Does decentralization of health systems translate into
decentralization of authority? A decision space analysis of
Ugandan healthcare facilities

John Chen¹*, Aloysius Ssennyonjo², Fred Wabwire-Mangen², June-Ho Kim³,⁴, Griffith Bell³
and Lisa Hirschhorn¹

¹Northwestern University Feinberg School of Medicine, 420 East Superior Street, Chicago, IL 60611, USA
²School of Public Health, College of Health Sciences, Makerere University, PO Box 7062, Kampala, Uganda
³Makerere University, Kampala, Uganda
⁴Ariadne Labs, 401 Park Drive, Boston, MA 02215, USA
⁵Department of Medicine, Brigham and Women's Hospital, 75 Francis Street, Boston, MA 02115, USA
*Corresponding author. Northwestern University Feinberg School of Medicine, 777 North Michigan Avenue, Apt 1403, Chicago, IL 60611, USA.
E-mail: john.chen1@northwestern.edu

Accepted on 14 June 2021

Abstract
Since the 1990s, following similar reforms to its general politico-administrative systems, Uganda has decentralized its public healthcare system by shifting decision-making power away from its central Ministry of Health and towards more distal administrative levels. Previous research has used decision space—the decision-making autonomy demonstrated by entities in an administrative hierarchy—to measure overall health system decentralization. This study aimed to determine how the decision-making autonomy reported by managers of Ugandan healthcare facilities (de facto decision space) differs from that which they are allocated by official policies (de jure decision space). Additionally, it sought to determine associations between decision space and indicators of managerial performance. Using quantitative primary healthcare data from Ugandan healthcare facilities, our study determined the decision space expressed by facility managers and the performance of their facilities on measures of essential drug availability, quality improvement and performance management. We found managers reported greater facility-level autonomy than expected in disciplining staff compared with recruitment and promotion, suggesting that managerial functions that require less financial or logistical investment (i.e. discipline) may be more susceptible to differences in de jure and de facto decision space than those that necessitate greater investment (i.e. recruitment and promotion). Additionally, we found larger public health facilities expressed significantly greater facility-level autonomy in drug ordering compared with smaller facilities, which indicates ongoing changes in the Ugandan medical supply chain to a hybrid ‘push-pull’ system. Finally, we found increased decision space was significantly positively associated with some managerial performance indicators, such as essential drug availability, but not others, such as our performance management and quality improvement measures. We conclude that increasing managerial autonomy alone is not sufficient for improving overall health facility performance and that many factors, specific to individual managerial functions, mediate relationships between decision space and performance.

Keywords: Decentralization, decision making, decision space, health care reform, local authority, policy research

Introduction
Decentralization and decision space

Starting in the latter half of the 20th century, decentralization—the transition of decision-making authority from higher to lower levels of organization control—has characterized health system reform in many low- and middle-income countries (LMICs) (Bhalla and Shotton, 2019; Marchildon and Bossert, 2018). Arguments in favour of health system decentralization highlight improvements to allocative efficiency due to decreased distance between decision-makers and their constituents as well as improved participation of community members into administrative affairs (Litvak et al., 1998; Peckham et al., 2015). However, public administration literature (Lægreid et al., 2008; Peters, 2005) and health systems research (Barasa et al., 2017; Peckham et al., 2015; Jafari et al., 2010) indicate ongoing tensions in decentralized systems between semi-autonomous lower-level units and the central government’s desire to maintain control. As a result, these systems are thought to be susceptible to inherent power struggles between their centre- and lower-level entities (Cammack et al., 2007).

The level of decision-making authority demonstrated by entities in the administrative hierarchy—known as decision space—can be used as a proxy measure of the extent of autonomy accorded to decentralized units (Bossert, 2016; James et al., 2019). Decision space has previously been a concept used to refer to the autonomy of middle- and lower-level governmental institutions with administrative oversight over healthcare facilities. In this study, we extend this concept to the individual healthcare facilities themselves.

© The Author(s) 2021. Published by Oxford University Press in association with The London School of Hygiene and Tropical Medicine. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (https://creativecommons.org/licenses/by/4.0/), which permits unrestricted reuse, distribution, and reproduction in any medium, provided the original work is properly cited.
Decision space can be allocated by the central government in legal and institutional frameworks such as government laws, policies and guidelines (de jure decision space). In healthcare systems, although de jure decision space is relatively static, susceptible only to changes in policies and legal instruments, de facto decision space—or the actual decision space reported by decentralized decision-makers—is more dynamic and multifaceted. Contextual factors such as the competence of facility managers, their knowledge of their own de jure decision space, the willingness of these managers to exercise discretion to push the boundaries of the de jure decision space they are given and managerial corruption may influence de facto decision space and result in differences between the actual and intended autonomy of decentralized decision-makers (Bossert, 1998; 2016; Barasa et al., 2017).

Therefore, accurate measurement of de facto decision space is an essential first step in assessing how successfully a country’s policies of decentralization have been adopted (Cahyaningsih and Fitrady, 2019; Park et al., 2013). In addition, such an assessment forms a basis to leverage decentralization to improve health system performance. As managerial autonomy increases, managers are thought to be emboldened to take more proactive steps in capacity building, operations management and other activities that improve performance (Miah and Mia, 1996). For example, Bossert and Mitchell (2011) found ‘spillover’ effects of decision space on institutional capacity, noting that increased decision space in one managerial domain tended to be associated with increased capacity in others. However, it is also possible that, without existing mechanisms to ensure accountability, increasing managerial autonomy may actually result in poorer health system performance due to less oversight over unskilled or corrupt managers (Yilmaz et al., 2008; Roman et al., 2017; Bossert, 2015). Therefore, further research is needed to better understand the association between managerial autonomy and health system performance.

