

Measuring efficiency and identifying drivers of efficiency in the district hospital system

Executive Summary

There is a general shortage of healthcare practitioners in South Africa, particularly in the public sector, which could be addressed with additional savings from enhancing efficiency, particularly in public hospitals (Ngobeni et al., 2020). The analysis below presents the technical efficiency (TE) scores based on a data envelopment analysis (DEA) of district hospitals across 52 district municipalities.¹ On average, the district hospital sector (DHS) is, to a large degree, operating inefficiently and there is significant scope to improve productivity within the sector. There is a disproportionate ratio of hospital resources, such as medical practitioners, to the number of patients in district hospital facilities. Despite some efficiency gains across a few districts, the results from the Malmquist Productivity Index (MPI) analysis suggest that the majority of district hospitals in the DHS declined in productivity between 2011 and 2019. From the results from the regression analysis, several factors were identified as having a positive impact on efficiency, such as reducing waiting times, increasing the ratio of nurses to the uninsured population, the optimal allocation of resources between district hospitals and primary healthcare facilities, and increasing preventative healthcare measures

Background

Providing accessible and quality healthcare services is a cornerstone of South Africa's post-apartheid democratic society. However, the provision of healthcare in South Africa

¹ The secondary data used for the quantitative analyses is the 2019/20 District Health Barometer (DHB), published by the Health Systems Trust.

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is characterised by deeply rooted and structural inequalities born out of the country’s apartheid legacy (Ranchod et al., 2017). Systematic differences in healthcare quality and outcomes by race and geography result in a highly inequitable system. The private-public divide in which the two healthcare systems operate separately from one another results in a separating equilibrium in terms of the costing and pricing of healthcare in South Africa (FFC, 2019).

The World Health Organisation (WHO) recognises various sources of inefficiencies in health systems, including underutilised health services, inequity in healthcare coverage and access to medicines, inadequately staffed facilities, the uneven distribution of health workers and the misallocation of resources (Yip and Hafez, 2015). The centralised nature of control over hospitals in South Africa, whereby hospitals report to the head office of the provincial Department of Health, can severely undermine the role of management functions in responding to changing operational requirements (Holdt and Murphy, 2007). A more decentralised approach to hospital systems, which affords managers greater control over hospital operations, may improve allocative and technical efficiency, quality of service provision, transparency and accountability (Bossert and Beauvais, 2002).

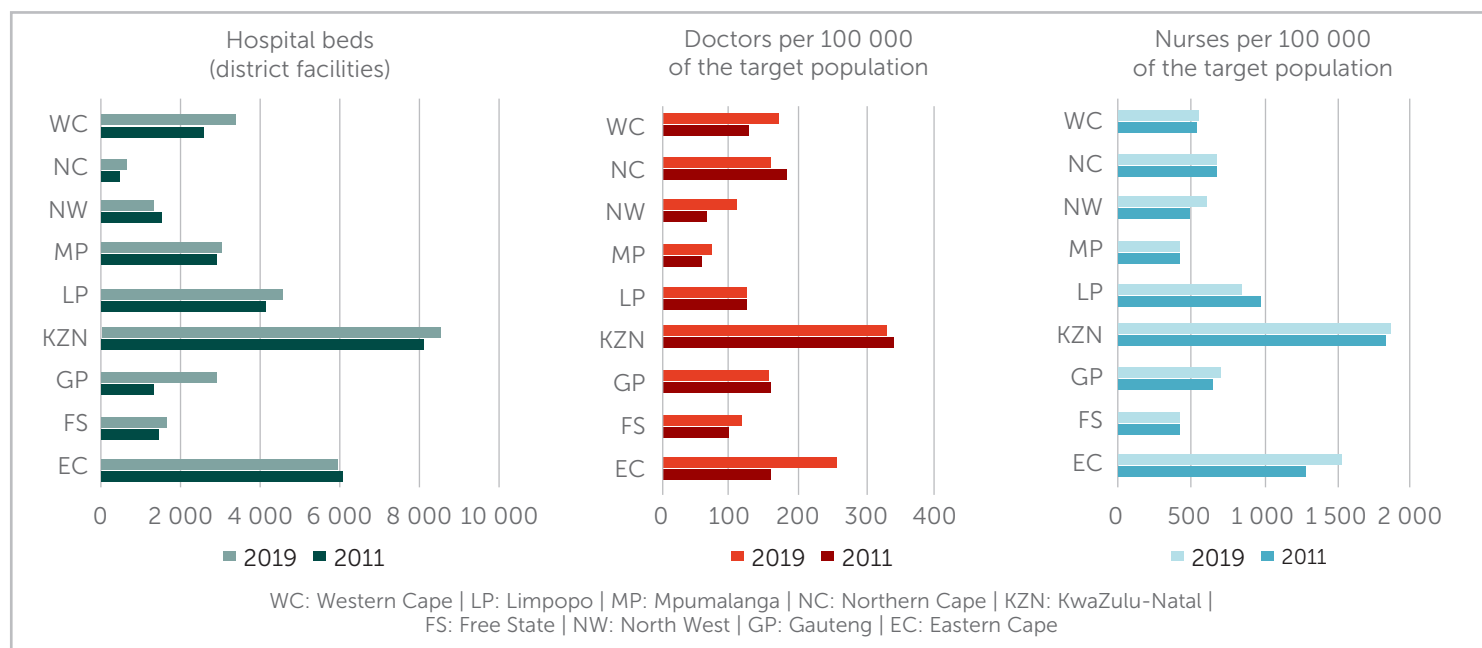
The quest to optimise resource allocation in the healthcare system to improve healthcare quality has led to extensive research into the factors that influence efficiency, particularly in hospital systems. With public sector health reform underway, assessing efficiency in the public healthcare system and understanding the underlying drivers of productivity in healthcare is of great importance.

