Assessing the Surgical and Obstetrics-Gynecology Workload of Medical Officers

Findings From 10 District Hospitals in Ghana

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Hypothesis: Surgical and obstetrics-gynecology (Ob-Gyn) workload of medical officers (MOs) is substantial and may inform policies for training investment and surveillance to strengthen surgical care at district hospitals in Ghana.

Design: Observational study.

Setting: Academic research.

Participants: Using standardized criteria, 12 trained on-site observers assessed the surgical and Ob-Gyn workload of MOs at 10 district hospitals in each of 10 administrative regions in Ghana, West Africa. The number of patients seen by MOs and the time spent managing each patient were recorded. According to each patient's diagnosis, the encounters were categorized as medical/nonsurgical, Ob-Gyn, or surgical.

Main Outcome Measures: The proportions of patients having Ob-Gyn and surgical conditions and the time expended providing care to Ob-Gyn and surgical patients.

Results: Of the observed patient encounters, 1600 (64.5%) were classified as medical or nonsurgical, 514 (20.7%) as Ob-Gyn, and 368 (14.8%) as surgical (9.0% nontrauma and 5.8% trauma). The most common diagnosis among Ob-Gyn patients was obstetric complication requiring cesarean section. The most common diagnosis among surgical patients was inguinal hernia. Medical officers devoted 24.8% of their time to managing Ob-Gyn patients and 18.9% to managing surgical patients (which included 5.4% for the management of traumatic injuries).

Conclusions: Surgical and Ob-Gyn patients represent a substantial proportion of the workload among MOs at district hospitals in Ghana. Strategies to increase surgical capacity at these facilities must include equipping MOs with the appropriate training and resources to address the significant surgical and Ob-Gyn workload they face.


Surgical conditions constitute more than 7% of the disease burden in sub-Saharan Africa, yet surgical care has been neglected on the public health agenda in Africa and other low- and middle-income regions.1,2 Globally, an estimated 234 million major surgical procedures are performed annually, yet the poorest one-third of the world's population benefit from only 3% to 5% of these interventions.3 The available literature documenting a lack of access to emergency and essential surgical care in sub-Saharan Africa illustrates a need for surgical care evaluation through a public health framework.1,3,5 Surgical care is increasingly recognized as critical to the prevention and treatment of disease. Male circumcision is a major public health intervention: it significantly reduces the risk of human immunodeficiency virus infection among men in sub-Saharan Africa, particularly among at-risk individuals.6 Recent evidence shows that the provision of surgical care can be cost-effective in low- and middle-income countries, discounting views that it is too expensive and is excessively resource intensive.7,8 Building surgical capacity at district hospitals has been championed as the most effective means to improve access to emergency and essential surgical care because these hospitals are usually the first point of access to surgical care in sub-Saharan Africa and in other low- and middle-income countries.5,9,10 Attaining suitable approaches to increase surgical and obstetrics-gynecology (Ob-Gyn) capacity necessitates a better understanding of the surgical and Ob-Gyn workload at the district level.

See Invited Critique at end of article

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Ghana, West Africa, was chosen as the location for this study and represents an ideal locale because of existing collaborative relationships between the study team and physicians in Ghana and the Ghana Health Service. Furthermore, Ghana's National Healthcare Insurance program and widespread district hospital system are an ideal setting for research on surgical care at the district level. District hospitals provide medical care under the supervision of a medical officer (MO). Medical officers are physicians who have completed at least a 2-year internship (or “housemanship”) following graduation from medical school. The housemanship program consists of 6-month rotations in internal medicine, pediatrics, surgery, and Ob-Gyn. The surgical rotation is spent in different surgical subspecialty units.11

In a study assessing surgical and Ob-Gyn capacity of district hospitals in Ghana, Choo et al12 surveyed infrastructure characteristics, personnel, equipment, and surgical, obstetric, and anesthesia procedures at 17 hospitals in Ghana. They found that more than 75% of hospitals had adequate resources to provide general patient care and basic intraoperative care; however, only 29% had a formally trained surgeon, and only 36% had a formally trained obstetrician available. Also, 13 of 14 MOs interviewed had no formal surgical training beyond housemanship, during which they had performed only 4 to 8 major surgical procedures.11

The present observational study assessed the workload of MOs at 10 district hospitals in Ghana (1 in each of 10 administrative regions). Medical officers were observed across the spectrum of their clinical duties, including inpatient ward rounds, outpatient clinic, operative cases, and emergency department consultations. The objectives of the study were to determine the proportion of patients seen by MOs with surgical and Ob-Gyn conditions and the time expended providing care to these patients.