Decentralization in Uganda’s health system

Generally, Uganda is characterized by a decentralized politico-administrative system comprising semi-autonomous districts and lower-level councils such as municipalities, town councils and village local councils (Green, 2008; Hizamu, 2014). Uganda’s health systems have undergone an extensive period of similar decentralization reforms. While its national Ministry of Health (MOH) still retains responsibility for national policy formulation and planning, it devolved many functions to district-level administrative units, such as operation of health centres and village health teams (Tashobya et al., 2018). With respect to governance and management, facility-level entities, such as health unit management committees and hospital boards, were assigned the task of overseeing the general administration of their respective health centres or hospitals. District-level entities, such as district health management teams (DHMTs), were given executive control over service delivery and health facility performance (Tashobya et al., 2018). District service commissions are tasked with human resources planning and performance management (PM) responsibilities, such as dismissal, recruitment and promotion of health workers (Public Service Commission Act, 2008). However, the actual, de facto decision space of these governance bodies reportedly differs from their supposed, de jure decision space dictated by MOH policies (Alonso-Garbayo et al., 2017; Henriksson et al., 2017; Tashobya et al., 2018).

Additionally, facility autonomy in Uganda’s healthcare system varies by facility type and level. In Uganda, the lowest healthcare level is occupied by village health teams, followed by health centres (II, III and IV), district hospitals, regional referral hospitals and national referral hospitals. As one moves up this healthcare facility hierarchy, the complexity of care and institutional capacity of each facility type increase accordingly, as does the level of autonomy each is afforded (Mukonzo et al., 2013).

Uganda also has an extensive network of private healthcare facilities, made up of for-profit healthcare providers and faith-based, not-for-profit health facility networks. The private health providers have more decision-making discretion and function generally with limited control from the public sector except for regulatory obligations (Ministry of Health, 2010). The private not-for-profits are largely autonomous—receiving most of their revenue from out-of-pocket expenditures or development partners—but still receive some financial and in-kind resource contributions from the government in exchange for meeting specified health objectives (Ssennyonjo et al., 2018).

To date, research has focused on the measurement of decision space in high- to middle-level administrative units (i.e. on the level of central government planners to district administrators). Measurement of decision space for managers of individual health facilities within a health system is important for understanding the success of decentralization in levels of the healthcare administrative hierarchy more proximal to healthcare delivery. Therefore, we used data from the Performance Monitoring and Accountability (PMA) 2020 (now Performance Monitoring for Action) survey, which included an assessment of the management of primary healthcare (PHC) facilities in Uganda to answer two questions: (1) the degree to which de facto decision space for health facility managers differs from their intended de jure decision space and (2) whether an association between de facto decision space and managerial performance outcomes is observed at the facility level.
**Methods**

**Survey platform**

Data were collected through the PMA 2020 survey platform, which has gathered family planning information from households and health facilities in 11 LMICs (Pmadata.org, 2020). In Ghana and Uganda, additional sections were added to assess PHC capacity and delivery and facility management practices. For the purposes of this study, only health facility data from Uganda were used.

**Management questions**

Questions on management practices were derived from the World Management Survey (WMS), a validated framework for assessing managerial performance across sectors (Bloom et al., 2017a; 2020). Since the WMS was originally an intensive, open-ended, qualitative survey that was challenging to implement at scale in LMIC PHC facilities, a close-ended, quantitative version of the survey was previously developed and validated in Ghana (Macarayan et al., 2019; Uy et al., 2019).

**Variables**

Eight multiple-choice questions—referred to as ‘authority level’ questions—were selected from the PMA survey to measure two aspects of facility autonomy: (1) decision-makers responsible for specific facility decisions and (2) the overall de facto decision space of facility managers.

These questions started by posing different situations that could arise in everyday health facility administration (hiring personnel, disciplinary action, promotion, drug ordering, facility upkeep, approving absences, setting priorities and spending funds). Respondents were then provided with a list of decision-makers and were asked to indicate which one had the most influence in responding to each respective situation. After data were gathered, responses were then grouped into four discrete authority levels (Figure 1): (i) national-level authorities (MOH), (ii) district-level authorities (e.g. District Health Service Commission), (iii) facility-level authorities (e.g. doctors/facility staff) and (iv) undetermined authorities (‘no response’). Answers of ‘other’ were grouped separately from these authority levels. During the development of the survey in Uganda, district-level authority responses were included only for authority-level questions pertaining to human resources management (hiring, disciplinary action and promotion), as the administrative purview of Ugandan district service commissions is restricted to human resources management (Public Service Commission Act, 2008). Two variables were derived from these authority-level questions:

1. **Facility authority for specific decisions**: This was a categorical variable that, for each authority-level question, indicated whether the specific managerial decision was carried out by facility-level authorities or non-facility-level authorities (e.g. national, district, undetermined and other authorities).

2. **Overall facility authority score**: This was an ordinal variable used as a measure of overall self-perceived de facto decision space for health facility administrators, with a minimum possible score of 0 and a maximum possible score of 8. This was the total number of times a respondent attributed managerial decisions posed by authority-level questions to facility-level authorities.

