongoing health system responsiveness and provision of high-quality care. Inadequate funding of health system functions has negative ramifications for health service provision, but so can imbalanced trends in facility expenditures and revenues. A system wherein more is spent than can be reimbursed through NHIS or recovered through funding sources can deplete program resources over time; at the same time, minimizing facility expenditures on health services, personnel, and supplies can have an equally detrimental effect, compromising the quality of care available to patients. As Ghana continues to assess the financial future of NHIS, determining how to achieve this monetary balancing act – adequately funding health system functions within set financial constraints – will be increasingly critical.

Facility expenditures

From 2007 to 2011, overall average expenditures by health facilities rose by 38%, from 818,420 cedi ($511,513) to 1,130,154 cedi ($706,346) (Figure 19). The greatest growth was seen in average expenditures on facility investments, rising from an average of 14,160 cedi ($8,850) in 2007 to 58,259 cedi ($36,411) in 2011. This growth is likely related to Ghana's focus on increasing the number of health facilities in the country and their corresponding service capacities. Average expenditures on facility administration and service provision also grew substantially between 2007 and 2011, rising 40% and 38%, respectively. From 2007 to 2011, health facilities spent more on personnel (30%); this trend was likely driven by increases in the average number of personnel staffing health facilities as well as the average salary provided per employee.

In disaggregating expenditure trends by platform type between 2007 and 2011 (Figure 20), less homogenous trends emerged. By 2011, hospitals, both regional referral and public, reported at least six times the expenditure of the next-highest-spending platform (private clinics). Average expenditures more gradually increased among most public facilities, whereas greater average spending increases were found for private clinics.

Looking at average expenditures for 2011, spending patterns across platforms were fairly heterogenous (Figure 21). The two hospital-based platforms featured nearly identical spending breakdowns, such that the majority of their expenditures were allocated to personnel and service. As the main public providers of primary care in Ghana, health centers and CHPS spent the most on personnel in 2011 (74% and 79%, respectively). Health centers spent 18% and CHPS allocated 15% of total expenditures to service provision. Maternity clinics posted the highest percentage of investments among the platforms (36%). This trend of spending on facility reinvestment like construction, equipment purchase, and building expansion was fairly consistent across maternity clinics. However, this finding may indicate that maternity clinics generally document facility investments with greater detail and consistency than other platform types. Service expenditures dominated pharmacy expenditures, driving 84% of total spending in 2011.