Research findings

1. Measuring efficiency in the district hospital sector

Despite some improvements in efficiency between 2011 and 2019, the results from the MPI analysis suggest that most district hospitals in the DHS declined in productivity over this period. On average, productivity in the ten worst-performing district hospital systems appears to have decreased by 27.7 per cent. Across all districts, productivity in the district hospital sector declined, on average, by approximately 8 per cent. These results of deteriorating productivity in the district hospital sector are unsurprising, given that the capacity of district hospitals in terms of key resources, such as doctors, nurses and hospital beds, is under severe strain, as shown in Figure 1.

Figure 1: Components of district hospital productivity across provinces between 2011 and 2019



Source: District Health Barometer

2. Drivers of inefficiency in the district hospital sector

The descriptive statistics from the DEA show that the average number of hospital beds is almost double the average number of in-patients, pointing to the underutilisation of hospital inputs and a potential mismatch between supply and demand for hospital services within the DHS (Sun et al., 2023). Technical efficiency scores range from a low of 0.47, indicating high levels of inefficiency, to 1, which indicates perfect efficiency. Importantly, the average TE score of all district hospitals across district municipalities is 0.71, which suggests that, on average, the district hospital sector was operating inefficiently in 2019, and that there is significant scope to improve efficiency within the sector.

In order to improve the efficiency of healthcare provision, or efficiency within a particular hospital system, it is crucial to gain a better understanding of the factors that lead to inefficiency. Using a Tobit regression with a bootstrap procedure, the analysis below identifies some of the factors that impact hospital-level efficiency, specifically in South Africa's district hospital system. Consistent with the literature, the findings indicate that long waiting times result in productivity losses in district hospitals (Orsini et al., 2021). District hospitals, therefore, need to reduce the length of patients' stay to increase their productivity levels. Unnecessary waiting times could be mitigated through an optimal patient-to-personnel ratio, which appears to be lacking in South Africa's district hospitals (Lake et al., 2010).

Table 1: Tobit regression results with bootstrap coefficients

	Model 1	Model 2
Efficiency	Bootstrap Coef.	Bootstrap Coef.
Average length of stay (days)	-.0820314 *** (.297439)	-.0792388 *** (.0295812)
Hospital beds per resident	-119.1128 ** (70.74839)	-143.246 ** (80.32248)
Nurses per 100 000 of target population	.0014357 ** (.0005975)	.001313 ** (.0006219)
Cervical cancer screening coverage	.3634758 ** (.2064575)	.3901543 * (.2096048)
Proportion of district population with HIV	1.592938 ** (.6776146)	1.488654 ** (.690033)
Coverage of core essential medicines at primary healthcare facilities	-.0140722 *** (.0039789)	-.0140779 *** (.003971)

Note: Table 1 only provides a summary of those variables which were found to be statistically significant and therefore excludes other control variables in the model.