Associations of overall facility authority scores with three indicators of managerial performance were explored using data available in the PMA PHC facility questionnaire (S1). The domains of managerial performance included:

- (a) **Essential Drug Index**: It is a proportion of availability of up to 20 drugs deemed essential by the Ugandan MOH, which was adapted from the Service Delivery Indicators’ list of essential drugs and a similar index used in Ghana (Macarayan et al., 2019). For the Ugandan version of the index, Ugandan MOH essential drug guidelines were consulted to determine what drugs were considered essential (Ministry of Health, 2016).

- (b) **Quality Improvement (QI) Index**: It comprises 13 multiple-choice, Likert-scale and yes–no items assessing adherence to QI guidelines set out by the Uganda MOH (Ministry of Health, 2015a; 2019). Answers to these questions were summed and then divided by the maximum observed score (10.75) to create a ratio score from 0 to 1.

- (c) **PM Index**: It comprises six multiple-choice and yes–no items assessing adherence to PM activities deemed as best practice by guidelines set out by the MOH.

---

![Figure 1. Methodology for Grouping Questionnaire Responses into Authority Levels.](image-url)
sampling and data collection
A multi-stage cluster sample design was used to probabilistically select enumeration areas (EAs) stratified by urban and rural areas, each of which contained approximately 200 households. Public facilities with catchment areas that overlapped with the boundaries of an EA and up to three randomly chosen private facilities within an EA were eligible to be sampled. In Uganda’s formal healthcare system, patients are referred to facilities of ascending complexity and capacity, depending on the severity of their conditions. Level-II health centres are the smallest facilities, providing basic preventative outpatient care, while national referral hospitals are the largest, offering a full range of inpatient and outpatient services (Institute for Health Metrics and Evaluation, 2014). Only public and private facilities that feed into this formal referral system were included in this study (e.g. hospitals and health centres). Therefore, chemists, pharmacies and private health clinics (which do not participate in this referral system and are distinct from private health centres) were excluded (Uganda Legal Information Institute, 2016). Decision space and managerial performance data were collected using a questionnaire, with a trained enumerator eliciting responses from a primary respondent for each health facility. Eligible respondents included the medical director, medical superintendent, or director of nursing of a public hospital or nurse-, midwife- or physician-in charge of a health centre, and the owner, managing partner, administrator or the highest-ranking doctor of a private facility. Facilities without an eligible respondent present at the time of questionnaire administration were excluded. Overall, 250 of 398 sampled facilities were included in our analysis (Table 1, Table S2).

analysis
Descriptive statistics
Cronbach’s alpha—a measure of scale quality that assesses internal consistency of questionnaire items—was calculated for the eight authority-level questions and managerial indicators. Overall facility authority scores and answers to individual authority-level questions were stratified by facility type and authority level, respectively, and graphically depicted. Descriptive statistics for overall facility authority scores and answers to authority-level questions were also assessed using counts and percentages. Chi-square tests were used to determine between-group differences on responses to specific authority-level questions.

Associations between managerial performance indicators and overall facility authority scores
Ordinary least squares (OLS) regression was used to predict the effects of our exposure of interest on our three outcome measures based on changes in overall facility authority scores. Based on previous studies using the PMA PHC facility data, the variables of public/private ownership, region, urban/rural distribution and facility type were included as covariates in our models (Macarayan et al., 2019; Uy et al., 2019). An interaction term between urban/rural and facility type was included as a covariate as well due to documented disparities in institutional capabilities of Ugandan hospitals, which have been attributed to whether these hospitals were located in urban or rural locations (Bossert and Beauvais, 2002). Bonferroni’s correction was used for each model to account for multiple comparisons. As each model tested 12 hypotheses, Bonferroni’s correction gave us a new significance cutoff of $\alpha = 0.004$. Our outcome variables measuring QI and PM were reflected and log-transformed in order to account for their negative skewness and non-normal distributions. Predicted values for outcome measures based on our OLS models were then obtained at 90% and 10% percentiles of overall facility authority scores to determine differences in managerial performance associated with higher and lower levels of local autonomy within our sample.

results
Decision space of local facility managers
Out of the 250 facilities included in our analyses, 47 (18.8%) were national referral, regional referral or general hospitals; 59 (23.6%) were level-IV health centres; 81 (32.4%) were level-III health centres and 63 (25.2%) were level-II health centres. Most (224, 89.6%) facilities were publicly owned while some (26, 10.4%) were privately owned (Table 1).

Regarding personnel management, public facility managers reported that decisions of recruitment and promotion were largely made at the district level (recruitment = 81.7%; promotion = 85.3%). However, a smaller proportion of public facility managers reported that decisions of discipline were made at the district level (58.9%), with almost a third reporting instead that facility-level authorities were responsible for these decisions (37.1%). No between-group difference for disciplinary autonomy was observed among different types of public facilities ($\chi^2 = 3.53, P = 0.316$). However, significant

Table 1. Descriptive statistics of health facilities in sample

| Characteristics | Facilities (N = 250) |
|-----------------|---------------------|
| Region          |                     |
| Central         | 55                  | 22.0 |
| Eastern         | 75                  | 30   |
| Northern        | 61                  | 24.4 |
| Western         | 59                  | 23.6 |
| Urban/Rural     | Facility type       | N    | %   |
| Urban Health centre |            | 9    | 3.6 |
| Level IV        | 3                   | 1.2  |
| Level III       | 12                  | 4.8  |
| Level III       | 8                   | 3.2  |
| Rural Hospital  |                     |
| Level IV        | 36                  | 15.2 |
| Level III       | 69                  | 27.6 |
| Level III       | 55                  | 22.0 |
| Ownership       |                     |
| Public          | 224                 | 89.6 |
| Private         | 26                  | 10.4 |
| Facility size   |                     |
| Hospital        |                      |
| Level IV        | 139                 | 0–400|
| Level III       | 38                  | 0–120|
| Level II        | 0                   | 0    |
between-group differences were observed between public and private Ugandan healthcare facilities on autonomy in discipline ($\chi^2 = 29.07$, $P < 0.001$), recruitment ($\chi^2 = 127.00$, $P < 0.001$) and promotion ($\chi^2 = 85.37$, $P < 0.001$). Private facility managers largely reported greater human resources autonomy compared with their public counterparts, indicating that decision-making authority for discipline (92.3%), promotion (65.4%) and recruitment (73.1%) rested at the local level.