FIGURE 19 Average annual facility expenditure types, 2007–2011

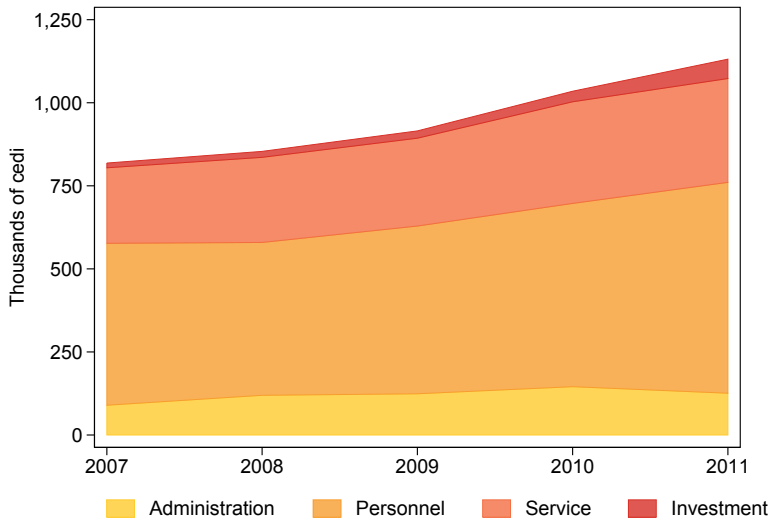


FIGURE 20 Average annual expenditures, by platform, 2007–2011

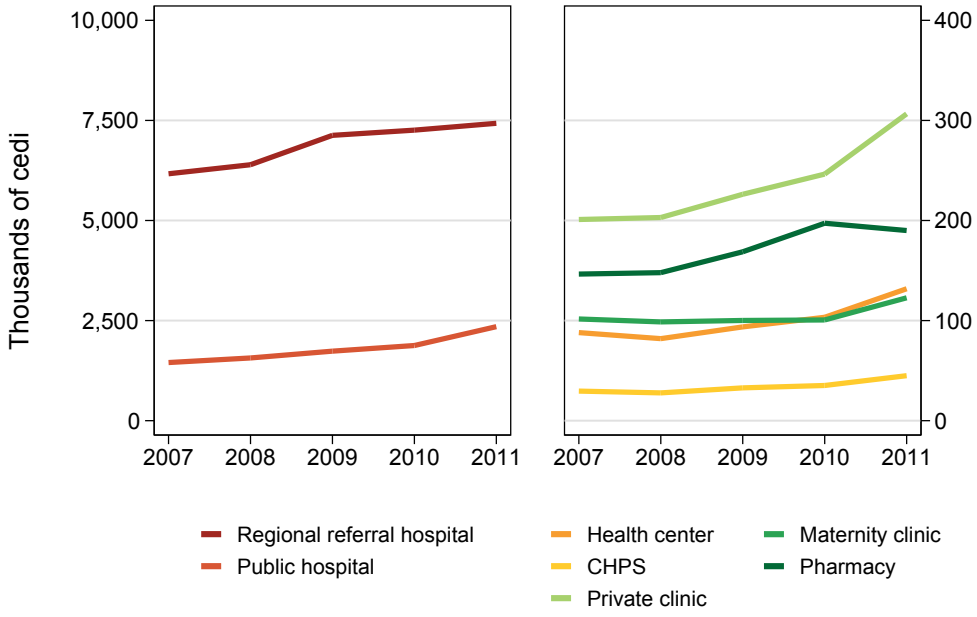


FIGURE 21 Average percent of expenditure types, by platform, 2011

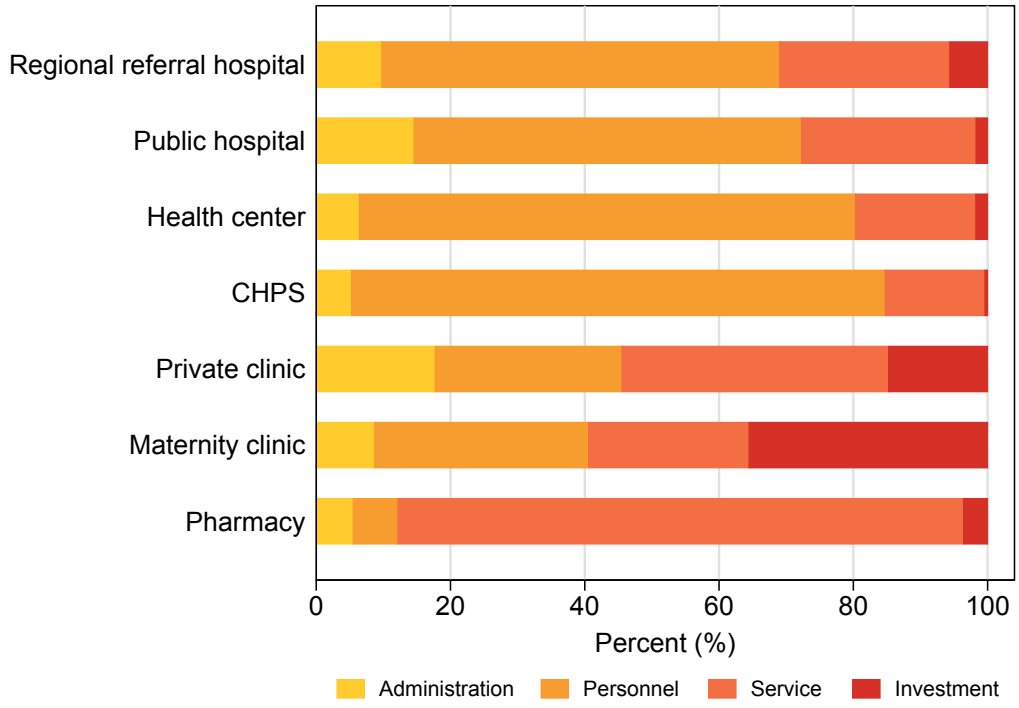


Figure 22 focuses on the expenditure trends over time for four important facility types in the Ghana health system: regional referral hospitals and public hospitals, as well as health centers and CHPS, which serve as the country's main public providers of primary care.

Across these four platforms, overall average spending increased between 2007 and 2011. Average spending on service generally grew more than expenditures on personnel, especially for health centers; from 2007 to 2011, health centers posted a 34% increase in spending on personnel but more than doubled their average expenditures on services. Regional referral hospitals recorded relatively less growth than the other platforms, increasing overall average spending by 20%, personnel by 6%, and service by 41%. Public hospitals reported higher rates of spending, increasing average total expenditures by 62%, personnel by 54%, and service by 56%. Some of the most interesting trends were found for CHPS, which posted a 52% increase in average total expenditures from 2007 to 2011. While average spending on personnel rose (35%), the percentage of total expenditures spent on personnel decreased from 2007 (83%) to 2011 (74%). At the same time, CHPS spending on service increased between 2007 and 2011, growing from 14% of total expenditures in 2007 to 19% by 2011.

Facility revenues

Although average overall spending appeared to slow in regional referral hospitals, their revenues exceeded expenditures each year (Figure 23). The ratio of revenue to expenditures remained fairly constant in regional referral hospitals, with a funding to spending ratio of 1.37 in 2007 and 1.28 in 2011. The ratio of revenue to expenditures was consistently lower in public hospitals over this period of time, recording a ratio of 1.05 in 2007 and 1.09 in 2011. The GOG directly funds personnel in most hospitals, and this was counted under both expenditures and revenues for these platforms.

In looking across all platforms, average annual revenue reported by health facilities in Ghana increased by an average of 30% across all facilities between 2007 and

FIGURE 22 Average annual facility expenditures, for a subset of platforms, 2007–2011

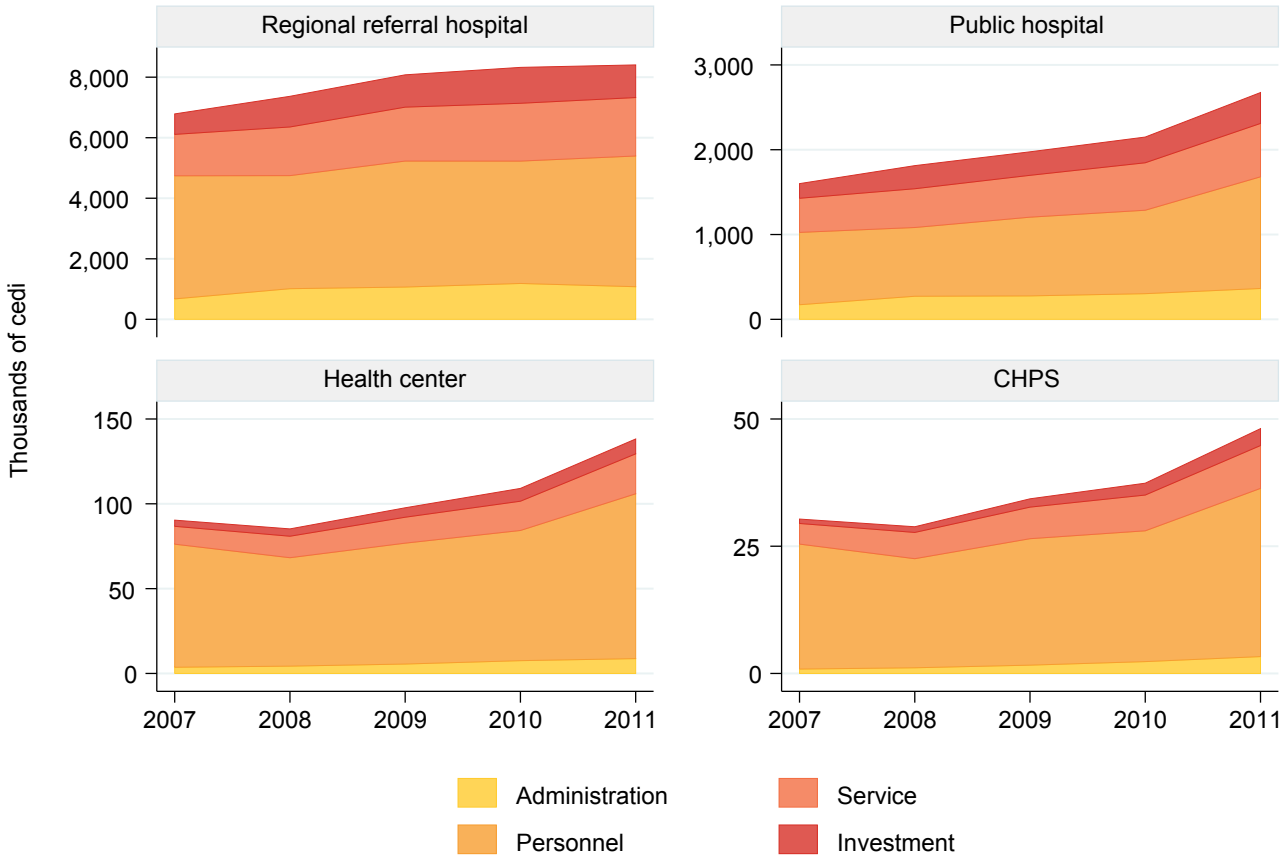
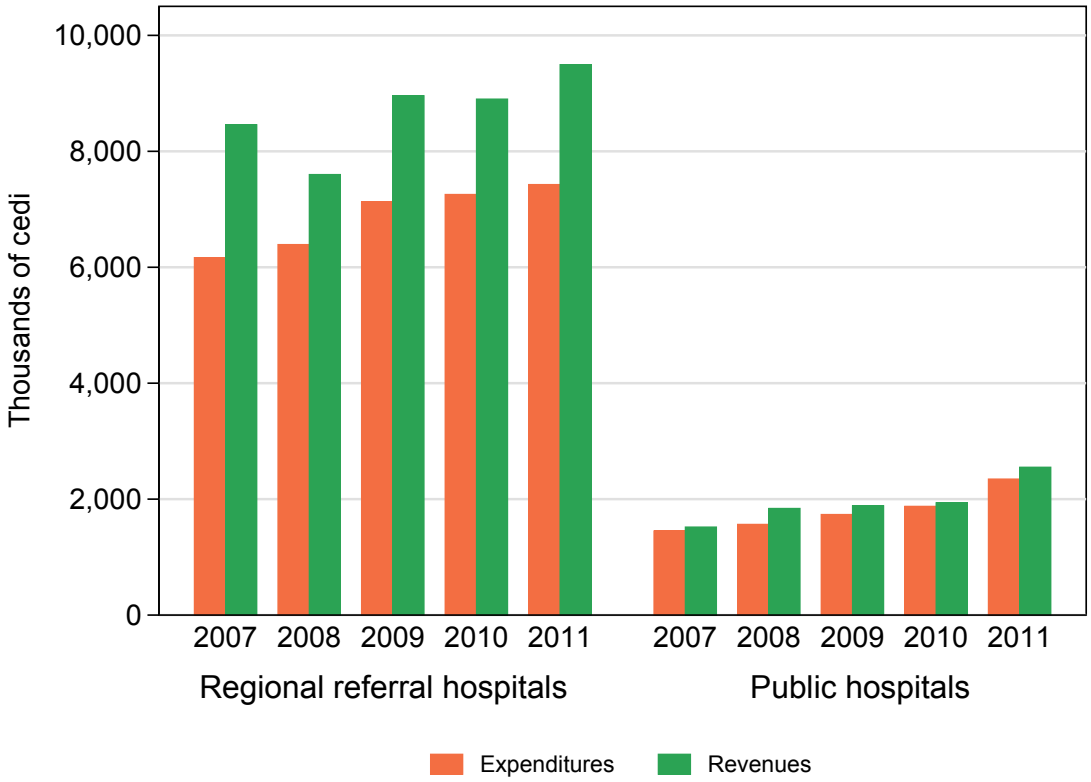


