Policy brief
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Using administrative data to measure the productivity and allocation of health workers and funds

Lessons from Ghana

In brief

- Since 2018, doctors and administrators from the Ghana Health Service (GHS) and academics from the University of Oxford have been working together to understand which health facilities personnel should be deployed to in order to have the greatest impact on health.
- This project undertook a government-academia collaboration using Ghana's District Health Information Management System II (DHIMS II) to study the productivity and optimal allocation of health personnel and resources across public health facilities in Ghana, and to identify the potential and challenges of conducting public sector productivity analysis using this type of data.
- This type of data, which is increasingly available in many countries, can answer the following questions:
  - How productive are health workers; are health workers more needed in urban or rural areas; should facilities be given more health workers or more funds.
  - What would be the optimal allocation of health workers in a country?
- The findings highlight challenges and how they can be addressed: the interconnection of different data systems; the measurement of facility productivity; and adapting the analysis to the intricacies of health systems.

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Overview of the research

National healthcare agencies run thousands of health facilities and employ tens of thousands of nurses, doctors, midwives, and other health workers. To which facilities should they deploy these personnel to have the greatest impact on health? Suppose there is a rural health clinic which employs two nurses, what would improve service delivery more, posting another nurse to this clinic, or simply sending more funds to the clinic?

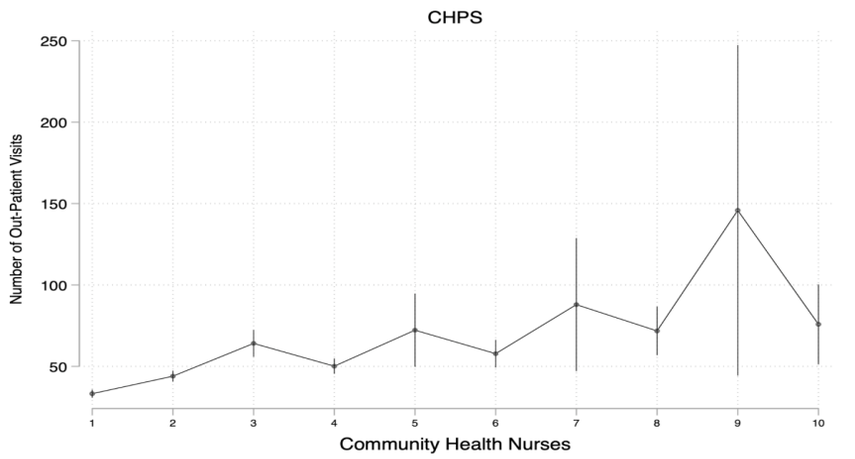
Questions like these are fundamental for health systems and health administrators, but we know of no rigorous studies that answer this question. They are also deceptively simple questions. They are simple, because the obvious answer is that resources should be deployed to the facility where they can make the greatest marginal contribution to quality health service delivery. However, they are deceptive, because measuring this marginal contribution requires careful analysis, difficult judgments about how to measure health system performance, and a lot of data.

Since 2018, we – doctors and administrators from the Ghana Health Service (GHS), and academics from the University of Oxford – have been working together to answer this question for Ghana. To do so, we are using Ghana's District Health Information Management System II (DHIMS II), a database of health service delivery in all health facilities nationwide. The data in DHIMS II is rich, as it contains hundreds of indicators of service delivery for all facilities nationwide, every month for the past several years, all collected and validated by GHS. It also contains information on the number of health personnel posted to each facility, and their revenues and expenditures.

We use this data to construct measures of the quantity and quality of health service delivery at each facility nationwide. We can then see how these measures change when the personnel and funds available to each facility change. Effectively, we are using the DHIMS II data to see what happens to health service delivery when a health facility goes from having one nurse to two nurses, or two nurses to three nurses, or two nurses to two nurses and a midwife, and so on.