For most other decisions assessed by the authority-level questions (facility upkeep, setting priorities, approving absences, ordering drugs and spending funds), a majority of both public and private facility managers reported that these were made by facility-level authorities (facility upkeep = 88%, setting priorities = 80%, approving absences = 96.8%, ordering drugs = 65.2% and spending funds = 53.6%; Figure 2A and B).

Although the majority of facilities (65.2%) indicated autonomy over drug ordering, this was affected by the variables of facility type and public/private ownership. Significant between-group differences were seen in drug-ordering autonomy based on facility type ($\chi^2 = 33.94$, $P < 0.001$), with 89.4% of hospitals indicating facility-level authority over drug ordering, 76.3% of level-IV health centres, 54.3% of level-III health centres and 50.1% of level-II health centres. This between-group significance persisted when comparing the drug-ordering autonomy of hospitals and level-IV health centres vs level-III and -II health centres.

**Figure 2.** (A) Distributions for authority-level questions assessing personnel management. (B) (middle) Distributions for non-personnel management authority level questions. (C) Distributions of overall facility authority scores.

**Table 2.** Predicted scores for outcome measures at 90th and 10th percentiles of authority level scores indicating facility autonomy based on OLS regression models

| Level of facility autonomy               | 90th Percentile | 10th Percentile | Relative (%) change in score |
|-----------------------------------------|-----------------|-----------------|------------------------------|
| Predicted                               | SE              | Predicted       | SEM                          |                              |
| Essential drug availability             | 0.678           | 0.026           | 0.559                        | 0.019                        | 21.3%*                       |
| Quality improvement                     | 10.5            | 0.064           | 10.4                         | 0.046                        | 1.4%                         |
| Performance management                  | 6.29            | 0.039           | 6.38                         | 0.050                        | -1.4%                        |

Level of facility autonomy measured via overall facility authority scores. 
*Association is significant at $\alpha = 0.004$ (after accounting for multiple comparisons).
indicating that the former had significantly higher drug-ordering autonomy ($\chi^2 = 25.11, P < 0.001$). No significant between-group differences in drug-ordering autonomy were seen when comparing hospitals with level-IV health centres ($\chi^2 = 3.34, P = 0.19$) and level-III with level-II health centres ($\chi^2 = 3.96, P = 0.265$). Additionally, significantly different between-group differences in drug-ordering autonomy were observed between public and private facilities ($\chi^2 = 9.88, P = 0.02$), with almost all private facilities (92.3%) indicating autonomy over drug ordering compared with 62.1% of public facilities.

Finally, a majority (53.6%) of facility managers reported that facility-level authorities spent internally generated funds. Private facilities were much more likely to indicate spending autonomy (96.2%) than public facilities (48.7%). Of these public facilities, hospitals were significantly more likely to report autonomy over spending (72.7%) than level-IV, -III and -II health centres (43.1%, 47.9% and 41.7%, respectively) ($\chi^2 = 18.08, P = 0.034$).

The maximum overall facility authority score reported was 8, while the minimum overall facility authority score reported was 1 (minimum possible = 0). Overall, the overall facility authority score distribution was bimodally distributed [median = 4, interquartile range (IQR) = 3–6; Figure 2C]. This bimodality was mostly due to private hospitals, which tended to report higher overall facility authority scores (median = 8, mean = 7.5) than the public hospitals or health centres. Conversely, overall facility authority scores for all health centres and public hospitals were more normally distributed (median = 4, mean = 4.25). The eight authority-level questions demonstrated acceptable internal consistency ($\alpha = 0.6021$).

**Associations of local autonomy with managerial performance measures**

Median Essential Drug Availability (ED), PM, and QI Index scores were 0.69, 0.87 and 0.78 (out of 1) respectively. Total score distributions for our indicators of managerial performance tended to be negatively skewed [median$_{ED} = 0.688$, IQR$_{ED} = 0.375–0.85$; median$_{PM} = 0.87$, IQR$_{PM} = 0.67–0.98$; median$_{QI} = 0.78$, IQR$_{QI} = 0.53–0.86$]. Cronbach’s alpha for our ED, PM and QI Indices were 0.89, 0.69 and 0.85, respectively, indicating average to good internal consistency.