FIGURE 23 Average expenditures and revenues for regional referral hospitals and public hospitals, 2007–2011



2011, but not with universal consistency (Figure 24). Overall average revenue spiked in 2009 and 2011, largely driven by an increase of funds provided via NHIS. Between 2007 and 2011, NHIS-based funding more than doubled, with its fastest rise between 2007 and 2009. The percentage of total average funding from NHIS rose quickly, from 19% of average revenue from NHIS in 2007 to 33% in 2011. While funds from the GOG and C&C gradually increased from 2007 to 2011 (9% and 3%, respectively), their relative contributions – especially in light of increases from NHIS – declined. In 2007, funding from the GOG accounted for 52% of total revenue, and 28% came from C&C. Five fiscal years later, 44% of total average funding originated from the GOG and 23% came from C&C. Other sources of funding, which were donor-based or from individual NGOs, consistently contributed to about 1% of total funding reported by Ghana's health facilities.

Our findings for C&C, at first glance, may seem relatively low compared to past reports, which indicate the majority of Ghanaians still rely on the country's C&C system to pay for care (UHCC 2013). These differences are likely due to variances in the populations under consideration: facility-based revenue trends capture the types of funding generated by individuals who actually access the health system, whereas reports of those reliant on C&C reflect how people might pay for services if they seek care.

Notably, delays in NHIS reimbursements to providers have been reported throughout Ghana (Addae-Korankye 2013), which could lead to an underestimate of NHIS revenues recorded at facilities. Quantifying this gap in pending and received NHIS funding, and its relative magnitude across levels of care, is crucial for improving NHIS operations.

In disaggregating revenue trends by platform type between 2007 and 2011 (Figure 25), less homogenous trends emerged. By 2011, hospitals, both regional referral and public, reported at least six times the revenues of the next-highest-spending platform (private clinics). Average revenues more gradually increased among public facilities, whereas greater average spending increases were found for private clinics.

FIGURE 24 Average sources of revenue in health facilities, 2007–2011

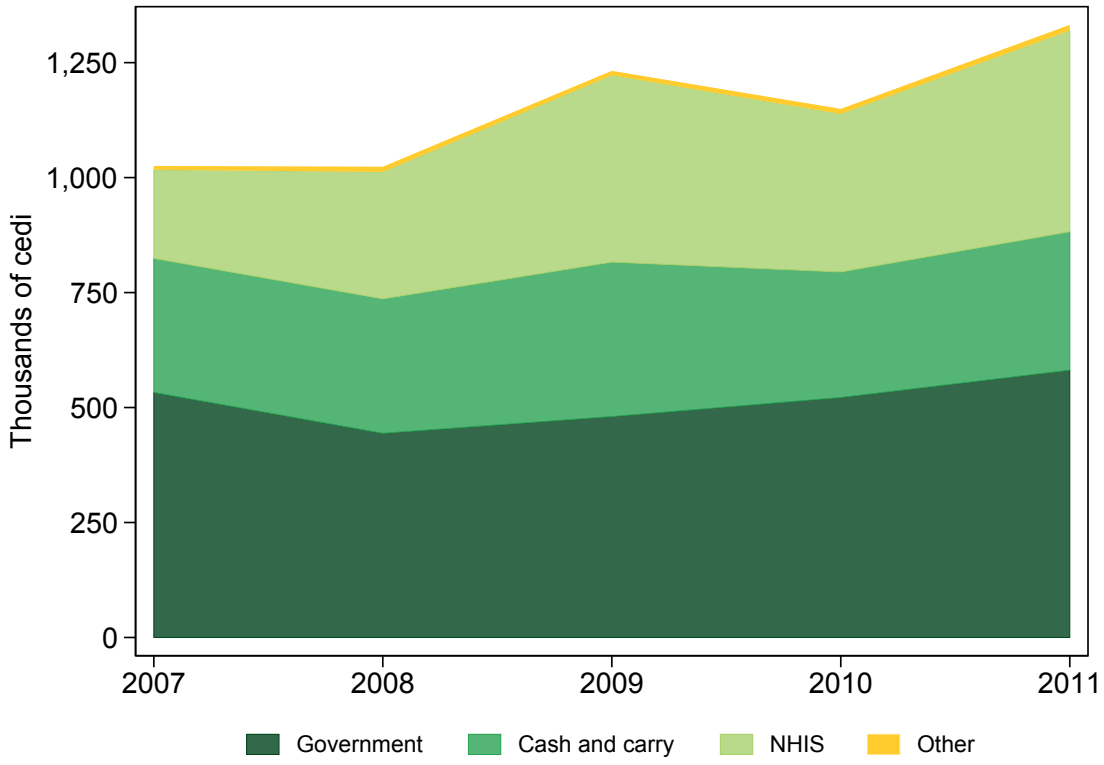
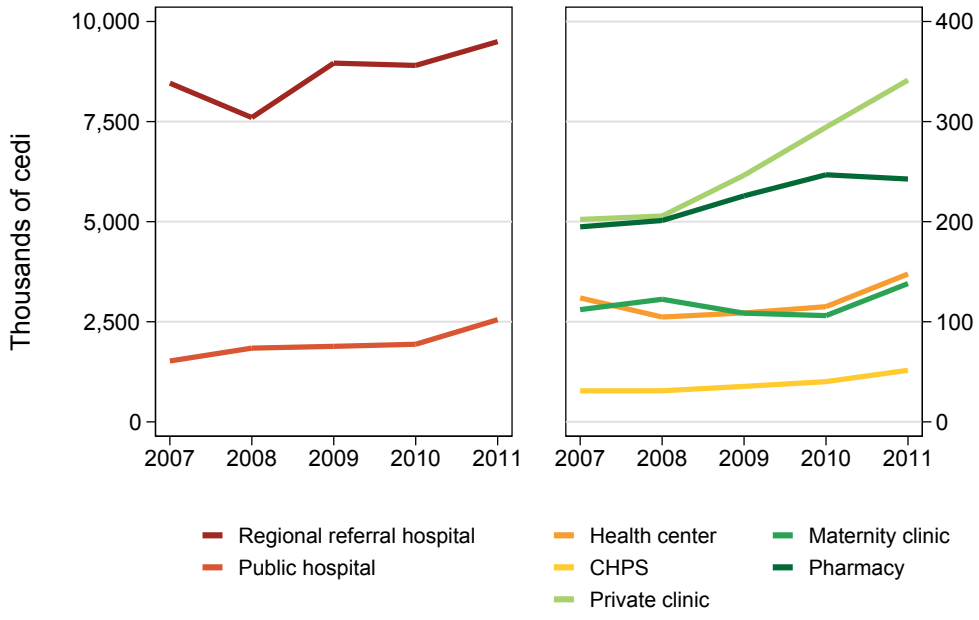