*** Statistically significant at 1 per cent level (p value <0.01). ** Statistically significant at 5 per cent level (p value <0.05). * Statistically significant at 10 per cent level (p value <0.1).

On average, an increase in available nurses relative to the uninsured population could lead to efficiency gains in the district health sector, as shown by the positive significance of the coefficient. The optimal utilisation of trained nurses could improve the quality of healthcare by compensating, at least to some extent, for the inadequate levels of medical personnel in the public health sector (Babalola et al., 2022). The negative correlation between the number of hospital beds per resident and efficiency could imply that, due to a shortage of staff and essential resources at district hospitals, fewer patients are attended to at a time, resulting in the under-utilisation of hospital beds (Sun et al., 2023).

Furthermore, the findings may point to a misallocation of resources between different levels of healthcare, as shown by the relationship between core medicines at primary healthcare facilities and efficiency at the district hospital level. On average, the greater coverage of core medicines at primary healthcare facilities appears to result in greater inefficiency within the district hospital system (i.e. outputs are not being maximised for a given level of inputs).

Finally, the positive relationship between cancer screening coverage and technical efficiency supports the notion that public interventions in preventative care by policymakers can have cost-saving effects, not only in health services, but also in the broader economy (Masters et al., 2017). Preventative care can be essential for addressing productivity losses in healthcare because health is closely linked to productivity and the economic viability of the population (Loeppke, 2008).

Conclusion and recommendations

The Financial and Fiscal Commission (FFC) has previously noted that the public health sector is under severe strain amid a heavy disease burden, input cost pressures, increasing demand for services and a shortage of healthcare workers (FFC, 2019). These challenges undermine the efficiency and overall performance of the public healthcare (PHC) system. Efficiency in healthcare services is a key component of improving the quality of living standards and producing a healthy workforce that can drive inclusive economic growth. Improving efficiency in the health system and how it operates is vital, especially when one considers the positive externalities associated with quality healthcare.

The efficiency analysis indicates that the large majority of district hospitals are operating inefficiently and have become more inefficient over time, pointing to a dire need for policy interventions in the DHS. The econometric analysis identified some of the factors that impact hospital-level efficiency in the DHS in South Africa. The results show that unnecessary waiting times coincide with efficiency losses. An optimal patient-to-personnel ratio could mitigate long waiting times and reduce inefficiency. However, the data shows that this is lacking in South Africa's district health sector. The findings show that increasing the number of nurses in proportion to the uninsured population could result in efficiency gains.

The results further provide evidence of the important interplay between district hospitals and PHC facilities, such as PHC clinics, pointing to a possible misallocation of resources between different levels of healthcare, in particular, across district and PHC facilities. The findings also support the notion that preventative healthcare investment could improve health sector productivity. The findings on the impact that provincial and local government grants have on the DHS show a positive correlation, but the results are inconclusive. Staff shortages, infrastructure deficits, inadequate leadership and lack of accountability mechanisms are some of the key challenges faced at the district level (Rispel, 2016).

The Commission made the following recommendations:

1. The Minister of Health needs to improve the quality of healthcare within the district hospital system by exercising allocative efficiency through reprioritisation. The technical efficiency of district hospitals should also be monitored at the provincial level through the Provincial Legislature's discretion of its money bills based on the National Division of Revenue Bill.
2. The Minister of Health must ensure that accountability mechanisms in district hospitals are strengthened to ensure that funds are allocated optimally. The Minister and provincial departments of Health should provide guidelines on how management practices in district hospitals can be improved to enhance transparency, oversight and accountability in the sector. Considerations should be given to the centralised nature of hospital oversight vested in provinces and the constraints on hospital managers to respond to the operational needs of hospitals.
3. Enhancing transparency and accountability in hospitals, and ultimately improving their performance, hinges on the effectiveness of the healthcare system in adopting integrated data-driven processes. The Minister of Health, in collaboration with the Ministry of Finance and provincial Members of the Executive Committee (MECs), should improve monitoring and evaluation procedures through the integration of health data.

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