After Bonferroni’s correction ($\alpha = 0.004$) and controlling for the covariates of public/private ownership, region, urban/rural distribution, facility type and the interaction between urban/rural and facility type, higher overall facility authority scores were associated with higher ED ($P = 0.002$) (S3). Our model predicted that facilities with overall facility authority scores in the 90th percentile would have 21.3% more essential drugs available at a given time than those with facility-level autonomy scores in the 10th percentile (Table 2). Furthermore, for our authority-level question assessing specifically drug-ordering autonomy, two-sample independent $t$-tests revealed that facilities which attributed drug-ordering autonomy to facility-level authorities had significantly higher ED (mean = 0.656, SD = 0.288) compared with facilities that did not [mean = 0.509, SD = 0.290; $t(248) = 3.83, P < 0.001$]. We also found that hospitals and level-IV health centres, which are able to individually requisition drugs from the National Medical Stores (NMS), had higher ED (mean = 0.775, SD = 0.233) than level-III and -II health centres (mean = 0.480, SD = 0.276), which receive predetermined essential drug kits from the NMS [$t(248) = 8.92, P < 0.001$].

After controlling for multiple comparisons, associations between overall facility authority scores and our indicators measuring QI ($P = 0.042$) and PM ($P = 0.375$) did not reach significance. Our models also found that the covariate of facility type was significantly associated with outcome measures. Specifically, level-II health centres were associated with lower ED compared with hospitals ($P < 0.001$). Public vs private ownership was not found to be significantly associated with managerial indicators.

**Discussion**

This study, through a decision space analysis of individual Ugandan healthcare facilities, has illustrated the current status of healthcare devolution in the country and has shed light upon the broader relationship between managerial autonomy and health facility performance.

Current *de jure* policies in the Ugandan healthcare system indicate that general administrative tasks and healthcare delivery should be carried out by facility-level entities, with executive control and oversight from district-level entities (i.e. DHMTs) (Tashoya et al., 2018). District-level entities are also meant to be responsible for human resources planning and PM responsibilities, such as recruiting, promoting and disciplining staff (Public Service Commission Act, 2008). Our study mostly found concordance between these *de jure* policies and the *de facto* autonomy reported by health facility managers, which is notable when considering that successful devolution of authority from central to peripheral decision-makers has not always been observed in decision space research, even in countries with ongoing decentralization efforts (Kigume et al., 2018; Mohammed et al., 2016). However, several exceptions did exist. For example, although public facilities indicated district-level entities had authority over recruitment and promotion, some of these facilities had taken on *de facto* control of disciplinary decisions. This could be because recruitment and promotion of health workers are more subject to financial constraints compared with discipline. Alonso-Garbayo et al. (2017) found that Ugandan DHMTs felt similarly constrained in making decisions of recruitment and promotion as, although they had a high level of autonomy in forecasting health sector staffing needs, they had more difficulty in receiving authorization from district governments to act upon their predictions due to budgetary restrictions. However, discipline—or firing of health workers—would result in a decrease in a health system’s financial burden, as opposed to recruitment and promotion, which would require input of financial or logistical resources. As a result, district authorities may be more likely to approve facility requests for discipline (compared with recruitment and promotion). This may lead to facility managers having higher perceived *de facto* disciplinary autonomy than expected. In Uganda, the inability of facility managers to hire and fire staff has been recognized as a constraining factor for health facility performance. Recent health system innovations characterized by performance-based financing have been thereby implemented in both private and public facilities. These measures aim to financially empower facilities to recruit personnel...
also found that nearly half (44.5%) of public health centres utilize this additional revenue stream. However, our study be contextualized as the proportion of public hospitals that privileges for patients able to afford these services. Our finding These private wings operate outside of the Ugandan public health system, where all facilities were responsible for quantifying their own drug needs, to a hybrid ‘push-pull’ system, where facilities either manage their own supply chains or delegate this responsibility upwards to more central administrative levels. Studies have shown that while some level-III and -II health centre personnel believe these changes have improved efficiency of drug delivery, others claim that the unique consumption needs of their specific areas are not taken into account enough by central planners, resulting in stock-outs of highly essential drugs (i.e. antibiotics and anti-malarials) and excess stock of less essential drugs (i.e. anti-diarrhoea drugs) (Bukuluki et al., 2013). These concerns are corroborated by our own results, as our models found that level-II health centres were associated with lower ED compared with hospitals. Therefore, while our data indicate that Uganda’s shift towards a hybrid ‘push-pull’ medical supply-chain model is undergoing adoption by individual healthcare facilities, it also suggests that smaller facilities may be more susceptible to essential drug stock-outs due to decreased supply-chain responsiveness to changes in local demand.

Our study found that, among public facilities, hospitals were more likely to indicate facility-level autonomy over the spending of internally generated funds than health centres. Since the abolition of user fees in Uganda in 2001, most of the revenue generated by public health facilities should come from external sources, such as the MOH or development partners (Ministry of Health, 2017). An exception can be seen in public hospitals, however, as after the abolition of user fees, many public hospitals established private wings as a way to bolster their revenues outside of grants from the MOH or non-governmental organizations (Ministry of Health, 2010). These private wings operate outside of the Ugandan public healthcare system and provide faster care and greater privileges for patients able to afford these services. Our finding that 72.7% of public hospital managers reported facility-level autonomy over internally generated funds could thereby be contextualized as the proportion of public hospitals that utilize this additional revenue stream. However, our study also found that nearly half (44.5%) of public health centres attributed spending of internally generated funds to facility-level authorities, despite the lack of private wings in these facilities—meaning they should not generating internal funds in the first place (Ministry of Health, 2017). This indicates potential confusion from some respondents over the distinction between internally generated funds (earned on the level of the facility) and total revenue, which can be composed of both internally generated funds and funding from district governments and development partners.