FIGURE 25 Average annual revenues, by platform, 2007–2011



When revenue source was broken down by platform for 2011, its composition widely varied by type of health facility (Figure 26). GOG-based funding dominated in health centers and CHPS, accounting for 73% and 76%, respectively, of platform revenue. It is important to note that the salaries of facility personnel directly paid by GOG were included for GOG-based funding. In 2011, NHIS reimbursements accounted for 71% of all funding recorded in maternity clinics, as well as 49% of funding reported by public hospitals and 51% by private clinics. Since health insurance began covering intrapartum care in 2008 as part of Ghana's free maternal healthcare initiative (Witter et al. 2009), it is not surprising that such a high percentage of funding in maternity clinics came from NHIS in 2011. In fact, the average percentage of NHIS-based funding recorded in maternity clinics jumped between 2007 and 2008 (from 60% to 69%), and has varied between 70% and 76% since 2009. C&C, which includes out-of-pocket payments, made up the majority of private facility revenues, accounting for 73% and 43% of revenues in pharmacies and private clinics in 2011.

Figure 27 focuses on the funding trends over time for a subset of platform types – hospitals, health centers, and CHPS – within the Ghanaian health system.

Funding increased across all platforms between 2007 and 2011, but overall growth was much more variable, ranging from a 12% increase in regional referral hospitals to a 68% increase in public hospitals. Funding from NHIS escalated the most from 2007 to 2011, rising more than 300% among health centers and CHPS. Aside from CHPS, revenue from C&C declined in regional referral hospitals, public hospitals, and health centers from 2007 to 2011, with reductions ranging between 13% and 20%. This trend may reflect the impact of NHIS affiliation rates on reducing out-of-pocket medical expenses, a major goal of Ghana's NHIS.

In 2011, funding from the GOG still remained the leading revenue source for all platforms except for public hospitals. Starting in 2008, the percentage of funding coming from NHIS started to surpass GOG at public hospitals and accounted for 53% of all funding by 2011. GOG funding was the dominant source for CHPS in 2011 (69%), which was largely driven by personnel directly paid for by the GOG; however, this funding source was even more prominent in 2007 (85%), while the average percentage of NHIS-based funding steadily increased from 2007 (8%) to 2011 (25%). These trends likely reflect the substantial expansion of CHPS throughout Ghana, as well as the personnel and corresponding services they provide through the CHPS platform.

FIGURE 26 Average percent of revenue sources, by platform, 2011

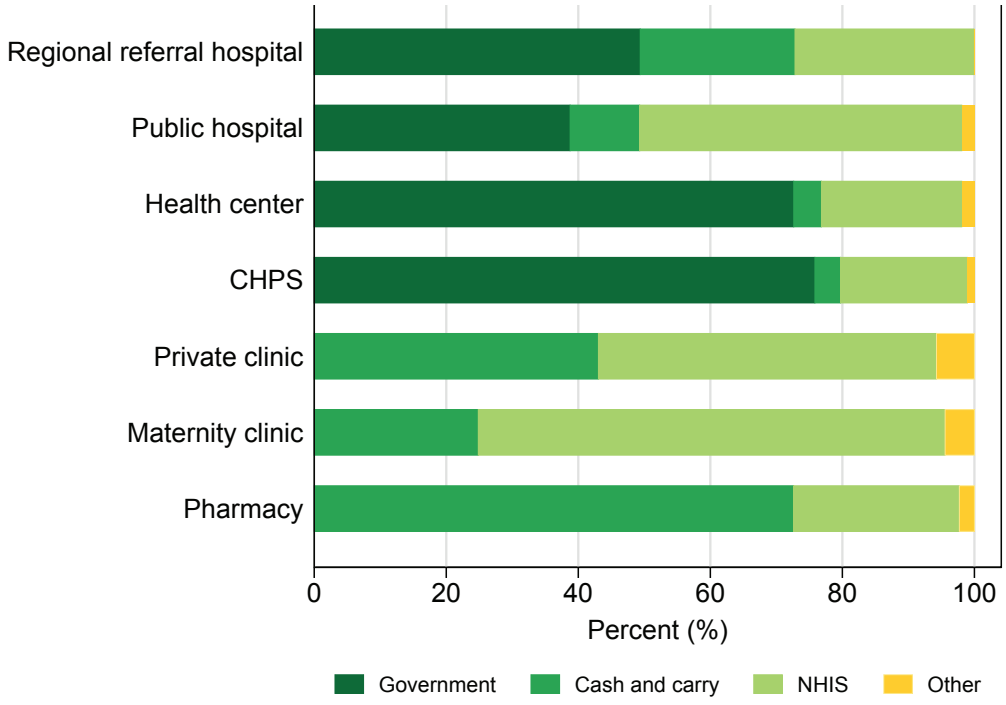
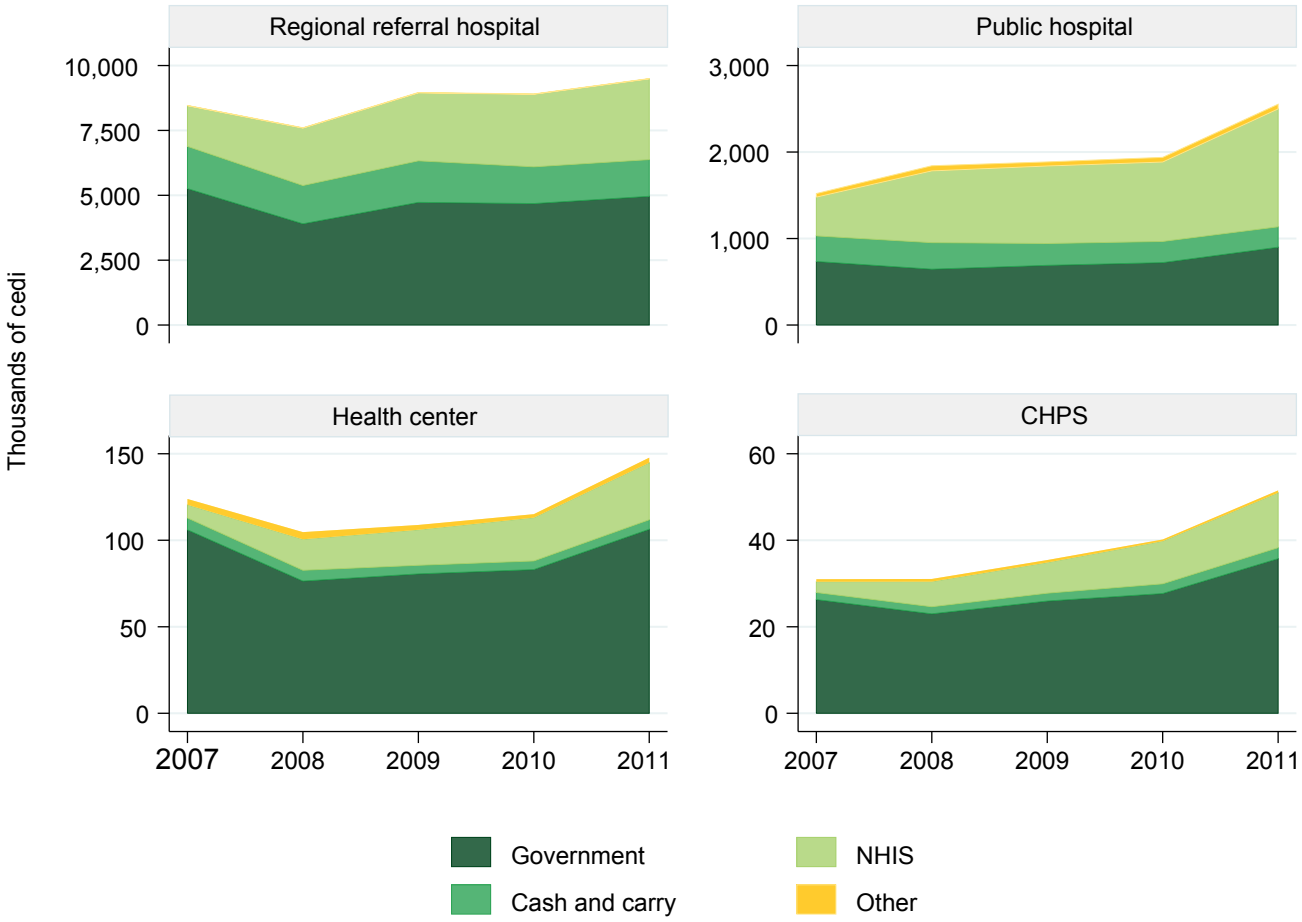