For example, the figure below shows the average number of outpatient visits for each number of community health nurses in rural outreach facilities. If each additional nurse were attracting the same number of patients to the facility, we would expect to see a straight line increasing from facilities with the smallest number of nurses to facilities with the highest number of nurses. We do not see such line, which implies that most of the gain in quantity of care stems from the first three nurses in an outreach facility. There are lots of caveats to this analysis and this relationship is not necessarily causal, but it illustrates the type of questions that this data can address.

Figure 1: Community nurses and outpatient visits in 2018



This approach to using administrative data to conduct evidence-based analysis of staff productivity and allocation is the first of its kind for a public sector agency, at least as far as we are aware. However, we think similar approaches may be of interest not just to other health services, but also to policymakers in other types of government agencies such as education ministries, tax agencies, agriculture ministries, or any other agency that has large numbers of frontline staff delivering services to clients.

Findings

To help other agencies see how they could undertake similar research, this policy brief discusses three challenges we have encountered so far, as well as how we think they can be addressed. While each organisation will have unique challenges to confront, we hope this account of how we approached these problems will be useful.

Challenge 1: Lack of connection between different data systems

Although most of the dataset we use are extracted from the DHIMS II, observations don't match one for one. The HR data and finance data within the DHIMS are also not audited with the same level of scrutiny as health outcome data. In order to address this, we use data from other divisions of the Ministry of Health and there is a substantial challenge in linking these datasets. These issues are compounded with a nationwide re-demarcation of districts that has been implemented over the period of our analysis.

Challenge 2: How to measure facility productivity

In the healthcare system, unlike private firms, there is not a single summary statistic like profit productivity in the healthcare system. It can therefore become quite complex to measure the productivity of staff.

First, because output is multidimensional, both the quantity of patients seen and quality of care are important metrics of a health care system. Additionally, measuring quality can be done via many different metrics that can go in opposite directions. In order to address this challenge, we take two approaches: estimating the impact of additional personnel/funds on a wide range of key performance measures, such as the number of outpatients, the number of child deliveries but also objective quality measures such as the number of wound infections, maternal and infant mortality, all of these metrics are collected in all facilities; and aggregating all these performance measures into a summary index.

Second, as the quality of care improves in a facility, a facility would attract sicker patients, and thus typical outcomes would underestimate quality improvements in a facility. Another component of quality is long term care to prevent the re-occurrence of pathology in patients. To address those issues, we use longitudinal data, which would allow us to control for the change in composition and monitor repeated visits.

Challenge 2: How to measure facility productivity

The idea of our analysis is a rather simple one: understanding marginal productivities and sketching an optimal allocation of staff. Although staffing norms providing guidelines on the qualification of all staff for each type of facility exist, anecdotal reports have highlighted substantial departures from these guidelines stemming either from individual requests from staff or leakages of staff to the private sector's network. This implies that we need to have a solid understanding of the staffing constraints faced by policymakers to make any substantial conclusions on productivity. We are addressing this by working closely with our colleagues at the Ghana Health Service to understand the nuances and constraints with staffing.

Policy recommendations

- **Conduct a dataset inventory of their administrative data.** What data is already being collected? How accurate and reliable is it? Are the different datasets updated at the same frequency, or different? Is there a way to link facilities and/or workers across the different datasets? Are there low-cost ways to improve data quality, or make these datasets more useful?

- **Think about how to measure the performance of workers and/or facilities using data that is available.** Performance can be measured using one or more indicators. Deciding on an appropriate set of performance measures is hard as you have to measure enough indicators to capture a relatively comprehensive range of key outputs/outcomes, but there is not usually data on all or even most measures. It is also important to measure indicators that might capture unintended

side effects. A good approach is to pick the best indicators that you currently measure, remembering that these indicators might be incomplete when interpreting the analysis, and identify the most important missing indicators so you can find a way to measure them

- **Start with simple analysis.** We have laid out an ambitious research agenda, asking questions like "how should we allocate workers across all facilities in the system?" As a first step it can be useful to just graph different indicators and conduct basic descriptive analysis like Figure 1 in this policy brief. This will help think through what the next step in the analysis should be, as well as identifying data quality issues that can be improved.