## METHODS

### STUDY SETTING

The study was conducted in Ghana, a low-income West African country with an annual per capita gross domestic product of $1098 and a population of 23.8 million.13 The administration of Ghana is divided into 10 regions and further into 110 districts. Government health services are administered by the Ghana Health Service, which operates at national, regional, and district levels.14 Community health centers, the smallest unit of the health delivery system, provide basic preventive and curative services. District hospitals provide preventive and curative services (including surgical care), serve populations of 100,000 to 200,000, and are the first referral center from community health centers.14 Regional hospitals serve as referral centers for district hospitals and provide more specialized health care.

### HOSPITAL SELECTION

Ten district hospitals, 1 from each of 10 administrative regions (Apam, Begoro, Ashanti, Brong Ahafo, Northern, Dodowa, Volta, Upper East, Western, and Upper West regions), were selected for inclusion in the study. The district hospitals represented a convenience sample based on existing relationships with physicians in Ghana and the availability of MOs to participate in the study. Although the facilities assessed do not constitute a representative sample of Ghanaian district hospitals, they serve large patient populations and are situated in diverse geographic locations in Ghana.

### STUDY TEAM AND LOGISTICS

This study was independently approved by the Institutional Review Board of The Johns Hopkins Bloomberg School of Public Health and by the ethics review committee of the Ghana Health Service. The study team consisted of students from The Johns Hopkins Bloomberg School of Public Health (W.T.M., K.W., L.M., and A.C.), each of whom worked in tandem with a Ghanaian team member recruited from the University of Ghana Medical School (V.E.K.T. and E.N.O.O.). Twelve team members were trained in the same standardized observation technique. Time and patient assessment methods were pilot tested by the entire observation team for 2 days before study initiation to standardize patient encounter timing procedures and patient categorization using the assessment tool. Interrater responses were compared, and all discrepancies and inconsistencies were reconciled during this time to ensure reliable results across facilities.

Data collection was conducted during a 14-day study period. On the basis of facility size, 1 or 2 study team members were placed in each district hospital. At the individual facilities, each study team member was assigned to observe 1 MO daily using the assessment tool during a period averaging 5 days (range, 4-6 days), including at least 1 weekend day. A 6-day observation period was achieved in 70.0% of hospitals during the study. This approach enabled simultaneous assessments at multiple district hospitals during the same period. At facilities where MOs outnumbered the study team, a different MO was randomly selected for observation each day of the observation period. A typical workday consisted of 8 to 12 hours, and no direct observation occurred overnight; however, an overnight log was kept to record the patients seen. Time expended was not recorded for these patient encounters.