FIGURE 27 Average sources of revenue, for a subset of platforms, 2007–2011



Efficiency and costs of care

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. In aggregate, a health system's mixture of efficient and inefficient health facilities can shape how easily patients can receive care and costs incurred to the institutions, such as NHIS, that ultimately fund service provision.

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 three groups: outpatient visits, inpatient bed-days, and births. 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 and one birth was equivalent to 10.9 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.

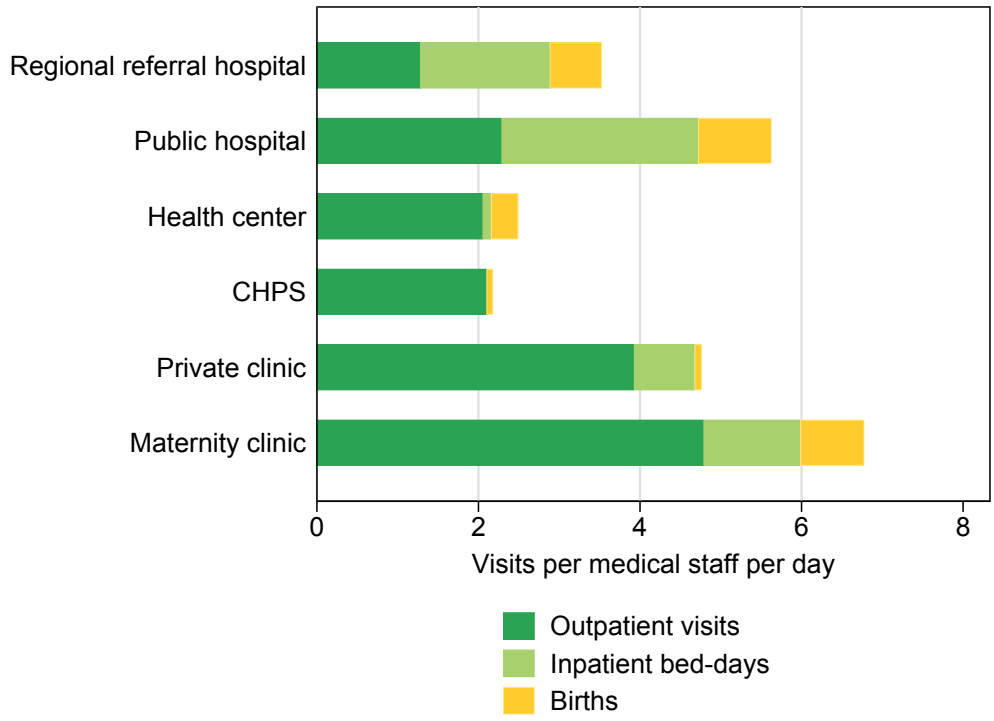
Efficiency

Both across and within platforms, we found a sizeable range in health-service production and efficiency scores among Ghanaian 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 over two visits at CHPS to about 6.8 visits at maternity clinics (Figure 28). Across all platforms, facilities averaged four visits per medical staff per day in 2011. Notably, private and maternity clinics recorded a greater number of outpatient equivalent visits per medical staff per day (an average of 5.5) than public facilities (about three visits per medical staff per day).