Our study was also able to further characterize the relationship between managerial autonomy and health system performance. Controlling for facility characteristics, overall facility authority scores—our measure of de facto decision space for individual facilities—were positively associated with ED. Furthermore, facilities that indicated greater autonomy over drug ordering had significantly higher ED than those that did not. These findings elaborate upon previous research establishing synergistic relationships between de facto decision space for district-level administrators and institutional capacity in Pakistan, demonstrating a similar relationship in Uganda between de facto decision space for lower-level, facility managers and ED, which can be seen as a possible outcome of improved capacity (Bossert and Mitchell, 2011). However, no significant associations were found between de facto decision space and our measures of PM and QI. This suggests that the relationship between managerial autonomy and health system performance is multifaceted and complex. Although increasing decision space may be associated with improvements in one managerial function, these improvements may not carry over to other functions. This difference is consistent with conclusions from previous decision space literature. Bossert et al. (2007) found that in drug-ordering supply chains in Ghana and Guatemala, increased decision space was associated with poorer performance in some functions such as inventory control, while it was associated with improved performance in other functions such as planning and budgeting. The authors hypothesized that this difference may be explained by other factors that mediate the relationship between decision space and performance, such as managerial competence and responsiveness. Liwanag and Wyss (2018) found that in the Philippines, which has been undergoing devolution for the past 25 years, most local-level public health decisions are made by elected local officials—politicians who may not have expertise in health system administration, instead of local health officers—physicians who are the de jure authorities on the health sector. This was reported by study participants as a hindering factor in healthcare delivery. Similarly, in Uganda, our study found greater ED in larger hospitals and health centres, whose administrators can independently requisition their own drugs in accordance with facility need, compared with smaller health centres, which receive predetermined essential drug kits from the NMS. Therefore, our findings may reinforce the importance of factors specific to managerial functions, such as ability to respond to changes in essential drug need, in mediating the association between decision space and performance of managerial functions.

There were a number of limitations to our study. First, since this study exclusively used cross-sectional data, outcomes that were more susceptible to daily fluctuations in supply, such as ED, may be more prone to error. Additionally, this meant that only inter-facility comparisons of de facto
decision space could be made, restricting our analysis from assessing the possible effects of changes in intra-facility de facto decision space on managerial performance. Second, due to the design of the PMA PHC questionnaire, participants were not able to clarify responses of ‘other’ to authority-level questions. Therefore, the particular authority level these responses specify remains unclear. However, the proportion of respondents that answered ‘other’ for authority-level questions was relatively marginal (0% to 6%; Figure 2A and B). Therefore, we predict that this ambiguity did not significantly impact authority-level distributions for individual questions or overall facility authority scores. Third, this study only assessed primary decision-makers responsible for facility actions. As a result, action necessitating equal input from multiple authority levels have been simplified in our analysis. Additionally, it is possible that our questionnaire is not sensitive to discrepancies in de facto and de jure decision space due to inadequate respondent knowledge (i.e. a respondent at a public health centre believes recruitment decisions are made on a facility level when in fact they are made at a district level). A follow-up survey asking the districts themselves whether they have de facto control over the functions attributed to them by facility managers in this study is needed. Finally, although items from the survey used in this study have been previously validated for use in Ghana, they have not yet been subsequently validated in Uganda. Additionally, the items used for our authority-level questions have not yet been formally validated in LMICs; however, our preliminary validation of these items showed that they demonstrated acceptable internal consistency. It should also be noted that this study’s outcome measures are meant to capture quality of healthcare management, rather than quality of healthcare delivery. Previous research has shown that managerial indicators, while useful, are sometimes incongruent with the actual quality of care delivered at a health facility (Komakech, 2005).

Conclusion

Our study has shown that decision space analysis, traditionally used to determine the autonomy of middle- and lower-level governments and managerial units, can also be used to study individual healthcare facilities. It also related decision space to public and private sector facilities in Uganda’s formal referral system of healthcare and to different levels of capacity (i.e. from larger hospitals to smaller health centres) and determined associations between decision space and specific managerial functions. We found that, although Ugandan district-level entities are meant to have executive authority over personnel management, this was not seen for all personnel management functions. Namely, authority over discipline of staff seems to have devolved to be shared among both district- and facility-level personnel. However, district-level entities still maintain control over personnel management functions requiring greater human resources and financial investment—such as recruitment and promotion. This suggests administrative functions more subject to financial constraints are less subject to devolution of authority to lower administrative levels. We also saw higher drug-ordering autonomy for hospitals and level-IV health centres compared with level-III and -II health centres. This suggests that previous reforms to change Uganda’s medical supply-chain infrastructure to a hybrid ‘push-pull’ system have been adopted by a majority of public health facilities. Finally, we concluded that increased decision space may be associated with improved performance in some managerial functions, such as essential drug ordering, but not others, such as PM or QI. This difference may be due to factors such as knowledge of one’s own de facto decision space, ability to exercise decision-making autonomy in response to changes in local need, mechanisms of accountability for managerial performance, or facility capacity and access to resources. Future research is needed to both identify and create interventions to address such factors that mediate the relationship between decision space and specific managerial functions. We believe this is necessary for effective implementation of decentralization efforts, facilitating the development of strong healthcare management to meet the logistical challenges of ensuring equitable healthcare delivery for all.

Supplementary data

Supplementary data are available at Health Policy and Planning online.

Data availability statement

The datasets supporting the conclusions of this article may be requested from the PMA 2020 repository (https://www.pma2020.org/request-access-to-datasets) managed and maintained by the Johns Hopkins Bloomberg School of Public Health, Department of Population, Family and Reproductive Health. The Stata codes used for data processing and analyses are available from the corresponding author on reasonable request.