### DATA COLLECTION

At each facility, a standardized assessment tool was used to quantitate the total time and the number and category of patients seen by MOs during the 14 days of data collection. The standardized data collection forms and observation techniques were developed by the study team before commencing the study. These were designed to collect facility-level data at each hospital (the numbers of beds, medical staff, and population served), patient demographic information (sex and age), and clinical details (diagnosis, referral decision, and diagnosis category). The patient diagnosis categories included the following 3 domains: Ob-Gyn, surgical (nontrauma and trauma), and medical or nonsurgical (including pediatric nonsurgical conditions). A list of conditions and disease states commonly encountered at district hospitals was compiled a priori across categories. Using guidelines by Bickler et al,15 surgical conditions were defined as those “ideally” requiring the expertise of a surgically trained physician. A similar definition was used to qualify Ob-Gyn conditions. Before the start of the study, the definitions and possible diagnoses for each category were reviewed and adjudicated by the study team and principal investigators (W.T.M., K.W., L.M., A.C., H.P., and F.A.). Patient diagnoses that did not fall under the surgical category or Ob-Gyn category and that did not require any incision or manipulation (eg, the setting of a fracture) were placed in the medical or nonsurgical category.
In cases in which multiple diagnoses were observed, patients were systematically grouped according to the first diagnosis listed by the MO. The length of the patient encounter was measured in minutes and seconds using a standardized technique with stopwatches. The start of the patient encounter was defined as the instant the MO came into contact with the patient or with related clinical information (including medical records, imaging, and others). The stopwatch was started at the initiation of the patient encounter, was paused during any interruption of the encounter, and was restarted when the encounter resumed. Finally, when the MO officially ended the encounter or moved on to the next patient, the stopwatch was stopped, and the time was recorded. Nonclinical duties were not assessed, and the encounters conducted in the absence of the study observers were excluded from measurement or analysis. Additional information collected included the following: hospital features, district population characteristics, distance to the nearest referral center, and the numbers of operating rooms, MOs and ancillary staff, and surgical specialists available at each hospital and total district hospitals in the region. Surgical specialists were defined as physicians who had completed residency training in general surgery or Ob-Gyn, including their respective subspecialties.

### OUTCOMES ASSESSED

In assessing the MO workload, the following primary outcomes were assessed: the total number of patients in each defined diagnostic category, the total time dedicated to the management of patients in each category, and the total number of patients referred to other facilities for further treatment. The secondary outcomes were computed relative to the total number of patients and the total encounter time recorded and included the proportions of patients and time spent in each respective diagnostic category, as well as the proportion of patients referred. These values were calculated for individual district hospitals and in aggregate for all facilities assessed.

### STATISTICAL ANALYSIS

Descriptive analyses were performed. Summary statistics of the primary and secondary outcomes were reported. A sensitivity analysis was conducted to compare categorical proportions between all the patient encounters and those directly observed.

### RESULTS

#### HOSPITAL DEMOGRAPHICS

The district population served by each hospital in the study ranged from 53,558 to 223,688 (Table 1). The number of district hospitals located within each region included in the study ranged from 4 to 27. The distance from district hospitals in the study to the nearest regional referral center ranged from 25 to 150 km. The number of MOs assigned to each district hospital ranged from 1 to 7, and at least 1 surgical specialist was on staff at 3 of the locations studied (Ob-Gyn in all 4 instances). In addition, the number of ancillary staff (including nurses, midwives, and student nurses) ranged from 26 to 140.

#### Analysis of Patients Seen by Diagnostic Category

In total, data were collected on 2847 patient encounters at 10 district hospitals during the study period. Among all patients seen by MOs, 1734 (60.9%) were female, 800 (28.1%) were designated as pediatric (<18 years), and 1337 (47.0%) were outpatients. In total, 2482 (87.2%) of the recorded encounters were directly observed and timed by the study observers. Of the directly observed adult and pediatric patient encounters, 1600 (64.5%) were classified as medical or nonsurgical, 514 (20.7%) as Ob-Gyn, and 368 (14.8%) as surgical (9.0% nontrauma and 5.8% trauma) (Table 2). An analysis of diagnostic categorical proportions between the total patients encountered and those directly observed showed no statistically significant differences.

#### Analysis Based on the Time Spent by Diagnostic Category

Among the directly observed encounters by MOs, 54% of their time was spent on inpatient ward rounds, 46%
at outpatient clinics, 15% in the operating room, and 7% with patients in the emergency department. On average, 56.3% of the clinical encounter time of MOs was expended on medical or nonsurgical patients, 24.8% on Ob-Gyn patients, and 18.9% on surgical patients (13.5% nontrauma and 5.4% trauma) (Table 3). Operative time accounted for 35% of the total time spent with Ob-Gyn patients and for 36% of the total time spent with surgical patients. District hospitals with 100 beds or more had significantly more surgical encounters ($P = .002$), and MOs there spent a mean of 139.3 seconds less on surgical encounters than hospitals with fewer than 100 beds ($P = .04$).