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 lower levels of care, particularly health centers and CHPS. For inpatient bed-days, as reported in outpatient equivalent visits, public hospitals had the highest outputs per medical staff per day (2.4), 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 82% of facilities scoring 50% or lower. Second, the range between the facilities with highest and lowest efficiency scores was quite large within

FIGURE 28 Range and composition of average output production across platforms, 2011



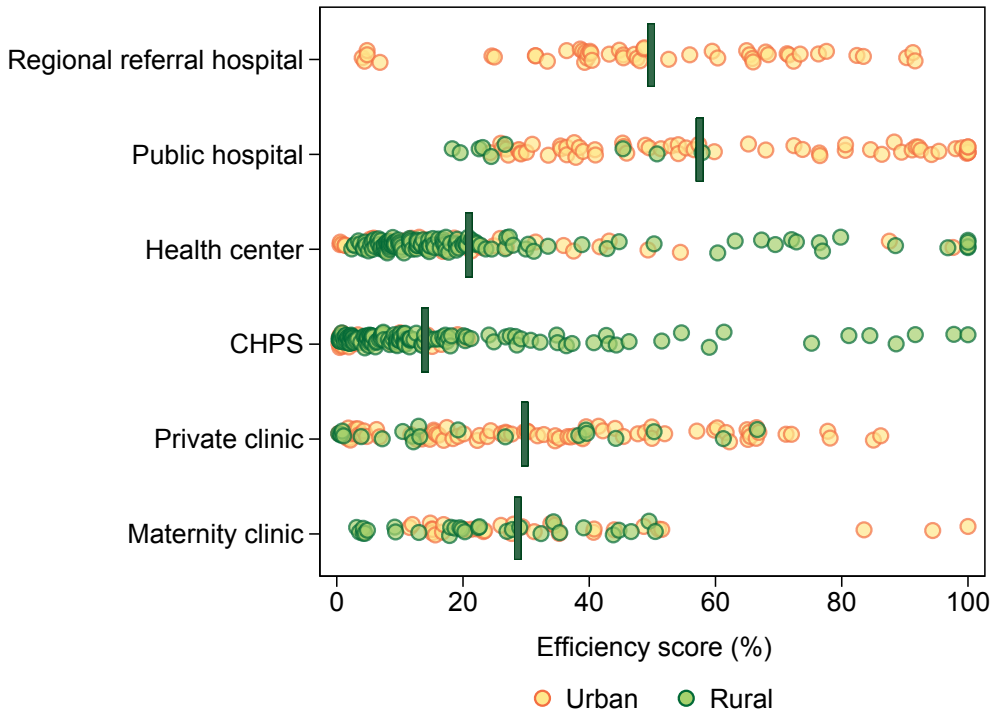
Note: All visits are reported in outpatient equivalent visits estimated at the facility level. Conversion to outpatient equivalent visits varied across facilities; on average, one inpatient bed-day was equivalent to 3.8 outpatient visits, and one birth was equivalent to 10.9 outpatient visits.

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 29 depicts this range of facility efficiency scores across platforms.

Larger facilities (regional referral hospitals and public hospitals) generally had much higher efficiency scores than smaller facilities (health centers and CHPS), suggesting that Ghana's hospitals are generally busier than the country's primary care facilities. At the same time, there was some overlap at each end of the efficiency spectrum. Except for regional referral hospitals and private clinics, at least one facility within each platform recorded an efficiency score of 100%. Further, multiple facilities at lower levels of care had efficiency scores close to 0%. More urban public hospitals appeared to have higher efficiency scores than rural public hospitals, whereas the relationship between facility location and its efficiency score was less clear-cut among public primary care facilities (health centers and CHPS). Urban private clinics and maternity clinics had a greater range of efficiency scores than their rural counterparts; for example, urban private clinics averaged an efficiency score of 32%, with a range of less than 1% to 86%, and rural private clinics scored an average of 22%, ranging from less than 1% to 67%.

Table 4 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 health centers with the lowest efficiency scores, for example, averaged more beds than health centers with the highest efficiency scores, whereas the opposite was true for private clinics (facilities with the highest efficiency scores had more beds than those with the lowest levels of efficiency). Maternity clinics with the highest efficiency scores averaged fewer outputs than the least efficient facilities, while other facility types with the highest efficiency scores averaged substantially larger patient volumes than those with the lowest scores.

FIGURE 29 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.

TABLE 4 Facility characteristics across efficiency score performance, by platform, 2011

INDICATOR	REGIONAL REFERRAL HOSPITAL		PUBLIC HOSPITAL		HEALTH CENTER		CHPS		PRIVATE CLINIC		MATERNITY CLINIC	
	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	**72%**	**5%**	**96%**	**22%**	**74%**	**4%**	**81%**	**1%**	**68%**	**1%**	**45%**	**8%**
Average outputs												
Outpatient visits	195,262	39,247	72,920	27,423	9,601	2,852	9,329	721	24,363	644	1,439	3,893
Inpatient bed-days	117,895	4,472	40,090	12,138	4,380	N/A	N/A	N/A	2,313	N/A	688	N/A
Births	3,533	N/A	1,819	625	679	33	148	2	40	7	89	155
Total patient volume	321,455	43719	115,940	39,890	11,205	2,885	9,378	722	25,147	646	1,872	3,971
Average inputs												
Beds	328	473	120	74	3	8	4	1	11	6	5	9
Doctors	54	6	2	2	0	0	0	0	1	1	0	0
Nurses	299	154	65	45	9	5	3	3	5	2	1	3
Other medical staff	103	180	6	39	1	8	0	6	2	1	0	4
Non-medical staff	295	230	132	42	9	4	2	18	8	3	2	6
Total number of facilities	**1**	**1**	**2**	**2**	**4**	**4**	**3**	**4**	**3**	**3**	**2**	**2**

Note: "N/A" under outputs indicates that the facility or facilities reported that they did not provide a given service. 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 it did not provide a given service, it was not included in calculating the average number of annual outputs for that service.

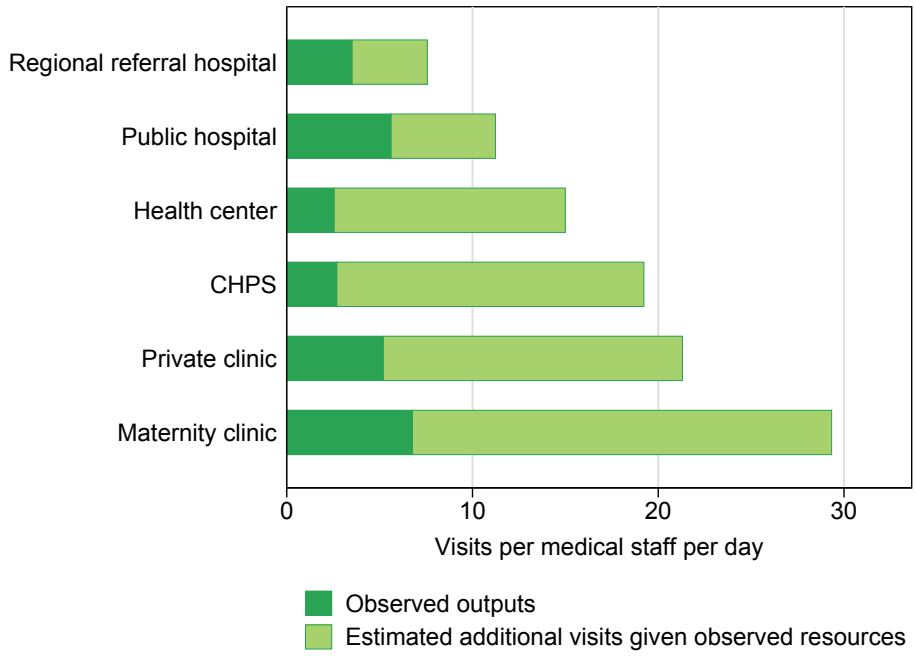
Private clinics with the highest efficiency scores average more skilled medical personnel per facility than those with the lowest efficiency scores, yet for all other primary care platforms, facilities with the lowest efficiency scores averaged more medical staff than facilities with the highest levels of efficiency. In sum, the efficiency with which health facilities operate in Ghana is likely affected by several factors, including but certainly not limited to facility-based capital and patient volumes.