Funding

This work was supported by the Bill & Melinda Gates Foundation (Grant No. OPP1149078) and the Feinberg School of Medicine’s Area of Scholarly Concentration (AOSC) Program, which played no role in the study design; data collection, analysis, and interpretation; manuscript writing; or submission for publication. Funding was given as part of the AOSC summer research stipend, which is given to rising second year medical students conducting research over the summer.

Acknowledgements

The authors would like to thank the enumerators in Uganda who collected data used in this study and the survey respondents who gave their time to this study. We would also like to thank Dr Frederick Makumbi, Dr Peter Kibira, and their team at the Makerere School of Public Health for spearheading data collection and curation efforts.

Ethical approval
de fixation. The study protocol was approved by Institutional Review Boards at Makerere University School of Public Health (Ref: HDREC 637), the Uganda National Council for Science and Technology (Ref: SS4869), the
Conflict of interest statement The authors have no conflicts of interest to report.

References
Alonso-Garbayo A, Raven J, Theobald S et al. 2017. Decision space for health workforce management in decentralized settings: a case study in Uganda. Health Policy and Planning 32: ii59–66.
Barasa E, Manyara A, Molyneux S, Tsofa B. 2017. Decentralization within decentralization: county hospital autonomy under devolution in Kenya. PLoS One 12: e0182440.
Bhalla K, Shotten M. 2019. Building road safety institutions in low- and middle-income countries: the case of Argentina. Health Systems and Reform 5: 121–33.
Bloom N, Lemos R, Sadun R, Van Reenen J. 2020. Healthy business? Managerial education and management in healthcare. The Review of Economics and Statistics 102: 506–17.
Bloom N, Sadun R, Van Reenen J. 2017a. Management as a technology? NBER Working Paper Series. Boston, MA: National Bureau of Economic Research.
Bossert T. 1998. Analyzing the decentralization of health systems in developing countries: decision space, innovation and performance. Social Science and Medicine 47: 1513–27.
Bossert T. 2015. Empirical studies of an approach to decentralization: “decision space” in decentralized health systems. In: Faguet J-P, Pöschl C (eds). Is Decentralization Good for Development?: Perspectives from Academics and Policy Makers. London: Oxford University Press, 277–98.
Bossert T. 2016. Decision space and capacities in the decentralization of health services in Fiji: comment on “decentralisation of health services in Fiji: a decision space analysis”. International Journal of Health Policy and Management 5: 443–4.
Bossert T, Beauvais JC. 2002. Decentralization of health systems in Ghana, Zambia, Uganda and the Philippines: a comparative analysis of decision space. Health Policy and Planning 17: 14–31.
Bossert T, Bowser D, Amenjah Y. 2007. Is decentralization good for logistics systems? Evidence on essential medicine logistics in Ghana and Guatemala. Health Policy and Planning 22: 73–82.
Bossert T, Mitchell A. 2011. Health sector decentralization and local decision-making: decision space, institutional capacities and accountability in Pakistan. Social Science and Medicine 72: 39–48.
Bukuluki P, Byansi PK, Sengendo J et al. 2013. Changing from the “Pull” to the “Push” system of distributing essential medicines and health supplies in Uganda: implications for efficient allocation of medicines and meeting the localized needs of health facilities. Global Health Governance 6: 1–11.
Cahyaningsh A, Fitrady A. 2019. The impact of asymmetric fiscal decentralization on education and health outcomes: evidence from Papua Province, Indonesia. Economics and Sociology 12: 48–63.
Cammack D, Golooba-Mutebi F, Kanyongolo F, O’Neill T. 2007. Neopatrimonial politics, decentralisation and local government: Uganda and Malawi in 2006. Working and Discussion Papers. London: Overseas Development Institute
Green E 2008. District creation and decentralization in Uganda. Crisis States Working Paper Series No. 2. London: London School of Economics
Henriksson D, Aybare F, Waiswa P et al. 2017. Enablers and barriers to evidence based planning in the district health system in Uganda; perceptions of district health managers. BMC Health Services Research 17: 103.
Hizaamu R. 2014. Analysis of public administration system reform process in Uganda: to what extent did it attain its objectives. International Journal of Public Administration and Management Research 2: 9–23.
Institute for Health Metrics and Evaluation, 2014. Health Service Provision in Uganda: Assessing Facility Capacity, Costs of Care, and Patient Perspectives. Seattle, WA: IHME.
Jafari M, Rashidian A, Abolhasani F et al. 2010. Space or no space for managing public hospitals; a qualitative study of hospital autonomy in Iran. The International Journal of Health Planning and Management 26: 121–37.
James C, Beazley L, Penn C, Philips L, Dougherty S. 2019. Decentralisation in the health sector and responsibilities across levels of government. OECD Journal on Budgeting 19: 13–28.
Kigume R, Maluka S, Kamuzora P. 2018. Decentralisation and health services delivery in Tanzania: analysis of decision space in planning, allocation, and use of financial resources. International Journal of Health Planning and Management 33: e621–35.
Komakech I. 2005. The curse of league tables: how Uganda missed the point. Health Policy and Development 3: 164–9.
Lagreid P, Verhoest K, Jann W. 2008. The governance, autonomy and coordination of public sector organizations. Public Organization Review 8: 93–6.
Litvack J, Ahmad J, Bird R. 1998. Rethinking Decentralization in Developing Countries. Washington, DC: World Bank.
Liwanag HJ, Wyss K. 2018. What conditions enable decentralization to improve the health system? Qualitative analysis of perspectives on decision space after 25 years of devolution in the Philippines. PLoS One 13: e026809.
Macarayan E, Ratcliffe H, Otupiri E et al. 2019. Facility management associated with improved primary health care outcomes in Ghana. PLoS One 14: e0218662.
Marchildon GP, Bossert TJ. 2018. An Introduction to Federalism and Decentralization in Health Care, In: Marchildon G, Bossert TJ. (eds). Federalism and Decentralization in Health Care. Toronto: University of Toronto Press, pp. 3–15.
Marchildon G, Bossert T. 2018. Federalism and Decentralization in Health Care: A Decision Space Approach. Toronto: University of Toronto Press.
Miah N, Mia L. 1996. Decentralization, accounting controls and performance of government organizations: a New Zealand empirical study. Financial Accountability and Management 12: 173–90.
Ministry of Health. 2010. Guidelines for Management of Private Wings of Health Units in Uganda. Kampala: Ministry of Health.
Ministry of Health. 2011. Assessment of the Essential Medicines Kit-Based Supply System in Uganda. Kampala: Ministry of Health.
Ministry of Health. 2015a. Performance Management Implementation Guidelines for the Health Sector. Kampala: Ministry of Health.
Ministry of Health. 2015b. The Quality Improvement Methods: A Manual for Health Workers in Uganda. Kampala: Ministry of Health.
Ministry of Health. 2016. Essential Medicines and Health Supplies List for Uganda (EMHSLU). Kampala: Ministry of Health.
Ministry of Health. 2017. Uganda Health Accounts: National Health Expenditure Financial Years 2014/15 and 2015/16. Kampala: Ministry of Health.
Ministry of Health. 2019. 5S-Continuous Quality Improvement (Kaizen)-Total Quality Management Implementation Guidelines in Uganda. Kampala: Ministry of Health.
Mohammed J, North N, Ashton T. 2016. Decentralisation of health services in Fiji: a decision space analysis. International Journal of Health Policy Management 5: 173–81.
Mukonzo JK, Namuwenge PM, Okure G et al. 2013. Over-the-counter suboptimal dispensing of antibiotics in Uganda. Journal of Multidisciplinary Healthcare 6: 303.
Park S, Lee J, Ikai H, Otsubo T, Imanaka Y. 2013. Decentralization and centralization of healthcare resources: investigating the associations of hospital competition and number of cardiologists per hospital.