District hospitals without a trained surgeon had fewer surgical encounters than hospitals with at least 1 trained surgeon ($P < .001$). However, no statistically significant difference in the mean time spent on surgical encounters was observed between hospitals with vs those without a surgically trained MO.

### DIAGNOSIS BY CATEGORY

Table 4 lists common diagnoses among all the patient encounters by diagnostic category. The most common diagnoses (by diagnostic category) were malaria (medical or nonsurgical), obstetric complication requiring cesarean section (Ob-Gyn), inguinal hernia (surgical nontrauma), and motor vehicle crash (surgical trauma).

To estimate the workload of MOs at district hospitals in Ghana, this study investigated surgical and Ob-Gyn care by recording the number of patients seen and by measuring the time expended. A review of the surgical and public health literature revealed no previous investigations using such methods to estimate surgical and Ob-Gyn workload. Similar methods have been used to assess physician efficiency in developed countries. The timed observation method in the present study represents a novel instrument for estimating the clinical workload of physicians working at the district hospital level in low- and middle-income countries.

The results show that surgical and Ob-Gyn patients accounted for more than one-third of patients seen by MOs and for almost half of an MO’s typical workday in the hospitals observed. Operative time dedicated to the care of surgical and Ob-Gyn patients represented more

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**Table 2. Number of Directly Observed Patient Encounters by Patient Diagnosis Category**

<table>
<thead>
<tr>
<th>District Hospital</th>
<th>Medical or Nonsurgical No. (%) of Patient Encounters</th>
<th>Obstetrics-Gynecology</th>
<th>Surgical</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apam</td>
<td>92 (71.9)</td>
<td>27 (21.1)</td>
<td>7 (5.5)</td>
<td>126 (5.2)</td>
</tr>
<tr>
<td>Begoro</td>
<td>126 (76.8)</td>
<td>13 (7.9)</td>
<td>14 (8.5)</td>
<td>164 (6.6)</td>
</tr>
<tr>
<td>Bekwai</td>
<td>47 (38.5)</td>
<td>48 (39.3)</td>
<td>27 (22.1)</td>
<td>122 (4.9)</td>
</tr>
<tr>
<td>Brong Ahafo</td>
<td>241 (56.3)</td>
<td>117 (27.3)</td>
<td>40 (9.3)</td>
<td>428 (17.2)</td>
</tr>
<tr>
<td>Damongo</td>
<td>332 (70.3)</td>
<td>71 (15.0)</td>
<td>31 (6.6)</td>
<td>474 (19.0)</td>
</tr>
<tr>
<td>Dodowa</td>
<td>57 (75.0)</td>
<td>8 (10.5)</td>
<td>5 (6.6)</td>
<td>70 (3.1)</td>
</tr>
<tr>
<td>Hohoe</td>
<td>170 (66.4)</td>
<td>53 (20.7)</td>
<td>15 (5.9)</td>
<td>256 (10.3)</td>
</tr>
<tr>
<td>Navrongo</td>
<td>185 (58.9)</td>
<td>78 (24.8)</td>
<td>26 (8.3)</td>
<td>314 (12.7)</td>
</tr>
<tr>
<td>Tarkwa</td>
<td>204 (60.7)</td>
<td>91 (27.1)</td>
<td>32 (9.5)</td>
<td>336 (13.5)</td>
</tr>
<tr>
<td>Tumu</td>
<td>146 (78.5)</td>
<td>8 (4.3)</td>
<td>27 (14.5)</td>
<td>186 (7.5)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1600 (64.5)</strong></td>
<td><strong>514 (20.7)</strong></td>
<td><strong>224 (9.0)</strong></td>
<td><strong>2482 (100.0)</strong></td>
</tr>
</tbody>
</table>

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**Table 3. Time of Patient Encounters and Percentage of Total Time Expended by Patient Diagnosis Category**