As shown in Figure 29, a large portion of health facilities in Ghana 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 30 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 CHPS, had the greatest potential for increasing service provision without expanding current resources. Overall, based on our estimation of efficiency, a large portion of Ghanaian 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, through which the vast majority of Ghanaian health centers

FIGURE 30 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, and one birth was equivalent to 10.9 outpatient visits. Using outpatient equivalent visits, we estimated the average additional visits facilities could have produced, given observed inputs, in 2011.

showed high levels of inefficiency (Akazili et al. 2008) and hospitals recorded a wide range of efficiency (Jehu-Appiah et al. 2014). At the same time, other reports and policy documents emphasize that pronounced deficiencies in human resources for health exist throughout Ghana (WHO and GHWA 2008, GHS 2011), and that facility staffing is a significant, if not the greatest, constraint to increasing health service provision. 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. These findings have substantial implications for Ghana's health system, particularly as policymakers consider ways to maintain or further expand NHIS-supported services within constrained budgets and funding deficits (UHCC 2013).

Compared to the other sub-Saharan African countries currently included in the ABCE project (IHME 2014b, IHME 2014c, IHME 2014d), we found that, on average, Ghana performed at lower levels of efficiency (Table 5). In Ghana, the average efficiency score across all facilities was 27% in

TABLE 5 Average efficiency scores and estimated additional outpatient equivalent visits, given observed facility resources, by country

INDICATOR	GHANA	KENYA	UGANDA	ZAMBIA
Average efficiency score, across platforms	27%	41%	31%	42%
Average observed outpatient equivalent visits per medical staff per day	4	7	5	8
Average estimated additional visits given observed facility resources	13	12	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, and one birth was equivalent to 10.9 outpatient visits.

2011, which was moderately lower than the average score for Uganda (31%). Ghana's average efficiency score across facilities was much lower than Kenya's (41%) and Zambia's (42%). Ghana featured one of the lower percentages of facilities operating at high levels of efficiency, with 5% of all facilities recording an efficiency score of 80% or higher in 2011. By comparison, 10% of Kenyan and 14% of Zambian 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 Ghana could add an average of 13 visits per medical staff per day, as measured in outpatient equivalent visits. We found similar results for Zambia in terms of absolute potential for expansion; in relative terms, however, the average health facility in Zambia was already producing twice as many visits as the average facility in Ghana.

These findings provide a data-driven understanding of facility capacity and how health facilities have used their resources in Ghana; 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 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

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 three types of facility output (outpatient visits, inpatient bed-days, and births) 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 cedi. All US dollar estimates were based on the 2011 exchange rate of 1.60 cedi per $1.

As illustrated by Figure 31, outpatient visits cost the least to provide across most platforms, ranging from 14 cedi ($4) at maternity clinics to 33 cedi ($10) at regional referral hospitals. Across all platforms, births were the most expensive output for facilities to produce; however, the average cost per birth ranged from 120 cedi ($38) at maternity clinics to 445 cedi ($139) at regional referral hospitals. The latter spent the most per patient visit across all services they provided, while maternity clinics generally produced the least expensive services across visit types; the exception was the average inpatient bed-day costs, which were lowest at health centers (22 cedi [$7]). Notably, health centers averaged similar costs for providing outpatient visits and inpatient bed-days, whereas other platforms saw inpatient bed-day costs exceeding those of outpatient visits by a minimum of 100%. Facility-based costs of care at private clinics were more simlar to average costs recorded at public hospitals than those estimated for other primary care facilities.

FIGURE 31 Average facility cost per visit, across output types and by platform, 2011

		REGIONAL REFERRAL HOSPITAL	PUBLIC HOSPITAL	HEALTH CENTER	CHPS	PRIVATE CLINIC	MATERNITY CLINIC
Outpatient visit	**(in 2011 cedi)**	**33**	**16**	**23**	**26**	**18**	**14**
	(in 2011 USD)	$10	$5	$7	$8	$5	$4
Inpatient bed-day	**(in 2011 cedi)**	**91**	**47**	**22**		**62**	**35**
	(in 2011 USD)	$28	$15	$7		$19	$11
Birth	**(in 2011cedi)**	**445**	**372**	**130**	**151**	**309**	**120**
	(in 2011 USD)	$139	$116	$41	$47	$97	$38

HIGHEST COST — LOWEST COST

Note: All cost estimates are in 2011 cedi, with 1.60 cedi equaling 1 USD.

In comparison with Kenya, Uganda, and Zambia (IHME 2014b, IHME 2014c, IHME 2014d), the average cost per patient in Ghana was generally higher (Table 6). Ghana recorded the highest average facility cost per outpatient visit, at 22 cedi ($22), as well as birth, at 219 cedi ($137). The average facility cost per inpatient bed-day at Ghanaian facilities was on the higher end, registering just below average costs found in Kenya and Uganda.

It is important to note that these facility cost estimates do not reflect the quality of care associated with service delivery. Using per-output costs as a proxy for service quality supposes a direct association between facility spending and health care quality, a relationship that, in practice, widely varies across countries and health care settings (Hussey et al. 2013, Skinner et al. 2009, Peabody et al. 1998, Supratikto et al. 2002). Quantifying facility costs is a critical step to understanding what goes into producing health services. To better determine the drivers of improved health, future analyses should consider assessing the linkages between costs of care and health outcomes experienced by patients.

TABLE 6 Average facility cost per visit across output types, for a subset of ABCE countries, 2011

OUTPUT TYPE		GHANA	KENYA	UGANDA	ZAMBIA*
Outpatient visit	**(in 2011 cedi)**	**22**	**16**	**14**	**14**
	(in 2011 USD)	$14	$10	$8	$9
Inpatient bed-day	**(in 2011 cedi)**	**62**	**66**	**66**	**33**
	(in 2011 USD)	$39	$41	$41	$21
Birth	**(in 2011 cedi)**	**219**	**170**	**120**	**101**
	(in 2011 USD)	$137	$106	$75	$63

* 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. All cost estimates are in 2011 cedi, with 1.60 cedi equaling 1 USD.

Conclusions and policy implications

To achieve its mission of improved health and vitality for all Ghanaians, the country 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. Ghana's expansion of NHIS and its ongoing efforts to maintain coverage serve as a prime example of how the country has prioritized enhancing health system performance. Our findings show that Ghana's long-term health 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.

From the largest hospitals to some of Ghana's smaller health clinics, the average number of total personnel in health facilities increased 69% between 2007 and 2011. In hospitals, between 40% and 50% of all employees were typically non-medical staff; however, over time, the composition of non-medical personnel in hospitals remained relatively constant. As compared with 2007, an average of 35% more doctors were found in regional referral hospitals in 2011, gaining an additional 11 doctors, on average, per facility during those five years. In CHPS, other types of personnel – like nurses and midwives – saw growth, averaging an added nurse or midwife per CHPS between 2007 and 2011. These kinds of gains in medical staffing at facilities have the potential to support expanded service provision throughout Ghana.