Johns Hopkins Bloomberg School of Public Health (protocol 7238), Northwestern University (protocol 00211507) and the Mass General Brigham Human Research Committee (protocol 2016P002284).
with mortality and resource utilization in Japan. *Health Policy* 113: 100–9.

Peckham S, Exworthy M, Powell M, Greener I. 2015. *Decentralisation, Centralisation and Devolution in Publicly Funded Health Services: Decentralisation as an Organisational Model for Health-care in England*. London: National Co-ordinating Centre for NHS Service Delivery and Organisation R&D (NCCSDO).

Peters BG. 2005. *The Search for Coordination and Coherence in Public Policy: Return to the Centre?*. Pittsburgh, PA: Department of Political Science, University of Pittsburgh.

Pmadata.org. 2020. Uganda. PMA Data. [https://www.pmadata.org/countries/uganda](https://www.pmadata.org/countries/uganda), accessed 15 November 2020.

Renmans D, Holvoet N, Criel B. 2017. Combining theory-driven evaluation and causal loop diagramming for opening the ‘black box’ of an intervention in the health sector: a case of performance-based financing in Western Uganda. *International Journal of Environmental Research and Public Health* 14: 1007.

Roman T, Cleary S, McIntyre D. 2017. Exploring the functioning of decision space: a review of the available health systems literature. *International Journal of Health Policy and Management* 6: 1–12.

Sengooba F, Ekirapa E, Musila T, Ssennyonjo A. 2015. Learning from multiple results-based financing schemes: an analysis of the policy process for scale-up in Uganda. In: Sengooba F (ed). *Alliance for Health Policy and Systems Research*. Kampala: Makerere School of Public Health.

Ssennyonjo A, Namakula J, Kasyaba R *et al*. 2018. Government resource contributions to the private-not-for-profit sector in Uganda: evolution, adaptations and implications for universal health coverage. *International Journal for Equity in Health* 17: 2.

Tashobya CK, Ogora VA, Kiwanuka SN *et al*. 2018. Decentralisation and the Uganda health system: what can we learn from past experiences to facilitate the achievement of Universal Health Coverage? In: Sengooba F, Kiwanuka SN, Rutebemberwa E, Ekirapa-Kiracho E (eds). *Universal Health Coverage in Uganda: Looking Back and Forward to Speed up the Progress*. Kampala: Makerere University: pp. 16–20.

Uganda Legal Information Institute. 2016. *Local Governments Act 1997*. Uganda Legal Information Institute, Kampala.

Ugandan Parliament. *Public Service Commission Act*. 2008. [https://ulii.org/ug/legislation/act/2015/11](https://ulii.org/ug/legislation/act/2015/11), accessed 15 November 2020.

Uy J, Macarayan E, Ratcliffe H *et al*. 2019. Preliminary validation of the Primary care facility Management Evaluation tool (PRIME-Tool), a national facility management survey implemented in Ghana. *BMC Health Services Research* 19: 2–4.

Yilmaz S, Beris Y, Serrano-Berthet R. 2008. Local government discretion and accountability: a diagnostic framework for local governance. *Social Development Working Papers: Local Governance and Accountability Series*. Washington, DC: The World Bank.