<table>
<thead>
<tr>
<th>District Hospital</th>
<th>Medical or Nonsurgical Time(s) of Patient Encounters (% of Total Time Expended)</th>
<th>Obstetrics-Gynecology</th>
<th>Surgical</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apam</td>
<td>15 148 (65.1)</td>
<td>5417 (23.3)</td>
<td>1883 (8.1)</td>
<td>23 252 (2.8)</td>
</tr>
<tr>
<td>Begoro</td>
<td>29 000 (78.6)</td>
<td>1595 (3.1)</td>
<td>4043 (11.0)</td>
<td>36 895 (4.5)</td>
</tr>
<tr>
<td>Bekwai</td>
<td>18 088 (23.4)</td>
<td>29 504 (38.2)</td>
<td>29 662 (38.4)</td>
<td>77 254 (9.3)</td>
</tr>
<tr>
<td>Brong Ahafo</td>
<td>67 590 (57.4)</td>
<td>27 895 (23.7)</td>
<td>13 077 (11.2)</td>
<td>117 692 (14.2)</td>
</tr>
<tr>
<td>Damongo</td>
<td>110 533 (68.2)</td>
<td>30 729 (19.0)</td>
<td>8696 (5.4)</td>
<td>182 055 (19.6)</td>
</tr>
<tr>
<td>Dodowa</td>
<td>11 499 (74.1)</td>
<td>1414 (9.1)</td>
<td>642 (4.1)</td>
<td>15 517 (1.9)</td>
</tr>
<tr>
<td>Hohoe</td>
<td>55 995 (59.3)</td>
<td>28 957 (30.7)</td>
<td>3103 (3.3)</td>
<td>94 358 (11.4)</td>
</tr>
<tr>
<td>Navrongo</td>
<td>53 512 (38.6)</td>
<td>54 557 (39.4)</td>
<td>22 955 (16.5)</td>
<td>138 634 (16.8)</td>
</tr>
<tr>
<td>Tarkwa</td>
<td>42 097 (60.1)</td>
<td>18 369 (25.7)</td>
<td>8570 (12.0)</td>
<td>71 585 (8.7)</td>
</tr>
<tr>
<td>Tumu</td>
<td>61 362 (68.6)</td>
<td>7326 (8.2)</td>
<td>18 801 (21.0)</td>
<td>89 449 (11)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>465 724 (56.3)</strong></td>
<td><strong>205 327 (24.8)</strong></td>
<td><strong>111 412 (13.5)</strong></td>
<td><strong>826 691 (100.0)</strong></td>
</tr>
</tbody>
</table>

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ties of 2.0% was observed among the patients seen. Severe consistent with these findings.

A surgical condition was defined as "any condition requiring suture, incision, excision, manipulation, or other invasive procedure that usually, but not always, requires local, regional, or general anesthesia." Weiser et al estimated and highlighted the global disparity of surgical care by modeling estimates based on surgical data from 56 of 192 World Health Organization member states: 73.6% of surgical procedures occurred in the wealthiest countries, which have only one-third of the world's population, while only 3.5% of all surgical procedures occurred among the poorest one-third. These pioneering studies have provided the first crude estimates of surgical disease burden and access to surgical services.

Bickler and Spiegel underscored a need for the development of data-driven strategies to improve surgical services in low- and middle-income countries. The present study may serve as an approximation of the workload resulting from surgical and Ob-Gyn conditions relative to other prevalent diseases at district hospitals. Our definition of a surgical condition expands beyond that used by the Disease Control Priorities Project. As highlighted by Ozgediz et al, some common surgical conditions may not require an incision and in some instances may not need operative management, despite the need for a qualified surgical consultant; common conditions, such as acute abdominal emergencies and surgical infections, were excluded from the initial Global Burden of Disease study. Our findings demonstrate that among surgical and Ob-Gyn patient encounters, more than two-thirds of patients did not undergo an operative intervention at the time of observation. Our data support the call for a broader definition of surgical conditions to include all aspects of patient care, not just the surgical procedure itself, for a more accurate understanding of conditions requiring surgical management.