Across platforms and regions, Ghana's health facilities showed a range of health service provision in terms of their capacity to diagnose, treat, and prevent many health conditions. Having adopted ACTs as the country's first-line treatment for uncomplicated malaria in 2005 (MOH 2009), health facilities in Ghana generally reported high availability of at least one type of ACT across platforms and regions. Of the two types of ACTs stocked in Ghana, AL (or Coartem) tended to be more available than AS+AQ across platform types and appeared to be stocked out less frequently. A range of factors may account for these ACT availability and stock-out trends; for example, a general preference for AS+AQ by consumers may drive lower availability and higher rates of stock-outs, or price differences based on drug purchasing source may influence the stocks and flows of different ACTs (MOH 2009). Aside from hospitals, health facilities in Ghana less consistently stocked ACTs and rapid-diagnostic tests (RDTs) at the same time, although both are needed for proper malaria case management.

While Ghana's HIV/AIDS burden is relatively low in comparison to neighboring countries, the magnitude of healthy life lost to HIV/AIDS has grown within Ghana in the last two decades (Murray et al. 2014). Correspondingly, hospitals in Ghana stocked a variety of ARVs, with 60% of regional referral hospitals providing all first-line drugs. Nonetheless, ARV stock-outs were not uncommon, with 30% of these hospitals experiencing recent stock-outs of at least one ARV. At least 90% of hospitals in Ghana appeared to provide HIV testing, which is important for an optimal continuum of care for HIV/AIDS. Aside from CHPS and maternity clinics, however, malaria testing capacity was much more prevalent across platforms than HIV diagnostics.

Given the burgeoning private market for pharmaceuticals, it is not surprising that Ghana's health facilities procure pharmaceuticals from a blend of public and private sources. In 2011, public hospitals showed the greatest variability, with about 10% of facilities only using public sources, 17% only procuring drugs through private markets, and 70% of facilities acquiring pharmaceuticals from both public and private sources. While privately owned facilities largely sought pharmaceuticals from private sources, many facilities also acquired pharmaceuticals from the public sector. This diversity of pharmaceutical markets in Ghana has substantial implications for the country's regulatory capacity, particularly for ensuring that first-line medicines are properly stocked and prescribed.

Effective vaccine storage capacity widely varied by platform, which is not surprising given that not every platform type is necessarily supposed to have this functionality; among the sampled facilities, 61% of facilities reported any routine vaccine storage. Of these facilities, 25% reported routine vaccine storage temperatures outside the recommended range. This finding seemed to be related to the presence of a temperature monitoring chart, as 56% of facilities that stored vaccines outside the recommended temperature range did not have a chart. By comparison, 90% of facilities that kept a temperature monitoring chart within their vaccine storage facilities had proper thermal conditions for vaccine storage.

Facility production of health services

With private clinics as the clear exception, average patient volumes gradually grew between 2007 and 2011 across most platforms. Shortages in human resources and overcrowding of facilities are viewed as widespread in Ghana (WHO and GHWA 2008, GHS 2011), but we found that most facilities averaged about four visits per medical staff each day in 2011. These four visits are observed in outpatient equivalent visits, which means that many health personnel may see even fewer patients per day given that inpatient bed-days equate to multiple outpatient visits. Outpatients largely accounted for the greatest proportion of daily visits per medical staff.

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 Ghana had an efficiency score of 27%. With this information, we estimated that facilities could substantially increase the number of patients seen and services provided each year – by an average of 13 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 Ghana, we found that a subset of facilities, particularly in urban 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 these findings 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; the optimal provision of services (e.g., some facilities with high efficiency scores had stocked out of first-line ARVs); 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 Ghanaian health facilities could potentially expand service provision without necessarily increasing personnel or bed capacity in parallel. These findings are immediately relevant to Ghana's current policy discussions about the financial future of NHIS, particularly as policymakers try to find ways to reduce inefficiencies and funding deficits (UHCC 2013).

In harnessing the wealth of data collected in other countries in sub-Saharan Africa, we found that Kenya, Uganda, and Zambia also demonstrated substantial potential for service expansion. However, Ghana showed the greatest potential, as the country's average efficiency score was well below those estimated for the other countries. This finding suggests that Ghana has the facility-based capacity, given observed resources, to markedly increase service delivery more than the other sub-Saharan African countries currently included in the ABCE project.

Costs of care

Aligning with the country's increased health system investments and emphasis on expanding health services via NHIS, overall facility expenditures increased by 38% between 2007 and 2011. While spending on personnel generally accounted for the greatest proportion of expenditures, substantial growth in expenditures on service provision was documented from 2007 to 2011 (38%). Facility-based revenues and funding also increased (30% across all facilities between 2007 and 2011). Increases in revenue may be a reflection of multiple factors, such as increased health service utilization, efficient insurance reimbursements, more patient visits involving complicated and increasingly expensive treatment, and escalating drug fees relative to other facility costs. While funds from all sources generally increased between 2007 and 2011, the composition of revenue sources changed over time. For instance, NHIS reimbursements accounted for a larger proportion of funds in 2011 (33%) than in 2007 (19%). At the same time, the proportion of funding from the GOG and C&C steadily

declined; the GOG, for instance, accounted for 52% of total funding in 2007 across facilities and decreased its relative contributions to 44% by 2011. The country's average facility revenue from NHIS increased, but less steadily, rapidly increasing between 2008 and 2009 before sliding in 2010 and rising again in 2011. It is possible that the NHIS reimbursement system, as well as membership renewal, is still in flux in Ghana, and that such variations in NHIS revenue likely reflect multifaceted insurance scheme dynamics and its phased-in implementation throughout the country.

When revenue source was broken down by health service platform, ranging from hospitals to pharmacies, a more heterogeneous picture emerged. Funds originating from the GOG accounted for over 70% of revenue for health centers and CHPS, whereas NHIS contributed closer to 20% of total funding for these platforms in 2011. These composition trends likely reflect the high prevalence of GOG-funded personnel working at health centers and CHPS. Public hospitals and maternity clinics received relatively more funding via NHIS, which was not necessarily surprising given NHIS reimbursement guidelines and the country's maternal health care plan (Witter et al. 2009). Facilities sampled from the private sector (i.e., private clinics and pharmacies) derived nearly all revenue through a combination of C&C and NHIS.

Average facility costs per patient visit differed across platforms and types of visit. Outpatient visits 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 regional referral hospital was over twice as high as that of an outpatient visit at a maternity clinic. Births were by far the most expensive output to produce across all platforms, incurring a minimum of five 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.

Compared with other countries involved in the ABCE project, the average cost per patient was generally higher in Ghana, particularly for births. These results offer insights into each country's health financing landscape, a key component of health system performance, in terms of cost to facilities and service production across outputs. These costs do not reflect the quality of care received or the specific services provided for each visit, but 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.

In combination, Ghana's relatively low levels of facility efficiency and high costs of service production emphasize the country's current health system challenges. While it is possible that increasing overall facility patient volumes would reduce average facility costs of care, other factors, such as decreasing the turnaround time for NHIS provider reimbursements and restructuring aspects of overall NHIS financing, may have an even more influential role in improving health service production in Ghana.

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 Ghana, 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 Ghana 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 Ghana.

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