Interpretations of these data reported herein should consider limitations that result from the methods used. Many patients in Ghana fail to seek care at health facilities because of economic constraints, inadequate transportation, and fear of or lack of confidence in the quality of care provided. These data herein reflect the characteristics of patients capable of accessing health care at a district hospital. Inherent variability also exists in

<table>
<thead>
<tr>
<th>Medical or Nonsurgical</th>
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</tr>
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<tbody>
<tr>
<td>Diagnosis</td>
<td>No. (%)</td>
<td>Diagnosis</td>
</tr>
<tr>
<td>Malaria</td>
<td>507 (27.3)</td>
<td>Obstetric complication requiring cesarean section</td>
</tr>
<tr>
<td>Hypertension</td>
<td>144 (7.6)</td>
<td>Malaria in pregnancy</td>
</tr>
<tr>
<td>Upper respiratory tract infection</td>
<td>121 (6.5)</td>
<td>Spontaneous vaginal delivery</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>116 (6.2)</td>
<td>Threatened abortion</td>
</tr>
<tr>
<td>Gastroenteritis</td>
<td>92 (5.0)</td>
<td>Uncomplicated active labor</td>
</tr>
<tr>
<td>Other</td>
<td>877 (47.2)</td>
<td>Other</td>
</tr>
<tr>
<td>Total</td>
<td>1857 (100.0)</td>
<td>Total</td>
</tr>
</tbody>
</table>
MO workloads across hospitals owing to differences in case mix, patient populations, and facility characteristics (operating room capacity, diagnostic and surgical equipment availability, and the numbers of physicians, specialists, and hospital beds, and others). Seasonal variations in disease conditions may have resulted in an underestimation or overestimation of disease categories because our assessments were conducted solely from January 4 through 19, 2011. Patients with multiple diagnoses were assigned to clinical categories based on the order of documentation, which may have biased the classification of patients with complex disease into certain categories. Finally, inferences related to quality of care, postoperative complications, or postoperative mortality are beyond the scope of this analysis.

Among the district hospitals studied, only 4 physicians had received formal surgical training (Table 1). This contrasts with the high concentrations of surgical specialists in regional and tertiary health facilities in Ghana. Most of Ghana’s population are located in rural areas, with limited access to these specialists, further underscoring the need to allocate adequate resources and training interventions at the district level. Health policy makers must be guided by regional and district data to establish adequate and appropriate interventions.

In conclusion, this study demonstrates a novel approach to assessing the workload of MOs by addressing not only patient mix but also the time allotted to patient care. Our findings may inform policies for training, investment, and surveillance to strengthen surgical care at district hospitals in Ghana. As initiatives to enhance surgical capacity in low- and middle-income countries emerge, the need for evidence-driven solutions to existing regional disease burden is paramount. Surgical care is a public health priority. Expanding the provision of surgical services in low- and middle-income countries will require the identification of strategies that address health system weaknesses and ensure adequate infrastructure and efficient use of human resources.

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We know that a sizable part of the world’s “disease burden” is owing to surgical conditions. Several assessments have estimated the years of life lost to death or disability from surgically treatable disease at around 10% of the total years lost to the world’s population. We believe that this burden is at least as great (and likely greater) in very poor countries, such as those in sub-Saharan Africa, and we know that less than 4% of the world’s surgical treatment is provided in low-income regions. Most of that surgery in poor countries is performed in the bigger cities, where only 10% to 20% of the population lives.

So, it is important to look closely at studies of surgical practice in the district hospitals of these poor countries. For practical purposes, these small units (usually 50-100 beds) are the only places where the rural poor can expect to receive treatment. Referral is limited by a weak transportation system, and poverty creates an even greater limitation. It costs too much for a poor family to transport a patient 50 miles or more and maintain them there for 1 week or longer. Yet, the treatment in these units has been shown to be remarkably cost-effective, with a cost per patient-day of less than $50.

Skin grafts for a child with burns on 20% of the body can prevent a life of disability. A cesarean section for a woman with transverse lie and a hand prolapse will save the lives of both mother and child.

Ghana is a particularly good place to look at district hospitals. Modestly better off economically than most sub-Saharan nations, it has developed a district hospital system that is accessible to most of the population. Most of these hospitals are adequately equipped for basic surgery, and they are reasonably well staffed in terms of numbers, with a mean of 3 physicians and 75 nurses for each district hospital in the study by Mehtsun et al published in this issue of the Archives. Their findings in Ghana give us an opportunity to look at where other poorer countries will be 10 years from now if they follow the same path in their development.